

together. Plants like *Trichoglottis fasciata*, which we shall discuss later, are rather intermediate in habit. The term climbing orchid is however useful, and there are a number of Vandas, Scorpion orchids and their allies to which it strictly applies.

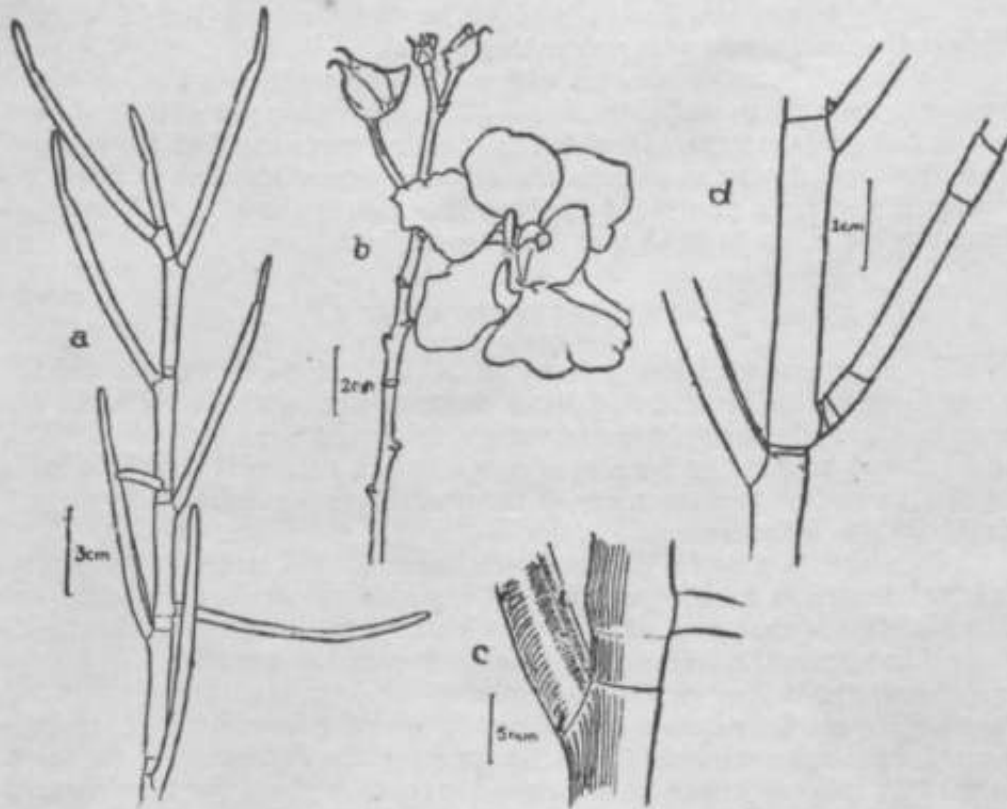


Fig. 7. *Vanda Miss Joaquim*. *a*, stem bearing leaves and roots, *b*, old inflorescence, *c*, base of leaf and top of its sheath, with base of sheath of leaf next above, *d*, base of scape showing relation to leaf-sheath.

The roots of our *Vanda* thus serve as supporting organs. But the primary service of a root is to absorb water, and with it various substances in solution. This the climbing roots do also. When they are dry, they appear silvery white on the outside, except near the growing tips; when wet they are green. The silvery appearance is given by a special layer of dead absorbent cells on the outside of the root, which serves as a sort of sponge, taking up at once rain or dew, and passing it on to the water-conducting channels inside. This absorbing layer is found in all air-roots of orchids (including *Dendrobium*, where the roots are much thinner), and is called the *velamen*.

The supporting roots of the *Vanda* which hold on to the bark of a tree or similar support for a short distance probably do not provide much in the way of dissolved substances for the plant. But we find that some of the lower roots grow down to the ground, and there branch very much when they can grow into a mass of dead leaves or other debris, losing their

silvery cover and becoming irregularly swollen, creamy-white in colour. These feeding roots are always infected with a fungus, which undoubtedly helps them to absorb food from the decaying leaves. Any root of the *Vanda* can become a feeding root if it finds a suitable place; some of them may grow into a layer of moss or old fern-roots on a tree, as do the roots of most epiphytic orchids. But it is usual for the climbing *Vandas* to find their main food supply on or near the ground.

In garden practice we give such a plant a wooden support, to which its aerial roots cling, and at the base of the support we put a litter of dead leaves and grass-cuttings, in which the feeding roots can find their needs. The plant will flower as soon as the growing top of its stem is above its supports, just as in nature its climbing stem flowers as soon as it emerges from the top of its bush or tree into the sunlight.

### THE INFLORESCENCE

We have now examined in some detail the individual flowers and the general vegetative structure of three common representative orchids. We must now consider some further details which indicate the kind of variation to be found within the family as a whole (as represented in Malaya), before proceeding to a summary of the classification scheme. First we will deal with the *inflorescence*.

This term is a useful one, and will be much used in this book; but as it is not a word in common use, a short explanatory note is here given. The inflorescence is that part of a plant which bears the flowers. Taking all flowering plants, the form of the inflorescence is most varied; the flowers may be single, in long slender sprays, erect or drooping, in short compact bunches, or much-branched open bunches, and the branching of the last-named may take various forms. In orchids the inflorescence is fairly simple. It consists either of a single flower, or a stem carrying a series of flowers, each with its own stalk of varying length, or the stem may have lateral branches. Always the lowest flower buds open first.\* An unbranched inflorescence of this kind is called a *raceme*; a branched raceme is called a *panicle*.

The stalk of the inflorescence is called a *peduncle* or *scape*; the stalk of the individual flower is called a *pedicel*. The axis of the inflorescence which bears the flowers is called the *rachis*. The inflorescence usually has a number of small leaf-like organs upon it. There is always one of these at the base of each pedicel; they are called *bracts*. Bracts may be of various sizes and shapes; sometimes they fall off as soon as the flowers open, sometimes they remain. Rarely they are large and showy, usually they are small and often inconspicuous; they are always the same in any species and are sometimes a useful means of identification. The function of the bracts is to protect the flower-buds when these are very small. We saw an example of this in the Pigeon orchid. Often there are bract-like leaves (sometimes larger than the floral bracts) on the peduncle; these may be called *sterile bracts*.

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\* In the genus *Oberonia* the middle flowers open first, but this is quite exceptional.

The inflorescence may be *terminal*, at the end of the pseudobulb or leafy stem, terminating its growth, or *lateral*, in the axil of a leaf (*axillary*). None of our three examples has a terminal inflorescence, but such are not uncommon. We find them for example in the common ground orchid *Arundina*. Some species of *Dendrobium* have a terminal inflorescence; some may have both a terminal inflorescence and also lateral ones in the axils of the upper leaves.

The inflorescence may have one or many flowers; it may have a short or long stalk, with the flowers close together or widely spaced; it may stand erect or hang limply downwards. The flowers may open almost all together, the inflorescence being of limited growth; or the flowers may open in a more or less slow succession from the base. An extreme case of the latter condition is when one flower only opens at a time, the next following after it has fallen; this occurs in many orchids, the inflorescence continuing to produce new flowers for many months. An intermediate case is *Vanda* Miss Joaquim, where several flowers are open together, the apex of the inflorescence continuing to grow for some time; a similar condition is also seen in *Spathoglottis*. In many species of *Dendrobium* (including *D. crumenatum*) the inflorescence-axis never elongates, but produces a succession of many flowers.

## TERRESTRIAL ORCHIDS

Terrestrial (or ground) orchids are less abundant in Malaya than epiphytes. We took *Spathoglottis* as our example for a preliminary examination, and found that it is sympodial, with each branch of the sympodium a short fleshy pseudobulb bearing a number of rather large leaves, and lateral inflorescences. We will now consider other growth-forms adopted by terrestrial orchids.

In the genus *Arundina* each new shoot produces a tall slender leafy stem, with a terminal inflorescence which goes on producing new flowers, usually one at a time, for some weeks. When the inflorescence dies, the stem below it often produces short lateral branches which have swollen bases; these later fall off and serve for propagation.

*Spathoglottis plicata* and *Arundina* grow continuously, and have no means of resting. Some other ground orchids, native of countries with a pronounced dry season (such as the north of Malaya), are adapted to rest in the rainless period. One species of *Spathoglottis*, *S. affinis* (wild on Kedah Peak and also in Java, but absent from the southern part of Malaya) has this habit. The leaves die and fall, leaving the fleshy pseudobulbs, which can withstand several months' drought. The resting period in this case (as in many others) is obligatory; the plants are incapable of strong continuous growth, for which reason they can only be kept alive in Singapore by artificial resting.

Another kind of resting-organ is a *tuber*, which is mainly a root structure, with a bud at the tip. A pseudobulb, such as that of *Spathoglottis affinis*, is entirely a stem structure, bearing leaves throughout. In *Habenaria* and other genera (to which belong most of the orchids of north temperate regions) a tuber is formed from a bud at the base of the stem,

or sometimes two tubers if the plant is strong. The tuber rests through the cold or dry season, the bud at its tip sprouting when warm or wet weather occurs, and forming a leafy shoot with terminal inflorescence. The store of food in the tuber is used up in this growth, and the plant must produce another tuber during the growing season to tide over the next resting period. The principle is the same in both cases, but the resting organ is of a different nature. *Habenaria susannsef* native in the north of Malaya, has a tuber of this kind.

Some terrestrial orchids have a rather irregular sympodial growth. They have a creeping leafy stem, the end of which after a time becomes erect and produces a terminal inflorescence. The creeping part of the stem then usually produces a branch near the base of the inflorescence and the process is then repeated. All orchids of the *Goodyera* tribe, and a few species of *Malaxis*, have this habit, which is evidently a primitive one. Such orchids also have no joint at the base of the leaf.

There is another group of terrestrial orchids which have no green leaves at all. The whole food supply for growth and flowering is provided for them by a fungus which exists partly in the surrounding soil (which is always rich in organic matter) and partly in the roots of the orchid. The fungus breaks down the humus of the soil into a form which the orchid can absorb. Such orchids continue throughout their life the entire dependence on the fungus which all orchids experience in their early seedling stages. They are called *saprophytes*. They are found in shady forests, and are often quite small; they are nearly always inconspicuous because of their lack of green colour. They have usually few small leaves, and small dull-coloured flowers. They usually have a resting period, the resting organs differing in character in different species. The exception to the general small size of saprophytic orchids is the genus *Galeola* (related to *Vanilla*) which produces a tall climbing stem with aerial roots (but only tiny leaves) and a large rather conspicuous inflorescence. All Malayan saprophytic orchids except *Cystorchis aphylla* and *Eulophia Zollingeri* belong to one group of genera, which are discussed on p. 89.

### EPIPHYTIC ORCHIDS

The range of form of epiphytic orchids is enormous, and it is impossible here to discuss all its variation. The two examples which we examined in detail showed clearly the difference between sympodial and monopodial apiphytes. Both are found among both wild and cultivated orchids in

*m. Grammitiaphyllum spectabile*), but we find that new growth always arises from a basal bud. The form of the pseudobulb may vary greatly; it may be short and massive or long and slender, or a combination of both as in the pigeon orchid; its leaves may be one or many, arranged only near the tip or other part or throughout the length of the pseudobulb, and they may be large or small, thin or fleshy. The pseudobulbs may be close together or widely spaced. In seasonal climates, new growth occurs when rain

follows the dry season, and at the end of the growing period the plant rests, often losing its leaves during the dry weather, passing through the same cycle each year. The leaves always fall off at the joint between blade and sheath. In Malaya, new growth may be found at almost any time of the year. The inflorescence we have already discussed. Sometimes the flowers are produced as soon as the pseudobulb has finished its growth; sometimes they may only be formed after the leaves have all fallen and a resting period has been passed. Sometimes, as in *Coelogyne*, the inflorescence is formed on the new growth before the pseudobulb proper and its leaves are developed.

Monopodial epiphytes vary from such plants as *Phalsenopsis*, which have a very short stem with leaves very close together, to the extreme case of the climbing *Vandas* and *Scorpion* orchids. They also vary immensely in the size, shape and spacing of their leaves, and in the form of their inflorescence. They cannot, by their nature, form resting organs, but many of them can withstand a considerable period of drought, ceasing new growth for the time being.

The most extremely reduced of monopodial epiphytes are the genus *Tseniophyllum* and its allies, in which there are no green leaves. The leaves are reduced to minute scales, in the axils of which are borne the slender inflorescences; the work normally done by leaves (carbon assimilation) is performed by the green roots.

Such small plants usually occur in moist and shady places, while the larger epiphytes with tough leaves are found in more exposed positions. Every species of orchid is adapted to a particular range of conditions of exposure or shade and of moisture. Some are very exacting, others more tolerant of a variety of conditions in their surroundings. Some only grow in mountains, some only in the lowlands, and some in both. Some Malayan orchids have a wide geographic range, but many of the species found in shady mountain forests are quite local, not existing outside the Peninsula.

The food supply of epiphytic orchids is an interesting problem which is still not entirely understood. It seems incredible that a plant can find enough nourishment when perched on a tree. In fact we nearly always find that there is some organic matter available for orchid roots; and we have seen how seedling orchids and saprophytes make use of a fungus to extract food from such material. The degree to which an adult orchid plant is dependent on fungus infection probably depends on circumstances; there is no doubt that a plant can grow quite healthily without any fungus if it has the necessary supply of mineral salts. The probability is that the fungus, being able to decompose the rotting bark, leaves, etc. in a way which the orchid root cannot, takes up mineral salts which it passes on to the orchid. Supply of such salts is the chief problem for all epiphytes; if they have green leaves they can build up all the carbohydrates and other complex substances they need, provided that minerals are available. Possibly the orchid in some cases provides carbohydrates for the fungus; but in the case of seedlings the reverse process certainly takes place, the fungus supplying not only salts but carbohydrates absorbed from the surrounding humus. Mineral substances are of course only needed by orchids

in very small quantities. The element which is most likely to be deficient is nitrogen, which is needed in the synthesis of proteins, the essential constituents of protoplasm. Some nitrogen may come to the plant dissolved in rain. But most of it must be provided from the humus around the roots, with the help of the fungus. It is not certain that the fungi in the roots of orchids can normally fix nitrogen from the air, as do the bacteria in the roots of legumes, but in some cases they may do this.

### CLASSIFICATION

Throughout this book, we shall use the botanical names of orchids, partly because in most cases they have no other names, and partly because these names are used in all countries. In case the reader is not familiar with the principles on which botanical names are made, a brief explanation is here given.

It is in many cases easy to see that groups of distinct kinds of plants are closely related together. Having studied the flower of the pigeon orchid, we can recognize that other kinds of orchids have a similar general structure, though differing in details. Each kind of wild plant is called a *species*; a group of closely related species is called a *genus*. Thus the Pigeon orchid is a species, and it belongs to a genus called *Dendrobium*, containing many species. Each species has its own name, which is in the form of an adjective (or the genitive case of a noun) written after the generic name, in latinized form. The Pigeon orchid is *Dendrobium crumenatum*.

Though the idea of a genus is easy to understand, in practice it is often not easy to decide where to draw the limit. Some genera are very distinct, with species all nearly related together and not similar to other plants. But in many cases we find a fairly large group of species with several characters in common, yet clearly divisible into smaller groups. Here we have to choose whether to call the larger group a genus, with several divisions, or to rank each division as a genus. Botanists do not always agree on such matters. The tendency at the present time is to divide the old genera; this is often justified, as new comparative studies reveal previously unknown differences of structure. In the group of small genera related to *Vanda*, in particular, recent study has led to many changes of genera.

When a genus is divided, each species keeps its own name, which is attached to a new generic name if necessary. Thus the white Scorpion orchid is called *Renanthera Hookeriana* if one takes a broad view of the genus *Renanthera*; but if one divides that genus into *Renanthera* proper and *Arachnis*, the white Scorpion orchid becomes *Arachnis Hookeriana*.

Sometimes the same species is given two different names by different botanists. In such cases the older name must be used; but sometimes there is dispute as to whether the two names really refer to the same species. Often names which are not the oldest come into common use, and so it may be desirable to quote them as synonyms. The white Scorpion orchid is often called *Arachnis alba*, though that is a later name than *A. Hookeriana*, and so incorrect.

If it is difficult sometimes to decide on the limits of genera, it is much more difficult to decide on the larger divisions of the family, and each new specialist has new ideas on the subject. The division proposed below is a simplified and slightly modified form of Schlechter's arrangement.

The first great division of the orchid family, as we noted above, is between plants with one and with two or three stamens. The great majority of orchids belong to the former group, *Monandrx*. The *Pleonandrx* include only a few native Malayan species, but as cultivated plants the Slipper orchid group are important. A discussion of the subdivision of the Pleonandrx is given later (p. 60).

The Monandrx are usually first divided into two groups on the position and structure of the anther. In the *Basitonx* the base of the anther is in contact with the rostellum, and the anther does not fall when the pollen is removed. In the *Acrotonse* the apex of the anther is in contact with the rostellum, and the anther often falls, though it may be joined by a slender filament (as in *Dendrobium*).

The *Basitonse* include the genera *Orchis*, *Ophrys*, *Habenaria* and others found in north temperate regions. Most of them form tubers, which tide them over the winter. In Malaya this is a small group, under twenty species, most of them small, and only two (from the north) in cultivation. Though placed first, for convenience, they are a highly specialized group, probably originating from ancestors like the primitive *Acrotonae*.

The *Acrotonse* include the great majority of Malaysian orchids. The group is divided again into orchids with granular pollinia, and those with waxy pollinia. There are some exceptions to this division, and the subject is too complicated to be discussed here, but the distinction holds broadly. The species with granular pollinia are the majority of the smaller local terrestrial orchids, including the saprophytes; there are 83 Malayan species. The only plants among them which are ordinarily cultivated are the so-called "Jewel Orchids", which have richly coloured leaves, and *Vanilla*.

The division of the *Acrotonse* with waxy pollinia includes the great majority of Malayan orchids, most of them being epiphytes. It may be divided into sympodial and monopodial groups. The Malayan sympodial genera are divided into 14 tribes. The monopodial genera constitute a single tribe (the great *Vanda-Arachnis* tribe) which includes 158 Malayan species. The divisions here called tribes are ranked by some authors as sub-tribes. Such authors have then to group the sub-tribes into tribes; but, as indicated below, I am doubtful how far such larger groups are natural, and I would prefer to rank the clearly natural groups as tribes. The present treatment is however informal, and I have not proposed latinized names for the tribes.

The tribes of the sympodial genera are in most cases well established, and are unlikely to be greatly changed. The main genera of a tribe usually show a number of obvious resemblances, but in some tribes there is great variation in vegetative characters, and there are often some peculiar genera which have departed to an exceptional extent from the general pattern of the tribe. The correct tribe for a few genera may even be in doubt. In

the same way, a large number of genera contain one or more abnormal species. It is thus not easy to construct an effective key to distinguish the individual tribes, and to base such a key on easily observable characters is not possible. The general key in this book therefore is not a key to the tribes as such; the members of a single tribe may be scattered in many parts of the key.

We call the groups of genera tribes, and by that we imply that the genera in one tribe are related together; that is, they are considered to have a common ancestor. This of course cannot be proved, but it is highly probable. In many cases orchid-breeders have shown that species of one genus will mate with species of another genus in the same tribe, but not with species from other tribes. The possibility of hybridizing is a definite indication of relationship between the species concerned, though the contrary is not always true. There is no known case of genera belonging to different tribes (as now constituted) being inter-fertile. If such a case occurred, the tribal position of the genera would have to be re-considered. *Calanthe* and *Phaius* were formerly placed in different tribes; but when a *Calanthe* was crossed with a *Phaius* the two genera were re-examined, and *Calanthe* brought into the *Phaius* tribe. It is notable however that without the direct evidence of hybridizing most genera have been so grouped that later hybridizing has confirmed their position.

Having grouped our genera into tribes, as we believe satisfactorily, we still have to consider the inter-relations of the tribes, and this is much more difficult; indeed, it has been very little discussed, and is far too complex a problem to present here. We may however briefly consider some of the factors concerned. For convenience we must group the tribes in some way, and the following is the scheme (for orchids with waxy pollinia) adopted in this book:

1. Mainly terrestrial orchids, with some epiphytes in the *Liparis* tribe, the pollinia without a disc.
2. Epiphytic orchids, the pollinia without a disc.
3. Epiphytic and terrestrial orchids, pollinia with a disc and also often with a stipes.

It will be observed that the main division is based on the presence or absence of a disc for the pollinia. By a disc is meant a definite part of the cellular tissue of the rostellum which is detached with the pollinia and to which they adhere. But in many orchids (such as *Spathoglottis*) a sticky mass becomes detached from the rostellum when it is touched, and the distinction between a structural disc and an amorphous mass of sticky substance may not be easy to observe. In some genera, more exact observation on the subject is desirable.

The presence of a disc is a specialized character, and it might be considered that those orchids with a disc are more highly evolved than those without. But the *Goodyera* tribe, which on many grounds is considered primitive, has a well developed disc, whereas *Dendrobium*, which is in many ways highly specialized, has none. It is of course possible that *Dendrobium* has lost the disc in the course of its evolution, though a disc was possessed by its ancestors. If the loss of a disc is possible, such loss



may have occurred in more than one group of orchids, and the disc-less condition may therefore not be any definite evidence of near relationship. Thus it is possible that some of the tribes placed in the group possessing a disc may be more nearly related to some of the disc-less tribes than to each other. This of course is conjecture; it is presented as an indication of the complexity of the problem, and of the probability that the grouping of the tribes here adopted for the sympodial orchids may not be based on any close relationship of the tribes within a group. There can be no doubt, however, of the unique position and high specialization of the monopodial orchids, which have both disc and stipes.

The earlier classifications of orchids were based entirely on the characters of the pollinia. Later authors, notably Pfitzer, saw that such classifications appeared in some cases to be unnatural. Pfitzer therefore introduced other characters into his scheme. These were chiefly: (1) the position of the inflorescence, whether terminal or lateral on each shoot of the sympodium; (2) the way the leaves are folded in a bud, whether the edges of a leaf overlap each other (convolute) or not (duplicate).

The first of these characters is certainly important, and will be used in this book. We must note however that it is sometimes not at all easy to see whether an inflorescence is terminal or lateral; and of course all plants with a terminal inflorescence are not necessarily related together. The folding of the leaves in the bud is also sometimes difficult to observe, and, though it is constant to a remarkable degree, is subject to some curious exceptions; for example, one species of *Eria* is different from all others, and from all *Dendrobiums*, in this character. The character is not used in this book.

The following is a list of all the tribes with which this book is concerned, arranged according to the scheme here adopted:—

SUBFAMILY Pleonandne

Apostasia tribe

The Slipper Orchids

SUBFAMILY Monandrse

BASITONiE: Habenaria

ACROTONJE:

I. Pollinia granular

The Saprophytes and their allies (4 tribes)

Goodyera tribe

Corymborchis tribe

II. Pollinia waxy

1. *Sympodial orchids*

A. Mainly terrestrial: pollinia without disc

Phaius tribe

Nephalaphyllum tribe

Arundina tribe

Sobralia tribe (American)

Liparis tribe

- B. Epiphytes: pollinia without disc  
 Coelogyne tribe  
 Dendrobium tribe  
 Bulbophyllum  
 Cattleya tribe (American)
- C. Epiphytic and terrestrial: pollinia with disc, sometimes also with stipes
- | <i>Malayan</i>       | <i>American</i> |
|----------------------|-----------------|
| Agrostophyllum tribe | Oncidium tribe  |
| Appendicula tribe    | Stanhopea tribe |
| Thelasis tribe       | Catasetum tribe |
| Acriopsis tribe      |                 |
| Eulophia tribe       |                 |
| Bromheadia tribe     |                 |
| Cymbidium tribe      |                 |
2. *Monopodial orchids:*  
 Vanda-Arachnis tribe.

### HYBRIDIZATION

Hybridization is the mating together of two different kinds of plants; it is done by taking the pollen from one flower and placing it on the stigma of the other. The seeds which develop will derive some characters from the male parent and some from the female. The plants which grow from them will usually be different from both parents; they are new kinds of plants. Most new kinds of garden plants are produced in this way, including a very large number of orchids. As we discuss the orchid genera in turn, we shall mention the more important hybrids which are cultivated in Malaya, especially those which have been raised locally. A discussion of hybridization is therefore given here. Details of the handling of seeds and young seedlings will be found in the next section (p. 39).

The result of crossing two plants depends partly on how nearly they are related together. Two plants which differ only in one or two characters (say in colour of flowers only) are usually regarded as *varieties* of the same species. When crossed together, their offspring will vary only in the characters where the parents are different. There are, for example, purple and white varieties of *Spathoglottis plicata*; these crossed together may give various shades of purple or mauve, but probably not white. A hybrid of this kind when self-pollinated may give offspring of the colour of either parent, or intermediates. Some natural species undoubtedly include many such hybrids. For example, the well known and widely distributed *Dendrobium Pflsenopsis* (from the Moluccas to Queensland) has all shades of colour from deep purple to white, and seeds of most plants will give a mixed offspring as regards flower-colour, though uniform in other respects.

If two species differing in many characters are crossed together, the situation is much more complicated. The hybrids usually are more or less intermediate between the two parents, where that is possible, in all parts.

Flowers will be of intermediate size, their parts of intermediate shape and colour. In the case of a first cross between two species, all the offspring will be much alike; except that when one parent is variable (e.g. *Dendrobium Phalsenoysis*) the offspring may show a good deal of variation in colour.

Now if we mate such a hybrid (between two quite distinct species) with one of its parents, or with another species, we get a different result. Instead of having offspring which are all alike, or differing only in flower-colour, we may get every possible combination of the ultimate parental characters. Thus we may have a flower of the shape and size of one original parent with the colouring of the other parent, or any admixture of these two groups of characters. Differences in leaves and in other vegetative characters may also occur. Another type of character is also important, namely vigour of growth and freedom of flowering under local climatic conditions. In a batch of seedlings which differ little in other respects, some may flower much more freely than others; they are thus far more valuable as garden plants.

It is evident that with so much variation in hybrids of the second (or later) generation, there is much scope for selection. The larger the number of plants produced, the greater the chance of a fine and rare combination of characters. We see therefore that to obtain the full benefit of hybridization, we must go beyond the first generation, which is fairly uniform. But here we come against the difficulty that hybrids are sometimes sterile, or almost sterile; or that for some reason a hybrid will not set seed when crossed with a particularly desirable mate. The further hybridization proceeds, the greater the degree of sterility. But as there are so many potential seeds in the ovary of an orchid, there is always the possibility that by some lucky chance a few of them may be fertilized, even if the great majority are not. Many fine hybrids are the result of such a lucky chance.

So far as Malaysian orchids are concerned, we do not yet know what are the limits of fertility in hybrids. If we keep within a small group of species, such as the climbing *Vandas* related to *Miss Joaquim*, it seems that we can carry on our crossing indefinitely. But if our original cross is between two species not very nearly related, the first generation hybrid may be almost sterile when crossed with its parents or any other species, and later generations difficult to obtain. Or the first cross may be fertile when mated with certain species and not with others. It takes time to discover the facts; there is no certain guide. We only know in general that species recognized by botanists as nearly related (on grounds of structure) are usually inter-fertile; but the limits of fertility are not clear. Among plants classified by botanists as *Dendrobium*, it is often impossible to cross species of one group with those of another (e.g. the Burmese species with a group from New Guinea); but in the *Vanda* group species placed by botanists in different genera are freely inter-fertile.

This brings us to the question of crosses between genera. Such have been produced in many cases. The best known are the *Cattleya* group (South American orchids) so much hybridized in Europe and America.

Here we have the genera *Cattleya*, *Lselia*, *Brassavola* and *Sophranitis*, which have all been crossed together, so that hybrids exist which have species of all four genera as their ultimate parents. In Malaya many intergeneric crosses have been made in the *Vanda* group, but (so far as I am aware) only one hybrid derived from three genera has yet been flowered, and in some cases the bigeneric hybrids are almost or quite sterile.

What is the genus of a hybrid of such complex parentage? The convention at present is to give them new "generic" names, formed from *the* names of the parent genera. Thus hybrids derived from crossing species of *Cattleya* with species of *Lselia* are called *Lselio-Cattleya*. If *Brassavola* is also included in the parentage, the name *Brasso-Lselio-Cattleya* is used. But in the case of more than two-parent genera it is often more convenient to devise an entirely new name. Hybrids derived from the four genera above-mentioned are called *Potinara*. Such "genera" are of course merely conventional names for convenience of classification; they are not botanical genera, in the sense of being homogeneous groups.

Hybrids also need their own particular names as well as generic names. The convention here is to give them "fancy" names which are not in a latinized form, so as to distinguish them from botanical species. This has not been done in all cases, but it is a very desirable practice, to avoid confusion. Our *Vanda* Miss Joaquim was so named by Mr. Ridley in 1893, when Miss Joaquim brought him the flower of the plant which had grown in her Singapore garden. It was the result of a cross between the two species *Vanda teres* and *Vanda Hookeriana* which were growing there side by side. We may write the name of the hybrid in two ways: *Vanda teres* x *Hookeriana* = *Vanda* Miss Joaquim.

For a name to have validity, it must be published. According to the rules agreed upon at international horticultural congresses, the name must be published with a description from which the hybrid can be recognized, but in practice this has not always been done. New hybrids grown by commercial nurseries are usually exhibited at some recognized show (e.g. those organized by the Royal Horticultural Society in London) and their names, with their parentage, are then published. Lists of orchid hybrids are published in various orchid journals, and a complete list of great value has been compiled by Messrs. Sanders of St. Albans.

Reverting for a moment to the variation that occurs at the second and later hybrid generations, we can see two problems; first and most important how to propagate any particularly desirable plant; and second what names to give the host of variations produced. Propagation must of course be by division of the plant; to grow its seeds would probably result in the production of more new varieties. Fortunately in some cases propagation from cuttings is easy; an excellent example is *Vanda* Miss Joaquim. In other cases it is more difficult, and slower, and so the hybrid is often rare and perhaps expensive.

As regards names of second generation hybrids, the same convention holds. Thus the name *Cooperi* has been given to a hybrid between *Vanda* Miss Joaquim and *Vanda Hookeriana*; all seedlings of this parentage must bear this name. But such seedlings are not alike, and to distinguish them

we must give each a third name. A fine variety superior to the original Cooperi but of the same parentage, has been called *Vanda Cooperi* var. *Cho Yam Neo*.

The first artificial orchid hybrid was produced by crossing two species of *Calanthe*, in England, and it flowered in 1856. Since that time an immense number of hybrids have been produced, in many genera, chiefly in greenhouse culture in Europe and America. Some of these hybrids have been imported to Malaya, and have proved successful here. But most of them have been selected, not only for their beauty, but for their ease of cultivation under glasshouse conditions; and conditions in Malaya (especially in the lowlands) are very different. It is evident that we shall only get plants well suited to Malayan conditions by selecting here; and that means raising hybrid seedlings here. This process began about the year 1929, and since 1945 has attained considerable proportions.

In this country we have a number of native or introduced orchids which are strong and free-flowering here, but have not proved well suited to greenhouse culture in other countries. It is these plants which we must use as our starting material. In many cases they had never been hybridized until the recent breeding work in Java and Malaya began. We are thus only at the beginning, and we cannot yet see the full possibilities of the material available. When we have had orchids of many generations, we shall doubtless obtain a wealth of fine new varieties, comparable with those now grown in such perfection in other countries. And in our climate, especially with the climbing group of orchids, one lucky seedling may become a host of plants in only a few years.

### THE DISTRIBUTION OF ORCHIDS

Orchids are found in almost all parts of the world, but by far the greatest number of kinds occur in the tropics. The majority of tropical orchids are epiphytes, and epiphytes cannot live in very dry countries, or countries with a very dry season every year. Therefore most orchids are found in those parts of the tropics which have plenty of rain and not too severe a dry season. Malaya has such a climate, and we have a large number of orchids in this country—almost 800 species as at present known.

Malaya forms only a small part of the region called *Malaysia*\* (in the broad sense), which extends from Sumatra to the Philippines and New Guinea. The whole of this great region has a high annual rainfall. The duration and intensity of the dry seasons vary much, being most extreme in the Lesser Sunda islands east of Java; but nowhere is the dryness of the air comparable with that of the dry season on the plains of India, and considerable numbers of species of orchids are found throughout. The greatest number of species occur however in those areas with only a short dry season, of which Malaya is one.

To the north of Malaya we have Lower Siam, Tenasserim, Burma and Assam, Siam and Indochina, the greater part of which countries have a fairly high rainfall but a pronounced dry season. The drought is not enough

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\*Some biologists restrict the term *Malaysia* to Sumatra, Malaya, Borneo and Java; others call this restricted area *Western Malaysia*.

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it would be well worth while to look for such, with the object of using them in breeding, so that garden orchids of American stock better suited to Malayan gardens may be developed. The majority of the finest American orchids certainly are not well suited to the lowlands of Malaya, but if they could be crossed with kinds which are sturdier and more free-flowering under our conditions, the result might be a magnificent acquisition to local horticulture.

But let us revert for a little to Malaysian orchids. Each species is adapted to a particular range of climatic conditions of exposure, humidity and temperature, and to a greater or less degree of seasonal change. Some species grow under the uniform moist and shady conditions of the forest; some need exposure and will stand much drought; some flower at any time, others only in response to some definite climate change; some will tolerate a wider range of conditions than others. According to their adaptation, the various species of orchids find a greater or smaller area in which they can live, and a greater or smaller number of possible growing places in that area. So we find that the common pigeon orchid, which grows best in exposed places and can tolerate a great range of rainfall, has spread over a very wide area. But it is remarkable also that some more exacting species are equally wide-spread; e.g. the interesting saprophyte *Epipogum roseum*, only once found in Malaya (at Cameron Highlands) and certainly not common, but distributed from Africa to Australia, probably over a wider area than the Pigeon orchid.

Some orchids need a rest every year, and this they are not allowed by the climate of southern Malaya. Many of these occur in the extreme north only, and again in Java, where similar seasonal conditions are found (e.g., *Spathoglottis affinis*, *Habenaria Susannse*).

In general, most orchids of the lowlands of Malaya are found also in Sumatra and/or Borneo, and often also in Java. In some cases where they are apparently confined to this country, they may not yet have been collected in Borneo or Sumatra, though existing in one of those islands. Many orchid species however are confined to the mountains; apparently they will not grow under lowland conditions, or cannot establish themselves from seed in the lowlands. Often they will live for a time in cultivation in the lowlands, but are difficult to maintain. Such species are isolated on the mountain groups of the various parts of Malaysia, as if they were on islands in a sea. Even within Malaya it is possible that species are isolated on mountains in one part of the country, not extending to the other mountains. For example, it appears that there are three related but distinct species of *Hetseria*, one on Mt. Ophir, one on G. Tahan, and one at Cameron Highlands. Our knowledge is still however very incomplete, and it is impossible to make definite statements about the distribution of such species. In Sumatra and Borneo are many mountain species which are absent in Malaya, probably because our mountains are not so high and do not have suitable temperature conditions. Dr. J. J. Smith has listed about 984 Sumatran orchids as against approximately 800 at present known for Malaya. Schlechter enumerated 1450 species from eastern New Guinea in 1913.

CULTIVATION

Under the descriptive account of each main group of cultivated orchids... The principal ones are under Spathoglottis, Dendrobium, Cattleya, Coelogyne, Grammatophyllum and Vanda. It is unnecessary here to duplicate statements made in other parts of the book. A few general observations however appear desirable.

Varying degree of shelter or exposure (according to the situation) and some food for their roots. In connection with (1) shelter, potting and watering, we must also consider orchids cultivated in garden-

Shelter

First, there is the question of orchid-houses or other equipment for which is needed mainly for orchids, especially for those which do not flourish in full sun. For some kinds of orchids, a house which can be closed may be desirable, and the orchid-house should be able to prevent theft.

The shelter only, it may be very simply constructed. The potted plants should be supported by horizontal bars to which horizontal laths are attached. The laths should not need heavy supports. Bamboo is quite effective and does not need to be replaced. Whatever material is used should be long to last. Whatever laths are used should be kept continuously in bright sunshine & plant will be kept continuously in bright sunshine. If the laths are laid east and west & turned 90 degrees at a time. If the plants may be damaged by scoring.

The house lying north and south. The side is best left open, but can be placed where they wish. Sun is better for most orchids than afternoon sun. The morning sun is that the morning shock such as is experienced by the plant to the hot afternoon sun. It is best to have the plants supported by tree laths or by climbing plants (which should be removed from the orchid plants needing more shade can then be placed on the west side of the house).

Moisture

orchids than v... more important for on the west side of the house... useful as holding water for watering the plants... must be so arranged that they can be emptied regularly. If a tank is considered undesirable...



of the benches may be built of rough coral, which when sprayed retains moisture and gives it back slowly to the air. A possible disadvantage of coral is that it may harbour snails and other pests, which must be guarded against. Meta-bran baits are extremely effective against snails. If the house is floored with concrete (as is desirable for cleanliness), this may be wetted periodically in dry weather.

A place to shelter plants from rain after re-potting is necessary, and some special plants may be best kept always from direct rain. If only a few plants are concerned at any one time, a place under the verandah of one's dwelling house often provides all the shelter necessary; but if a larger number need shelter, it may be preferable to have an orchid-house, or part of such a house, roofed with glass. A small glass-roofed section may be arranged inside such a flat-roofed house as that described above. Or the roof may be made of opaque material, if enough light is admitted on the east side of the house. Glass roofing in any case admits too much overhead light, and must be partially dimmed. Some plants may need specially moist or sheltered conditions. This may be provided by small closed frames with bricked sides and glazed covers, which may be lifted to admit air as required.

A pest-proof orchid-house is a luxury few can afford; such a house must be walled with fine copper gauze like that used for making dwelling-houses mosquito-proof. To be effective, this must be carefully joined to the roof, and the doors must fit accurately. Such a house excludes most pests. If the roof is not too low or wide it need not be of glass. A large glass-roofed house needs careful planning to ensure sufficient air-circulation, without which it may become very hot. The span should not be too wide, nor the roof too low. Its position as regards shading from trees, exposure to winds, or shelter from neighbouring buildings also needs to be considered.

A shed is needed for potting, and for storing spare pots, potting material of all kinds, manures, garden tools, etc. This should include a bench large enough to provide good working space and at a convenient height.

If only a few orchid plants are kept, it is quite satisfactory to hang them under a tree which provides suitable shade, or a few benches under such a tree may be used. Experiment will soon show whether the situation is suitable. Judicious pruning of the shade-tree from time to time will probably be required. A fairly light shade is enough for many orchids; a low tree giving too dense a shade is unsuitable. A "cherry" tree (*Muntingia*) is also unsuitable owing to the frequent visits of bats, the droppings from which may be harmful.

Many orchids grow best in full sun, both such as *Vanda Miss Joaquim* and the *Scorpion Orchids*, which are grown on posts, and also many potted *Dendrobiums*, *Vandas*, etc. Benches in an open place to support the pots for these are desirable. It is convenient to have the benches raised 12-18 inches or so above ground. Shady trees on the west side of such an area will provide a little shelter for those plants which do not stand full sun all day.

Potted or hanging plants in flower are often brought into the house, or to the verandah, for decoration. If these plants are brought indoors out of the strong sunlight, and kept indoors for two or three weeks (many flowers will last as long as this, or longer) they must be handled carefully on taking them out again. After two weeks in a weak light in the house, a plant may become badly burnt if it is put directly into full sun all day. Plants are best not kept too long in the house. While indoors, they must naturally be watered a little, but not excessively.

In general, most of the best decorative orchids do not need much shade. Many will tolerate a considerable range of conditions, but nearly always they flower best when the light is as strong as they can stand. It is a good plan to move plants about to find out what conditions suit them best. By carefully noting their behaviour after such change, one can learn much about the habits of the plants. But it is never good to make a change too abrupt. Plants must not be taken from continuous shade and put into continuous sun, or they will be scorched and perhaps killed. But plants may often be hardened to stand exposure if their position is gradually changed.

### Potting

The question of potting is dealt with at some length under both *Dendrobium* and *Cattleya*. The great essential is a sufficiently open potting medium, to allow air to reach the roots and to prevent them remaining too wet after rain and watering. In this connection, advice given for the handling of plants in greenhouse culture in temperate countries must not be followed. Under the uniform high temperature, humidity and rainfall of the lowlands of Malaya, potting mixtures suitable for drier and cooler conditions are harmful. In Europe, it is customary to pot *Cattleya* plants in a mixture of fern-root and *Sphagnum* moss. The latter holds too much moisture under local conditions, and most plants so potted in Malaya soon develop rot of their roots and may die if not re-potted. Different species of orchids vary much in the amount of moisture they will stand, but it is a safe rule always to avoid any kind of potting material which will rot quickly, or which will choke the potting mixture and prevent free access of air to the roots.

Orchid pots with holes in their sides and good draining-holes in the bottom are best for nearly all species. Even the semi-terete *Vanda* hybrids (*Marguerite Maron*, etc.) which will grow quite well in ordinary pots, grow better in orchid pots. Wooden baskets may naturally also be used, and are good especially for *Cattleyas* or other spreading plants which it is desired to grow to a large size. In that case, the wood should be of good quality, or it will not last long enough. Very fine plants have been grown in Singapore in baskets of wire-netting, either hung or placed on a bench. These baskets are cheap and long-lasting, and are easily made of any size desired. Baskets of stout galvanized wire are better-looking.

The bottom of a pot or basket must be filled with large pieces of broken brick or crocks (which must be so placed that they allow good air spaces and do not hold water). For most orchids, the upper part needs to be filled with a firmly packed mixture of smaller material, as explained on p. 352. *Aerides* and *Vandas*, which have stout roots, do not need such

firm potting as *Dendrobium* and *Cattleya*. Mr. Galistan in Singapore has had much success, especially with *Aerides*, by using pieces of bird's nest fern loosely packed as sole potting material (in wire baskets) ; the pieces of root are not washed, but first soaked in a mixture of cattle-manure and water, and then sun-dried, after which they are used for potting. They need renewal from time to time.

Many orchid plants are not grown in pots or baskets, but attached to pieces of tree-branches, or to pieces of tree-fern trunk. The majority of the smaller epiphytes are best handled in this way. To support these pieces of wood, etc., a horizontal bar, or series of bars, are needed. A piece of wood with its bark intact provides natural conditions for the growth of many orchids; but a dead piece of wood hanging by a wire is not the same thing as part of a living tree. On the tree, the roots of an orchid can spread for a long distance, find shelter and perhaps food in bark-crevices or among the roots of ferns or mosses, and they have washed down to them by the rain all the accumulation of soluble and insoluble material which may be on the upper part of the tree. Further, the living tree continually renews its bark from within, the outer part gradually rotting and providing some food for the orchid. On a cut piece of dead wood the growth of the orchid roots is restricted, they do not have any material which may be washed down from the upper parts of a tree, and the bark beneath them is not being renewed; it rots and finally drops away. Therefore we must give our hanging plants water and food, and renew their wood from time to time, if we are to maintain them in healthy growth.

A new plant needs to be firmly attached to its piece of wood. Copper wire may safely be used for this purpose, but vegetable fibre or string is preferable. As soon as the plant has produced some new roots, it will hold itself in position. The plant should be fixed to the wood in a natural position, with those parts only in contact which normally touch the supports, the rest drooping or erect, according to its nature. Living plants on their trees should be observed, and their positions imitated.

Not all kinds of wood and bark are equally suitable for orchids. For example, Tembusu bark is coarse and absorbent, and looks very suitable, but it is not so good as the smooth bark of the Mempoyan tree (*Rhodamnia*). A branch of any kind of tree which naturally bears epiphytes may be used. The Calabash tree is much used for orchids in the West Indies; in Malaya it grows well in the north, and in the south will grow nearly as well if in well-drained soil (not in clay). Living Frangipanni trees are also very suitable for the cultivation of orchids.

Tree-fern trunk is much used in Java. It is cut into slabs which consist mainly of the closely interlacing black roots of the fern. These are very suitable for most epiphytes, the roots of which penetrate among the fern-roots. The fern-roots also hold a certain amount of water, thus providing moister conditions than a block of wood. The fern-roots rot very slowly and remain serviceable for a long time. The trunks of the large mountain tree-fern in Malaya, where this is abundant, might be used in the same way.

Coconut husks are also often used as support for orchids, especially for *Phalsenopsis*. These husks hold moisture, and by their decay provide also some food for orchid roots. If used, care should be taken not to over-water the plants, as the coconut husk absorbs much water and may be kept too wet.

### Watering

The watering of plants may seem a simple process, but every experienced gardener knows that it needs very careful controlling. The unskilled gardener waters all plants alike at regular intervals, without considering their individual needs. In the climate of Malaya this always results in some plants having too much water, and this may be quite as bad as having too little. If this is true of ordinary pot-plants, it is doubly true of orchids. On the whole, over-watering does far more harm than under-watering. But plants in active growth, especially in exposed positions, need plenty of water; and (other things being equal) plants in a potting mixture which holds a good deal of water need less frequent watering than those potted only with brick and charcoal. In wet weather it may be desirable to put some plants under cover from rain to prevent the potting material remaining too wet. Some kinds of plants, which are especially sensitive to excess of moisture, may be kept permanently under cover, and their watering carefully controlled.

Many fine orchids are natives of climates which are strongly seasonal. In such climates, the plants cease from growth in the dry season; they rest, and this resting is often necessary for the development of flower-buds, and for the vigorous development of the next growth of stem and leaves. In Malaya we have no regular dry season and some such plants need artificial resting, under cover from rain. They must be watched, and when they show signs of shedding leaves, watering gradually stopped and the plants sheltered. Some other kinds of imported orchids do not show any signs of natural resting, but continue to grow indefinitely in our climate. These are often difficult to rest artificially, and they often fail to flower well. All such cases are mentioned in the accounts of the individual species in the main part of this book.

It is therefore impossible to give a general rule about watering. All plants must be watched and their needs judged by experience. Plants in active growth (especially sympodial plants which have new shoots developing) need sufficient water or their growths will suffer. Plants not in active growth (those in which the new shoot has completed its development) need less water, and often flower better if they have less. Most monopodial plants continue growth all the time, and they are much more difficult to rest artificially than sympodial plants.

### Manuring

The question of manuring orchids is one that has aroused much discussion. Mr. Dakkus is strong in his condemnation of manuring. He advocates potting most orchids in a firm mixture of fern-roots, and finds that the decay of these provides quite sufficient food for the plants (by food is meant the requirements of mineral salts, etc. normally absorbed by roots and needed for the growth of plants). He states that advocates

of manuring have never made comparative experiments, and that though it may do no harm it is generally of little use.

I am sure however that, with orchid plants potted in a brick and charcoal mixture, manuring is very beneficial, and if judiciously applied promotes much stronger growth than occurs when no manure is used. It is equally certain that with climbing orchids grown on posts in the open, some form of rotting organic matter round the roots is necessary for vigorous growth. In the latter case, a litter of cut grass is not perhaps strictly manure, but it serves exactly the same function as manure.

Potted orchid plants, when actively growing, all benefit by receiving manure in dilute liquid form. Solid manure, such as cattle manure, is not good for general use, as it sooner or later chokes the potting mixture with wet rotting material and prevents free access of air to the roots; this is fatal to many orchids. In dilute form, liquid manure may be applied once a week to actively growing plants, or less frequently.

The exact nature of the manure is not important if it provides a reasonably well-balanced supply of the substances needed by the plant. Manures with excess of nitrogen are not desirable. An entirely artificial fertilizer composed of a mixture of mineral salts (such as the "complete" fertilizers sold for ordinary garden use) is quite satisfactory if given in the form of dilute solution. In my experience, by far the best manure for orchids is dilute urine (diluted at least 1:10 with water). This contains all the necessary salts, and also certain growth-promoting substances, which doubtless have some effect, though the exact effect in the case of orchids has not been demonstrated. Prawn-dust, cattle manure and ground-nut cake are all good sources of manure. They should in all cases be soaked in water and the clear liquid only used. Cattle manure may be used fresh; prawn-dust needs to be kept a few days in water to rot, and ground-nut cake should be soaked for about three weeks. The latter then has a foul smell, but is an excellent manure. One pound of ground-nut cake may be soaked in one gallon of water, and the resultant liquid diluted about ten times for use. The rotting process continues for some time, and the mixture may be enriched by adding new cake without throwing away the old. But the vessel must be kept well covered! A watery extract of finely shredded fresh fish is an excellent manure, applied weekly if possible.

Plants attached to pieces of wood may be manured by dipping them into the manure-water. Such plants are often also manured by covering part of the supporting wood with a paste of cattle manure. This is quite a good method, but plants so treated must not be kept too wet. Watering once in two or three days is usually enough, and in wet weather the plants should be sheltered from rain. Otherwise the manure remains too wet, and roots may rot.

### Bedding Plants

Plants of the following genera may be grown in garden beds, or attached to posts in the open: *Spathoglottis*, *Phaius*, *Arundina*, *Bromheadia*, *Grammatophyllum*, *Vanda*, *Arachnis*, *Renanthera* and *Trichoglottis*. Particulars of the treatment of the plants are given below under the

genera concerned. Some other terrestrial orchids such as *Calanthe* are best grown in pots. The special treatment required by the climbing orchids (*Vanda Miss Joaquim*, the Scorpion Orchids, etc.) is given under *Arachnis* and *Vanda*.

#### Pests

The subject of pests is also mentioned under *Vanda* (p. 728) as pest control is more important than any other attention needed by *Vanda Miss Joaquim*. The most harmful orchid pests are Thrips, beetles, grass-hoppers, cockroaches and scale insects.

*Thrips* are very small winged insects. They lay their eggs on flower-buds, which are penetrated by the young unwinged Thrips. These are so small as to be hardly visible without the use of a lens, but they do so much damage to the buds that the flowers show brown marks or more serious disfigurement on opening, or in some cases may quite fail to open. Misshapen or brown flowers, especially of *Vanda* and *Arachnis*, are nearly always the result of attack of Thrips. The best remedy is regular spraying with Tuba root (Derris), a local product always obtainable in Malaya. Other insecticides (such as DDT preparations and nicotine) may also be used, but those which have dark-coloured solutions cannot be used on flowering plants without disfiguring the flowers; Tuba root is free from this objection, if the solution is made from clean roots. Spraying once a week (or at least once in two weeks) is desirable to keep Thrips in check; they will continually come flying in from outside, and can possibly live on other plants, so that it is impossible to be permanently free from them. Fortunately, regular spraying with Tuba root keeps most other pests away also. It is therefore a good thing to spray all orchid plants regularly with this insecticide, whether flowering or not.

*Beetles* which attack orchids are of several kinds. The worst are the small black weevils (with long black snout) which bore into the young growing tips of many kinds of orchids. They are especially dangerous on *Phalsenopsis*, which are often killed by their attacks. A look-out should always be kept for these insects (which can fly, and so may come at any time) and those seen killed. Regular spraying with Tuba root usually keeps them away. DDT dusts may be also used as a deterrent.

A rather large yellow beetle eats *Vanda* and other flowers voraciously and lays its eggs on the flowers also. The grubs cover themselves with a slimy substance and are easily seen and picked off by hand. Again regular Tuba spraying is a deterrent, and where such spraying is carried out the beetles are rarely seen.

A small dull yellow beetle is very destructive in eating certain kinds of orchid flowers, feeding by day (perhaps also by night). It seems particularly attracted by *Oncidium* and *Spathoglottis*. Careful and regular hand-picking, and regular Tuba spraying, are the best control methods.

A rather larger narrowly oblong yellow beetle may be a serious pest of *Spathoglottis*. It lays its eggs at the bases of the leaves, where the larvae hatch out and eat the young leaves, which appear full of holes when fully grown. Regular spraying with Tuba, DDT, or nicotine will keep this pest under control, and may quite eradicate it locally.

*Grasshoppers* are sometimes troublesome in eating orchid flowers, especially small green hoppers. The best control is to keep the surroundings of the orchid nursery or houses clear of long grass; regular spraying with Tuba is again a deterrent. Poison baits, made of bran with a little Paris Green, may also be used against grasshoppers and cockroaches.

*Cockroaches* are chiefly troublesome in attacking roots. They find the crevices between the drainage-crocks or bricks in orchid pots good hiding-places, and they enjoy eating the young tips of growing roots. Plunging the pots in Tuba-root solution in a large vessel is the best treatment; or plunging in plain water will probably drive the cockroaches out of their hiding-places. When young shoots of *Cattleyas* and *Dendrobiums* have their new roots eaten, cockroaches are the most likely offenders.

*Scale-insects* are fortunately not a serious pest of most orchids plants, though they may often occur in small numbers. They are small, usually brown, fixed sucking insects, and look like little scales; they may easily be removed with the finger-nail. *Cattleyas* are sometimes attacked by them. The best remedy is to wipe all leaves and shoots with a soapy rag. This is quite possible in the case of a limited number of potted plants, but if a serious attack of scales is found on larger plants such as *Scorpion Orchids*, spraying with an oil emulsion, with or without the addition of nicotine, as used in ordinary garden practice against scale insects, is the only method available. Well-tended healthy orchid plants rarely suffer seriously from scales in Malaya, which is a most fortunate thing.

### CULTIVATION OF ORCHID SEEDLINGS

(Written in collaboration with Mr. J. L. Pestana)

Owing to the minute size of orchid seeds, they cannot be grown by ordinary methods, and for many years all orchids in cultivation were derived directly from wild plants by vegetative propagation only. Though a number of observations on orchid seedlings were made from the year 1804 onwards, little or no practical use was made of the raising of seedlings until the possibility of hybrid orchids was suggested. The first man to produce and raise hybrid orchid seeds was Dominy, employed by the firm of Veitch at Exeter, who crossed *Calanthe masuca* with *C. furcata* in 1853, and exhibited the first flowering seedling in 1856. This was followed in 1859 by the first *Cattleya* hybrid. Dominy was for some time the only producer of such plants; but his success was so striking that others experimented and were successful also, so that orchid hybrids in ever-increasing numbers appeared. The methods used for handling the seeds were various, but in all cases there were many losses in the early stages of growth.

The fact that orchid seedlings were infected by a fungus was first observed about 1850, and the relation of orchid roots to fungi was studied by various botanists during the next half-century, but it was not until 1904 that Noel Bernard succeeded in isolating a pure culture of a fungus from orchid roots and causing it to infect sterilized orchid seeds. Bernard thus grew seedling orchids in culture-flasks by a method that for the first time could ensure one hundred per cent germination of the minute

orchid seeds and the development of the young seedlings under ideal conditions. Burgeff in Germany followed with work on similar lines soon afterwards, and these two men were mainly responsible for developing' a technique which revolutionized the raising of orchid hybrids, as well as in discovering many facts of great interest about the inter-relations of roots and fungi.

The next step forward was made about 1920 in America, by Knudson. He had been thinking about the remarkable fact that orchid seeds grew little or not at all when placed in flasks on a culture medium containing' salts which would be sufficient for the growth of most seeds, but at once germinated if a fungus was added to the medium. What did the fungus contribute to the orchid? The only other substance taken up by ordinary plants is carbon dioxide, from the air. From this and water, green plants manufacture carbohydrates (sugar and starch) ; from carbohydrates and the salts taken up by roots plants can make all the more complex substances needed for their growth. Knudson thought that perhaps orchid seeds failed to grow simply because they lacked the power to produce carbohydrates from carbon dioxide. He decided to test this idea, and was immediately successful. He found that by simply adding two per cent of sugar to an ordinary culture medium containing a mixture of salts in agar-agar, orchid seeds would germinate just as well as if the right fungus were present. He claimed to have shown that the principal service done for the orchid by the fungus was the supply of sugar. This sugar the fungus was able to prepare in nature by decomposing the tree-bark, dead leaves, etc. of its surroundings, whereas the orchid could not do this. The orchid however did have the power of abstracting the sugar from the fungus which had made it, and so the orchid itself was enabled to grow. This may not be the whole story, but at least it is the essential part of the story for raisers of orchid seedlings.

By Knudson's method the preparation of culture media suitable for orchid seeds was at once much simplified. The tedious and exacting work of isolating different strains of fungi in pure culture became unnecessary. All that needed to be done was to weigh carefully specified quantities of half a dozen different salts and some sugar, dissolve them in water with agar-agar, pour the mixture into flasks and sterilize them. This could all be accomplished in a few hours. Knudson's method therefore soon became used in many parts of the world. It was first adopted in Java about 1929, and in Singapore soon after, and resulted in the production of a large number of new hybrids of tropical orchids in genera which had hitherto been little hybridized in temperate countries.

#### **Preparation of Culture Flasks**

Orchids seedlings are grown in glass test-tubes or flasks such as are commonly used in chemical laboratories. The flasks most suitable are of conical shape, their wide bottom giving maximum room for the seedlings. In each flask is a layer of jelly made from agar-agar. This jelly contains enough water for the seedlings and yet has a firm surface upon which the seedlings can rest. Dissolved in the water used to prepare the jelly are



the salts needed by the seedlings, and sugar. These must be accurately weighed with a chemical balance, the amounts used being very small. Various different mixtures of salts are possible. The main complication is the question of acidity. Orchid seedlings are very sensitive to small changes of acidity, and some flourish better in more acid media than others. The treatment of the agar-agar in sterilization may affect the acidity of the final product; and of course any change in composition of the salt-mixture will also affect the acidity. Therefore, for uniform results, the preparation of the culture flasks must be very carefully done always in the same way. No attempt is made here to give particulars of elaborate methods of testing and varying acidity; the following account merely presents a simple method which has been found in practice to give satisfactory results.

The only large item of equipment required is an autoclave, for sterilization by steam under pressure. This must be large enough to hold a reasonable number of test-tubes or flasks (test-tubes have the advantage of packing more closely in the autoclave). The remaining requirements are: a measuring-cylinder or litre measure, a double cooker, a glass funnel, test-tubes or flasks (conical flasks of 100 cc. or 250 cc. are most often used), small specimen tubes for sterilizing the seeds, good quality absorbent cotton wool for plugs, agar-agar, sugar, and the salts mentioned below, which must be pure and carefully weighed. The use of a chemical balance is thus necessary.

The following quantities of salts, sugar and agar-agar are needed for each litre of water:—

Potassium phosphate ( $K_2HPO_4$ )	..	0.25 gram
Ammonium sulphate	..	0.75 gram
Magnesium sulphate, cryst.	..	0.25 gram
Calcium nitrate	..	100 gram
Iron-ammonium sulphate	..	0.10 gram
Sugar	..	10 to 20 grams
Agar-agar (prepared)	..	17.5 grams

The potassium phosphate is separately dissolved in half of the water, the other salts and sugar dissolved separately in small quantities of water and added. The agar-agar is then added, and the whole heated (preferably in a double cooker, to avoid the necessity of stirring) until the agar is dissolved. The mixture, while still hot is poured into the test-tubes or flasks, through a funnel, so that none of it touches the sides or neck of the vessel. The volume of hot jelly poured in should be about one-fifth of the volume of each flask or test-tube. The test-tube or flasks are then plugged with cotton-wool; the plugs must be very firm, and enough left protruding to cover the rim of the neck of each flask. A good test is to lift the flask by holding the plug; if this cannot be done, the plug is not tight enough. The plugged flasks or test-tubes are then put into the autoclave, which is closed, heated, and brought to fifteen pounds pressure, at which it is maintained for 15-20 minutes. The test tubes or flasks are then removed and allowed to cool. The test-tubes should be laid so that the jelly will have a slanting surface when it solidifies; this gives more surface

area for seedlings. It is preferable to tilt the flasks also, for convenience of manipulation of seeds and seedlings later, but this is not essential and flasks are often laid with bottoms flat to cool. When cold, the vessels are ready for sowing orchid seeds. As an additional protection against moulds, the plug (while in position) may now be dipped into saturated copper sulphate solution.

The greatest difficulty in handling orchid seeds and seedlings in culture flasks is in maintaining sterility of the cultures. The air is full of floating bacteria and the spores of mould fungi. Our orchid culture flasks form ideal growing places for these if they can get a chance to enter; and once a single spore has entered and settled upon the agar-agar it will grow to a mass of mould and smother all our orchid seedlings in a few days. The object of the cotton-wool plug is to keep out the spores; and to do this it must be tightly packed. But even the most carefully made plug sometimes allows a spore to pass through it. As an additional protection, a piece of thin paper or cellophane is folded over the plug and neck of the flask, being kept in position by a rubber band or tied with cotton thread.

The above method gives a medium the acidity of which is about that expressed as pH 6 (pH 7 is neutral; figures below 7 indicate increasing acidity). This is suitable for some orchids, and is about the best acidity for *Spathoglottis* and some other terrestrial orchids. But for *Phalsenopsis* and some *Vandas* a more acid medium (about pH 5) is better. Such seedlings will turn yellow on the less acid medium. For accurate experimental work, the acidity of each batch of culture solution should be assessed, and acid added until it has the correct acidity. In practice, if a more acid medium is desired, it is found satisfactory to add 0.5 cc. of five per cent hydrochloric acid (i.e. 5 parts of concentrated acid to 95 of water) for each litre of solution. This should be added at the time the salts are dissolved. The proof of the effectiveness of the medium is in the growth of the seedlings. If this is satisfactory, there is no need for the ordinary grower to change his methods. But if seedlings turn yellow, it is a sure sign that conditions are not suitable, and a more acid medium should be used. If the grower can test the acidity of his media, he is advised to make some about pH 6, and some about pH 5, and to try seedlings on both in cases where he is not sure which is more suitable. Yellow seedlings may be restored to health by adding acid culture solution, as described below.

Various alternative mixtures of salts have been tried by different workers. A recent mixture which has proved successful in Singapore is one devised by Dr. E. F. Vacin and reported in the *Bulletin of the Pacific Orchid Society of Hawaii*, February, 1950. The salts used for one litre of solution are as follows:

Calcium phosphate	..	..	0.200 gram
Potassium nitrate	..	..	0.525 gram
Potassium dihydrogen phosphate	..	..	0.250 gram
Magnesium sulphate	..	..	0.250 gram
Ammonium sulphate	..	..	0.500 gram

Iron (ferric) tartrate	..	..	0028 gram
Manganese sulphate	..	..	0-002 gram

These salts, together with two per cent of sugar and the necessary agar-agar, produce a medium of pH about 6-8. It is necessary to add acid to this to reduce the pH to about 5-2, which is suitable for *Vanda* and *Dendrobium*. Citric acid, in the quantity of 0.2 gram for each litre of solution, will effect this change.

In Vacin's mixture, the iron is considered to remain more accessible to the orchid roots than in Knudson's. The addition of Manganese is also considered helpful. Manganese is one of the elements of which plants require only a trace. Such "trace elements" are supplied in almost sufficient quantity by commercial agar-agar. If very pure agar-agar were used, more trace elements, and perhaps other substances also, would be required.

### Sowing Orchid Seeds in Culture Tubes or Flasks

In handling culture flasks, sowing seeds and transplanting seedlings, the utmost cleanliness is necessary. The hands must be thoroughly washed, and all apparatus used, and the surrounding bench, be as clean as possible.

The orchid fruit which is to produce the seeds must be watched carefully. After some experience, it is possible to judge when the fruit is nearly ripe, and it may then be picked before it breaks open. But in any case it should be picked within a day of breaking, or some of the seeds will be lost, and also those that remain will become so much infected with mould-spores and bacteria that they are difficult to sterilize. If an unopened fruit is taken, its outer surface may be sterilized by dipping for a moment into alcohol and then passing it through a flame; then it may be cut with a similarly sterilized knife, after which the seeds may be put direct into the culture tubes, observing the precautions described below. But if the fruit has opened, the seeds will certainly be infected with mould-spores or bacteria, and these must be killed before the seeds can be safely put into the sterilized tubes. Sterilization of the seeds is performed as follows.

About 2 grams of fresh bleaching-powder is shaken for a minute or two with 50 c.c. of water in a wide test-tube, and then filtered. The clear solution is used for sterilizing the seeds. The seeds are placed on a piece of clean paper, and freed from the twisted hairs which (in *Vanda* and other genera) are mixed with them. A small quantity of seeds (enough for one flask or tube) is taken up with a small piece of paper and placed in a flat-bottomed glass specimen-tube (size 6 or 8 cm. long and 1 cm. diameter is convenient). Two or three cubic centimetres of fresh bleaching-powder solution is added, and the tube is corked and shaken at intervals for 2 or 3 minutes. This is sufficient to sterilize seeds from freshly-opened fruits. Seeds from fruits which have been kept some days after opening may require longer treatment with bleaching powder to sterilize them. In such cases, the seeds are allowed to settle, and the liquid poured off (or removed with a fountain-pen filler), fresh bleaching-powder solution is added, and the shaking repeated for another 2-3 minutes. Instead of bleaching powder, a two per cent solution of chloramine-T may be used.

The transfer of the sterilized seeds to the culture flasks must be done in a room without draughts of air, which may carry mould-spores into the opened flasks. A gas flame for sterilizing the mouths of the flasks and tubes is necessary. The plug of a culture flask is removed slowly, and the mouth of the flask passed over the flame for about ten seconds to sterilize it. The plug must remain held in the hand, in such a way that the part which was inside the neck of the flask does not touch anything. The cork of the tube containing the seeds is also removed, and the mouth of the tube sterilized with the flame. The contents of the tube are quickly shaken and the whole poured into the flask, so that the liquid does not touch the neck of the flask. The mouth of the flask is then again passed to and fro over the flame for a few seconds to sterilize it, and the cotton-wool plug sterilized with the flame and tightly replaced. A piece of thin paper or cellophane is then folded over the plug and tied, and the flask labelled with the name of the hybrid, date, and any other necessary information. The small quantity of bleaching-powder solution introduced into the flask with the seeds does not appear to have any harmful effect. It may be used to cause an even spreading of the seeds over the surface of the jelly, and the flask then tipped on one side to leave the surface free of liquid.

When the seedlings are so large that they have become too crowded, they should be transplanted to other flasks. One such transplanting is usually necessary, but if the seeds are not too thickly sown there may be room for the plants to grow large enough (for potting) in the original flask. Transplanting must be done very carefully, as there is always danger of infection when the old and the new flasks are opened. The process is essentially the same as the original planting of the seeds. The necks of the flasks must be flamed after removing the plugs and before replacing them. The transfer of the seedlings is done as quickly as possible, with the aid of a short loop of platinum wire in a glass-rod holder. The platinum wire is well heated in the flame every time before putting it into a sterilized flask. A platinum wire is the best implement because it cannot become corroded and is quickly and easily sterilized.

If the agar-agar in a flask has become dry, but the seedlings are not yet ready for transplanting, water or culture solution may be added. The culture solution is made up as for preparing the agar-agar medium, but no sugar is included. The solution, or water, is sterilized in the autoclave in a plugged flask. When cold, the necessary quantity is removed in a sterilized fountain-pen filler having a long tube (sterilized with bleaching-powder solution), and placed in the flask, the mouth of which is flamed as before. The agar-agar will quickly absorb the new water or solution, and the plants will soon start healthy new growth.

In cases where young seedlings are unhealthy due to wrong acidity of the culture medium, this may be rectified by adding sterile culture solution. *Vanda* and *Phalaenopsis* seedlings in a medium not sufficiently acid turn yellow. The added solution should include acid at the rate of 1 cc. of 5 per cent hydrochloric acid for every litre of solution. *Spathoglottis* seedlings may turn brown owing to the medium being too acid; they need a culture solution which has no acid added to it.

Even when the greatest care is taken, some flasks become infected with mould or bacteria. These should be watched for carefully. In some cases it may be possible to remove a small mould-spot with a sterilized platinum loop; care must be taken to remove the whole spot, including the spreading fungus threads (mycelium) around. After removal, a little bleaching powder may be placed on the infected area. If a flask containing very young seedlings is infected, it is usually a total loss. But if seedlings large enough to handle (a few millimetres long) are infected, they may sometimes be sterilized and transferred successfully to another flask. The seedlings are removed from the infected flask and the agar-agar carefully washed away from them with water. If any felt of mould remains firmly attached to the seedlings, it is left. The seedlings are soaked overnight in water (to wet them thoroughly), and next day the soaked mould can be easily removed. After further washing, the seedlings are placed in bleaching powder solution for 10-20 minutes, and shaken carefully. They are then put into a new flask, with a sterilized platinum wire. The bleaching-powder may kill young roots, but if sterilizing has been effected new roots will grow.

Culture-flasks containing seedlings should be kept in a fairly bright light, but are better not exposed to direct sunlight, even in the early morning. One reason for this is that direct sun heats the flasks, the air in which expands; in cooling, fresh air is drawn in, and this may assist the entry of mould-spores. *Cypripedium* seedlings need a dim light, or even darkness, for about six weeks or even more after sowing. Epiphytes and *Spathoglottis* may be placed at once in a quite bright light.

#### Transfer of Seedlings from Flasks to Pots

When seedlings are large enough to handle conveniently, they are transferred from sterile flasks to pots. The larger the seedlings at the time of transfer, the easier they are to handle and the fewer losses occur. If small seedlings which are infected with mould have to be planted out, they may survive, but their mortality is usually much higher. It is best to keep seedlings in flasks until they are 2-3 cm. high.

The seedlings on removal from the flask are carefully washed to remove all agar-agar, and carefully separated from each other. Their roots are usually more or less entangled, and if separation is not done carefully, they will be damaged. The seedlings are then spread out to dry overnight before planting.

Planting is done in small pots, usually of 2 inches diameter. Or a number of seedlings may be placed in one 4-inch pot, to be transplanted later to single pots. The bottom half of the pot is filled with freshly broken pieces of brick, and above this a mixture of small freshly broken brick and charcoal, mixed with chopped washed fern-root. The seedlings should be placed with their roots just covered, or partly covered, by this mixture, in as firm a position as possible. They must be moved and placed very carefully, without touching the roots with the hands. Two small flattened and pointed smooth sticks, and a small pair of forceps, are useful tools. A top layer of coir dust half an inch deep is suitable for planting out very small seedlings, but it must not be kept too wet.

The newly potted plants are kept in a place under cover from heavy rain and sheltered from sun. They are best in a glass-topped frame that can be closed in dry windy weather but is usually kept partly open to allow some circulation of air. The pots may be plunged in a layer of coir dust, which holds much moisture and keeps the air humid. It takes the seedlings some weeks to get over the shock of transplanting and to begin new growth. The larger the seedling, the quicker it will adapt itself to its new surroundings. As the seedlings begin new growth, they may gradually be transferred to more open conditions, but they need a moist atmosphere throughout their early stages. This may be provided by a layer of coir dust in which the pots are partly plunged. As an alternative, a layer of coke which is kept moist will maintain a suitably humid atmosphere round the seedlings, which should be watered with a fine spray only. As soon as the plants have begun to make new root-growth, they may be given very dilute liquid manure once a week. New growth is always slow, but it is an accelerated process, and after some months the plants should have leaves 5 cm. or so long. Then they may be moved to more airy quarters and will stand rain. They should not be re-potted until they have fully outgrown their first pot, but if some of the surface brick particles have become black, they may be removed and clean ones replaced, without disturbing those pieces to which roots have become attached. When a plant is big enough for re-potting, roots will probably have become attached to the pot. Either it may be carefully broken, and the unwanted fragments removed, or the whole pot containing the plant may be put into a pot of the next larger size, packed round with clean freshly-broken brick-fragments.

Seedlings that are put several together in a 4-inch pot should be removed to single 2-inch pots before their roots have grown so much as to be entangled together.

*Spathoglottis* seedlings may be planted in sand mixed with fern-roots, chopped leaf-mould, and small charcoal. Small *Dendrobium* seedlings have also been grown successfully in a similar mixture. Spraying with Tuba-root (Derris) solution is perfectly safe for seedlings, as for older plants, and should be done regularly to keep pests under control.

Seedlings of *Spathoglottis plicata* have flowered when only 18 months old from seed, but hybrid *Spathoglottis* usually takes 2 years or more. The quickest *Dendrobiums* may flower in 2½ years, but 3-4 is more usual. *Vanda* and *Arachnis* hybrids in Singapore have usually taken 4-5 years or more, but terete *Vanda* seedlings have flowered in three years.

#### GENERAL KEY TO MALAYAN ORCHIDS

The object of this key is to enable the reader to discover the genus or tribe of any Malayan orchid; he is then referred to another part of the book, where a further key or keys should lead him to his species. Cultivated orchids introduced from other countries are not included, but these are much less numerous, and their genera are few and fairly easy to learn.

For those who are not familiar with the use of keys, a few words of explanation and advice are here given. The key consists of a number of pairs of alternative statements, from which the reader chooses in turn those with which his plant agrees. Sometimes one of the statements is separated by several lines of type from its alternative; in that case the two are equally indented from the left hand margin. When the reader has chosen one of the first two alternatives, he passes to the pair next below the one he has chosen, and so eventually arrives at a statement which is labelled with a generic or tribal name and page reference. The first pair of statements is: saprophytes, not saprophytes. If the plant in hand is a saprophyte, the reader looks at the pair of statements under the first alternative, and finds he has to decide whether the lip has a short spur containing two glands, or not. If the plant is not a saprophyte, he finds the next question to answer is whether it is terrestrial or epiphytic.

The main divisions of the key are based on vegetative characters, and in all cases characters which do not need minute examination have been chosen where possible. But the reader must realise that with such characters the alternatives are not always sharply distinct. For example, a normally epiphytic orchid may sometimes grow on the ground (especially on exposed mountain ridges) and more often on rocks. It is also not easy to phrase such brief statements so clearly that they are not open to misinterpretation. A further difficulty in constructing a key of this type is that species of one genus may have to be included in different parts of the key, and it may be that some cases of this kind have been overlooked. Thus *Phaius* includes both species with short fleshy pseudobulbs and species with long leafy stems, and so the genus must be included under both these alternatives. The case of *Dendrobium* is more complicated, its species appearing in several parts of the key.

There are three points in the key where some experience is necessary to make a correct choice. They are: (1) the distinction between epiphytes and terrestrial plants, (2) the distinction between the *Goodyera* tribe and the regularly sympodial terrestrial orchids, (3) the distinction between monopodial and sympodial epiphytes. A careful study of the introduction to this book, in comparison with plants of the examples there discussed, should prove helpful in understanding the difference between monopodial and sympodial orchids. As regards the *Goodyera* tribe, all the species are very much alike in habit (except *Lepidogyne*), and when one of them has been learnt, the others will easily be recognized also. In the case of epiphytes and terrestrial plants, under the latter are included only those which are always terrestrial. If a normally epiphytic species is found on the ground, it will probably be found on trees also not far away.

The reader who has already some knowledge of orchids will often not need to use this key; but when he finds an unfamiliar plant the key will help him to trace it to a genus. The beginner may find it easier to locate some species by looking through the illustrations; but if he perseveres with the key he will find that its use will teach him a good deal. It will teach him what characters to look for, and so help him to learn to recognize different orchid plants.





Not this combination of characters

Stem erect, bearing only a terminal inflorescence; lip at top of flower, narrow, erect, acute, with concave base; leaves from base of plant only ..

*Cryptostylis*  
p. 103

Not this combination of characters

Leaf single, broad and ovate or heart-shaped, arising from a small round tuber

Leaf 4-16 cm. wide, separate from flowering stem .. ..

*Nervilia* p. 105

Leaf 1-2-5 cm. wide, with single flower immediately above it ..

*Corybas* p. 92

Not this combination of characters

Base of stem creeping, often bearing foliage leaves, rooting at the nodes, the apex curved upwards and bearing a terminal inflorescence; no pseudobulbs and no regular sympodial growth

Flowers with lip at the top; lip with an erect blade and an auricle descending on either side of the column ..

*Malaxis* p. 193

Flowers usually with lip at bottom; if at top, its base hidden by the lateral sepals, without auricles

*Goodyera* tribe  
p. 111

Growth sympodial, the successive shoots forming pseudobulbs, each bearing 1 or more leaves, or erect leafy stems; or plant with an underground rhizome bearing a succession of leaves and inflorescences, without distinct pseudobulbs

One leaf on each new shoot of the sympodium

Leaf grass-like, about 40 by 0.6 cm. .. ..

*Pachystoma*  
p. 147

Leaf much wider

Leaf attached at base of a small pseudobulb, which bears the inflorescence at its apex

*Liparis* p. 199

## ORCHIDS OF MALAYA

- Leaf attached at apex of pseudobulb; junction of leaf-stalk and pseudobulb sometimes not distinct
- Lip joined to whole length of column ..; .. *Calanthe* p. 148
- Lip at most joined to base of column
- Lip at top of opened flower *Nephelephyllum* p. 179
- Lip at bottom of opened flower
- Pollinia 2 .. .. *Diglyphosa*,  
*Chrysoglossum*  
p. 177
- Pollinia 4 .. .. *Plocoglottis*  
p. 158
- Pollinia 8 .. .. *Tainia* p. 180
- Successive shoots of the sympodium each bearing more than one leaf
- Shoots forming short or fairly short pseudobulbs, or tufts of leaves without obvious pseudobulbs, not long leafy stems
- Shoots spaced 10-20 cm. or more apart on a slender rhizome .. .. *Claderia* p. 184
- Shoots much closer together
- Leaves not jointed at base of blade .. .. *Liparis* tribe  
p. 192
- Leaves jointed at base of blade (joint best seen on old leaves)
- Sepals joined to form a bell-shaped tube .. *Acanthephippium*  
p. 148
- Sepals not joined, or only slightly at the base
- Lip spurred
- Lip joined to whole length of column *Calanthe* p. 148
- Lip not joined to column, or only to its base
- Pollinia 2 (each bilobed) with a disc .. *Eulophia* p. 533

- Pollinia 8, no disc  
Lip not spurred  
Rachis of inflorescence drooping, short, with flowers close together .. *Phavus* p. 171
- Rachis not drooping, sometimes its apex slightly bent  
Flowers many, sepals 6–7 mm. .. *Geodorum* p. 538
- Sepals much longer  
Midlobe of lip 2 mm. wide at base, with 2 calli .. *Idparis ferriginea* p. 203
- Midlobe otherwise  
Shoots forming long leafy stems  
Inflorescences from base of leafy stems, or from lower part of stem below leaves  
Inflorescence from base of leafy stem, scape stout, to 75 cm. tall .. *Spatho glottis* p. 161
- Inflorescence from lower part of stem, not from base; scapes shorter, 1 or more to a stem  
Scape not visible; whole inflorescence to about 2-5 cm. long .. *Cymbidium* p. 517
- Scape distinct; inflorescence much longer .. *Plocoglottis* p. 158
- Inflorescence terminal, or in axils of leaves, or both  
Floral bracts very close together in 2 alternate rows; flowers borne singly in succession .. *Bromheadia* p. 540
- Floral bracts very close together in 2 alternate rows; flowers borne singly in succession .. *Phavus* p. 171
- Floral bracts very close together in 2 alternate rows; flowers borne singly in succession .. *Bromheadia* p. 540

## ORCHIDS OF MALAYA

Bracts otherwise

Inflorescence only terminal

Inflorescence with several branches; bracts broad, white or nearly so

Sepals scurfy-hairy outside, 8 mm. long; lip small with hairy keel in centre ..

*Eria Scortechinii*  
p. 363

Sepals not hairy, longer; lip with 5 keels, not hairy

*Dilochia* p. 190

Inflorescence with few branches; bracts otherwise; 3 hairless keels on lip ..

*Arundina* p. 187

Inflorescences in leaf-axils, sometimes terminal also

Flowers small, mentum conspicuous ..

*Dendrobium* §  
*Conostalix*  
p. 341

Flowers without mentum

Leaves well-spaced, elliptic, plicate; flowers in short-stalked inflorescences, axillary and terminal ..

*Corymborchis*  
tribe p. 141

Leaves very close, not widened above base, not plicate; flowers in long-stalked axillary inflorescences ..

*Dipodinm* p. 512

Plants epiphytic, or high-climbing

Plants with very short stem, green roots and no leaves; flowers very small, on gradually elongating slender inflorescences

*Txniophyllum*  
p. 587

Plants otherwise

Monopodial orchids; apical growth of any stem continuing indefinitely; roots at any node; inflorescences lateral, usually piercing a leaf-sheath

A root borne by the stem opposite every leaf *Vanilla* p. 94

Roots not opposite every leaf

Leaves to 25 by 2 cm., very close together, strongly curved away from stem; sepals and petals spotted outside, 2-5 cm. long; pollinia with disc but not stipes .. .. .

*Dipodium pictum*  
p. 513

Not this combination of characters; pollinia 2 or 4, with separate stipes and disc .. .. .

*Vanda-Arachnis*  
tribe p. 578

Sympodial orchids

Pseudobulbs or stems 1-leaved

Inflorescence from top of pseudobulb

Flowers solitary or in a small group on short separate stalks immediately from the top of the pseudobulb

Pseudobulbs 15-25 cm. long, with long narrow neck; sepals and petals 3.5 cm. long .. .. .

*Dendrobium* §  
*Diplocaulobium*  
p. 263

Pseudobulb otherwise; sepals and petals usually much shorter

Pseudobulbs distinctly fleshy, never entirely hidden by sheaths ..

*Dendrobium* §  
*Desmotrichum*  
p. 263

Stems slender, not pseudobulbous, often very short and quite covered by sheaths ..

*Ceratostylis*,  
*Sarcostoma*  
pp. 491, 499

Flowers more than 1 on an inflorescence, with distinct peduncle (sometimes only 1 flower open at a time)

1-3 flowers open together on the same inflorescence

Leaf terete; inflorescence of 2-3 flowers in all .. .. .

*Eria teretifolia*  
p. 379

## ORCHIDS OF MALAYA

- Leaves not terete; inflorescence elongating slowly and producing a succession of flowers, 1-3 at a time
- Bracts small, persistent, in 2 rows, close together . . . *Liparis*, spp. 21, 22 p. 209
- Bracts falling when flower opens *Ccelogyne* p. 241
- Many flowers in each inflorescence open together
- Bracts persistent
- Column with narrow arms on its front edges, below the apex *Dendrochilum* § *Platyclinis* p. 228
- Column without arms below the apex (apex may be winged)
- Base of lip saccate, distinct from blade; apex of column winged . . . . . *Pholidota* p. 236
- Base of lip not saccate nor distinct from blade; apex of column not winged . . . . . *Liparis* p. 199
- Bracts falling when flowers open .. *Pholidota*, *Chelonistele* p. 227
- Inflorescence from base or side of pseudobulb, or from rhizome between pseudobulbs
- Lip joined at its base with an outgrowth from the column and with the column-foot to form a tube at right angles to the base of the column; sepals at least 8 mm. long . . . . . *Thecostele* p. 557
- Lip otherwise
- Pseudobulbs of several internodes, with bladeless sheaths at the nodes . . . . . *Eria* § *Hymeneria* p. 386
- Pseudobulbs of one internode
- Column-foot distinct, with lip hinged at its end . . . . . *Bulbophyllum* p. 397
- No column-foot
- Pseudobulb small, broadly ovoid, dull green; pollinia 8 . . . . . *Thelasis* p. 549

- Pseudobulbs small, spindle-shaped, usually shining brown; pollinia 4 *Dendrochilum* p. 228
- Pseudobulbs or stems 2-leaved (to p. 56)  
 Flowers solitary, either direct from pseudobulb or on a slowly elongating inflorescence; or 2-3 on a single inflorescence . . . . . *m* . . . . .
- Pseudobulbs disc-like, wider than high; flower solitary, sepals joined to form a tube . . . . . *Porpax* p. 396
- Not this combination of characters  
 Flowers solitary from stem below leaves . . . . . *Dendrobium* § *Euphlebiium* p. 276
- Flowers or inflorescence from apex of pseudobulb  
 Inflorescence slowly elongating and bearing a succession of solitary flowers . . . . . *Eria* § *Callostylis* p. 372
- Inflorescence not slowly elongating  
 Flower or flowers with distinct peduncle (often short)  
 Inflorescence woolly-hairy, with 1-3 flowers . . . . . *Eria* § *Strongyl-eria* p. 379
- Inflorescence with sparse hairs, bearing 1 flower . . . . . *Ceratostylis*, *Sarcostoma* pp. 491, 499
- No distinct peduncle . . . . . *Dendrobium* § *Bolbidium* p. 274
- Flowers more than 3 (often many) open together on same inflorescence  
 Lateral sepals entirely joined, like one sepal, behind the lip . . . . . *Acriopsis* p. 554
- Lateral sepals not or only partly joined together

- Mentum present
- Pseudobulb or stem of several (often short) internodes, a sheath at each node .. *Eria* p. 356
  - Pseudobulbs of one internode
    - Sepals not over 2-3 mm. long .. *Phreatia* p. 551
    - Sepals much longer
      - Leaves 30-50 cm. long; pseudobulbs green when old, not angled .. .. *Eria javanica* p. 377
      - Leaves 5-18 cm. long; pseudobulbs brown and angled when old .. .. *Dendrobium* § *Sarcopodium* p. 271
- No mentum
- Sepals not over 8 mm. long, usually much less
    - Bracts rather large and concave, in 2 regular rows .. *Pholidota* p. 236
    - Bracts small, not conspicuously concave, not in 2 rows
      - Leaves on same pseudobulb very unequal .. *Thelasis macrobulbon* p. 550
      - Leaves on same pseudobulb about equal .. .. *Liparis* p. 199
    - Sepals at least 1-2 cm. long, usually much longer .. .. *Ccelogyne* p. 241
  - Stems or pseudobulbs with more than 2 leaves, often with many leaves
    - Stems and leaves laterally flattened, so that the leaves have no upper surface except at the sheathing base
      - Inflorescence of many small flowers, many open together
        - Inflorescence terminal
          - Individual stems spaced about 4 cm. apart on rhizome .. .. *Hippeophyllum* p. 225



- Individual stems close together at base, forming a tuft .. *Oberonia* p. 210
- Inflorescence lateral .. .. *Octarrhena* p. 548
- Inflorescences short, each bearing only 1 or 2 flowers at a time
- Mentum present .. .. *Dendrobium* §  
*Aporum*, §  
p. 329  
*Oxystophyl-  
lum*, § p. 335  
*Strongylp*  
p. 337
- No mentum .. .. *Bromheadia*  
p. 540
- Stems and leaves not laterally flattened, but leaves sometimes terete
- Leaves terete or nearly so
- Sepals about 1-5 mm. long .. *Octarrhena*,  
*Phreatia*  
p. 548, 551
- Sepals much longer
- Stem short with about 3 leaves and short hairy inflorescence .. *Eria pannea*  
p. 380
- Stem longer with several leaves; flowers solitary, hairless .. *Dendrobium* §  
*Rhopalanthe*  
p. 324  
§ *Strongyle*  
p. 337
- Leaves not terete
- Stem with a short swollen part near the base, the rest slender .. *Dendrobium* §  
*Rhopalanthe*  
p. 324
- Stem otherwise
- \*Stem elongated, with a few leaves near the apex, basal part (bearing sheaths only) much longer than leafy part
- Pollinia 4 .. .. *Dendrobium*  
p. 261
- Pollinia 8 .. .. *Eria* p. 356
- Stems otherwise
- \*Stems over 5-6 cm. long, with several to many leaves

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\* Young stems, which have not yet lost leaves, must be examined.

## ORCHIDS OF MALAYA

- Inflorescence terminal, bearing flowers singly in succession, bracts 1.2 cm. long in 2 close ranks *Bromheadia alticola* p. 543
- Inflorescence otherwise  
 Inflorescence terminal, elongated, with spreading bracts 2-5 cm. long; sepals 2-5 cm. long .. *Dilochia Wallichii* p. 190
- Inflorescence otherwise  
 Inflorescence terminal, hardly stalked, dense, of many small white flowers .. .. *Agrostophyllum* p. 486
- Inflorescence otherwise  
 Inflorescence from base of plant, not from leafy stem *Grammatophyllum, Porphyroglottis* pp. 526, 515
- Inflorescence from leafy stem, or from old stem after leaves have fallen  
 Lip with 1 or 2 appendages near its base, free end of appendage pointing to base of lip  
 Flowers small .. *Appendicula* tribe p. 499  
 Flowers large .. *Dendrobium § Pedilonum* p. 312
- Lip without appendage, or with appendage pointing towards apex  
 Lip with saccate base separate from blade by a fleshy transverse partition; flowers in axils

- of a small group of close 2-ranked bracts at stem-apex . . . *Agrostophyllum* p. 486
- Otherwise
- Inflorescence 1 cm. long, slender, lateral, of 3—4 flowers, sepals 3 mm. long; pollinia 8, all lightly joined to a narrow disc . . . *Posephyllum* p. 510
- Not this combination of characters
- Pollinia 4 . . . *Dendrobium* p. 261
- Pollinia 8 . . . *Eria* p. 356
- Stems under 5—6 cm. long, bearing few leaves the bases of which often completely cover the stem
- Stems swollen into fleshy pseudobulbs . . . *Eria* § *Dendrolirium* p. 375  
§ *Callostylis* p. 372
- Stems not swollen into pseudobulbs
- Flowers small; sepals to about 4 mm. long
- Mentum distinct
- Inflorescences brown-woolly-hairy . . . *Eria* § *Aeridostachya* p. 381
- Inflorescences not thus hairy . . . *Phreatia* p. 551
- No mentum . . . *Thelasis* p. 549
- Flowers much larger
- Lip not pouch-shaped . . . *Cymbidium* p. 517
- Lip pouch-shaped . . . *Paphiopedilum* p. 69

## THE PLEONANDRÆ

The Pleonandræ consist of two distinct tribes. These are so different in the general appearance of their plants and of their flowers that one's first impression is that they could not belong to the same family. One of the tribes (Apostasia tribe) has been ranked as a separate family by some recent authors, but the other (the *Cypripedium* tribe of Slipper Orchids) has not been so ranked during the past hundred years. But though the *Cypripedium* tribe may look more like orchids than the *Apostasia* tribe, they are undoubtedly very different from the Monandræ, to which ninety-nine per cent of orchids belong; and in the structure of the column, which is considered the most characteristic part of orchid flowers, the *Apostasia* and *Cypripedium* tribes are far more nearly related to each other than either is to the Monandræ. Accepting the importance of the column in the classification of this group of plants, we cannot logically remove the *Apostasia* tribe from the orchid family without also removing the *Cypripedium* tribe. If we were to remove both tribes, we could constitute each of them a separate family; but nobody wishes to do this. If we do not exclude both, we must rank both together as orchids, and this course is adopted here.

The *Apostasia* tribe have more or less elongated stems with pleated leaves and terminal inflorescences bearing many small flowers; the Malayan Slipper Orchids have short stems with one or few large flowers, the lip in the shape of a slipper and quite different from the other petals. There is however a South American group of slipper orchids which have bushy plants with terminal inflorescences of many small flowers. If the latter had a lip like the petals, instead of slipper-shaped, they would come very near the *Apostasia* tribe. We thus see that there is not really so much difference between *Apostasia* and Slipper Orchid as appears at first sight; and if we reflect on the enormous range of plant-form in the orchid family, we must admit that the vegetative difference between the two may not be of any great importance.

If we consider the lily flower-type which is basic for the orchid family and its allies, we can understand the relationships between the two sub-families Pleonandræ and Monandræ (see p. 3). The lily flower has six stamens, in two whorls of three. In the orchid, ginger and other families, some of the stamens do not develop, or are modified in structure. In the Pleonandræ (Fig. 8), two stamens of the inner whorl are developed, and the stamen of the outer whorl between them is developed, either fertile or as a sterile structure called a staminode (except in a few species of *Apostasia*, where it is quite lacking). Only the genus *Neuwiedia* (Fig. 8a) has all three stamens fertile. The common ancestor of the Monandræ and Pleonandræ must have had all three stamens fertile like *Neuwiedia*, which evidently has the most primitive flower-structure of all orchids. The petal opposite the middle stamen or staminode is usually different from the other two petals, and as in the Monandræ is called the lip; but in *Apostasia* it is hardly different from the other petals. The pollen of the Pleonandræ

is granular or sticky; it is never aggregated into pollinia, which are universal in the Monandrae.

The Pleonandrae and Monandrae differ also in the other parts of the column, and in the structure *pf* the ovary. In the Pleonandrae the end of the column is continued into the style, with a stigma at its tip. The stamens are joined to the column by distinct long or short stalks, usually not far above the base of the column. In the Monandrae the single stamen has usually no stalk, or sometimes a very short one, and there is no free part of the style. The ovary in the Pleonandrae is in many cases divided into three chambers, as in the lily family; in the Monandrae it always has one chamber. In both sub-families the seeds are very small.

Though *Neuwiedia* is the only genus with three stamens, we cannot therefore assume that the orchid-ancestor was like *Neuwiedia*; changes (both in flowers and in vegetative parts) may have occurred in the evolution of *Neuwiedia* as we know it to-day. All we can say is that *Neuwiedia* has flowers of very primitive structure, flowers of a type which could give rise on the one hand to the Pleonandrae and on the other to the Monandrae. It is very remarkable how much more prolific the Monandrae have been than the Pleonandrae; they have produced somewhere about one hundred times as many species, of an astounding variety, spread almost all over the earth.

It is easy to see how the Pleonandrae, as we know them, could arise from primitive plants with flower-structure similar to that of *Neuwiedia*. The transition from the primitive flower to the Monandrae is less clear, as all the Monandrae we know have a column of highly evolved form and also the pollen grouped in pollinia, often with appendages. If we wish to find the most primitive Monandrae, we must look among the terrestrial orchids; the epiphytic habit is probably a later development. Among terrestrial orchids, the *Goodyera* tribe are perhaps nearest to the primitive type, but there is a long gap between them and anything like *Neuwiedia*. Perhaps it is not surprising that, in a family which has evolved in such a varied and complex manner as the Monandrae, the original primitive form should have disappeared.

The Pleonandrae are divided as follows:

*Apostasia* Tribe. Plants with rather stiff but not thick erect stems, often fairly long and sometimes branching, bearing many fairly large plicate leaves and terminal inflorescences of small flowers; sepals and petals almost equal; column bearing three distinctly stalked stamens, or two stamens and a staminode, or two stamens only, the end of the column bearing style and stigma; pollen powdery; ovary always with three chambers. Distribution: Indo-Malaya. Fig. 8, a, b.

*Cypripedium* Tribe. Plants (as found in Malaya) with a succession of very short stems, each bearing several two-ranked rather fleshy leaves; inflorescence terminal, of one or few rather large flowers; lateral sepals joined together; lip slipper-shaped; column bearing two very shortly-stalked stamens and a large staminode which during its development

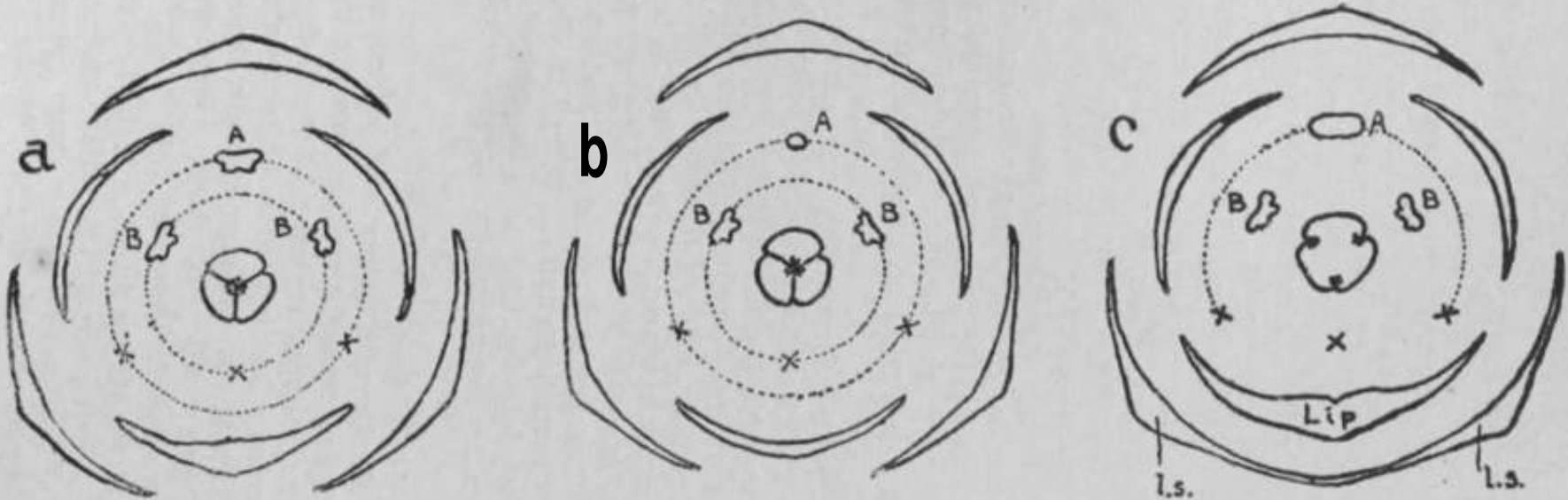


Fig. 8. Diagrams of flowers of Pleonandrae. *a*, Neuwiedia; A, B, B, the 3 stamens, *b*, Apostasia; A is a staminode; B, B, stamens, *c*, Cyripedium tribe; A, large staminode; B, B, stamens; l.s., joined lateral sepals.

pushes aside the smaller stigma, the stigma then appearing lateral; pollen sticky but not formed into pollinia; ovary with one or three chambers (one in Malayan plants). Distribution: all warm parts of the earth. **Fig. 8, c.**

### THE APOSTASIA TRIBE

The general characters are given above. The stems are usually more or less creeping at the base, with stiff roots, and new erect branches arise from the creeping part. The basal part of the erect stem often has stilt roots which help to support it. There are two genera, *Apostasia* and *Neuwiedia*, the former with wider distribution than the latter. *Neuwiedia* is the more primitive in having three perfect stamens, on fairly long stalks, with a quite normal style and stigma; but in *Neuwiedia* there is a slight distinction between the lip and the other two petals (hardly seen in *Apostasia*), and the flowers show a distinct two-sidedness. In *Apostasia* there are two stamens, which are short-stalked and very close to style and stigma; the third stamen is represented by a small staminode or quite lacking.

Plants of this tribe are fairly common in lowland forest in Malaya, but are not showy. They are perhaps nearest in general aspect to the *Corymborchis* tribe of the *Monandrase*, but have only terminal inflorescences. The stiffly erect inflorescence of *Neuwiedia* is rather like that of a small-flowered *Calanthe*, but the leaves and stem are stiffer than those of a *Calanthe*. The genera are thus distinguished:

Stamens 3; inflorescences simple, erect	..	<i>Neuwiedia</i>
Stamens 2, with or without a staminode; inflorescence usually branched, curved and spreading, not erect	..	<i>Apostasia</i>

### NEUWIEDIA

Erect stem usually unbranched and not very tall, bearing several to many leaves; inflorescence terminal, erect, on a long or short scape; bracts conspicuous; sepals and petals 0.6 to 2.0 cm. long, hardly separating, with short narrow tips, nearly equal, the lip a little larger than the other petals, usually with midrib raised on the upper surface; column short, bearing 3 stalked stamens, the stalks attached above the base of the anthers: fruit stalked, more or less ovoid, either a dry capsule or a berry.

#### Key to the Malayan species of *Neuwiedia*

- Sepals and petals pale yellow, 1-2-1.8 cm. long
- |   |    |                           |
|---|----|---------------------------|
| Scape to about 40 cm. long; fruit a dry capsule | .. | 1. <i>N. veratrifolia</i> |
| Scape about 7-8 cm. long; fruit an orange berry | .. | 2. <i>N. singaporeana</i> |
- Sepals and petals white, 6-8 mm. long; inflorescence usually not taller than leaves
- |  |    |                         |
|--|----|-------------------------|
|  | .. | 3. <i>N. Griffithii</i> |
|--|----|-------------------------|

1. **Neuwiedia veratrifolia** BL, Tijdschr. Nat. Gesch. 1: 142. 1833. Rolfe, J.L.S. 25: 231, 241. Hk. f., Ic. PL t. 1987. J.J.S., Fl. Buit. 6: 15. Bull. Btzg., Ser. 2, XIV: 1. Ser. 3, 5: t. 18, I.—*N. Lindleyi* Rolfe, J.L.S. 25: 232, t. 48, f. 10-12. 1889. Bot. Mag. t. 7368. Ridl., Flora 4: 295.

Leafy part of stem short (to about 20 cm.) and fairly stout at base with several thick roots; leaves 6 or more, middle ones largest, blade to about 40 by 6 cm., stalk and sheath to 10 cm.; scape to about 40 cm. long above base of highest leaf, bearing many short narrow sterile bracts; scape and rachis but not leaves very shortly rough-hairy; rachis elongating to 30 cm. or more, bracts narrow, lowest ones to 4 cm. long, upper ones shorter; pedicel and ovary at flowering 13 cm. long, very short-hairy; sepals and petals 1-2-17 cm. long, pale yellow, petals wider than sepals; sepals short-hairy outside, with a short narrow tip; petals slightly hairy on the back of the prominent midrib, slightly tipped; lip differing from petals in having a raised midrib on the upper surface; column to 7 mm. long; anthers as long as the stigma; fruit a dry capsule, 3-angled, about 12 cm. long and 7 mm. thick. Distributed from Sumatra to the Philippines; in Malaya found at many localities in lowland forest, from Penang to Singapore.

2. **Neuwiedia singaporeana** (Bak.) Rolfe, Kew Bull. 1907: 412.—*Tupistra? singaporeana* Bak., J.L.S. 14: 581. 1875.—*Neuwiedia Curtisii* Rolfe, J.L.S. 25: 233, 241, t. 48, f. 13, 14. 1889. Ridl., Flora 4: 297.—*N. ocrea* Ridl., J.S.B.R.A.S. 86: 308. 1922. Flora 4: 296.

Erect part of stem to about 10 cm. long, rather stout, with many leaves and stout roots; leaf-blade to 30 by 5-8 cm., stalk and sheath to 12 cm.; scape 7-8 cm. long above base of highest leaf, bearing several overlapping small leaves which are broader than the floral bracts; rachis to about 12 cm. long, more or less densely short-hairy as are the bracts and flower-buds; bracts to about 2 cm. long; pedicel and ovary at flowering 1 cm. long, ovary swollen; sepals and petals 1-7-2 cm. long, pale yellow; stamens as long as stigma; fruit an orange berry. Distributed in Sumatra and Malaya; found in the lowlands at many localities, in forest, and to 2,000 feet on the hills. There is also a Java species with a fleshy fruit, but it seems to be distinct in several characters.

3. **Neuwiedia Griffithii** Rchb. f., Xen. Orch. 2: 215. 1874. Rolfe, J.L.S. 25: 235, 241, t. 48, f. 2-9. Bot. Mag. t. 7425. Ridl., Flora 4: 296.

Stem rather slender, base sometimes decumbent, leafy part 20-30 cm. tall, with up to 12 or more leaves, and stilt-roots on the basal part; leaf-blade to 25 by 4 cm., stalk and sheath to 8 cm.; scape very short, the whole inflorescence usually much shorter than the leaves or sometimes about as long as the upper leaves; rachis 10-12 cm. long, short-hairy; bracts green, narrow, to 1-7 cm. long, hairy, especially on the edges; pedicel and ovary 8 mm. long; sepals and petals 6-8 mm. long, white (or pale yellow ?); stamens much shorter than stigma; fruit a dry capsule, short-hairy, about 7 mm. long. Distributed in Sumatra and Borneo; in Malaya found in the southern half, in wet ground in forest, or by streams, locally abundant. The flowers are scentless; they appear usually to be white, but one specimen is stated to have had yellow flowers.



## APOSTASIA

Erect stems slender, often branched, leafy throughout; leaves usually narrow, rarely short and relatively broad; inflorescence terminal, hardly stalked, often branched, the branches more or less decurved or spreading; bracts small; sepals, petals and lip almost equal, usually wide-spreading, and sometimes curled backwards; fertile stamens 2, with short filaments attached near base of anther; anther often widest at base, pointed at apex, usually close to style; a staminode present or not, usually joined to the style above the attachment of the fertile stamens, with a short free tip; stigma small, not distinctly lobed; ovary and fruit long and slender, not stalked.

There are apparently four Malayan species of this genus, three found in the lowlands and one only on mountains. The lowland species are very much alike in appearance; two of them have a staminode and the other has not. The species of *Apostasia* lacking a staminode have been separated as a distinct genus; but in view of the peculiar plants mentioned below under *A. Wallichii*, this seems hardly justified. Our mountain species is imperfectly known, and should be looked for at Cameron Highlands.

Key to the Malayan species of *Apostasia*

Staminode present; fruits more than 2 cm. long

Leaves to 10 mm. wide; sepals about 5-5 mm. long 1. *A. Wallichii*

Leaves to 17 mm. wide; sepals about 9 mm. long .. 2. *A. platystylis*

No staminode; fruits shorter

Leaves to 1 cm. wide; lowlands and to 3,000 feet 3. *A. nuda*  
on hills .. .. .

Leaves to 3 cm. wide; mountains only .. 4. *A. latifolia*

1. *Apostasia Wallichii* R. Br. ex Wall., *Plant. Asiat. Rar.* 1: 75, t. 84. 1830. Rolfe, *J.L.S.* 25: 237, 242, t. 48, f. 22-27. 1889. *J.J.S.*, *Fl. Buit.* 6: 18, f. 3. *Bull. Dep. Ag. XIII*: 1. *Bull. Btzg.*, Ser. 3,5: t. 18, III. *RidL*, *Flora* 4: 297.

Stem 20-30 cm. tall, often branched; leaves many, to 22 by 0.7-1.0 cm.; inflorescence branched, base not densely covered with bracts, branches few and spreading, to about 5 cm. long; bracts 3 mm. long; ovary at flowering 1.2-1.5 cm. long, elongating in fruit to 2.5 cm.; sepals and petals about 5-5 mm. long, yellow, spreading, apparently not curled backwards; base of column below attachment of stamens curved, about 1 mm. long, rest of column about 4 mm. long; stalks of stamens curved, 1 mm. long, attached on back of anther just above its base, the base unequal; apex of anthers reaching almost to stigma; staminode short, fleshy, blunt, not far below stigma. Distributed in India and Ceylon and through Malaysia to New Guinea; in Malaya found in lowland forest and to 2,000 feet on the hills, at several places in widely scattered parts of the country.

At Kota Glanggi in Pahang and Gua Musang in Kelantan have been found plants which appear to agree in every particular with this species, but quite lacking the staminode.

2. **Apostasia platystylis** J.J.S., Bull. Botz., Ser. 3, 2: 16. 1920. Suppl. H, t. 1, V.

Leaves to 30 by 17 cm. (2 cm.?), edges slightly crisped, narrowed gradually to the base and then widened again to the sheath; inflorescence terminal and from axils of upper leaves, to 12 cm. long, with few branches, floral bracts 5 mm. long; ovary at flowering about 1.5 cm. long, lengthening to 2.1 cm.; sepals about 9 mm. long, petals slightly shorter; base of column below attachment of stamens broad and flattened, broad face elliptic, grooved slightly on the side away from the stamens, total length of column 8 mm.; stalks of stamens 1.5 mm. long, anthers as in *A. Wallichii*; staminode about as long as anthers, its free end very short, about 1 mm. below the stigmas. Only known previously from N. W. Sumatra (Talamau); now reported from Koh Mai F. R., near Baling, Kedah. Differs from *A. Wallichii* in larger leaves, larger flowers and broad flattened base of column.

3. **Apostasia nuda** R. Br. ex Wall., Plant. Asiat. Rar. 1: 76, t. 85. 1830. Rolfe, J.L.S. 25: 239, 242, t. 48, f. 20, 21, J.J.S., Fl. Buit. 6: 19, i. Ridl., Flora 4: 297.—*A. brunonis* Griff., Notul. 3: 243, Ic. t. 1851. J.J.S., Bull. Botz., Ser. 3, Suppl. II, t. I, II.

Stem 30-50 cm. tall; leaves variable in size, sometimes only 15 by 0.6 cm., sometimes to 30 by 1 cm.; inflorescence terminal, with lateral branches in the axils of upper shortened leaves; base of each branch covered with many overlapping narrow bracts; flowers yellow or white; ovary at flowering about 8 mm. long, lengthening to 1.2 cm. in fruit; sepals and petals about 4 mm. long, rolled backwards; column with style about 4 mm. long; stamens very shortly stalked, anthers with wide symmetrical base, narrowed upwards, close to the column and apparently joined together along their inner edges; style slender, stigma small, no staminode. Distributed in Western Malaysia and northwards to 3,000 feet in Malaya found in all parts of the country, in lowland forest and to 3,000 feet altitude. Both yellow and white flowers appear to occur in this species, the white probably commonest.

4. **Apostasia latifolia** Rolfe, J.L.S. 25: 242. 1889. Ridl., Flora 4: 297.

Stem 30-50 cm. tall; leaves 6-26 cm. long, 1-2-3 cm. wide, elliptical the apex with a thread-like tip 2 mm.—2-5 cm. long, base stalked, stalk above sheath 1-4 cm. long; inflorescence terminal, bent downwards, with 2-4 lateral branches in the axils of bracts like small leaves; total length of inflorescence to 17 cm. including stalk, of branches to 7 cm.; bracts 4 mm. long; ovary at flowering about 1.2 cm., at fruiting 1.7 cm. long; sepals and petals about 3.5 mm. long, curled backwards; column and style about 5 mm. long; stalks of stamens 0.5 mm. long, attached 1 mm. above base of column, anther slightly unequal at the base, tip broader than in *A. mida*; no staminode. Found on Mt. Ophir, G. Kerbau and at Cameron Highlands. There is much variation in the length of the leaves of the three specimens known of this species, but they appear to agree in other respects. Further field observations are needed. There is also a broad-leaved species of *Apostasia* in Java, but it has a much shorter inflorescence.

THE CYPRIPEDIUM TRIBE  
(Slipper Orchids)

The Slipper orchids are so called because the lip has the form of a slipper. For over a century after the time of Linnaeus (whose work is the foundation of our present nomenclature of plants) all Slipper orchids were called by the name *Cypripedium* given to them by him, and this name is still much used, especially by horticulturists. But later studies of the group, and the knowledge of more species discovered in both Asia and America, led to the recognition that the tribe includes four distinct groups of species which are now generally ranked as genera. The name *Cypripedium* (or its variant *Cypripedilum*) is given to the group found in Europe which Linnaeus knew; this group only occurs in northern temperate regions, and is not found in Malaya, either wild or in cultivation. The name *Cypripedium* will therefore not be used further here, though if the reader prefers he can use it for all the species described below.

The other three genera of Slipper orchids are called *Selenipedilum*, *Phragmopedilum* and *Paphiopedilum*. *Selenipedilum* consists of a few species native in Central America and Brazil. They are very large plants (one is reported as a branched bush 15 feet high) but have small flowers and are little cultivated. *Phragmopedilum* is another genus of tropical America; it has large flowers and the species have been both cultivated and hybridized. Two species have recently been introduced to Singapore and have flowered. *Paphiopedilum* is found only in tropical Asia and through Malaysia to New Guinea. Its flowers resemble those of *Phragmopedilum* in many respects, but the ovary of *Phragmopedilum* has three separate chambers, whereas that of *Paphiopedilum* has only one.

We have therefore to deal only with the genus *Paphiopedilum*. This name was proposed by Pfitzer in 1886 and is a companion-name to *Cypripedium*, which means Venus' slipper; *Cypris* was a name given to Venus, and the town of Paphos was celebrated for its temple to Venus. The termination *pedilum* (Greek *pedilon*) is in strict accordance with this derivation; it is presumed that *-pedium* was a contraction, whether intentional or otherwise.

In Pfitzer's monograph of the tribe, he reckons 46 species of *Paphiopedilum*. A few others have since been described. In Malaya we have five native species; a sixth was reported to have been found on Mt. Ophir, but has not been found there again and perhaps the report of origin was incorrect.

The growth of the plants is sympodial, as in *Dendrobium* and *Spathoglottis* above described, but there are no thickened pseudobulbs. Each new shoot arises from a bud near the base of an old one, and ascends almost immediately, the shoots with their groups of leaves growing close together in most cases. The shoot is short, bearing two rows of leaves close together; at its base it bears thick roots which spread horizontally. The flower-stalk is always terminal; it ends the growth of a shoot. The leaves sometimes spread horizontally just above ground level; sometimes they are more or less erect. In some cases the leaves are tessellated with darker and paler green, and in other cases they are uniformly green.

The flower may be solitary, or there may be several flowers in the inflorescence. The upper sepal is usually large; the lateral sepals are always joined together, the combined structure being called the *synsepalum*, and are hidden behind the lip (their tips are sometimes separated). The petals spread out horizontally on either side of the flower, or when they are long they may droop. The lip is slipper-shaped, the pouched part usually about half the total length, with incurved side-lobes towards the base, varying in shape; the base of the pouch has in many cases (but not always) raised and spreading lobes, called *auricles*.

The great difference from the Monandrese lies in the column. The end of the column, pointing forwards so that it is clearly seen at the base of the lip, is occupied by a curious structure called a staminode; it is considered to represent a sterile condition of the stamen which is fertile in the Monandrese. On either side of the column, behind the staminode, are two functional stamens. Each anther contains two masses of sticky (not waxy) pollen, which are easily removed like the pollinia of the Monandrese. On the lower side of the column (as one sees the flower in face view) is the rather large stigma, usually a broad fleshy disc with a short stalk; it is usually hidden by the staminode and the incurving side-lobes of the lip. The stigma is really the end of the column, but it is pushed aside by the growth of the large staminode.

Pollination is effected by insects entering the pouch of the lip to look for nectar. They find that the easiest way out is towards the column, and in taking this route they meet first the stigma, upon which they deposit any pollen they may be carrying, and then one of the stamens, the pollen of which they will remove. Among cultivated plants at least, insect visits appear to be rare; but the flowers are very long-lived. The flowers are not usually scented, and there is apparently little nectar to be obtained. After pollination, the fruit takes eight months or more to ripen. The floral parts above the ovary fall away completely, in contrast to most orchids, in which they remain in a more or less shrivelled condition attached to the end of the ovary.

Species of *Paphiopedilum* are mostly terrestrial, often growing in rock-crevices or among mosses and ferns on rocks; a few are epiphytes, including the Malayan *P. Lowii*. The majority are mountain plants, and do not take kindly to the lowland climate of Malaya, but a few grow at low elevations and so are more amenable to cultivation in this country. On the other hand, the mountain species, adapted to cool conditions, have proved very suitable for greenhouse culture in temperate regions. Their flowers are large and striking, and last for a long time. The species have been hybridized very extensively and many hundreds of new forms produced. Few of these are at all suited to lowland cultivation in Malaya, though many would probably succeed at our hill stations. A few have flowered at Cameron Highlands. Little however has been recorded on this subject, and no hybrids are here described. A start has been made in the production of hybrids among the species most suited to Malayan conditions, and two of these have reached the flowering stage. Seedlings of *P. philippinense* X *callosum* have proved vigorous and free-flowering in Singapore.

In the following account, descriptions are given of species native and known to be cultivated in Malaya, with notes on some others which are cultivated in Java. All are terrestrial, except as otherwise noted.

### Classification of Paphiopedilum

The species of this genus were divided by Pfitzer into three sub-genera, based on the shape of the lip and of the petals. Locally cultivated or native species occur in all three sub-genera, the third being much the largest. They are distinguished as follows. Recent genetical work shows that this classification may not be the most natural one.

- I. *P. niveum* and its allies. Pouch of the lip without auricles, its edge incurved and occupying almost the whole length of the lip; petals very broad; leaves short, tessellate above, purplish beneath.
- II. *P. philippinense* and its allies. Pouch of the lip without auricles, its edge not incurved, forming only about half the length of the lip; petals long (at least twice as long as the upper sepal), narrow and often twisted; leaves strap-shaped, often long, not tessellate.
- III. *P. barbatum* and its allies. Pouch of the lip with pronounced auricles at the base, its edge not incurved, the pouch about half the total length of the lip; petals elongate but not usually so long as in sub-genus II; leaves various, sometimes tessellate.

### Key to the species of sub-genus I (Malayan species\*)

- Flowers white, with only minute purple spots . . . 1. *P. niveum*\*
- Flowers with many purple blotches
- Background of flowers white; petals twice as long as the upper sepal and longer than the lip .. 2. *P. bellatulum*
- Background colour of flowers cream; petals less than twice as long as the upper sepal, equal in length to the lip .. .. 3. *P. Godefroyse*

**1. Paphiopedilum niveum** (Rchb. f.) Pfitz., Engl. Bot. Jahrb. 19: 40. 1894. Ridl., Flora 4: 231.—*Cypripedium niveum* Rchb. f., Gard. Chron. 1869: 1038. Bot. Mag. t. 5922.

Leaves horizontal, fleshy, 10 cm. or more long, tessellate with pale mottling on a dark green background, the surface dull, purple beneath; scape 12 cm. or more high, purplish and finely grey-hairy, bearing one or two flowers 5 or 6 cm. wide; upper sepal almost round, slightly pointed, almost pure white; synsepalum  $\frac{2}{3}$  the length of the upper sepal, concave, ovate, with a slightly cleft tip; petals broadly elliptic, hardly pointed, the edges somewhat crisped, the midrib distinctly marked, white with minute purple stippling especially towards the base; lip shorter than upper sepal, the edge of the pouch slightly incurved and running in a smooth curve almost to the base of the lip, below the staminode, white; staminode broader than high, elliptic, with 3 blunt teeth on the lower edge, white, flushed with yellow in the centre. Native from Langkawi northwards into Peninsular Siam (northern limit not known); in Langkawi, found in crevices of the limestone rock, almost down to the sea. **Fig. 9, a, b.**

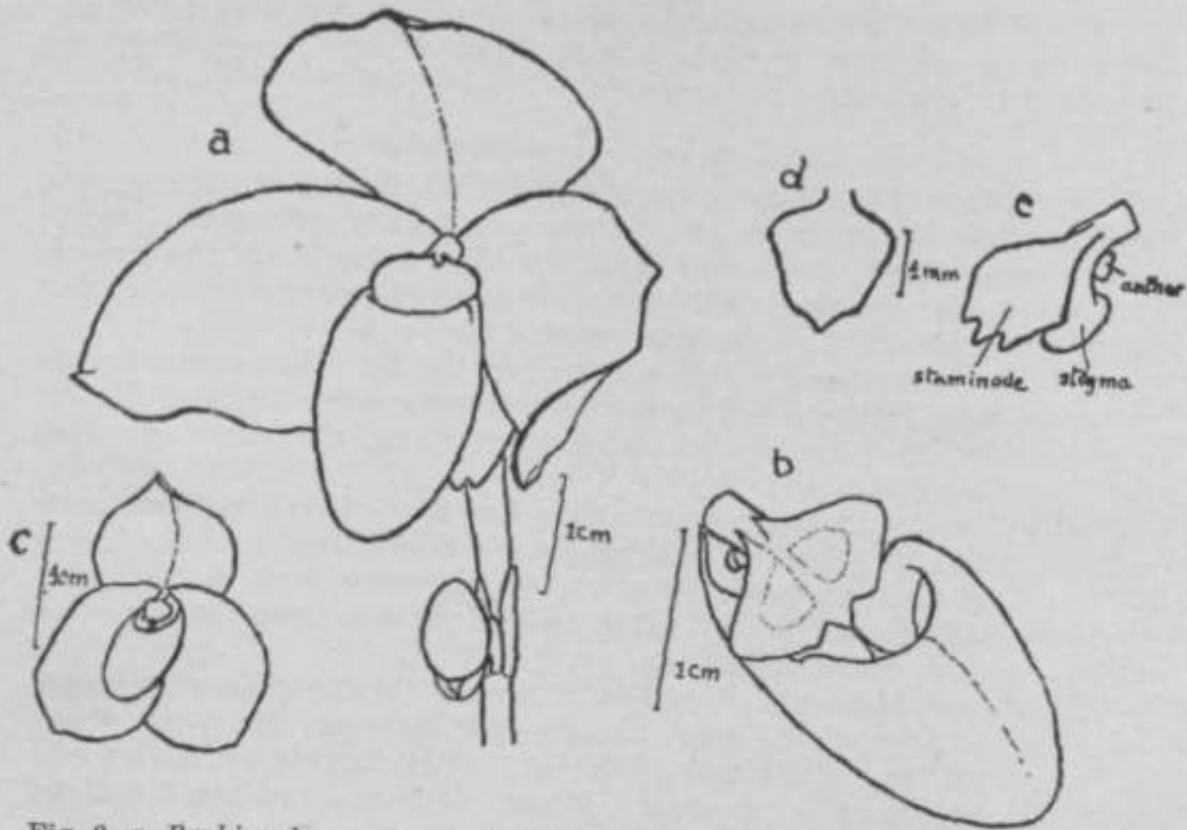


Fig. 9. a, *Paphiopedilum*, showing staminode of *P. coloratum*. b, lip and column of same from above. c, *P. bellatulum*, showing stigma of *P. coloratum*. d, stigma of *P. bellatulum*.

Collectors formerly ransacked Langkawi for this beautiful little spe-

than it should be, though from pillage; it is one of of Langkawi. It has been (between Singapore and

Borneo); but horticultural collectors did not always give correct localities for their plants, and no recent confirmation of the statement is available. If true, it is a curious case of discontinuous distribution.

*P. niveum* is often cultivated in Malaya, but is a difficult to manage. It needs very good drainage and is best in a pot with clean broken brick or old coral interspersed with fern-root and well-rotted peat. It does not appear to need limestone. The potting mixture should be changed every year or so, care being taken to disturb the roots as little as possible. When the plants are in healthy growth, a little dilute liquid manure may be given. It is probably better if possible to grow this species under a roof, in a light shade.

2. *P. bellatulum*

Leaves similar to those of *P. niveum* but usually rather larger, deeper green above and deeper purple below; scape very short, so that the flower touches the leaves; flowers 6 cm. or more wide, all parts white with rather bold purple mottling; upper sepal broader than long; synsepalum nearly as long but much narrower; petals very large, nearly twice as long as the

sepal, almost round, with a notch at the tip; lip similar in shape to that of *P. niveum*; staminode narrower than in *P. niveum*, with 3 small teeth. Native in Burma. Fig. 9, c.

This species is occasionally cultivated in Malaya, and behaves in much the same way as *P. niveum*. It is not very free-flowering, and the very short flower-stalk is a disadvantage, but the flowers are very attractive. The large petals almost surround the lip, instead of spreading on either side of the flower as in *P. niveum*. Both *P. niveum* and *P. bellatulum* have been hybridized in Europe, but there are no records of trials of their hybrids in Malaya. Some new hybrid seedlings have been produced in Singapore.

### 3. *P. Godefroyae*

Similar to *P. bellatulum*, but the scape longer, the upper sepal less wide, the petals smaller, the lip about equal in length to the petals, the teeth at the tip of the staminode larger, the general colour of the flowers usually a pronounced creamy tint. Native in CochinChina and Siam. This species is also sometimes cultivated in Malaya (fig. 9e). It is rather variable, and may be a natural hybrid between *P. bellatulum* and another species, *P. concolor*. *P. concolor* is the fourth species in this sub-genus; it is similar in habit to *P. niveum* but the flowers are pale yellow, minutely spotted, with a much narrower staminode which has a much enlarged middle tooth (fig. 9d). It occurs in Lower Burma, and has been cultivated and hybridized in Europe. It is reported by Dakkus to be cultivated in Java; in Singapore, recently imported plants will flower, but they are difficult to maintain in vigorous condition.

#### Key to the species of Sub-genus II (no Malayan species)

- |   |                              |
|---|------------------------------|
| Staminode cylindric, flexed like a knee in the middle, with flattened bilobed tip; petals deflexed, with hairy edges, not twisted . . | 1. <i>P. Rothschildianum</i> |
| Staminode broad, not flexed, convex on outer surface, concave beneath   |                              |
| Petals deflexed, with hairy warts on the edges, twisted   |                              |
| Staminode with broad notched tip; petals 4 times as long as upper sepal . .   | 2. <i>P. philippinense</i>   |
| Staminode with narrowed tip, not notched; petals 2-3 times as long as upper sepal   | 3. <i>P. praestans</i>       |
| Petals with smooth edges, not or hardly twisted - . . . .   | 4. <i>P. Stonei</i>          |

#### 1. *P. Rothschildianum*

Leaves to 50 cm. or more long and 7 cm. wide, rising well above the ground, shining green; scape 70 cm. long, bearing 2-5 flowers; height of flower about 13 cm.; upper sepal ovate, acute, yellowish with about 15 deep purple lines; synsepalum as long but narrower; petals twice as long as the sepal, narrow, drooping, wavy towards the blunt tip, pale greenish with purple spots; lip about as long as the sepal, dull purple, yellowish

towards the tip; staminode as described in the Key. Native in New Guinea, a mountain species; cultivated in Java and said to flower in the lowlands, but best above 2,500 ft. It should be tried in Malaya.

2. *P. philippinense* sp.

Leaves to about 30 cm. long and 4 cm. wide, ascending, shining green; scape 30 cm. or more tall, with 3-5 flowers; upper sepal 3-5 cm. long, ovate-acute, yellowish with about 11 violet-purple lines; synsepalum as long but narrower; petals pendulous, four times as long as the sepal, narrowed gradually towards the tips, twisted about 3 times, the edges with black hairy warts towards the base, the whole surface black-hairy towards the tips; lip somewhat shorter than the sepal, yellowish with green veins; staminode yellow, fleshy, longer than wide, notched at the tip, the outer surface with several horizontal curved grooves.

This species is native in the Philippines, growing on limestone rocks near the sea. It is thus suited to cultivation in the lowlands of Malaya, and grows well in Singapore under light shade, treated as above described for *P. niveum*. It is not free-flowering in Singapore, but probably flowers better than any other member of the sub-genus.

3. *P. praestans*

Similar to *P. philippinense*, but the upper sepal larger (5 cm. long), the petals shorter (12 cm.), the petals more spreading, the staminode pointed; the colour varies somewhat. This species is native in western New Guinea and is often cultivated in Java. It grows well in Singapore but does not flower freely; it probably needs more change of season.

4. *P. Stonei*

Habit and leaves as *P. philippinense*; scape 30 cm. long, bearing several flowers; upper sepal 6 cm. long, ovate with a long point, white with purple stripes; synsepalum as long but narrower, the sides folded together; petals 12-15 cm. long, spreading at an angle below the horizontal, not twisted, yellowish with elongated red-brown spots, not hairy nor warty; lip shorter than the sepal, the pouch much inflated as compared with the rather narrow lower part, pouch purplish with deeper purple veins, base almost white; staminode shaped much as in No. 2 but without the grooves on the upper surface, hairy on the edges.

This very handsome species is native on limestone in Sarawak at 1 000-1 500 ft. altitude. It is now little cultivated in Malaya; past records suggest that it is not free-flowering in Singapore. It should be worth growing further north at medium altitudes, and is a species to use in local hybridization when possible. It has been hybridized in Europe.

Key to the species of Sub-genus III (Malayan species\*)

- Scape with several flowers, all open together .. 1. *P. Lownii*\*
- Scape with several flowers, only one open at a time .. 2. *P. glaucophyllum*
- Scape with one flower, or rarely two flowers  
Leaves uniformly green, not tessellate . - 3. *P. exul*



Leaves more or less tessellate

Petals distinctly widened towards the apex

Plants spreading by long runners bearing  
small leaves .. .. .

4. *P. Robinsoni*\*

Plant compact, successive stems close  
together

Petals with brownish hairless warts on  
the upper edge near the base ..

5. *P. Bullenianum*\*

Edges of petals without warts ..

6. *P. Hookerx*

Petals not or little widened towards apex

Only the upper edges of the petals with  
hairy black warts

Synsepalum elliptic, blunt; warts on  
petals 1 mm. diameter ..

7. *P. barbatum*\*

Synsepalum acute; warts on petals  
nearly 3 mm. diameter ..

8. *P. callosum*

Both edges of the petals with black hairy  
warts

Leaves tessellated pale yellow-green and  
deep olive .. .. .

9. *P. Lawrenceanum*

Leaves tessellated light and dark blue-  
green .. .. .

8. *P. callosum*

4. *Paphiopedilum Lowii* (Lindl.) Pfitz., Engl. Bot. Jahrb. 19: 42. 1894. J.J.S., Fl. Buit. 6: 22, f. 6. Ridl., Flora 4: 232.—*Cypripedium Lowii* Lindl. Gard. Chron. 1847: 765.

Epiphytic; leaves to 30 by 4 cm., uniformly green; scape to 50 cm. long, bearing 2-6 flowers 5-15 cm. apart; flowers 10-12 cm. wide; upper sepal broadly elliptic, shortly pointed, the upper part concave and the edges reflexed towards the base, yellowish green with purple brown suffusion and radiating lines in the basal part about 4 mm. long; synsepalum narrower, concave, spreading backwards away from the lip; petals twice as long as the upper sepal, the basal part spreading horizontally, the apical part drooping, once twisted, the basal part greenish yellow and with large brown spots, the apical part somewhat widened and flushed with purple; lip about as long as the sepal, greenish with brown markings; staminode heart-shaped with a hairy tooth at the base. Native in Malaya, Borneo and Sumatra; in Malaya found as an epiphyte on big trees on the Main Range at 3,000-4,000 ft. altitude. Fig. 11.

This handsome species can be grown and will flower in Singapore, but is not so vigorous as in cooler conditions. Dakkus recommends a potting mixture of two-thirds fern-roots (washed) and one leaf-mould. The plants need light shade. The flowers are variable in colouring; their soft tints are quite pleasing. A number of hybrids have been raised in Europe and should do well at our hill stations.

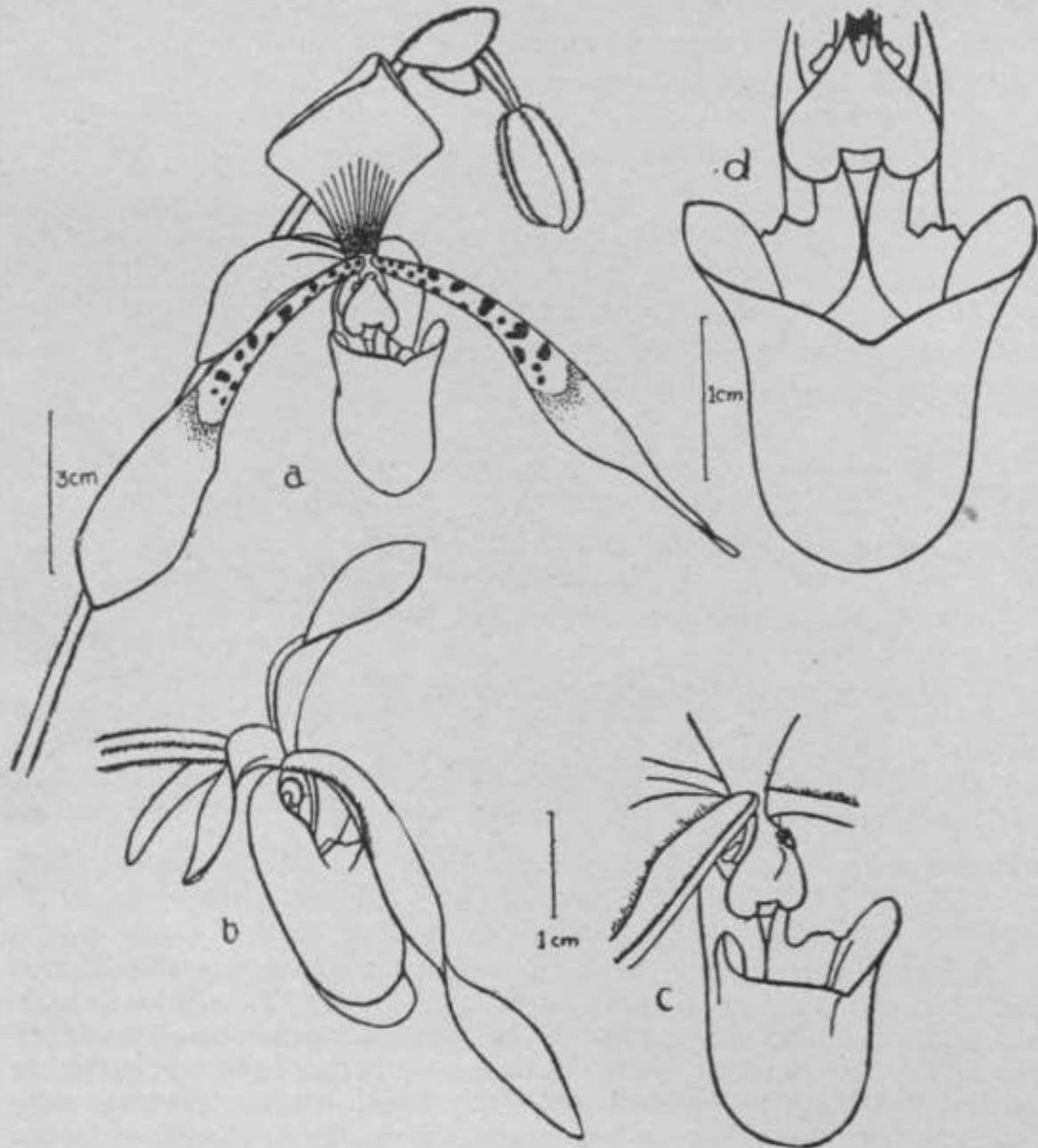


Fig. 11. *Papkiopedilum Lowii*. a, inflorescence with one expanded flower and two buds. b, flower, c, d, lip and column. Synsepalum abnormal, split into two parts.

## 2. *P. glaucophyllum*

Leaves rather blue-green (not very deep), the surface dull, broad and rather thin in texture, to 20 cm. long; scape to 15 cm. or more long to the first flower, bearing an indefinite succession of flowers, one at a time, about 2 cm. apart; flowers about 8 cm. across; upper sepal broadly elliptic, light green at the base shading to deeper green towards the tip, with about 12 dark brown lines and some lighter brown mottling; synsepalum small, hidden by the lip; petals spreading almost horizontally, somewhat twisted, with crisped hairy edges, very pale greenish, with small scattered dark purplish spots; lip very pale green at the base, with a large mauve pouch; staminode large, ovate, base green, rest dark brown.

This species is native in south-east Java, at about 1,000 ft. altitude. A finer and larger variety has also been found, but its place of origin is uncertain. *P. glaucophyllum* is much cultivated in Java and has been brought into Malaya. It is certainly the most free-flowering Paphiopedilum in cultivation in Singapore. With care, the plants will attain a large size, and each inflorescence produces a long succession of flowers, which are quite pleasing, though not so fine as those of some other species. Light shade is needed, and when in healthy growth the plants respond markedly to manuring.

There is an allied species in Sumatra, of similar habit but more richly coloured, growing at 6,000 ft. altitude, *P. Chamberlainianum* (named in honour of Sir Joseph Chamberlain, who was a keen orchid grower). Dakkus reports this growing and flowering at Buitenzorg, but it is unlikely to succeed in Malaya except at our hill station.

### 3. *P. exul*

Leaves uniformly green, fleshy, to about 20 by 2 cm., the surface shining; scape about 15 cm. long, bearing a large bract and one flower about 6 cm. wide (to 8 cm. in strong plants); upper sepal broadly ovate, obtuse, keeled and hairy on the back, the face smooth, yellowish green with several brown spots towards the base and a white margin; synsepalum as large as the upper sepal, curving forwards behind the lip, pale green; petals narrowly oblong, longer than the sepal, curving forwards, slightly widened towards their tips, yellowish with purple streaks down the middle; lip shining, dull yellowish, almost at right angles to the sepal the pouch prominently auricled; staminode almost round, with a small wart in the middle, dull yellow. Fig. 10.

This species is native in Lower Siam, growing in rock crevices in the same way as *P. niveum*, and responds to similar treatment. It is best however in a somewhat more exposed position. If in vigorous growth, it flowers occasionally in Singapore, but undoubtedly flowers better, with larger flowers, in a somewhat cooler and more seasonal climate. The waxy shining flowers with their tones of dull yellow and white are very attractive. A natural hybrid between *P. exul* and *P. niveum* has been found.

Allied to *P. exul* are some very fine species, notably the Himalayan *P. insigne*, which has been in cultivation in Europe since 1820. *P. insigne* will flower in Singapore but is not very vigorous and the flowers are small. It is very like *P. exul*, but has broader more prostrate leaves and usually more spots on the upper sepal, but it is variable.

### 4. *Paphiopedilum Robinsoni* (Ridl.) Ridl., Flora M.P. 4: 232. 1924.— *Cypripedium Robinsoni* Ridl., J.F.M.S. Mus. 6: 83. 1915.

Stems often forming long runners bearing many small leaves; normal leaves about 8 cm. long, tessellate; scape about 30 cm. long, bearing a single flower; upper sepal broadly ovate with a narrow base, 3-5 cm. long, the base dull purple shading into green towards the apex; synsepalum ovate, shorter, pale green; petals 5 cm. long, widened towards the apex, half twisted at the base, dull yellowish green with a central purplish band and some purple spots; lip purplish, 3 cm. long; staminode rounded, notched at the tip, yellowish.

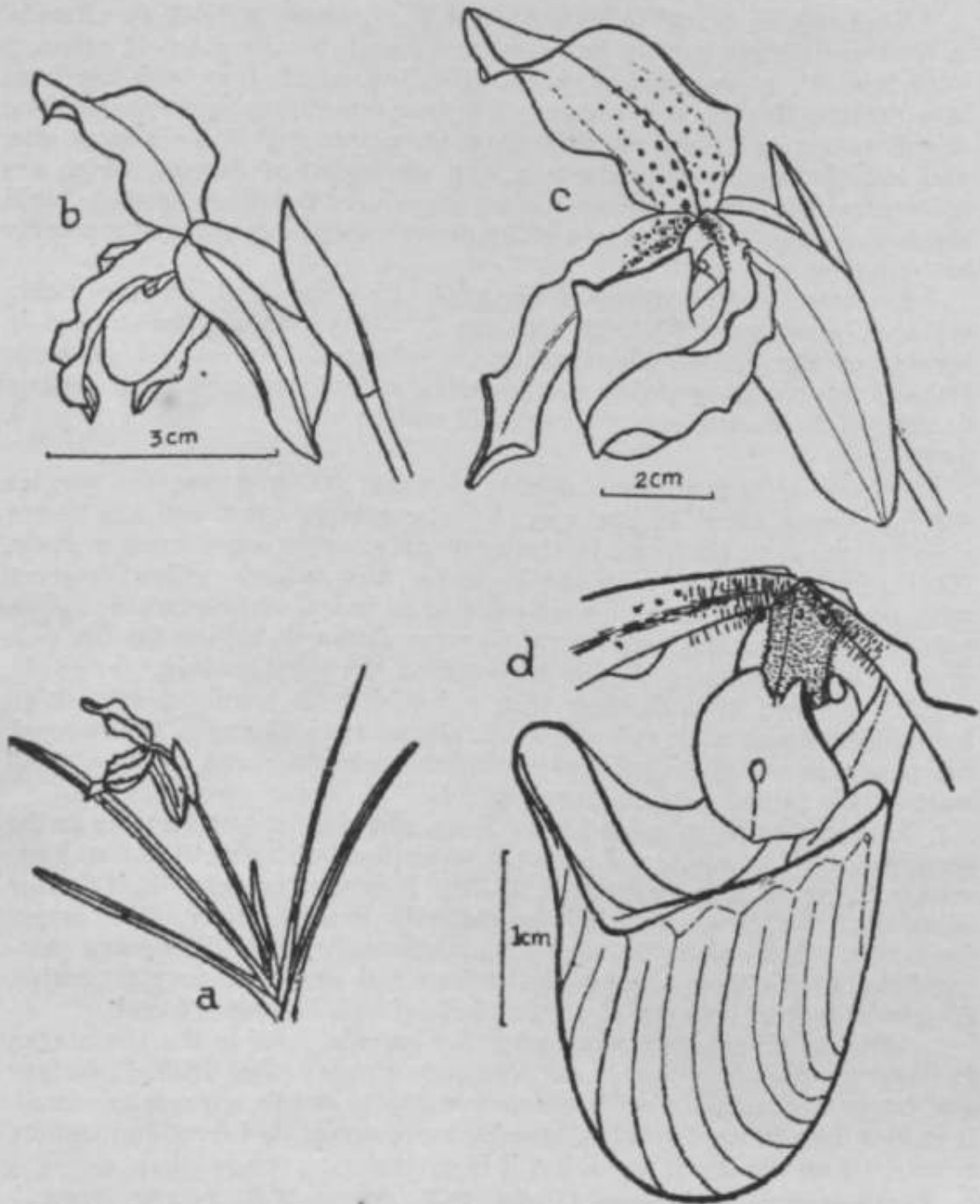


Fig. 10. *Paphiopedilum exul*, a, plant and inflorescence, b, c, flower from back and from side, d, lip.

This species is only known to occur on Gunong Tahan at 4,000-6,000 feet altitude, in moist, lightly shaded places, in deep moss. Its spreading runners are often strongly developed. The flower is interesting but not so beautiful as others in the genus. Plants brought to Singapore have not flourished and have flowered very weakly, perhaps because a satisfactory potting material was not used. No doubt an acid peat is required; but the species is unlikely in any case to flourish in the lowlands.

5. **Paphiopedilum Bullenianum** (Rchb. f.) Pfitz., Engl. Bot. Jahrb. 19: 40. 1894.—*Cypripedium Bullenianum* Rchb. f., Bot. Zeit. 1865: 99.

Leaves rather pale blue-green, rather faintly tessellated, about 15 cm. long; scape to 30 cm. long, bearing a single flower 7 cm. or more in diameter; upper sepal ovate with an acute tip, the sides reflexed towards the base, about 3 cm. long, pale green with a darker central band; synsepalum shorter and narrower; petals much longer than the sepal, spreading horizontally with the widened ends somewhat drooping, greenish with purple-brown hairless warts near the edge towards the base and a purplish flush in the middle; lip longer than the sepal but shorter than the petals, the pouch short, deep purplish red, the inflexed side-lobes with large warts.

This species was first found in North Borneo by Low. In recent years it has been found also on Pulau Tioman and on Gunong Pantii in Johore, the latter probably its only locality in Malaya. Unfortunately collectors have quite stripped some parts of the mountain, which should be constituted a nature reserve, as the flora is unique. *P. Bullenianum* grows on wet mossy rocks in light shade. It is not easy to cultivate successfully, in Singapore, and flowers rarely, so that it is not worth extensive cultivation, and its flowers cannot compete for beauty with many others species of the genus. It belongs to the group as *P. Robinsoni*, having petals broadened towards the apex. Of related species, *P. Hookerae* from Borneo (see below) and *P. venustum* from the Himalayas have proved popular in Europe and have been hybridized.

6. **P. Hooker\***

Leaves about 10 by 4 cm.; scape about 20 cm. high bearing \* sŪ|p® flower about 10 cm. across; upper sepal ovate acute, yellowish, flushed with green in the central part; synsepalum shorter and narrower; petals straight, drooping slightly below the horizontal, gradually widened from the base to near the apex, the edges hairy and crisped towards the base, greenish at the base and pinkish at the apex, with rather closely placed small round purplish spots in the basal two-thirds; lip longer than the sepal, its pouch longer than the basal part, greenish with a brown suffusion; staminode longer than wide, elliptic, with a broad incision at the apex.

The species is native in Borneo, on limestone at 1,000-1,500 feet altitude. It is said to be well suited to lowland cultivation in Java, but there is no record of its introduction to Malaya. It has a finer flower than our allied *P. Bullenianum*.

7. **Paphiopedilum barbatum** (Lindl.) Pfitz., Engl. Bot. Jahrb. 19: 40. 1894. Ridl., Flora 4: 231.—*Cypripedium barbatum* Lindl., Bot. Reg. 1841: Misc. 110; 1842: t. 17. Bot. Mag. t. 4234.

Leaves 10-15 cm. long and 2-3 cm. wide, thin in texture, strongly tessellated with light and dark, rather bluish green; scape to about 25 cm. tall, bearing one flower (exceptionally 2); diameter of flowers to about 8 cm.; upper sepal large, up to 4 cm. long, almost round with a short tip and the margin reflexed towards the base, with about 15 strong curved longitudinal stripes which are green at the base, purple towards the tip, on a white or pale greenish background; synsepalum shorter and much

narrower, narrowly elliptical, obtuse; petals drooping somewhat, almost straight, slightly widened towards their tips, with finely hairy edges and prominent hairs on a few black warts on the upper edge (warts about 1 mm. diameter), greenish towards the base and purplish towards the apex; lip about as long as the sepal, the pouch brown-purple, the inflexed side-lobes bearing small purplish warts and also small spots; staminode semi-circular with projecting points at the ends of the straight side (which is basal), green with purple markings. Fig. 12.

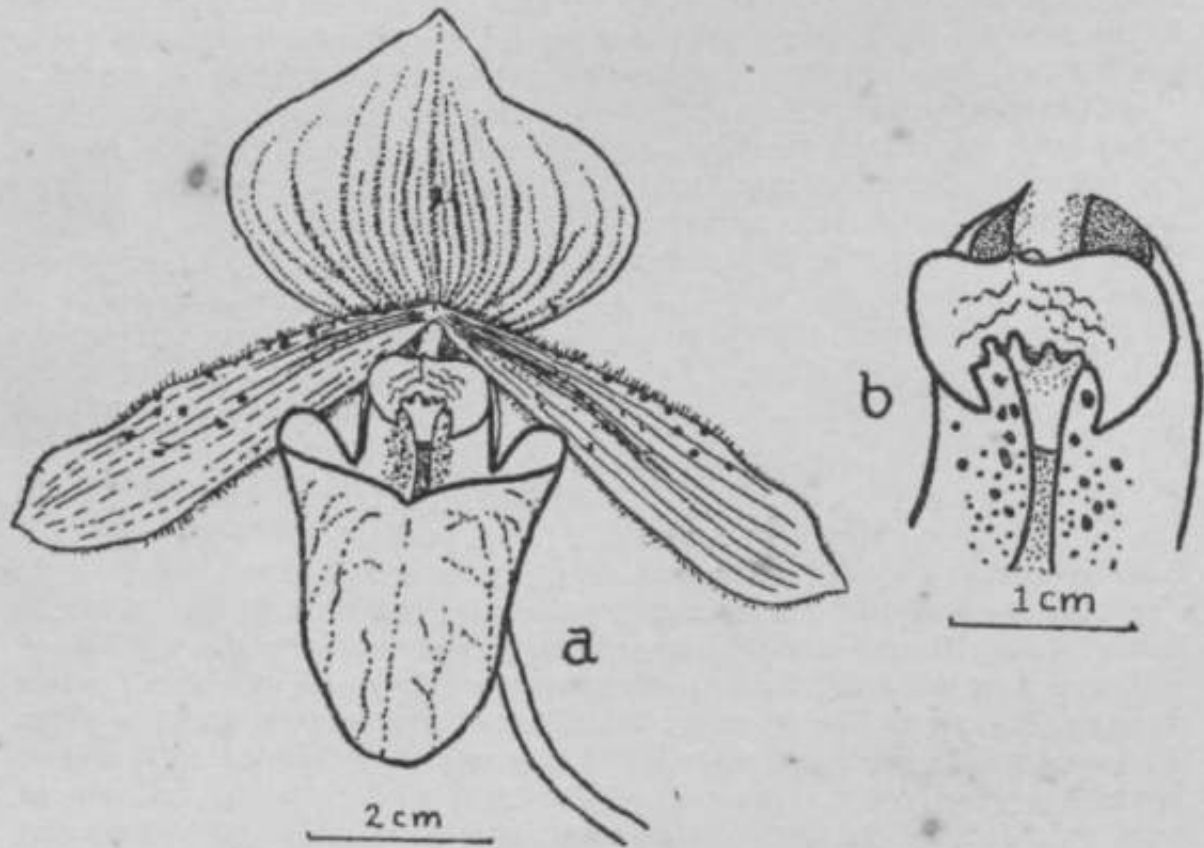


Fig. 12. *Paphiopedilum barbatum*. a, b, flower and column from front.

This species is native in Malaya, and northwards into Peninsular Siam. It was first found by Hugh Cuming on Mt. Ophir in 1838 and has been extensively cultivated and hybridized in Europe. It is local in its occurrence, usually between 2,000 and 4,000 feet altitude, in a number of mountain localities from G. Bftumut in Johore northwards. It grows either in shaded mossy places on sandy or peaty ground, or among mosses on granite boulders in moist shady valleys. It will not stand much exposure to sun. In Singapore it grows quite well in a pot filled with broken brick or granite chips mixed with fern-root, but flowers rarely. On Penang Hill it flourishes and flowers freely; the wild plants there appear to have a definite flowering season. There is a good deal of variation in the details of colouring of the flowers of different plants.

#### 8. *P. callosum*

Very similar to *P. barbatum*, differing in the details mentioned in the Key, namely the synsepalum ovate, acute, and the warts on the petals

much larger. The petals may have warts on both edges (I have not seen this), and are slightly curved in the form of an S.

This species is native in Siam and is sometimes imported into Malaya. Pfitzer says the side-lobes of the lip have large warts, whereas those of *P. barbatum* have smaller contiguous warts. In specimens seen by me there is little difference in these warts but in *P. barbatum* there are also small spots. *P. callosum* as imported to Singapore from Siam (locality and elevation not known) has grown more strongly and flowered better, with larger flowers (upper sepal 5 by 5 cm.), than *P. barbatum* introduced from Penang Hill, which suggests that *P. callosum* grows naturally at low elevations. It is certainly well worth cultivation in Singapore, which is not true of *P. barbatum*.

### 9. *P. Lawrenceanum*

Leaves about 15 by 5 cm., strongly tessellated with pale" yellow-green and deep olive; scape to 30 cm. or more high, bearing a single flower which may be 10 cm. across in strong plants; upper sepal to 5 cm. long, nearly round, shortly pointed, white flushed with green at the base, with about 11 prominent purple stripes and shorter narrower ones between; synsepalum shorter, narrowly ovate; petals spreading almost horizontally, narrowly oblong, with black hairy warts on both edges, pale green at the base grading into purplish brown at the apex; lip about as long as the sepal, greenish, or more or less flushed with purple, the inflexed side-lobes with small separate warts; staminode much as in *P. barbatum* but larger.

This fine species, with its leaves of distinctive yellow-green, is native in various parts of Borneo, apparently at about 1,500 feet altitude, on rocks and on the ground. It is distinctly more strong-growing in Singapore than *P. barbatum*, and flowers occasionally, but the flowers do not usually attain their full size. No doubt it would do well in localities with a slightly lower minimum temperature. At Buitenzorg it flowers throughout the year.

### BASITONJE

Habenaria is the only known Malayan genus of the main division of the Orchid family known as *Basitonse*, distinguished by the position of the anther, which is joined by a broad base to the column, not separable and easily falling as in most other orchids. There are two pollinia, in separate cells, each with a fairly long caudicle and a sticky disc. The pollinia are not smooth and waxy, as in most epiphytic orchids, nor powdery as in many terrestrial ones, but are covered with tiny separate pollen-masses, giving the surface a tessellate appearance; this arrangement is sometimes called *sectile*. The discs are sometimes covered by the rostellum (as in *Orchis*) but are not so in *Habenaria*.

A great porportion of the orchids of Europe belong to the *Basitonse*, including the genus *Orchis* itself, but the group is poorly represented in the tropics. Besides the genus *Habenaria*, the only other Malaysian representative is a species of *Herminium*, which occurs in Java, and might also be found in Malaya, as its distribution extends southwards from Burma and China. In Burma are other species of *Herminium* and of a few other genera of the group, which become more numerous as we go northwards.

## HABENARIA

Terrestrial plants, usually growing from tubers (rarely from a short rhizome) ; stem erect, bearing few to many leaves, sometimes near the ground, sometimes much higher, with sheaths on the stem below the leaves and narrow bract-like leaves above them; leaves thin, usually broad, rarely stalked, not jointed at the base; inflorescence terminal, usually fairly long, of many small to fairly large flowers; upper sepal and petals usually forming a hood over the column (not in *H. susannx*) ; lateral sepals usually spreading or reflexed; lip spurred, the blade variously shaped, 3-lobed or simple; column short, consisting mainly of the anther, usually with a small auricle on either side; pollinia 2, separate, the caudicles enclosed in long or short, often prominent, tubes, separated more or less widely by a rostellum; stigmas 2, usually separate, convex or on elongated processes, on either side of the base of the column, often joined to the base of the lip and the auricles, in two species flat and joined across below the rostellum.

This is a large genus of world wide distribution. There is considerable variation in the details of the structure of the column, especially as regards the stigmas, and some authors have adopted a division of the genus on the basis of stigma-structure. Thus Dr. J. J. Smith divides *Habenaria* into the three genera *Platanthera*, *Peristylus* and *Habenaria* proper. In his comprehensive book on orchids. Schlechter recognized only *Platanthera* and *Habenaria*, but he subsequently removed a few species (including our *H. susannx*) to a genus *Pecteilis*. Though such divisions may appear distinct in a limited number of species, they are said not to be sharply separable when all known species are considered. Further, as applied to the local species, the divisions based on form of stigmas are not clearly distinguishable on other characters.

*Platanthera* is a name given to those species which have a flat stigma-surface, usually continuous but sometimes slightly divided, beneath the rostellum, very much like the stigma of most orchids. Of Malayan species, *H. angustata* and *H. susannx* have been included in *Platanthera*. The other divisions of *Habenaria* all have two separate stigmas which are convex or more or less elongated, often club-shaped. If the stigmas are convex and entirely united to the base of the lip and to the auricles of the column, we have the *Peristylus* condition; if the stigmas are long and cylindric or club-shaped we have *Habenaria* proper. Our species 3-5 and 7-9 are *Habenaria* proper; No. 6 and 10-14 are *Peristylus*. In *Habenaria* proper the stigmas are often quite long and prominent; they are usually below and shorter than the tubes containing the caudicles of the pollinia.

Most of our *Habenarias* have quite small flowers. Some of them are found in open places, some in the forest. Four are mountain plants. The three species which have fairly large and decorative flowers are all found only in the north, and on account of the need to rest their tubers regularly they are little difficult to manage in Singapore. One of the three (*H. rhodocheila*) has only been found on Penang Hill in our area. The second (*H. carnea*) occurs only on Langkawi Islands, and has become scarce there through raids by collectors. The third (*H. susannx*) occurs locally



in quantity in northern Kedah, and has such a wide range of distribution that there is no fear of its destruction. All three are unusually beautiful and distinctive plants, very different in character from most cultivated orchids.

### Key to the Malayan species of *Habenaria*

- Solitary stalked leaves, from base of plant, as well as unstalked leaves on the stem; lip not lobed 1. *H. angustata*
- Leaves all on the erect stems; lip 3-lobed
- Spur of lip longer than sepals and petals
- Side-lobes of lip as broad as long, or nearly so
- Side-lobes fringed with long narrow teeth 2. *H. susannx*
- Side-lobes not toothed
- Leaves olive-green with pale spots; whole flower pink .. .. 3. *H. carnea*
- Leaves green with fine darker network of veins; lip yellow, sepals and petals green .. .. 4. *H. rhodocheila*
- Side-lobes of lip very narrow, and midlobe usually also
- Sepals with slender tails 3-5 mm. long .. 5. *H. singaporensis*
- Sepals not tailed
- Midlobe of lip much shorter than side-lobes 6. *H. bambusetorum*
- Midlobe of lip longer than side-lobes
- Flowers salmon pink (rarely white) 7. *H. roseata*
- Flowers pale green
- Upper edge of lateral sepals 5 mm. long, width 8-10 mm. .. 8. *H. reflexa*
- Upper edge of lateral sepals 6 mm. long, width 6 mm. .. 9. *H. Kingii*
- Spur of lip shorter than sepals and petals
- Plant about 150 cm. tall .. .. 10. *H. gigas.*
- Plant rarely over 50 cm. tall
- Side-lobes of lip about 1 cm. long, very narrow; spur bilobed .. .. 11. *H. monticola*
- Side-lobes of lip shorter; spur not bilobed
- Leaves at about the middle of the stem 12. *H. goodyeroide?*
- Leaves all near the ground
- Flowers green; side-lobes of lip much narrower than midlobe . 13. *H. lacertifera*
- Flowers white; side-lobes of lip as wide as or wider than midlobe
- Sepals about 5 mm. long; lip not much longer than sepals, lobes nearly equal .. .. 14. *H. sumatrana*
- Sepals about 7 mm. long; lip longer. 1-2 cm. wide, the side-lobes much longer than the midlobe *H. sumatrana* var. *major*

1. **Habenaria angustata** (Bl.) O. Ktze, Rev. Gen. PL 2: 664. 1891.—*Mecosa angustata* Bl., Bijdr. 404. 1825.—*Platanthera angustata* Lindl., Gen. et Sp. Orch. 290. 1835. J.J.S., Fl. Buit. 6: 29, f. 12.—*Habenaria zosterostyloides* Hk. f., F.B.I. 6: 155. 1890. RidL, Flora 4: 226.

No tubers; stems arising from short rhizome bearing several spreading thick roots; one or more leaves from rhizome in addition to those on the erect stem; leaves from rhizome stalked, stalk 4-10 cm. long, blade 7 by 3.5 to 12 by 7 cm., elliptic, acute; leaves on erect stem unstalked, distant, to about 8 by 4.5 cm. (sometimes narrower); stem (including inflorescence) 30 to 120 cm. high, inflorescence to 30 cm.; flowers 1-2 cm. apart, pale green; upper sepal 7 by 5 to 8.5 by 6 mm., petals narrower, the three overlapping and forming a hood; lateral sepals reflexed, 6-9 by 2-3-5 mm.; lip with single narrowly triangular blade 9-10 by 3 mm. and spur 15 mm. long; column 4-5 mm. high, anther large, pollina widely separated with continuous flat stigma between them. Distributed to Java, Sumatra and Borneo; in Malaya found at many mountain localities at 4,000-7,000 feet. Plants in exposed places at high altitudes are sometimes small, with basal leaves only 4 by 2 cm. on a stalk 1 cm. long.

2. **Habenaria susannae** (L.) R. Br., Prodr. 312. 1810. RidL, Flora 4: 228.—*Orchis susannx* Linn., Sp. PL 939. 1753.—*Platanthera susannx* Lindl., Gen. et Sp. Orch. 295. 1835. J.J.S., FL Buit. 6: 26, f. 9.—*Pecteilis susannx* Rafin., Fl. Tellur. 2: 37. 1836. *Habenaria gigantea* Don, Prodr. Fl. Nep. 24. 1825. Bot. Mag. t. 3374.

Tuber large; whole plant to 120 cm. or more high; stem leafy almost throughout, the largest leaves rather below the middle, to about 12 by 5 cm., stalkless, widest near base; inflorescence to about 20 cm. long, with 4-10 large white flowers, bracts large; upper sepal erect, nearly circular, about 3 cm. across; lateral sepals spreading, raised above horizontal, about 3-6 by 2-4 cm., their edges reflexed; petals very narrow, 1-3 cm. long; lip about 5 cm. wide, 3-lobed to the base, with very large side-lobes and narrow midlobe, side-lobes fringed with long narrow teeth, midlobe 3 cm. long, 8 mm. wide, blunt; column 1 cm. tall, 1-2 cm. wide, pollinia widely separated, caudicles 7 mm. long; stigma a broad patch between the pollinia, slightly grooved down the middle. Distributed in India, China and throughout Malaysia; in Malaya only found in Kedah, in open grassy places. **Fig. 13.**

This is a very beautiful species, and not difficult to cultivate if care is taken to rest the tuber in dry earth after the leafy stem has died. After about 4 months, the bud at the top of the tuber will begin to grow, when it should be repotted. It will take about 4 months to flowering, and then will live another 2 months before dying back. It is important to tend the plant carefully even after flowering, as during this period the new tuber is being formed. Well-grown cultivated plants, manured carefully during their most active growing period, will attain a size rarely seen in wild plants, and bear a large number of flowers. Susanna, after whom the species is named, was the wife of G. E. Rumphius, the 17th century author of the *Herbarium Amboinense*.

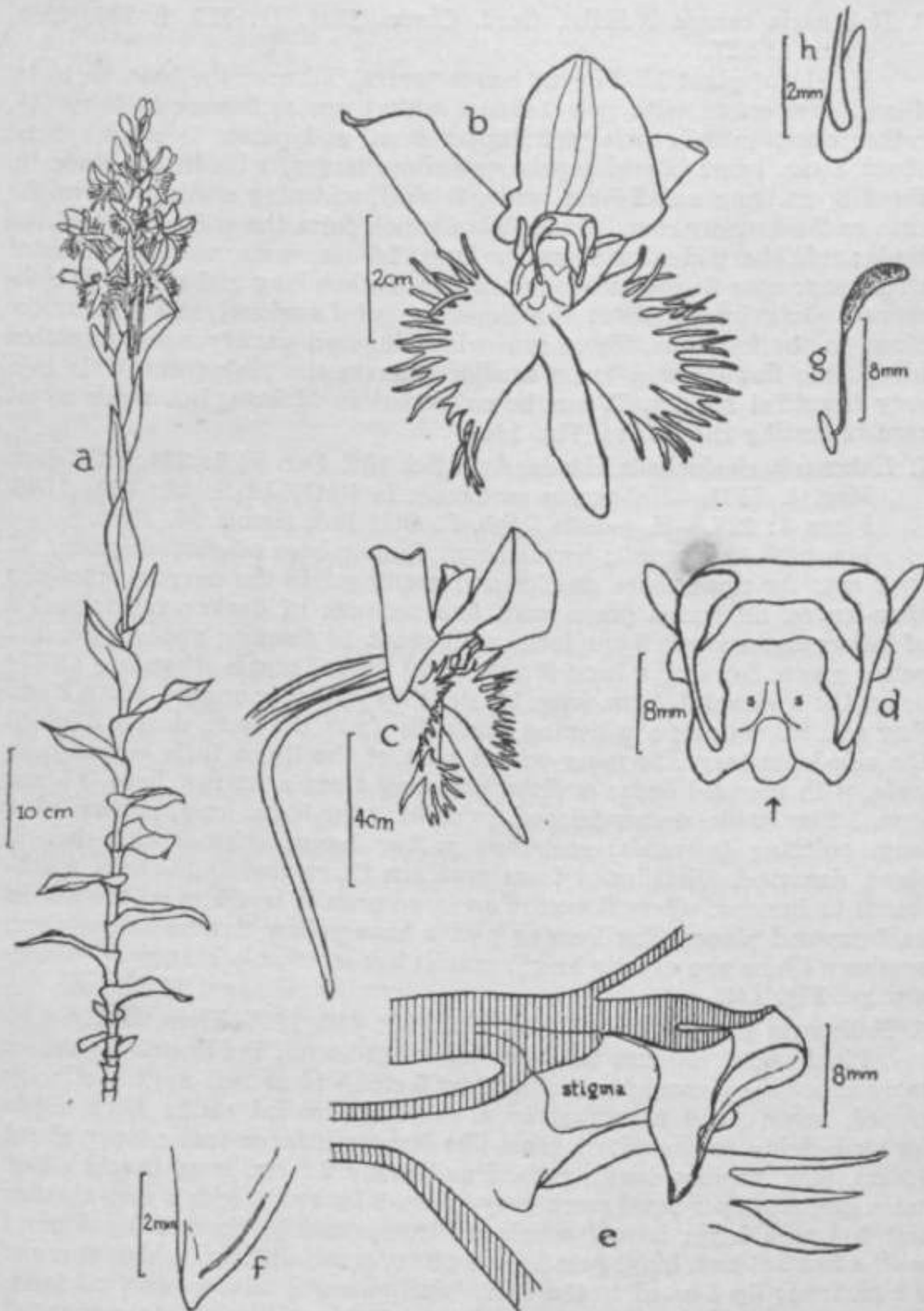


Fig. 13. *Habenaria susannac*. *a*, whole plant, *b*, front of flower, *c*, side of flower showing spur, *d*, column and petals; s,s, stigmas; arrow points to entrance to spur, *e*, longitudinal section of column and base of lip. *f*, tip of anther-lobe showing slit from which disc of pollinium emerges, *g*, one pollinium. *h*, disc and base of caudicle.

3. **Habenaria carnea** N.E.Br., Gard. Chron. 1891, II: 729, f. 105. Ridl., Flora 4: 227.

Height of plant 15-25 cm.; leaves several, all near the base, to 10 by 4 cm., olive green with pale (almost white) spots; flowers to about 15, rather close, entirely pale pink; upper sepal and petals forming a hood about 1 cm. long; lateral sepals spreading, larger, with broad base; lip about 3 cm. long and 2.5 cm. wide, 3-lobed, widening abruptly from the base to the broadly rounded side-lobes which form the widest part of the blade; midlobe widening from its base, 1.8 cm. wide near its rounded cleft apex; spur 5 to 6 cm. long; stigmas rather long and slenderly club-shaped. Only known from the limestone of Langkawi and Peninsular Siam, in the lowlands. There is a white-flowered variety with unspotted leaves, the flowers said to be smaller than in the pink form. This is a very beautiful species. It can be cultivated in Malaya, but needs great care in resting the tubers. **Fig. 14e.**

4. **Habenaria rhodocheila** Hance, Ann. Sci. Nat. Ser. V, 5: 243. 1856. Bot. Mag. t. 7571.—*Habenaria xanthocheila* Ridl., J.L.S. 32: 411. 1896. Flora 4: 227.—*H. pusilla* Rchb. f., Otia Bot. Hamb. 33. 1878.

Plant 20-30 cm. tall; leaves about 6, near base of stem, to about 12 by 2 cm., the upper ones smaller and grading into the narrow bract-like stem-leaves, all leaves green with fine network of darker veins; rachis of inflorescence about 5 cm. long, with about 10 flowers; upper sepal and petals green, forming a hood 9 mm. long; lateral sepals spreading at 45° below the horizontal, 1 cm. long, twisted; lip yellow or orange, about 3 cm. long and 2.2 cm. wide, widening gradually from the base, deeply 3-lobed, the side-lobes large, forming widest part of the lip, a little longer than wide, with rounded ends; midlobe widening from a narrow base, 1.5 cm. long, 1.2 cm. wide, deeply bilobed, rounded; spur 5 cm. long; anther-tubes long, pointing forwards; rostellum rather large; stigmas club-shaped, short, decurved. Distributed from southern China and Indo-China southwards to Penang, where it occurs on large granite boulders on the hill in half exposed places. The Penang plants have yellow flowers; those from southern China are usually bright scarlet but sometimes orange or yellow-orange. **Fig. 14f.**

5. **Habenaria singaporensis** Ridl., J.L.S. 32: 410. 1896. Flora 4: 229.

Plant about 100 cm. tall, with about 12 leaves, the lowest 40 cm. or more above the ground; leaves to 20 by 5 cm., widest near apex, distinctly tipped, acute, base narrowed to a short channelled stalk; stem above leaves bearing several short bract-like leaves; inflorescence proper about 10 cm. long, flowers dense; pedicel and ovary 2-2 cm. long, bracts about same length; upper sepal erect, grey-green, 9 by 3 mm. with a very slender tail 3-4 mm. long; lateral sepals white, spreading, about 9 by 4 mm., with a tail 5-6 mm. long; petals olive green, erect, slightly curved, narrow, 9 mm. long; lip 3-lobed to the base, "dull glaucous olive-green", all lobes very narrow, midlobe about 9 mm. long, laterals a little shorter; spur 1.8 cm. long; anther-tubes 4 mm. long; stigmas large, decurved. Found in Singapore, Johore and Kemaman, in swamp forest. There is a group of related species in Java and Sumatra, all with tailed sepals but differing in the details of the flower.

6. *Habenaria bambusetorum* Krzl., Orch. Gen. et Sp. 1: 384. 1898.—  
*Peristylus gracilis* BL, Bijdr. 404. 1825. J.J.S., Fl. Buit. 6: 31, f. 13.—  
*Habenaria inconspicua* Ridl., J.F.M.S. Mus. 4: 75. 1909. Flora 4: 229.

Plant about 50 cm. tall; leaves 6 or more, well above base of stem, to 10 by 1.8 cm., without stalk (in Java to 13 by 3 cm.) ; inflorescence proper about 15 cm. long with many small greenish flowers; ovary about 1 cm. long, bracts a little shorter; upper sepal and petals forming a hood over the column nearly 3 mm. long, the sepal ovate with blunt tip, the petals a little longer, triangular; lateral sepals spreading, concave, over 3 mm. long; lip deeply 3-lobed; side-lobes spreading, 5-7 mm. long and 0.5 mm. wide ; midlobe broader, 2-5 mm. long, blunt; spur 5-6 mm. long, narrowly club-shaped; column short with rather large auricles, caudicles of pollinia short, stigmas not prominent, at junction of column and lip. Distributed in Sumatra, Java and Borneo; in Malaya only found once, near Cameron Highlands.

7. *Habenaria roseata* Ridl., J.S.B.R.A.S. 49: 42. 1908. Flora 4: 228.

Plant to 45 cm. tall; leaves several, largest a little above base of stem, the blades to 12 by 1 cm., unstalked; above the leaves many small stem-leaves like the floral bracts; inflorescence proper to 5 cm. long with 5-12 flowers; flowers pale salmon-pink (or white ?) ; bracts narrow, about 1.5 cm. long, edges minutely hairy; ovary with long beak at top, in all 2 cm. long; upper sepal and petals forming a hood about 5 mm. long; lateral sepals reflexed, a little longer and much broader, the upper edge nearly straight, the lower edge broadly rounded; lip 3-lobed from base, the lobes all very narrow, the middle one longest, about 1.2 cm.; spur curved, nearly as long as ovary, thickened towards the tip; anther-tubes long, curved, forward-pointing; stigmas club-shaped. Found in open places in Kedah, Trengganu and Lower Siam; very nearly allied to *H. rostrata* of Tenasserim and perhaps not specifically distinct. Fig. 14h.

8. *Habenaria reflexa* BL, Bijdr. 403. 1825. J.J.S., FL Buit. 6: 39, f. 20.  
 Bull. Botz., Ser. 3, 3: 229 (revised descr.).—*H. Murtonii* Hk. f.,  
 F.B.I. 6: 144. 1890.—// *Kingii* quoad Ridl., Flora 4: 228. *p.p.*

Height of plant 30-50 cm.; leaves 4-6, near base of stem, blade to 16 by 5 cm., tip acute, edges crisped, dark green above and pale beneath, at base a broad channelled stalk 3 cm. long above the sheath; stem above leaves bearing several narrow bract-like leaves 1.5-2 cm. long; inflorescence about 10 cm. long, the rachis angled and minutely hairy; flowers many, pale green; bracts broad, as long as ovary, pale green, edges minutely hairy; ovary 2 cm. long, strongly curved, with a narrow neck; upper sepal and petals forming a hood about 4 mm. long, the sepal very broad, blunt, the petals triangular with narrow tip; lateral sepals reflexed, the upper edge 5 mm. long, nearly straight, the lower edge very strongly curved, width 8-10 mm.; lip 3-lobed to base, lobes all very narrow, laterals diverging, curved, about 9 mm. long, midlobe about 1.6 cm. long, curved in an S as seen from the side; spur strongly curved forwards from about the middle, the end thickened, a little shorter than the ovary; anther-tubes 6 mm. long, straight beyond the bent base and pointing obliquely

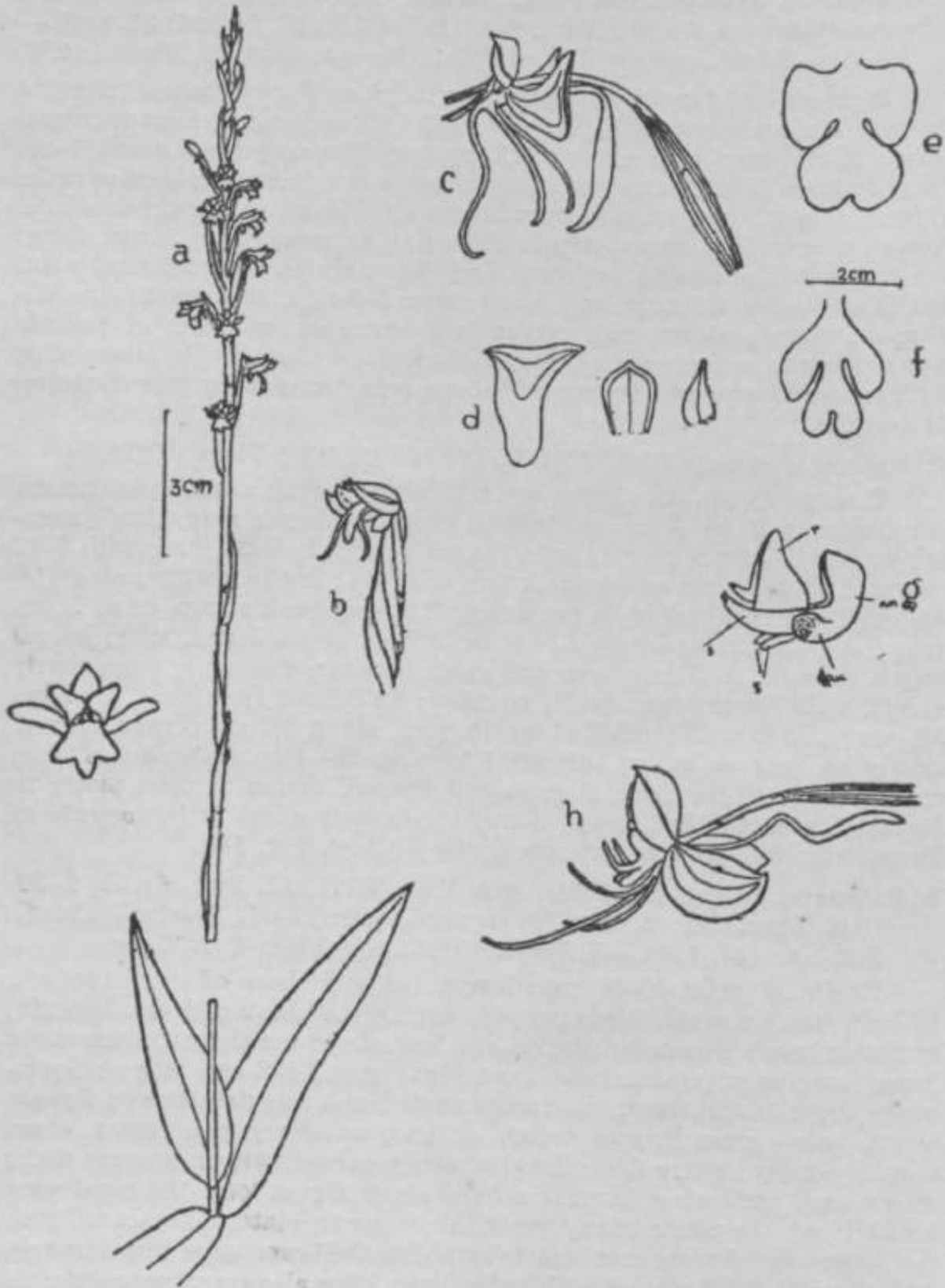


Fig. 14. *Habenaria*. spp. (drawings copied from de Alwis and Carr). *a*, *H. sumatrajia*, plant; with single flower enlarged, *b*, flower of *H. tacertifem*. *e*, flower of *H. Kingii*. *d*, *H. reflexa*, lateral sepal, upper sepal, petal. ♀ *H. carnea*, lip. *l*, *H. rhodocheila*, lip. *g*, *H. rhodocheila*, column; an, anther; t, tube of pollinium; s, stigmas; r, rostelluni; au, auricle, *h*, *H. roseata*, flower.

forwards (the two diverging); stigmas short, rounded, broad. Distributed in Java and Sumatra; in Malaya found especially on limestone, in forest, in Pahang and Perak. **Fig. 14d.**

9. **Habenaria Kingii** Hk. f., F.B.I. 6: 144. 1890. Ridl., Flora 4: 228. p.p.

In habit closely resembling *H. reflexa* but with inflorescence to 30 cm. long, upper sepal about 6 mm. long, petals narrower, blunt, lateral sepals with upper edge 6 mm. long and width 6 mm., lip with midlobe not so strongly bent, anther-tubes not projecting more than 4 mm. Ridley considered this not different from *H. reflexa*; but if the above-mentioned differences are established a separation seems warranted. *H. Kingii* is only known from a few collections from the limestone of Perak, and further information about it is desired. **Fig. 14c.**

10. *Habenaria gigas* Hk. f., F.B.I. 6: 160. 1890. Ridl., Flora 4: 229—*Peristylus grandis* BL, Bijdr. 405, f. 30. 1825. (not *Habenaria grandis* Benth.). J.J.S., Fl. Buit. 6: 33, f. 15.

Whole plant about 150 cm. high, the lower third leafless and covered with long sheaths, the base of the stem very stout and fleshy; leaves 6-10, rather near together, to 30 by 10 cm., shortly tipped, base gradually narrowed but not stalked, pale beneath; inflorescence proper 15-30 cm. long, flowers close, green, small; bracts to 2 cm. long, longer than the flowers; sepals and petals 8-9 mm. long, not widely spreading, the petals wider than the sepals; lip 3-lobed, blade about as long as sepals and petals, side-lobes 2 mm. wide, a little longer than the midlobe, acute; midlobe bluntly triangular; spur ovoid, about 3 by 2 mm.; column short and broad, pollinia short, stigmas convex but not very prominent. Distributed in Java, Sumatra and Borneo; in Malaya found at Fraser's Hill and on Taiping Hills, in moist shady valley-forest.

11. **Habenaria monticola** Ridl., J.L.S. 32: 413. 1896. Flora 4: 230.—*Peristylus bilobus* Rolfe, Kew Bull. 1899: 132. (?)

Plant to about 60 cm. high; leaves 3-7, near base, to 15 by 2.5 cm., unstalked; inflorescence slender, to about 35 cm. long, bracts to about 10 mm. long, ovary and pedicel 5-7 mm., flowers small, green; sepals and petals 3 mm. long; lip 3-lobed nearly to base, side-lobes thread-like, ascending, 5-10 mm. long, midlobe about 2.5 by 0.5 mm.; spur nearly as long as sepals, dilated and the tip distinctly 2-lobed. Found on Penang Hill, Kedah Peak and Mount Ophir, in open places (sometimes in moss), at 2,000-3,500 feet altitude. Very closely allied and possibly identical species have been reported from Borneo, Sumatra and Java; the Penang Hill specimens have lip side-lobes only 5 mm. long, the others to 10 mm.

12. **Habenaria goodyeroides** Don, Prodr. Fl. Nep. 25. 1825.—*Peristylus goodyeroides* Lindl., Gen. et Sp. Orch. 299. 1835. J.J.S., Fl. Buit. 6: 32, f. 14.—*Habenaria glaucescens* Ridl., J.L.S. 32: 412. 1896. Flora 4: 229.

Whole plant to about 60 cm. tall, basal part leafless; leaves about 5, to 16 by 7 cm., almost exactly elliptic, shortly acute-tipped, not stalked, dark green above, glaucous beneath; inflorescence proper nearly 20 cm,

long, with many small flowers; bracts narrow, to 12 cm. long, about as long as the ovary, glaucous like the rachis; upper sepal 6 mm. long, concave, lateral sepals a little longer, with edges rolled back, widely spreading, sepals all greenish turning reddish; petals wider than sepals and of thicker texture, spreading, triangular, dull greyish olive green (or cream ?); lip 3-lobed, as long as petals and similarly coloured, side-lobes a little longer and narrower than midlobe; spur almost round, 2.5 mm. long; stigmas convex. Distributed from India and China southwards and throughout Malaysia; in Malaya only found at Langkawi, but may be expected elsewhere in the north. The Malayan form has apparently rather differently coloured flowers from the normal, and has been called *H. glaucescens*.

13. **Habenaria lacertifera** (Lindl.) Benth., Fl. Hongkong 362. 1861. Ridl., Flora 4: 230, p.p. *Coeloglossum lacertiferum* Lindl., Gen. et Sp. Orch. 302. IZSZ.—*Peristylus tentaculatus* J.J.S., Fl. Buit. 6: 35, f. 17. 19<sup>05</sup>—(not *Glossula tentaculata* Lindl.).

Plant 20-40 cm. tall; leaves about 3, all close to base, 5 by 15 to 12 by 2-5 cm., not stalked; stem bearing several bract-like leaves; inflorescence proper 10-20 cm. long, bracts, about 1 cm., about as long as pedicel and ovary, which lie close to the rachis; flowers small, pale greenish, not widely opening; sepals and petals about 3 mm. long; lip about 5 mm. long, longer than wide, lobed to about the middle, the side-lobes narrow, curved, not widely diverging, twice as long as the wider midlobe, a fleshy callus across the base; spur short, ovoid, with a short point, bent forwards, column very short, with short auricles, stigmas convex. Distributed in Tenasserim and Malaysia (also to India and China ?); in Malaya in rather open places in many parts of the country, in the lowlands. The amount of variation in the lip of this and related species is not certainly known. **Fig. 14b.**

14. **Habenaria sumatrana** (Schltr.) Schltr., Engl. Jahrb. 45, Beibl. 104: 3. 1911.—*Platanthera sumatrana* Schltr., Bull. Herb. Boiss. Ser. 2, 6: 296. 1906.—*Peristylus candidus* J.J.S., Fl. Buit. 6: 36, f. 18. 1905. (not *Habenaria Candida* Lindl.). *Habenaria lacertifera* quoad Ridl., Flora 4: 230 p.p. Var. major Holtt., Gard. Bull. 11: 281. 1947.

Plant 25-35 (rarely to 50) cm. tall; leaves about 3, all near base of stem, to 8 by 2-5 cm.; inflorescence proper to 10 cm. long (rarely to 17 cm.), bracts and ovary to about 1 cm., pressed close to rachis; sepals and petals white, 5-6 mm. long, their apical halves spreading fairly widely; lip with convex swollen greenish base 4 mm. long, the blade white, 3-lobed, the side-lobes spreading and a little longer than the midlobe, all the lobes shortly and bluntly triangular; spur pointing forwards, ovoid, acute, 1-5 mm. long. Distributed from Sumatra to the Moluccas; in Malaya found in *miny* places, in similar situations to *H. lacertifera*, especially in the south. There appears to be some variation in the shape and size of the lip, but the white colour of sepals and petals and the broader side-lobes appear to distinguish it adequately from *H. lacertifera*, though Ridley united the two. **Fig. 14a.**



Var. *major*. Differs from the typical form above described in larger flowers, the sepals and petals 7-8 mm. long, the lip 12 cm. long, the narrow green base 6 by 3 mm., the white blade widening rather abruptly to 1-2 cm., 3-lobed, the side-lobes spreading at 60° to the axis of the lip, parallelogram-shaped, 4 mm. wide, edges slightly toothed, midlobe blunt, 2 by 1 mm., spur 3 mm. long. Rather common locally in open places in Kedah. Both this and the smaller form of the species have a hump near the base of the lip; this hump obscures the column as one looks into the throat of the flower. It is just possible that this variety should rank as a species; but further information of the variation of *H. sumatrana* is needed before this can be decided. The form of *H. sumatrana* described from Java seems to be larger than the common one in Malaya, and perhaps comes between the latter and var. *major*.

#### THE TERRESTRIAL ORCHIDS WITH GRANULAR OR SECTILE POLLEN

This is a major division of the orchid family, containing several distinct tribes. It forms a large proportion of the orchid flora of Australia, and is well-known also in northern floras (including *Epipactis*, *Cephalanthera*, *Neottia*, *Listera* and *Spiranthes* in Britain). In Malaya only about ten per cent of orchids belong to this group, but they are very diverse, and in many cases complex in structure. The characters they have in common are: granular or sectile pollen; a terrestrial habit; no regular sympodial growth (except to a limited extent in the *Corymborchis* tribe); no joint at the base of the leaf-blade. The exact structure of the pollinia in the various genera needs further investigation. The granules each normally consist of four pollen-grains; and are more or less connected together by a viscid medium. In the *Goodyera* tribe they are sometimes in many elongate groups attached to the axis of the pollinium.

These orchids are separable into two main divisions, which we may call (1) the Saprophytes and their allies, and (2) the *Goodyera* and *Corymborchis* tribes.

The members of the saprophyte group are the most varied, and really consist (so far as we are here concerned) of four different tribes. Their pollinia have (in most cases) no disc; for the rest, they are most easily distinguished by saying that they do not conform to the particular structure of the next division.

The *Goodyera* and *Corymborchis* tribes have granular or sectile pollinia which have a very distinct disc (part of the rostellum) and caudicles. The anther is always on the back of the column, its tip pointing vertically upwards behind the rostellum. The two tribes each have a distinct vegetative habit.

The *Goodyera* tribe are nearly all small plants, 20-50 cm. tall. They have succulent, not woody stems, which creep along the ground, rooting at the nodes, and give rise to erect shoots bearing terminal inflorescences. The leaves are more or less ovate, usually stalked, thin, and sometimes coloured. The flowers rarely open widely; the upper sepal and petals form

a hood for the column, and the lip is saccate or spurred at the base, usually containing glands or hairs, with or without a small terminal blade. The *Goodyera* tribe includes one saprophytic species.

The *Corymborchis* tribe have flowers very like the *Goodyera* tribe, but they have taller, rather stiff woody stems and stiffer, longer, unstalked pleated leaves, more like the leaves of *Spathoglottis* and *Calanthe*.

#### THE SAPROPHYTES AND THEIR ALLIES

Saprophytes are plants which live entirely on decaying organic matter. They get all their carbohydrates through their roots or rhizomes—not through their leaves from the air, with the help of sunlight and chlorophyll, like most plants. But the decaying organic matter (dead leaves, etc.) around their roots is not soluble; it must be suitably decomposed before the orchid plants can make use of it. The orchid roots themselves cannot do this. The service is performed for them by certain kinds of fungi, which invade the living cells of the root or rhizome and carry into them the transformed substance of the dead leaves in the soil. When a cell is full of fungus-threads which have accumulated food-material, the orchid has the power to digest the fungus, and so to absorb the food-supply it has won. In this way the saprophytic orchids are dependent throughout their life on the help of fungi, just as nearly all orchids are at the seedling stage (*see* p. 39). Most saprophytes are rather small plants, not easy to see on account of their small size and dull colouring, but a few are quite large, especially the climbing *Galeola* species, which grow to 50 feet or more long, and also grow quite rapidly; they are an astounding example of the power of fungi to decompose dead plant material rapidly, and of the complete control of the fungus by the orchid plant.

Saprophytic orchids must have developed from green-leaved orchids. In fact, it may be that many of the latter are partly saprophytic, as most of them have fungus-infected roots when adult as well as in the seedling stage. We should therefore expect to find that saprophytes have green-leaved relatives; and some such relatives are included in the present group of genera. There are other saprophytic orchids besides those belonging to this group, but they are not numerous, being usually single species in otherwise green genera. The present is the only group in which a large proportion of species have become saprophytes.

The orchids in this group are very diverse. They are usually divided into four separate tribes. The most practicable way of classifying them is in accordance with their underground parts, whether tubers, fleshy rhizome, or thin rhizome with thick fleshy roots. Two of the tribes are each represented by a single genus (*Corybas* and *Cryptostylis*, both with green leaves). The other two tribes each have several genera; one tribe have a tuberous rhizome (*Gastrodia* tribe) and the other a fairly thin rhizome with fleshy roots (*Vanilla* tribe).

The *Gastrodia* tribe is divided into two parts, according to whether the sepals and petals are united or not; but this distinction does not seem to be a very fundamental one. There is one genus with green leaves, *Nervilia*. This has round tubers which produce first an inflorescence and

then a single green leaf, the leaf in its turn producing more tubers which it stores with food in the manner of other green plants. The other genera have fleshy underground rhizomes which grow to their full size by the help of fungi before they produce their pallid leafless inflorescences.

The Vanilla tribe is rather sharply divided into climbing and not-climbing species. The climbing species start life like the others, but on account of their climbing habit we are apt to overlook their humble beginnings. The species *Galeola javanica* is an interesting relic which has failed to climb. The seeds of *Galeola* and *Vanilla* are particularly interesting, being the largest of all orchid seeds.

Saprophytes are nearly always found in primitive forest, especially where under-growth has been recently cleared, as for making a temporary path or rentis.

In the following arrangement, genera nos. 2-5 constitute the Vanilla tribe, and nos. 7-11 the Gastrodia tribe.

#### Key to the Malayan saprophytes and their allies

- Very small plants, with a small tuber, a single green leaf, large upper sepal and lip, the other sepals and petals very narrow .. .. . 1. *Corybas*
- Not this combination of characters
- Climbing plants, with a root at each node
- Stems green, with or without green leaves .. 2. *Vanilla*
- Stems not green, more or less brownish, with a small brownish leaf at each node .. 3. *Galeola*
- Plants not climbing
- Sepals and petals free, not joined together
- Rhizome usually short and vertical, with rather thick roots
- No green leaves present
- A small toothed cup at the apex of the ovary, just below the sepals and petals 4. *Lecanorchis*
- No such cup present
- Lip with a distinct narrow basal part to which the blade is jointed; blade not cup-shaped .. .. 5. *Aphyllorchis-*
- Lip without narrow basal part, cup-shaped, unlobed .. .. 3. *Galeola*
- Green leaves present .. .. 6 *Cryptostyli*&
- Rhizome tuberous or fleshy, usually horizontal and more or less cylindrical, much thicker than the roots
- Tubers almost spherical, bearing a single green leaf after the flowers have withered .. .. . 7. *Nervilia*
- Tubers not spherical; no green leaves
- Tuber ovoid, about 5 by 3-5 cm.; lip spurred 8. *Epipogum*
- Tuber more slender; lip not spurred .. 9. *Stereosandra*

- Sepals and petals more or less joined together  
 Petals joined to about half their length with  
 the upper sepal, but only slightly to lateral  
 sepals; stigma near top of column .. 10. *Didymoplexis*  
 Petals joined equally to upper and lateral  
 sepals; stigma at base of column .. 11. *Gastrodia*

### 1. CORYBAS

Very small plants, usually growing in moss on rocks or trees; stem slender, arising from a small round tuber, bearing a single small leaf and a single flower just above the leaf; leaf heart-shaped or ovate, sometimes with red or white veins; flowers about 1-2 cm. high; upper sepal large, more or less erect at the base with broad hooded apex; lateral sepals and petals very narrow, almost thread-like; lip large, with 2 short spurs, the base embracing the column, the apex widened, rounded and turned down, usually fringed at the edge; column short, the anther erect on its back; pollinia 2, 2-lobed, granular.

This very peculiar genus has a distribution from the eastern Himalayas to Australia and New Zealand, and far into the Pacific. In Malaya we at present know five species, all found on mountains, growing in moss-cushions on the ground or on rocks, or in the thick masses of mosses and allied plants which are often found on trees in the cloud zone. They are found in local colonies, rarely in great numbers, and are both curious and beautiful in their form and colouring. The colours are white and crimson-purple of various shades. The very narrow lateral sepals and petals are sometimes longer than the rest of the flower, and spread like whiskers, but in one species they are quite short. The colours given below for the various species may not be entirely accurate, or may be subject to variation; how much variation is unknown, and further colour-records would be welcome. The pedicel, which is very short at flowering, sometimes elongates very much in fruit, as in *Didymoplexis* and *Gastrodia*, thereby giving the seeds a better chance of dispersal. Full records of this character also are lacking. The name *Corysanthes* has also been given to this genus.

#### Key to the Malayan species of *Corybas*

- Lateral sepals and petals about 3 to 4.5 cm. long  
 Upper sepal rounded at the end, with slender tip  
 3-4 mm. long; lip with fringe to 2-5 mm. wide 1. *C. caudatus*  
 Upper sepal with broad nearly straight apex, the tip  
 hardly developed; edge of lip short-toothed .. 2. *C. pieties*  
 Lateral sepals and petals not over 2 cm. long  
 Lateral sepals joined at the base for 4 mm. 3. *C. Johannis-  
 Winkleri*  
 Lateral sepals not joined together  
 Lateral sepals and petals 0.8 to 1.2 cm. long; leaf  
 to 2 cm. long, heart-shaped .. .. 4. *C. mucronata*  
 Lateral sepals and petals 4 mm. long; leaf to 4  
 cm. long, hardly heart-shaped .. .. 5. *C. fornicata*

1. **Corybas caudatus** Holtt., Gard. Bull. 11: 278. 1947.

Leaf heart-shaped, acute, about 1-8 cm. long and 1-2 cm. wide, pale green, edges not crisped; flower about 2 cm. high including the ovary of 4 mm.; upper sepal white with crimson stripes, erect in basal part and 3 mm. wide, the apical part bent over horizontally, slightly hooded, widened to 7 mm., the end rounded with a caudate tip 3-4 mm. long, with small irregular teeth on either side of it; lateral sepals and petals crimson, whitish in basal part, 3-3-5 cm. long; base of lip erect, the outer edges reaching nearly up to the hood of the upper sepal, the apical half bent abruptly down and spreading into almost a circle, about 1-5 cm. wide, fringed, the fringe 2-5 mm. wide in the middle, the tip of the fringed edge reaching down below the level of the top of the ovary; colour of lip white with crimson lines, and a crimson band within the white edge; spurs crimson on upper side, nearly 4 mm. long. Found once only, on G. Tahan\*

2. **Corybas pictus** (Bl.) Rehb. f., Beitr. Syst. Pfl. 67. 1871.—*C. ale ear ia picta* Bl., Bijdr. 418, f. 32. 1825—*Corysanthes picta* Lindl., Gen. et Sp. Orch. 394. 1840. Bl., Fl. Jav. N.S. 147, t. 61, f. 1. 1858. J.J.S., Fl. Buit 6: 51, f. 29. Ridl., Flora 4: 204.

Leaf heart-shaped, short-pointed, edges crisped, veins sometimes reddish (?), 1-2 cm. long and wide; flower about 2 cm. high, deep red with a white zone on the lip; upper sepal widening gradually from the base and then rather abruptly near the apex which is 1-2 cm. wide, cut off nearly square, the middle more or less recessed with a very short tip; lateral sepals and petals 3-4-5 cm. long, very narrow, white with purplish tips; lip about 1-5 cm. wide, the edge shortly toothed, the tip very shortly pointed, sometimes recessed; spurs slightly curved, conical, 3 mm. long. Originally found in Java; in Malaya known from Cameron Highlands, G. Benom and Gua Tipus.

3. **Corybas Johannis-Winkleri** J.J.S., Mitt. Inst. Bot. Hamb. 7: 14, t. 1, f. 4. 1927.

Similar to *C. mucronatus* but flower larger, about 1-6 cm. high, the upper sepal with less regular keels, pink outside, much paler within (with red stripes?); lateral sepals about 1-2 cm. long, joined at the base for 4 mm.; petals about 1-8 cm. long, joined for a short distance at the base to the lateral sepals; lip about 1 cm. wide, fringed as in *C. mucronatus*, greenish with dark purple spots, a low broad callus near the base. Distributed on the mountains of Borneo and Sumatra; in Malaya known only from G. Tahan and Cameron Highlands. The G. Tahan specimen differs in having the upper sepal with only a slight median keel, the flowers wholly deep crimson except for white tips to lateral sepals and petals, white edge and fringe of the lip, white streaks laterally inside the lip and a whitish mark at the base of each spur.

4. **Corybas mucronaius** (Bl.) Schltr., Fed. Rep. 19: 20.1923.—*Corysanthes mucronata* Bl., Fl. Jav. N.S. 147, t. 66. 1858. J.J.S., Fl. Buit. 6: 52, f. 30. Ridl., Flora 4: 205.

Leaf green, heart-shaped, acute, to about 2 by 1-5 cm.; flower about 1-2 cm. high; upper sepal curved in almost a semi-circle as seen from the

side, the upper part hooded over the top of the flower, about 7 mm. wide, with 5 veins strongly keeled on the outside, white with dark red streaks; lateral sepals about 8 mm., petals 1.2 cm. long, white or greenish; lip white with red edges and streaks, strongly bent forwards and downwards about the middle, the blade widened, rounded, a little wider than the upper sepal, edges finely toothed, the teeth narrow, rather irregular, to 1 mm. long, with a dark 4-lobed callus inside; spurs 2.5 mm. long. Distributed to Java; in Malaya found on G. Panti and G. Belumut in Johore, at Gua Panjang, and at Cameron Highlands.

5. *Corybas fornicatus* (Bl.) Rchb. f., Beitr. Syst. Pfl. 42. 1781.—*Calcearia fonticata* Bl., Tab. f. 32. 1825.—*Corysanthes fomicata* Lindl., Gen. et Sp. Orch. 394. 1840. Bl., Fl. Jav. N.S. 147, t. 61, f. 1. 1858. J.J.S., Fl. Buit 6: 53, f. 31. Ridl., Flora 4: 205.

Leaf to 4 by 2.5 cm., ovate-acute, hardly heart-shaped; flower about 1.8 cm. tall; upper sepal with base nearly erect, apex broadly rounded, curved forwards and forming a hood, about 8 mm. wide; lateral sepals and petals about 4 mm. long; lip red with white edges, erect almost to the hood of the upper sepal, the base somewhat swollen in front, with very short spurs, the apex rounded, shortly downturned, as wide as the upper sepal, the edge very slightly toothed, slightly cleft at the tip. Distributed in Java and Borneo; in Malaya known from Fraser's Hill, and from Kedah Peak (near the summit), on rocks.

## 2. VANILLA

Climbing plants bearing a leaf and a root at each node; leaves large and fleshy, or sometimes reduced to small scales, the base not sheathing; inflorescences axillary, bearing few or many rather large flowers; sepals and petals about equal, free, the petals with a strongly marked midrib; lip joined to the sides of the column (often almost to the top of the column), the free part widened, more or less 3-lobed, usually with hairy appendages inside; column long, bent near the top; anther pointing downwards on the front of the column over a broad rostellum; pollinia granular without disc; fruit long, fleshy, cylindric, often not opening; seeds rather large, dark, not winged.

This genus is found throughout the tropics, and comprises about 65 species. The Vanilla of commerce consists of the fermented pods of *V. planifolia* of Mexico and a few other species. The Malaysian species have large fruits, which are said to be sweet and edible, but they have little if any of the fragrance of the American species. *V. planifolia* is easily cultivated in Malaya, but in Singapore it flowers rarely. In order to ensure the setting of fruit, hand-pollination is desirable, as suitable insects may not be present. One native Malayan species is however locally common, and when it flowers seems to be freely pollinated. The pollinia are waxy in external appearance but soft and easily broken.

In its climbing habit Vanilla is comparable with the Vanda tribe; but it is easily distinguished by the very regular occurrence of one root at each node, opposite the leaf. These roots are in the main supporting organs

and do not grow very long. Those nearest the ground however grow downwards, and, when they reach a litter of dead leaves or similar material, branch freely in exactly the same way as the feeding roots of *Vanda*. It is a remarkable thing that among the terrestrial orchids *Vanilla* and *Galeola* alone should have evolved the climbing monopodial habit which has been so prolifically developed in the *Vanda* tribe.

The large flowers of *Vanilla* are often very beautiful, the commercial species being among the least attractive. The Malayan species however do not flower very profusely, and they grow to a large size, so that they are not very convenient or useful subjects for ornamental gardening. They might be useful if one could devise a method of making them flower freely. *V. Griffithii* is a common lowland plant; two species are only found on mountains and are perhaps nowhere common; *V. aphylla*, which has no proper leaves, is found in the north only. No hybrid *Vanillas* are reported; it would be interesting to attempt their production.

#### Key to the Malayan species of *Vanilla*

Leaves normal, broad

Sepals and petals about 2.5-3.5 cm. long; hairs  
in middle of lip

Column joined less than half its length to the  
lip, end of column exposed . . . . .

1. *V. Griffithii*

- Column joined  $\frac{1}{2}$  of its length to the lip, end  
of column covered by side-lobes . . . . .

2. *V. pilifera*

Sepals and petals about 5 cm. long; plates in  
middle of lip

Leaves 30 cm. long . . . . .

3. *V. kinabaluensis*

Leaves 12-14 cm. long . . . . .

4. *V. montana*

Leaves reduced to small scales . . . . .

5. *V. aphylla*

1. *V. Griffithii* Rchb. f., Bonpl. 2: 88. 1854. Ridl., Flora 4: 201.—*V. tolepephora* Ridl., Tr. L.S. 3: 276. 1893.—*Vanilla* sp., Griff., Notul. 3: 247, t. 281.

Internodes of the stem 7-10 cm. long; leaves 10-16 cm. long, 4-8 cm. wide, with abrupt narrow tip and short stalk; rachis of inflorescence 3-7 cm. long, flowers 12 or more; bracts spreading, to 1 cm. long, lower ones largest; sepals and petals white, flushed with pale green, 2-5 to 3 cm. long, 1-4-1.5 cm. wide, spreading; lip white, the tip pale yellowish, with two red-brown bands in the basal part; base of lip joined to less than half length of column; side-lobes broad, rounded, reflexed and exposing the column; midlobe bilobed, the edge thin and finely frilled, with a V-shaped callus pointing towards the apex and below it a ball of woolly hairs 6-7 mm. wide; column white; fruits cylindric, about 7 cm. long and more than 1. cm. thick. Distributed in Borneo and Sumatra; in Malaya occurring in all parts of the lowlands, or trees in fairly open places. **Fig. 16c.**

2. *V. pilifera* Holtt., Gard. Bull. Singapore 13: 253. 1951.

Habit of *V. Griffithii* but inflorescence with somewhat fewer flowers. Pedicel white, ovary green, sepals pale green, petals cream with a green keel on the back, lip cream with pale pink veins on the upper surface.

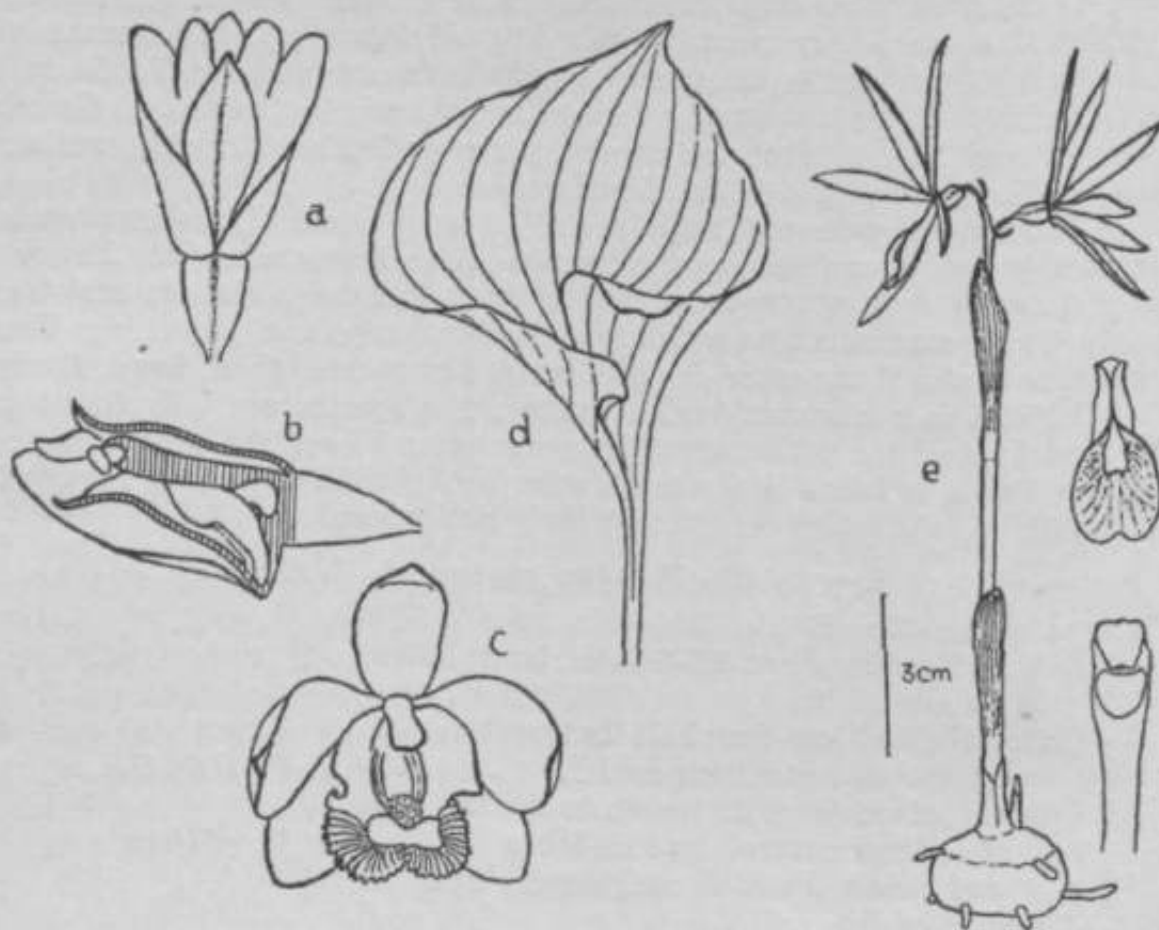


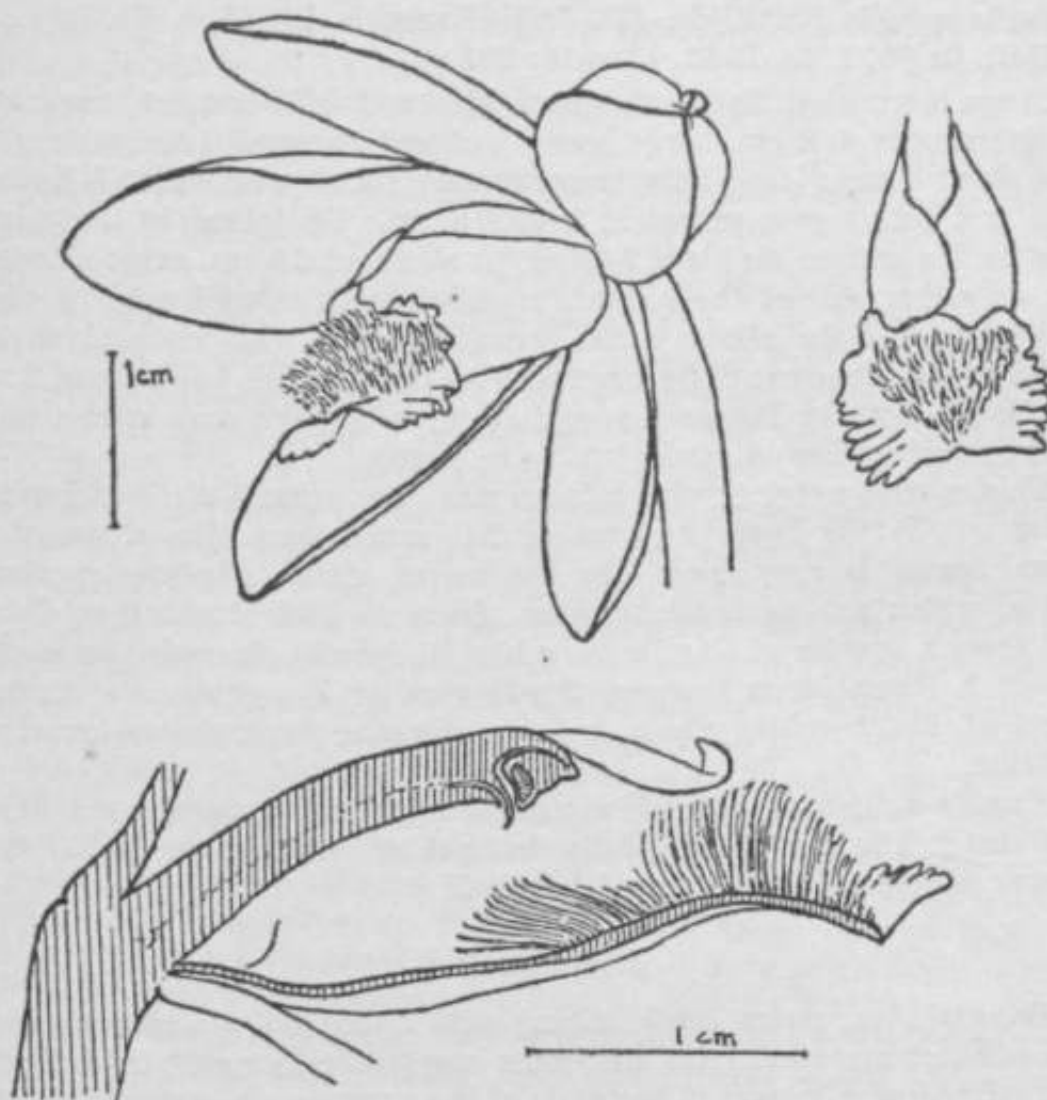
Fig. 16. *a*-, *Gastrodia javanica*, flower from below (after Carr). *b*, same in section. *c*, *Vanilla Griffitkii*, flower (after de Alwis). *d*, *NervUia aragoama*, leaf (after Blume). *e*, *NervUia discolor*, tuber with inflorescence; lip and column.

Sepals 34 by 11 cm., petals 16 cm. wide; lip 3 cm. long, side-lobes overlapping and enfolding the end of the column; midlobe with thin crinkled edges, the middle part bearing erect hairs c. 5 mm. long; midline of lip raised above, grooved below, bearing opposite the anther a tuft of fine hairs directed towards the base of the lip; column 18 mm. long, white, joined for  $\frac{2}{3}$  of its length to the lip, with two orange projections on the front at the base. Found once only, at Kota Tinggi in Johore. **Fig. 16A.**

### 3. *Vanilla kinabaluensis* Carr, Gard. Bull. 8: 176. 1935.

Internodes of stem 8-10 cm. long; leaves to about 30 by 10 cm. almost evenly elliptic, with narrowed tip 2 cm. long and broad stalk 15 cm. long; inflorescence to 10 cm. or more long, bearing a close succession of many flowers; bracts rounded, about 4 mm. long; sepals and petals greenish yellow, rather more than 5 cm. long, about 1.7 cm. wide; lip white, veined with purple, yellowish towards the apex, about 4.3 cm. long, joined to the column almost to its top, the joined part funnel-shaped, the free blade widening, slightly 3-lobed, trumpet-shaped with wavy edges; a thickened band from base to apex of lip; about  $\frac{1}{3}$  from apex a bundle of very thin fan-shaped plates with toothed edges, about 5 by 8 mm., pointing inwards, and just within the apex a dense group of branched dark red papillae;





"Fig. 16A. *Vanilla pffifera*. Above, on left, a single flower; on right, lip and column from above. Below, longitudinal section of lip and column.

column 3-4 cm. long. Found originally on Mount Kinabalu in Borneo at 2,700 feet, and once in Malaya, at Jor on the road to Cameron Highlands. The Kinabalu plant had flowers with sepals and petals 6 cm. long, but the shape and structure of the lip exactly as in the Malayan plant.

4. *Vanilla montana* Ridl., J.F.M.S. Mus. 6: 58. 1915. Flora 4: 201.

Leaves 12-14 by 3-5-5 cm.; inflorescences 1 cm. long, of few flowers; bracts rounded, 2 mm. long; sepals about 5 cm. long and 10 mm. wide; petals smaller; lip 4-2 cm. long, its base narrow, joined to the column, the whole trumpet-shaped, 2 cm. across the mouth, the edge at the centre with thread-like processes; in the mouth a bundle of broad, fan-shaped, toothed plates; column 4 cm. long; fruit 8 cm. long. Found only on G. Kerbau at 4,500 feet; the flower has been very imperfectly described. It is just possible that this and *V. kinabaluensis* are not distinct, but the very large leaves of the latter, and its apparently much wider sepals, seem quite different from the leaves and sepals of *V. montana*. More collections of the latter, and a careful description of the lip, are needed.

5. *Vanilla aphylla* Bl., Bijdr. 422. 1825. Rumphia 1: 195, t. 68. J.J.S., Fl. Buit. 6: 66, f. 43. Ridl., Flora 4: 201.

Stems somewhat flattened, green, fleshy, to 200 cm. or more long, with internodes 6-8 cm. long; leaves reduced to small triangular green scales about 7 mm. long; inflorescences very short, with about 3 flowers; sepals and petals pale greenish, 3 by 0.8 cm.; lip joined to the column almost to the anther, its blade 3-lobed, in all about 2.6 cm. long; side-lobes erect, on either side of the column, rounded, with crisped reflexed edges, pale green; midlobe about 1 cm. long, rounded, with reflexed slightly toothed edges, almost entirely covered with pale pinkish hairs about 2 mm. long. Native both in Tenasserim and Java; in Malaya only known in the north, on low bushes in open country in Perlis.

This species never attains a large size. The normal work of leaves is carried out by the fleshy and rather flat green stem. The shape of the reduced leaves is very much like the leaves of the climbing species of *Galeola*, which are pure saprophytes. There is little doubt that *Galeola* arose from a species of *Vanilla* very like *V. aphylla*. It is also interesting to trace a resemblance between the flowers of *V. aphylla* and those of species of *Lecanorchis*, which are non-climbing saprophytic orchids of this tribe.

*Vanilla aphylla* is not difficult to cultivate in Singapore, and flowers occasionally. The flowers are pretty, but not long-lasting, nor as handsome as those of some other species of *Vanilla*.

### 3. GALEOLA

Saprophytes; stems long-climbing with a root and a scale-leaf at each node, or short and erect from a rhizome bearing fleshy roots; inflorescences terminal, and also lateral in the axils of the upper scale-leaves of climbing stems; flowers yellowish or brownish; sepals and petals about equal, free, usually hardly spreading; base of lip surrounding the column, the blade concave with longitudinal ridges; column rather short, somewhat curved, thickened at the top; pollinia 2, cleft, granular; fruit a long dry capsule, opening with two unequal valves, or fleshy and not opening; seeds winged, rather large.

This interesting genus includes by far the largest saprophytic orchids, and probably the largest of all saprophytes. These are climbing plants, with exactly the habit of *Vanilla*, but lacking all green colour, the stems being dull brownish, with the scale-leaves reddish. The inflorescences are quite long, and produce a succession of many flowers. It is not known how long a *Galeola* plant can go on flowering, but presumably it has a limited life; limited perhaps by the supply of available food for the fungus to absorb. The genus is distributed from the eastern Himalayas to Australia. There is one non-climbing species of *Galeola*, a rare mountain forest plant in Malaya, *G. javanica*. The description of this species given below is taken from Dr. J. J. Smith, who made it from Java plants; Peninsula plants need checking to see how they agree.

## Key to the Malayan species of Galeola

Stems climbing

Stems covered with short rusty hairs; lateral sepals

about 8-9 mm. wide .. .. . 1. *G. Kuhlii*

Stems not hairy; lateral sepals about 4-5 mm. wide 2. *G. altissima*

Stems not climbing . . . . • 3. *G. javanica*

1. **Galeola Kuhlii** (Rchb. f.) Rchb. f., Xen. Orch. 2: 78. 1865.—*Erythropsis Kuhlii* Rchb. f., Xen. Orch. 2: t. 119. 1862.—*Galeola hydra* Rchb. f., Xen. Orch. 2: 77. 1865.—King & Pantl., Ann. Calc. 8: 264, pi. 351. J.J.S., Fl. Buit. 6: 68, f. 45. Ridl., Flora 4: 202.—*Galeola pterosperma* Schltr., Engl. Jahrb. 45: 386. 1911. J.J.S., Bull. Btzg., Ser. 2, IX: 10 (revised descr.).

Stems tall, rusty red-brown, climbing or sometimes sprawling, to 1 cm. or more thick, internodes 5-20 cm. long; scale leaves to 2-5 cm. long, triangular with a broad base, reddish; inflorescences branched, the branches 15-30 cm. or more long, bearing flowers in succession near the growing tips only, the young parts rusty-hairy; flowers about 5 mm. apart, yellow with orange-red veins inside, not opening widely; upper sepal about 1.4 by 0.6 cm., blunt, elliptic; lateral sepals 8-9 mm. wide, oblique, ovate, acute; petals about same size as upper sepal, thinner; lip nearly round, strongly concave, the edges incurved towards the apex which is thus somewhat pointed, short-hairy throughout inside, with a callus at the base close to the column; column 5 mm. long, strongly curved forwards; fruit very large, cylindrical when young (flattened when mature ?), to 30 cm. long and 2 cm. wide; seeds winged, length of wing about 2 mm. Distributed from the eastern Himalayas southwards through Malaysia to the Philippines; in Malaya found at many localities, in the lowlands and to 4,000 feet on the hills, often in rather open places. The climbing stem may attain 50 feet or more long.

2. **Galeola altissima** (Bl.) Rchb. f., Xen. Orch. 2: 77. 1865. J.J.S., Fl. Buit. 6: 67, f. 44. Bull. Btzg., Ser. 2, XXVI: 9. 1918. Ridl., Flora 4: 203.—*Erythrorchis altissima* BL, Rumphia 1: 200, t. 70. 1825.

Habit of *G. Kuhlii* but stem more slender, probably not so long, not rusty-hairy, dull yellowish more or less flushed with purple; scale leaves to about 1.5 cm. long; inflorescences branched, ultimate branches slender, to about 30 cm. long, bearing a succession of many flowers, only a few open together, about 3 mm. apart; bracts short, acute, spreading; flowers yellow, thin in texture; sepals 1-1-1.8 by 0.4-0.5 cm.; petals a little narrower; lip about 1 cm. long and nearly as wide, concave, 3-lobed, with a median thickened band having a hairy constriction above the middle, and a callus near the base of the midlobe; side-lobes short, rounded, incurved; midlobe short, bilobed, edges incurved and wavy, 5 mm. wide and 2 mm. long; column curved, 7 mm. long; fruit long and slender, to 16 cm. long and 7 mm. wide, opening by two very unequal valves; seeds With wing about 1 mm. across. Distributed in Java and Borneo; in Malaya found at several localities, but not so commonly as *G. Kuhlii*. The above description of the flowers is taken mainly from Dr. J. J. Smith. A more

slender plant, with short branches of the inflorescence (5 cm.), its fruit 22 cm. long and only 3 mm. thick, has been found in Province Wellesley. It might prove to be a distinct species, but the details of the flower are unknown.

3. *Galeola javanica* (Bl.) Benth. & Hk., Gen. Plant 3: 590. 1883. J.J.S., Fl. Buit. 6: 69, f. 46. Bull. Botz., Ser. 2, IX: 12. 1913; Ser. 3, 5: t. 25, III. Ridl., Flora 4: 203.—*Cyrtosia javanica* Bl., Bijdr. 39. 1825. *Rumphia* 1: 199, t. 61.

Rhizome stout, erect, to 12 cm. long, with several spreading cylindrical fleshy roots to about 6 cm. long and 1-1.8 cm. thick; stems several from one rhizome, to 25 cm. or more tall, erect, branched, often curved, with numerous scale leaves 5-10 mm. long; inflorescence terminal, elongating slowly and producing flowers in succession; bracts fleshy, mealy, concave, to 5 mm. long; flowers 1.4 cm. long, opening only slightly, the broad concave sepals diverging a little, pale brownish, mealy outside; petals white with yellowish tips; lip not lobed, the sides at the broad base raised on either side of the column, the edge of the rounded tip inrolled, the raised sides hairy and reddish, the apex yellow, the base white with a red thickening on either side of the column; column curved, white, 8 mm. long; fruit reddish, fleshy, not opening, to 10 cm. long and 2 cm. thick. Distributed in Java, Sumatra and Borneo; in Malaya found in mountain forest at Cameron Highlands and on Taiping Hills. The description of the flowers is taken from Dr. J. J. Smith and needs verifying for Peninsular plants.

#### 4. LECANORCHIS

Saprophytes; rhizome erect, bearing numerous thick pale roots and a slender erect often branched stem; inflorescence terminal, with few to many flowers; a small toothed cup present at the top of the ovary, below the sepals; sepals and petals almost equal, rather narrow; lip joined at the base to the column, not spurred, the blade more or less distinctly 3-lobed, hairy; column rather long, thickened at the top; pollinia 2, granular.

This is a small Malaysian genus. There are two quite distinct Peninsular species, which are among the most common of local saprophytes; or at least have been most commonly collected, perhaps because they are taller and more conspicuous than some others. The stems are thin and brittle. The genus is easily recognised from the little toothed cup just below the sepals; this is most obvious when the fruit has developed.

##### Key to the Malayan species of *Lecanorchis*

- Sepals and petals about 1 cm. long; midlobe of lip  
 5 mm. long; column 6 mm. long ... .. 1. *L. multiflora*  
 Sepals and petals about 1.6 cm. long; midlobe of lip  
 3 mm. long; column 1-1 cm. long .. .. 2. *L. malaccensis*

*Note.*—A third species, *L. pauciflora*, may also occur. This has sepals and petals a little longer than in *L. malaccensis*, midlobe much longer (6 mm. long and wide), less hairy, side-lobes more distinct, column a little shorter, top of fruit below cup slightly swollen.

1. **Lecanorchis multiflora** J.J.S., **Bull.** Botz., Ser. 2, XXVI: 8. 1918. Ser. 3, 5: t. 25, II.

Stem to 60 cm. long, sometimes branched; inflorescence to 6 cm. or more long with many flowers close together, in succession; sepals and petals widely spreading, pale greenish (nearly white), 9-10 by 3 mm., the sepals more pointed and a little narrower than the petals; lip about same length as sepals, 3-lobed, the side-lobes with free ends about 1 mm. long, rounded, close to the top of the column, very pale yellowish, midlobe about 5 by 5 mm., rounded, the end reflexed, covered with a dense mass of white hairs; a yellow patch and two low white hairy keels below base of midlobe, between the side-lobes; column 6 mm. long; capsule 1-2 cm. long. Distributed in Java, Sumatra and Borneo; in Malaya common in lowland forest **all** over the country, but not found in Singapore.

2. **Lecanorchis malaccensis** RidL, Tr. L.S. 3: 377, t. 65. 1893. Flora 4: 206. —*Lecanorchis Ridleyi* Schltr., Fed. Rep. 9: 428. 1911.

Stems 20-35 cm. tall, slender, brittle, dark purple-brown, with short apical inflorescence of 3-6 flowers; bracts short, rounded, hairless; sepals and petals pale purplish or pinkish, about 1-6 cm. long and 4 mm. wide, not spreading (?); lip about as long as sepals, the base joined to the sides of the column, widening gradually to a 3-lobed apex, 7-5 mm. from tip to tip of side-lobes when flattened; side-lobes triangular, without free forward-pointing ends; midlobe 3 mm. long, wider than long, rounded, densely covered with white hairs; column 11 cm. long; fruit 2-3 cm. long. Found in Singapore, Johore and Pahang only, in lowland forest. This species is very distinct from the more widespread *L. multiflora* in its much larger flowers with shorter midlobe. Whether the flowers open widely or not has not certainly been reported; they undoubtedly open widely in *L. multiflora*. *L. malaccensis* is nearly related to *L. pauciflora* (found in Java and Sumatra) but differs in the points mentioned in the note above.

## 5. APHYLLORCHIS

Saprophytes; rhizome short, rather thin, erect, with spreading thick roots; stem erect, with terminal inflorescence of many flowers; sepals and petals about equal, free; lip with distinct short narrow basal part to which the more or less 3-lobed blade is joined; column rather long; anther erect on back of column; pollinia 2, powdery.

This is a genus of about 12 species, distributed from Ceylon and northern India through Malaysia to New Guinea. In Malaya we have three species. The small basal part of the lip, between the column and the blade, is distinctive. The sepals and petals usually do not spread widely.

### Key to the Malayan species of *Aphyllorchis*

Stems to 50 cm. long; sepals and petals about 6 mm.

long . . . . . 1. *A. pallida*

Stems to about 100 cm., tall; sepals and petals 1-1-1-4 cm. long

- Lip as long as sepals, its narrow base short, not winged . . . . . 2. *A. striata*  
 Lip shorter than sepals, its base with two narrow curved acute wings 3-5 mm. long . . . . . 3. *A. Prainii*

1. *Aphyllorchis pallida* Bl., Bijdr. f. 77. 1825. Fl. Jav. N.S. 43, t. 13, t. 17. J.J.S., Fl. Buit. 6: 71, f. 47. RidL, Flora 4: 205. ...

Erect stem slender, 20 to 50 cm. tall, the base with several short sheaths, pale cream with purple streaks; rachis of inflorescence 7-20 cm. long; bracts reflexed, to about 7 mm. long; pedicel and ovary 1 cm.; flowers straw-colour or nearly white with purple markings, not widely opening; sepals about 6 mm. long, purple-spotted; petals a little shorter, with purple midribs; lip shorter than sepals and petals, the basal 1.5 mm. narrow, the blade hinged at the end of this and bent downwards; blade 3-lobed, the side-lobes broad, erect, midlobe small and fleshy; column 2.5 mm. long, white. Distributed from Sumatra to the Philippines; in Malaya found in many localities, in lowland forest, from Singapore to Penang.

2. *Aphyllorchis striata* (Ridl.) RidL, Mat. Fl. M.P. 1: 205. 1907. Flora 4: 205.—*Pogonia striata* Ridl., Tr. L.S. 3: 377. 1893.

Stems to 100 cm. tall, fleshy, whitish with purple streaks, bearing several short sheaths with acute tips, only the lower ones tubular at the base; rachis of inflorescence 15-20 cm.-long, bearing up to 20 flowers; bracts reflexed, white with purple lines, narrow, 1.5 cm. long; pedicel and ovary about 1.8 cm. long; sepals and petals 1.4 cm. long, narrow, white with purple streaks; lip about as long and wide as sepals and petals, basal part short and unwinged, blade indistinctly 3-lobed, white with a median purple stripe near the base, side-lobes low, erect on either side in basal half; column slender, slightly curved, 8 mm. long, mauve with a yellow apex. Distributed to Borneo; in Malaya found in lowland forest in Johore, Pahang, and southern Kelantan, at few localities.

3. *Aphyllorchis Prainii* Hk. f., F.B.I. 6: 117. 1890. Ic. Pl. t. 2192.

Erect stem to 100 cm. tall, the base rather thick and fleshy, with several short sheaths not or hardly tubular at the base; rachis of inflorescence to about 30 cm. long, bearing many flowers; bracts to about 1.8 cm. long, 2.5 mm. wide, reflexed; pedicel and ovary at time of flowering 2 cm. long, afterwards elongating; sepals and petals 1.1 cm. long; sepals 3 mm. wide, very fleshy, narrowed and apparently keeled towards the tip; petals a little narrower, oblong, very shortly narrowed at tip; basal part of lip with two narrow, erect, curved, acute wings 3-5 mm. long, 1.5 mm. wide; blade of lip bent downwards, 7 mm. long and 5 mm. wide, fleshy, upper surface wrinkled, slightly 3-lobed, the side-lobes small and rounded, one-third from the tip; column 1 cm. long, curved, widened to the top. Originally found in Assam; in Malaya collected once, at Cameron Highlands at about 4,800 feet altitude. This species is very like *A. striata* in habit, but the flowers are smaller and the lip a different shape, especially in the curved wings of the short basal part. No colours of the flower have been recorded.

## 6. CRYPTOSTYLIS

Terrestrial plants with short vertical rhizome, thick spreading roots, a few separate ovate stalked leaves from ground level, and erect slender stems terminating in an inflorescence of many flowers; sepals and petals narrow, spreading, the sepals longer than the petals; lip erect at the top of the flower, unlobed, widest near base and tapering to the apex, base strongly concave, surrounding the column; column very short, with lateral auricles; anther erect at back of column; pollinia 4, powdery; stigma prominent, fleshy.

This is a genus of perhaps 10 species, extending from Ceylon and N. India to Australia and Fiji. The species are all rather alike, and it is not certain how many exist in Malaya; there are certainly two, and may be three. The extent of colour-variation in one species is not known with certainty.

These are green-leaved plants, not saprophytes like most of the present group of genera. *Cryptostylis* belongs to a different tribe from all the other local genera, and has no near relatives in Malaya. The leaves arise separately from the rhizome, near the base of the flowering stem, and do not clasp the base of that stem as in many leafy terrestrial orchids. The two local species are thus distinguished:

Lip about 5-7 mm. wide, spotted towards the tip	1. <i>C. arachnites</i>
Lip 1-1.2 cm. wide, not spotted ..	.. 2. <i>C. conspicua</i>

1. *Cryptostylis arachnites* (Bl.) Hassk., Cat. Bog. 8. 1844. BL, Fl. Jav. N.S. 112, t. 45, f. 2. 1858. J.J.S., Bull. Botz., Ser. 3, 3: 240; 5: t. 24, IV. Ridl., Flora 4: 225, *p.p.*—*ZosterostyUs arachnites* BL, Bijdr. 419. 1825.

Whole plant 20-60 cm. tall, with several very hairy thick roots at the base; leaves 1-4, all from the rhizome, blade to about 17 by 7.5 cm., rather pale green with a more or less distinct network of darker veins, ovate-acute, base rounded, stalk slender, 5-15 cm. long, spotted with purple, the base not forming a sheath, (stem covered with separate sheaths); base of stem covered with several overlapping sheaths, with 2 or 3 sheaths higher up; rachis of inflorescence 10-30 cm. long with many flowers; bracts narrow, 1-2 cm. long, a little shorter than the ovary; sepals and petals pale greenish or flushed with dull red; upper sepal pointing straight downwards, very narrow, 1.4-1.6 cm. long, about 2.5 mm. wide at base, edges inrolled; lateral sepals spreading almost horizontally, about same size; petals spreading, narrow, 8-10 mm. long; lip erect, concave at the base, almost flat above, narrowed evenly to acute tip, 1.5-2.0 cm. long, 5-7 mm. wide at base of flattened part, upper surface velvet-hairy all over, purplish red towards the base, pale with deep red or purplish spots towards the apex. Distributed to Java and Sumatra; in Malaya found at many localities, in lowland and mountain forest, up to 6,000 feet altitude. In Java the species called *C. arachnites* is said to have the sepals and petals always reddish (not green) and the upper (distal) part of the lip bent forwards. It is possible that the Malayan plants represent a distinct species; they do not exactly agree with any other

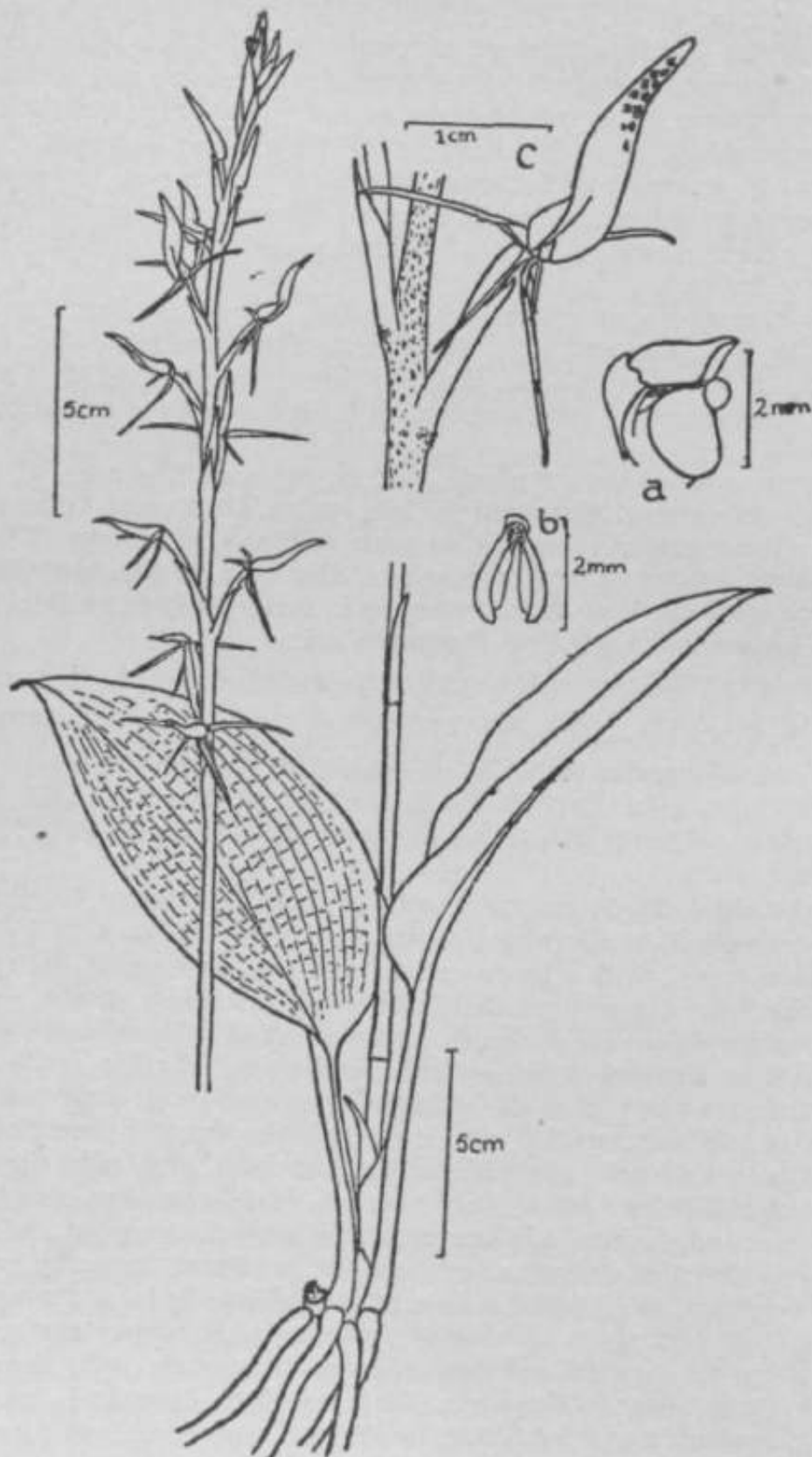


Fig. 15. *Cryptostylis arachnites*, plant in flower, *a*, column; the stigma occupies the whole front and above it is the round disc of the pollinia. *b*, pollinia attached to disc, from below, *c*, flower.



described from Sumatra or Java. At Cameron Highlands there is much variation in size of flowers on different plants. The petals are sometimes enfolded in the upper sepal. **Fig. 15.**

\*

2. **Cryptostylis conspicua** J.J.S., Bull. Botg., Ser. 3, 3: 247. 1921; 5: t. 24, II.—*C. arachnites* quoad Ridl., Flora 4: 225, p.p.

Habit of *C. arachnites*; sepals about 2 cm. long, green, the laterals spreading horizontally; petals about 1 cm. long, green, pointing downwards beside the upper sepal; lip erect, large, pale greenish yellow or cream, not spotted but in part sometimes flushed with brown-purple, about 2 cm. long and 1-1.2 cm. wide, on old flowers bending forwards from the base, still straight. Distributed in Java and Sumatra; in Malaya only found in mountain forest at 4,000-6,000 feet, on G. Tahan, at Cameron Highlands and on the Taiping Hills.

## 7. NERVILIA

Plants growing from round underground tubers, the leaf and inflorescence at different times; leaf single, short or long-stalked, broadly heart-shaped; inflorescence erect, bearing 1, 2 or several flowers; sepals and petals similar, spreading, rather long and narrow; lip not spurred, usually 3-lobed, the base embracing the column; column rather long, straight, thickened at the top, anther almost horizontal; pollinia 2, divided, granular.

This is a genus of some 40 species, distributed from Africa to India and China and through Malaysia to Australia. In Malaya we have three species. No other orchids have quite similar leaves, so that the genus is easy to recognize from this character; but the plants do not usually bear both leaves and flowers simultaneously. The resting tuber, when ready for new growth, produces an inflorescence; when the flowers have withered, the same tuber produces a leaf; slender horizontal underground runners grow out from the base of the leaf, and each produces a tuber at its end; and so the life-cycle of the plant is complete. The relation of the various parts of the life-cycle to local climatic conditions has not been recorded. The plants are commonest in the parts of Malaya with most regular seasonal climate. The flowering stems of *Nervilia*, lacking leaves, have very much the appearance of saprophytes. As leaves and flowers are not usually seen together, two keys are provided for this genus; one based on leaf-characters, one on flowers.

### Key to the Malayan species of *Nervilia*

Leaf-blade hairless

- |   |       |                       |
|---|-------|-----------------------|
| Leaf-stalk 15-20 cm. long, blade to 16 cm. wide,<br>edge waved but not angled . . . . . | .. .. | 1. <i>N. aragoana</i> |
| Leaf-stalk 3-10 cm. long, blade to 9 cm. wide, edge<br>angled at vein-endings . . . . . | .. .. | 3. <i>N. punctata</i> |
| Leaf-blade hairy . . . . .  | .. .. | 2. <i>N. discolor</i> |
| Inflorescence with one flower . . . . .   | .. .. | 3. <i>N. punctata</i> |
| Inflorescence with two flowers . . . . .  | .. .. | 2. <i>N. discolor</i> |
| Inflorescence with about six flowers . . . . .  | .. .. | 1. <i>N. aragoana</i> |

1. **Nervilia aragoana** Gaud., Freyc. Voy. Bot. 422, t. 35. 1829. J.J.S., Bull Btzg., Ser. 3, 3: 236. 1921.—*Pogonia flabelliformis* Lindl., Gen. et Sp. Orch. 415. 1840. J.J.S., Fl. Buit. 6: 57, f. 36. Duthie, Ann. Calc. 9: 158, t. 125.—*Aplostellis flabelliformis* Ridl., Flora 4: 203. 1924.

Leaf-stalk about 15-20 cm. long, blade green, sometimes with dark purplish blotches, not hairy, to 12 cm. long and 16 cm. wide, very broadly heart-shaped, shortly tipped, edge slightly wavy, the basal lobes more or less overlapping; inflorescence about 30 cm. tall, the scape bearing several long bladeless sheaths; bracts 1.5 cm. long, narrow, reflexed; pedicel and ovary 8-10 mm.; sepals and petals narrow, spreading, 2-2.5 cm. long, pale green; lip shorter than sepals, white with purplish or green veins; side-lobes small, triangular, erect with tips spreading, just beyond the top of the column; midlobe ovate with incurved edges, hairy on the veins. Distributed from India through Malaysia to Samoa; in Malaya found in Kedah, Perak and Pahang, especially under limestone cliffs, in damp spots in long grass, locally abundant. Fig. **16d**.

2. **Nervilia discolor** (Bl.) Schltr., Engl. Bot. Jahrb. 45: 403. 1911.—*Cordyla discolor* Bl., Bijdr. 417. 1825.—*Pogonia discolor* Bl., Mus. Bot. Lugd. Bat. 1: 32. 1849. Fl. Jav. N.S. 128, t. 57. J.J.S., Fl. Buit. 6: 54, f. 33.—*Pogonia velutina* Par. et Rchb. f., Tr.L.S. 30: 142. 1874.—*Aplostellis velutina* Ridl., Flora 4: 204. 1924.

Leaf-stalk very short (blade just above ground level), blade brown-purplish, heart-shaped, outer edge almost evenly rounded, 8-12 cm. in diameter, with many curving veins raised alternately above and below, hairy, in both surfaces; inflorescence 2-flowered, scape 6-10 cm. long, bracts 2 cm. long; sepals and petals 2-5-3-5 cm. long, pale olive green to dull pale purplish; lip not lobed, the blade widening beyond the column but not reflexed, tip broadly rounded or slightly cleft, to 1.5 cm. wide, white at the base, with a raised median yellow band, the veins yellow to brown or purplish. Found in Tenasserim and Siam, and in Java; in Malaya found once on Penang Hill and in Langkawi Islands. Fig. **16e**.

3. **Nervilia punctata** (Bl.) Schltr., Engl. Bot. Jahrb. 45: 402. 1911.—*Pogonia punctata* Bl., Mus. 1: 32. 1849. Fl. Jav. N.S. 127, t. 49, 54. 1858. J.J.S., Fl. Buit. 6: 55, f. 34.—*Aplostellis punctata* Ridl., Flora 4: 204. 1924.

Leaf-stalk 3-10 cm. long, blade 4-9 cm. wide, heart-shaped, with 7 main veins, edge slightly angled at the ends of the veins, green; inflorescence about 10 cm. tall, elongating in fruit, 1-flowered; sepals and petals spreading, very pale yellowish with copious dull purple marks, about 2 cm. long; lip shorter, the base embracing the column, with small slightly incurved acute side-lobes at the level of the top of the column; midlobe bent back, about 6 mm. wide, acute, white or pale mauve with small purple spots; column 6 mm. tall. Distributed to Java and Sumatra; in Malaya found at many places, from Singapore to Langkawi, in forest, often on muddy stream-banks.

## 8. EPIPOGUM

Saprophytes; rhizome tuberous; inflorescence terminal on an erect fleshy stem; sepals and petals more or less equal, narrow; lip wider, spurred, concave, with minutely warty ridges; column short; pollinia 2, granular, each with a slender curved caudicle; stigma prominent, broad.

This is a genus of few species, but very widely distributed. *E. aphylla* is distributed from western Europe to Japan. The Malayan species described below has an almost equal range but mainly further south.

**Epipogum roseum** (D. Don) Lindl., J.L.S. 1: 177. 1857. Ames, Orch. 2: 48. 1908.—*Limodorum roseum* Don, Prodr. Fl. Nep. 30. 1825.—*Galera nutans* BL, Bijdr. 416, f. 3. 1825. Fl. Jav. N.S. 117, t. 52, f. 3; t. 54, E. 1858. *Epipogum nutans* Rchb. f., Bonpl. 5: 36. 1857. King & Pantl., Ann. Calc. 8: 253, pi. 335. J.J.S., Fl. Buit. 6: 61, f. 39.

Rhizome an ovoid horizontal tuber, to about 5 by 3-5 cm., of many short internodes; erect stems to 60 cm. tall, hollow, fleshy, brownish at the base and nearly white higher up, with a few sheaths; rachis of inflorescence to 20 cm. long, of many flowers; bracts broad, to 1.5 cm. long; flowers white; sepals and petals about 1 cm. long, narrow, not spreading; lip about same length as sepals; spur broad, 4 mm. long, pointing backwards below the ovary; blade ovate, acute, the sides raised at the base, edges rather irregular, upper surface minutely warty in 2 rows; column very short; anther larger than column; stigma at base of column, prominent, 2-lobed; ovary at flowering broad and conspicuous. Distributed in Africa, India, Malaysia and Australia; in Malaya found once only, at Cameron Highlands, in the humus of moist shady forest near a stream.

Dr. W. M. Docters van Leeuwen has published an account of the very remarkable life-history of this orchid (in *Blumea*, Suppl. I, 57-63, fig. 3 and pi. VI, VII. 1937). The growth of the inflorescence (which alone appears above ground) is very rapid, its whole life, even including the development of fruit and seeds, occupying only a few days. There is no rostellum, and the pollen comes into contact with the stigma one or two days before the flower opens. On the third or fourth day after the flower opens, the fruit dehisces and the seeds are scattered. The embryo is unusually small (consisting of 8 cells only) and the seeds are among the lightest of all orchid seeds; it would take ten million of them to weigh one gram. The very short life of the flowers is probably the reason why the plants have not been more frequently found in Malaya; further finds may be expected at middle elevations on the mountains, in the wetter part of the year.

## 9. STEREOSANDRA

Saprophytes; rhizome tuberous; stem erect with terminal inflorescence of many flowers; sepals and petals about equal, narrow; lip narrow, undivided, with two glands at the base; column short; anther erect, on a broad filament rising from the back of the column; pollinia 2, powdery, with a caudicle; stigma forming an erect 2-lobed structure with the rostellum on front of the column.

This is a Malaysian genus, of only one known species. The plants are rather small.

*Stereosandra javanica* Bl., Mus. 2: 176. 1856. Fl. Jav. N.S. 27, t. 10, f. 3r t. 11G. J.J.S., Fl. Buit. 6: 63, f. 41. Ridl., Flora 4: 224.

Rhizome an elongated tuber of several short swollen internodes, the whole to 4 cm. long; erect shoots pale yellowish, with a few short sheaths, to about 40 cm. tall, the rachis of the inflorescence about 15 cm. long; bracts 7-10 mm. long; flowers 0.9-1.1 cm. long, only the tips of the sepals and petals diverging; sepals and petals about 2 mm. wide, almost white with dark violet tips and a few violet lines on the outside of the sepals; lip not lobed, narrow, concave with wavy inflexed edges, white with dark violet tip and 2 round yellowish calli at the base; ovary at flowering broad and conspicuous. Distributed in Borneo, Java and Sumatra; in Malaya found at several localities, from Singapore to Penang, in the lowlands and to 4,000 feet in the mountains, in primitive forest. The dark violet tips of the hardly opening flowers and their broad ovaries are distinctive. The structure of the column is very peculiar.

### 10. DIDYMOPLEXIS

Saprophytes; rhizome fleshy; erect stem slender, bearing a terminal inflorescence; sepals and petals joined in a short tube at the base, the upper sepal and petals joined together to a higher level, and the lateral sepals also similarly joined; lip joined to the column-foot, free from the sepals and petals, lobed or not; column long, widened at the top, with or without slender arms, with a short foot; pollina 4, soft, without caudicle but sometimes with a sticky disc; fruit erect, the pedicel lengthening considerably as the fruit ripens.

This is a genus of few species, distributed from India through Malaysia to New Caledonia and Fiji. The plants are very inconspicuous when in flower, but the long-stalked fruits are more easily seen. Not many collections have been made in Malaya, and much more information about the genus is desirable. There may be more species than the two here described, which are distinguished as follows:—

Lip distinctly 3-lobed; column with long slender

arms .. . . . 1. *D. ornata*

Lip not 3-lobed; column without slender arms 2. *D. pattens*

1. **Didymoplexis ornata** (Ridl.) J.J.S., Bull. Btzg., Ser. 3, 2: 20. 1920.—

*Leucolaena ornata* Ridl., J.L.S. 28: 340. 1891. Flora 4: 207.

Erect stem slender, 20-80 cm. tall, the inflorescence of many flowers close together, few open at one time, the rachis elongating to 10 cm.; bracts triangular, 1-5 mm. long; pedicel and ovary at flowering about 8 mm. long; upper sepal and petals joined for about half their length, the sepal in all about 7 by 4 mm., a little longer and wider than the petals, brownish; lateral sepals each about 6.5 by 4.5 mm., joined for about half their length, streaked with pink at the base; lip white with pink or purplish centre, about 7 mm. wide and 5 mm. long, the base narrow with a

small bilobed callus, the blade 3-lobed; side-lobes much larger than mid-lobe, rounded, slightly deflexed; midlobe oblong or bluntly triangular, about 1.5 by 1.5 mm., upcurved; column 5 mm. tall, foot very short; top of column widened, with a slender arm on each side of the stigma, the arms more than half total length of column, curved downwards; fruit at first deflexed, then erect on a slender pedicel 6 mm. long. Distributed to Borneo and Sumatra; in Malaya found at several localities from Perak to Johore, in lowland forest. Owing to the presence of the column-arms, this species has been placed in a separate genus, called *Leucolaena*; but the distinction from *Didymoplexis* is not a sharp one, as there are species with short arms, and all *Didymoplexis* have a column widened at the top. The peculiar shape of the lip with its large deflexed side-lobes and small upturned mid-lobe, is distinctive; the flower is more beautiful in both shape and colouring than in most saprophytes.

2. *Didymoplexis pallens* Griff., Calc. Journ. Nat. Hist. 4: 383, t. 17. 184/3.  
J.J.S., Fl. Buit. 6: 77, f. 51. Ic. Bog. 2: t. 101, B. King & Pantl., Ann. Calc. 8: 260, pi. 364. Ridl., Flora 4: 206.

Rhizome to 8 cm. long, narrowed to the apex; erect stems 5-12 cm. long, with few flowers; bracts small, triangular; flowers erect, pale brown-olive or pinkish, 1-1.4 cm. long; upper sepal united to petals for their full length; lateral sepals similarly united; lateral sepals joined for a short distance to petals; lip yellowish white, about 5 mm. long, with raised sides, when flattened wider than long, almost triangular with the obtuse angle at the base, with a row of yellowish warts along the middle; column curved, widened at the top with two short pointed auricles; pollinia 4, with thick gland; column-foot curved, 2-3 mm. long; pedicel lengthening to 1.2 cm. or more in fruit. Distributed from India to Java and Sumatra; in Malaya found at several places in lowland forest. Owing to its small size, this species is not easily seen. There are allied species in Java and Sumatra, with somewhat different lip-structure, and it may be that one or more of these occur also in Malaya. The structure of the lip of Malayan plants has not been accurately described.

## 11. GASTRODIA

Saprophytes; rhizome horizontal, tuberous, of many short internodes; erect stem bearing terminal inflorescence; petals and sepals joined together into a 5-lobed tube, which may be split between the lateral sepals; petals smaller than sepals; lip not lobed, joined to the end of the column-foot; column fairly long, with distinct foot; stigma at base of column, pollinia 2, lobed, of large granules; fruit erect, sometimes on an elongated pedicel.

*Gastrodia* is a genus of some 15 species, distributed from the Himalayas to Japan, and southwards through Malaysia to Australia and New Zealand. In Malaya we know at present two species. The joining of all sepals and petals together distinguishes the genus among Malayan saprophytes, and the presence of the hollow stigma at the very base of the column is also remarkable. Ridley described a species *Gastrodia malayana* as having "petals free to near the base"; but no specimen

which strictly accords with this description exists in the Singapore herbarium. If Ridley was correct in his statement, there is a third *Gastrodia* to add to the two described below, which are distinguished as follows:

Tube of sepals and petals split to the base  
between the lateral sepals; pedicel not  
elongating in fruit .. . . 1. *G. javanica*

Tube not split between lateral sepals; pedicel  
much elongating in fruit .. . . 2. *G. Holttumii*

1. *Gastrodia javanica* (Bl.) Endl., Gen. PL 212. 1836 (?). BL, Fl. Jav. N.S. 121, t. 52. 1858. J.J.S., Fl. Buit. 6: 75, f. bO.—*Epiphanes javanica* BL, Bijdr. 421. 1825.—*Gastrodia malayana* RidL, Mat. FL M.P. 207. 1907. Flora 4: 207. Carr, Gard. Bull. 5: 40. 1929. Carr, J.M.B.R.A.S. 6: 67, pi. 17.

Rhizome to about 15 cm. long; erect stem to 70 cm. tall, flowers to about 12; bracts broad, about 4 mm. long; flowers about 1.5 cm. long, the sepals and petals all joined together except for free tips about 3 mm. long, the lateral sepals separated to the base, showing the lip in the gap between them; outside of flower pale dull purplish brown, inside with yellow anthers on the lateral sepals; lip parallel with and close to the column, yellow with longitudinal green line on lower surface, narrowly diamond-shaped, the sides raised in the middle, edges thickened near the base, a median thickened band throughout; column straight, nearly as long as the nPr column-foot distinct; pedicel not elongating in fruit. Occurring in Java and probably also in Sumatra; in Malaya found at several localities in lowland forest. This is a more conspicuous plant than many saprophytes. **Fig. 16, a, b.**

Mr. Carr made some observations on the pollination of this species. The visiting insects are flies, which take a powdery substance from the upper surface of the lip. Owing to the presence of the column-foot, there is a gap between column and lip at the base. This the fly enters, and crawls from base to apex of the lip; the apex is pressed close to the anther and so the fly removes the pollinia on leaving the flower. On entering a second flower in the same way, it deposits pollen on the stigma, which is at the base of the column.

2. ***Gastrodia Holttumii*** Carr, Gard. Bull. 5: 38, pi. 17. 1929.

Rhizome tuberous, constricted at intervals; erect stems to 10 cm. long, bearing 1-4 flowers; bracts to 3.5 by 2 mm.; flowers, each lasting one day, drooping, bell-shaped, the free tips of the sepals not spreading, pale yellow-brown, warty outside; sepals about 2 cm. long, joined together for half their length; free part of petals very small, 1 mm. long; lip and column small, quite enclosed by the sepal-tube; lip 3 by 2 mm., ovate, with a blunt tip, concave, with a thickened median band and two small calli at the base; column a little longer than lip, with short foot; pollinia reddish yellow; pedicel elongating to 40 cm. in fruit. Found once in Pahang (near Tembeling) and probably once in Johore. This species is not easy to see when in flower, but the long pedicel of the fruit makes it more conspicuous, as in some species of *Didymoplexis*.

THE GOODYERA AND CORYMBORCHIS TRIBES

Terrestrial plants with erect leafy stems arising from a creeping base; leaves without a joint at the base; inflorescences terminal and sometimes also lateral; flowers usually rather small, often not widely opening; upper sepal and petals usually more or less joined to form a hood over the column; lip usually saccate or spurred at the base, the hollow part often containing glands, with or without a small terminal blade; column short or long, with the anther on its back, the tip of the anther pointing upwards behind the rostellum; pollinia 2, granular, with a well-developed disc; rostellum usually triangular, erect, cleft; wings or other appendages often present on the front of the column; stigma usually convex, either undivided on the front of the column, or divided into two parts, one on each side of the column.

The two tribes are thus distinguished:—

- |  |         |                           |
|--|---------|---------------------------|
| Stems succulent, 20-100 cm. tall; leaves thin, not very large, usually broad, sometimes coloured, never pleated; inflorescence terminal only | . .     | <i>GOODYERA</i> Tribe     |
| Stems stiff and woody, 75-300 cm. tall; leaves tougher, rather long and narrow, pleated; inflorescences axillary or terminal or both         | . . . . | <i>CORYMBORCHIS</i> Tribe |

In this interesting group of plants we probably have the nearest living relatives of the original monandrous orchids. The ancestors of orchids were certainly terrestrial plants. We are therefore likely to find the most primitive remaining orchids among the terrestrial species. Of these, the Goodyera tribe are considered to be among the most primitive of the Monandrese on account of their non-specialized vegetative habit (not regularly sympodial) and because of their flower-structure, particularly the structure of the column. The anther is erect, on the back of the column, connected by a small filament to its base. This is very near the natural position of one of the stamens in the kind of primitive flower from which the orchid flower probably evolved. The more advanced monandrous orchids have the anther perched on the top of the column, even hanging down in front. In the Goodyera tribe there are often two separate stigmas, one on either side of the column, and the rostellum (representing the third stigma) points upwards. This is somewhere near the 3-stigma arrangement of a primitive flower. But of course the pollinia and their disc represent quite a highly evolved state, and these flowers have departed a long way from a primitive condition. The curious glands or fleshy hairs found in the base of the lip of many species may also represent a relic of some of the suppressed floral parts. They are usually called glands but little is known of their structure or function.

## THE GOODYERA TRIBE

The Malayan members of this tribe are divided into 14 genera, the division resting mainly on the structure of the lip and of the column. The separation of the genera is perhaps in some cases artificial (as between *Zeuxine* and *Hetaeria*), but it is convenient. The plants are nearly all found in shady primitive forest. In some cases they have beautifully coloured leaves, and the leaves are often slightly asymmetric, the midrib being curved. Many species have been collected only once or twice, and we need to know more about them. The plants do not flower continuously, and when not flowering are impossible to identify with certainty. Probably many of the species are not abundant, and it is rare to find any of them locally common. Where the lip has a terminal blade, the narrow part between the saccate base and the blade is called the *claw*; this term is used in the following key.

## Key to the Malayan genera of the Goodyera tribe

- Flowers with lip at the top  
 Leaves green; lip and column not twisted .. 1. *Hetseria*  
 Leaves very dark green with golden or reddish  
 veins; lip and column twisted .. .. 2. *Macodes*
- Flowers with lip at the bottom  
 Spur or saccate base of lip containing neither glands  
 nor hairs (hairs may occur near midlobe)  
 Lip with spur which projects between the lateral  
 sepals ... .. 3. *Erythrodes*  
 Lip saccate, entirely enclosed by the lateral sepals 4. *Hylophila*  
 Lip hairy within or having papillae or glands on  
 either side near the base or in the spur  
 Lip hairy within .. .. 5. *Goodyera*  
 Lip with a single gland or small group of papillae  
 on either side near the base or in the spur  
 Column and lip twisted .. .. 6. *Hxmaria*  
 Column and lip not twisted  
 End of lip rather abruptly widened to a  
 transverse blade (2 mm. wide or more  
 when flattened), usually 2-lobed  
 Claw of lip with a toothed or fringed  
 flange on either side .. .. 7. *Anoectochihs*  
 Claw of lip without a toothed flange  
 Sepals joined together half way; blade  
 of lip distinctly toothed 8. *Cheirostylis*  
 Sepals not joined together; blade of lip  
 not toothed  
 Stigma one, on front of column  
 Lip with rather large side-lobes each  
 with a flap inside; spur bent up  
 under the blade .. .. 9. *Queteletia*



- Neither of these characters present
- Column without appendages . . 10. *Kuhlhasseltia*
- Column with 2 wings near base,  
projecting into lip . • 11. *Cystopus*
- Stigmas 2, one on each side of the  
column .. .. 12. *Zeuxine*
- End or lip not widened into a blade
- Spur of lip containing 2 stalked glands . . 13. *Vrydagzynea*
- Spur or saccate base of lip containing 2  
or more unstalked glands
- Plant about 100 cm. tall with leaves 40  
cm. long, base of lip containing  
about 6 small calli . . . . 14. *Lepidogyne*
- Plant much smaller; base of lip contain-  
ing a single gland on each side
- Leaves broad or none; flowers not in  
a spiral . . . . . 15. *Cystorchis*
- Leaves not over 10 mm. wide; flowers  
spirally arranged . . . . 16. *Spiranthes*

### 1. HETIERIA

Plants in flower about 25-60 cm. tall; leaves relatively broad, usually asymmetric, distinctly stalked above the sheathing base, green; inflorescence of many rather small flowers which have the lip uppermost; upper sepal and petals forming a hood; lateral sepals enclosing the saccate base of the lip; base of lip almost always containing papillae or glands of various kinds, the whole lip concave, shallow and narrowed towards the tip, which may be flattened but is never broad; column short, with two parallel wing-like appendages on the front; anther usually short; rostellum sometimes fairly long; stigmas 2, convex, sometimes close together.

This is mainly a Malaysian genus, extending from India to Fiji. It is very nearly related to *Zeuxine*, but distinct in the lip being borne at the top of the flower, and usually in the absence of a flattened blade at the end of the lip. The glands or papillae are confined to a small area on each side inside the base of the lip. The first three species are peculiar in the presence of a small flap reflexed from the apex, inside the lip; they are all closely allied. Only 3 out of our 8 species have been collected at more than a single locality.

#### Key to the Malayan species *Hetaeria*

- Lip with a small flap directed backwards within from  
the apex; sepals 2-3 mm. long; flowers many,  
rather crowded, ovary at right angles to the  
rachis
- Rachis of inflorescence 7 cm. long; sides of lip very  
thin and broad, so that lip when flattened is  
wider than long . . . . . 1. *H. ophirensis*

- Rachis of inflorescence much longer; sides of lip not so wide
- Upper sepal 2 mm. long; apical flap of lip very fleshy . . . . . 2. *H. elata*
- Upper sepal 3 mm. long; apical flap of lip thin . . . . . 3. *H. elegans*
- Lip without such a flap; sepals sometimes longer; flowers usually with ovary at an acute angle to rachis
- Plant to 60 cm. tall . . . . . 4. *H. alia*
- Plant smaller
- Lip with a pair of (sometimes lobed) papillae each side, within, near the base
- Sepals to 7 mm. long; column-wings as tall as rostellum . . . . . 5. *H. obliqua*
- Sepals about 4 mm. long; column-wings shorter than rostellum . . . . . 6. *H. nitida*
- Lip with a single papilla or gland each side, within, near the base
- Lip with 2 short keels near the middle; column with conspicuous wings all down the front . . . . . 7. *H. pauciflora*
- Lip without such keels; column without conspicuous wings down the front . . . . . 8. *H. parvifolia*

1. **Hetaeria ophirensis** Ridl., Flora M.P. 4: 222. 1924.—*H. elata* Ridl. (non Hk. f.), Mat. Fl. M.P. 1: 221. 1907.

Plant 45 cm. tall, with about 6 leaves near the base; leaf-blade to 8.5 by 3.5 cm., rather narrowly ovate with a distinct acute tip, stalk and sheath together about 4 cm. long; scape slender, 30 cm. long, short-hairy, with several short narrow sterile bracts; rachis 7 cm. long, with many small flowers; bracts 5 mm. long, as long as the ovary or a little longer, bracts and flowers hairless; sepals little over 2 mm. long, the upper one joined to the petals; lip strongly concave, the sides very thin and broad, when flattened wider than long; 2 pairs of papillae near the base; apex triangular, acute, with a 2-lobed backward-pointing flap within; wings of column acute, shorter than the rostellum; anther short and broad. Only known from a single collection from Mt. Ophir.

2. **Hetaeria elata** Hk. f., F.B.I. 6: 116. 1890. Ic. Pl. t. 2191. Ridl., Flora 4: 222.

Plant 40-60 cm. tall, with few leaves at base; leaf-blade to 12 by 4.5 cm., elliptic, acute, stalk and sheath together about 6 cm. long; scape to 30 cm., with several narrow sterile bracts; rachis 20 cm. long, short-hairy, with many crowded small pale greenish flowers; bracts 5-12 mm. long, hairy on their edges, ovary at flowering 5-6 mm. long; upper sepal about 2 mm. long, the laterals a little longer, as wide as long, not hairy; lip ovate, strongly concave, with 2 pairs of fleshy papillae in the base; apex fleshy, shortly pointed, with a fleshy 2-lobed, blade pointing backwards

from the apex; column very short, with a small triangular wing on each side near the top below the stigmas; anther and rostellum short and broad. Known from two collections, from Cameron Highlands at about 5,000-6,000 feet. Fig. 17.



Fig. 17. *Hetseria elata*; flower; column with lip, lip from above.

3. *Hetaeria elegans* Ridl., J.L.S. 38: 330, 1908. Flora 4: 222.

Plant about 45 cm. tall, with about 4 leaves at the base; leaf-blade to 9 by 3-3 cm., shaped as in *H. opkirensis* but with narrower base, stalk and sheath to 45 cm. long; scape hairless at base, hairy upwards, to 28 cm. long with 3 or 4 sterile bracts; rachis to 12 cm. long; bracts 3-5 mm. long, hairy, shorter than ovary; flowers greenish, hairless; sepals 3 mm. long, the laterals a little wider than the upper; lip shaped nearly as in *H. ophirensis*, but with the inflexed sides narrower, the reflexed apical flap much thinner; column short, both rostellum and tip of anther short and broad, the column-wings with incurved pointed tips, nearly as in *H. elata*. Found only on G. Tahan at 4,500-6,000 feet altitude. This species is nearly related to the two preceding, each coming from a different mountain; further collections are needed to show whether the distinctions between them are constant.

4. *Hetjeria alta* Ridl., J.L.S. 404. 1896. Flora 4: 221.

Plant to about 60 cm. tall, the basal half leafy, internodes 2-3 cm. long; leaf-blade to 10 by 4-5 cm., ovate to elliptic, acute, with 3 main veins, stalk and sheath to 3 cm. long; scape to 18 cm. long, short-hairy, with 3 or 4 sterile bracts; rachis to 22 cm. long, all parts short-hairy, flowers many, yellow; bracts to about 8 mm. long, shorter than the ovary; sepals nearly 6 mm. long, slightly hairy; lip a little shorter, the narrowed tip slightly reflexed, under 1 mm. long, the base containing 2 simple or slightly lobed papillae on each side; column with two tall wings in front, taller than the rather short rostellum. Found on Hermitage Hill in Perak,

5. *Hetwria obliqua* Bl., Fl. Jav. N.S. 87, t. 34, f. 1. 1858. Ridl., Flora 4: 221.

Plant 25-35 cm. tall, basal third leafy, internodes 1-5-2-5 cm.; leaf-blade to 7 by 2-8 cm., ovate, acute, stalk and sheath together to 2-5 cm.; scape to 15 cm. long, short-hairy, bearing a few sterile bracts; rachis 10-12 cm. long, with many flowers; bracts to 8 mm. long, hairy, shorter than ovary; sepals 6-7 mm. long, reddish-hairy on the outside, the upper one

joined at base to petals, all with apical halves spreading; petals white, as long as sepals; lip white, a little shorter than sepals, base concave, containing flattened, sometimes lobed, papillas on 2 veins each side of the mid-line; sides of the lip inflexed, the apex narrowed to a short straight blade about 1 mm, long; column yellow, with 2 wings on the front as tall as the rostellum; anther red. Distributed in Sumatra and Borneo; in Malaya found in lowland forest in the south and in Pahang. Fig. 18.

6. *Hetseria nitida* RidL, J. L. S. 32: 404. 1896. Flora 4: 222.

Plant 20-30 cm. tall with about 4 leaves near the base; leaf-blade to 6.5 by 3.2 cm., broadly elliptic with a short point, stalk and sheath to 2 cm. long; scape to 12 cm. long, short-hairy, with several sterile bracts; rachis 7-12 cm. long, with many crowded small flowers, their ovaries pressed close to the rachis; bracts 6-7 mm. long, pale pink, shorter than ovary; ovary and sepals short-hairy; upper sepal 4 by 2 mm., petals joined

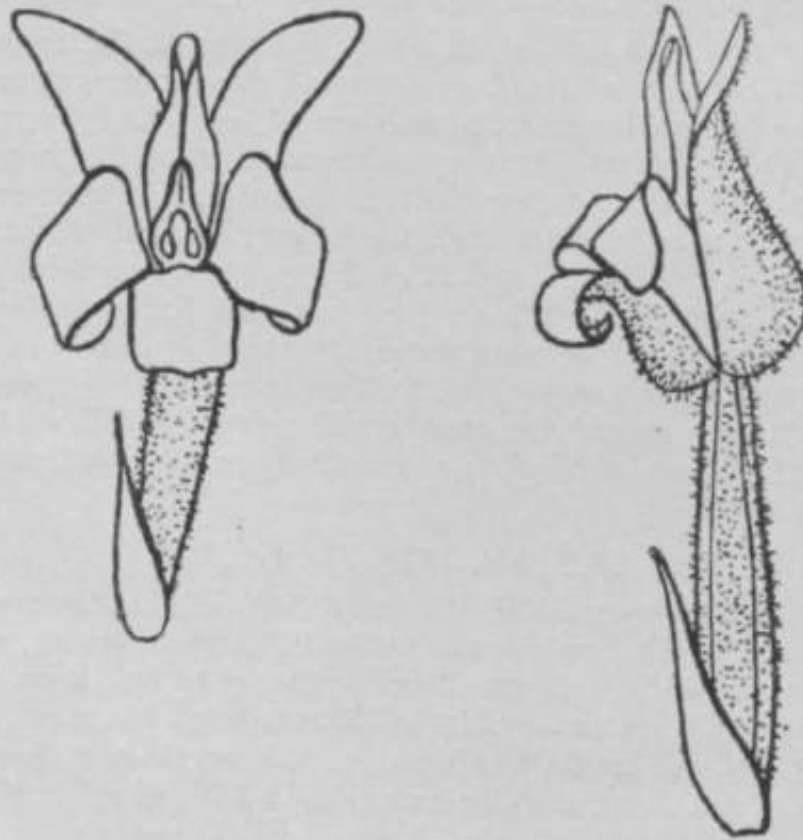


Fig. 18. *Hetseria obliqua*; flower with lip at top (after de Alwis).

to its base; lateral sepals a little narrower; all sepals slightly diverging, pink, petals white; lip joined at the base to the sides of the column, boat-shaped, with 2 small groups of papillae each side at the base, the sides inflexed towards the short narrow fleshy apex; column short, joined to half its height with the lip, wings rather large, with upcurved lower edges; rostellum rising much above both column-wings and anther; anther yellow. Found at a number of places in Penang, Pahang and Singapore, all in the lowlands.

7. *Hetseria pauciflora* Ridl., J.F.M.S. Mus. 4: 73. 1909. Flora 4: 222.

Plant barely 15 cm. tall, with about 5 leaves; leaf-blade to 5.5 by 1.2 cm., widest near the base, narrowed gradually to the tip, stalk and sheath 1.2 cm. long; scape about 7 cm. long, short-hairy, with 2 sterile bracts; rachis 3 cm. long, with about 6 flowers; bracts 5-7 mm. long, hairy on the edges; ovary 5 mm. long, hairless like rest of flower, sepals 3 mm. long, reddish with white spots; petals white, narrower; lip concave, the sides inflexed towards the acute slightly fleshy apex; mid-line grooved below and raised above, with 2 small keels in the middle and two small glands on either side near the base; column broad, with wings right down the front, a little inflexed and pointed at the top; rostellum broad, with incurved teeth; anther broad, pollinia with a very broad disc. Only known from one specimen found near Cameron Highlands.

8. *Hetaeria parvifolia* Ridl., J.S.B.R.A.S. 39: 87. 1903. Flora 4: 223.

Plant about 25 cm. tall, with 4-5 leaves near base; leaf-blade to 2.5 by 1.5 cm., widest near base, narrowing gradually to apex, stalk very short, with sheath 1 cm. long; scape about 10 cm. long, short-hairy, with one or two sterile bracts; rachis 5 cm. long, with about 12 flowers, all short-hairy; bracts 5-6 mm. long, about as long as ovary; sepals 3 mm. long, upper one joined to petals; lip thin, concave, 3-veined, narrowed to the acute tip, with (?) two small papillae in the base; column without appendages in front; anther long, longer than rostellum. Known only from one specimen found on Penang Hill, and one from Sungei Krian Estate, Perak. It seems doubtful whether there are really any calli in the lip, the base of which is small.

## 2. MACODES

Leaves rather fleshy, broad, with coloured veins; flowers rather small with lip uppermost, asymmetric owing to twisting of lip and column; lateral sepals enclosing base of lip; lip 3-lobed, saccate at base, sac containing two glands; side-lobes of lip short, rounded, midlobe with narrow base and short spreading blade; column short, twisted, with two thin close parallel wings on the front, the wings descending downwards into the spur; anther acute; rostellum cleft; stigma not divided, large.

This small genus is confined to the Malaysian region. There is one species only in Malaya. The leaves are among the most beautiful in this group of orchids, and the plants have been cultivated in Europe for their foliage. The flowers are small, with lip and column twisted as in *Hsemaria*, but differing from *Hsemaria* in having the lip at the top. The two genera have been hybridised together.

*Macodes petola* (Bl.) Lindl., Gen. et Sp. Orch. 497. 1840. Bl., Fl. Jav. N.S. 100, t. 31, f. 2; t. 36D. 1858. J.J.S., Fl. Buit. 6: 103, f. 73. Ridl., Flora 4: 215.—*Neottia petola* BL, Bijdr. 407. 1825.

Leaves few, all near the ground, close together, blade to 6.5 by 4.2 cm., ovate, shortly pointed, very dark green with 5 longitudinal golden veins and groups of small golden cross-veins; scape to 16 cm. long, short-hairy, with 2 sterile bracts; rachis to 7 cm. long with about 15 flowers; bracts to 8 mm. long, shorter than ovary; flowers red-brown with white lip; upper sepal about 5 mm. long, laterals 6 mm., spreading; lip shorter than the lateral sepals, the midlobe with a short narrow claw and small blade which is wider than long. Distributed from Sumatra to the Philippines; in Malaya found at several localities in forest, in the lowlands and at moderate elevations on the hills, from Singapore to Penang.

### 3. ERYTHRODES

Leaves green, ovate with unequal halves; scape fairly long; upper sepal and petals forming a hood, lateral sepals spreading; lip spurred, the spur projecting between the lateral sepals, the blade concave with reflexed apex, no warts or hairs inside; column short; stigma hollow, at foot of rostellum.

This is a small genus but widely distributed from Ceylon and northern India to China and through Malaysia to Samoa. In Malaya we have certainly two species and perhaps three. They are distinguished by their spur and the absence of glands and hairs in the lip.

#### Key to the Malayan species of *Erythrodes*

- Spur 4-5 mm. long; lip not distinctly lobed  
 Leaf-stalk and sheath together 5 cm. long; rachis of  
 inflorescence elongating to 30 cm. .. .. 1. *E. latifolia*  
 Leaf-stalk and sheath together little over 2 cm. long;  
 rachis of inflorescence shorter .. .. 2. *E. humilis*  
 Spur 1-5-2 mm. long; lip 2-lobed .. .. 3. *E. brevicar*

1. *Erythrodes latifolia* Bl., Bijdr. 411, f. 72. 1825.—*Physurus latifolius* Bl., Fl. Jav. N.S. 80, t. 27. 1858. J.J.S., Fl. Buit. 6: 84, f. 56. Ridl., Flora 4: 210.

Plant when flowering to 60 cm. high, with few leaves near base; leaf-blade to 12 by 6.5 cm., ovate, acute; stalk and sheath to 5 cm. long; scape about 25 cm., short-hairy, with about 3 sterile bracts; rachis elongating to 30 cm., with many but not crowded flowers, hairy in all parts; bracts to 1.2 cm. long, about as long as ovary; sepals and petals pinkish-brown, lip with white edges; sepals 6-7 mm. long; petals forming a hood with upper sepal; lateral sepals spreading obliquely; lip with spur 4-5 mm. long, slightly bilobed, close to ovary, blade about same length, close to column except for the strongly recurved tip, concave, fleshy, with a median groove. Distributed in Java and Sumatra; in Malaya found once on Taiping Hills and once at Fraser's Hill.

2. *Erythrodes humilis* (Bl.) J.J.S., Bull. Dep. Ag. XIII: 11. 1907.—  
*Physwrus humilis* BL, Fl. Jav. N.S. 81, t. 27, f. 2. 1858. J.J.S., Fl.  
Buit. 6: 85, f. 57. Ridl., Flora 4: 210.

Habit of *E. latifolia* but smaller; leaf-blade to 8 by 4.5 cm., stalk and sheath to 2-3 cm.; rachis of inflorescence to about 12 cm. long; flowers a little larger than in *E. latifolia*, the spur more deeply 2-lobed, the blade more deeply grooved. Distributed in Java and Borneo; in Malaya reported to have been found at Ulu Langat in Selangor, but no specimen exists in Singapore. The species is in any case very near *E. latifolia*, and the distinction between the two a matter of some doubt.

3. *Erythrodes brevicar* J.J.S., Bull. Btzg., Ser. 3, 5: 17. 1922. Suppl. II:  
t. 7, III.

Habit of *E. latifolia*; leaf-blade to 7 by 3.3 cm., stalk and sheath to 2-2 cm.; scape about 25 cm.; rachis about 7 cm. long; sepals 5 by 2 mm.; petals 5 by 1 mm., forming a hood with the upper sepal; lip with slightly 2-lobed spur 1.5-2 mm. long; blade 3-lobed, fleshy, the side-lobes erect, rounded, midlobe with abruptly widened base, recurved, triangular when flattened, about 2.5 mm. long and 1 mm. wide; column with long rostellum and anther. Discovered originally in Sumatra, and found once in Malaya, at F]aser's Hill. The short spur and shape of the lip are distinctive.

#### 4. HYLOPHILA

Inflorescence dense, with many flowers; upper sepal and petals forming a hood; lateral sepals oblique, enclosing whole of lip; lip saccate, hairy within near the narrow reflexed blade; column short; anther long, acute; rostellum long, deeply divided; stigma convex, on front of column, in one species with a short horn-like appendage spreading on either side.

This is a small Malaysian genus, of which two species occur in Malaya. The lip forms almost a closed sac, the small blade not projecting beyond the forward end of the sac. The species with horns on the column has been made into a separate genus (*Dicerostylis*) but in all other respects is so similar to *Hylophila* proper that the two may be united. The two species are distinguished as follows:—

- |   |       |                         |
|---|-------|-------------------------|
| Rachis 15-30 cm. long; upper sepal 4 mm. long;<br>stigma without horns            | .. .. | 1. <i>H. mollis</i>     |
| Rachis 5-8 cm. long; upper sepal 8-9 mm. long;<br>stigma with a horn on each side | ..    | 2. <i>H. lanceolata</i> |

1. *Hylophila mollis* Lindl., Gen. et Sp. Orch. 490. 1840. Bl., Fl. Jav. N.S. 97,  
t. 35, f. 2, t. 36F. 1858. Ridl., Flora 4: 223.

Plant in flower 40-60 cm. tall, the base with 6-12 leaves, their sheaths overlapping; leaf-blade 8 by 2.5 to 12 by 3.5 cm., elliptic, acute, the halves unequal, stalk and sheath to about 4 cm.; scape short-hairy, to 20 cm. long, bearing a few sterile bracts; rachis 15-30 cm. long, with many small

flowers close together, softly short-hairy throughout, including bracts and flowers; bracts to 1 cm. long; ovary at flowering about 6 mm. long; flowers pale greenish; upper sepal 4 mm. long, concave, bent forwards at one-third from base, forming a hood with the petals and enclosing the column; lateral sepals broader, asymmetric, concave, together enclosing the lip; lip consisting almost entirely of a swollen slightly bibbed sac, with a small aperture just below the column, apex a narrow pointed blade; column short, the rostellum and anther bent forwards at a right angle under the upper sepal; stigma large, convex, on lower surface of column. Distributed in Sumatra and Borneo; in Malaya found in lowland swamp forest in the south and on Taiping Hills and Kedah Peak at 2,500 feet. **Fig. 19.**

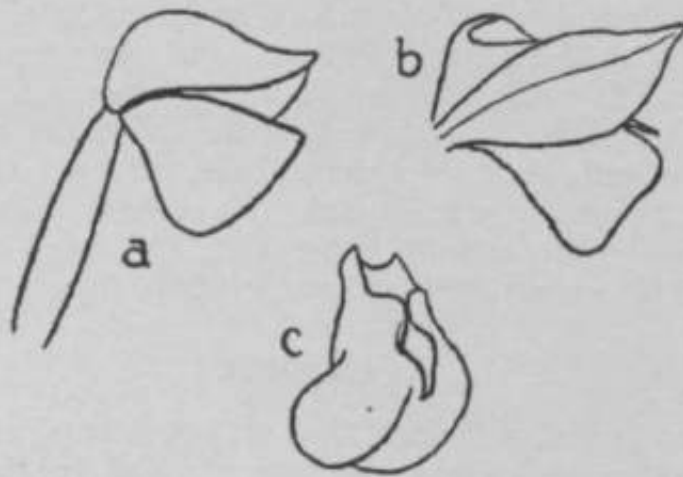


Fig. 19. *Hylophila mollis*. a, flower from side, b, same with sepals removed, c, lip.

2. *Hylophila lanceolata* (Bl.) Miq., Fl. Ind. Bat. 3: 746. 1859. Ridl., Flora 4: 223.—*Dicerostylis Umceolata* Bl., Fl. Jav. N.S. 98, t 38, f 1. 1858. J.J.S., FL Buit. 6: 117, f. 85. Bull. Btzg., Ser, 3, 3: 255 (revised descr.).

Height of flowering plant about 20 cm.; leaves 3-6, 2-3 cm. apart, blade 9 by 2 to 14 by 4 cm., elliptic, asymmetric, tip narrowed, acute! stalk and sheath 3-4 cm., sheath broad; scape to about 5 cm. long, with one or two sterile bracts, hairy; rachis 5-8 cm. long, with many crowded flowers; bracts to 1-2 cm. long, hairy; ovary at flowering nearly as long as bracts, hairy; flowers mainly white, hardly opening; sepals hairy outside, greenish at base; upper sepal about 9 mm, long, 4 mm. wide, concave; lateral sepals slightly diverging, much wider, very asymmetric, concave, together enclosing the lip; petals joined to upper sepal in a hood, partly pinkish; lip shaped much as in *H. mollis* but larger; column as in *H. mollis* but the anther embedded in a deep clinandrium on the back, the stigma with a short horn-like appendage on each side. Distributed in Java and Sumatra; in Malaya found on mountains at a few localities, apparently not common. The rather large leaves, short scape and short dense inflorescence, with the strongly saccate lip, are distinctive.



5. GOODYERA

Inflorescence erect, of few or many flowers; sepals all parallel to the floral axis, or the two lateral ones spreading, the upper sepal forming a hood with the petals; petals sometimes joined near their tips; lip hollow or saccate, with bristly hairs inside, narrowed to an acute tip which is sometimes reflexed, not lobed; column short, without appendages at base; rostellum usually long, deeply cleft; stigma not divided, large, on front of the column.

This is a fairly large genus, distributed to all the warmer parts of the world except Africa. The flowers are easily recognized from the hairs inside the lip (usually not confined to two small areas in the base as in other genera) and the large stigma on the front of the column. In Malaya eight species have been found, but only three of them at more than one locality, and the identity of two others is in doubt. As with most other genera of this tribe, we need to know a good deal more about the Malayan species of *Goodyera*. A few of them have coloured leaves, but not so decorative as in other genera.

Key to the Malayan species of *Goodyera*

Lateral sepals spreading

Sepals woolly-hairy

Leaves to 16 by 7 cm. . . . . 1. *G. rubicunda*

Leaves about 4 by 1-2 cm. . . . . 2. *G. lanceolata*

Sepals almost or quite hairless . . . . . 3. *G. cordata*

Lateral sepals not spreading

Leaves dark green with network of white or red  
**veins**

Lateral sepals enclosing saccate base of lip

Sepals 5-6 mm. long . . . . . 4. *G. colorata*

Sepals 3 mm. long . . . . . 5. *G. hispida*

Lip with swollen spur projecting between bases  
of lateral sepals . . . . . 6. *G. pusilla*

Leaves green (reddish in no. 2?), veins not red

Sepals woolly-hairy

Flowers many; bracts 2 cm. long, longer than  
flowers . . . . . 7. *G. fohosa*

Flowers few; bracts 1 cm. long, not longer than  
flowers . . . . . 2. *G. lanceolata*

Sepals not hairy . . . . . 8. *G. bifida*

1. **Goodyera rubicunda** (Bl.) Lindl., Bot. Reg. 25: Misc. 61. 1839. J.J.S., Fl. Buit. 6: 121, f. 55.—*Neottia rubicunda* Bl., Bijdr. 408. 1825.—*Goodyera rubens* Bl., Fl. Jav. N.S. 36, t. 90, f. 17-26. 1858. Ridl., Flora 4: 220.

Plant to 60 cm. tall, stem stout; leaves several, green, blade to 16 by 5 cm., elliptic, oblique, acute, stalk about 5 cm. long; scape about 20 cm. long, with several sterile bracts; rachis to 20 cm. long, hairy; bracts about 2 cm. long, woolly; ovary 1 cm. long, woolly; flowers red-brown; sepals 9 mm. long, the laterals spreading; lip swollen, hairy within, the apex narrowly triangular, reflexed, white, 3 mm. long. Distributed from Sumatra to New Guinea; in Malaya found once in the Batang Padang Valley and once on G. Panti, Johore.

2. **Goodyera lanceolata** Ridl., J.S.B.R.A.S. 39: 86. 1903. Flora 4: 220.

Stem about 22 cm. tall; leaves 3-7 by 1-2 cm., long-pointed; scape 8-5 cm. long, hairy, flowers few; bracts 1 cm. long, woolly; sepals 1-2 cm. long, reddish, woolly; lateral sepals "oblique"; petals joined to upper sepal, reddish; lip saccate at base, with a tuft of bristles each side of the middle within, apex long-pointed; anther very long-pointed, rostellum long. This species is known only from one specimen (at Kew), found at The Gap in 1902, the flowers in bud. The leaves may have been coloured.

3. **Goodyera cordata** (Lindl.) Hk. f., F.B.I. 6: 114. 1890. Ic. Pl. t. 2187. Ridl., Flora 4: 220.—*Georchis cordata* Lindl., Gen. et Sp. Orch. 496. 1840.

Plant to 20 cm. tall above creeping base, with 5-6 leaves; leaf-blade to 4-5 by 2-4 cm., ovate, shortly pointed, base slightly heart-shaped, stalk slender, 1 cm. long above the sheath; scape slender, 5-10 cm. long, short-hairy, with one or two sterile bracts; flowers 2-6, dull red with white tip to the lip; sepals not hairy; upper sepal and petals forming a hood 1 cm. long, lateral sepals spreading; lip as long as sepals if straightened, but with acute tip turned down, the base swollen and hairy within; column widened at the stigma, bearing a very long rostellum with long beaked anther behind it. Found originally on the Khasya hills; in Malaya at Fraser's Hill and on Penang Hill, on rocks in valley near the top. This is very near *G. viridiflora* from Java.

4. **Goodyera colorata** (Bl.) BL, Fl. Jav. N.S. 31, t. 9B, f. 2. 1858. J.J.S., Fl. Buit. 6: 126, f. 93.—*Neottia colorata* BL, Bijdr. 409. 1825.

Plants to about 15 cm. tall, basal part with about 6 leaves, leaf-blade to 6 by 2-5 cm., narrowly ovate, acute, almost black, with red veins which fade in old leaves, stalk and sheath about 1-8 cm.; inflorescence 8 cm. long with many flowers, the scape short-hairy; flowers not widely opening, the sepals red-brown with white tips, petals and lip white; ovary barely 1 cm. long; sepals 5-6 mm. long, almost hairless; lip swollen and bristly within,

the tip (1-5 mm. long) sharply deflexed, acute; column much thickened below the hollow stigma, the rostellum nearly 3 mm. long, a little longer than the anther. Found in Sumatra and Java; in Malaya only from Tembeling, Pahang, a rather doubtful record. The description is taken mainly from Dr. J. J. Smith.

5. **Goodyera hispida** Lindl., J.L.S. 1: 183. 1857. King & Pantl., Ann. Calc. 8: 282, pi. 375.

Plant to about 20 cm. tall, leaves 4-6; leaf-blade 2-5 by 1-2 to 7 by 2-7 cm., base broadly rounded, apex narrowed to a point, green, more or less flushed with pink, with white or pink vein-network, stalk and sheath to 1-8 cm.; whole inflorescence short-hairy; scape to about 5 cm. long with several sterile bracts; rachis to 7 cm. long, with many flowers close together; bracts to 8 mm. long, not quite as long as flowers; sepals about 3 mm. long, hairy, somewhat diverging, nearly equal, greenish with white tips; petals not joined, as long as sepals, nearly white; lip about 3 mm. long, basal  $\frac{2}{3}$  strongly concave with numerous stiff hairs inside, apical  $\frac{1}{3}$  narrow, acute, slightly reflexed; column about 1 mm. long to the stigma, the rostellum 1 mm. tall above the stigma. Found originally on the Sikkim Himalayas and the Khasya Hills; in Malaya on Gua Panjang, Gua Ninek, Kelantan, at 1,500 feet. A pretty little species.

6. **Goodyera pusilla** Bl., Fl. Jav. N.S. 31, t. 9B, f. 3. 1858. J.J.S., Fl. Buit. 6: 127, f. 94. RidL, Flora 4: 219.

Plant about 12 cm. tall, leaves 4-5; leaf-blade ovate, acute, edges slightly waved, to 3-3 by 1-5 cm., velvety dark brown-purple with a network of red veins, paler in the middle, stalk and sheath to 1 cm. long; scape short-hairy, 3-5 cm. long, with few sterile bracts; rachis 2-5 cm. long, with about 8 flowers; sepals hairless, brown with whitish tips, 3-4 mm. long; petals 3 mm. long, yellowish; lip with almost round spur-like base projecting between the lateral sepals, hairy inside, blade concave, narrowed to the tip which is not reflexed, yellow with white edges, edges slightly toothed. Distributed in Java and Sumatra; in Malaya reported to have been found in Perak, but there is no specimen in Singapore. The description is taken from Dr. J. J. Smith.

7. **Goodyera foliosa** (Lindl.) Hk. f., F.B.I. 6: 113. 1890. King & Pantl., Ann. Calc. 8: 281, pi. 374. RidL, Flora 4: 220.—*Georchis foliosa* Lindl., Gen. et Sp. Orch. 496. 1840.

Plant 15-30 cm. tall, leaves about 6, well spaced; leaf-blade green, to 8 by 4 cm., elliptic, acute, asymmetric, stalk and sheath 2 cm. long; scape to 5 cm. long, short-hairy, with several sterile bracts; rachis to 7 cm. long, short-hairy like the bracts, ovaries and sepals; flowers many, rather crowded, shorter than the bracts; bracts 2 cm. or rather more long; sepals not spreading, salmon to orange with pale edges, about 7 mm. long (to 10 mm. ?) ; petals as long, pale pink; lip with basal saccate half hairy inside,

apical half narrowed and slightly reflexed, orange with a white tip; column with long rostellum and broad hollow stigma. Found in Assam and Burma; a specimen (at Kew) from G. Berumban, has been so named, but it is probably *G. bifida* (sepals not hairy, 10 mm. long).

8. *Goodyera bifida* (Bl.) Bl., Fl. Jav. N.S. 33, t. 9, C. 1858. J.J.S., Fl. Buit. 6: 122, f. & 9.—*Neottia bifida* Bl., Bijdr. 408. 1825.

Erect part of plant 15-25 cm. tall; leaves green, 4-6, on lower half of plant; leaf-blade 4 by 2 to 8 by 4 cm., ovate, acute, base slightly heart-shaped, stalk 1 cm., sheath 1 cm. long; scape short, usually with one sterile bract; inflorescence of 2-8 flowers, rachis short-hairy; bracts to about 2 cm. long, edges hairy towards base, otherwise almost or quite hairless; ovary at flowering shorter than bract; flowers white, more or less flushed with pink; sepals not spreading, 1.3 to 1.6 cm. long, about 5 mm. wide; lip about as long as sepals, hollow at the base, bearing many stiff bristles within, in two areas near the base, the apex narrowed, acute, slightly deflexed; column nearly as long as sepals, the stigma near the base in front, hollow, the rostellum very long. Distributed in Java, Sumatra and Celebes; in Malaya found on Taiping Hills and Fraser's Hill, the largest-flowered Malayan species.

## 6. HEMARIA

Leaves more or less purplish with red or gold veins; upper sepal and petals forming a hood; lateral sepals spreading; lip twisted and saccate at base, grooved below so that it is slightly bilobed, containing a bilobed unstalked gland on each side, apex of lip a transversely widened blade; column twisted clockwise (the opposite direction to the lip), without appendages on the front, stigma single, on front of column; pollinia slender and elongate.

This is a genus of one variable species, which has often been cultivated, like *Macodes*, for the beauty of its leaves. As in *Macodes*, the flowers have the lip and column twisted, but the lip in *Hsemaria* is in the usual position at the bottom of the flower. The two genera have been crossed (about 1860, in England) but the hybrid was not described in detail, and perhaps no plants now exist. *Hsemaria* has also been crossed with *Dossinia* (a small Bornean genus) and *Anoectochilus*, both of which have beautifully veined leaves.

*Haemaria discolor* (Ker.) Lindl., Gen. et Sp. Orch. 490. 1840. Ridl., Flora 4: 216. Burk., Gard. Bull. 1: 351. 1916.—*Goodyera discolor* Ker., Bot. Reg. 4: t. 271. 1817.

Erect leafy part of stem short, with 3-6 leaves; leaf-blade dark purple or dark green, usually with midrib, two main veins on each side, and cross-veined, red or gold; or the blade green with pale green veins; blade to 8 by 4.3 cm., sometimes proportionately narrower, ovate, with very short acute tip, stalk and sheath to 2.5 cm.; scape to about 12 cm.,

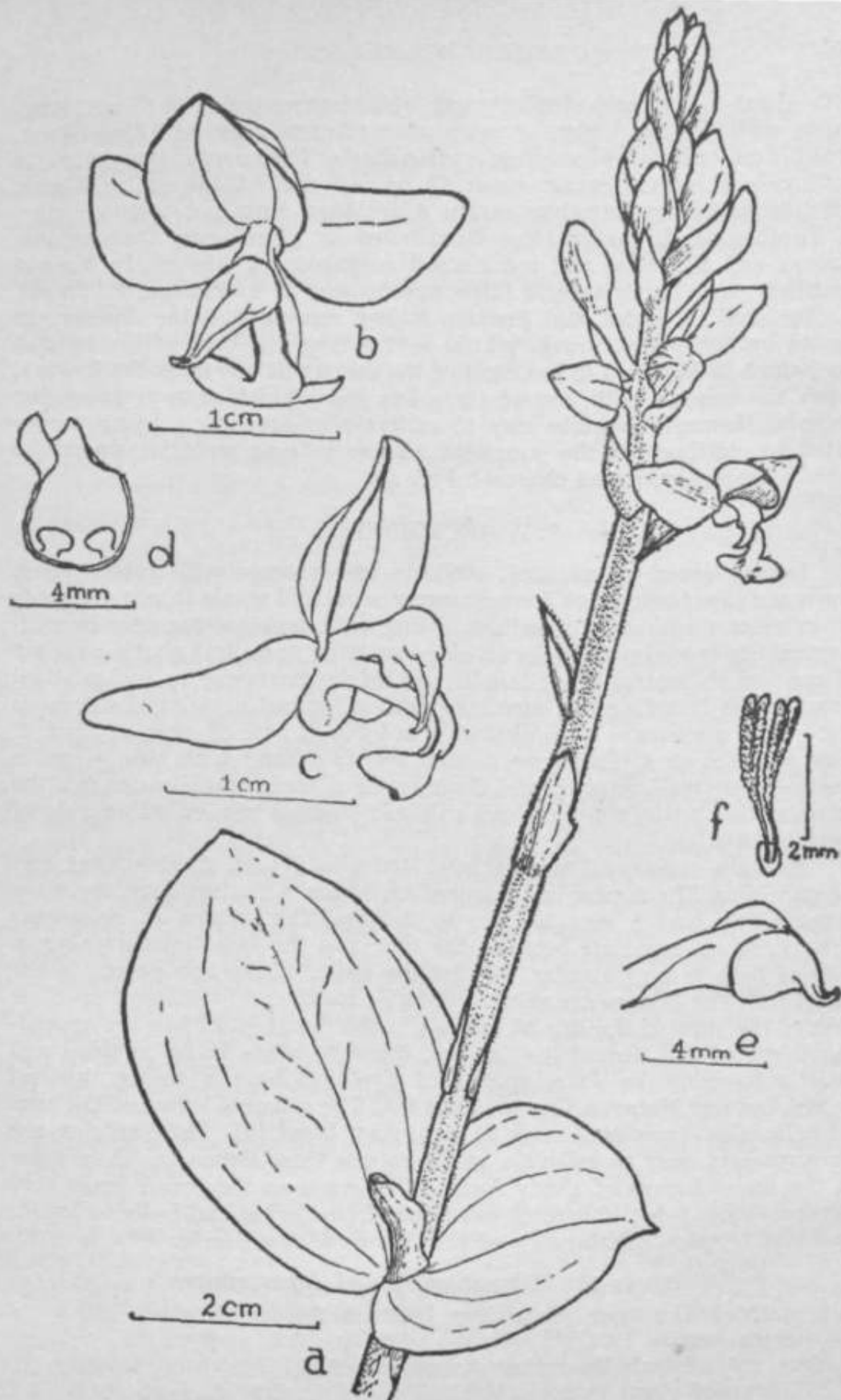


Fig. 20. *Hsemaria discolor*, a, leaves and inflorescence. b, c, flower from front and from side, d, base of lip, from within. \*, column. /, pollinia.

with about 3 thin pale sterile bracts, short-hairy; rachis 5-15 cm. long, hairy, with flowers 5 mm. or more apart; bracts pink, to 1.5 cm. long, broad, thin, hairy on edges only, a little shorter than ovary; *flowers* white with yellow anther; sepals about 10 by 5-7 mm.; blade of lip 8 mm. wide, transversely spreading, much wider than long, not toothed; claw of lip channelled, 5 mm. long. Distributed in Tenasserim, Cochinchina, Malaya and Sumatra, and some small neighbouring islands. In Malaya found on rocks by streams in fairly open places on P. Tioman, P. Tinggi, P. Aor, and in Kedah and Penang. Ridley reports that the flowers are visited by butterflies, which, taking nectar from the base of the twisted lip (which is displaced to the right of the column as one faces the flower), touch the column with one of their left legs, which thus removes the pollinia. Hsemaria is quite easy to cultivate in Singapore, being propagated by cuttings of the succulent stems; potting material should be mainly broken brick and charcoal. Fig. 20.

### 7. AN(ECTOCHILUS

Leaves green or coloured, stalked; inflorescence with rather short scape and few fairly large flowers; upper sepal and petals forming a hood; lip in contact with base of column, either with a projecting spur or with a saccate base enclosed by the sepals; two large unstalked glands near tip of spur or in saccate base; middle part of lip narrowed to a channelled claw (edges infolding and meeting) with a toothed or fringed flange on either side, sometimes with distinct side-lobes at base of claw, at apex of claw widened to a transverse 2-lobed blade; column with two wings in front, either small, or prolonged downwards as free parallel plates into the spur; anther acute, short or long-pointed; stigmas two, on either side of base of rostellum.

As here construed, this includes the two genera *Anoectochilus* and *Odontochilus*. The former has coloured leaves and a distinct spur, the latter green leaves and a saccate base to the lip. The species *A. calcaratus* however is intermediate between the two; and the essential flower-structure of both is very similar, so that the union of the two genera is not unnatural. The flowers are very remarkable for the curious flange on either side of the claw of the lip; at first sight the flange looks like the spreading edges of the claw, but it is not, the true edges being infolded and usually touching. In Java, species of *Cystopus* have a similar toothed flange, but our Malayan *Cystopus* has not. The coloured leaves of the true *Anoectochilus* (species 1 and 2) are very beautiful. These species are however less easy to cultivate in Singapore than *Hsemaria*. They grow in the moist humus of shady forest. The genus in the broad sense here taken includes some 40 species, extending from Ceylon and India to Japan, and southwards to Malaysia and the islands of the Pacific.

#### Key to the Malayan species of *Anoectochilus*

- Lip spurred, the spur protruding between the lateral sepals  
 Spur not bilobed; lip rather strongly bent at base of claw .. .. . 1. *A. geniculatus*

- Spur distinctly bilobed, acute; lip evenly slightly curved throughout .. .. 2. *A. albolineatus*
- Spur or saccate base of lip covered by base of lateral sepals  
Leaves about 7 by 4 mm.; spur with upcurved tip .. .. 3. *A. calcaratus*
- Leaves much larger; base of lip saccate, hardly spurred  
Two rows of teeth on each side of claw; upper sepal 5 mm. long .. .. 4. *A. duplex*
- One row of teeth on each side of claw; upper sepal 8-9 mm. long  
Column short; lobes of blade of lip each about 9 by 5 mm. .. .. 4. *A. brevistylis*
- Column long (more than half length of upper sepal); lobes of blade of lip each about 5-5 by 2-5 mm. .. 6. *A. pectinatus*

1. *Anoectochilus geniculatus* Ridl., J.L.S. 32: 406. 1896. Flora 4: 213.

Leafy part of stem short, with about 4 leaves; leaf-blade ovate, to about 6 by 4 cm., apex very shortly pointed, very dark green with gold or reddish vein-network, stalk and sheath to 2 cm. long; scape to about 14 cm. long, short-hairy, with 2 or 3 sterile bracts; rachis short, bearing 2-5 flowers; bracts to 1.5 cm. long, a little shorter than ovary; flowers white, reddish-hairy on outside of sepals, and with two pink spots on lip; upper sepal 1.2 cm. long, joined to petals; lateral sepals spreading, a little shorter; spur of lip close to ovary, 9 mm. long, very shortly pointed, containing 2 large glands; base of blade channelled, close to front of column, 6 mm. long, ending in distinct rounded side-lobes; claw bent at a little over a right angle to base of lip, 6 mm. long, with about 8 spreading threads, to 1.2 cm. long, each side on the flange; end of lip recurved, bearing a 2-lobed blade, the lobes widening from their base, 8 mm. along the longest edge, the square apex 4 mm. broad; column with parallel wings extending downwards into the spur, below base of column, for 7.5 mm. Found in many places in Malaya, from Penang to Singapore, in the lowlands and on mountains up to about 3,000 feet.

2. *Anoectochilus albolineatus* Par. et Rchb. f., Tr. L.S. 30: 141. 1874. Ridl., Flora 4: 213.

Habit of *A. geniculatus*; leaf-blade dark purplish with red veins, to about 6 by 4 cm., shortly pointed; scape to about 12 cm. long; rachis with 3-5 flowers; flowers coloured as in *A. geniculatus*, but apparently without the pink spots on the lip; upper sepal about 1 cm. long; spur of lip 7 mm. long, acute, distinctly cleft, with two points; lip curved slightly and evenly from tip of spur to tip of blade, not strongly bent as in *A. geniculatus*; claw of lip 4 mm. long, shorter than basal channelled part, with about 9 filaments up to 1 cm. long on each side; lobes of blade with longest

edge 6 mm.; column with wings as in *A. geniculatus* but their free ends in the spur shorter. Originally found in Tenasserim; in Malaya found in mountain forest, at many places, between 3,500 and 5,000 feet. This species is very nearly related to *A. geniculatus*, but seems to be distinct in the shape of the lip and lobed spur, and has rather smaller flowers. It is related to a species in Sumatra which has a much longer spur.

3. *Anoectochilus calcaratus* (Hk. f.) Ridl., Mat. Fl. M.P. 1: 214. 1907.  
Flora 4: 214.—*Odontochilus calcaratus* Hk. f., F.B.I. 6: 99. 1890.  
Ic. Pl. t. 2162.

Plant about 7 cm. tall; leaf-blade about 7 by 4 mm., ovate, acute, said to be dark purple (or partly purple), stalk and sheath 3 mm.; scape short; rachis with 1-3 flowers; bracts 6 mm. long, shorter than ovary, hairless like all parts of flower; flowers pale pink with white lip; upper sepal and petals 7-8 mm. long; petals a little longer; lateral sepals with long base close to the ovary, enclosing the spur of the lip; spur 4 mm. long, with the end curved up in front, containing 2 glands; total length of lip from tip of spur to apex of blade 1-1 cm.; no distinct side-lobes; claw with a toothed flange, the teeth small, short, many on each edge; lobes of blade of lip each about 3-5 by 3-5 mm.; column with rather long rostellum and longer anther, and two wings down the front, prolonged downwards into the spur for 1-5 mm. Found on Taiping Hills at about 3,000 feet, and at Jor on the way to Cameron Highlands. This is a very interesting little species.

4. *Anoectochilus duplex* Holtt., Gard. Bull. 11: 275. 1947.

Plant about 10 cm. high (always ?); leaf-blade to 3-5 by 2-1 cm., ovate, very shortly pointed, green; stalk and sheath to 2 cm. long; scape very short; rachis short, hairy, with 3-5 flowers; bracts with scattered rather long hairs, to 1-1 cm. long, shorter than ovary; flowers green with white blade of lip, sepals with scattered hairs; upper sepal 5 mm. long, broadly ovate, blunt; petals very thin, joined to upper sepal; lateral sepals with saccate base enclosing the lip, in all 9 mm. long, the saccate base 3 mm.; lip 1-2 cm. long; saccate base containing two flattened (?) glands with median keel between them; no distinct side-lobes; claw very narrow with edges of blade folded together; flange on each side having one row of 4 teeth 2-3 mm. long and a second row above it of smaller teeth; blade of lip bilobed, lobes about 6-5 by 4 mm.; column about 4-5 mm. high including the broad rostellum; two small triangular wings in front of column at level of stigmas. Found twice, at the Gap and Fraser's Hill only. There is apparently no other recorded species having a double row of teeth on each side of the flange; the short upper sepal is also distinctive. Further information about this species is desirable.

5. *Anoectochilus brevistylis* (Hk. f.) Ridl., Mat. Fl. M.P. 1: 214. 1907.  
Flora 4: 214.—*Odontochilus brevistylis* Hk. f., F.B.I. 6: 100. 1890.  
Ic. Pl. t. 2166.

Plant to 30 cm. tall from a creeping base, the lower part usually leafless at flowering; leaves green, blade to 7 by 3-2 cm., ovate, acute, stalk and sheath to 2 cm. long; scape 2-3 cm. long; rachis about 3 cm.



long with 6-10 flowers; bracts to 1 cm. long, a little shorter than ovary; flowers green and white; sepals about 8 mm. long, the laterals swollen at the base, enclosing the base of the lip; lip about 1 cm. long, narrowed and channelled throughout, more deeply towards the base which has a median ridge with a (?) flat quadrangular gland on each side of it; flange on either side of the claw toothed, the basal teeth very small, the conspicuous ones about 4 on each side, rather irregular, to 3 mm. long; blade 2-lobed, the lobes nearly semi-circular, their broad outer edges slightly irregular toothed, each lobe about 9 by 5 mm., column short, with small wings near top in front. Found at Cameron Highlands and on Taiping Hills only. The basal teeth on the flange of the lip are very small and hidden by the bulging sides of the base of the lip.

6. *Ancectochilus pectinatus* (Hk. f.) Ridl., Mat. Fl. M.P. 1: 214. 1907. Flora 4: 214.—*Odontochilus pectinatus* Hk., f., F.B.I. 6: 99. 1890. Ic. Pl. t. 2165.

Habit of *A. brevistylis*, but plants usually smaller; upper sepal 9 mm. long with upcurved tip, joined to petals; lateral sepals with saccate base containing the lip, in all 1.1 cm. long; lip about 1.1 cm. long, shaped at the base as in *A. brevistylis*, the flange on the claw widest in the middle, with about 10 irregular short teeth on either side; lobes of blade of lip each about 5.5 by 2.5 mm.; column including rostellum more than half as tall as upper sepal, the anther as long; wings on front of column small, triangular, near the stigmas. Found only on G. Hijau (Taiping Hills). This is near the previous species, but seems quite distinct.

## 8. CHEIROSTYLIS

Small plants; leafy stem arising from a fleshy creeping base; inflorescence erect, with few flowers; sepals joined for half their length to form a swollen tube; upper sepal joined to petals; lip joined to the base of the column, with a short saccate base containing a few papillae; claw of lip entire; blade of lip transversely widened, 2-lobed, lobes toothed; column short, thickened, with a stigma on either side and two narrow appendages parallel to the rostellum and close to it.

This genus is very closely allied to *Zeuxine*, differing chiefly in the united sepals and the toothed blade of the lip. There are about 15 species, extending from India to Queensland, and perhaps also in Africa. In Malaya only one is known at present.

- Cheirostylis montana* Bl.**, Bijdr. 413, f. 16. 1825. Fl. Jav., N.S. 44, t. 13, f. 2. J.J.S., Fl. Buit. 6: 102, f. 72.—*C. flabellata* quoad Ridl. Flora 4: 218.

Plant in flower 14-22 cm. tall, leafy at base; leaves few, close together, brownish green, blade to about 3 by 1.6 cm., ovate, shortly pointed, stalk and sheath short; scape 10-16 cm. long, with about 4 sterile bracts, slightly hairy; rachis to about 4 cm. long with 6-8 flowers; bracts about 8 mm. long, as long as ovary at flowering; sepals 5 mm. long, joined

half-way to each other, green; petals and lip white; lip with saccate base containing a few papillae close together on each lateral vein; blade 2-lobed, the outer edges of the lobes irregularly toothed (teeth about 5), the whole blade when flattened about 3 mm. wide; column with arms about as long as rostellum and close to it. Distributed to Java; in Malaya found on rocks at 1,000-2,000 feet on Penang Hill, and on Kota Glanggi in Pahang. There are some allied species in Burma, but the Malayan plants appear to agree more closely with the Java one.

### 9. QUETELETIA

Upper sepal forming a hood with the petals; lateral sepals enclosing base of lip; lip joined to sides of basal part of column, spurred, with a 3-lobed blade; spur pouch-shaped, curved forwards under the blade, containing a group of fleshy hairs on each side; blade with erect rounded side-lobes which touch the column and have inside each a flap with its end pointing towards the column; midlobe small, with a narrow base, widened abruptly to a transverse crescent-shaped end; base of column short, bearing the single stigma on its front; rostellum and anther much longer than base of column and bent forwards at a right angle to it; tip of rostellum with two narrow teeth, edges winged, the wings produced downwards to base of column; pollinia very long and narrow.

This is a genus of two known species, one in the Philippines, and one in Java and Malaya. It is probably most nearly related to *Hylophila*, but differs in the much larger blade of the lip with its curious flaps inside the side-lobes, and in the groups of fleshy hairs in the spur. The genus has also been called *Orchipedum*.

***Queteletia plantaginifolia*** (Breda) Bl., Fl. Jav. N.S. 99, t. 37, f. 1. 1858. J.J.S., Fl. Buit. 6: 86, f. 58.—*Orchipedum plantaginifolium* Breda, Gen. et Sp. Orch. Fasc. II, t. 5. 1827. J.J.S., Blumea 1: 213. 1934.

Erect part of plant to 50 cm. tall, with several leaves, the lowest part of the stem sometimes bare of leaves, with internodes 2.5 to 4 cm. long; leaf-blade 10 by 4.5 to 6.5 cm., asymmetric, elliptic, shortly pointed, stalk and sheath to 5 cm. long; scape about 6 cm. long with a few sterile bracts; rachis of inflorescence to 15 cm. long with many flowers; bracts about 1.5 cm. long, a little longer than ovary, hairy; upper sepal and petal forming a hood about 11 cm. long, pointing forwards over the bent column; midlobe of lip about 2.5 mm. long in all; anther 6 mm. long, pollinia nearly as long as anther. This species has apparently been collected in flower only 3 times; once in Java in 1820, once in 1929, and on G. Lang in Kedah in 1938.

The structure of the lip is very peculiar and quite different from any other orchid of the *Goodyera* tribe. The anther and rostellum are almost parallel to the blade of the lip and close above it as in *Hylophila*; the base of the lip is joined to the whole length of the erect part of the front of the column. The leaves of the plant appear to be green, without any other colour, the sepals green, and the petals and lip white.

## 10. KUHLLHASSELTIA

Terrestrial, with habit of *Goodyera*; sepals and petals not spreading, the upper sepal and petals joined, the lateral sepals enclosing the saccate base of the lip; lip containing two glands in the saccate base, narrowed forwards into a claw with inflexed edges, ending in a short spatulate blade; column without appendages; anther long and narrow; stigma undivided, on the front of the column.

This is a small genus, with a few species reported from Java, Borneo and the Philippines. The name commemorates Kuhl and van Hasselt, who were pioneers in the field study of orchids in Java and both died at an early age (1823-24); the Malayan species described below is dedicated to the memory of Mr. C. E. Carr, who added so much to our knowledge of Malayan orchids.

***Kuhlhasseletia Carrii*** Holtt., Gard. Bull. 11: 281. 1947.

Plant when flowering about 18 cm. tall; leaf-blade about 4 by 1.4 cm., almost evenly elliptic, acute, stalk and sheath about 1.6 cm. long; scape 11 cm., short-hairy, with 3 sterile bracts to 4 cm. long; rachis short, with 3 flowers; bracts to 9 mm. long, hairless except on edges; ovary about 1 cm. long, hairy; upper sepal 8 mm. long, not hairy; lateral sepals enclosing base of lip; petals narrow, joined to upper sepal; lip with saccate base about 1.5 mm. deep, in all about 8 mm. long; blade 2-lobed, the lobes spreading, each about 2.5 by 1.3 mm. Found by Mr. Carr at Fraser's Hill in November 1930; no other specimens known. This species has much longer leaves and larger flowers than the other known species of the genus.

## 11. CYSTOPUS

Leaves rather small, green or somewhat coloured; inflorescence short, of few rather large flowers; sepals and petals not spreading, the petals joined to the upper sepal; lip with short saccate base enclosed by the lateral sepals and containing two unstalked glands, narrowed to a long channelled claw which widens at the end to a bilobed blade; column with long rostellum and anther, a single stigma in front, and below it two narrow wings which project into the base of the lip.

This is a genus of few species, distributed in India and Malaysia. Most species hitherto reported have a toothed flange on either side of the claw of the lip, as in *Anoectochilus*, but the only known Malayan species lacks this. *Cystopus* has a single stigma, *Anoectochilus* has two.

***Cystopus macranthus*** (Hk. f.) Holtt., Gard. Bull. 11: 278. 1947.—  
*Odontochilus macranthus* Hk. f., F.B.I. 6: 98. 1890. Ic. Pl. t. 2161.—  
*Anoectochilus macranthus* Ridl., Mat. Fl. M.P. 1:215. 1907. Flora  
4: 214.

Stem to 15 cm. tall, leafy throughout, internodes 1-2 cm. long; leaf-blade very deep red, paler beneath, to 3.5 by 1.2 cm., widest near base, tapering evenly to tip; stalk and sheath to about 1 cm. long; flowers 1 or 2, only just appearing above the leaves; bract about 1 cm. long, shorter

than the ovary; upper sepal 1.5 cm. long, laterals 1.6 cm., hardly diverging, all pink; petals and lip pale yellow; lip 1.9 cm. long, the saccate base enclosed by the lateral sepals and containing 2 glands; no side-lobes; claw channelled, without a toothed flange; blade when flattened 9 mm. wide and 7 mm. long, ovate, acute, abruptly widened from the claw, concave, the tip a little downturned; column 1 cm. long including the rostellum; anther occupying almost the whole of the back, a single stigma on front about half-way from base, and two narrow wings projecting into base of lip. Known only from the Taiping Hills at 1,500 feet, and from G. Blumut in Johore at 2,300 feet.

## 12. ZEUXINE

Leaves stalked or not, often rather small; inflorescence of few or many rather small flowers; flowers hardly opening; upper sepal and petals forming a hood; lateral sepals enclosing base of lip; lip with saccate base (edges usually inflexed) containing 2 glands and more or less grooved on the lower surface; blade transversely widened, small, connected to the saccate base by a short neck or a more or less elongated claw; column short, with or without appendages on the front; rostellum large, deeply divided; stigmas 2, convex (sometimes papillose), on either side of the column.

This is a genus of about 30 species, extending from Africa through India and Malaysia to Samoa. It is closely related to *Hetseria*, but differs in having the flowers with lip in the usual position at the bottom, and usually in having a distinct transversely widened blade at the end of the lip. There appear to be 10 Malayan species, but only two of them have been collected more than once. Much more information is needed about them. Two species (nos. 3 and 7) have a pair of keels or calli in each side of the base of the lip. The question of their status in the genus needs investigation.

### Key to the Malayan species of *Zeuxine*

- Leaves grass-like, to about 4 cm. by 4 mm. . . . 1. *Z. strateumatica*
- Leaves not grass-like, usually much wider
  - Leaves about 7 to 8 by 3 cm.
    - Lip with two short thin rounded keels close together in the middle; blade longer than wide .. .. . 2. *Z. abbreviata*
    - Lip without such keels; blade when flattened wider than long
      - Base of lip containing 2 short low keels each side; blade of 2 obovate lobes each 3 mm. long .. .. . 3. *Z. biloba*
      - Base of lip containing one large curved papilla each side; blade not bilobed, the end broadly rounded .. .. . 4. *Z. reniformis*

Leaves much shorter and narrower

Leaves about 1 by 0.6 cm., blade of lip about  
1 mm. wide .. .. 5. *Z. purpurascens*

Leaves larger; blade of lip wider

Leaves dark purplish with a pale midrib 6. *Z. violascens*

Leaves green

Leaves distinctly stalked; 2 low narrow  
calli each side within base of lip . . 7. *Z. palustris*

Leaves hardly stalked; one curved pa-  
pilla each side within base of lip

Blade of lip 2.5 mm. wide; sepals 3  
mm. long .. .. 8. *Z. clandestina*

Blade of lip 4-5 mm. wide when  
flattened; sepals 4.5 mm. or more  
long

Flowers two only; lip with a long  
claw . . .. 9. *Z. rupestris*

Flowers many; lip with a short claw 10. *Z. gracilis*

1. **Zeuxine strateumatica** (Linn.) Schltr., Orch. Deutsch. N. Guin. 77, 19H. *Orchis strateumatica* Linn., Sp. PL 943. 1753.—*Adenostylis sulcata* BL, Bijdr. 414. 1825.—*Zeuxine sulcata* Lindl., Gen. et Sp. Orch. 485. 1840. King & Pantl., Ann. Calc. 8: 286, t. 381. J.J.S., FL Buit. 6: 108, f. 76. Ridl., Flora 4: 217.

Plant 12-20 cm. tall; leaves several, unstalked, with narrow grassy blade to 4 by 0.4 cm., the edges turned back; scape above leaves very short; rachis to about 4 cm. long, with many small white flowers; lower bracts a little longer than the flowers, upper ones shorter; sepals about 3 mm. long, greenish at base; petals white; lip with short saccate base containing 2 curved glands, the narrow part between base and blade fleshy and warty, grooved, the blade small, blunt, concave, yellow-green; column short and broad, with broad rostellum deeply cleft. This is the most widely distributed species in the genus, occurring throughout the warmer parts of Asia, but only collected once in Malaya, near Malacca in 1889. Hooker called it the commonest Indian orchid.

2. **Zeuxine abbreviata** (Lindl.) Hk. f., F.B.I. 6: 109. 1890. Ic. Pl. t. 2178. King & Pantl., Ann. Calc. 8: 287, pi. 383.—*Etseria abbreviata* Lindl., Gen. et Sp. Orch. 491. 1840.

Basal part of stem creeping and rooting; leafy part about 7 cm. long with 5 leaves; leaf-blade to 7 by 3 cm., narrowly ovate, very shortly pointed, stalk and sheath to 4 cm. long; scape 13 cm. long with three decreasing sterile bracts with rather broad blades; rachis about 5 cm. long with about 15 flowers; bracts 8 mm. long, nearly as long as ovary; flowers hairless, white with brownish or pink bases to the sepals; sepals about 5 mm. long; petals broad, joined to upper sepal; lip a little longer

than the sepals; basal half saccate with infolded edges; on the midline two close erect thin rounded keels, and nearer the base two low fleshy glands; claw narrow with raised edges, shorter than the saccate part; blade deflexed, longer than wide, 2-lobed, the lobes acute and not widely diverging, the whole about 1.5 mm. long; column 2.5 mm. long in all, very broad, with two wings from top to bottom down the front, each ending in a small quadrangular plate at the base. Found originally at Sikkim, and recently in Sumatra, and once at Cameron Highlands.

3. ***Zeuxine biloba*** Ridl., J.F.M.S. Mus. 4: 73. 1909. Flora 4: 218.

Plant about 35 cm. tall, with about 5 leaves near the base; leaf-blade to 8 by 3.3 cm., narrowly ovate to elliptic with short acute tip, stalk and sheath about 3 cm. long; scape about 15 cm. long, with 2 sterile bracts, short-hairy; rachis about 8 cm. long with 15 flowers, not crowded, the ovary spreading from the rachis, the whole inflorescence hairy; bracts 6–8 mm. long, shorter than the ovary; sepals about 6 mm. long; lip with saccate base containing 2 short narrow keels each side on the lateral veins; edges at base inflexed, further forwards produced into two small triangular lobes; a short neck only between saccate base and blade; blade of 2 obovate lobes spreading at right angles to the axis of the lip, each lobe 3 mm. long and 2.5 mm. wide; column with narrow wing down each side in front; rostellum long, erect. Known only from one collection, from near Cameron Highlands.

4. ***Zeuxine reniformis*** Hk. f., F.B.I. 6: 107. 1890. Ic. Pl. t. 2173. Ridl., Flora 4: 217.

Leaves about 4, rather close together; blade about 8 by 3 cm., narrowly ovate with rather long point, asymmetric, stalk and sheath to 2 cm. long; scape about 8 cm. long, bearing 3-4 sterile bracts; rachis 5 cm. long, short-hairy throughout, with about 15 flowers; bracts a little longer than ovaries; sepals about 6 mm. long; petals joined to upper sepal, the blade narrow on the side towards the sepal; lip with short saccate base containing 2 curved papillae separated by a median ridge, the edges inflexed, produced forwards into a claw nearly as long as the saccate base, the claw narrow, with raised edges; blade abruptly widened from the claw, not lobed, wider than long, broadly rounded, the edge slightly toothed, about 4 mm. wide; column short, with two wings down the front and a rather long rostellum. Only known from one collection made in Perak nearly 60 years ago; there is no specimen in Singapore, and the description is made partly from a published drawing which may not be entirely accurate.

5. ***Zeuxine purpurascens*** BL, Fl. Jav. N.S. 58, t. 18, f. 3; t. 23E. 1858. J.J.S., Fl. Buit. 6: 109, f. 77.

Whole plant often under 10 cm. tall (in Java to 25 cm.) arising from a rather thick fleshy horizontal base; leaf-blade to about 1 cm. long and 6 mm. wide, ovate, acute, very dark green with red midrib, hardly stalked, sheath 5 mm. long; scape short (in Malayan plants seen, only 2.5 cm.), with a few sterile bracts, hairy; inflorescence of few (to many ?) flowers close together; bracts to 5 mm. long, with broad fringed base and narrow

tip, longer than ovary; flowers small, sepals green, petals and tip of lip white, base of lip dull orange; sepals 2.5 mm. long, not hairy; petals joined to upper sepal; lip deeply saccate at base, containing two large curved papillae, edges incurved, papillose towards the short neck, blade small, bluntly pointed, about 1 mm. wide and not so long; column short with a prominent stigma each side and no distinct wings on the front; rostellum rather short and broad. Distributed in Java, Sumatra and Borneo; in Malaya only known from one collection, from Tembeling, Pahang. The Tembeling plants are much smaller than those described by Dr. J. J. Smith in Java.

6. *Zeuxine violascens* Ridl., Mat. Fl. M.P. 1: 218. 1907. Flora 4: 218.—  
*Hetxria purpurascens* BL, Fl. Jav. N.S. 88, t. 9, f. 3; t. 37B. 1858  
(not *Z. purpurascens* BL).

Erect part of plant 17 cm. high, with few leaves near base; leaf-blade to 2 by 1 cm., ovate, acute, dark purplish with a pale midrib, stalk and sheath 8 mm. long; scape slender, 10 cm. long, with 2 or 3 narrow sterile bracts, short-hairy; flowers few, white (or pink ?); bracts 7 mm. long, shorter than ovary; sepals 4-5-5 mm. long, short-hairy, laterals narrower than upper; petals as wide as upper sepal, acute; lip with deeply saccate base, containing a small lobed papilla each side; neck short; blade abruptly widening, about 2.5 mm. wide and 1.5 mm. long, the apex cut off nearly square, with a slight notch in the middle; column with triangular wings near the top in front, a rather long erect rostellum, the tip of the anther much shorter. Distributed in Java and Sumatra (also Borneo ?); in Malaya found once, at Tanjong Kupang, Johore, in wet forest.

7. *Zeuxine palustris* Ridl., J.S.B.R.A.S. 57: 100. 1911. Flora 4: 217.

Plant about 30 cm. tall with about 6 leaves near the base; leaf-blade to 3.5 by 2 cm., ovate, blunt, stalk and sheath 1.5 cm.; scape slender, short-hairy, 17 cm. long, with 2 or 3 sterile bracts; rachis 8 cm. long, flowers not crowded; bracts to 7 mm. long, shorter than ovary; ovary short-hairy but sepals not hairy; sepals 3.5 mm. long, laterals narrower than upper; lip with saccate base joined to base of column, within the sac on each side two low narrow warts (one on each vein); neck of lip short, blade of two spreading lobes, when flattened about 2.5 mm. wide; column with rounded triangular wings near top; rostellum and anther about equal, not greatly elongated. Found once only at Ulu Temango in Perak.

8. *Zeuxine clandestina* Bl. Fl. Jav. N.S. 57, t. 39, f. 4. 1858. J.J.S., Fl. Buit. 6: 111, f. 79. Ridl., Flora 4: 217.

Plant 10-25 cm. tall; leaves to about 6, to 3.5 by 1.5 cm., stalk very short, with sheath 1 cm. long; scape slender, hairy, bearing 2 or 3 sterile bracts, to about 12 cm. long; rachis to about 10 cm. long, flowers small, not crowded; bracts to 7 mm. long, the lowest longer than the ovary, the upper not; flowers greenish; sepals 3 mm. long, hairy; lip a little shorter,

the basal 2/3 concave, with two curved papillae near base, the neck very short, blade when flattened about 2-5 mm. wide, white with greenish base; column short, with a narrow wing each side towards base only. Originally described from Java; in Malaya found at many localities in the lowlands, in open places, rubber estates, etc. Fig. 21.

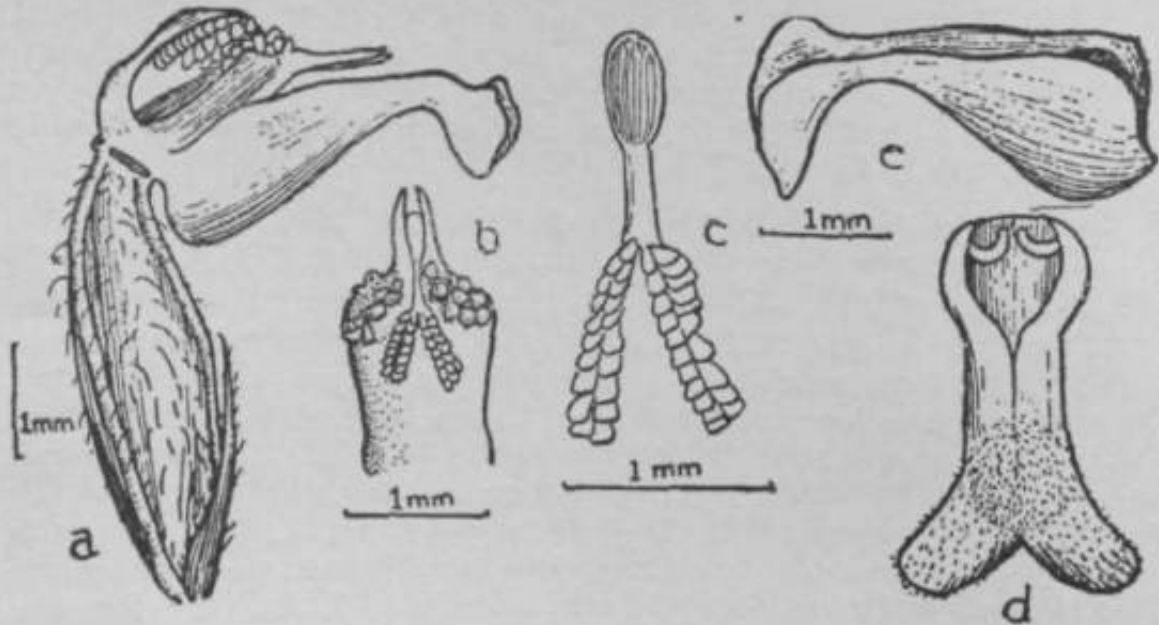


Fig. 21. *Zeuxine clandestina*. a, flower with all parts removed except lip and column. b, back of column with anther cap removed, c, pollinia and disc, d, e, lip from front and from side.

9. *Zeuxine rupestris* RidL, J.S.B.R.A.S. 39: 86. 1903. Flora 4: 218.

Plant 14-20 cm. tall, leafy in basal half; leaf-blade to 2 by 0.7 cm., blunt, hardly stalked, sheath short; scape slender, short-hairy, about 8 cm. long, with 2 small sterile bracts; inflorescence of two flowers; bracts 6 mm. long, shorter than ovary; flowers white; sepals 5-6 mm. long, hairy; lip a little longer, saccate base short, containing 2 curved papillae, neck narrow, papillose; blade of two oblong lobes at right angles to the axis of the lip, slightly diverging, each lobe about 25 mm. long and 5 mm. wide. Found only once on Penang Hill, at 2,000 feet, on a rock in forest; near *Z. gracilis*, but has larger flowers and a longer neck (or claw) to the lip, and 2-flowered condition may be also distinctive.

10. *Zeuxine gracilis* (Breda) BL, Fl. Jav. N.S. 56, t. 18, f. 2; t. 2%T>. 1855. J.J.S., Fl. But. 6: 110, f. 78. Bull. Botz., Ser. 3, 8: 353. 1927. Carr, Gard, Bull. 7: 2. 1932.—*PsychechUos gracite* Breda, Gen. et Sp. Orch. t. 9. 1827.—*Zeuxine affinis* quoad RidL, Flora 4: 217 (probably).

Leafy part of stem about 10 cm. long, creeping at base; leaves fading at flowering, blade thin, to 4.5 by 18 cm., shortly pointed, hardly stalked, sheath 1-2 cm. long; scape 12-18 cm. long, with 2-3 sterile bracts, hairy; rachis to about 7 cm. long, with few to many flowers; bracts to 6 mm. long, shorter than ovary; sepals about 4.5 mm. long, with scattered long hairs, greenish; petals greenish with white tips; lip yellowish at base with white blade, basal saccate part containing 2 curved papillae, neck short, blade of two slightly diverging oblong lobes at right angles to the



axis of the lip, each lobe 2 mm. long; column short, without distinct wings on the front. Distributed in Java, Sumatra and Borneo; in Malaya found in a rubber estate at Tembeling (Pahang) and on Penang Hill. Whether the Malayan plants are quite identical with *Z. gracilis* from Java, or with *Z. affinis* from India, is not certain. There is much variation in this group of Zeuxine, and the exact limitation of species is not certain without more careful observation of living plants. Fig. 22.

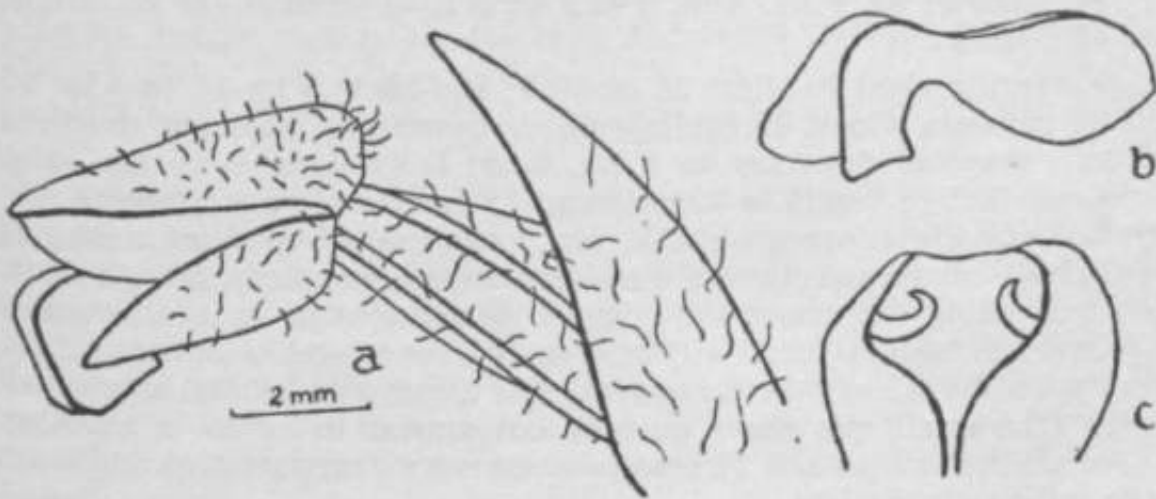


Fig. 22. *Zeuxine gracilis* (after Carr). a, flower and bract from the side. b, lip from side, c, base of lip from above.

### 13. VRYDAGZYNEA

Inflorescence usually short and dense; sepals and petals not spreading; lip parallel to column, undivided, concave, with spur projecting between the lateral sepals, with 2 stalked glands in the spur; column very short; rostellum short, 2-toothed; stigmas 2, prominent on either side of the column.

This is a genus of about 20 species, distributed from N. India through Malaysia. The short dense inflorescence and curious stalked glands in the spur of the lip are distinctive. The genus was named by Blume after a Dutch scientist named Vrydag Zynen.

#### Key to the Malayan species of Vrydagzynea

Leaves green

Leaves 4 by 1 to 7 by 2 cm. .. .. 1. *V. lancifolia*

Leaves 3 by 1-8 to 6-5 by 3-5 cm. .. .. 2. *V. albida*

Leaves dark red with 3 pale red longitudinal veins .. 3. *V. tristriata*

1. *Vrydagzynea lancifolia* Ridl., J.L.S. 32: 398. 1896. Flora 4: 210.

Whole plant when flowering to 20 cm. tall; leaves several, blade 4 by 1 to 7 by 2 cm., widest near base, narrowed evenly to tip, stalk and sheath to 1-2 cm.; scape at flowering barely 1 cm. long, lengthening to 5 cm. in fruit; flowering head dense, to about 2-5 cm. long; bracts to 8 mm. long,

longer than ovary; flowers white, tips of sepals sometimes pink; sepals not hairy, upper sepal a little over 4 mm. long; lip with spur 3-5 mm. long, blade thin, shorter than sepals, concave with raised edges and blunt tip, the midrib raised, not hairy; column less than half as long as sepals; rostellum little taller than stigmas. Found at many localities in lowland forest in Malaya, from Singapore to Kedah.

2. *Vrydagzynea albida* (Bl.) Bl., Fl. Jav. N.S. 61, t. 20, f. 3. 1858. J.J.S., Fl. Buit. 6: 89, f. 61. Ridl., Flora 4: 211.—*Etseria albida* Bl., Bijdr. 410. 1825.

Flowering plant to about 23 cm. tall; leaf-blade 3 by 1.8 to 6 by 3.5 cm., asymmetric, widest in middle, with short acute tip, stalk and sheath to 2.5 cm.; scape at flowering to 8 cm. long; flower-head 2-2.5 cm. long, dense, not hairy; bracts to 1 cm. long, longer than ovary; flowers pale greenish and white; upper sepal 4.5 mm. long; spur of lip about as long as sepals, blade shorter, concave, the middle distinctly papillose; column short, rostellum rising well above the stigmas. Distributed in Borneo, Sumatra and Java; in Malaya found at Cameron Highlands and at an unrecorded locality in Perak, and in Singapore. The Singapore plants have small leaves (the small size above quoted) but appear to agree in all other respects. This species and *V. lancifolia* are very nearly related, but seem to be sufficiently distinct.

3. *Vrydagzynea tristriata* Ridl., J.L.S. 32: 398. 1896. Flora 4: 211.

Plant to about 8 cm. tall; leaf-blade dark red with 3 pale longitudinal veins, to 3 by 1.3 cm., ovate, acute, stalk and sheath to 8 mm. long; scape about 1 cm. long; flowering-head 1.5 cm. long, dense; bracts to about 7 mm. long; flowers white with greenish base to sepals; upper sepal about 5 mm/long, laterals a little longer; spur of lip 3 mm. long, blade shorter than sepals, papillose in the middle; rostellum much longer than stigmas. Found in Sarawak, and in swamp forest in Singapore and southern Johore. This is a pretty little species.

#### 14. LEPIDOGYNE

Tall plants with many long narrow unstalked leaves; inflorescence dense and long; upper sepal and petals forming a hood; lateral sepals loose; base of lip; lip with swollen base containing a transverse row of calli, the blade 3-lobed, side-lobes small, erect, midlobe long and narrow; column short, anther long-pointed; pollinia 2, long, club-shaped, 2-lobed; rostellum very long, deeply cleft; stigma transverse, covered by a plate springing from its lower edge. Only one known species.

- Leptocyclopis longifolia* (Bl.) Bl., Fl. Jav. N.S. 78, t. 25. 1858. J.J.S., Fl. Buit. 6: 129, f. 95. Ridl., Flora 4: 22A.—*Neottia longifolia* Bl., Bijdr. 406. 1825.

Base of plant creeping, with thick roots; erect stem to about 100 cm. the base stout, with many leaves close together; leaves about 40 by 3.5 cm., narrowed to long-pointed tip and short sheathing base, the midrib prominent below; scape about 30 cm. long, bearing many sterile

bracts which are smaller upwards; rachis to about 40 cm. long, grooved, short-hairy, densely covered with many flowers; bracts to about 35 cm. long, longer than flowers, slightly hairy, brownish; sepals light red-brown, about 1 cm. long, laterals wider than upper, with spreading tips; petals and lip white; base of lip concave, the edges near the base raised as small side-lobes close to the column, the apex drawn out to a long narrow fleshy tip, bent downwards at a very obtuse angle to the basal part of the lip. Distributed from Sumatra to the Philippines and probably to New Guinea; in Malaya found in Pahang, and in peat forest in Johore, apparently not common, but perhaps rarely flowering and so not collected.

### 15. CYSTORCHIS

Green-leaved plants with the usual habit of the tribe, and one which is a saprophyte; scape relatively long; upper sepal and petals joined in a hood; lateral sepals partly or wholly enclosing the base of the lip; lip with blade parallel to column, partly fleshy, its edges infolded, often with a distinct apical part, spur short, projecting between the lateral sepals or not, at the base on either side a swollen vesicle containing a gland, in two species the spur not elongated beyond the vesicles; column very short; rostellum rather large (in one species absent); stigma on front of column, large, rounded.

This is a small but widely distributed genus, with one species known from China, the others Malaysian. The vesicles, like small bladders blown out on either side of the short spur, are distinctive. In two species the end of the spur does not project beyond the vesicles, and in one of them (*C. gracilis*) the vesicles are hardly distinct. The saprophytic species *C. aphylla* is the only Malayan saprophyte in the Goodyera tribe.

#### Key to the Malayan species of *Cystorchis*

##### Green-leaved species

Spur distinct, projecting between lateral sepals

Leaves pale green with darker network . . . 1. *C. variegata*

Leaves dark purplish brown, the main veins paler . . . var. *purpurea*

Spur not projecting between lateral sepals .. 2. *C. gracilis*

Saprophytes . . . .. 3. *C. aphylla*

1. *Cystorchis variegata* BL, Fl. Jav. N.S. 74, t. 24, f. 3. 1858. J.J.S., Fl. Buit. 6: 92, f. 63. Ridl., Flora 4: 211.

Var. *purpurea* Ridl., J.L.S. 32: 399. 1896. ? = *C. javanica* (Bl.) BL, Fl. Jav. N.S. 73, t. 24, f. 1. 1858.

Plants 15-25 cm. tall with about 6 leaves near the base; leaf-blade to 7 by 2-8 cm., asymmetric, light green with darker network, elliptic or somewhat widest near the base, acute, stalk and sheath barely 2 cm. long; all parts of inflorescence short-hairy; scape slender, 10-15 cm. long, bearing 1 or 2 sterile bracts; rachis to 3 cm. long, bearing 7-12 flowers;

bracts to 7 mm., base broad, apex narrow; ovary 6 mm. long at flowering; flowers not widely opening; sepals pinkish-brown, greenish yellow at base, 6 mm. long, the laterals concave at the base and enclosing the vesicles of the spur; petals white; lip white and orange, blade as long as sepals, straight, fleshy with a central groove, the sides in the apical half inflexed to form a tube; spur short and slightly decurved, projecting between the lateral sepals, with on either side a swollen vesicle containing a gland. Distributed in Java, Sumatra and Borneo; in Malaya found at many localities in primitive lowland forest, from Singapore to Perak.

*Var. purpurea.* Plant 10-15 cm. tall; leaves dark purplish brown, only the main veins paler, the blade to about 3 by 1.8 cm. Found in lowland forest in Singapore, Johore and Pahang. This seems quite distinct from the typical form of the species in small size and colouring of leaves; the flowers are said not to differ, but living plants should be carefully compared. It has been suggested that this is the same as *C. javanica*; but it does not agree well with Dr. J. J. Smith's description of that species.

2. *Cystorchis gracilis* (Hk. f.) Holtt, Gard. Bull. 11: 279. 1947.—*Goodyera gracilis* Hk. f., F.B.L 6: 112. 1890. Ic. Pl. t. 2183. Ridl., Flora 4: 219.—*Cystorchis aberrans* J.J.S., Bull. Btzg., Ser. 3, 5: 22. 1922; Suppl. II: t. 8, III.

Flowering plants to 30 cm. tall with about 5 leaves close together near the base; leaf-blade ovate or broadly elliptic, bluntly pointed, to 3-7 by 20 cm., stalk 5 mm., sheath 1 cm. long, the sheaths overlapping; scape long and slender, slightly hairy, bearing several narrow sterile bracts; rachis 2-5 cm. long, with 6-15 flowers; bracts hairless, to 1 cm. long; ovary at flowering 5-6 mm. long; flowers white, fragrant; sepals 4.5 mm. long, lateral sepals not spreading, enclosing base of lip; lip 5 mm. long, the broadly saccate base containing 2 prominent glands, blade concave the central part much thickened, the tip separated by a constriction under 1 mm. long; anther rather long and narrow. Known only from Taiping Hills; very nearly the same as, and perhaps identical with *C. aberrans* of the Padang Highlands of Sumatra. This species has been placed in *Goodyera*, but it is just like a *Cystorchis* from which the small end of the spur has been completely removed leaving only the two vesicles which join together. The glands in the spur, and the fleshy hairless blade of the lip are quite unlike any species of *Goodyera*.

3. *Cystorchis aphylla* Ridl., J.L.S. 32: 400. 1896. Flora 4: 212. J.J.S., Fl. Buit. 6: 93, f. 64. Bull. Dep. Ag. XIII: 12. 1907.

- Saprophyte; rhizome about 4 mm. thick, branched, fleshy, of short internodes, without roots; erect shoots to about 15 cm. tall, red-brown, the part below the flowers bearing many reduced brown scale-leaves; rachis to about 2 cm. long with 2-6 brownish flowers (in Java to 17 flowers); bracts not hairy, to about 1 cm. long (often less); ovary at flowering 5-8 mm. long; sepals 6 mm. long, laterals with swollen bases enclosing the spur of the lip, forming a sort of mentum 2 mm. long, wider than long; lip with short broad spur divided into two halves, each half containing a gland; blade of lip as long as sepals, narrow, divided into 3

parts; basal part concave, comprising nearly half of the whole; middle part narrower, fleshy, with inflexed edges and densely papillose lower surface; tip very small, hardly 1 mm. long and wide, separated by a small constriction; column short; anther with short upturned tip; rostellum (always ?) lacking; stigma 3-lobed, self-pollinating. Distributed in Java, Sumatra and Borneo; in Malaya found in the lowlands and at moderate elevations on the mountains at few localities, apparently common at 3,000-4,000 feet on G. Tahan. The structure of the lip in this species is essentially the same as in *C. gradlis*, though the two plants look so different. All plants examined lack a rostellum, and are self-pollinated, but plants with a developed rostellum may exist.

### 16. SPIRANTHES

Terrestrial; leaves narrow; inflorescence erect with small flowers spirally arranged; flowers only slightly opened; lip concave at the base, containing appendages; column short, with convex stigma in front, pollinia 2, with caudicle.

*Spiranthes lancea* (Thunb.) B.B. & S., *Blumea* 6: 361. 1951. *Ophrys lancea* Thunb. ex Sw., *Vet. Akad. Handl. Stockh.* 21: 223. 1800.—*Neottia sinensis* Pers., *Syn. Pl.* 2: 511. 1807. *Spiranthes sinensis* Ames, *Orch.* 2: 53. 1908. Holtt, *Rev. Fl. Mai.* 1: 139.—*Neottia australis* R. Br., *Prodr. Fl. N. Holl.* 319. 1810. *Spiranthes australis* Lindl., *Bot. Reg.* 10, sub t. 823. 1824. J.J.S., *Fl. Buit.* 6: 81, fig. 55. King & Pantl. t. 369.

Plant 25 cm. tall, with few leaves near the base; leaves to about 9 cm. long and 10 mm. wide (on plant at Cameron Highlands 5 cm. long, 5 mm. wide); rachis 6-10 cm. long, many-flowered; bracts 5 mm. long; flowers sessile, ovary 2 mm. long; sepals 3 mm. long, 1 mm. wide at base, translucent white or tinged with rosy mauve; petals close to upper sepal, narrowly spatulate; lip as long as sepals, white with apical flush of mauve, apex rounded, base concave containing 2 spherical glands; column green, anther brown, pollen white. Very widely distributed in Asia and to Australia and New Zealand; in Malaya found only in open grassy land at Fraser's Hill and Cameron Highlands.

### THE CORYMBORCHIS TRIBE

Rhizome short; erect stems slender, rather woody, fairly tall, sometimes branched, bearing several rather tough unstalked pleated leaves; inflorescences terminal and axillary, simple or branched; sepals and petals free, usually narrow, about equal, not widely spreading but the tips sometimes diverging; lip not lobed, parallel to the column or embracing it; anther on the back of the column, about as long as the rostellum and close to it; pollinia granular with shield-shaped disc and thin stipes.

This is not a large tribe, but is spread to the tropics of both America and Africa as well as Asia. There are two genera, which are quite distinct, but within each the species are closely related, and the distinctions between them are not always clearly understood. The Malayan species would repay further field study. Though the flower structure is very similar to that of

the *Goodyera* tribe, the aspect of the plants, with their tall slender stems and pleated leaves, more like those of a palm in texture, is very different. All species are found in primitive forest. The two genera are thus distinguished:

Lip widest at base; column short; inflorescences not branched .. .. .	<i>Tropidia</i>
Lip widest at apex; column long; inflorescence often branched . . . . .	<i>Corymborchis</i>

### TROPIDIA

Inflorescences short and dense, not branched; lateral sepals enclosing base of lip; lip with broad shortly spurred or saccate base, narrowed to a slender often downturned tip; column short.

This is a genus of about 15 known species, two in tropical America, the rest spread from Ceylon to Fiji. As noted above, the distinctions between the species in this tribe are not always clear. The arrangement proposed below is the best that can be done with the information at present available; field study may show that it should be modified.

#### Key to the Malayan species of *Tropidia*

- Leaves 2 only, at top of stem; inflorescence only terminal .. .. . 1. *T. angulosa*
- Leaves many, inflorescences axillary and terminal  
Upper sepal 6-8 mm. long; inflorescences all apical on short lateral branches, with lowest bracts elongated .. .. . 2. *T. pedunculata*
- Upper sepal 1 cm. long; inflorescences axillary, on very short stalks, close to the main stem, the lowest bracts not elongated  
Leaves 15 by 1.5 to 34 by 4 cm., very long-pointed 3. *T. graminea*  
Leaves 14 by 2.7 to 22 by 5 cm., short-pointed . . 4. *T. curculigoides*

1. ***Tropidia angulosa*** Bl., Orch. Arch. Ind. 122. 1858. King & Pantl., Ann. Calc. 8: 275, pi. 365. Ridl., Flora 4: 209. J.J.S., Bull. Btzg., Ser. 2, IX: 21. 1913.

Stem about 30 cm. tall, sometimes branched, internodes 3-4 cm. long; basal part of stem with sheaths shorter than internodes, at apex two unequal leaves; largest leaf to 16 by 7.5 cm., elliptic, with short acute tip and broad base, main veins about 11; inflorescence terminal only, about 6 cm. tall above the base of the leaves, including a scape 2.5 cm. long; flowers many, white or very pale yellowish; bracts narrow, nearly as long as the flowers; upper sepal about 11 by 0.3 cm., laterals 1.6 by 0.6 cm., spur of lip 3 mm. long, blade 1 cm. long, elliptic, blunt, concave. Collected in south and north India, Tenasserim and Java; in Malaya only found once, near Ipoh. This is a very distinct species.

2. ***Tropidia pedunculata*** Bl., Fl. Jav. N.S. 103, t. 40. 1858.—*T. Maingayi* Hk. f., F.B.I. 6: 93. 1890. (?). Ridl., Flora 4: 209.

Stems 50-100 cm. tall; leaves to 23 by 4-5 cm., narrowed almost evenly to base and apex, the apex with a slightly extended narrow tip; inflorescences apical on main stem and on axillary shoots 5-8 cm. long, which bear about 2 small leaves; lowest bract narrower and longer than the next, like a reduced leaf; flowers white; upper sepal 6-8 mm. long; lip with tip less abruptly turned down than in species 3 and 4 (?). Distributed in Sumatra and Borneo; in Malaya found in the lowlands and on mountains, by streams in forest. It is said that the tip of the lip is not turned down, but this is not true of the specimens in the Singapore herbarium. Whether the habit of bearing inflorescences only on short axillary branches is always associated with the small flowers is not certain.

3. ***Tropidia graminea*** Bl., Fl. Jav. N. S. 104, t. 41, f. 3. 1858. J.J.S., FL Buit. 6: 132, f. 98.

Stems to 75 cm. or more long, often branched; internodes 2-5 cm.; leaf-blade 15 by 1-5 to 34 by 4 cm., with narrow tip 5 cm. or more long (commonly 2-5-4 mm. wide at 5 cm. from the tip); inflorescences mainly unstalked or very shortly stalked, axillary, sometimes two at one node, to about 1-5 cm. long, the bracts to 8 mm. long; lowest empty bract smallest, except on terminal inflorescence; upper sepal 1 cm. long; laterals larger, enclosing base of lip; tip of lip strongly turned down. Distributed in Java and probably in Sumatra; in Malaya found in lowland forest and on the mountains to 3,000 feet.

4. ***Tropidia curculigoides*** Lindl., Gen. et. Sp. Orch. 497. 1840. Ridl., Flora 4: 209.—*T. squamata* Bl., Fl. Jav. N.S. 104, t. 41, f. 1. 1858.

As *T. graminea*, but leaves 14 by 2-7 to 22 by 5 cm., not long-pointed, commonly more than 2 cm. wide at 5 cm. from the apex. Distribution and local occurrence as in *T. graminea*. This species appears to be distinct from *T. graminea* in its leaves, but no difference in the flowers has been discovered. Field observation of the two is needed.

### CORYMBORCHIS

Stems rather tall, unbranched; leaves usually broader than in *Tropidia*; inflorescences lateral, branched, with many white flowers; sepals and petals long and narrow, widened towards the tip; lip as long as sepals and petals, narrow and close to the column except for a short reflexed ovate blade at the tip; column long, slender, straight, thickened at the end, rostellum erect, acute, stigma broad, deeply 2-lobed.

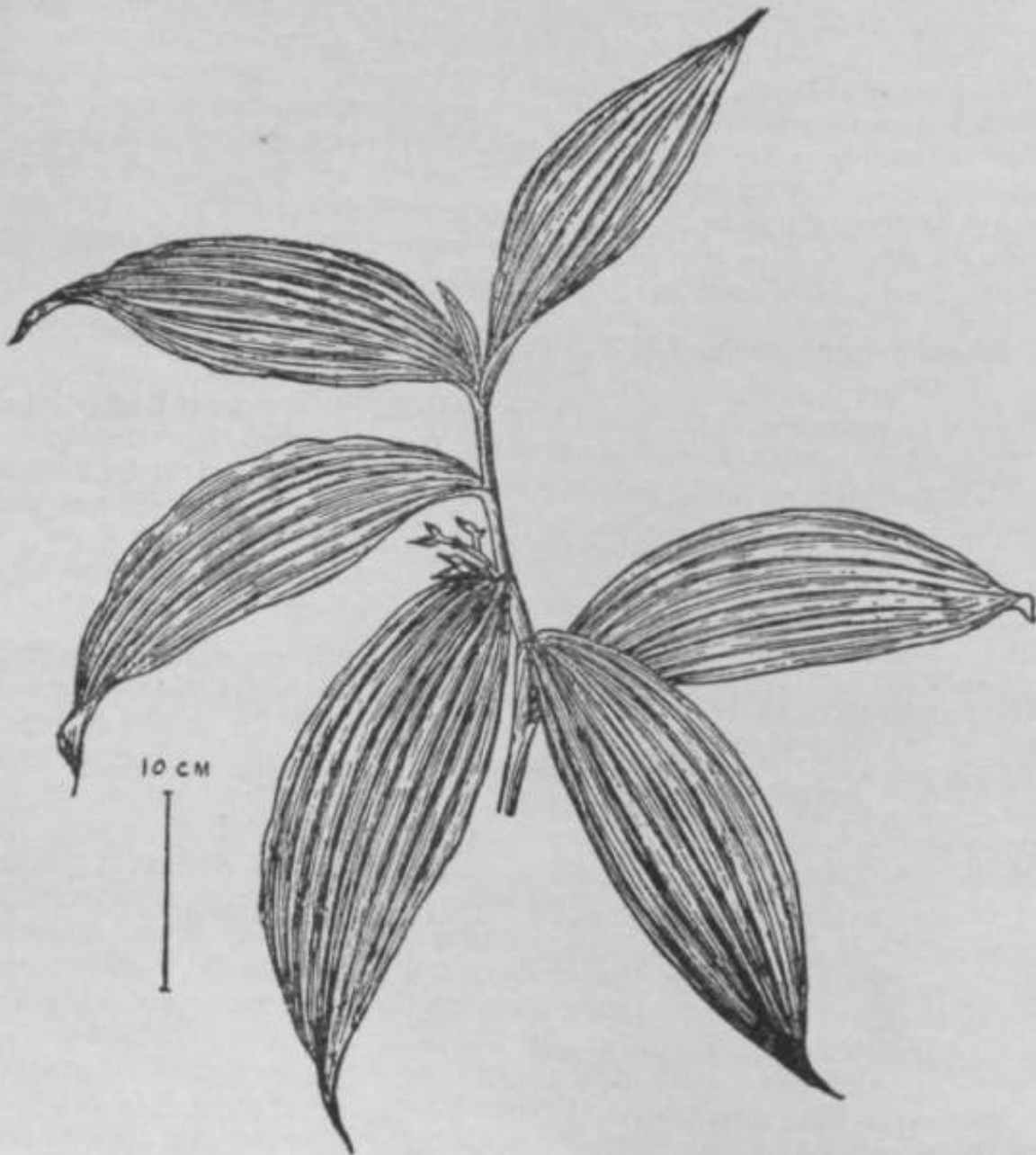
This is a genus of few species, distributed from Africa to Samoa. The Malayan plants are just as difficult to divide clearly into species as those of *Tropidia*. A division on the size of the flowers seems the only practical one, and nobody has investigated the variation of flower-size among plants of different origin grown together. The plants are taller and stouter than those of *Tropidia*. The leaves are spirally arranged on the stems, and the upper part of the stems may also be somewhat spirally twisted, as in the genus *Costus* (Ginger family). This genus has also been called *Corymbis*, but that is a later name than *Corymborchis*, though proposed by the same author.

Key to the Malayan species of *Corymborchis*

Plants 120-300 cm. tall; column 2-4-2 cm. long

Sepals and petals 3-3-5-2 cm. long, column 2-7-4-2

cm. long . . . . .

. . . . . x. *C. veratrifolia*  
Sepals and petals about 2.5 cm. long; column about 2Plant, i n . cm! ta..; cown 8 mm ,on<sub>g</sub> [ [ J g ffl<sup>pa</sup>L *Corymborchis veratrifolia* Bl., Fl. Jav. N.S. 105 t 42E f 1 IS<sup>S</sup> ITS. . . . . *C. longiflora* quoad RidL, Flora 4 : 208,Stems to 300 cm. tall; leaves to 45 by 15 cm., sheaths to 9 cm long,  
almost covering the stem; inflorescences with « branches, each withFig. 23. *Corymborchis veratrifolia*, upper part of a stem.



2-6 flowers, total length to 10 cm.; sepals and petals 3-5-5-2 cm. long; sepals slightly divergent, straight, very pale green, widened apical part 7 mm. wide when flattened, upper sepal joined to petals at the base for 5 mm.; petals white, close to the column except for their reflexed apical part which is 8 mm. wide with crisped edges; reflexed blade of lip white, ovate, 17 mm. wide, with finely crisped edges, tip very shortly pointed; column 2-7-42 cm. long, rostellum slightly cleft, anther brown, narrow, 8 mm. long. A Malaysian species of fairly wide distribution; in Malaya found at many localities in lowland forest, and also at about 3,000-4,000 feet on the mountains. The lowland plants seem all to have sepals about 4-5-5 cm. long and have been called *Corymbis longiflora* by Hooker; the mountain plants have smaller flowers, about the size reported for this species in Java by Dr. J. J. Smith. Whether the large size is always found in lowland and the smaller size in mountain plants is not certain; the shape of the floral parts seems the same in all. The flowers are beautiful and the plants are worth growing in a shaded place. Figs. 23, 24.

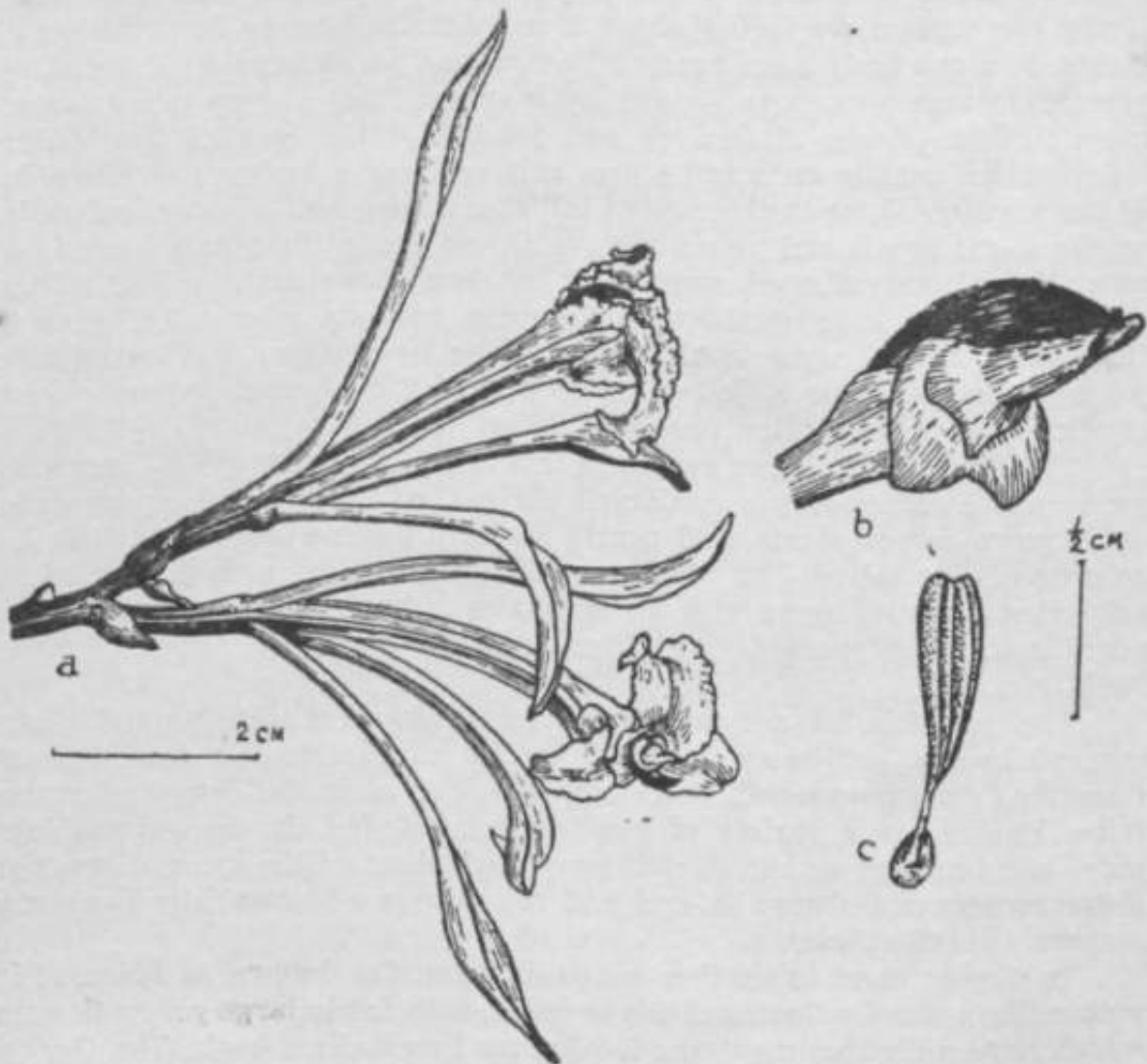


Fig. 24. *Corymborchis veratrifolia*. a, two flowers, b, top of column, c, pollinia.



## Key to the Malayan genera of the Phaius tribe

- Inflorescence and narrow solitary leaves (about 40 cm. by 6 mm.) arising from an underground rhizome not clearly divided into separate pseudobulbs .. .. . 1. *Pachystoma*
- Inflorescence and leaves arising from distinct separate stems or pseudobulbs which rise at least a little above ground; leaves much wider
- Sepals united in a swollen tube .. .. . 2. *Acanthephippium*
- Sepals free to base
- Lip joined to column throughout length of column 3. *Calanthe*
- Lip not or only slightly joined to column at its base
- Lip fleshy with a short stiff point, less than half as long as sepals .. .. . 4. *Plocoglottis*
- Lip otherwise, longer in proportion to sepals
- Base of midlobe of lip very narrow (about 2 mm. wide) with two ovoid yellow calli 5. *Spathoglottis*
- Base of midlobe much wider, without such calli
- Lip usually spurred: Asiatic plants . . . 6. *Phaius*
- Lip not spurred: cultivated plants of tropical American origin . . . 7. *Bletia*

## PACHYSTOMA

Rhizome underground, fleshy, bearing single narrow leaves and tall slender inflorescences with many rather small flowers; sepals and petals not widely spreading; lateral sepals distinctly swollen at the base, like a small mentum; lip 3-lobed, slightly saccate at the base, with 5 longitudinal keels; column slender, without foot (or with a short foot ?) ; pollinia 8.

This is a small genus, distributed from India through Malaysia; in Malaya our only species is found in the extreme north. In Java the native species is said to be a saprophyte. Schlechter, writing of New Guinea plants, stated that in his experience all species of *Pachystoma* inhabited open grassy country, and having leaves very like those of lallang grass were easily overlooked. The plants stand burning, like lallang. It seems likely that the plants often flower in dry weather when the leaves have withered, or even in some cases after a fire has cleared the ground. In such cases the leaves would not be gathered with the flowers.

***Pachystoma senile*** (Lindl.) Rchb. f., Bonpl. 3: 250. 1858. King & Pantl., Ann. Calc. 8: 101, pi. 140. Ridl., Flora 4: 116 (as *P. sessile*).—*Apatura senilis* Lindl., Gen. et Sp. Orch. 130. 1830. ? = *P. pubescens* Bl.

Leaves about 40 cm. long and 6 mm. wide; inflorescence 60 cm. or more tall, bearing a few distant sterile bracts, and about 20 well-spaced flowers; flowers short-hairy, pinkish with greenish-yellow lip; sepals and

petals about 1 cm. long, the petals very narrow, side-lobes of lip large, blunt, erect, midlobe with down-turned shortly pointed tip. Distributed from northern India and Burma southwards to Kedah. This species is very similar in flower-structure to *P. jntbescens* of Java and Sumatra, but *P. pubescens* is said to be saprophytic, whereas *P. senile* is not.

### ACANTHEPHIPIUM

Pseudobulbs rather long, with a few leaves near the top; scape of inflorescence short and fleshy, flowers few, rather large; sepals joined to form a swollen tube, their tips spreading slightly; petals and lip enclosed in the sepal-tube; lip hinged movably at the end of the column-foot, strongly 3-lobed; column long, with a long curved foot, to which the sepals are joined, forming a broad mentum; pollinia 8, unequal.

An Indo-Malaysian genus of few species, of which three are known to occur in Malaya, but only one has been identified. The swollen sepal-tube, with its mentum, and the saddle-shaped lip, are quite distinctive of the genus.

***Acanthephippium javanicum*** Bl., Bijdr. 352, f. 47. 1825. Fl. Jav. N.S. 132, t. 49. Bot. Mag. t. 4492. J.J.S., Fl. Buit. 6: 214. f. 158. Burkill, Gard. Bull. 2: 44. 1918. Ridl., Flora 4: 116.

Pseudobulbs to 25 cm. long and 5 cm. thick, with about 4 leaves near the top; leaves short-stalked, blade to 50 by 15 cm.; inflorescences 1 or 2, from middle nodes of the pseudobulb; scape fleshy, about 10 cm. long; rachis short, bearing large bracts and few flowers; sepal-tube about 4.5 cm. long and 3-3 cm. wide, free tips of the sepals 1-8 cm. long, spreading slightly, the whole dull yellow or pale pink with red-purple stripes and spots; petals projecting a little between the sepals at the mouth of the tube; side-lobes of lip large, erect, with rounded ends, white with red spots near the edge; midlobe smaller, about 8 by 6.5 mm., convex, with rows of dark red spots; base of lip between side-lobes with toothed keels. Distributed in Java, Sumatra and Borneo; in Malaya collected once on G. Tampin, at 1,800 feet altitude, in a sandy hollow in the valley of a small stream, and probably also on Penang Hill (once only).

At Fraser's Hill and Cameron Highlands have been found two other species with smaller flowers. The Fraser's Hill plant has a narrow tip at the end of the mentum, but that from Cameron Highlands has a broad rounded mentum. These species may be *A. striatum* and *A. sylhetense*, but details of structure for an exact comparison are lacking.

### CALANTHE

Pseudobulbs usually rather small, covered by the bases of the leaves, rarely large and conspicuous, in one species bearing one leaf only; leaves large, usually thin and pleated, distinctly stalked above the joint, in two species deciduous; inflorescence erect, with a long scape arising from a leaf-axil; bracts small and persistent or large and deciduous; flowers in most cases not very large; sepals and petals free and more or less widely

spreading; lip spurred, the spur often long and slender, the blade 3-lobed or rarely unlobed, often with short keels or calli at the base; column short, joined throughout its length to the base of the lip, with which it forms a tube; stigma sometimes divided into two parts, one on each side of the entrance to the tube; pollina 8, in two groups of four.

This is a large and widely distributed genus, occurring in South Africa and the islands of the Indian Ocean, through India to China and Japan, and southwards and eastwards through Malaysia to Australia and to Tahiti. In Malaya we have, according to present reckoning, 20 species, but a few of them are not well characterized; on the other hand, there may remain more yet to be discovered.

The characteristic feature of *Calanthe* is the union of the column with the base of the lip. Vegetatively the genus is divided into two groups according to whether the bracts are small and persistent, or large and falling as soon as the flowers open. There is a further vegetative division into evergreen species (the majority) and those with large pseudobulbs which lose their leaves in the dry season and flower when bare of leaves. The latter are naturally confined to seasonal climates, and are only found in the north of Malaya, and exceptionally on limestone further south. The evergreen species are all found in the shade of primitive forest, not in the open" like *Spathoglottis*. Several of them are mountain plants, and some probably peculiar to Malaya, allied but distinct species being found in Sumatra and Borneo; a few species however are widely distributed, and we still do not know enough about the others to make any very definite statements. Further field study of the mountain species of Malaya is much needed.

#### Key to the Malayan species of *Calanthe*

##### Bracts persistent

Plants with large pseudobulbs, flowering when leafless

Flowers white; sepals and petals 2 cm. or more long; midlobe of lip nearly equal to width across the side-lobes . . . . . 1. *C. vestita* -

Flowers pink; sepals and petals 1.5 cm. long; midlobe of lip much narrower than width across side-lobes . . . . . 2. *C. rubens*

##### Plants never leafless

One leaf to each pseudobulb . . . . . 3. *C. monophylla*

Several leaves to each pseudobulb

Sepals 3-6 cm. long; lip without, or with extremely small, side-lobes . . . . . 4. *C. emarginata*

Sepals much shorter; lip with well-developed side-lobes

Spur 3 to 5 cm. long

Sepals about 2 by 0.7 cm., acute; side-lobes of lip narrowed to tip, curved forwards, midlobe fan-shaped, toothed . . . . . 5. *C. masuca*

- Sepals about 1-6 by 10 cm., blunt; side-lobes of lip widest near tip, not curved forwards, midlobe not toothed .. 6. *C. cecithx*
- Spur under 3 cm. long
- Plant short-hairy on almost all parts .. 7. *C. pubescens* -
- Plant only slightly hairy .. ..
- Pedicel and ovary 3-5-5 cm. long .. 8. *C. veratrifoia*
- Pedicel and ovary 14 cm. long .. 9. *C. ovata*
- Bracts falling when flowers open
- Spur 25 mm. long; sepals 8 mm. long; flower never opening, self-pollinated .. .. 10. *C. cleistogama*
- Spur and or sepals longer; flowers not self-pollinated
- Sepals and petals white; lip sometimes yellow
- Rachis to 30 cm. long; flowers pure white; lip midlobe 2-5 mm. wide, much larger than side-lobes .. .. 11. *C. johorensis*
- Rachis shorter; lip yellow at least in part, midlobe usually much wider
- Midlobe about 3 mm. wide, about same size as side-lobes .. .. 12. *C. pusilla*
- Midlobe 7-8 mm. wide
- Leaves 2-4 cm. wide; sepals 1-1-3 cm. long 13. *C. angustifolia*
- Leaves to 9 cm. wide; sepals 1-5 cm. long 14. *C. albo-lutea*
- Sepals and petals yellow or orange
- Spur distinctly hooked at the end
- Sepals orange; petals and lip yellow; leaves 3-5 cm. wide; spur slightly hooked .. 15. *C. aurantiaca*
- Sepals and petals orange-yellow; lip orange-red; leaves to 10 cm. wide; spur strongly hooked .. .. 16. *C. pulchra*
- Spur straight or slightly curved, not hooked at the tip
- Spur 4-5 mm. long
- Flowers entirely yellow; lip not fleshy .. 17. *C. Fcerstermannii*
- Flowers bright yellow with scarlet lip; lip fleshy, with sides inflexed towards apex .. .. 18. *C. salaccense*
- Spur 8-10 mm. long
- Leaves 2-4 cm. wide .. .. 13. *C. angustifolia* var. *flava*
- Leaves much wider .. ..
- Midlobe of lip bilobed with minutely toothed edges .. .. 19. *C. rigida*
- Midlobe of lip shortly pointed, edges not toothed .. .. 20. *C. speciosa*

1. *Calanthe vestita* Lindl., Gen. et Sp. Orch. 250. 1833<sup>^</sup> Bot Mag<sup>^</sup> t 4671  
—*Preptanthe vestita* Rchb. f., Fl. des Serres 8: 245. 1852. Ridl., Flora  
4: 123.

Pseudobulbs ovoid, angled, silvery, to about 10 cm. long; leaves to about 45 by 12 cm., hardly stalked; scape to 70 cm. long, hairy, erect at base, usually bending over, bearing an inflorescence of about  $\sqrt{}$  weu-spaced flowers; bracts broad, 1.5 cm. long; pedicel and ovary very hairy, 3-5 cm. long; flowers white with a yellow or red callus, or sometimes with rose-flushed lip; sepals 2 cm. or more long; blade of lip 2 cm. long, side-lobes spreading, about 1 cm. long and 5 mm. wide, midlobe widening from narrow base, 1-2 cm. long and 1-8 cm. wide, end rounded and slightly 2-lobed; spur 2 cm. long, slender. Found in Tenasserim and Lower Siam, and in Borneo and Celebes; in Malaya found once on the top of the limestone at Batu Caves.

This species is native of climates with a dry season; the effect of such a season is accentuated by limestone, the soil on which soon dries out, and many plants of this nature are found further south on limestone than elsewhere. *C. vestita* is certainly rare on the limestone in Malaya, but might be expected to occur somewhere in the north. It is a very beautiful species, and has been much cultivated in Europe, and hybridized. In Singapore it needs careful resting, and its management is not easy; *C. rubens* is much more amenable, but unfortunately much less beautiful. The resting pseudobulbs of both species should be kept dry, under cover from rain, until new shoots appear, when they may be re-potted in clean material and watered progressively as the new growth develops new roots. The plants will stand more exposure than the evergreen *Calanthes*, but not full sun.

2. *Calanthe rubens* Ridl., Gard. Chron. 1890, I: 576.—*Preptanthe rubens*  
Ridl., Flora 4: 123.

Pseudobulbs usually smaller than in *C. vestita*; leaf-blades to 40 by 15 cm., shortly stalked; scape hairy, to 50 cm. long; rachis many-flowered, gradually increasing in length for some time; bracts broad, about 2 cm. long, pedicel and ovary 3-5 cm.; flowers pink with crimson median stripe on lip, rarely white; sepals 1.5 cm. long, tips acute, lateral sepals reflexed; lip 1.6 cm. long and 2 cm. wide, much wider across side-lobes than midlobe; side-lobes 1 cm. long and 5 mm. wide with rounded ends, midlobe 1 cm. wide, fan-shaped, 2-lobed; spur slender, 1.5 cm. long. Native on the limestone of Langkawi Islands and the country further north. The tube formed by the column with the base of the lip is much widened to its mouth, and laterally flattened Fig. 25.

3. *Calanthe monophylla* Ridl., J.F.M.S. Mus. 4: 70. 1909. Flora 4: 122.

Pseudobulbs small, each bearing a single leaf and an inflorescence, the base of the shoot covered by long sheaths when young; leaf-blade to 19 by 7.5 cm., short-hairy on the veins beneath and on the stalk, stalk about 10 cm. long; scape to 30 cm., short-hairy; rachis elongating gradually

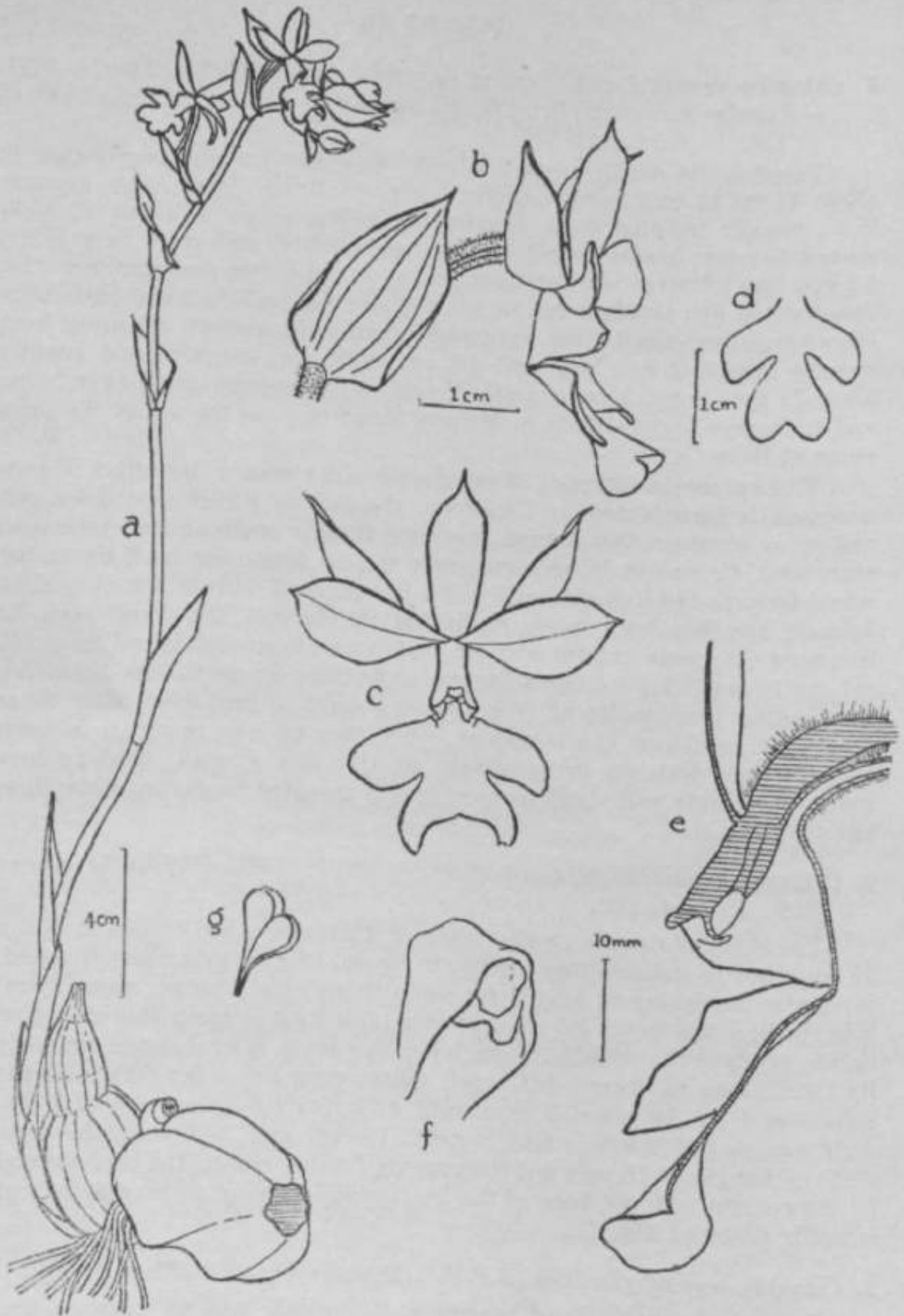


Fig. 25. *Calanthe rubena*. a, pseudobulb and inflorescence. b, flower and bract from side, c, flower from above, d, lip, flattened, e, longitudinal section of column and broad rostellum. f, detail of pollinia. g, 4 of the 8



and bearing well-spaced flowers; bracts to 5 mm. long; sepals and petals rosy or nearly white, apparently not spreading widely; sepals short-hairy, 1.3 by 0.5 cm., ovate with slender tips; petals 8 by 3 mm.; lip with spur 5 mm. long and blade 6 mm. long beyond the tubular part; side-lobes short, rounded, near base of blade, with 2 keels between them; midlobe with bilobed apex 4 mm. wide, widening from a narrow base, with 2 small calli. Found only twice, at Cameron Highlands; nearly related to *C. chrysoglossiodes* of Java and Sumatra. The flowers appear to be self-pollinating. This is one of a small group of 1-leaved species of *Calanthe*; they resemble *Plocoglottis* and *Chrysoglossum* in habit, but are easily distinguished by the column and lip.

4. ***Calanthe emarginata* (Bl.) Lindl.**, *Gen. et Sp. Orch.* 249. 1833. J.J.S., *Fl. Buit.* 6: 207.—*Amblyglottis emarginata* BL, *Bijdr.* 370. 1825.

Pseudobulbs small, with several leaves; leaf-blade to 30 by 15 cm., short-hairy on both sides, stalk about 15 cm. long; scape 40 cm., rachis about 10 cm. long; bracts about 1.5 cm., pedicel and ovary 3.5 cm. long; flowers white, more or less flushed with violet; sepals about 3.6 by 1.2 cm., narrowed to their tips, petals 2.8 by 1.2 cm., blunt; spur 5 cm. long; blade of lip 6 mm. wide at base, widening rather abruptly and almost circular, about 2 by 2 cm., with or without small side-lobes at the base, the apex slightly decurved and folded, with a very short tip; a yellow callus 3 mm. wide at base of lip. This very beautiful species is distributed in Sumatra, Java and Celebes; in Malaya it has been found once only, on G. Lang, Kedah. It is nearly related to the next species, but seems to be distinct in the almost total lack of side-lobes, and in larger flowers. Further observations on the two species in the north of Malaya would be interesting.

5. ***Calanthe masuca* (Don.) Lindl.**, *Gen. et Sp. Orch.* 249. 1833. *Bot. Reg.* 1844: t. *Zl.*—*Bletia masuca* Don, *Prodr. Fl. Nep.* 30. 1825.

Like *C. emarginata*, but rather smaller in all parts; bracts to 1.2 cm. long, pedicel and ovary about 2.6 cm.; sepals 2 by 0.7 cm., acute; blade of lip 2.2 cm. long, with narrow spreading curved side-lobes 8 mm. long and 3 mm. wide at base, midlobe fan-shaped, widening to 1.5 cm. from a narrow base, the end rounded and minutely toothed, cleft about 5 mm. Widely distributed in India (both north and south) and China; in Malaya found once, on G. Lang, Kedah, growing near *C. emarginata*. The G. Lang plants were said to have pale yellow flowers; Indian plants are usually violet or pinkish, but there is a var. *versicolor* which is white with a pale violet lip, fading to yellow. Further data on Malayan plants, and their distinctions from *C. emarginata*, are desirable.

6. ***Calanthe cecilize* Rchb. f.**, *Gard. Chron.* 1833, I: 432. *Ridl.*, *Flora* 4: 119. J.J.S., *Fl. Buit.* 6: 210, f. 156. *Bull. Btzg.*, Ser. 3, 5: 71 & 8: 356.

Leaf-blade about 30 by 10 cm., stalk to 15 cm. long; scape to 45 cm., rachis short with crowded flowers; flowers white, tinted or flushed with violet; lateral sepals about 1.6 by 10 cm., blunt; spur of lip 3.5 cm. long,

pointing upwards, a little flattened at the base; side-lobes spreading, not curved forwards, widening from the base, the ends rounded, midlobe broad with a narrow cleft at the apex. Distributed in Java and Sumatra; in Malaya found in many places, but not in Johore, in the lowlands and to 3,000 ft. on the mountains. In Pahang *C. cecilix* occurs especially on some of the limestone hills (Kota Glanggi), often in rock crevices and sometimes quite abundant, but it is not confined to limestone. It is distinct from *C. veratrifolia* in its short inflorescence, long spurs pointing upwards, violet-tinted flowers and in the side-lobes of the lip.

7. ***Calanthe pubescens*** Ridl., Kew Bull. 1923: 117. Flora 4: 120 (? = *C. veratrifolia*).

Leaves about same size as in *C. cecilix* but densely velvet-hairy; scape 50 cm. tall, rachis short, with many crowded flowers; colour of flowers not known; lip with small side-lobes and a deeply cleft midlobe. Known only from one collection made 40 years ago, the locality uncertain. It might be an unusually hairy and rather small-flowered form of *C. veratrifolia*.

8. ***Calanthe veratrifolia*** R. Br., Bot. Reg. 9: t. 270. 1823. Bot. Mag. t. 2615 J.J.S., Fl. Buit. 6: 211, f. 157. Ridl., Flora 4: 119.

Leaf-blade to 50 cm. or more long and 15 cm. wide, deep green or silvery, slightly hairy beneath, stalk to 15 cm. long; scape to 60 cm. or more long, more or less velvet-hairy; rachis with many flowers, extending to 15 cm. or more long; bracts 1-1.8 cm. long, broad at base; flowers 2.5 cm. or more wide, the sepals and petals lying almost in one plane and facing obliquely downwards, the petals a little smaller than the sepals; lateral sepals commonly about 1.5 by 0.6 cm., acute, more or less hairy on the back; whole flower white except for the yellow or red callus at the base of the lip; blade of lip almost at right angles to the plane of the sepals and petals, to about 1.6 cm. long; side-lobes spreading obliquely, oblong, midlobe very deeply cleft with spreading halves which may be larger or smaller than the side-lobes; spur 1.5 to 2.7 cm. long. Distributed from India and China through Malaysia to Australia (as far south as New South Wales); in Malaya found in the lowlands and also on the hills (to nearly 5,000 feet) at many localities. It is especially abundant in fresh-water swamp forest, growing with its roots spreading horizontally in deep layers of decaying leaves which are constantly moist. Flowers from which pollen has been removed sometimes turn yellowish. Fig. 26, a-e.

This species is often cultivated, and makes an attractive pot-plant, flowering in the shade, as do few other orchids. It needs a potting mixture rich in humus, kept constantly moist, but at the same time well aerated. A little manure in liquid form every few weeks is beneficial. The plants are best re-potted about once a year, after flowering. The pure white graceful flowers are beautifully shaped, and numerous, and each inflorescence lasts for three or four weeks. The broad grey-green leaves are also decorative if the plant is kept in good condition.

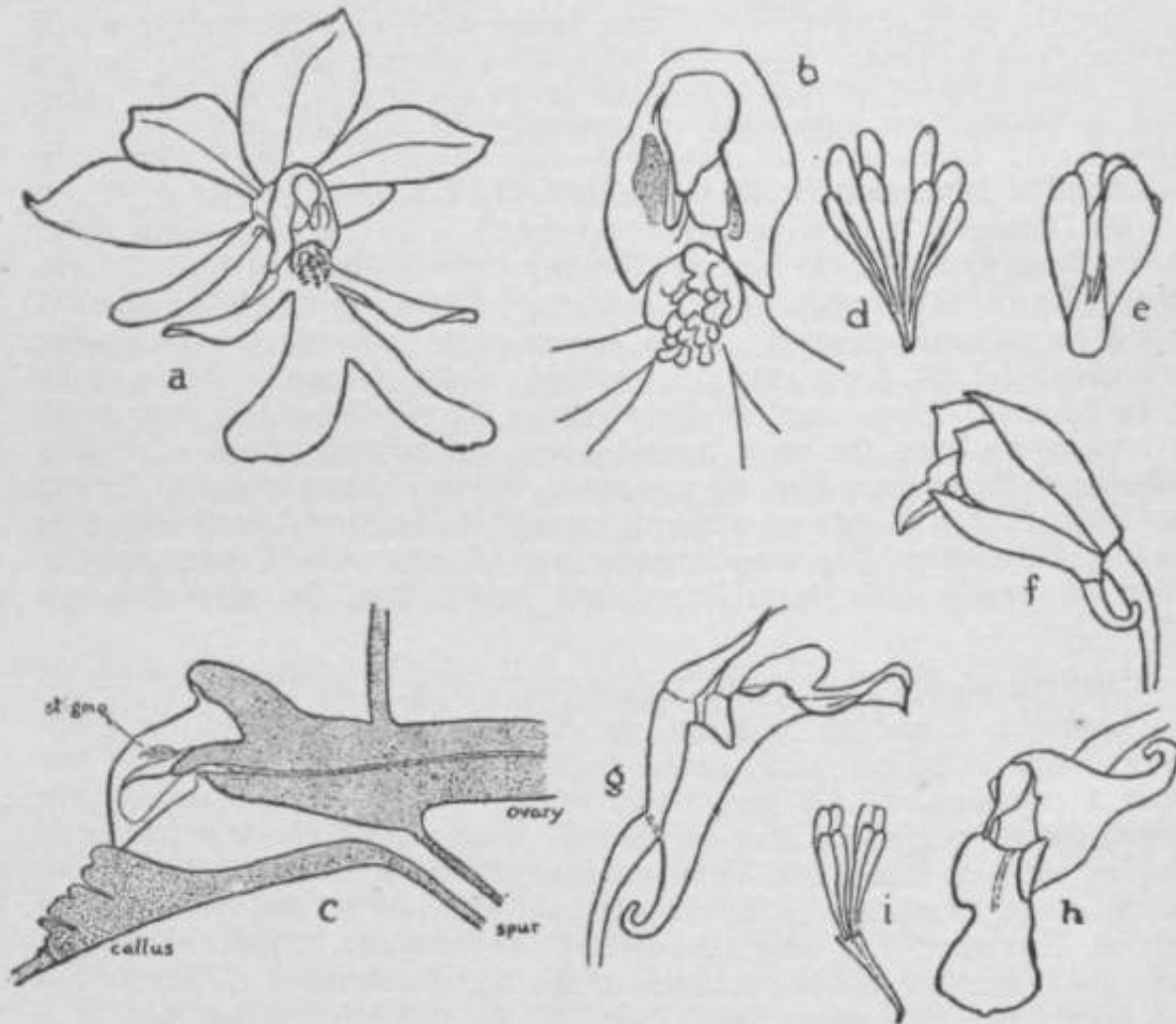


Fig. 26. *Calanthe v&ratrifolia*. a, flower. b, column and base of lip; stigmas shaded. c, longitudinal section through column and base of lip. d, pollinia. e, anther cap from below with pollinia removed, f-4, *Calanthe pulchra* (after Bot. Mag., t 6104).

9. *Calanthe ovata* Ridl., J.F.M.S. Mus. 4: 69. 1909, Flora 4: 120.

Leaf-blade about 20 by 7.5 cm., stalk 15 cm. long; scape 75 cm. tall, rachis 10 cm. long; bracts to 7 mm., pedicel and ovary about 14 cm. long; flowers about 25, white, barely 2 cm. across; side-lobes of lip erect, oblong-rounded, mid-lobe broad and cleft at the tip, the halves fringed (?), broader than the side-lobes; column violet, callus on lip yellow; spur 14 cm. long. This species is only known from one collection from Cameron Highlands, and further information is needed to complete the description.

10. *Calanthe cleistogama* Holtt., Gard. Bull 11: 277. 1947.

Size of leaves unknown; flowers self-pollinating, not opening widely; sepals about 8 by 3.5 mm., very shortly pointed; petals nearly same shape

but a little shorter; total length of lip including spur 9 mm.; spur 2.5 mm. long; free blade 4 mm. long, not lobed, strongly concave (sides raised to the tip), in natural position 3.5 mm. wide, with very short tip; sepals greenish yellow, petals yellowish, lip yellow, column white. Only known from one collection of flowers made at Fraser's Hill. The only other Malayan species with such small flowers is *C. Fcerstermannii*.

11. *Calanthe johorensis* Holtt., Gard. Bull. 11: 277. 1947

Leaf-blade to 70 by 8 cm., stalk and sheath to 20 cm. long; scape about 80 cm. long, rachis to 30 cm., with many flowers; bracts about 2.5 cm. long, falling; pedicel and ovary 1 cm. long; flowers pure white; sepals 1 by 0.5 cm., shortly pointed; petals 4 mm. wide, oblong with blunt tip; blade of lip 4.5 by 2.5 mm., oblong with 3 slight ridges, the side-lobes like very small cleft, the left not more than 0.5 mm. deep, the two halves rounded. Known abundant locally near Sijang, where it appears to be abundant locally near Sijang. Inflorescence of pure white flowers and the side-lobes, are

12. *Calanthe pusilla* Carr, Gard. Bull. 5: 147, pi. 4 f. 3. 1930

Leaves to about 25 by 3 cm., short-stalked, the edges of the blade wavy; scape to 25 cm. long, rachis to 9 cm.; bracts falling; sepals and petals 1 cm. long, 4.5-5.5 mm. wide, white; blade of lip almost equally 3-lobed, 1 cm. long and 6 mm. across near base, with 2 short yellow keels between the side-lobes; side-lobes orange yellow; midlobe white, almost arched. Very shortly pointed. Spur 1.2 cm. long, slightly clubbed. This species is very similar to *C. angustifolia* in general appearance but is smaller and the midlobe of the lip is undivided. *C. pusilla* has only been found in a valley on G. Tahan at 3,000-3,500 feet altitude.

13. *Calanthe angustifolia* (Bl.) Lindl., Gen. et Sp. Orch. 251. 1833 J.J.S., Fl. Buit. 6: 205, f. 152. Bull. Botz., Ser. 2, XIV: 30. 1914. Ridl., Flora 4: 120.—*Amblyglottis angustifolia* Bl., Bijdr. 369. 1825

Leaf-blade 30-50 cm. long, slender, with one or two large sheaths near the base; rachis 5 to 7.5 cm. long; bracts 4 cm. long, falling early; flowers white, the lip sometimes yellowish with a deep yellow callus; sepals 1-1.3 by 0.6-0.7 cm.; petals to 8 mm. wide; blade of lip nearly 1 cm. long, side-lobes short, almost square, midlobe large, rounded and rather deeply cleft, to 8 mm. wide; spur 8-10 mm. long, club-shaped. Distributed from Sumatra to the Philippines; in Malaya found at many localities on the mountains in the northern part of the country including Cameron Highlands, where it occurs up to 6,000 feet altitude.

*Var. flava* Ridl., I.e. Differs from the typical form of the species only in having flowers entirely deep cream or yellowish with orange-yellow lip. This variety appears to be common.

14. *Calanthe albo-lutea* Ridl., J.S.B.R.A.S. 39: 80. 1903. Flora 4: 121.

Blade of leaf to 75 by 9 cm., stalk about 15 cm.; scape stout, about 30 cm. tall, with several sheaths near the base; bracts large, falling early;

pedicel and ovary 1.5 cm.; flowers white except for yellow base of lip; upper sepal 1.5 cm. long, petals 1.2 cm. long, not widely spreading; blade of lip 3-lobed, side-lobes very short, rounded (5 mm. across from tip to tip), midlobe 7 mm. wide, apex broad and slightly cleft; spur 9-10 mm. long, curved and club-shaped. Found in mountain forest on Taiping Hills and G. Bujang Malacca. This species is very near *C. angustifolia*, but the plants are larger, with much wider leaves and a stout scape. The shape of the lip is very similar. A field comparison of the two species is desirable.

15. ***Calanthe aurantiaca*** Ridl., J.S.B.R.A.S. 39: 80. 1903. Flora 4: 120.

Leaf-blade to 35 by 3.5 cm., stalk short; scape to 30 cm., rachis to 10 cm. long with many flowers; bracts falling early; pedicel and ovary 1.5 cm. long; sepals orange, petals and lip yellow; sepals and petals 1.3 cm. long, petals 8 mm. wide, sepals 7 mm.; blade of lip 1 cm. long, widest near base with 2 short keels, not very distinctly 3-lobed, side-lobes at base, erect, midlobe narrow, bluntly pointed; spur 1 cm. long, slightly hooked. Found at Fraser's Hill and on G. Tahan. This species is very near the widely distributed *C. pulchra*, but has narrow leaves, a less hooked spur and differently coloured flowers, and is only found on mountains.

16. ***Calanthe pulchra*** (Bl.) Lindl., Gen. et Sp. Orch. 250. 1833. J.J.S., Fl. Buit. 6: 202, f. 150.—*Amblyglottis pulchra* Bl., Bijdr. 371. 1825.—*Calanthe curculigoides* Lindl., Gen. et Sp. Orch. 251 1833. Bot. Reg. 33: t. 8. Bot. Mag. t. 6104. Ridl., Flora 4: 121.

Leaf-blade to 70 by 10 cm.; scape to 60 cm. tall, rachis with flowers densely crowded; bracts 3-4 cm. long, falling early; pedicel and ovary 1.5 cm.; flowers not widely opening, deep orange-yellow with an orange-red lip; upper sepal 1.5-1.8 by 0.6-0.7 cm., narrowly acute; lateral sepals a little smaller; petals as wide as upper sepal; blade of lip 9 mm. long, with 2 very low keels between the side-lobes; side-lobes small, rounded, near base of blade, 5-5 mm. from tip to tip; midlobe 6 by 3.5 mm., widening a little from the base, very shortly pointed; spur strongly hooked at the end, effective length 8-9 mm. Distributed in Java and Sumatra (and probably Borneo); in Malaya found in wet forest in the lowlands and to 3,000 feet on the hills, in many localities. Often called *C. curculigoides*, but *pulchra* is the older name. This is the only yellow *Calanthe* suitable for cultivation in the lowlands. It is not so easy to manage as *C. veratrifolia*, nor do the flowers last as long. It should be used if possible for hybridization; but there is no evidence as to whether it is inter-fertile with *C. veratrifolia* and other species having persistent bracts. **Fig.** 26, g-i.

17. ***Calanthe Foerstermannii*** Rchb. f., Gard. Chron. 1883, I: 814. Ridl., Flora 4: 121.—(probable synonym) *C. Scortechinii* Hk. f., F.B.I. 5: 854. 1890.

Leaf-blade about 60 by 7.5 cm.; scape stout, about 45 cm. long, bearing a short dense inflorescence of small dull yellow flowers, at first covered by bracts 3 cm. long; sepals and petals about 7-8 mm. long; blade of lip about 5 by 5 mm. with two small keels near the base; side-lobes short, blunt, midlobe larger, often slightly notched, much wider than the width

from tip to tip of the side-lobes; spur 4 mm. long. Distributed from Assam southwards to the Taiping Hills, where it is common locally between 2,000 and 4,000 feet.

18. **Calanthe salaccensis** J.J.S., Bull. Dep. Ag. XLIII: 20. 1910. Bull. Botz., Ser. 3, 5: t. 27, IV.

Leaf-blade 35 by 6.5 cm., stalk 12 cm. long; scape about 30 cm., rachis 8 cm. long; sepals and petals bright golden yellow, lip orange scarlet; upper sepal 1.3 by 0.7 cm., very shortly pointed; petals 8 mm. wide, very broadly pointed; blade of lip 5 mm. long, side-lobes small, rounded, slightly raised, fleshy at the base, midlobe acute with sides inrolled near the tip; spur thick, 5 mm. long. Distributed in Java and Sumatra; in Malaya only found once, on G. Panti in Johore.

19. **Calanthe rigida** Carr, Gard. Bull. 5: 145, pi. 4, f. 2. 1930.

Leaf-blade to 60 by 7 cm., stalk to 20 cm.; scape stout, about 25 cm., rachis 12 cm. long; bracts covering flowers when young, falling early; flowers light golden yellow, fairly well opening; sepals 1.3 by 0.6 cm.; petals a little shorter; blade of lip 1.2 cm. long, 7.5 mm. wide across side-lobes when flattened; side-lobes erect, triangular, blunt, edges toothed, apex 4 mm. from base of lip; midlobe widening a little from base, apex rounded, bilobed, edges slightly toothed; spur 1 cm. long, curved, clubbed. Found only on G. Tahan at 5,000-6,000 feet, and at Cameron Highlands at 5,000 feet.

20. **Calanthe speciosa** (Bl.) Lindl., Gen. et Sp. Orch. 250. 1833. J.J.S., Fl. Buit. 6: 204, f. 151. Ridl., Flora 4: 121.—*Amblyglottis speciosa* Bl., Bijdr. 371. 1825.

Leaf-blade to 100 cm. long; scape stout, 60 cm. tall; inflorescence of very numerous small orange yellow flowers; midlobe of lip shortly pointed, its edges not toothed. Distributed in Java and Sumatra; reported from Malaya, but occurrence doubtful, the only specimens being at the fruiting stage. It is a mountain species.

### PLOCOGLOTTIS

Pseudobulbs slender, one-leaved, or in one species elongated to a leafy stem; leaves pleated, with several prominent longitudinal veins; inflorescence from base of pseudobulb, scape tall, erect, rachis bearing a succession of many flowers, a few open at one time; bracts rather small, persistent; sepals and petals similar, spreading, laterals sepals forming a very short mentum with the the column-foot; lip short, fleshy, joined to the sides and tip of the short column-foot, thus forming a sac at the base, usually with an elastic joint that springs when the lip is touched; columi? rather short; pollina 4.

The species of this genus have all rather small flowers, except *P. acuminata*, the occurrence of which in Malaya is doubtful. The small lip, with its spring mechanism, is peculiar. The mechanism has been studied carefully in one species, but not in the others.

Key to the Malayan species of *Plocoglottis*

- One leaf only (rarely 2) on each shoot  
 inflorescence almost hairless; upper sepal and petals  
 yellow with red spots
- Sepals shortly tipped, about 1.5 cm. long .. 1. *P. javanica*  
 Sepals gradually narrowed to the tip, about 2.4  
 cm. long .. .. 2. *P. acuminata*
- Inflorescence softly hairy; upper sepal and petals  
 dull yellow, not spotted .. .. 3. *P. Lovni*
- Leaves up to 8 in number on a stem to 100 cm. high 4. *p. gigantea*

1. *Plocoglottis javanica* BL, Bijdr. 380. 1825. Fl. Jav. N.S. 50, t. 14. 1858.

J.J.S., Fl. Buit. 6: 189, f. 142. Ridl., Flora 4: 143. Van der Pijl, Natuurw. Tijdschr. Ned. Ind. 101: 272-274. 1941.

Pseudobulbs about 10 cm. long and 1 cm. thick, when young covered with long sheaths, bearing one leaf; leaf-blade to 35 by 12 cm. (relative width varying much), stalk 15-25 cm., slender; scape 25-70 cm. long, almost hairless; rachis elongating gradually to 30 cm.; bracts 8 mm. long; sepals and petals yellow with red spots; sepals 1.5 by 0.6 cm., suddenly narrowed to a sharp tip, petals narrower; lip yellow with a red suffusion towards the base, convex, broader than long (omitting the tip), ending in a reflexed narrow tooth-like tip, 4 mm. long without the tip; base of lip and column-foot forming a sac. Distributed to Java and Sumatra; in Malaya found in rather wet places in both lowland and mountain forest in many parts of the country, including Singapore Island. The exact behaviour of the lip needs observation; when the flower first opens the lip points below the horizontal; when touched it moves up near the column, but not into close contact with the column as in *P. Lowii*. Fig. 26A.

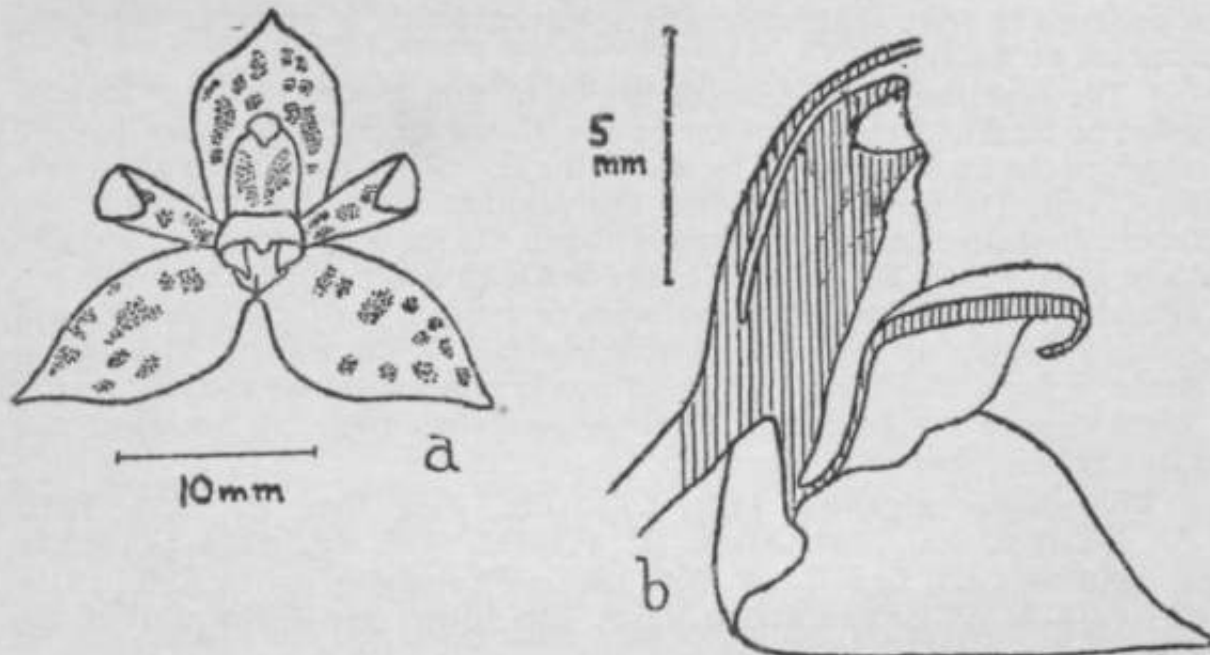


Fig. 26a. *Plocoglottis javanica*. a, front view of flower, b, section of column and lip, showing attachment of sepals.

2. **Plocoglottis acuminata** Bl., Mus. 1: 46. 1849. J.J.S., Fl. Buit. 6: 190, f. 143. Ridl., Flora 4: 143.

Differs from *P. javanica* in having shorter leaf-stalk (7-15 cm.) and longer sepals and petals (2-4 cm. long), which are gradually narrowed to a slender tip. It is found on the mountains of West Java and of Sumatra. Two specimens from the Main Range have been so named by Ridley, but it is doubtful if they differ from *P. javanica*. This is the only Plocoglottis which has flowers of a size usually considered to be worth cultivation.

3. **Plocoglottis Lowii** Rchb. f., Gard. Chron. 1865: 434. Xen. Orch. 2: 1 t. 154. J.J.S., Bull. Botz., Ser. 3, 11: 19. 1930.—*Plocoglottis phyrophylla* Ridl., Tr. L.S. 3: 368. 1893. Flora 4: 144. Burk., Bull. 1: 190. 1913.

Pseudobulbs to 8 cm. tall, 1.5 cm. thick at the base, tapering upwards, covered with sheaths when young, bearing one or sometimes two leaf-blades rich purple, or green, to 30 by 9 cm., narrowed at the base a short stalk (0.5 cm. long); inflorescence softly short-hairy, to 10 or more tall, growing and producing new flowers singly for several weeks; bracts to 10 mm. long; sepals hairy on the back; upper sepal 1.5 cm., shortly pointed, uniform dull yellow; lateral sepals a little longer and wider, ends bent down, fleshy and swollen on the sides that face each other, red; petals coloured like the upper sepal, 1.4 by 0.35 cm., narrowed gradually to the tip, spreading; blade of lip 6 mm. long and 7 mm. wide, with a narrow reflexed tip 2.5 mm. long, the whole blade fleshy and coloured yellow to orange with a complicated pattern of dark spots, with a pointed wart at each forward corner. Distributed in Borneo and Sumatra, in Malaya found chiefly in the south and Pahang (once near Ipoh), usually in moist sandy soil in forest not far from the sea or from tidal rivers, but sometimes further inland. The variety with green leaves differs in no other respect from that with purple leaves, which is probably the more common in Malaya.

The explosive mechanism of the lip of this species has been investigated by Burkill. The base of the lip is a strong spring, against the tension of which the lip is held back by one of the lateral sepals (always the right-hand one). The lip is pushed into this position during the opening of the flower by the petals, as they expand; when the lip is in position, the right-hand sepal moves across a little and holds it, after which the petals expand fully. When the right-hand sepal is touched, the lip is released, and springs sharply up into contact with the face of the column. This action would bring a small visiting insect into contact with the column, and it might remove the pollina in its struggles to get free; but no insect has actually been observed to do this.

4. **Plocoglottis gigantea** (Hk. f.) J.J.S., Fed. Rep. 32: 288. 1933. Holttum, Mai. Nat. Journ. 9: 111-115, with fig., *ISbb.*—*Calanthe gigantea* Hk. f., F.B.I. 5: 656. 1890.—*Plocoglottis fctida* Ridl., J.L.S. 32:319. 1896. Flora 4: 144. J.J.S., Bull. Botz., Ser. 3, Suppl. II: t. 39,

### III.

Leafy stems to about 100 cm. tall, the basal 40 cm. covered with several sheaths, above this 6-8 unstalked leaves; leaf-blade to about 25



by 5 cm.; inflorescence stout, from the base of the leafy stem, to 75 cm. tall, bracts to 1.5 by 0.8 cm. with narrow tip; sepals 2 by 0.8 cm., fleshy, laterals deflexed and close together; petals nearly as wide, tips bent down; all coloured about as in *P. javanica*; lip 9 mm. long, cream, with 3-lobed apex, midlobe triangular, 3 mm. long. Distributed to Sumatra; in Malaya found at many localities in moist places in lowland forest. The flowers have a foetid smell. The lip has a spring, but no trigger-mechanism. It is at first deflexed so as to expose its whole upper surface, but it is not held in position by a sepal. If the lip is moved forwards a little, it springs up into contact with the column, but no pollinating insect has been observed to effect this movement. If the lip is moved downwards again, it will stay in its original position until again moved forwards.

### SPATHOGLOTTIS

Pseudobulbs usually ovoid, sometimes depressed, each bearing a few plicate leaves; inflorescence from a basal leaf-axil, scape tall and slender; rachis bearing a succession of many flowers; sepals and petals about equal, usually spreading widely; lip strongly 3-lobed, side-lobes narrow (lacking in one species), oblong, curved upwards, midlobe with a very narrow claw, at the base of which are 2 small ovoid calli and 2 small laterally spreading teeth, the end of the blade more or less widened and sometimes cleft; column slender, curved, without foot; pollina slender, 8, in two groups of 4.

This genus is distributed from northern India and southern China through the Malayan region to the Pacific and Australia, reaching Samoa and New Caledonia; 21 species have been described in New Guinea. In Malaya we have three which are widely distributed (two of them in the mountains), two which are only found in the extreme north, and one more only found on P. Tioman. This last occurs also in Borneo, where there are a few more species, and others in the Philippines. Our common *S. plicata* (which is described fully in the introductory chapter of this book) is very widely distributed almost throughout Malaysia, but the mountain species tend to be more local.

*S. plicata* has long been cultivated, and several varieties selected, including white ones. Many mountain species are yellow, and very beautiful, but difficult to grow in the lowlands. In recent years many hybrids have been raised between lowland and mountain species, and a considerable range of new forms and colours produced, suitable for lowland culture. An account of these is given below. Because several species are sometimes cultivated, a key is given below covering all those known at present to be native in Sumatra, Malaya, Borneo, Java and the Philippines. There are still others in New Guinea, some said to be very fine, but they are not at present cultivated, and it is difficult to find accurate distinguishing characters for them.

A few species of *Spathoglottis* are deciduous, losing their leaves in the dry season and flowering when almost leafless. Of these, *S. affinis* is native in northern Malaya. Our other northern species, *S. Hardingiana*, may be deciduous, but there is no definite record of this. There is a species very nearly related to *S. affinis*, found from the Himalayas to southern

China, called *S. pubescens*, differing chiefly in lip characters; and a small but very graceful yellow-flowered deciduous species (*S. ixioides*) growing at 6,000-10,000 feet on the Sikkim Himalayas, more like an alpine than a tropical plant.

**Key to the species of *Spathoglottis* (Malayan\*)**

- Flowers yellow or orange-salmon  
 Flowers facing all ways and well spaced on an erect inflorescence .. .. . 1. *S. affinis*'<sup>a</sup>  
 Flowers close together near apex of inflorescence which is slightly curved over, not erect  
 Flowers light orange to salmon pink, 4-5 cm. across .. .. . 2. *£. Parsonsii*  
 Flowers yellow or orange-yellow, usually larger  
 Side-lobes of lip very broad at the tip, almost as broad as long .. .. . 3. *S. Kimballiana*  
 Side-lobes at least twice as long as wide  
 Petals much wider than sepals  
 Flowers under 5 cm. across .. .. . 4. *S. Vanoverberghii*  
 Flowers about 7 cm. across .. .. . 5. *S. confusa*  
 Petals not much wider than sepals  
 Side-lobes of lip 1 cm. by 2 mm.; leaves 1-5 cm. wide .. .. . 6. *S. chrysantha*  
 Side-lobes of lip proportionately wider; leaves wider  
 Flowers not over 4-5 cm. across  
 Flowers not opening (W. Malaysia) .. .. . 7. *S. microchilina*\*  
 Flowers opening widely (Philippines) .. .. . 8. *S. Elmeri*  
 Flowers 6-7 cm. across  
 Midlobe of lip blunt, 7-5 mm. wide near apex; flowers pale yellow .. .. . 9. *S. gracilis*'<sup>a</sup>  
 Midlobe of lip pointed, 4 mm. wide; flowers deep yellow .. .. . 10. *S. aurea*\*  
 Flowers purple, mauve or white  
 Flowers well spaced along an erect inflorescence; lip without side-lobes .. .. . 11. *S. Hardingiana*\*  
 Flowers close together near the nodding apex of inflorescence; side-lobes of lip well developed .. .. .  
 Bracts hairless; end of midlobe more or less rounded .. .. . 12. *S. plicata*\*  
 Bracts hairy; end of midlobe with spreading narrow lobes .. .. . 13. *S. tomeyitosa*

**1. *Spathoglottis affinis*** de Vr., *Ill. Orch.* 2, pi. 15. 1854. J.J.S., *Fl. Buit* 6: 217, f. 160. Ridl., *Flora* 4: 118.

Pseudobulbs small, flattened (wider than high), of irregular shape, resting leafless in the dry season; leaves to about 30 cm. long and 2 cm.

wide; scape 20-30 cm. long, finely hairy; rachis long, slender, erect, bearing many well-spaced flowers facing all ways; flowers rather small (upper sepal about 1.8 cm. by 0.8 cm.), yellow, the upper sepal and petals almost equal; lateral sepals slightly wider on the sides towards the lip, with a few purple streaks confined to the widened part; lip with a broadened notched end to the midlobe. Native from Tenasserim southwards to Kedah, and in Java; in Kedah it has only been found on G. Jerai (Kedah Peak) at 2,000-3,000 feet in open rocky places. **Fig.** 27a.

*S. affinis* may be cultivated in all parts of Malaya if care is given to resting the pseudobulbs. Good drainage and well-aerated soil are essential. The resting pseudobulbs should be planted just below the surface of the soil, and the pot kept in a place sheltered from rain and sun until growth begins. Then they need liberal watering, and when root growth is well established liquid manure may be given. Full sun is needed at this stage to produce a full flowering. The flowers soon appear, and continue for about four months. When the leaves show signs of browning, watering should be restricted, and when the leaves have fallen the pots should be kept in an airy sheltered place for another three or four months before re-potting, when the pseudobulbs may be divided. It is necessary to re-pot for each growing season; if left in their old pots the plants will be weak and will not make strong new pseudobulbs for the next season. A little bone meal in the potting mixture is beneficial.

## 2. *S. Parsonsii*

Flowers a little smaller than in *S. plicata*, rather deep orange-salmon when first opening, fading next day to a pale shade; petals distinctly wider than sepals, with a very wide base; midlobe of lip short, wide at the tip. This is a natural hybrid found on the mountains of Luzon, the parents being considered to be *S. plicata* and *S. Vanoverberghii*. This grows and flowers fairly well in Singapore, but has few flowers open at one time on an inflorescence.

## 3. *S. Kimballiana*

A large-flowered species related to *S. aurea* but the flowers rather pale clear yellow, the sepals strongly flushed with purple on the backs (not the petals), and the side-lobes of the lip very much widened, with rounded ends. Native in Borneo; rarely seen in cultivation, but has been used in hybridization.

## 4. *S. Vanoverberghii*

A yellow-flowered species from the mountains of Luzon, apparently deciduous, with rather small flowers, the petals very much wider than the sepals (petals 12-13 mm., sepals 7-8 mm. wide).

## 5. *S. confusa*

Leaf-blade to 70 by 6 cm., stalk to 30 cm. long; flowers yellow, about as in *S. Kimballiana*; sepals about 3-6 by 1-7 cm., petals 3-5 by 2-2 cm.; side-lobes of lip narrower than in *S. Kimballiana*, midlobe 2 cm. long and 6 mm. wide near the tip (i.e. wider than in *S. aurea*). Native in Borneo,

on mountains, and until recently confused with *S. aurea*, from which it differs in the very wide petals and wider midlobe, clear yellow colour and long-stalked leaves (the value of the last character is uncertain). *S. confusa* has been cultivated in Java.

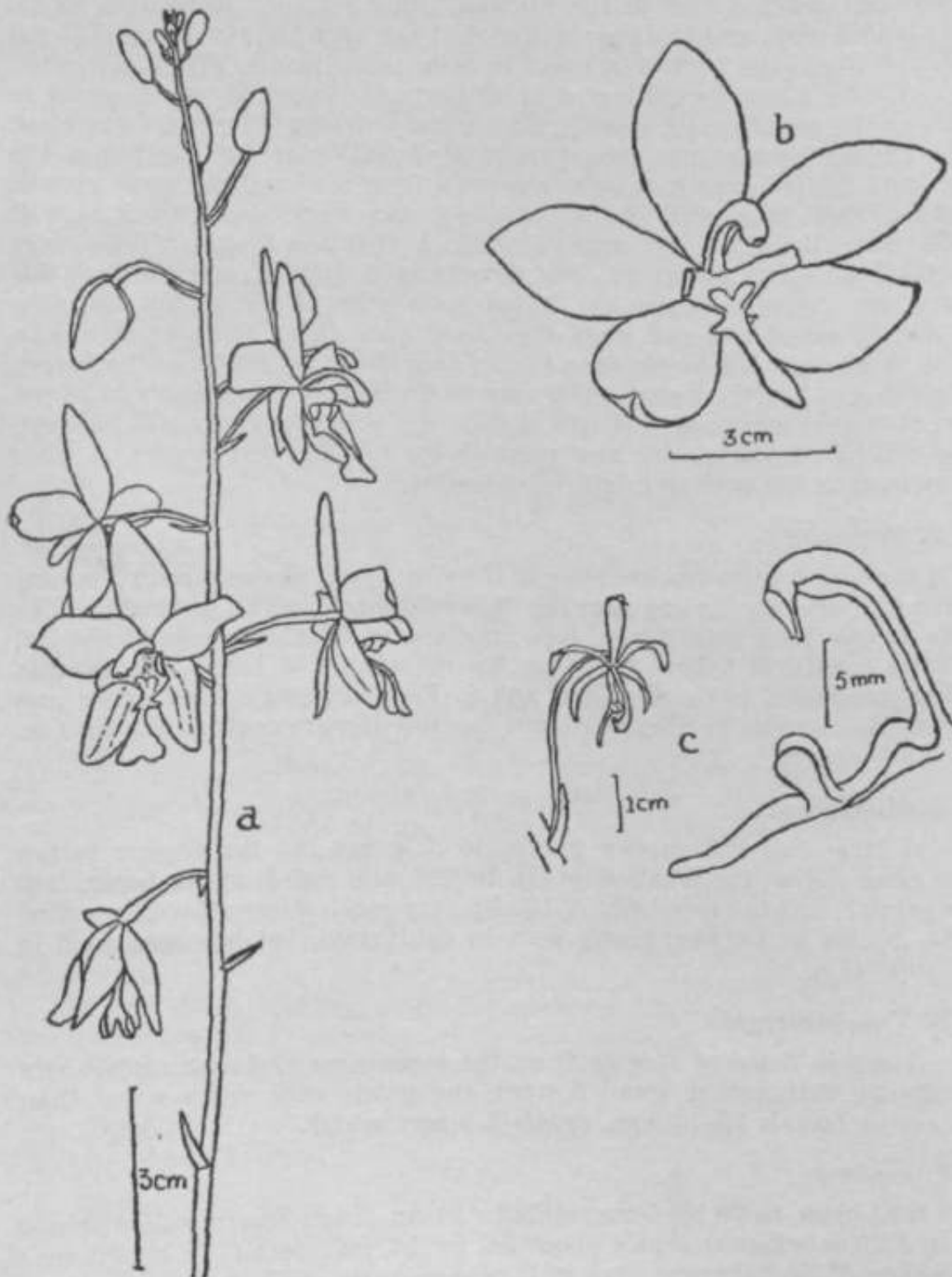


Fig. 27. *a*, *Spathoglottis affinis*. *b*, *S. aurea*. *c*, *S. Hardingiana*; flower; column with lip.

6. *S. chrysantha*

Leaves about 1.5 cm. wide; flowers yellow; sepals 2.4 by 0.3 cm., petals 2.2 by 1.1 cm.; side-lobes of lip very narrow, 1 cm. long and only 2 mm. wide. Native in the mountains of Luzon and cultivated in the Philippines. Plants have been brought to Singapore, but are not easy to cultivate here. The species has been used in hybridization.

7. *Spathoglottis microchilina* Krzl., Engl. Bot. Jahrb. 17: 484. 1893.

Habit of *S. aurea*; leaves not tinged with purple (always ?) ; flowers yellow (paler than in *S. aurea* ?) not opening, self-pollinating; sepals about 2 cm. long. Originally found on the Padang Highlands of Sumatra; in Malaya occurring at 3,000-4,000 feet on the Main Range and Taiping Hills. On Kedah Peak is a pale yellow *Spathoglottis* with flowers about 5.5 cm. across; it may possibly be the normal form of *S. microchilina*, with flowers not self-pollinating. This species needs more field-study.

8. *S. Elmeri*

Leaves to 7 cm. wide; flowers light lemon-yellow, rather small; side-lobes of lip 1.0 by 0.45 cm. Native in the mountains of Negros (Philippines).

9. *Spathoglottis gracilis* Rolfe ex Hk. f., Bot. Mag. t. 7366. 1894.

Flowers pale yellow; sepals and petals about equal, about 3 cm. long; side-lobes of lip about as in *S. confusa* but midlobe widened at the tip as in *S. plicata*, 7.5 mm. wide. Native in Borneo and at 3,000 feet on Pulau Tioman. There appears to be no other large yellow-flowered species with a midlobe of this shape.

10. *Spathoglottis aurea* Lindl., Paxt. Fl. Gard. 1: 16. 1850. J.J.S., Fl. Buit. 6: 218, f. 161. Ridl., Flora 4: 117. (not *S. aurea* quoad Rchb. f., Gard. Chron. 3rd Ser. 4: 92, f. 9, which is *S. confusa* J.J.S.).—*S. Wrayi* Hk., f., F.B.I. 5: 813. 1890. Ic. Pl. t. 2086.

Leaves/ to about 4 cm. wide, stalks 10-20 cm. long, sheaths (and sometimes leaves also) tinged with purple; scape 60 cm. or more tall, hairless; flowers 6-7 cm. across, rich deep golden yellow, the sepals and petals about equal in width; side-lobes of lip more or less flushed or spotted with crimson; calli and base of midlobe with small crimson spots in streaks; midlobe quite narrow (4 mm. wide), hardly expanded near the tip which is pointed. Found at 3,000-5,000 feet altitude in many parts of Malaya; originally discovered on Mount Ophir. It occurs also in Sumatra and Java, but apparently not in Borneo, where its place is taken by other yellow-flowered species (*S. Kimballiana*, *S. gracilis*, *S. confusa*), with which it was sometimes confused by collectors. *S. aurea* is difficult to keep alive in the lowlands of Malaya, but does well as a pot plant on Penang Hill. It has a very fine colour, unusual in an orchid, and the flowers are a good size. There is some variation in the details of crimson colour on the lip. Fig. 27, b.

11. *Spathoglottis Hardingiana* Par. et Rchb. f., Oria Bot. Hamb. 1: 45. 1878. Bot. Mag. t. 7964. Ridl., Flora 4: 118. (by error as Handingiana).

Pseudobulbs small, rounded; leaves to about 15 cm. long; scape slender, about 20 cm. long; rachis elongated, erect, bearing a number of flowers which are about 2-5 cm. wide, crimson to pale magenta; sepals and petals narrow; lip with very short (hardly developed) side-lobes and a narrow midlobe bearing two yellow club-shaped calli at its base. Native from Langkawi northwards to Lower Burma. In Langkawi this curious little species grows on limestone near the sea, in similar situations to *Paphiopedilum niveum*, but is not at all common. It is hardly worth cultivating except as a curiosity and for breeding; for the latter purpose its distinctive habit might be useful, though its flowers are small. It is not easy to cultivate successfully in Singapore. The name of the species was originally published as *Handingiana*, but was intended to commemorate a Mr. Harding; *Hardingiana* is therefore the correct spelling. Fig. 27, c.

12. *Spathoglottis plicata* Bl., Bijdr. 401. 1825. J.J.S., Fl. Buit. 6: 219, t 162. Ridl., Flora 4: 117.

This species has already been very fully described (p. 5). It is very widespread, certainly from Sumatra to the Philippines; the *Spathoglottis* in New Guinea and the Pacific Islands formerly called *S. plicata* are now regarded as distinct. *S. plicata* has many cultivated varieties, differing in size, colour and in some details of the shape of the flower. As regards size, some varieties are larger vegetatively as well as in flowers. As regards colour, there may be independent variation in the colour of petals and sepals, side-lobes and calli of the lip. As regards shape, the sepals and petals vary somewhat in the ratio of width to length, the petals may be wide or narrow at the base, and widest at or above the middle, and the teeth at the base of the midlobe may spread sideways, be turned downwards, or curved in an intermediate position. The following varieties have mostly been described from cultivated plants in Singapore. Other varieties have also been named, but I have seen no authentic specimens, and cannot make an effective comparison with the Singapore varieties.

#### A. Flowers bright purple

*Typical form* of the species. Sepals a little longer and narrower than petals; petals widest about the middle; side-lobes of lip a deeper purple than the petals; calli pale yellow; midlobe deep purple like the side-lobes.

Var. *aureocallus*. Calli bright yellow, side-lobes purple suffused with yellow.

Var. *moluccana*. A larger plant than the typical form or var. *aureocallus*; calli deep yellow; shape of flowers as in var. *Vieillardii*.

#### B. Flowers white or almost white

Var. *Penang white*. Flowers pure white; petals widest above the middle, narrowed gradually to the base; side-lobes of lip and calli a rich yellow. This breeds almost true from seeds, all plants having pure white flowers, but some having side-lobes a paler yellow.

Var. *alba*. Like typical form but flowers pure white except for very-pale yellow side-lobes and medium yellow calli; petals widest below the middle.

Var. *pallidissima*. Petals, sepals, column and midlobe very faintly flushed with mauve (often hardly noticeable except on column and midlobe); petals evenly elliptical; calli deep yellow, side-lobes very pale yellow.

### C. Flowers mauve or pale mauve

Var. *Vieillardii*. Whole plant very large, with long scapes; sepals and petals pale mauve, the petals widest 1/3 from the apex and narrowed to the base; side-lobes deep orange-brown, paler at the base, calli bright yellow spotted with deep orange; midlobe with pronounced knee, the tip deeper mauve than the petals. There is some doubt whether this is the true *S. Vieillardii* as originally discovered in New Caledonia, but the name has long been used for the cultivated plant above briefly described. It is surely a variety of *S. plicata* and not a distinct species; and it is one of the finest varieties.

Var. *purpureolobus*. Plants nearly as large as in var. *Vieillardii*, but petals and sepals a deeper mauve, the sepals a little wider; side-lobes a deep purple, calli pale yellow and midlobe deep mauve.

Var. *pallidilobus*. Plants about the same size as in the typical form; flowers similar in shape and colour to var. *Vieillardii* but sepals wider, side-lobes mauve tinged with pale yellow, calli very pale yellow. A rather Poor variety but often cultivated.

Cultivation of *S. plicata*. *S. plicata* will grow under a great variety of conditions, but careful cultivation is well worth while, as well-grown plants are very floriferous. Mr. A. G. Sanders describes his method of cultivation in the *Malayan Orchid Review* for 1940 (p. 36). Plants may be grown in the open ground or in pots. If the former, an open site should be selected, free from tree-roots; good drainage and well-aerated soil are essential. If good burnt earth can be procured, that is best, the bottom of the bed being filled with large firm pieces only, a layer of smaller-sized pieces following, and after that the rooting layer of a mixture of burnt earth and dried cattle manure in the proportion 3:1; then the top of the bed is made with coarse burnt earth only. The plants must be planted with the upper part of the pseudobulbs above ground level. After planting, they need sheltering from the sun for a week or two while the roots recover from the transplanting and begin new growth.

— In pots, the same principle of good drainage is the important factor. Burnt earth again is very satisfactory, but it must be well sieved to get rid of fine dust which will clog the soil. The bottom half of the pot should be filled with large pieces of burnt earth, then a mixture of burnt earth and dry cattle manure to within 2 inches of the top, then a layer of burnt earth only in which the pseudobulbs are planted. After new growth is well begun, frequent applications of dilute manure water will greatly benefit the plants. The plants need full sun, or almost full.

If good burnt earth cannot be procured, it has been found that broken bricks in combination with pieces of bird's-nest-fern-root make a very satisfactory potting medium for *Spathoglottis* of all kinds. The bricks should be clean and newly broken. The fern-root is broken into pieces 1-2 inches long and wide. Large pieces of brick only fill the bottom third of the pot, then a layer of fern-root, then smaller brick pieces, then a second layer of fern-root, and finally a layer of very small pieces of brick in which the pseudobulbs are planted. When the plants are in active growth, they need manure at regular intervals. This mixture appears to be specially suitable for the hybrid *Spathoglottis* which are a little difficult to manage.

### 13. *S. tomentosa*

Leaves narrow; scape and bracts and buds finely velvet-hairy; flowers rather smaller than in *S. plicata* (4-3 cm. across), purple-mauve, lobes of the lip a deeper shade, the tip of the midlobe with two widely spreading narrow halves, calli and base of midlobe yellow with small spots. A species native in Mindanao, grown in Manila and imported to Malaya. It is not so vigorous as *S. plicata* in Singapore, nor are the flower-heads so large, but it is quite a dainty and attractive species. It has been used in hybridizing.

### Hybrids of *Spathoglottis*

All *Spathoglottis* species are freely inter-fertile, but most hybrids are very nearly sterile, when either selfed or crossed with a parent or other species. This has resulted in difficulty in raising second generation hybrids, where variation may be expected. Many crossings have proved seedless, or produce one or two seeds only in a capsule, and the seeds are then difficult to isolate. The fruits ripen about six weeks after pollination. They are still green when they ripen, and must be watched carefully every day, or all seeds will be lost. The seedlings grow quickly, and should be ready to plant out in pots 4-6 months from sowing in flasks. Seedlings sometimes flower in 18 months from seed, and should not take much longer than 2 years if they are carefully tended.

A general account of cultivation of *Spathoglottis* is given under *S. plicata* (p. 165). Most hybrids are best with a little less than full exposure; otherwise they are treated as *S. plicata* in the matter of good drainage.

### *Aureo-vieillardii*

*S. Kimballiana* X *plicata* var. *Vieillardii*. This was exhibited by James Veitch & Sons in London in 1897, and received an award from the R.H.S. The name *Veitchii* is also given to this hybrid, but I cannot find its origin. The parentage was originally given as *S. aurea* X *Vieillardii*, but the broad shape of the side-lobes of the lip, and the purple-flushed backs of the sepals indicate *S. Kimballiana*, not *S. aurea*, as the yellow parent. The hybrid is extensively grown in Ceylon, and flowers well in the lowlands of Malaya, but few flowers are open at a time. It has been extensively used in Bangkok for the production of further hybrids. Some of these are grown in Singapore but have no names.



**Chrysops**

*S. Primrose* X *chrysantha*. Described in M.O.R. 1941, p. 102; raised at Botanic Gardens, Singapore. The flowers are a good deep yellow and are of good size (6.5 cm. diameter on second day). There is some suffusion of purple on sepals and petals when the flowers first open, but this disappears from old flowers. Less vigorous than some other hybrids in Singapore.

**Colmanii**

*S. aurea* X *aureo-vieillardii*. Raised at Gatton Park, Surrey, and exhibited by Sir Jeremiah Colman in 1906, illustrated in O.R. 1908. This hybrid seems never to have been brought to Malaya.

**Dwarf Legion**

*Primson* X *tomentosa*. Dwarf free-flowering plants with a large range of colours, mainly delicate pinks; one pure cream (var. Milkmaid).

**Echo**

*S. tomentosa* X *plicata* var. Penang White. Raised at Botanic Gardens, Singapore, and described in M.O.R. 1941, p. 102. The plants are rather small and the bracts and flower-buds are finely velvety as in *S. tomentosa*. The flowers are 5.1 cm. diameter, white with the faintest tinge of mauve on petals and sepals, tip of column mauve, side-lobes white strongly mottled with mauve, and calli bright yellow. The whole effect is very dainty and attractive though the flowers are not large.

**Edinensis**

*S. pulchra* X *pubescens*. Raised at the Royal Botanic Gardens, Edinburgh. *S. pulchra* is a species from New Guinea, near *S. plicata* but said to be much finer. *S. pubescens* is nearly allied to *S. affinis*, from S. China. The hybrid has never been brought to Malaya; it is probably near Jubilee, but with a fuller colouring and perhaps larger flowers.

**Elisabeth Catherine**

*S. plicata* var. *Vieillardii* X *chrysantha*. Raised in Java, illustrated and described in *De Orchidee* 1938, p. 293; 1939, p. 7. It is no doubt an attractive hybrid, but with flowers smaller than in Primrose.

**Jubilee**

*S. plicata* var. *Vieillardii* X *affinis*. Raised at Botanic Gardens, Singapore; described and illustrated in M.O.R. 1936, p. 100. This has an erect inflorescence like *S. affinis*, with flowers intermediate in size between the two parents, varying in colour from pale yellow or pale mauve to rich orange or purplish. If properly treated the plants are strong and free-flowering, and have a distinctive habit.

**Kewensis**

*S. plicata* X *plicata* var. *Vieillardii*. Raised at Kew and exhibited in 1903. It may be identical with the variety of *S. plicata* called *purpureo-lobus*.

**Parslee**

*S. Jubilee X Parsonsii*. Raised at Botanic Gardens, Singapore, and described in M.O.R. 1941, p. 101. This shows the Jubilee character in rather wide spacing of flowers, which are of moderate size (5-7 cm. diameter), of a pleasing salmon colour, fading to orange-yellow. Only 3 or 4 flowers are open together.

**Parsons Junior**

*S. Parsonsii X plicata* var. Penang White. Raised at Botanic Gardens, Singapore; described and illustrated in M.O.R. 1938, pp. 147-150. This has flowers of much the same shape as *S. Parsonsii*, but much larger, with extremely wide petals, the colour being a very pleasing pink, quite different from the mauve of *S. plicata*. There are two varieties, one a deep and one a pale pink. The plants have large pseudobulbs and broad leaves; with good drainage they grow strongly. The head of flowers is not so large as in Primrose.

**Penang Beauty**

*S. plicata* var. Penang White X *gracilis*. Raised at Botanic Gardens, Singapore; described in M.O.R. 1941, p. 102. This is a strong-growing hybrid with very large flowers (7 cm. diameter) of pale clear yellow with a little mauve marking and deep purple side-lobes. The inflorescence is rather lax, and not so graceful as in Primrose, but the flowers are very pleasing and distinctive.

**Primrose**

*S. aurea X plicata*. Raised in Botanic Gardens, Singapore, from seeds obtained by crossing plants on Penang Hill, described and illustrated in M.O.R. 1932, p. 18, and 1934, p. 15. The flowers vary in details of colouring, but all are a clear pale primrose yellow with some flush of mauve in sepals and petals. The best varieties are distinctly deeper yellow, with less mauve, than the poorer ones. All have flowers of a good size (6 cm. diameter) and strong plants have large heads of flowers. Good drainage is even more essential than in *S. plicata*. This cross was flowered by Dr. J. J. Smith at Buitenzorg in 1916, described in *Teysmannia* in 1920, but not named.

**Primrose var. Singapore**

*S. plicata* var. *purpureolobus X aurea*. Raised at Botanic Gardens, Singapore, described in M.O.R. 1934, p. 15. It is distinguished by having very little mauve in petals and sepals, and the side-lobes of the lip a solid rich purple, and is much the finest variety of Primrose.

**Primson**

*S. Parsonsii X Primrose*. Raised at Botanic Gardens, Singapore, described in M.O.R. 1941, p. 101. The flowers are somewhat smaller than in Primrose, coloured with delicate tints of pale yellow and pink-mauve.

**Primson selfed**

Raised at Botanic Gardens, Singapore, described in M.O.R. 1941, p. 101. This is a stronger plant with larger flowers of good substance and better colour than in its parent. The petals are broad (3.2 by 2.1 cm.). Petals and sepals have a combination of the beautiful fresh pink of Parsons Junior with a pale primrose yellow; the side-lobes of the lip have large purple blotches. The flowers fade in colour after the first day but still are very attractive. Two finer new seedlings of this parentage were described in M.O.R. 1950, p. 46, 47, as **Dwan** and **Primaurea**.

**Radiance**

*S. Jubilee X gradlis*. Raised in Botanic Gardens, Singapore, described in M.O.R. 1941, p. 103. This has flowers of a good yellow colour but only about 3 open together, and the side-lobes of the lip lack character (yellow with small purple spots).

**Rhodojnelon**

*S. Primrose X plicata* var. *moluccana*. Raised at Botanic Gardens, Singapore, described in M.O.R. 1941, p. 103. A strong hybrid, with wide-opening flowers of good substance and almost the same pleasing pink as the paler variety of Parsons Junior, the old flowers up to 6.8 cm. diameter; side-lobes of the lip a warm chocolate, calli deep yellow, apex of midlobe deep purple, 1.2 cm. wide. This is a good hybrid but unfortunately seems to be less free-flowering than some of the others.

**Zebrina**

*S. pubescens X plicata*. Raised by Sir Jeremiah Colman at Gatton Park, Surrey; first flowered 1910; illustrated in O.R. Oct. 1913. A plant was presented by Sir Jeremiah to the Botanic Gardens, Singapore, in 1934. It has flowered, but requires careful management in Singapore, as it needs to rest in the same way as *S. affinis*, to which *S. pubescens* (native of N. India and S. China) is nearly related. Zebrina has rather small yellow flowers.

**PHAIUS**

Each shoot of the sympodium consisting of several internodes, in some species forming a short pseudobulb bearing several leaves, in others a tall slender leafy stem; inflorescence one or more, lateral on the pseudobulb or stem, long or short; flowers rather large; sepals and petals free and more or less spreading; lip slightly joined to base of column and embracing column, more or less distinctly 3-lobed, more or less saccate or spurred at the base, with longitudinal ridges on the upper surface; column slender; pollinia 8, in two groups of 4, with caudicles.

In Malaya four of our species of Phaius are rather sharply divided into two pairs, one with short pseudobulbs, the other with long leafy stems. At first sight, it would seem more natural to separate these as two distinct genera; but there is an intermediate species (*P. flavus*) which has pseudobulbs about 10 cm. tall bearing leaves on its upper part and an inflorescence from near the base. This is very near indeed to our P.

*longipes*, which only differs in having a longer thinner stem; and *P. pauciflorus*, with its still longer stem and inflorescences borne higher up on it, is only another step removed.

Phaius is not a large genus, but is very widely distributed in Indo-Malaysia, extending north into China. The plants all grow in shady primitive forest, much as *Calanthe*. Most of them have large flowers and some are often cultivated, including our *P. Tankervilleae*. Hybrids between *Phaius* and *Calanthe* have been raised, but none have been grown in Malaya. Further trials of such crosses between local species should be made. It has been shown also that *Phaius* will cross with *Spathoglottis*, but no plants have yet been raised to flowering.

### Key to the Malayan species of *Phaius*

- Stem pseudobulbous, inflorescence arising near base of pseudobulb
- Flowers 10-12 cm. across, red-brown
- Sepals and petals about 6 cm. long, narrowed gradually to acute tip, white on the outside 1. *P. Tankervilleae*
- Sepals and petals about 5 cm. long, rather abruptly narrowed near the tips, not white outside . . . . . 2. *P. callosus*
- Flowers smaller, yellow . . . . . 3. *P. flavus*
- Stem long and slender, bearing one or more inflorescences, from below leaves or from leaf-axils
- Inflorescences to 18 cm. long, usually several on one stem; sepals and petals 3 cm. long, pale yellow 4. *P. pauciflorus*
- Inflorescence to 50 cm. tall, single, from near base of stem; sepals and petals about 1-2 cm. long, white . . . . . 5. *P. lohripes*

**1. *Phaius Tankervilleae*** (Aiton) Bl., Mus. 2: 177. 1&52.—*Limodorum Tankervilleae* Aiton, Hort. Kew, Ed. I, 3: 302, t. 12. 1789.—*Phaius grandifolius* Lindl. (non Lour.) Gen. et Sp. Orch. 126. 1831.—*Phaius Blumei* Lindl., Gen. et Sp. Orch. 127. 1831.—*Phaius Wallichii* Hk. f., F.B.I. 5: 816. 1890. Ridl., Flora 4: 123.—*Limodorum incarvillei* Pers., Syn. PL 2: 520. 1807.—*Phaius incarvillei* O. Ktze., Rev. Gen. Pl. 2: 675. 1891. J.J.S., Fl. Buit. 6: 194, f. 145.

Leaves to 100 cm. long and 20 cm. wide, thin in texture, borne on a short thick green pseudobulb to 3 cm. tall and wide; scape to 140 cm. tall, stout; rachis erect, bearing 10-20 flowers, several open together; bracts large, falling before the flowers open; flowers to 12 cm. across, sepals and petals about equal in length but the petals narrowed to the base, all spreading in an almost horizontal plane with the lip below them, white on the outside and more or less red-brown on the face; lip large, embracing the column, trumpet-shaped; spur 6 mm. long, more or less forked at the tip; blade of lip dark wine-red inside, mainly whitish outside, purplish

towards the apex and a little at the base, the edges of the apical part more or less crisped and recurved. Distributed from northern India and southern China through Malaysia to Australia and the Pacific; in Malaya found not very commonly in lowland and mid-mountain forest (up to 4,000 feet). The flowers are pleasantly fragrant. Over its wide range of distribution, this species has had several different names, including *Wallichii*, *Blumei* and *gmdifolius*; *Tankervillix* is the oldest name, dating from 1789, at which time the species was already in cultivation in Europe. Fiff. 28, 28A.



Fig. 28. *Phaius Tankervilli* &. a, plant in flower, b, flower in face view, c, flower from side, with lip cut open to show column and spur.

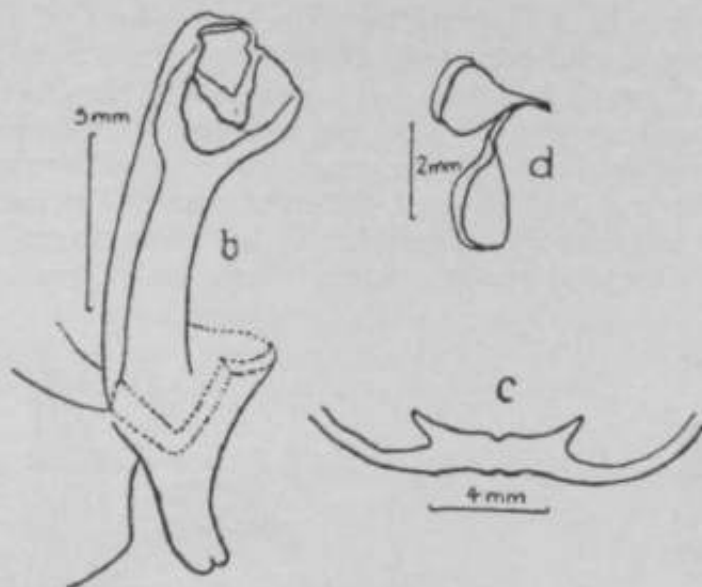


Fig. 28A. *Phaius Tankervillise*. *b*, column and base of lip, showing bilobed spur, *c*, section across middle of lip, showing keels, *d*, 4 of the 8 pollinia.

In cultivation, *Phaius* needs much the same conditions as *Calanthe veratrifolia*, a well-aerated potting soil with plenty of humus, and a lightly shaded position. Re-potting about once in two years is necessary, after flowering. In the lowlands, it is not easy to grow *Phaius* successfully in a border, though this might be managed if good drainage were prepared and special attention given. Plants have grown well in a shady border on Penang Hill. There is a local variety which is self-pollinating, the flowers never opening.

2. *Phaius callosus* (Bl.) Lindl., Gen. et Sp. Orch. 128. 1831. Bl., Fl. Jav. N.S. 5, t. 2, t 1. 1858, J.J.S., Fl. Buit. 6: 196, 1 146. Ridl., Flora 4: 124.—*Limodorum callosum* Bl., Bijdr. 374. 1825.

Rather smaller than *P. Tankervillix* in all parts; flowers opening more widely; sepals and petals about 5-5-5 cm. long, rather suddenly narrowed to a blunt tip, the petals widest  $\frac{1}{2}$  from the apex, coloured on both sides, the colour variable, usually reddish-brown on the back and yellowish-brown on the front, the lip yellowish with purple markings towards apex; spur about 8 mm. long, not or slightly bilobed. This is a Malaysian species. In Malaya it appears to be confined to mountain forest, and has been found at a number of places at altitudes of 4,000-5,000 feet. It is probably as well suited to cultivation on the hills as *P. Tankervillix*, but not in the lowlands. In Java, however, *P. callosus* occurs at lower elevations, and Dakkus states that it is suited to lowland culture. Few people in Malaya seem to have experimented with the culture of *Phaius* plants. They are worthy of further attention, and should be hybridized, both among themselves and with *Calanthe* and *Spathoglottis*.

3. *Phaius flavus* (Bl.) Lindl., Gen. et Sp. Orch. 128. 1831. J.J.S., Fl. Buit 6: 192, fig. 144.—*Limodorum flavum* Bl., Bijdr. 375. 1825.—*PJaius maculatus* Lindl., l.e. 127. King & Pantl., Ann. Calc. 8: 107, t. 149.

Pseudobulbs conical, to 10 cm. long and 3.5 cm. thick, each bearing 5-8 leaves; leaf-blades to about 45 by 11 cm., their sheaths overlapping

to form a false stem to 60 cm. tall; inflorescence from the base of the pseudobulb, 50-90 cm. tall, many-flowered, scape 25-50 cm.; bracts 12-20 mm. long; pedicel and ovary 2 cm. long; flowers light yellow with brown markings on the lip; sepals 3-5-4 cm. long, 12-14 mm. wide; petals a little smaller, narrowed gradually to the base; lip as long as sepals, hairy and 3-keeled within, spur 6 mm. long; column 2 cm. long, conspicuously hairy on the front. Distribution: N. E. India, Sumatra to Philippines; in Malaya found only once, at Cameron Highlands.

4. **Phaius pauciflorus** (Bl.) Bl., Mus. Bot. 2: 181. 1852. Fl. Jav. N.S. 11, t. 4, f. 1; t. 11A. J.J.S., Fl. Buit. 6: 197, f. 147.—*Limatodis pauciflora*, Bl., Bijdr. 375. 1825.

Var. **pallidus** (Ridl.) Holtt., Gard. Bull. 11: 286. 1947.—*Phaius pallidus* Ridl., J.L.S. 32: 313. 1896.—*Limatodis pallidus* Ridl., Flora M.P. 4: 124. 1924.

Stems 60-100 cm. tall, basal part angled and bearing only sheaths which are shorter than the internodes; apical part bearing about 5 leaves, leaf-blades to about 30 by 10 cm., with or without a short stalk above the sheath; inflorescences from stem below the leaves (or in axils of lowest leaves), several, elongating to 18 cm., bearing a succession of 8-15 flowers, the scape 4-7 cm. long; bracts persistent, to 1-3 cm. long; pedicel and ovary 2 cm. long; sepals and petals 3 cm. long, acute, petals wider than sepals; sepals pale yellow, petals white with violet spots; lip orange yellow with red spots in lines; spur slender, 2 cm. long, narrowed evenly to the tip, pink. This species is distributed in Java and Sumatra, in which countries three different varieties have been found. Our Malayan var. *pallidus* is very near one of the Sumatran varieties, but has a longer inflorescence and differs in some details of the flowers; it is found at 2,000-4,000 feet on the Main Range and Taiping Hills, in forest.

5. **Phaius longipes** (Hk. f.) Holtt., Gard. Bull. 11: 286. *lml.*—*Calanthe longipes* Hk. f., F.B.I. 6: 195. 1890.—*C. gracilis* Lindl., Gen. et Sp. Orch. 251. 1833 (not *Phaius gracilis* Hayata 1911). King & Pantl., Ann. Calc. 8: 165, pi. 222. Bot. Mag. t. 4714. Ridl., Flora 4: 122.

Stem about 30 cm. tall, bearing several leaves on its upper part, leaf-blade about 20 by 4-5 cm.; inflorescence single, erect, arising from the lower leafless part of the stem, scape slender, to 35 cm., rachis to 15 cm. long; sepals hairy on the outside; sepals and petals white, about 1-2 cm. long; lip not spurred but slightly saccate at the base; side-lobes erect, triangular, midlobe with crisped edges and two yellow ridges. Distributed from Sikkim and southern China southwards to Kedah Peak, where it has been collected twice. This species has been included in the genus *Calanthe*, but has the lip quite free from the column. A spurless lip is unusual in *Phaius*, but other spurless species do exist (including typical large-flowered species). In habit, *P. longipes* is not far from *P. pauciflorus*. This is one of the interesting cases of northern species which are limited in their spread southwards by the uniform Malayan climate. In other cases (e.g. *Spathoglottis affinis*) such species jump to Java, where the climate is again suitable, but there is no evidence that *P. longipes* has done so; Kedah Peak seems to be its southern limit.

## BLETIA

The genus *Bletia* is confined to the American tropics, from Mexico and the West Indies to Peru. In habit the plants are very near to *Spathoglottis*, so that without flowers it would be difficult to distinguish them, but apparently most species are deciduous, whereas most *Spathoglottis* are evergreen. There is no recent comparative account of all species of *Bletia*, and some are not well known. Schlechter in 1915 thought there might be 20 good species. The inflorescences are erect, not nodding as in most *Spathoglottis*, the flowers often do not open widely, and the lip has a more or less oblong midlobe with a varying number of longitudinal keels or crests.

The only species known to have been introduced to Malaya is ***Bletia verecunda*** (fig. 29) (or *B. Shepherdii*), which flowers fairly well in Singapore but has not such fine flowers as *Spathoglottis plicata*, which it resembles in colouring and size. This species was one of the first tropical orchids to be cultivated in Europe; it was sent from the West Indies to England in 1731. At the present time probably few *Bletias* are in cultivation outside their native countries, though two species, *B. patula* with pale mauve flowers and *B. Sherrattiana* with deep violet-purple flowers, are quite large and would be well worth cultivation. They probably need *B.* more seasonal climate than the south of Malaya.

## THE NEPHELAPHYLLUM TRIBE

Terrestrial plants; shoots of the sympodium forming either slender pseudobulbs of one internode bearing one leaf, or erect inflorescences without leaves; leaves either slightly fleshy, without prominent veins, or somewhat plicate, on long or short stalks; inflorescences short or rather tall, with close or well-spaced flowers; sepals and petals free and about equal; lip 3-lobed or almost unlobed, with or without a spur; column fairly long, usually rather slender, with a distinct foot, or sometimes without a foot; pollina 2 or 8.

The plants of this tribe somewhat resemble *Plocoglottis* in habit, having pseudobulbs of one leaf; but in *Plocoglottis* the inflorescence is lateral on the pseudobulb, whereas in this tribe it is terminal on a separate shoot of the sympodium. In practice, this is not always easy to see. The leaf-bearing pseudobulbs are usually quite slender, and the junction of pseudobulb and leaf-stalk is sometimes indistinct. In some plants of this tribe there is no proper leaf-stalk, but the pseudobulb behaves as such; these plants may appear to consist merely of a rhizome bearing a succession of stalked leaves.

*Nephelaphyllum* means cloud-leaf, and is given because the leaves of that genus have a clouded variegation of colour; this does not usually occur in the other genera. The tribe is not a large one, and there are few Malayan species, none of them common. They are however very interesting and some have beautiful flowers.



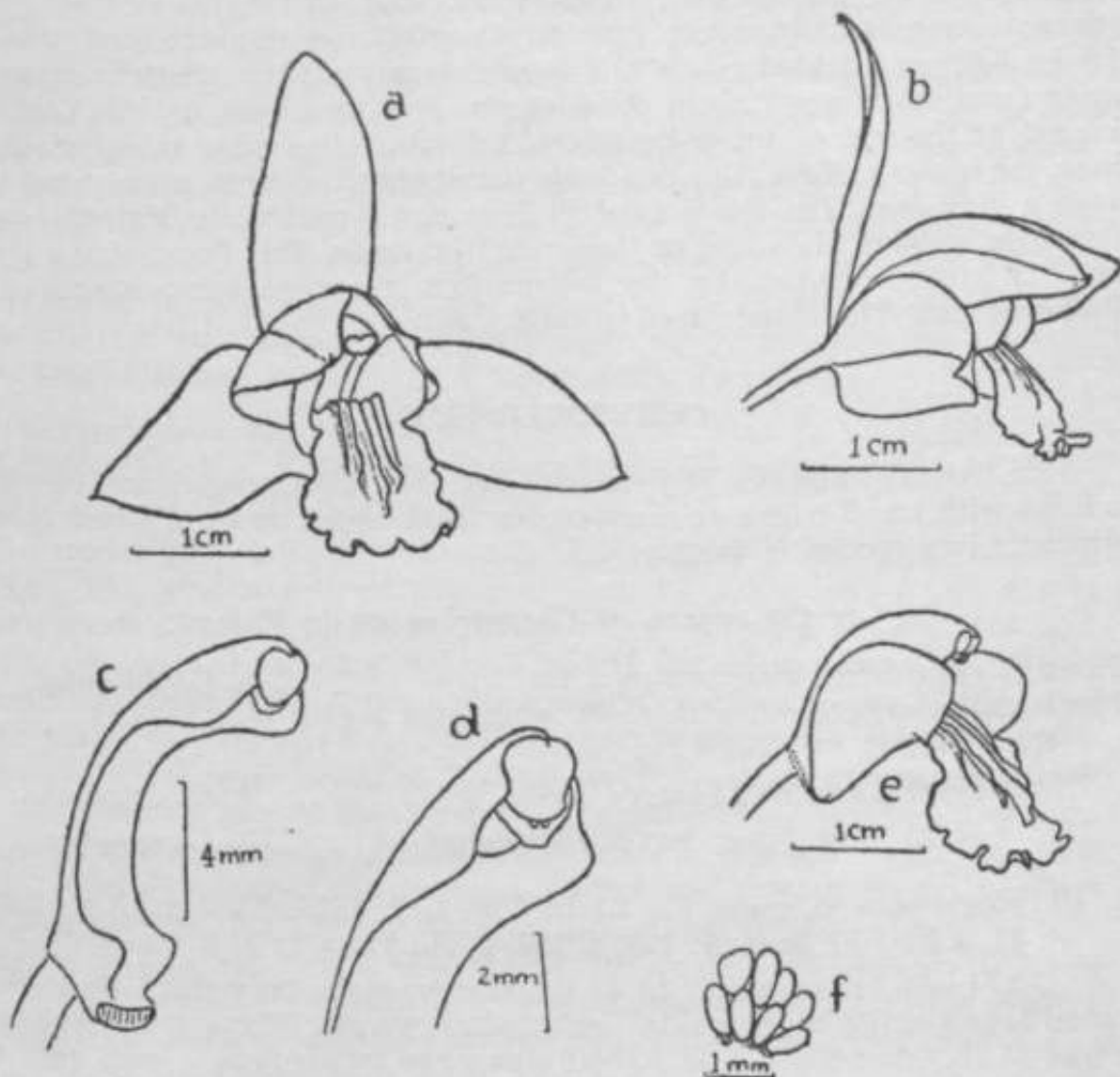


Fig. 29. *Bletia verecunda*. a, flower from the front. b, flower from the side, c, column. d, top of column, e, lip and column. f, pollinia.

Key to the genera of the Nephelaphyllum tribe

Pollinia 2

- Column without appendages .. .. 1. *Diglyphosa*
- Column with wings or arms .. .. 2. *Chrysoglossum*

Pollinia 8

- Lip at the top of the flower; leaves variegated 3. *Nepketaphyllum*
- Lip at bottom of the flower; leaves not variegated .. .. 4. *Tainia*

DIGLYPHOSA

*Diglyphosa latifolia* Bl., Bijdr. 337, f. 60. 1825. J.J.S., Fl. Buit. 6: 171, f. 130. Ridl., Flora 4: 112.—*Diglyphis latifolia* Bl., Fl. Jav. N.S. 138, t. 55. 1858.

Leaves stalked, plicate, blade to about 30 by 10 cm.; scape 20 cm. tall, dark purple, bearing a dense inflorescence of small flowers; bracts.

dark purple, narrow, reflexed, about 1 cm. long, as long as pedicel and ovary; flowers orange-yellow with purple markings; upper sepal about 1.5 by 0.45 cm., acute; petals and lateral sepals a little shorter, curved away from upper sepal, about equal, acute; lip 6 mm. long, curved, fleshy, hinged at the end of the column-foot, not lobed, the sides raised at the base, the upper surface with two keels converging forwards, apex rounded with a very short tip. Distributed in Java and Sumatra; in Malaya only found on Taiping Hills and at Cameron Highlands. The shape of the lip, and its hinged position on the column-foot, resemble some species of *Bulbophyllum*. The column-foot is quite short.

### CHRYSOGLOSSUM

Similar in habit to *Diglyphosa*, but the inflorescence not dense; column with small wings or arms on its front edges, and a distinct foot, which in two species is saccate.

#### Key to the species of *Chrysoglossum* in Malaya

- Plant hairy; column with narrow arms . . . . . 1. *C. villosum*  
 Plant not hairy; column with short wings, not longer  
 than wide  
 Upper sepal 2 cm. long; leaves green . . . . . 2. *C. ornatum*  
 Upper sepal 1 cm. long; leaves purple-spotted . . . . . 3. *C. simplex*

1. ***Chrysoglossum villosum*** BL, Bijdr. 339, f. 7. 1825. Fl. Jav., N.S. 137, t. 47. J.J.S., Fl. Buit. 6: 173, f. 131. Ridl., Flora 4: 111.

Leaf-blade brown-hairy, to 27 by 12 cm., stalk very short; inflorescence brown-hairy, to 70 cm. tall, scape dark purple, 40 cm. long; flowers about 25; bracts 1.5 cm. long, hairy; sepals and petals yellow, each with 2 dark red-brown stripes; upper sepal 1.7 by 0.3 cm.; lateral sepals 1.2 by 0.35 cm.; lateral sepals and petals curved towards the lip; lip hinged movably to the end of the column-foot, about 7 mm. long, 3-lobed, whitish with purple spots; side-lobes narrow, spreading, 4 by 1 mm.; midlobe with 2 keels, red, abruptly widened near rounded shortly-tipped apex; column 9 mm. long, with 2 narrow arms about the middle, arms 3 mm. long; column-foot 3 mm. long. Distributed in Java and Borneo; in Malaya found once only, on the Taiping Hills, over 50 years ago.

2. ***Chrysoglossum ornatum*** BL, Bijdr. 175. 1825. Fl. Jav., N.S. 136, t. 46 J.J.S., Fl. Buit. 6: 175, f. 132.

Rhizome creeping, about 1 cm. thick, with short sheathing leaves at intervals of 1-1.5 cm.; leaf-bearing pseudobulbs about 4 cm. tall, 1.5 cm. thick at base, covered with sheath 12 cm. long; leaf-blade to 40 by 11 cm., elliptic, shortly tipped, with 5 main veins, stalk 10-15 cm. long; scape about 50 cm. tall, hairless, purplish, with a few tubular sheaths at base; rachis elongating to 20 cm. or more, with many spaced flowers; bracts persistent, green, to 1.2 cm. long, a little shorter than pedicel and ovary; sepals and petals olive green with small red-brown spots in longitudinal

rows, suffused with purple towards base; upper sepal 2 cm. long, 4 mm. wide, concave; lateral sepals a little shorter, spreading, bent downwards; petals 5 mm. wide, spreading, a little curved away from the upper sepal; lip 1.2 cm. long, white or pale yellow with purple spots, hinged to the column-foot, with cross-folds on either side at the base, 3-lobed; 3 close keels in middle of lip; side-lobes erect, rounded, midlobe concave with raised sides; column 7 mm. long, with 2 short wings in the middle of the front edges, and 2 ridges towards the base; column-foot short and saccate. Distributed in Java, Celebes and Sumatra; in Malaya found once at Fraser's Hill only. This species is also very nearly the same as *C. erraticum* from Sikkim, and perhaps the two should be united.

3. *Chrysoglossum simplex* (Rchb. f.) J.J.S., Fl. Buit. 6: 177, f. 134. 1905. Bull. Dep. Ag. XIII: 20. 1907.—*Collabium simplex* Rchb. f., Card. Chron. 15, 1: 462. 1881.

Pseudobulbs about 2.5 cm. long; leaf-stalk 2-4 cm. long, blade to 30 by 9 cm., at first entirely purplish, then pale green with purple spots; scape about 25 cm. long, rachis to 12 cm. with many flowers; bracts 8 mm. long, purplish, about as long as pedicel and ovary; sepals not widely spreading, about 10 by 3 mm., pale green with edges purple in the basal 2/3; petals a little smaller, acute, the purple edges not continuous; lip white with yellowish midlobe, 3-lobed, twisted a little at the base; base narrow, 1.5 mm. long, widening abruptly to the side-lobes which are erect, rounded, not sharply distinct from the midlobe; midlobe 5 mm. long and wide, with down turned tip and toothed and crisped edges; two low keels in the basal part of the lip, their lower ends raised; column 4.5 mm. long, with 2 wings which extend downwards into the saccate column-foot, which is 3.5 mm. long. Distributed in Java and Sumatra; in Malaya found on the Taiping Hills and at Cameron Highlands.

## NEPHELAPHYLLUM

Rhizome creeping, covered with thin sheaths; pseudobulbs slender, not or hardly distinct from short leaf-stalks; leaf-blades slightly fleshy, more or less heart-shaped, marbled with lighter and darker green and flushed with purple; inflorescence dense or open; flowers with lip at the top; lip with a short spur, blade not divided or slightly 3-lobed; column rather short, slightly winged; anther with a small conical horn on either side at the back; pollina 8.

### Key to the Malayan species of *Nephelaphyllum*

Flowers close together on a fleshy inflorescence; lip

1-1 cm. or more wide, erect

Lip with bluntly pointed tip, about 1.1 cm. wide . . . 1. *N. yulchrum*

Lip with tip slightly recessed, about 2 cm. wide . . . 2. *N. latilabre*

Flowers well spaced, on slender inflorescence; lip 0.6

cm. wide, drooping . . . . .

3. *N. tenuiflorum*

1. **Nephelephyllum pulchrum** Bl., Bijdr. 373, f. 22. 1825. Fl. Jav. N.S. 144, t. 61, f. 1; t. 54F. Bot. Mag. t. 5332. J.J.S., Fl. Buit. 6: 178, f. 135. Ridl., Flora 4: 115.

Leaf-blade 4 by 2.5 to 10 by 6 cm., triangular-ovate, not heart-shaped, apex blunt, stalk and pseudobulb to 3 cm. long; scape at flowering about 5 cm. long, stout and fleshy, elongating to 10-12 cm. in fruit; rachis short, bearing flowers crowded together; sepals and petals about 1.3 by 0.3 cm., all curved backwards, pinkish; lip standing erect at the top of the flower, fleshy, slightly concave, nearly oblong, bluntly pointed, about 1.6 by 1.1 cm. (sometimes larger), pinkish at the base, rest pale yellow with deep yellow central bar ending in 3 papillose ridges near the tip; spur 3 mm. long and wide; column 5 mm. long. Distributed throughout Western Malaysia; in Malaya found in moist places in lowland and mid-mountain forest in many places. It appears that mountain plants have the largest flowers, the lip being especially variable in size. This is a very pretty species in foliage and habit, and its flowers are very striking.

2. **Nephelephyllum latilabre** Ridl. in Stapf, Tr. L.S. 4: 238. 1894. Carr, Gard. Bull. 8: 201. 1935.

Leaf-blade more nearly heart-shaped than in *N. pulchrum*; inflorescence as in *N. pulchrum*; sepals and petals 1.8 cm. long, green, flushed with purple, or with purple veins; lip to 2 cm. long and wide, white, flushed with yellow when young, the keels purple in the lower half, orange in distal half, apex very broad and slightly recessed. Originally found in Borneo, and once at Cameron Highlands. This species is very near *N. pulchrum*, and the constancy of the distinction of the shape of the lip is rather uncertain. More field observation is needed. Fig. 30.

3. **Nephelephyllum tenuiflorum** Bl., Bijdr. 373 1825. Fl. Jav. N.S. 145, t. 61, f. 2. J.J.S., Fl. Buit. 6: 180, f. 136. Ridl., Flora 4: 115.

Rhizome slender; leaf-blade strongly heart-shaped, about 4.5 by 3 cm., acute, the stalk and pseudobulb together to 1.5 cm. long; scape 10-15 cm. tall, slender, flowers 2-4 (-8 ?), rather drooping, not widely opening, greenish tinged with purple; sepals and petals 1.3 cm. long, narrow; blade of lip 1.3 by 0.6 cm., widest near tip, slightly 3-lobed, with 3 white short-hairy keels at the base, and a few large fleshy purple hairs at the tip; spur 3-5 mm. long, curved, club-shaped, purple. Widely distributed in Western Malaysia; in Malaya only found in mountain forest, in moist places, apparently not common. It is a much more delicate species than *N. pulchrum*; the lip is almost horizontal, not stiffly erect.

### TAINIA

Leaves stalked, pleated or rarely fleshy; inflorescence usually rather long, with few to many well-spaced and often fairly large flowers; lateral sepals joined to column-foot (when present) to form a mentum; lip hinged to the end of the column-foot, or not hinged but spurred, entire or 3-lobed, with keels on the upper surface; column slender, with or without a foot; anther often with 2 small horns; pollinia 8.

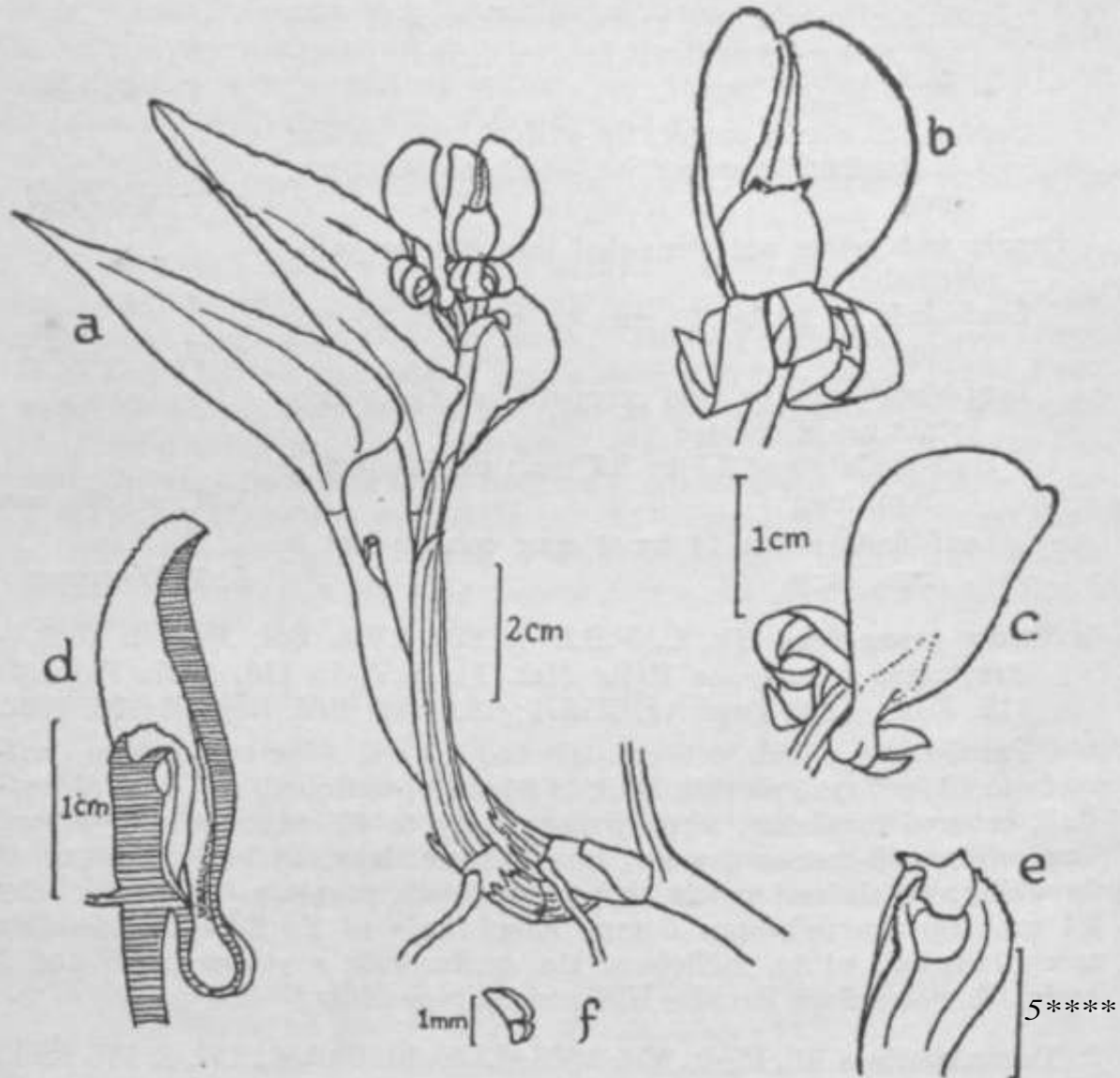


Fig. 30. *Nephelaphyllum latilabre*. a, plant. b, c, flower, d, longitudinal section, e, column. f, 4 pollinia.

This is a larger genus than the others of the tribe, but none of the species are at all common. They are rather varied both in flowers and vegetatively. *T. Wrayana* has been put into a separate genus (*Mischobulbum*) but differs only in its leaves not being pleated, and so more resembling *Nephelaphyllum*, but its flowers are quite unlike *Nephelaphyllum*. *T. penangiana* has unusually large pseudobulbs in this tribe, and also has a spurred Up, for which reason it also has been separated generically (as *Ascotainia*), but it is connected with the spurless *Tainia* species by some which have the base of the lip saccate.

#### Key to the Malayan species of *Tainia*

- Column without foot; pseudobulbs 2-5 cm. or more  
 thick at base . . . . . 1. *T. penangiana*  
 Column with foot; pseudobulbs all slender  
 Sepals and petals elongated into slender tails, up to  
 6 cm. long

- Sepals and petals pale greenish-yellow with deep red veins, lip without toothed lamellae; leaf-stalk 15 cm. long .. .. . 2. *T. speciosa*
- Sepals and petals purple, lip with 3 keels ending in toothed lamellae; leaf-stalk about 3 cm. long .. .. . 3. *T. Maingayi*
- Sepals and petals not elongated into slender tails, much shorter  
Leaf-blade to 30 by 10 cm., on stalk to 20 cm. long .. .. . 4. *T. latilingua*
- Leaf-blade shorter and proportionately wider, stalk much shorter  
Leaf-blade about 5.5 by 2.7 cm.; column-foot 2 mm. long .. .. . 5. *T. vegetissima*
- Leaf-blade about 14 by 9 cm.; column-foot 9 mm. long .. .. . 6. *T. Wrayana*

1. **Tainia penangiana** Hk. 1, F.B.I. 5: 820. 1890. Bot. Mag. t. 7563.—  
*Ascotainia penangiana* Ridl., Mat. Fl. M.P. 1: 116. 1907. Flora 4: 112. J.J.S., Bull. Dep. Ag. XLIII: 18. 1910. Fed. Rep. 31: 76. 1932.

Pseudobulbs ovoid, to 5 cm. tall and 2.5 cm. wide at the base; leaf-blade to 40 by 7 cm., pleated, stalk to 20 cm.; pseudobulb and base of leaf-stalk covered by sheath when young; scape to 45 cm., rachis to 30 cm. long, with well-spaced flowers; bracts 1 cm. long, as long as ovary at flowering; sepals and petals pale yellow with purple veins, about 2 by 0.4 cm.; lip spurred, spur 3 mm. long; blade of lip 3-lobed, side-lobes erect, rounded, white, midlobe ovate, acute, with a yellow patch and 3 keels. Only found on Penang Hill and Taiping Hills.

2. **Tainia speciosa** Bl., Bijdr. 354. 1825. J.J.S., Fl. Buit. 6: 181, f. 137. Ridl., Flora 4: 114.

Pseudobulbs 6 cm. long; leaf-blade 15 by 4 cm., pleated, stalk 15 cm.; scape about 30 cm. long, rachis to 15 cm., with 4-6 flowers; sepals, petals and lip all greenish with fine purple stripes; sepals 6-8 cm. long, 5 mm. wide at base, narrowed to a long slender tip; petals same shape, 4 cm. long; upper sepal and petals near together, lateral sepals widely spreading; lip undivided, about 2.2 by 1.0 cm., finely pointed, the sides raised and tip curled under, with raised hairy midline; column-foot 5 mm. long. Distributed in Java and Sumatra; in Malaya found at many places on the mountains, including Fraser's Hill and Cameron Highlands. The long-tailed sepals and petals make this and the next species very distinctive.

3. **Tainia Maingayi** Hk. f., F.B.I. 5: 822. 1890. Ic. Pl. t. 2094. Ridl., Flora 4: 114.

Leaf-blade to 30 by 7.5 cm., stalk to 3 cm.; scape to 75 cm. tall, rachis to 50 cm., with up to 15 flowers; flowers similar in shape and size to those of *T. speciosa* but sepals and petals purple with yellow-green tips; lip yellow, with distinct side-lobes bearing fleshy hairs; middle of lip bearing

three raised lines ending on the midlobe in reddish toothed lamellae. Found at several mountain localities from Kedah Peak southwards to Fraser's Hill. This is a very striking species, and the structure of the lip most peculiar. Data on the colour of the flowers are incomplete.

4. **Tainia latilingua** Hk. f., F.B.I. 5: 822. 1890. Ic. PL t. 2093. Ridl., Flora 4: 114.

Pseudobulb about 4 cm. long; leaf-blade to 30 by 10 cm., stalk to 20 cm.; scape to 30 cm., rachis to 30 cm. with many flowers open together; sepals and petals pale greenish, more or less suffused with purple; upper sepal to 2.5 by 0.4 cm.; lateral sepals shorter, 5 mm. wide; petals 4 mm. wide; lip 3-lobed, very pale yellow, pink at the base; side-lobes triangular, erect; midlobe 1 cm. long and wide, with short tip and finely toothed edges, bearing three low keels, the middle one straight, the laterals curved (converging forwards) and finely waved; column-foot 3 mm. long. Found at several localities in Johore, Pahang, Selangor and Perak, in mid-mountain forest, and probably also in Sumatra (where it has been given another name).

5. **Tainia vegetissima** Ridl., J.L.S. 38: 328. 1908. Flora 4: 114.

Leaf-blade to 5.5 by 2.7 cm., purplish when young, stalk with pseudobulb about 1.5 cm. long; scape slender, 20 cm. long, flowers 3-6; sepals 1.2 cm. long; sepals and petals pale yellow with crimson streaks; lip crimson with yellow edge, nearly as long as sepals, not lobed, with broad rounded end 8 mm. wide; column-foot 2 mm. long. Found only on Gunong Tahan.

6. *Tainia Wrayana* (Hk. f.) J.J.S., Bull. Botz., Ser. 2, VIII: 6. 1912.—*Ipsia Wrayana* Hk. f., F.B.I. 5: 812. Apr. 1890. Ic. Pl. t. 2085.—*Mischobulbum Wrayanum* Rolfe, Orch. Rev. 20: 127. Ridl., Flora 4: 115.—*Nephelaphyllum grandiflorum* Hk. f., F.B.I. 6: 192. Dec. 1890. Ann. Calc. 5: 23, t. 34. King & Pantl., Ann. Calc. 8: 104, pi. 144.—*Tainia atropurpurea* Ridl., J.L.S. 32: 315. 1896.

Leaf-blade to 14 by 9.5 cm., heart-shaped with short acute tip, fleshy, not pleated, with 5 main veins, stalk and pseudobulb about 7 cm. long; scape 15-20 cm., rachis 6 cm. long, with 6-8 flowers; bracts 1.2 cm. long, pedicel and ovary the same; sepals and petals greenish with brown-purple veins and more or less flushed with brown-purple; upper sepal 1.8 cm. long; petals nearly as long as upper sepal, 7 mm. wide; lip curved as seen in profile, with 3 keels from base to apex, white, flushed with purple near apex, elsewhere spotted or veined pink, 3-lobed; side-lobes broad, erect, midlobe pointing forwards, acute; column-foot 9 mm. long, curved. Distributed from the Sikkim Himalayas southwards to Malaya; found on G. Bintang (Kedah), Taiping Hills, G. Batu Puteh and Penang Hill, but apparently nowhere common. The leaf is seated directly on the pseudobulb and has no true stalk. The shape and texture of the leaf resemble *Nephelaphyllum*.

THE ARUNDINA TRIBE

Stems leafy, relatively slender, not pseudobulbous; leaves rather narrow, jointed at the base of the blade; inflorescence terminal, sometimes branched, with persistent (often large) bracts; flowers large or fairly large; lip in most cases not strongly 3-lobed, usually embracing the column, with longitudinal keels, not spurred but sometimes saccate at the base; column rather long and slender, curved, without a foot, the rostellum long and slender, with the stigma 4 or 8, in two groups with caudicles, which may be covered with granular pollen.

This is a small tribe, of few genera, none of which has many species. *Thunia* (Thunia) as far south as Malaya and a few others have been cultivated, and there are some fine species of them growing in the hills of Malaya.

Key to the genera of the Arundina tribe

- Leafy shoots distant, with about 4-6 strongly plicate leaves on each; flowers greenish .. 1. *Ciaderia*
- With many leaves together, with bright colours, not green .. 2. *Thunia*
- Leaves thin, slightly waxy, deciduous .. 2. *Thunia*
- Leaves firm in texture, not waxy; plant never leafless ..
- Leaves grass-like, stem slender, petals wider than sepals .. 3. *Arundina*
- Leaves stiff, stems stout, petals not wider than sepals .. 4. *Dilochta*

CLADERIA

Rhizome long and slender, bearing erect leafy shoots 20 cm or more apart; leaves about 4-6 on each shoot, close together; flowers green, lip slightly saccate at the base. Only two species of *Ciaderia* are known, one of them being not uncommon in Malaya. Its rhizome sometimes creeps over logs, or a little above ground level, but never rises much above ground level. The erect shoots are much shorter than in most members of the Arundina tribe.

***Ciaderia viridiflora*** Hk. f., F.B.I. 5: 810. 1890. Ic. Pl. t. 2083. **Ridl., Flora** 4: 140.

Leaf-blade 15 by 3-5 to 30 by 6 cm., strongly pleated; scape slender, about 15 cm. long; rachis slowly elongating and bearing a succession of many flowers, one or two at a time, in the axils of stiff bracts; upper sepal 2-5 by 0-7 cm., erect or curved over the column; petals 2-3 by 0-6



cm., oblong, blunt, curved over the column; lateral sepals spreading horizontally, curved towards each other; lip paler green than the sepals, with deeper green veins; side-lobes large, upright, blunt, on either side of the column and as long as the column; midlobe much wider than long, the end turned down, 7 mm. wide at the base, maximum width 1.5 cm., length when flattened 7 mm., apex recessed; two low rounded hairy keels between the side-lobes; sac at base of lip 2.5 mm. wide and deep. Distributed in Sumatra and Borneo; in Malaya found in many places, in lowland and mid-mountain forest.

### THUNIA

Stems close together, rather fleshy, to about 60 cm. tall, recurved at the tip, bearing many leaves; leaves thin, blade to about 20 by 5 cm., covered with a slight waxy bloom; flowers few, in a rather close pendulous group at the end of the stem, with very large pale green or white persistent bracts; sepals and petals about equal in width, 6 cm. or more long; lip large, embracing the column, shaped almost as in *Arundina*, the centre of the midlobe bearing several keels or crests with long teeth or soft spines.

This genus is found in India and Burma, extending southwards to the extreme north of Malaya. There are few species, differing little except in the colour of the flowers. The stems taper upwards, and the flowering apex is curved over. The flowers are borne at the end of the leafy stems, as soon as growth is completed. After flowering, the stems lose their leaves, and rest leafless during the dry season. In Singapore the plants have to be artificially rested. When the leaves begin to wither, the plants should be gradually dried off, and kept in a dry sheltered place until new growth begins, when they should be re-potted. Dakkus recommends a potting mixture of leaf-mould, fern-roots, sand and dried cow-dung; in other words, a compost of open texture containing plenty of humus. It is doubtful if *Thunias* would ever flower well in the south of Malaya, but they certainly will at Alor Star in Kedah, and *T. alba* is native in Setul. An attempt should be made to cross *Thunia* and *Arundina*.

*T. alba* is the most widely distributed species. The flowers are white with purple teeth on the keels of the lip; they last for about a week in Singapore. At its best, it is quite handsome, but as with other species the flowers do not open very widely. Fig. 31.

*T. Bensonix* is a species native in Burma, with bright magenta-purple sepals and petals, the lip a deeper purple with yellow markings in the throat, 7.5 cm. long.

*T. Marssialliana* is also a Burma species. It has white flowers with a rich yellow lip.

*Hybrids* have been raised within the genus, but are little grown in any part of the world to-day. Hybrids of any of the fine Burmese species would be worth growing in Kedah; hybrids with *Arundina* and *Dilochia* (if such could be raised) would be worth growing in other parts of Malaya.

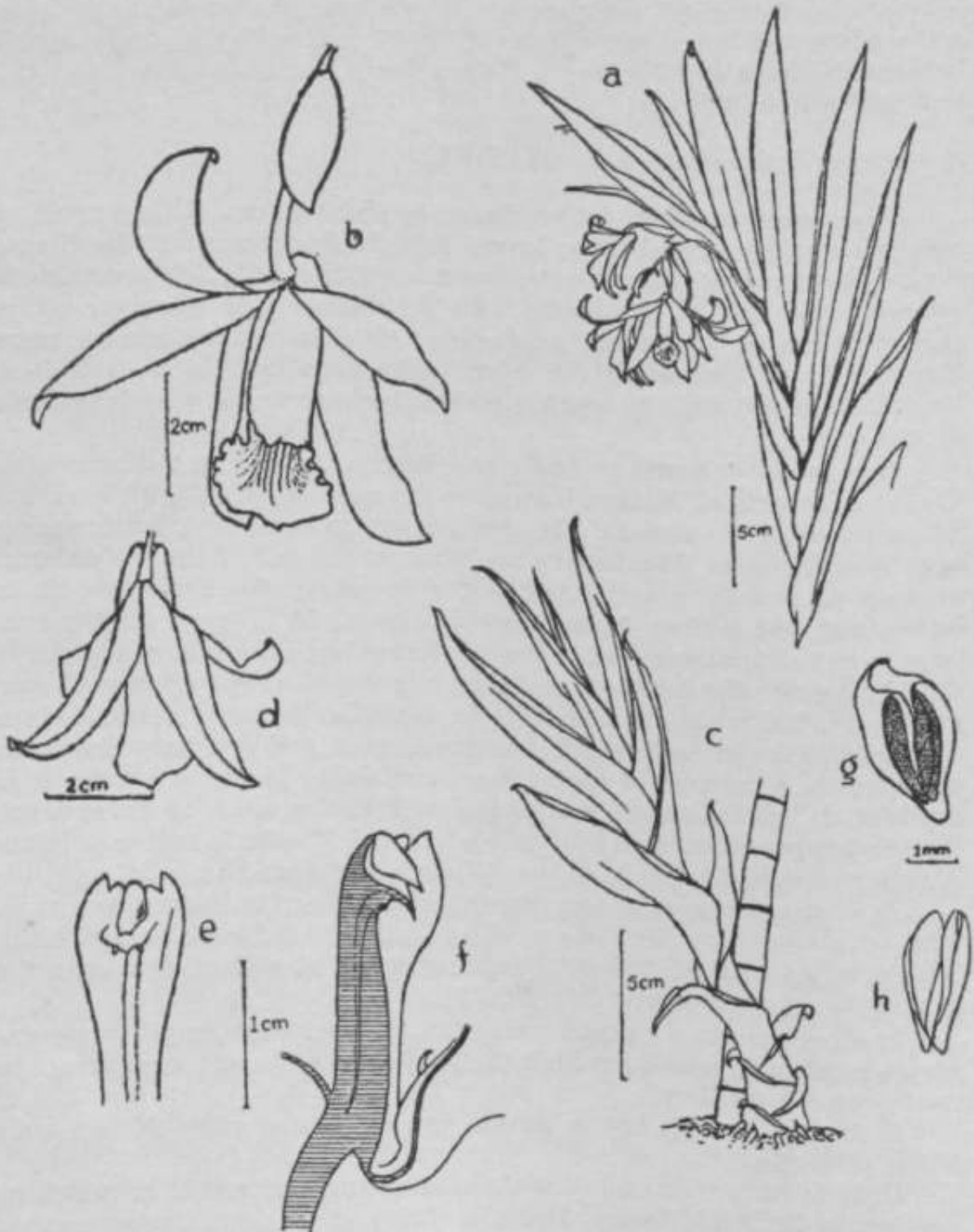


Fig. 81. *Thunia alba*, a, top of flowering plant, b, flower, c, base of plant, d, flower from below, e, top of column, f, section of column, g, anther from below, h, pollinia.

## ARUNDINA

Terrestrial plants; stems close together, slender, erect, bearing many narrow grass-like leaves with overlapping sheaths; inflorescence terminal, sometimes branched, elongating gradually and producing a succession of flowers one or two at a time; bracts small, acute, stiff; flowers fairly large; sepals narrow, the upper one erect, the laterals usually close together behind the lip; petals much wider than sepals, spreading horizontally, acute; lip large, embracing the column, trumpet-shaped, hardly 3-lobed, the apex deeply cleft, with 3 thin longitudinal keels, the lateral ones nearly reaching the apex, the middle one shorter; column slender; pollinia 8, flat, the caudicles covered with granular pollen. Fig. 32.

Arundina is distributed in Ceylon, northern India, southern China, Malaysia (not the Philippines) and some Pacific islands. Several species have been distinguished by different authors, but all are nearly related, and (as indicated below) it seems likely that all should be regarded as belonging to one variable species.

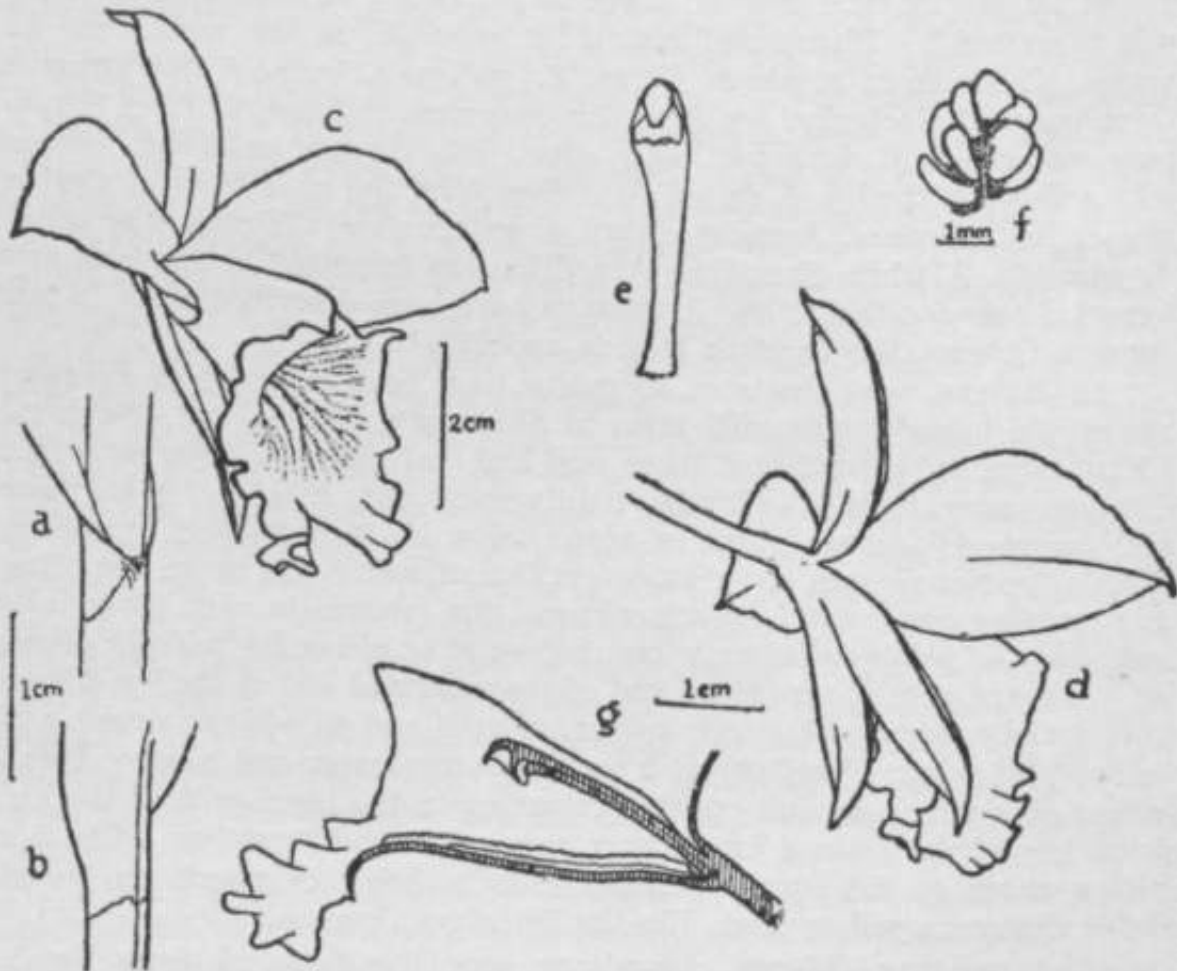


Fig. 32. *Arundina graminifolia*. a, b, base of leaf, c, d, flower, e, column, f, pollinia, g, section of flower.

The flowers of *Arundina* are shaped much as in *Cattleya*, except for the lateral sepals being close together behind the lip. Petals and sepals are white or pale rosy mauve; the width and shape of the petals varies

somewhat, even among native Malayan plants, the widest point being sometimes at the middle, sometimes not; the lip usually has a bright rosy-purple end, the throat paler, veined with purple, with a yellow patch in the middle; the amount and intensity of the purple colour varies much, and in some cases the yellow is absent; white flowers have been reported.

**Arundina graminifolia** (Don) Hochr., Bull. N.Y. Bot. Gard. 6: 270. 1910.  
—*Bletia graminifolia* Don, Prodr. Fl. Nep. 29. 1825.—*Arundina bambusifolia* Lindl., Gen. et Sp. Orch. 125. 1830. Ridl., Flora 4: 125.—*A. speciosa* Bl., Bijdr. 401. 1825. J.J.S., Fl. Buit. 6: 229, f. 168. Ridl., Flora 4: 126.—*A. revoluta* Hk. f., F.B.I. 5: 858. 1890. Ridl., Flora 4: 126.—*A. densa* Lindl., Bot. Reg. 28: t. 38. 1842.

The Himalayan *Arundina* was the first to be described; it was called *Bletia graminifolia* in 1825, and a few years later re-named *Arundina bambusifolia*. By the present rules, the name should be *A. graminifolia*. It was described as a tall species, six feet high or more, without any yellow on the lip, the flowers fairly large. Later, an *Arundina* in Java was described by Blume and named *A. speciosa*; at the same time he named plants from southern China *A. chinensis*, but did not describe them very satisfactorily. An *Arundina* imported to England from Singapore was called *A. densa*; it had a short inflorescence and large flowers with yellow on the lip. A dwarf *Arundina* from the mountains of Ceylon was called *A. minor*. Another dwarf *Arundina* from Taiping was called *A. revoluta*. A white Sumatran *Arundina* was imported to England and named *A. sandariana*. Other *Arundinas* have been described from China, Annam, Celebes, the Caroline Islands and Tahiti.

In Malaya, wild plants of *Arundina* have been collected at different places and brought into cultivation in Singapore, Penang and elsewhere. I have examined a number of these, and find that plants of different origin differ in many ways. The kinds of differences are: height of plant; size and spacing of leaves; length of scape below the first flower; branching of inflorescence; length and relative position of sepals, the upper one being at a varying angle with the laterals, and the laterals to each other; size and shape of petals, whether widest below, at or above the middle; colour of sepals and petals; size of lip and of the expanded end of the lip; distribution and intensity of purple colour on mid- and side-lobes; extent and intensity of colour of yellow patch; presence or absence and relative distribution of a purple or dull crimson colouring in the basal part of the lip; colouring of the keels. I have never seen a lowland *Arundina* without a yellow patch on the lip; but Ridley says he has seen plants on Mount Ophir without a yellow patch, like the Himalayan ones.

I crossed two different *Arundinas*, one large-flowered, from Perak, and one with smaller flowers from Penang, the two differing in details of colouring; the resulting seedlings all differed slightly from each other.

It seems to me extremely probable that the whole *Arundina* population of Malaya is a complex hybrid mixture. If we selected our plants, it would be possible to describe a number of quite distinct "species", the differences

being all of the kind indicated above. But if we were to search for Arundinas throughout Malaya, intermediates would certainly be found. The only logical conclusion seems to be to regard all as one species. The question then arises: what should it be called? Malayan Arundinas are probably more nearly related to those of Java than to those from the Himalayas, and lowland plants at least seem never to lack yellow on the lip; it would thus seem appropriate to use the Java name *A. speciosa*. But some authors admit Arundinas with a yellow patch as *A. graminifolia*; and a recent description of the wild Hong Kong Arundina shows no essential difference from the smaller Arundinas found in Malaya. I therefore prefer to use the oldest name, *A. graminifolia*, and to regard as one variable species all Arundinas from Sikkim to Java. We can select specially fine varieties for garden use and give them garden names; and there should be scope for the breeding of finer varieties than any hitherto produced by nature.

*A. graminifolia* is found in almost all parts of Malaya, in lowlands and mountains, always in open sunny places, never in the shade of the forest. It often grows in rocky places by streams, but is rarely so abundant as to make a display of colour. Apparently the Himalayan Arundinas, which have tall branched inflorescences and are seasonal in flowering, make a brighter showing; Hooker commented on their beauty. The finest Malayan varieties have quite large flowers (petals to 5 by 2-8 cm.) ; these are usually not very tall in growth. White flowers are occasionally found, but rare (they are said to be more common in Java) ; they have a little yellow on the lip. Flowers with white, or almost white, sepals and petals, with more or less purple on the lip, are more common. A variety with fairly widely separated lateral sepals has a flower of better shape than most, and is worth cultivating and breeding.

In the garden, Arundinas are quite easy to grow. They are best in beds, and grown in quantity, as most of them are not really free-flowering and an odd plant or two hardly make a show. The beds need well digging, to ensure good drainage, and the top soil should have plenty of half-rotted compost mixed with it. The plants should not be planted too deeply; the base of the stems should be only just below the surface of the soil. If new plants are top-heavy, they must be supported by sticks; the average unskilled gardener will bury them too deeply, to make them stand firm, smother the growing-points, and perhaps kill the plants. When in good growth, occasional application of liquid manure, and occasional light top-dressings of new compost (not too much at once) will keep the plants healthy.

When a stem has finished flowering, it produces side-shoots below the inflorescence. Some of these may flower, but often not well, and it is better to cut the stems right back unless they are needed for propagation. In that case, the side-shoots should be allowed to grow until they have produced a firm swelling (like a little pseudobulb) at the base, when they may be removed, and put into sand, in a cool sheltered place, where they will produce roots. This is the best way to produce a quantity of new plants; but of course quicker results are obtained by dividing the bases of large

old plants. A variety of *Arundina* grown in Singapore, with tall stems and widely-spaced leaves, has much-swollen side-shoots, as described for *A. chinensis* at Hong Kong, but the Hong Kong plants are dwarf.

*Arundinas* need a sunny place. If they are growing well, they will flower throughout the year. Each flower lasts about three days, which is not long enough for the cut-flower trade, but quite long enough for home-grown cut flowers. *Arundinas* are most attractive for this purpose, but in order to have a good bunch of flowers one must have a number of plants. It is a good plan, if possible, to have an *Arundina* bed in an inconspicuous part of the garden, and use this for cut flowers. Alternatively, the plants may be grown in pots. With good burnt earth and dry cowdung, treated in the Chinese manner, very fine pot-plants may be grown.

### DILOCHIA

Terrestrial plants; stems tall, stout, with rather broad stiff leaves; inflorescence terminal, usually branched, the bracts conspicuous; flowers usually smaller than in *Arundina*, the petals not wider than the sepals, the lip with 5 keels.

This is a Malaysian genus of five species (as at present known), closely related to *Arundina* and united with that genus by some authors. The plants however are very different in general appearance from *Arundina*, and a separation seems justified. There are two Malayan species:

- |   |           |                        |
|---|-----------|------------------------|
| Inflorescences long, straight, with few or no branches; bracts 2.5 cm. long | . . . . . | 1. <i>D. Wallichii</i> |
| Inflorescence decurved, with many branches, bracts smaller                  | . . . . . | 2. <i>D. Cantleyi</i>  |

1. ***Dilochia Wallichii*** Lindl., Gen. et Sp. Orch. 38. 1830. J.J.S., Fl. Buit. 6: 231, f. 169. Ridl., Flora 4: 126.

Stems to 150 cm. long; leaves stiff, elliptic, acute, to about 15 by 6 cm.; inflorescence erect, with few or no branches; bracts 2.5 cm. long; sepals and petals 2.5 cm. long, apparently not widely spreading, dull yellow inside, more or less purplish outside; lip yellow or yellow-green marked with purplish red; side-lobes erect, incurved, midlobe broad, rounded. Distributed in Java, Sumatra and Borneo; in Malaya not common, found at several localities in low country and at moderate elevations on the hills, on rocks and sometimes as an epiphyte. An accurate description of the flowers is needed.

2. ***Dilochia Cantleyi*** (Hk. f.) Ridl., J.L.S. 32: 332. 1896. Flora 4: 127.—  
*Arundina Car&eyi* Hk. f., F.B.I. 5: 858. 1890. Ic. Pl. t. 2112.

Stems to 200 cm. or more tall; leaves 5 by 2 to 14 by 3.5 cm., narrowly pointed; inflorescence rather compact, with several branches, each bearing a succession of flowers; bracts cream, cup-shaped, smaller than in *D.*

*Wallichii*, rachis and ovaries purplish; sepals and petals 1-2-1-8 cm. long, white or pale lemon-yellow, sepals purplish on the midline outside; lip more or less yellow, suffused with brown-orange; side-lobes erect, free ends bluntly triangular, midlobe oblong, with dilated bilobed yellow apex, 10 mm. long, 11 mm. wide, with 5 wavy white longitudinal keels; fruit almost round, purple or deep red. Distributed in Borneo and Sumatra; in Malaya exclusively a mountain species, locally common in peat bogs at Cameron Highlands and elsewhere, often occurring in open places on high mountain ridges where there is an accumulation of Sphagnum moss. **Fig. 33.**

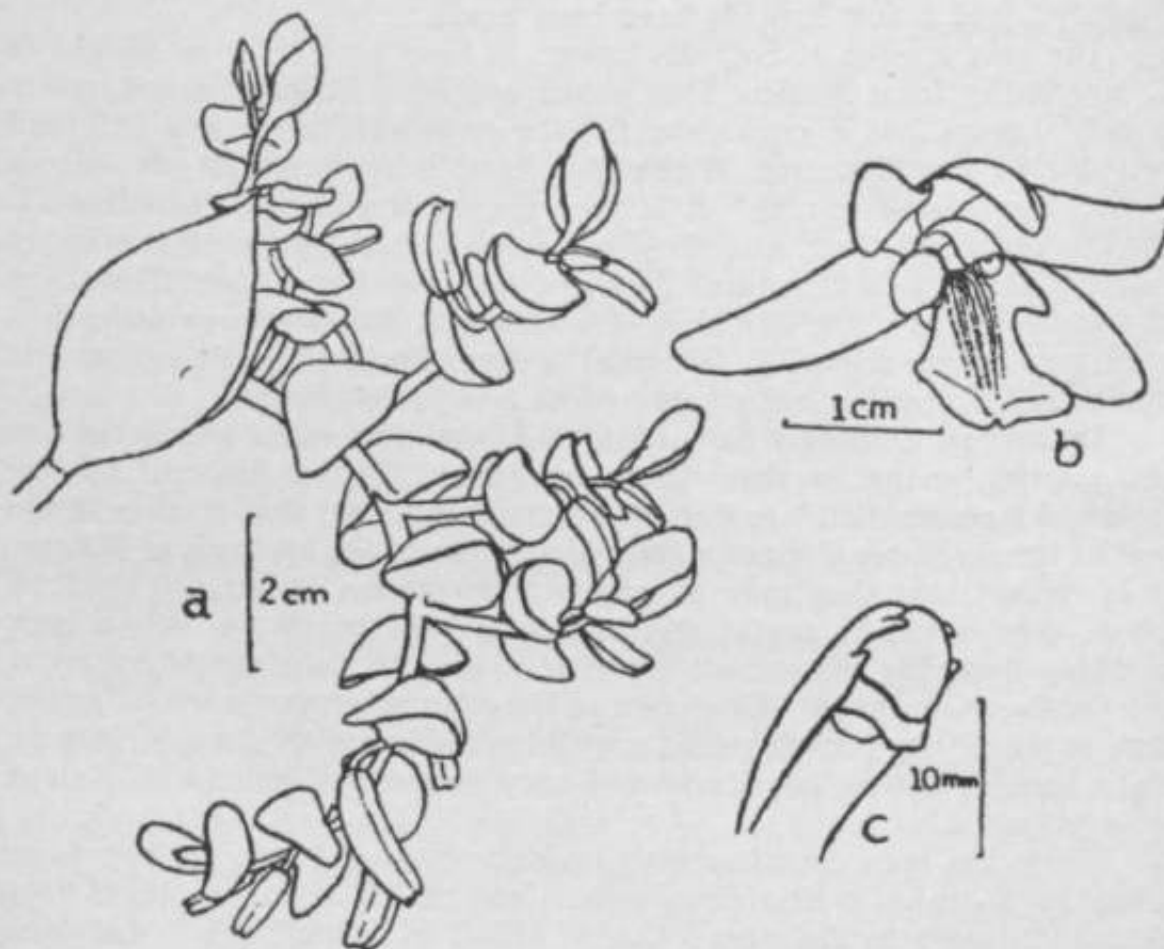


Fig. 33. *Diolochia Cantleyi*. a, young inflorescence, b, flower, c, top of column.

This is not a strikingly handsome species, but quite attractive when seen growing in quantity. It would be well worth hybridizing with the larger-flowered varieties of *Arundina*, to produce a large-flowered plant with branched inflorescence. The experiment of crossing has been made, and seeds produced which appeared good, but they failed to germinate, perhaps because the nutrient medium was not suitably acid. Further experiments would be well worth making, and would perhaps have to be carried out on the hills.

## SOBRALIA

Sobralia is a genus confined to the American tropics. The habit of the plants is much like that of Arundina, with tall slender leafy stems not swollen at the base, and terminal inflorescences. The leaves are however broader than in Arundina, and are strongly pleated, much as in Spathoglottis; they are 15 cm. or more long, and sometimes rather broad. The flowers are of similar shape and structure to those of Arundina, but many are much larger. The shape of the column is similar, but the pollinia are different and there is a small horn-like appendage, more or less developed, on either side of the top of the column. About 60 species have been described, and a few hybrids have been made.

The only species of Sobralia known to have been tried in Malaya is *S. macrantha* from Mexico. This grows poorly in Singapore, and rarely if ever flowers, but it grows and flowers quite well on Penang Hill, and very strongly at Cameron Highlands. As it has flowers 20 cm. across (when in vigorous growth) it is very showy, though unfortunately the flowers are short-lived, and they are seated at the base of the upper leaves, hardly stalked, so that they are not good for cutting. The shape of the flowers is much like that of a Cattleya. *Sobralia macrantha* is a good rosy-mauve colour. *S. leucoxantha* from Costa Rica is very similar in size and shape, but has creamy white and yellow flowers.

In Europe Sobralias have been cultivated for many years, but are not popular owing to their being unsuitable for cut-flowers. All are reckoned "intermediate" in their requirement of heat; that is, they thrive best at temperatures distinctly lower than those of the lowlands of Malaya. It is evident that they may be grown with success at our hill stations, where they would be useful and handsome bedding plants for gardens, probably flowering throughout the year. Owing to their spreading roots, the plants are probably best grown in the open wherever possible, rather than in pots. They probably need a well-drained soil with plenty of humus, and a sunny position. Introduction of more species and hybrids to Malaya is very desirable.

There has been dispute among orchidologists as to the position to be given to Sobralia in the classification scheme. It seems probable that Sobralia belongs to the same group of tribes as Arundina, but that it is not very closely related to Arundina. Attempts to cross Arundina and Sobralia on Penang Hill have been unsuccessful.

## THE LIPARIS TRIBE

Terrestrial plants and also epiphytes; *stems* (elements of the sympodium) either thin, or partly thickened into pseudobulbs of one or more internodes, bearing one to many leaves; *leaves* often plicate, or with prominent longitudinal veins, in the genus Oberonia laterally compressed, with or without a joint at the base of the blade; *inflorescence* always terminal; *flowers* in some cases with the lip uppermost; *Up* usually rather



broad, very varied in shape, not spurred; *column* short or long, without a foot; *anther* usually falling when disturbed (no filament); *pollinia* 4, waxy, without caudicles, in two groups of 2.

This tribe differs from the Nephelaphyllum tribe in having a column without foot, lip without spur, and 4 pollinia; except for some of the epiphytic species of Liparis, most species differ also in having more than one leaf on each shoot of the sympodium.

The range of plant-form in the tribe is rather large. The terrestrial species of Liparis and all Malaxis agree in having broad, thin, not jointed, plicate leaves, several to each shoot, the stem usually forming a short fleshy pseudobulb, but slender throughout in some Malaxis. The epiphytic species of Liparis have short or long pseudobulbs each with one or two jointed leaves, usually tougher than those of the terrestrial species. In Oberonia and Hippeophyllum we have an entirely different type of growth, the shoots short or long, the leaves all laterally flattened and rather fleshy, much as in the Section *Aporum* of Dendrobium.

The flowers may have the lip at the top (always in Malaxis, sometimes in Liparis; in Oberonia the lip points to the apex of the inflorescence which may be pendulous) or at the bottom. The flowers of Oberonia are all minute, but rather complex in structure. A few terrestrial species of Liparis and Malaxis have fairly large and quite decorative flowers, but none of them are likely to become common garden plants.

### Key to the genera

- Leaves not laterally compressed; epiphytes or terrestrial plants
- Lip at the top of the flower, column very short; all terrestrial .. .. *Malaxis*
- Lip at top or bottom of flower; column long; terrestrial or epiphytes . . . . *Liparis*
- Leaves laterally compressed; epiphytes
- Groups of leaves close together, column short .. *Oberonia*
- Groups of leaves 4 cm. apart; column long . . *Hippeophyllum*

### MALAXIS

*Terrestrial*, rarely epiphytic or rock plants; *stems* creeping with erect leafy apex, or short, fleshy and close together, bearing few to many leaves; *leaves* broad, ovate-acute, often unequal at the base, thin, more or less plicate, with often purplish or brownish wavy edges, stalks short, broad, passing below into sheaths without a joint; *inflorescence* terminal, erect, with many small or rather small flowers; *flowers* with lip at the top; *sepals* and *petals* spreading, or more or less curved backwards or forwards, the petals usually narrower than the sepals, the lateral sepals usually

shorter than the odd one; *lip* more or less flat, often with a hollow near the base, usually with two large lobes (called *auricles*) close to the sides of the column and extending downwards below it, the apex often toothed; *column* very short, with short broad wings; *anther* on the back of the column, its tip pointing upwards.

This is a large genus, found in the warmer parts of both Old and New Worlds, extending into north temperate regions. Schlechter estimated that about 230 species had been described, of which he himself discovered nearly 50 in New Guinea. In Malaya we at present recognize 9, but it is likely that more exist; in Sumatra 24 are known. They are terrestrial forest plants of similar habit to the terrestrial species of *Liparis*; one species at least is sometimes epiphytic in moist mossy forest, or grows on rocks. Some species have a slender creeping stem which never produces thickened pseudobulbs; how far these produce a regular sympodium is not clearly recorded, and the question needs careful field investigation. Their habit is near that of the *Goodyera* tribe, but the flowers are very different. The curious auricled lip at the top of the flower with a small hollow (containing nectar) near its base, is quite characteristic and unlike that of any other orchids. One species lacks the auricles (and perhaps also a second one). The column is always short, as in *Oberonia*.

The name *Microstylis* has been used for this genus, but is a later name than *Malaxis*, and *Malaxis* should therefore be used according to the Rules of Nomenclature. Formerly the European and American species *MaUixispaludosa* was placed alone in *Malaxis*, the tropical species being called *Microstylis*; but botanists now generally agree in uniting all in one genus.

#### Key to the Malayan species of *Malaxis*

**Lip** without auricles or with short acute auricles

Lip 3-lobed, not toothed .. .. . i. *M. latifolia*,

**Lip** toothed .. .. . 2. *M. macrochila*

T • -J.1 li J i J -i var. *minor*

**Lip** with well-developed auricles

Apex of lip not toothed .. .. . 3. *M. reniloba*

**Apex of lip** toothed or at least distinctly cleft

**Lip** with cleft apex, one tooth on each side of the cleft

Leaves to 7 by 3 cm.; lip not distinctly 3-lobed 4. *M. calophylla*

Leaves to 6 by 0.6 cm.; lip distinctly 3-lobed .. 5. *M. stenophylla*

**Lip** with at least two distinct teeth on either side of the middle

**Lip** less than 4 mm. long; leaf-blade not over

8 cm. long .. .. •• 6. *M. micrantha*

Lip more than 4 mm. long; leaf-blade often much larger

Lip 7-5-10 mm. long, with 2 or 3 long narrow teeth on each side of the middle .. 7. *M. perakensis*

Lip shorter, with 4 long narrow teeth each side of middle

Stems to 4 cm. long; leaves to 18 cm. long; auricles of lip narrow .. 8. *M. acutangula*

Stems often longer; leaves to 10 cm. long; auricles of lip broad .. 9. *M. nemoralis*

1. **Malaxis latifolia** Sm., Rees Cycl. 22: no. 3. 1819.—*Microstylis latifolia* J.J.S., Fl. Buit. 6: 248, f. 185. 1905.—*Dienia congesta* Lindl., Gen. et Sp. Orch. 22. 1830.—*Microstylis congesta* Rchb. f., Walp. Ann. 6: 206. 1861. King & Pantl., Ann. Calc. 8: 19, pi. 23. RidL, Flora 4: 12.

Stems close, to about 10 cm. long, thick, 4-5 leaved; leaf-blade 12-22 cm. long, 4-7 cm. wide, stalk broad, with sheath 4-7 cm. long, purplish; scape stout, to 20 cm. long, rachis 5-20 cm., flowers small, close, bracts 5 mm. long, reflexed; flowers yellow-green, more or less flushed with purple, the sepals and petals all curved forwards; upper sepal 3 by 1 mm.; lateral sepals 3 by 1-5 mm.; petals 3-5 by 0-5 mm.; lip barely 2 mm. long and wide, 3-lobed, the midlobe narrow, the side-lobes broad, blunt, no auricles. Distributed from India and China to Australia; in Malaya throughout, in lowland forests. **Fig. 34, a-d.**

2. **Malaxis macrochila** (Rolfe) Holtt., Gard. Bull. 11: 282. 1947.—*Microstylis macrochila* Rolfe, Kew Bull. 1895: 6.  
Var. *minor* Ridl., Flora 4: 11. 1924.

Stems 2-5 cm. long, 3-leaved; leaves about 6 by 3 cm.; inflorescence 10<sup>1</sup> cm. tall, with about 6 flowers near the top; sepals and petals narrow, 9 mm. long; lip green, strongly veined, 7 mm. across, rounded, the base broad and nearly straight with short acute auricles, the upper edge with 3 teeth 2 mm. long each side of the sinus. Found once, at Langkawi. The specimen (at Kew) does not agree well with that of the original *M. macrochila*, which had a lip 1-2 cm. long, almost round, purple, with very broad auricles; probably var. *minor* is a distinct species.

3. **Malaxis reniloba** (Carr) Holtt., Gard. Bull. 11: 283. 1947.—*Microstylis reniloba* Carr, Gard. Bull. 7: 5. 1932.

Stems stout, to 13 cm. long, base 1-5 cm. thick, covered with sheaths, 6-7-leaved; leaf blade to 13 by 4-5 cm. (exceptionally to 17 by 6-7 cm.), green, stalk and sheath to 5 cm. long, purplish; scape to 8 cm., rachis to 9 cm., flowers many, green, 1 cm. long and wide; upper sepal 7 by 3-5 mm., lateral sepals 6 by 3-5 mm., petals 7 by 2 mm.; lip not toothed, 7-5 mm. long, 9 mm. wide when spread out, 3-lobed; midlobe triangular, blunt, 2 mm. long, 3 mm. wide, side-lobes and auricles forming a broad oblique ellipse on each side of the lip, the auricles nearly touching. Found only in Perlis, on limestone hills. **Fig. 34, i.**

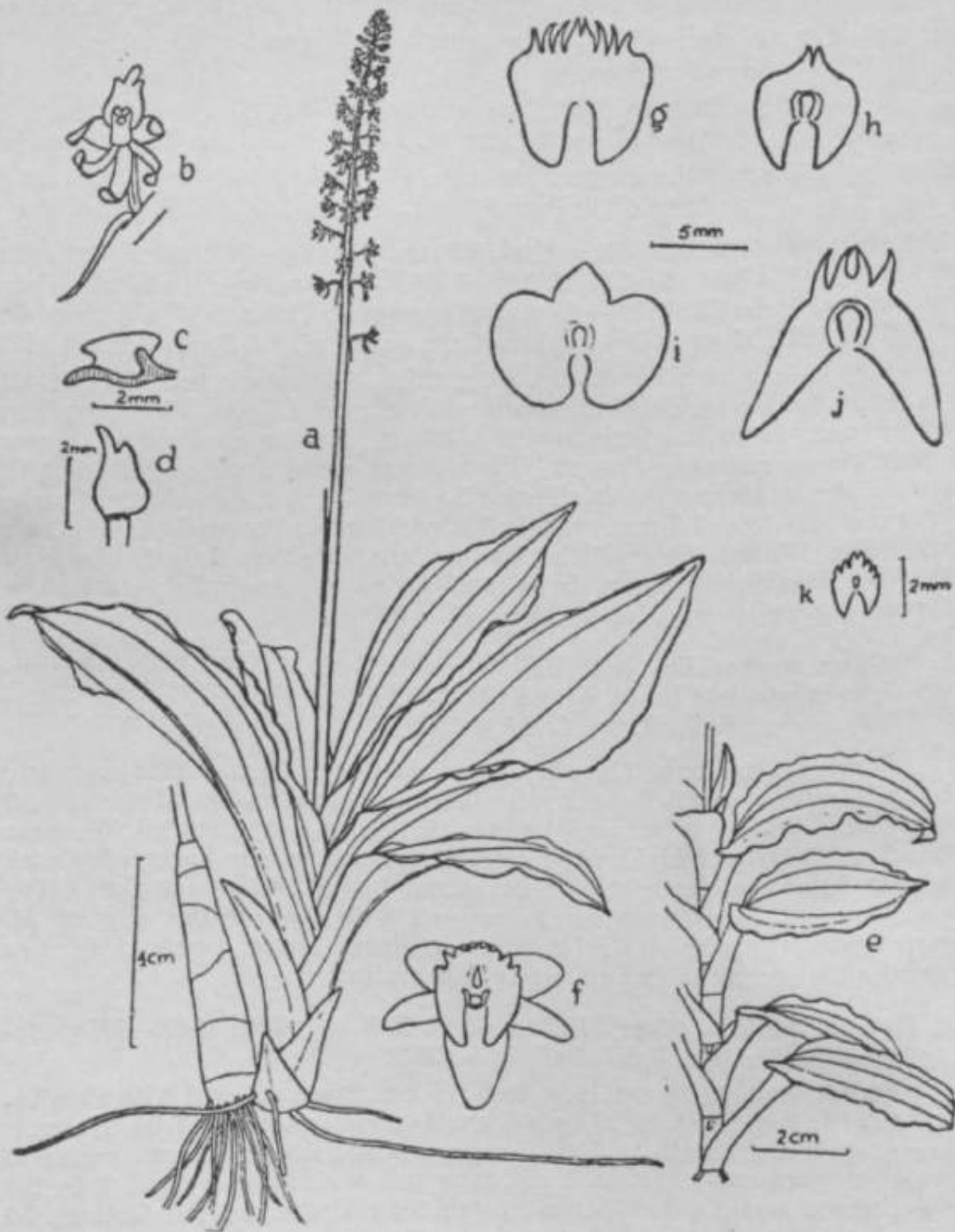


Fig. 34 *Malaxis*. a, *M. latifolia*, after Carr. b, flower of same, after de Alwis. c, d, lip in section and from side, after J. J. Smith, c, l, *AT. micrantha*, after de Alwis. e, lip of *AT. nemoralis*. h, lip of *M. calophylla*. j, lip of *M. reniloba*. k, lip of *M. perakensis*. k, flattened lip of *M. mivrantha*. {g-k after Carr}.

4. **Malaxis calophylla** (Rchb. f.) O. Ktze., Rev. Gen. PL 673. 1891.—*Microstylis calophylla* Rchb. f., Gard. Chron. 1879, ii: 718. Ridl., Flora 4: 11.—*Microstylis Scottii* Hk. f., F.B.I. 5: 678. 1890. Bot. Mag. t. 7268.

Stems stout, short, erect, with about 3 leaves and some sheaths below them; leaf-blade to 7 by 3 cm. (in Siamese specimens to 12 by 4.5 cm.), bronze with spotted green crisped edges, broad stalk and sheath together about 2 cm. long; scape 5-8 cm., rachis to 10 cm. long (to 10 and 15 cm. in Siamese plants); bracts narrow, to 5 mm. long; flowers numerous, small, pale pink or pink and cream; upper sepal about 3.5 mm. long, lateral sepals 2.5 by 1 mm.; petals narrow, as long as upper sepal; lip little over 3 mm. long, with 2 teeth at the apex (i.e., the apex is cleft), auricles nearly as long as blade. Distributed to Lower Siam; found also on Penang Hill and on steep limestone at Baling in Kedah. The plants found in Malaya are small; the larger size of Siamese plants is indicated above. It is possible that an extra pair of teeth may also sometimes be found on either side of the cleft apex of the lip. The foliage is pretty. Fig. 34, h.

5. *Malaxis stenophylla* Holtt., Gard. Bull. 11: 283. 1947.

Pseudobulbs (or stems) about 1 cm. tall, bearing about 6 leaves; largest leaves to 6 cm. long and 0.6 cm. wide, narrowed to tip and to sheathing base 1 cm. long, edge slightly crisped; inflorescence to 12 cm. tall, slender, the scape to 5 cm.; flowers 3-5 mm. apart, few open together; bracts 3-5 mm. long; pedicel and ovary at flowering 4-5 mm. long; sepals 2 mm. long, broad; petals much narrower; lip 2-5 mm. long in all, and nearly as wide, distinctly 3-lobed, the lobes nearly equal; side-lobes almost evenly elliptical, each extended beyond the column as a short rounded auricle; midlobe almost heart-shaped, with a rounded tip shortly cleft, the two points curved a little towards each other, the sinus rounded; column short, with distinct short wings. Found once only, on G. Padang, Trengganu, at 4,000 feet. This is probably nearest to *M. calophylla* but has very narrow leaves and a distinctly 3-lobed lip. The shape of the side-lobes is nearly as in *M. reniloba*, but the whole lip is much smaller in *M. stenophylla* and the midlobe proportionately much longer than in *M. reniloba*. No colours are recorded.

6. *Malaxis micrantha* (Hk. f.) O. Ktze., Rev. Gen. PL 673. 1891.—*Microstylis micrantha* Hk. f., Ic. PL t. 1834. 1889. Ridl., Flora 4: 12.—*Microstylis flavoviridis* Ridl., J.S.B.R.A.S. 61: 37. 1912. Flora 4: 12. (?).—This is very near *Microstylis oculata* Rchb. f.

Stem creeping at base, with 6-12 or more leaves, the internodes about 1 cm.; leaves flushed with brown or purple, especially on the sheaths, edges crisped, blade usually about 6 by 2.5 cm. (rarely to 8 by 3 cm.), the sheath and stalk 2 cm. long; inflorescence to 22 cm. long, including purplish scape of 5-12 cm. bearing a few narrow flowerless bracts; floral bracts 4 mm. long; flowers many, small, greenish yellow, more or less flushed with purple; sepals and petals with edges reflexed; upper sepal 2.5-

by barely 1 mm.; lateral sepals 2 by 1 mm.; petals about 2.5 by 0.5 mm.; lip 2.5-3.5 mm. **long**, tip curved forwards, auricles nearly equal to the blade in length; blade ovate-triangular, the apex more or less deeply cleft with 2 or 3 more teeth each side, the outermost very small. Found on mountains at about 2,000-4,000 feet (Taiping Hills, Fraser's Hill etc.) and in lowland forests in the south; very near *M. oculata* from Java. The size of the lip, and the length of its teeth varies a little. There may be a distinct species with green leaves and shorter stems, but if so it has very similar flowers, and the distinctions need careful checking in the field. **Fig. 34, e, f, k.**

7. **Malaxis perakensis** (Ridl.) Holtt., Gard. Bull. 11: 283. 1947.—*Microstylis perakensis* Ridl., J.L.S. 32: 222. 1896. Flora 4: 11.—*Microstylis longidens* **J.J.S.**, Bull. Btze., Ser. 2, XXVI: 25. 1918 (a variety of *M. perakensis*?).

Stem ascending from creeping base, to 10 cm. long, with 6-10 leaves; leaves green (?), blade to 15 by 5 cm., stalk and sheath to 5 cm.; inflorescence to 30 cm. tall, the scape 6-12 cm., bracts to 7 mm. long; sepals and petals pink, lip purple, column green; upper sepal 4-5 by 2 mm., lateral sepals shorter and wider; petals to 5 by 1 mm.; lip 7-5-10 mm. long, auricles narrow, about half total length, spreading, apical teeth long and narrow (to 2 mm. long), 2 or 3 on each side of the middle. Terrestrial in forests at 400-1,200 feet altitude (perhaps also higher), in Perak, Pahang and Negri Sembilan, not found in the south. A Java species named *Microstylis longidens* appears to be identical with this. **Fig. 34, j.**

8. **Malaxis acutangula** (Hk. f.) O. Ktze., Rev. Gen. PL 673. 1891.—*Microstylis acutangula* Hk. f., Ic. Pl. t. 1835. 1889. Ridl., Flora 4: 11. (? = *M. Blumei* Boerl. et J.J.S.).

Stems to about 4 cm. long, 4-5-leaved; leaves green, blade to 18 by 5 cm., stalk and sheath to 5 cm.; inflorescence about 20 cm. tall, the scape usually short; flowers green; upper sepal nearly 5 by 1 mm., lateral sepals about 4 by 1.5 mm.; petals about 5 by less than 1 mm.; lip 5-5 mm. long, broad, the auricles about half the total length, teeth narrow, 4 on each side of the middle. Found on Taiping Hills and Bukit Hitam, on rocks and trees; near *Microstylis Blumei* of Java, which has a similar habitat. This species is near *M. perakeiisis* in the shape of its flowers but differs in its habit and the lip is smaller. The exact shape of the lip and its natural position on the flower need to be observed more accurately; the only records are from dried specimens.

9. **Malaxis nemoralis** (Ridl.) Holtt, Gard. Bull. 11: 283. 1947.—*Microstylis nemoralis* Ridl., J.S.B.R.A.S. 54: 47. 1910. Flora 4: 13.

Stems arising from creeping base, usually short, with 4 to 8 leaves; leaves more or less flushed with purple, blade to 10 by 4.5 cm., stalk and sheath about 3.5 cm.; scape 8-12 cm., rachis to about 7 cm. with rather few flowers; flowers red with an orange lip; upper sepal about 5 by 1.5 mm., laterals 4 by 2.5 mm., petals 5 by less than 1 mm.; lip nearly round in outline, about 7 mm. long and 6 mm. wide, the auricles broad, shorter

than the blade; tip of blade deeply cleft, with 3 long narrow teeth on either side, the longest over 2 mm. long. Found in Malacca and Johore in swampy forest; perhaps also in Pahang. This is probably distributed throughout southern Malaya, but not easy to identify except when flowering. **Fig.** 34, g.

### LIPARIS

Terrestrial plants and epiphytes; stems forming more or less elongated pseudobulbs, 1- or more-leaved; leaves more or less plicate, broad and thin without a joint at the base, or narrower and tougher with jointed base; inflorescence terminal, erect, usually bearing many flowers which are small to medium-sized; sepals and petals erect or reflexed; lip not 3-lobed, usually bent at or below the middle, often cleft at the apex, the edges often toothed or fringed; column rather long, curved, slightly winged, rarely short; anther with its apex pointing forwards or downwards in front of the column.

This is another large genus, the species numbering more than 200 and extending to almost all parts of the earth except the arctic and antarctic. There is much more variety of vegetative habit than in *Malaxis*. The four terrestrial species (nos. 5 to 8) are closely similar to *Malaxis* in general appearance, but have the lip at the bottom of the flower, without auricles. They are perhaps seasonal in growth and flowering, and observations on their behaviour would be interesting. Then we have a very peculiar group of terrestrial or rock plants with the pseudobulb thickened only above the base of the single leaf (nos. 1-4); the leaves of these are also unjointed. *L. ferruginea*, with narrow unjointed leaves, is a rather intermediate type. The rest of the genus are epiphytes (or in a few cases may sometimes grow on the ground), and have only one or two leaves, rather long and narrow, jointed at the base and falling when old. The inflorescences of the epiphytic species have a flattened or terete scape; the rachis in most cases is long, bearing flowers facing all ways, but in a few species it is short, with crowded 2-ranked bracts, producing only a single flower at a time and elongating slowly for many weeks. The flowers of many epiphytic species face towards the rachis, with the lip towards the top of the inflorescence. The lip of these is nearly always sharply bent, at or below the middle, and this bent lip with the rather long curved column, and absence of column-foot, makes these species very easy to recognize. The bracts are always narrow and often reflexed. The prevailing colours of the flowers throughout the genus are greenish-yellow and purple; sometimes a single species may have either greenish or purplish flowers, or old flowers may become purplish. More details of colour are needed.

#### Key to the Malayan species of *Liparis*

Leaves not jointed at the base; terrestrial or **rock**  
plants

Leaves broad (not more than 3 times longer  
than wide)

- Pseudobulb short, bearing the inflorescence at its apex, and one leaf attached at its base
- Apex of lip not bilobed
- Lip with fringe of hairs 2.5 mm. long all round . . . . . 1. *L. purpureo-viridis*
- Lip** with 6-8 long slender teeth at apex 2. *L. Maingayi*
- Apex of lip distinctly bilobed
- Lobes narrow, acute, not toothed . . . . . 3. *L. parvula*
- Lobes not narrowed to tip, tips with a few long teeth . . . . . 4. *L. furcata*
- Pseudobulbs longer, each with several leaves
- Sepals and petals 1.5 cm. or more long
- Lip crimson-purple, with broad slightly 2-lobed apex . . . . . 5. *L. atrosanguinea-*
- Lip pale greenish with crimson-purple veins, tip broadly pointed, not at all bilobed . . . . . 6. *L. tricallosa*
- Sepals and petals not over 8 mm. long
- Lip 7 mm. long with toothed apex; mainly lowlands . . . . . 7. *L. Wrayi*
- Lip to 4.5 mm. long, not toothed; mountains . . . . . 8. *L. Rheedii*
- Leaves about ten times longer than wide . . . . . 9. *L. ferruginea*
- Leaves jointed at the base, 1 or 2 to each pseudobulb, mainly epiphytes
- Flowers facing all ways; bracts not in 2 close opposite ranks
- Scape slightly flattened, with narrow wing along each edge
- Column with a wing down each side, a very narrow wing 1.5 mm. long spreading from each side of the stigma, and 2 triangular wings on the front edges . . . . . 10. *L. hirundo*
- Column not winged in this way
- Sepals and petals about 6 mm. long; pedicel with ovary 1 cm. . . . . 11. *L. bootanensis*
- Sepals and petals not over 3.5 mm. long; pedicel with ovary to 5 mm.
- Pseudobulbs 2-leaved . . . . . 12. *L. viridiflorcL*
- Pseudobulbs 1-leaved . . . . . 13. *L. csespitoscu*



- Scape not flattened nor winged  
 Pseudobulbs 1-leaved  
 Lip bilobed; lobes with long slender  
 teeth . . . . . 14. *L. lacerata*  
 Lip bilobed; lobes with very short teeth  
 Pseudobulbs to 8 cm., leaf to 30 cm.  
 long . . . . . 15. *L. latifolia*  
 Pseudobulbs to 2.5 cm., leaf to 12 cm.  
 long . . . . . 16. *L. rhombea*  
 Pseudobulbs 2-leaved  
 Inflorescence erect; pseudobulbs 2-3  
 cm. long  
 Sepals 4 mm,\* pedicel and ovary 4 mm.  
 long . . . . . 17. *L. elegans*  
 Sepals 6 mm., pedicel and ovary at  
 flowering 10-12 mm. long (fruit-  
 ing pedicel 2 cm.) . . . . . 18. *L. viridicollus*  
 Inflorescence curved from an erect base;  
 pseudobulbs longer  
 Sepals about 7 mm. long . . . . . 19. *L. bicolor*  
 Sepals 3 mm. long . . . . . 20. *L. parviflora*  
 Bracts in two close opposite ranks; flowers in  
 succession  
 Leaf to 35 by 3 cm.; lip 1 cm. wide . . . . . 21. *L. compressa*  
 Leaf to 20 by 0.8 cm.; lip 3-5 mm. wide . . . . . 22. *L. gibbosa*

**1. *Liparis purpureoviridis* Burk. ex Ridl., Flora M.P. 4: 21. 1924.**

Stems very short, each bearing a single leaf with sheaths below it, the stem swollen above the attachment of the leaf, with small sheath at its apex, at the base of the scape; leaf-blade heart-shaped, acute, to about 8 by 7 cm., veins dark green with paler patches between them, stalk and sheath 2-3 cm.; inflorescence 15-25 cm. long, the scape to 12 cm.; bracts 6 mm., pedicel and ovary 1-2 cm. long; sepals pale green, 1-2 by 0.3 cm.; petals dark purple, 1-2 cm. long, less than 1 mm. wide; lip 9-10 mm. long, 9-10 mm. wide including the fringe, with a short narrow purple base from which 2 low keels diverge on to the blade, the blade ovate, blunt, greenish white with purple veins and a fringe of purple hairs 2-5 mm. long all round. Distributed to Sarawak; in Malaya only found at Fraser's Hill and G. Tahan, terrestrial and on mossy rocks in forest. It is a very attractive species.

**2. *Liparis Maingayi* (Hk. f.) Ridl., J.L.S. 32: 226. 1896. Flora 4: 21.—  
*Microstylis Maingayi* Hk. 1, Ic. Pl. t. 1826. 1889.**

Habit of no. 1; leaf 7 by 5 to 14 by 10 cm., ovate-acute, stalk and sheath short; inflorescence to about 15 cm. tall, the scape to 4 cm.; bracts 5 mm. long, pedicel and ovary 8 mm.; flowers many, deep crimson; sepals and

petals about 5 mm. long; lip about 5 mm. long including the teeth, nearly oblong, widening somewhat from the base, the apex not cleft, with 3 or 4 long slender teeth on each side of the middle. Distributed to Sumatra; in Malaya found on wet rocks in forest at 2,000–4,000 feet on Penang Hill, Taiping Hills and Mt. Ophir.

3. *Liparis parvula* (Hk. f.) Ridl., J.L.S. 32: 226. 1896. Flora 4: 22.—  
*Microstylis parvula* Hk. f., Ic. Pl. t. 1827B. 1889.

Habit of (under 2 cm.) on fl. flowering plants, inflorescence to about 8 cm. tall, bracts 1.5 mm. long, ovate, acute, to 5 by 3 cm., often much smaller than 2 mm. long and about 1 mm. wide; petals half as wide as sepals, 1.5 mm. long, heart-shaped, nearly 1.5 mm. wide near the base, curved acute entire lobe near the tip, the tips of lobes close, small, deep red. Known only on Taiping Hills, on wet rocks at 2,000 feet.

4. *Liparis furcata* (Hk. f.) Ridl., J.L.S. 32: 226. 1896. Flora 4: 22.—  
*Microstylis furcata* Hk. f., Ic. Pl. t. 1827A. 1889.

Habit and leaf similar to nos. 2 and 3; leaf-blade to 6.5 by 3.5 cm.; inflorescence to 18 cm. tall, scape 3.5–6.5 cm.; flowers many, bracts 2 mm., pedicel and ovary 3 mm.; sepals and petals about 2 mm. long, the sepals much wider than petals; lip longer than sepals and petals, similar in shape to that of no. 3 but with longer broader lobes which are of even width throughout and have long teeth at the tip and small teeth on their outer edges. Known only from the Taiping Hills; very near to no. 3 but apparently always larger and with a different lip; no colour of the flowers has been recorded. Further information about the two species is desired.

5. *Liparis atrosanguinea* Ridl., J.S.B.R.A.S. 39: 71. 1903. Flora 4: 19.—  
*L. tabularis* Rolfe, Kew Bull. 1908: 68. Bot. Mag. t. 8195.

Pseudobulbs about 12 cm. long and 2 cm. thick at base, bearing several leaves; leaf-blade to 13 by 5 cm., edges crisped and pinkish, stalks short and broad; scape stout, about 15 cm. long, rachis 15 cm. or more with many well-spaced crimson-purple flowers; upper sepal about 1.6 by 0.3 cm.; lateral sepals 1.3 by 0.3 cm.; petals 1.5 by 0.1 cm.; lip broadly ovate, 1.7 by 1.3 cm., slightly 2-lobed at the tip with a shallow rounded sinus between the lobes, edges finely toothed, base with a short median callus. Found only on the Taiping Hills. At the Gap in Selangor a rather smaller-flowered plant has been found, which may be a distinct species; the upper sepal of this is 1.3 cm. long, the lip 1.1 cm., thus proportionately smaller, and obovate. No colour notes are available.

6. *Liparis tricallosa* Rchb. f., Gard. Chron. N.S. 11: 684. 1879. Ridl., Flora 4: 20. Bot. Mag. t. 7804.

Habit of no. 5 but larger, leaf-blade to 18 by 6.5 cm.; inflorescence to 45 cm. tall, stout, scape and rachis purple; sepals pale greenish, the upper one 2 cm. by 2 mm., the laterals shorter; petals about same length

as upper sepal, very narrow, purple with greenish base; lip about 1.8 cm. long and wide, pale greenish with rose-purple veins (on old flowers somewhat suffused with pink generally), broadly ovate, the tip broadly pointed, the edges minutely toothed towards the tip. Distributed from Sumatra to the Philippines; in Malaya found in the lowlands and to about 2,000 feet, in many localities. Flowering appears to be seasonal, the month varying in different parts of the country (perhaps more than once a year ?).

7. **Liparis Wrayi** Hk. f. F.B.I. 6: 181. 1890. Ridl., Flora 4: 21. J.J.S., Bull. Btzg., Ser. 2, IX: 45. 1913.—*L. pectinifera* Ridl., J. Bot. 36: 210. 1898. J.J.S., Fl. Buit. 6: 265, f. 203.

Pseudobulbs to about 12 cm. tall, bearing about 4 leaves, with sheaths below them; leaf-blade to 14 by 7 cm., base unequal, stalk and sheath to 5 cm.; inflorescence to about 20 cm. tall, the scape 6-12 cm., flowers well spaced, bracts 2-3 mm. long, pedicel and ovary 8 mm.; flowers pale green; upper sepal 8 by 2 mm., bent back; lateral sepals shorter and a little wider; petals 7 by 0.5 mm., curved forwards; lip 7 mm. long, 4 mm. wide at base, widening to 5 mm. near broad slightly bilobed toothed apex, with a small callus at the base and two purplish patches in the middle. Distributed to Java, Borneo and Sumatra; in Malaya found in fresh-water swamp forests in Singapore, Johore and Perak.

8. **Liparis Rheedii** (Bl.) Lindl., Gen. et Sp. Orch. 27. 1830. J.J.S., Fl. Buit. 6: 264, f. 202.—*Malaxis Rheedii* Bl., Bijdr. 389, f. 54. 1825.—*Liparis transtillata* Ridl., J.L.S. 32: 225. 1896. Flora 4: 21.

Pseudobulb to 12 cm. long, bearing 4-5 leaves; leaf-blade to 20 by 10 cm., green, acute, base unequal, stalk and sheath about 5 cm.; inflorescence to 40 cm. tall, the scape to about 20 cm., bracts to 9 mm. long, pedicel and ovary to 9 mm., flowers many; sepals and petals greenish or purplish, 5-5 mm. long, sepals 2 mm., petals 1 mm. wide; lip yellowish or dark purple, 3-4-4-5 by 2-5-3-5 mm., strongly bent backwards in the middle, base broad, widened somewhat to the broadly rounded slightly notched not toothed tip (edges slightly wavy) ; callus at base of lip green, broad, short, with a concave front. Distributed from Sumatra to New Guinea; in Malaya found in mountain forests at many localities, at about 4,000 feet.

9. **Liparis ferruginea** Lindl., Gard. Chron. 1848: 55. Ridl., Flora 4: 20. —*L. odorata* sensu J.J.S., Fl. Buit. 6: 263, f. 201 (? of Lindl., Gen. et Sp. Orch. 26. 1830).

Stems very short, swollen, not rising above ground level, each bearing 3 or 4 leaves of unequal size and sheaths below them; leaf-blade 16 by 1.5 to 30 by 2.5 cm., narrowed gradually to a broad stalk up to 10 cm. long; scape stout, 20-30 cm. long, rachis to 20 cm. or more, bearing many flowers; flowers pale yellow-green with purple lip (sometimes entirely purple ?) ; upper sepal 7 by 2 mm., lateral sepals shorter, petals about 6 by 1 mm.; lip 4 by 3 mm., the apex broad, notched, with a small tooth in

the sinus. Probably widely distributed in Malaysia (called *L. odorata* i\*\* Java), doubtfully to India; in Malaya found in low country, in open swampy ground, among grasses and similar plants, in many localities.

**10. *Liparis hirundo*** Holtt., Gard. Bull. 11: 281. 1947.

Pseudobulbs ovoid, about 6 mm. tall; leaves 2, blade to 20 by 0.5 cm., elliptic, acute; stalk and sheath, below the joint, to 6 mm. long; inflorescence to about 7 cm. long, very slender, the scape short and narrowly winged; flowers about 5 mm. apart on narrowly winged rachis; bracts 2-3 mm. long, pedicel and ovary 5-6 mm.; sepals with reflexed edges, about 3-5 mm. long, the laterals close together, apparently joined in the basal part; petals very narrow, not over 2.5 mm. long; lip about 2.5 mm. long, the fleshy base pressed to the base of the column, with a small round hollow in front; rest of lip bent at right angles to the column, abruptly widened at its base, nearly oblong, with short recurved triangular lobes at its basal corners, the apex broadly rounded, with a very short tip; column 2.5 mm. long, curved, a wing down each side, a very narrowly triangular wing 1.5 mm. long on each side of the stigma, and a short triangular wing on each front edge near the top. Found only twice, at Cameron Highlands. Related to *L. decurrens* and a few other species of Java, Sumatra and the eastern Himalayas, but none of them are so small, and none have the long wings on each side of the stigma. These wings are spreading and curved slightly backwards, and in that position have the shape of a swallow's wings in flight, the anther representing the head of the bird and the front column-wings its breast. **Fig. 35.**

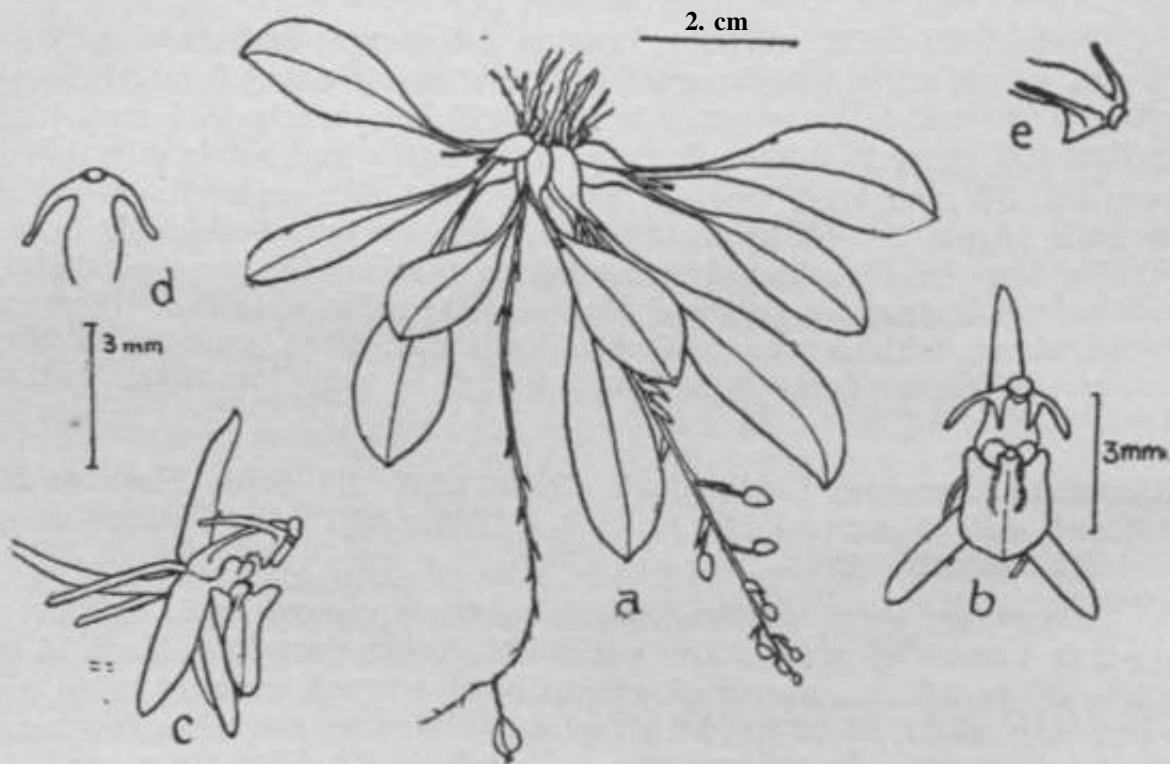


Fig. 35- *Liparis hirundo*. a, plant. b, c, flower from front and from side, d, e, column.

11. **Liparis bootanensis** Griff., Notul. 3: 278. 1851. Ic. PL Asiat. 3: t. 287. Ridl., Flora 5: 337.—*Liparis lancifolia* Hk. f., F.B.I. 5: 700. 1890. Ic. Pl. t. 1855.

Pseudobulb about 1.5 cm. tall, 1-leaved, with a basal sheath 5 cm. long; leaf to 24 by 2-3 cm., narrowed evenly to base and apex, acute, hardly stalked; inflorescence to about 18 cm. tall, the scape 11 cm., flattened and narrowly winged, bearing no bracts; flowers about 12, bracts 4-6 mm. long, pedicel and ovary 1 cm.; flowers light red-brown with green column and green calli on lip; sepals and petals about 6 mm. long; lip 6 by 5 mm., base erect, blade turned downwards, widening from a narrow base to a broad almost straight slightly toothed apex, with 2 small calli near base. Distributed from the eastern Himalayas southwards to Gunong Raya, Langkawi Islands.

12. **Liparis viridiflora** (Bl.) Lindl., Gen. et Sp. Orch. 31. 1830. J.J.S., Fl. Buit. 6: 268. Bull. Botg., Ser. 3, 3: 271; 5: t. 34, IV; 9: 483.—*Malaxis viridiflora* BL, Bijdr. 392. 1825.—*Liparis longipes* Lindl. in Wall., PL Asiat. Rar. 1: 31, t. 35. 1830. Ridl., Flora 4: 23. King & PantL, Ann. Calc. 8: 29, pi. 37.

Pseudobulbs close, flattened, 3-9 cm. long, 2-leaved; leaves to 27 by 3-7 cm., widest near acute tip, narrowed gradually to base, hardly stalked; scape 6-12 cm., flattened and narrowly winged, to 3 mm. wide; rachis to 15 cm., flowers very crowded, bracts 5 mm. long, pedicel and ovary 5 mm.; flowers small, pale greenish with orange-yellow lip; sepals and petals 3 mm. long, reflexed, sepals wider than petals; lip at top of flower, when spread out 3 by 2 mm., basal half erect and concave, distal half bent at a right angle to it, widest near very broadly pointed apex, not toothed nor lobed. Distributed from India and Ceylon to the Philippines; in Malaya apparently not common, found in mountains and lowlands in Penang, Perak and Pahang, sometimes on rocks with *L. elegans* (Penang Hill).

13. **Liparis caespitosa** (Thouars) Lindl., Bot. Reg. 11: sub t. 882. 1825. J.J.S., Fl. Buit. 6: 266, f. 204.—*Malaxis caespitosa* Thou., Orch. lies d'Afr. t. 90. 1822.—*Liparis pusilla* Ridl., J.L.S. 22: 294. 1886. Hk. f., F.B.I. 5: 701. Ic. PL t. 1856A. King & PantL, Ann. Calc. 8: 32, pi. 41.—*L. comosa* Ridl., J.L.S. 32: 229. 1896. Flora 4: 23.

Pseudobulbs close, ovoid, about 1-2 cm. long, wrinkled when old, 1-leaved; leaf to 15 by 1 cm. (rarely to 20 by 1.5 cm.) widest near tip, narrowed very gradually to base; inflorescence erect, about as long as leaf, scape to 8 cm. long, winged, to 2 mm. wide, usually without bracts; flowers close, many, bracts to 5 mm. long, pedicel and ovary 4 mm.; sepals and petals very pale greenish, 2-5-3-5 mm. long, reflexed, sepals 1 mm. wide, petals narrower; lip fiddle-shaped, basal part erect, distal part bent downwards, the broad apex with a very short tip. Distributed from eastern tropical Africa, Madagascar, Ceylon and N. E. India, to the Philippines (originally described from the Mascarene Islands); in Malaya fairly common, on rocks and trees from 1,000 to 4,500 feet, often forming dense tufts. **Fig. 36.**

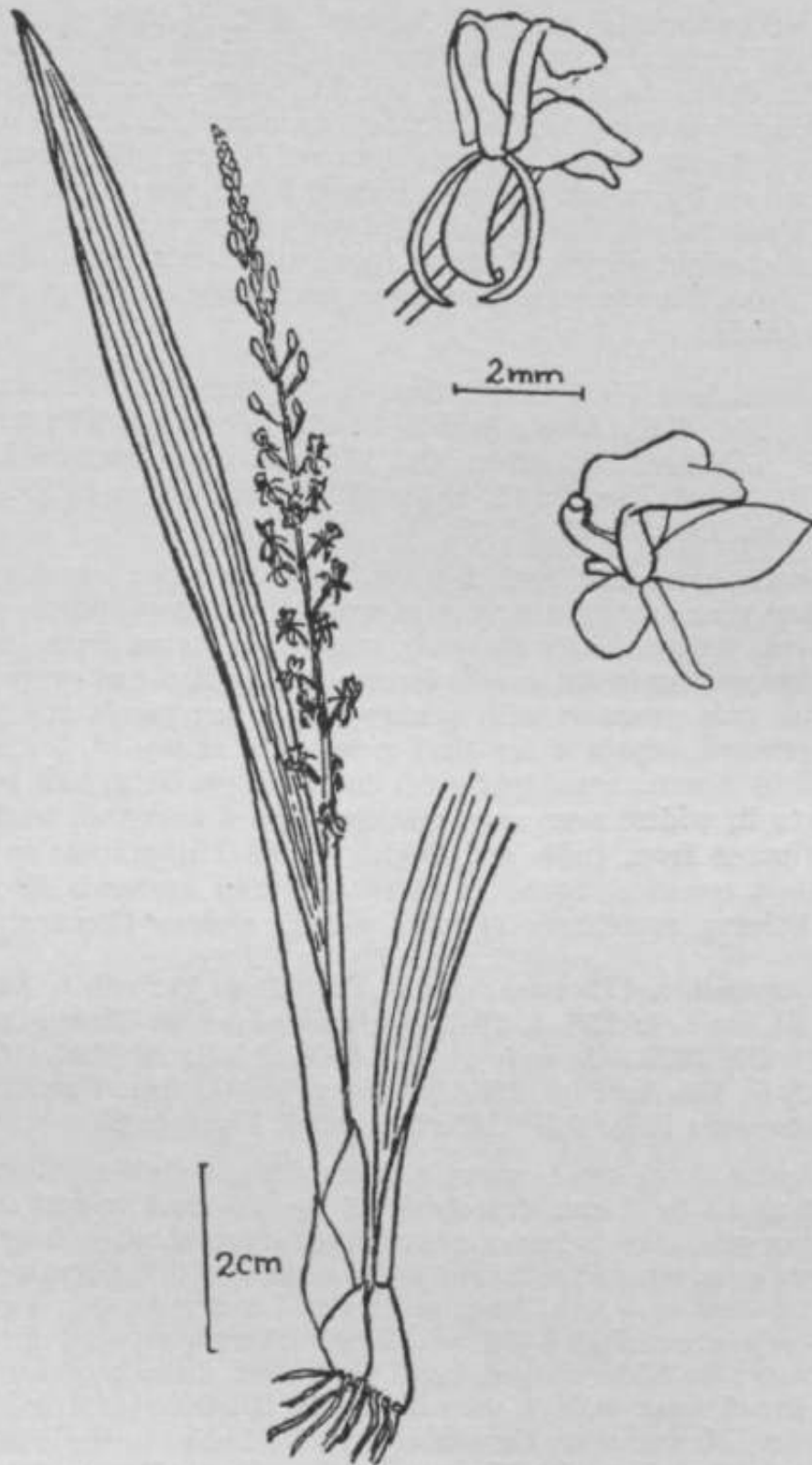


Fig. 36. *Lipa-ris caespitosa*, plant and 2 flowers.

14. **Liparis lacerata** Ridl., J.L.S. 22: 284. 1886. Flora 4: 22.

Pseudobulbs 2-3 cm. tall, ovoid, 1-leaved, with sheath at base to 5 cm. long; leaf-blade to 18 by 3-8 cm., acute, equally narrowed to base and apex, stalk to 4 cm.; inflorescence about 20 cm. tall, the scape 5 cm., flowers not crowded, bracts 3 mm. long, pedicel and ovary 8 mm.; flowers white with orange lip; upper sepal 6 by 2 mm., lateral sepals a little shorter; petals 6 by 1 mm.; lip 8 mm. long, base widening abruptly to 4-5 mm., erect for a short distance, with a small transverse callus, hollow in front, rest of lip bent sharply away from the column, narrowed a little in the middle, apex widening to 6-5 mm., deeply 2-lobed, the lobes diverging, with broad ends each bearing about 6 slender teeth 1-5 mm. long. Distributed to Borneo and Sumatra; in **Malaya** only found in S.E. Johore, at Kuala Teku in Pahang, and on the Taiping Hills.

15. **Liparis latifolia** (Bl.) Lindl., Gen. et Sp. Orch. 30. 1830. J.J.S., FL Buit. 6: 271, f. 208. Ridl., Flora 4: 22.—*Malaxis latifolia* Bl., Bijdr. 393. 1825.—*L. Scortechinii* Hk. f., F.B.I. 5: 703. 1890. Ic. Pl. t. 2009.—*L. robusta* Hk. f., Ic. Pl. t. 2012. 1890.

Pseudobulbs 1-leaved, about 8 cm. long, flattened and narrowed upwards, 3 cm. wide at base which is covered with several large red-brown sheaths; leaf to 33 by 7-3 cm., apex rather broadly pointed, narrowed to channelled but hardly stalked base; inflorescence erect, about as long as leaf, the scape short, with a sheath 5 cm. long at base; flowers many, bracts 8-10 mm. long, pedicel and ovary 1-5 cm.; flowers yellowish with orange-brown lip; sepals reflexed, 8 by 3 mm., petals 1 mm. wide; lip 1 cm. long, basal half narrow, parallel to column, with small 2-lobed callus, apical half turned down, widening to 9 mm., deeply 2-lobed, the lobes rounded and finely toothed. This species is believed to be distributed to Sumatra, Borneo and Java; the Malayan plant above described (from Taiping Hills only) is not typical of *L. latifolia* as originally described from Java, being somewhat intermediate between this and *L. pallida* in several characters. Further information about the species in Malaya, and its variation, is needed.

16. **Liparis rhombea** J.J.S., Bull. Dep. Ag. XLIII: 35. 1910. Bull. Btzg., Ser. 3, 5: t. 35, III. Carr, Gard. Bull. 7: 6. 1932.

Pseudobulbs close, ovoid, flattened, 1.5-2.5 cm. long, 1-leaved at the top, with 2 unequal sheaths at the base; leaf 6 by 0.8 to 12 by 3 cm., widest at or above middle, sharply pointed, gradually narrowed to base, unstalked; inflorescence erect, 7-15 cm. tall, the scape to 7 cm. long with a sheath at base and 2 small bracts higher up; flowers not crowded, bracts 3-5 mm. long, pedicel and ovary 6 mm.; sepals and petals very pale greenish yellow, curved backwards; upper sepal 5.5 by 2 mm., lateral sepals 5 by 2.5 mm., petals 5 by less than 1 mm.; lip when flattened nearly diamond-shaped, 6 mm. long and nearly as wide, the basal half nearly parallel to the column, the apical half sharply bent backwards, the tip with 2 small obtuse finely toothed lobes; a median red-brown band almost throughout length of lip, widening in the apical half, rest coloured as petals. Distributed to Java; in Malaya only found near Tembeling in Pahang, not common there.

17. **Liparis elegans** Lindl., Gen. et Sp. Orch. 30. 1830. Ridl., Flora 4: 23.  
*L. gracilis* Hk. f., Ic. Pl. t. 2011.—*L. stricta* J.J.S., Bull. Dep. Ag. V: 3. 1907.

Rhizome slender, creeping; pseudobulbs 1-2.5 cm. apart, ovoid, 2-3 cm. long, 2-leaved at top, with sheaths up to 6 cm. long at base; leaves 12-25 by 2-3 cm., widest in upper half, acute, below gradually narrowed to a broad channelled stalk 2-6 cm. long; inflorescence erect, straight, 25-35 cm. long, the scape to 15 cm.; flowers many, crowded (except the lower ones), bracts to 5 mm. long, pedicel and ovary 4 mm.; sepals and petals pale greenish yellow, lip orange to salmon; sepals curved backwards, 4 by 1-7 mm.; petals spreading, 4 by 0-7 mm.; lip 4 by 1-5 mm., basal half parallel to column, apical half bent sharply away, sides parallel from middle to apex which is broad, finely toothed, and slightly notched in the middle. Distributed from Sumatra to the Philippines but not in Java; in Malaya common on rocks and trees (also sometimes on sandy ground) from the lowlands to 3,000 feet on the hills.

18. **Liparis viridicallus** Holtt, Gard. Bull. Singap. 14: 4. 1953.

Rhizome creeping, about 4 mm. thick; pseudobulbs 3 cm. or more apart, 2 cm. long, 1-5 cm. wide, ovoid, wrinkled when old, 2-leaved, with about 4 sheaths below the leaves; sheath of lower leaf 2-5, of upper leaf 1-5 cm. long, blades 2-4 cm. long, 3-4 cm. wide, equally narrowed to base and acute tip, rather thin; scape 26 cm. long, slightly flattened near base, bearing 6 sterile bracts 10-15 mm. long; flowers to about 20, well spaced, bracts 5-6 mm. long, pedicel and ovary at flowering 10-12 mm. long (pedicel at fruiting 2 cm.); upper sepal 6 mm. long, 1 mm. wide; lateral sepals close together behind the lip; petals 6 mm. long, narrower than sepals, green; lip pale green with a darker median line, its basal 3 mm. close to the column, its blade reflexed at a right angle, 5 mm. long and wide, nearly round, denticulate towards the slightly retuse apex, at the base a small callus; column 5 mm. long, pale green, with small wings near anther. Found only at Fraser's Hill; nearly related to *L. torta* Hk. fil. from Burma, but the latter has only one leaf and larger flowers.

19. **Liparis bicolor** J.J.S., Fl. Buit. 6: 270, f. 207. 1905.

Pseudobulbs close, to 20 cm. long, 3 cm. wide at base, tapering to 1-5 cm. at top, bearing 2 or 3 leaves; leaves to 32 by 5-5 cm., narrowed and folded at the base; inflorescence curved from an erect base, about as long as leaves, the scape 12 cm.; flowers many, bracts to 1 cm. long, pedicel and ovary 9 mm.; flowers pale yellow-brown with red-brown lip; sepals and petals about 7 mm. long; lip bent backwards near the middle, when flattened 6-5 by 4-5 mm., widened near apex and 2-lobed, lobes finely toothed near tips, edges minutely hairy. Distributed in Java and Sumatra; reported from the Taiping Hills, but the specimen in Singapore is incomplete, and the identification cannot be confirmed. The description above is mainly taken from Dr. J. J. Smith.

- 20 **Liparis parviflora** (Bl.) Lindl., Gen. et Sp. Orch. 31. 1830. J.J.S., Fl. Buit. 6: 276, f. 212. Ridl., Flora 4: 23.—*Mctiaxis parviflora* BL, Bijdr. 392. 1825.—*Liparis tembelingensis* Carr, Gard. Bull. 5: 2, t. IB. 1929.



Pseudobulbs close, narrowed upwards from a broad base, 5-10 cm. long, 2-leaved, with basal sheaths; leaves to 28 by 3 cm., widest near acute apex, narrowed very gradually to base; inflorescence 20-50 cm. long, slender, drooping from a short erect base, the scape 5 cm. long; flowers many, bracts 3-4 mm. long, pedicel and ovary 5-6 mm.; flowers greenish white with tips of all parts pink, or all parts pink at base, red at tip; sepals and petals all curved backwards, about 3 mm. long; lip oblong, 3-5 by 2 mm., basal half nearly parallel to column, concave, with 2 small calli, apical half bent back and parallel to basal half, convex, cleft at apex, edges very shortly hairy; anther green. Distributed from Sumatra to the Philippines; in Malaya found in the lowlands and on mountains to 4,000 feet, often on tall trees. The form with entirely pink and red flowers has been called *L. tembelingensis* (originally found in Pahang) but does not differ except in colour. Such colour variation appears to be common in Liparis.

21. **Liparis compressa** (Bl.) Lindl., Gen. et Sp. Orch. 32. 1830. J.J.S., Fl. Buit. 6: 280, f. 215. Ridl., Flora 4: 24.—*Malaxis compressa* BL, Bijdr. 390, f. 54. 1825.

Rhizome slender, long-creeping; pseudobulbs 3-8 cm. or more apart,, to 2-5 cm. or more long, ovoid, flattened, 1-leaved with several large sheaths at the base; leaf to 35 by 3 cm., acute, widest in upper half, narrowed gradually to channelled base, jointed to flattened sheath 5 cm. long; inflorescence about 30 cm. long; scape erect at base, curved, flattened and winged, widening to 3-5 mm. near rachis; rachis to about 5 cm. long, with close oblique 2-ranked bracts, the whole 8 mm. wide, the bracts 6 mm. long; flowers singly in succession, red-brown; upper sepal and petals reflexed; sepals about 10 by 0-3 cm., petals very narrow; lip with narrow basal part 3 mm. long, from which the downturned blade widens; blade 8 mm. long, 1 cm. wide, grooved down the midline, with two dark stripes diverging from the 2 basal calli, apex broadly rounded and finely toothed. Distributed from Sumatra to the Philippines; in Malaya found not uncommonly in mountain forests at 4,000-5,000 feet altitude.

22. **Liparis gibbosa** Finet, Bull. Soc. Bot. France, 55: 342. 1908. J.J.S., Bull. Dep. Ag. XLIII: 37.—*L. disticha* auctt. non (Thouars) Lindl. J.J.S., Fl. Buit. 6: 281, f. 216. Ridl., Flora 4: 24.

Rhizome slender, creeping; pseudobulbs to 3 cm. apart, ovoid,, slightly flattened, to 1-2 cm. long, 1-leaved; leaf to about 20 by 0-8 cm., shortly pointed, narrowed very gradually to base; inflorescence as no. 21 but smaller, scape to 15 cm. long and 2 mm. wide, rachis to 2 cm. long and 6 mm. wide across the bracts, bracts 5 mm. long; flowers salmon to orange-brown; sepals reflexed, the upper 5 by 2, the laterals 5 by 2-5 mm.; petals erect and spreading, widened to a shortly pointed tip, 1-5 mm. wide, lip about 3-5 mm. long and wide, of complex shape, 4-lobed, the lobes convex and rounded, the two basal ones a little larger than the apical; column short, laterally flattened. Widely distributed in India and Malaya; formerly considered identical with *L. disticha* from Madagascar etc., but now thought to be distinct. In Malaya this species is fairly common, both in mountains and lowlands, in moist forest (on mangrove and by

rivers in the south). Some of the mountain specimens so named may possibly be distinct, and mountain plants of this habit need careful examination; several allied species have been found in Sumatra and Borneo, and some of these may also occur in Malaya. Fig. 37.

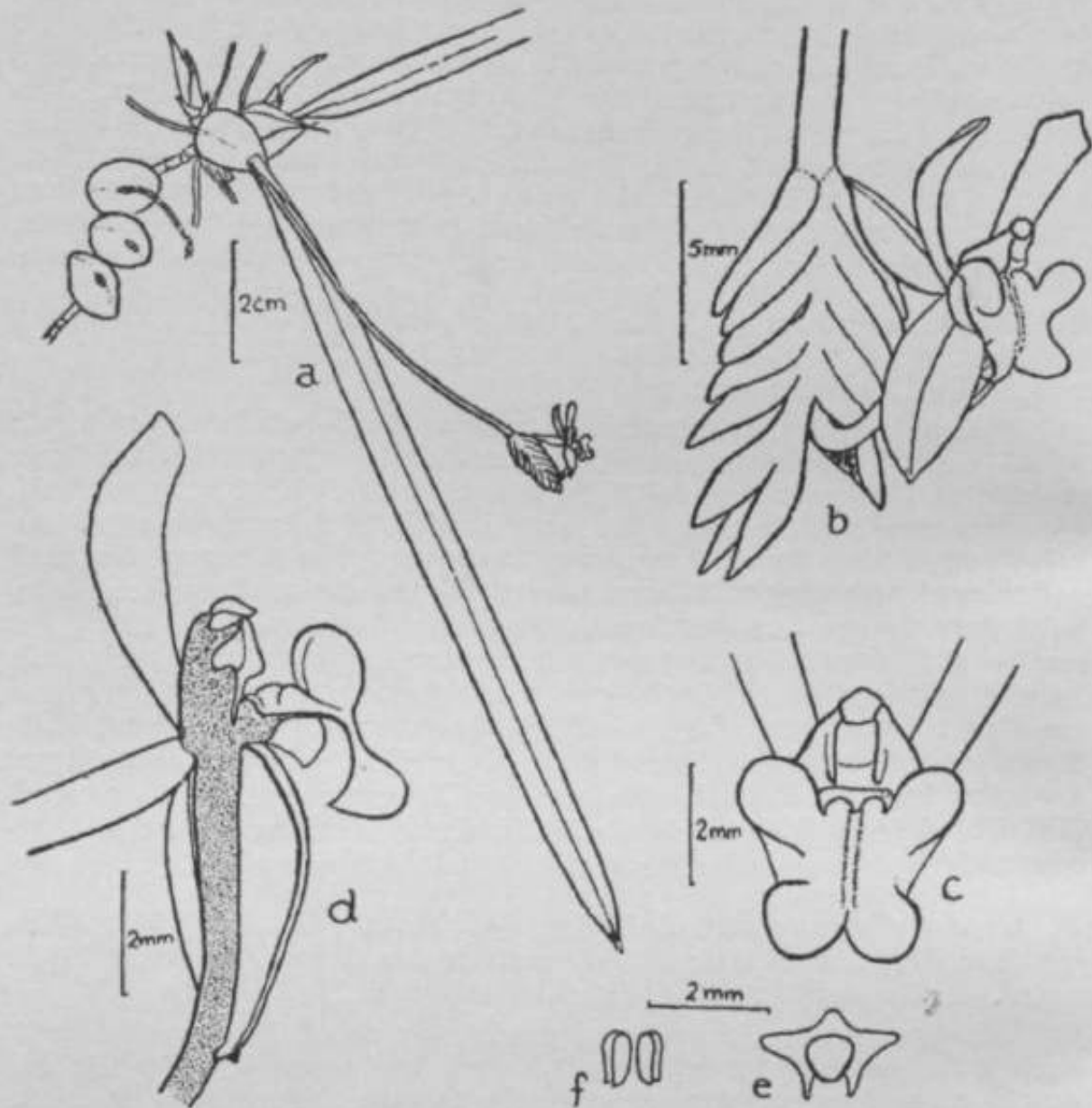


Fig. 37. *Liparis gibboxa*. a, plant, b, inflorescence, c, column and lip. d, Longitudinal section through flower, e, column from above. f, pollinia.

### OBERONIA

Epiphytes; stems close together, short or long, slender; leaves much laterally compressed, with broad flattened overlapping sheaths at the base, sometimes jointed at the base of the blade but more often not; inflorescence terminal, short or long, densely covered with very small flowers, often in regular whorls; sepals nearly equal, often broad, often reflexed;

petals usually narrower than sepals, sometimes toothed; lip usually 3-lobed, spreading, always at the top of the flower, concave at the base, often with basal lobes embracing the column; column very short; pollinia 4, in two pairs, without caudicles.

This genus consists of at least 150 species, distributed from East Africa to Samoa. The plants are very easy to recognize, owing to their much-flattened leaves, looking as though they had been put into a press. The leaves are so much laterally flattened that they have practically no upper surface except at the sheathing base. In this they agree with some species of *Dendrobium*, *Bromheadia* and *Microsaccus*; but the peculiar feature of *Oberonia*, shared by none of these, is the slender terminal inflorescence covered with its tiny flowers. The flowers are never more than about 2 mm. long, and often hardly more than 1 mm.; no dimensions are therefore given in the following account, but only the relative sizes of the parts of the flower, which are important. It is also important to note whether the sepals and petals are spreading or reflexed. The lip varies much in shape, and provides many diagnostic characters, but there is a group of species which all have lips of rather similar shape. Also, there is often some variation in details of the lip among flowers on a single plant. Some species with similar lips are distinguished by vegetative characters. The character of a joint at the base of the leaf is important.

Thirty Malayan species are described below. A few of these are still only known from the original collections, and more information about them is needed. Two or three have been rather imperfectly described, and it is possible that they are really not distinct from other species. A few species are common epiphytes by rivers, and on limestone, especially in the lowlands, and *O. anceps* grows in quite exposed places (e.g. on coconut palms). Apparently fewer species are found on the mountains. The flowers are usually greenish to yellowish, orange or red, sometimes a rich red-brown. They are often beautifully shaped. The inflorescence continues to grow at the base after the middle part is mature; the middle flowers open first, and the basal flowers usually last of all. Usually many fruits are produced.

**Key to the Malayan species of *Oberonia***

Leaves jointed at the base (not clearly so in *O. dissitiflora*)

Stems 2-5 cm. or more long

- Midlobe of lip bilobed, lobes acute . . . . . 1. *O. fiava*
- Midlobe of lip transversely oblong, not bilobed .. 2. *O. transversiloba*

Stem very short

- Leaves to about 6 cm. long .. .. 3. *O. calcicola*

- Leaves to 15 cm. or more long
- Apex of lip deeply cleft .. .. 4. *O. iridifolia*
- Apex of lip rounded, entire .. .. 5. *O. dissitiflora*
- Leaves not jointed at base
- Stems to 10 cm. or more long
- Longest leaves to about 16 cm. long .. 6. *O. grandis*
- Longest leaves to about 7 cm. long
- Tips of leaves narrow, hardly spreading from stem; width across stem and leaves together about 1 cm.
- Lip long and narrow, midlobe bilobed, lobules narrow, acute .. .. 7. *O. sinuosa*
- Lip hardly longer than petals, midlobe broadly oblong, bilobed, lobules short, blunt .. .. 8. *O. gracilis*
- Tips of leaves broader or more widely spreading; stem with leaves together much wider
- Flowers lying flat against rachis, overlapping and covering rachis completely .. 9. *O. anceps*
- Flowers on distinct pedicels, not completely covering rachis
- Leaves about 3 mm. wide .. .. 10. *O. pendula*
- Leaves much wider
- Midlobe of lip oblong, not widened towards tip .. .. 11. *O. miniata*
- Midlobe distinctly widened from base to near tip
- Midlobe strongly toothed .. 11. *O. ciliolata*
- Midlobe not toothed
- Lip 1± times as long as petals; midlobe slightly bilobed .. 13. *O. spathulata*
- Lip twice as long as petals, midlobe deeply bilobed .. .. 14. *O. fungumolens*
- Stems not more than about 5 cm. long
- Lip twice as long as petals, midlobe long, narrow deeply bilobed

- Side-lobes of lip 2- or 3-lobed . . . . . 15. *O. insectifera*
- Side-lobes of lip simple
- Stems 3-5 cm., inflorescence 5 cm. long . . . 16. *O. caudata*
- Stems very short, inflorescence about 10 cm. long
- Side-lobes of lip short . . . . . 17. *O. anthropophora*
- Side-lobes equal to half length of lip . . . 18. *O. tiomanensis*
- Lip shorter, not or little longer than petals, mid-lobe usually a different shape
- Lip unlobed, narrowed almost evenly to apex, edges short-toothed throughout . . . 19. *O. Prainiana*
- Lip otherwise, in nearly all cases 3-lobed
- Sides of lip deeply toothed
- Leaves to about 2 cm. long . . . . . 20. *O. flabellifera*
- Leaves much longer
- Petals strongly toothed, spreading; lip with distinct separate midlobe . . . 21. *O. stenophylla*,
- Petals not toothed, reflexed; midlobe of lip not distinct . . . . . 22. *O. lunata*
- Sides of lip not deeply toothed
- Lip 3-lobed, the midlobe widening conspicuously from its base
- Upper sepal and petals with hairy edges, lateral sepals and lip not hairy . . . 23. *O. semifimbriata*
- Sepals not hairy, petals at most slightly toothed
- Petals about same width as upper sepal
- Inflorescence twice as long as leaves, or longer
- Inflorescence about 7 cm. long, midlobe rather deeply bilobed 24. *O. rhizophoreti*

- Inflorescence to 15 cm. long, mid-lobe with broad rounded apex 25. *O. pumilio*
- Inflorescence little longer than leaves .. .. 26. *O. demissa*
- Petals narrower than upper sepal
- Inflorescence as long as longest leaves .. .. 27. *O. rosea*
- Inflorescence much longer than longest leaves .. .. 28. *O. intermedia.*
- Petals almost circular, wider than upper sepal .. .. 29. *O. suborbicularis*
- Lip not clearly 3-lobed, oblong or narrowing towards the bilobed apex .. 30. *O. Bertoldii*

**1. *Oberonia flava* Ridl., J.F.M.S. Mus. 4: 64. 1909. Flora 4: 17.**

Stems 2-5 cm. long, flexuous, with about 5 leaves; leaves jointed at the base, to 6.5 by 0.5 cm., slightly narrowed, acute; inflorescence 12 cm. long including scape of 4.5 cm.; flowers yellowish, in close whorls, pedicel and ovary 3 mm., bracts narrow, slightly toothed; sepals broadly ovate, blunt, somewhat reflexed; petals oblong, blunt, narrow (4 times as long as wide), ends rolled back; lip rather longer than petals, 3-lobed, side-lobes entire, blunt, raised at the base on either side of the column, mid-lobe not widening from base, oblong with two rather narrow acute divergent lobes which are one quarter total length of lip; when spread out, the lip is much widest at the base, the forward ends of the side-lobes not very distinct from the base of the mid-lobe. Found once only, near Cameron Highlands; apparently very near *O. Boerlageana* from Java. Fig. 39, b.

**2. *Oberonia transversiloba* Holtt, Gard. Bull. 11: 285. 1947.**

Stems about 4-5 cm. long, with about 6 leaves; leaves at a very acute angle to the stem, nearly straight, slightly incurved, acute, conspicuously jointed at base of blade, blade above joint to 9.5 by 0.5 cm.; inflorescence erect, to 16 cm. long, the scape to 6 cm., flowers in fairly regular whorls of about 6, 2-5-3 mm. apart; bracts entire, pedicel and ovary 2 mm. long; upper sepal and petals spreading, entire, about equal but petals with narrower apex; lateral sepals wider, reflexed; lip orange-yellow, 3-lobed, as long as petals,  $\frac{1}{2}$  \*imes wider than long; side-lobes small, rounded^ basal; mid-lobe transversely oblong, wider than the base of the lip when

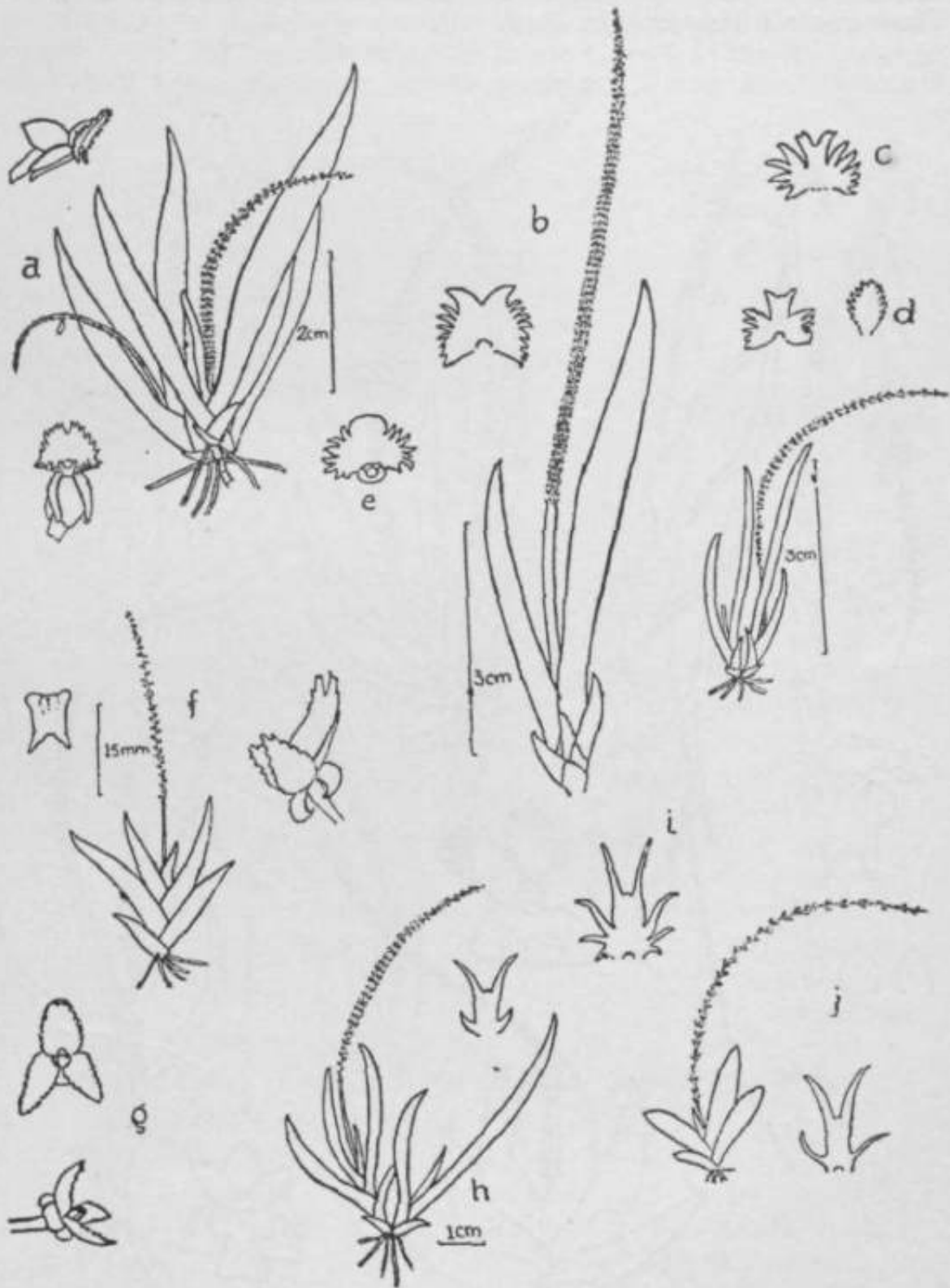


Fig. 38. *Oberonia*. a, *O. lunafa*, plant and 2 flowers, b, *O. iridifolia*, plant and Hp. c, *O. flabelifera*, lip. d, *O. stenophylla*, plant, lip and petal, e, *O. dissitiflora*, lip (after Carr). f, *O. Berioldii*, plant; on left, lip spread out; on right, flower (after Scortechini). g, *O. Prainiana*, after Carr. h, *O. anthropophora*, plant and lip. t, *O. insectifera* (after Hooker). ;, *O. tiomanensis*.

flattened, edges slightly irregular; a low median fleshy bar from base to near apex of lip. Only known from one collection, from limestone on Gua Tipus in north Pahang. Fig. 39, d.



Fig. 39. *Oberonia*, a, *O. pmdula*, fruiting and flowering plants, flower (after Carr) and outlines of upper sepal, lateral sepal and petal. b, *O. fiava*, plant and flower (after Carr). c, *O. semifimbriata*, plant and flower (after Carr). d, *O. transversiloba*, flower, upper sepal and petal (after Carr). e, *O. rosea*, plant and flower (after Hooker).



3. *Oberonia calcicola* Holtt., Gard. Bull. 11: 284. 1947.

Stems very short; leaves about 6, spreading evenly in the form of a fan, to 5.5 by 0.9 cm., nearly straight, widest at base, apex rather shortly pointed, acute; inflorescence about 10 cm. tall, erect or the tip nodding, scape about 1 cm.; flowers in whorls of about 6, 2 mm. apart; bracts 2.



Fig. 40. *Oberonia*, a, *O. calcicola*, plant and lip. b, *O. anceps*, plant and flower (after Carr). c, *O. fungum-olens*. d, *O. sinuosa*, fruiting. e, *O. pumila*, plant and lip. f, *O. riliolata*, plant and flower. g, *O. miniata* (after Carr). h, *O. gracilia* (after Hooker), i, *O. fungum-olens* (after Burkill).

mm. long, entire or nearly so; sepals and petals entire, the sepals apparently reflexed, broadly ovate, the laterals broadest; petals narrowly oblong, less than half width of upper sepal; lip as long as petals, a little longer than wide, side-lobes small, short, nearly quadrangular, entire; mid-lobe oblong, widening only slightly from the base, the apex bilobed, with a broad sinus, the lobules rather narrow, acute, about 1/3 total length of the lobe^ base of lip rather fleshy. Only known from one collection from the limestone at Langkawi, as an epiphyte. The flowers on the specimen are old, and the details of the lip uncertain. **Fig.** 40, a.

4. **Oberonia iridifolia** (Roxb.) Lindl., Gen. et Sp. Orch. 15. 1830. King & Pantl., Ann. Calc. 8: 8, pi. 8. 1898. J.J.S., Fl. Buit. 6: 239, f. 175. Ridl., Flora 4: 14.—*Cyribidium iridifolium* Roxb., Hort. Beng. 63. 1814.

Stem very short; leaves 4-6, basal ones smallest, largest to 18 by 2 cm., jointed at base; scape about 6 cm. long, flat, 2-5-3 mm. wide, rachis of inflorescence to about 18 cm., curved; flowers in rather regular close whorls, distinctly stalked, pale greenish or brownish; bracts broad, toothed at the tips, as long as pedicel and ovary; sepals and petals reflexed, petals broadly ovate; lip with base auricled and raised on either side of the column, the sides rather deeply toothed, apex broad, bilobed, lobes acute, diverging. Distributed from the eastern Himalayas southwards through Malaysia, perhaps to the Pacific; in Malaya only found at Langkawi, other plants formerly so named from southern Malaya being *O. dissitiflora*. **Fig.** 38, b.

5. **Oberonia dissitiflora** Ridl., J.L.S. 32: 218. 1896.—*O. lunata* p.p. quoad Ridl. Flora 4: 14.—*O. indragiriensis* Schltr., Bull. Herb. Boiss. Ser. 2, 6: 304. 1906. J.J.S., Bull. Btzg., Ser. 3, 3: 266. 1921; 5: t. 32, II.

Stem very short; leaves about 3, to 15 by 1-2 cm., jointed at the base but perhaps not always falling when old; inflorescence to 24 cm. long including the flattened scape of 3-4 cm.; flowers close and not very regularly whorled, lying very close to the rachis, yellowish or brownish; bracts very short; sepals and petals spreading, sepals very broad, petals narrow with more or less reflexed acute tips; lip small, wider than long, slightly 3-lobed, side-lobes with a few irregular teeth, midlobe small, rounded, not cleft. Distributed in Java and Sumatra; in Malaya found at many localities in the lowlands of the south and in Pahang, on trees by rivers. The jointing of the leaves is less pronounced than in *O. iridifolia*, and the almost stalkless flowers with rounded midlobe to the lip are distinctive.

6. **Oberonia grandis** Ridl., J.L.S. 41: 297. 1913. Flora 4: 16.

Stems about 12 cm. long, with about 4 leaves each side, the lowest small, the upper ones about 16 by 1-2 cm., very oblique, slightly incurved, acute; inflorescence about 18 cm. long, flowering almost to base, the whorls of 8 yellow (?) flowers about 2-5 mm. apart; bracts not hairy; sepals ovate-acute, petals narrower; lip oblong-ovate, tip bilobed, edges slightly toothed. Found at 2,000-3,000 feet at 2 or 3 localities on the Main Range; specimens imperfect, more needed for a full description.

7. **Oberonia sinuosa** Ridl., J.L.S. 31: 263. 1896. Flora 4: 15.

Stems to about 25 cm. long, including the leaves about 1 cm. wide; leaves very oblique, with narrow acute tips spreading little from the stem, the upper edge 1.5 cm. long; inflorescence to about 8 cm. long, flowers red, close near the base, more distant near the apex; sepals oblong, blunt; petals narrow; lip narrow, longer than petals, apex bilobed, lobes narrow, acute. Originally found in Borneo; specimens from Batu Caves and from a locality in Negri Sembilan have been so named but the identification needs confirmation. **Fig. 40, d.**

8. **Oberonia gracilis** Hk. f., F.B.I. 5: 685. 1890. Ridl., Flora 4: 17.

~ Habit of *O. sinuosa*; stems to 20 cm. long, internodes about 8 mm., width of stem with leaves about 1 cm.; upper edge of leaf to 2 cm.; inflorescence to 15 cm. long, scape very short; flowers reddish, in distinct whorls; sepals broad, ovate, the upper wider than laterals; petals very narrow; lip as long as petals or a little longer, 3-lobed, the side-lobes narrow, fleshy, round in section, curved up on either side of the column, midlobe broadly oblong, apex 2-lobed, lobules short and blunt. Found near the Kinta River about 1888 and never collected again; there is a closely allied species in Java. **Fig. 40, h.**

9. **Oberonia anceps** Lindl., Sert. Orch. sub t. 8. 1838. J.J.S., Fl. Buit. 6: 238, f. 174. Bull. Botg., Ser. 2, XXVI: 18. 1918 (revised descr.)-Ser. 3, 5: t. 32, I. Ridl., Flora 4: 15.

Stems 10-30 cm. long, internodes about 1 cm., the stem and leaves 1.5-2.5 cm. wide; leaves oblique, tips blunt, upper edge 1.5-3 cm. long, nearly straight, outer edge curved, width to 8 mm. near the base; inflorescence 5-8 cm. long, densely covered with flowers to the base, scape about 1 cm.; flowers yellow to orange; bracts broad, with toothed edges; sepals as broad as long, ends rounded with a very short point; petals much narrower, acute; lip almost square when flattened, with very small basal lobes raised on either side, apex very broadly rounded, slightly toothed and notched. Distributed from Sumatra to the Philippines; in Malaya one of the commonest species of the genus, found in the lowlands, in fairly exposed places. **Fig. 40, b.**

10. **Oberonia pendula** Ridl., J.S.B.R.A.S. 61: 38. 1912. Flora 4: 18.

Stems 10-20 cm. long, slender, pendulous, internodes 1-2.5 cm. long, leaves at about 45° to the stem, ends incurved, acute, upper edge 2-6 cm. long, about 3 mm. wide, sheaths to 4 mm. wide; inflorescence 4-10 cm. long, including the flowers 3 mm. wide, bearing flowers almost to the base; sepals and petals all spreading, greenish; sepals ovate-acute, laterals broader than upper; petals less than half as wide as upper sepal, elliptic, blunt, entire; lip  $\frac{1}{2}$  times as long as upper sepal, 3-lobed, red at base grading to olive-green at apex; side-lobes spreading, small, almost square; midlobe oblong,  $\frac{1}{2}$  times as long as wide, bilobed, lobes variable in length, narrow, acute, often spreading, up to nearly half the length of the midlobe. Found at Fraser's Hill and Cameron Highlands; very nearly related to *O. falcata* from the eastern Himalayas. **Fig. 39, a.**

- 11. *Oberonia miniata*** Lindl., Bot. Reg. 1843: Misc. 8. Ridl., Flora 4: 16.—*O. Rolfeana* King & Pantl., Journ. As. Soc. Beng. 66: 581. 1897. Ridl., Flora 4: 18.—*O. discolor* J.J.S., Bull. Btzg., Ser. 2, XXV: 21. 1917; Ser. 3, Suppl. II: t. 23, II. (?).

Stems 10-30 cm. long, internodes 0.8-1.5 cm., stems with leaves usually 2-3 cm. wide, sometimes more; leaves very oblique, acute, upper edge nearly straight, usually 2.5-3.5 cm. long, exceptionally to 7 cm., outer edge incurved towards the tip; inflorescence 10-20 cm. long, including the flowers 6 mm. wide, flowers in rather irregular whorls 2-2.5 mm. apart; bracts fringed with short hairs, pedicel and ovary papillose; flowers orange with a greenish lip; sepals and petals all spreading, sepals broadly ovate, not hairy, petals much narrower, with slightly uneven edges and blunt tips; lip little longer than sepals, broadly oblong with small raised rounded auricles at the base, apex cut off nearly square or slightly indented. Distributed to Sumatra and perhaps Java; in Malaya found at many lowland localities, especially in Johore and Pahang. Some plants approach *O. ciliolata* in shape; but *O. miniata* has a longer inflorescence, hairless sepals and a different lip. Fig. 40, g.

- 12. *Oberonia ciliolata*** Hk. f., F.B.I. 6: 181. 1890. Ic. Pl. t. 2318. **Ridl.**, Flora 4: 16.—*O. lampongense* J.J.S., Bull. Btzg., Ser. 2, XXV: 22. 1917. Carr, Gard. Bull. 5: 124, pi. 1, f. 2. 1930.

Stems to 10 cm. long or sometimes more, with 4-7 leaves on each side; leaves spreading at 45° to the stem, upper edge to 7 cm. long, nearly straight, tip acute, outer edge slightly incurved towards apex, base to 6 mm. wide; inflorescence to about 12 cm. long, minutely hairy throughout, scape to 1 cm.; flowers very small, pale yellowish, not densely crowded; sepals and petals spreading; sepals short-hairy on backs and edges, ovate, broadly pointed; petals much narrower, elliptic, edges uneven; lip hardly longer than petals, with small rounded raised auricles at base, narrowed slightly in the middle, widening to the broad slightly bilobed apex, lobes rounded with irregularly toothed edges. Distributed to Sumatra; in Malaya found at many localities in the lowlands of the south and Pahang, especially on trees by rivers. This sometimes has short leaves, and then appears like *O. miniata*. **Fig. 40, f.**

- 13. *Oberonia spathulata*** Lindl., Gen. et Sp. Orch. 16. 1830. **J.J.S., FL** Buit. 6: 238, f. 173. Ridl., Flora 4: 17.

Stems 10-20 cm. long, internodes 8-10 mm.; leaves at a small angle to the stem, tip acute, upper edge nearly straight, 2.5-4.5 cm. long, outer edge curved, the leaves a little below stem-apex largest; inflorescence to about 15 cm. long, with flowers down to the uppermost leaf, the whole short-hairy; flowers in whorls of about 8, whorls close at the base, more distant towards apex of inflorescence; sepals and petals pale greenish-yellow, spreading; sepals ovate, blunt; petals narrower, elliptic; lip 1½ times as long as petals, with small round raised auricles at the base, middle slightly narrowed, widened to the slightly bilobed apex, lobes round, entire. Distributed to Java, Sumatra and Borneo; in Malaya found at about 4,000 feet, at Fraser's Hill and Cameron Highlands.

14. **Oberonia fungum-olens** Burk., Gard. Bull. 3: 292. 1924. Ridl., Flora 4: 337.

Stems pendulous, about 20 cm. long, internodes 1-1.5 cm., the whole 2-5 cm. wide including leaves; leaves bright green, very oblique, upper edge to 3 cm. long, slightly S-curved, tip very obtuse, outer edge straight at the base, strongly incurved towards the tip; inflorescence to 12 cm. long, scape about 1 cm., rachis and bracts short-hairy, flowers in fairly regular whorls 4 mm. apart, dull honey-colour, smelling of fungi; sepals, petals and lip spreading almost in one plane, at about 45° to the rachis; sepals very broad, blunt; petals narrowly elliptic, blunt; lip twice as long as petals, the base broad with small raised auricles on either side, apical half widened, apex cut off nearly square, in the middle deeply cleft, the edges of the cleft close or overlapping. Found only near Tanjong Malim; near *O. spathulata* but with blunt leaves and larger flowers with larger lip. Fig. 40, c, i.

15. **Oberonia insectifera** Hk. f., Ic. PL t. 2004. 1890. Ridl., Flora 4: 15.

Stem short, with 4-6 leaves about 14 by 0.7 cm., narrowed gradually to the tip, slightly curved; inflorescence with drooping tip, about 15 cm. long, scape 3 cm.; flowers in irregular close whorls; sepals ovate, petals, narrow, all entire; lip much longer than sepals and petals, side-lobes deeply and unequally divided into 2 or 3 narrow acute lobules, midlobe long and narrow, deeply bilobed, the halves narrow, acute, more or less divergent. Found only at Tapah and at Kuala Tahan, Pahang. No record of flower-colours exists. Fig. 38, i.

16. <sup>h</sup>~~1897~~ <sup>h</sup>*Oberonia* <sup>h</sup>*udata* King & Pantl., Journ. R. As. Soc. Beng. 66: 581. 1897. Ridl., Flora 4: 18.

Stems 3-5 cm. long, with 4 or 5 leaves; leaves at 45° to the stem, to 5 by 0.4 cm., tips acute, incurved; inflorescence decurved, about 5 cm. long including scape of 1.5 cm., flowers not dense; sepals rather narrowly ovate, acute, the lateral ones apparently reflexed; petals very narrow, acute, the ends curved forwards; lip much longer than sepals and petals, 3-lobed; side-lobes spreading, about half as long as sepals, base ovate with a long point; midlobe narrow, deeply divided into two very long-pointed divergent lobes. Only known from the original collection made by Scortechini in Perak; no specimen in Singapore.

17. **Oberonia anthropophora** Lindl., Gen. et Sp. Orch. 16. 1830. Hk. f., F.B.I. 5: 684. 1888. Carr, Gard. Bull. 7: 4. 1932.—*O. aurantiaca* Ridl., J. Bot. 36: 210. 1898. Flora 4: 15.

Stems short; leaves about 5, unequal, incurved, to about 5 by 0.6 cm.; inflorescence to 10 cm. long, drooping, the scape slender, to 2 cm. long, flowers in irregular close whorls; sepals and petals pale red-brown, spreading, petals much narrower than sepals with toothed blunt tips; lip much longer than sepals and petals, deep red-brown with paler lobes; side-lobes short, narrow, curved, acute; midlobe long, deeply bilobed, lobules very narrow, divergent, acute. Distributed from Tenasserim southwards to Malaya; found in the lowlands of Selangor and Johore. Fig. 38, h.

**18. *Oberonia tiomanensis*** Hend., Gard. Bull. 5: 79. 1930.

Stems very short; leaves 3 or 4, to 3.5 by 0.5 cm., curved, tips blunt or broadly pointed; inflorescence to 10 cm. long, curved, the scape short and bearing a few very narrow bracts; flowers rather distant, not regularly whorled, entirely red; lower bracts much longer than flowers, long-pointed, upper bracts shorter; sepals ovate, blunt, concave; petals oblong, acute, shorter and narrower than sepals; lip twice as long as petals, with very narrow spreading side-lobes near the base, their length nearly equal to that of the lip; midlobe narrowly oblong, bilobed for about half its length, the lobes very narrow, acute, diverging. Found on Pulau Tioman and Kedah Peak, at 2,000 feet; very near *O. rufilabris* from Tenasserim and perhaps identical. **Fig. 38, j.**

**19. *Oberonia Prainiana*** King & Pantl., Journ. As. Soc. Beng. 64: 331. 1895. Ann. Calc. 8: 3, pi. 1. 1898. Ridl., Flora 4: 14.—*O. brunnescens* Ridl., J.L.S. 32: 220. 1896. Flora 4: 17.

Stems very short; leaves about 5, to 2.5 by 0.6 cm.; inflorescence slender, to 10 cm. long, scape 2.5 cm.; flowers in distinct whorls 3 mm. apart, red-brown, very small, distinctly stalked, bracts short; sepals rolled back below the flower, edges entire; petals and lip spreading, all with similarly short-toothed edges, petals narrowly triangular, acute, lip larger, much longer than wide, apex blunt, base with a small hollow. Distributed from the eastern Himalayas southwards to Malaya; found in the lowlands of Perak, Negri Sembilan and Johore, a very dainty little species. **Fig. 38, g.**

**20. *Oberonia flabellifera*** Holtt., Gard. Bull. 11: 284. 1947.

Stems to 2.5 cm. long, slightly sinuous, with 3-5 leaves; leaves at less than 45° to the stem, the free part about 1.5 by 0.25 cm., oblong, shortly pointed; inflorescence to 7 cm. long, including scape of 1 cm.; flowers in whorls of about 7, 3-4 mm. apart; bracts short and broad, edges minutely papillose; pedicel and ovary little over 1 mm. long; sepals and petals pale yellow, all spreading, flower about 1.5 mm. wide; sepals broadly ovate, about equal in width, upper blunt, laterals acute, all entire; petals a little over half as wide as sepals, widest near apex, edges irregularly toothed; lip egg-yellow, as long as sepals and petals, wider than long, nearly semi-circular in outline, with a narrow midlobe widening to its more or less cleft apex, side-lobes fan-shaped and deeply toothed, basal teeth smallest. Found on old mangrove in Singapore and by the Sedili River at Mawai, Johore. The side-lobes of the lip almost meet the midlobe, which is not very distinct; otherwise the lip is like that of *O. stenophylla*, but the leaves are very short and the sepals not deflexed. **Fig. 38, c.**

**21. *Oberonia stenophylla*** Ridl., J.L.S. 32: 218. 1896. Flora 4: 15.

Stems very short, often tufted, each with 3-5 leaves; leaves to 10 by 0.6 cm.; inflorescence to 10 cm. long, curved, flowers in close whorls of about 8; bracts elliptic, slightly toothed; sepals and petals pale orange-yellow, sepals all reflexed, broadly ovate, entire, petals elliptic, spreading, strongly toothed; lip orange-brown, 3-lobed, a little wider than long, side-lobes broad, rather deeply toothed, midlobe narrow, more or less deeply

bilobed, lobules sometimes toothed, acute, with a small tooth in the sinus. Found in the lowlands of Singapore, Johore, Pahang, Kemaman and Perak. The colours have also been described as: sepals light red, petals red, lip bright red. **Fig. 38, d.**

22. **Oberonia lunata** (Bl.) Lindl., Gen. et Sp. Orch. 17. 1830. J.J.S., Fl. Buit. 6: 240. Ridl., Flora 4: *U.—Malaxis lunata* Bl., Bijdr. 394. 1825.—*O. biaurita* Hk. f., F.B.I. 6: 180. 1890. Ic. PL t. 2317-Q. *subnavicularis* King & Pantl., Journ. As. Soc. Beng. 66: 579. 1897. Ridl., Flora 4: 14. Carr, Gard. Bull. 5: 124, pi. I, f. 1. 1930.—*O. porphyrochila* Ridl., J.L.S., 32: 220. 1896. Flora 4: 16.

Stems short; leaves 3-5, to 16 by 11 cm., gradually narrowed to acute tip; inflorescence about as long as leaves, scape to about 3 cm., not winged; flowers in close whorls, more distinct and irregular towards apex; bracts ovate with rather long tip, papillose, about as long as pedicel and ovary; sepals reflexed, broadly ovate, entire, pale pinkish or brownish, petals narrow, blunt, also reflexed, coloured as sepals; lip deep red-brown, heart-shaped, the sides rather deeply and sharply toothed, apex cleft, basal auricles raised on either side of the column. Originally described from Java. Found in the lowlands of Perak, Pahang, Johore and Singapore. A mountain form, differing in larger size (leaves to 25 by 1.2 cm.) and apparently sometimes having a purplish lip, has been found at about 4,000 feet on the Taiping Hills, at Cameron Highlands and on Bukit Hitam; it has been called *O. porphyrochila*. **Fig. 38, a.**

23. **Oberonia semifimbriata** J.J.S., Bull. Btzg., Ser. 3, 10: 46. 1928. Carr, Gard. Bull. 7: 4. 1932.

Stems 2.5 to 4.5 cm. long, with 6-16 leaves; basal leaves widely spreading, uppermost nearly erect, all slightly incurved, to 8 by 1 cm.; inflorescence to 10 cm. long, scape short, with many bracts; flowers in whorls of 8-10, whorls 3 mm. apart; bracts entire, the lower ones with long slender tips; sepals and petals rose, lip and column deep rose; upper sepal and petals spreading, densely fringed all round the edges, much longer than wide; lateral sepals reflexed, entire, a little wider than long; lip shorter than petals, broader than long, 3-lobed, side-lobes small, raised, rounded, midlobe transversely elliptical, its edges entire or very slightly toothed. Originally found in Sumatra; in Malaya only collected once, near Tembeling, Pahang. **Fig. 39, c.**

24. **Oberonia rhizophoreti** J.J.S., Bull. Btzg., Ser. 3, 9: 42, t. 4, f. II. 1927.

Stem very short; leaves about 4, to 3 by 0.4 cm., acute, more or less erect; inflorescence to 7 cm. long, scape 1.5 cm.; flowers in fairly regular whorls of about 8; bracts as long as pedicel and ovary, tips narrowed, edges uneven but hardly toothed; sepals and petals yellowish, lip red-brown\* upper sepal and petals spreading, equally long and wide, sepals ovate-acute, entire, petals elliptic, blunt, slightly toothed; lateral sepals reflexed as wide as long; lip a little longer than sepals, 3-lobed; side-lobes small spreading, nearly square, with toothed outer edges, midlobe widening from a narrow base, 2-lobed, lobules rather broad, bluntly pointed,

at the base with raised side-lobes and a reflexed midlobe. Distributed to Java and Sumatra; in Malaya found in the lowlands of Pahang and Perak, an epiphyte of moderately shady places, often by rivers. Fig. 41.

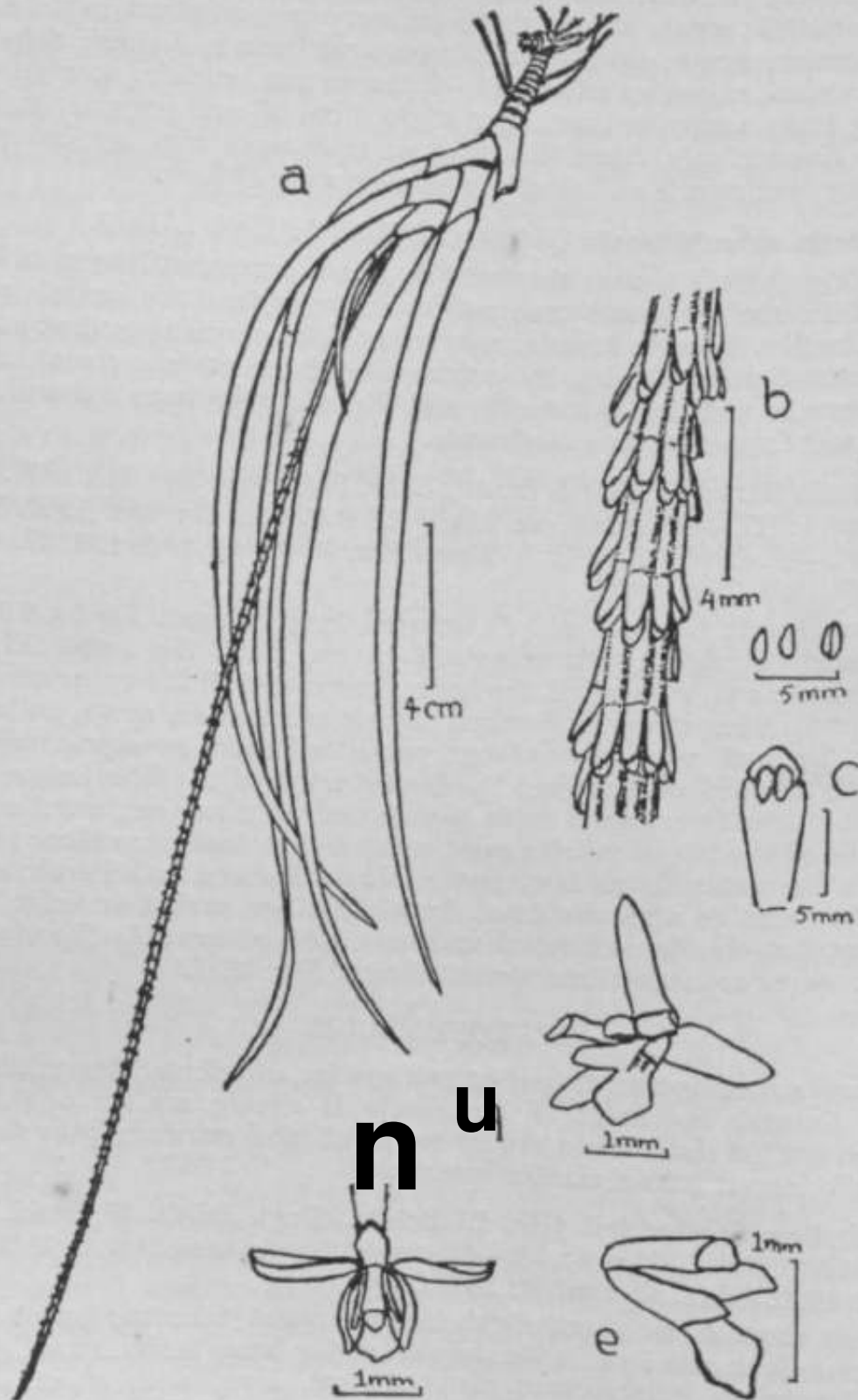


Fig. 41. *Hippeophyllum ScortechinU*. a, plant. b, part of inflorescence, flowers in bud. c, column and pollinia. d, 2 flowers, e, lip and column.



## THE COELOGYNE TRIBE

Sympodial epiphytes with creeping rhizome, each new rhizome-element ending in a 1-jointed, 1- or 2-leaved, pseudobulb; inflorescence apical on the pseudobulb, developing either (*a*) after the pseudobulb has finished its growth (*hysteranthous*), or (*b*) simultaneously with the growth of the pseudobulb (*synanthous*), or (*c*) before the pseudobulb with its leaves develop (*proteranthous*), or on a separate shoot which only produces rudiments of pseudobulb and leaves (*heteranthous*); inflorescence usually long, with many large or small often 2-ranked flowers, erect or pendulous, sometimes with flowers in sequence, one at a time; sepals and petals free, the petals usually narrower than the sepals; lip usually 3-lobed, often concave or saccate at the base, often with longitudinal keels or crests; column short or long, winged or hooded round the anther and sometimes bearing also lateral wings or arms; no column-foot, but the base of the column sometimes curved a little forwards; anther joined to the column by a filament and remaining attached after the removal of the pollinia; pollinia 4, with elastic caudicles, in two pairs, without disc.

This is a large group of orchids native in the Old World tropics and subtropics, and contains some beautiful large-flowered species, often cultivated; the group is well represented in the Malayan region. The chief characters are the one-jointed pseudobulbs, often very large, bearing only one or two leaves, the terminal inflorescence, and shape of the column and lip. The time of development of the inflorescence is characteristic of each species, and the terms given above are useful as a shorthand to indicate this in descriptions; they are used throughout the following account. The *heteranthous* inflorescence is a development from the proteranthous condition in which the growth of the pseudobulb and leaves is deferred until after the flowering; in the heteranthous state the pseudobulbs and leaves never grow beyond a rudimentary stage on the flowering shoots. The distinction may be seen by comparing the commonly cultivated species *C. asperata* (proteranthous) and *C. Rochusseni* (heteranthous). In the genus *Coelogyne* we find quite closely related species having these two different conditions; in *Dendrochilum* the species within one section are all synanthous, those within another section all heteranthous.

The only important genus for horticultural purposes is *Coelogyne*, nearly all species of which have large flowers, but the other genera contain some characteristic and common Malayan plants.

#### Key to the Malayan genera of the Coelogyne Tribe

- Column with winged apex round the anther, and also  
with lateral wings or arms separate from the  
apical wing . . . . . •• •• •• *Dendrochilum*
- Column often winged at the top, without lateral arms  
or wings  
Basal part of Up saccate, distinctly separate from  
the blade; blade rarely 3-lobed .. .. *Pholidota*

Basal part of lip often concave but not sharply distinct from the blade; lip nearly always 3-lobed

Base of lip narrow, saccate, widening to 3-lobed blade; side-lobes narrow, at right angles to blade, arising above the base .. .. *Chelonistele*

Lip more or less concave at the base, not narrow and rarely saccate, side-lobes broad, widening gradually from base of lip .. .. *Ccelogyne*

### DENDROCHILUM

Pseudobulbs 1-leaved, crowded or well-spaced on the rhizome; inflorescence synanthous (section *Platyclinis*) or heteranthous (section *Eudendrochilum*) with slender scape and rachis, small 2-ranked flowers, and persistent bracts; sepals and petals spreading, more or less equal; lip 3-lobed or undivided, with 2 or 3 simple keels, usually with small side-lobes and a large midlobe; column usually short, curved, with narrow lateral arms and also a wing (often toothed) round the anther.

This is a large genus, containing considerably more than 100 species, entirely Malaysian in distribution, from Tenasserim to the Philippines and New Guinea; the greatest number of species occur in Sumatra and Borneo, mostly on the mountains. Many species are local, but we do not yet know enough about their occurrence to say how local. As at present known, there are 60 species in Sumatra, of which only 8 have been found in Malaya, Borneo or Java; but this in part indicates our lack of knowledge. As compared with Sumatra, Malaya is certainly poor in species of this genus; this is because they are mostly mountain plants, and our mountains **are not** so high nor so extensive as those of Sumatra.

#### Section *Platyclinis*

Plants of this section have ovoid or narrowly ovoid erect pseudobulbs, close together or not very widely spaced in a creeping rhizome. The inflorescences are synanthous, appearing with the young leaves, erect at the base, the flowering portion curved gracefully with more or less drooping tip. The plants are dainty and attractive, though the flowers are small.

#### Key to the Malayan species of the Section *Platyclinis*

Pseudobulb to 8 cm. long; leaf to 40 by 6-5 cm.; low-lands .. .. •• •• •• 1. *D. longifolium*

Pseudobulb usually much shorter; leaf always much narrower; mountain plants

Base of lip, with short side-lobes, distinctly broader than midlobe; keels very short, curved .. 2. *D. Kingii*

- Base of lip not broader than midlobe; keels nearly straight, about half the length of the lip  
 Leaf-blade to 23 by 2.5 cm. or larger; no side-lobes to lip  
 Lip 2-5 mm. wide, most of blade turned back underneath and rolled up; keels 2 .. 3. *D. simile*  
 Lip 1-5 mm. wide; blade not rolled up; keels 3 of equal length .. .. . 4. *D. odora* Uim  
 Leaf-blade not over 16 by 2 cm.; lip with side-lobes  
 Pseudobulbs 1-5-3 cm. apart, rhizome hanging free from substratum, with stout roots .. 5. *D. carnosum*  
 Pseudobulbs closer, rhizome close to substratum, with thin roots  
 Leaf not over 8 mm. wide; rachis of inflorescence 5-6 cm. long, with 8-12 flowers .. 6. *D. linearifolium*  
 Leaf wider; rachis longer, with more flowers  
 Side-lobes of lip very narrow; midlobe widening from a narrow base; rachis usually longer than scape .. 7. *D. gracile*  
 Side-lobes very small; midlobe widening little from a broad base; rachis shorter than scape .. .. . 8. *D. gramineum*

**1. *Dendrochilum longifolium*** Rchb. f., Bonpl. 4: 329. 1856. J.J.S., FL Buit. 6: 166, f. 125.—*Platyclinis longifolia* Hemsl., Gard. Chron. N.S. 16: 656. 1881. Ridl., Flora 4: 25.

Pseudobulbs close, narrowly conical, to 8 cm. long and 2 cm. wide at base, pale green and smooth; leaf-blade to about 40 by 6.5 cm., with stalk to 7 cm. long; inflorescence about as long as leaf, the scape slender, to 25 cm. long, the bracts broad and as long as the pedicel and ovary; flowers pale greenish brown with sepia lip; sepals and petals 7-8 mm. long, narrow; lip with small acute side-lobes and two small keels between them, and a midlobe 2-5 mm. wide; column short, with curved arms from the middle, the arms bilobed at their tips and curved upwards. Distributed from Sumatra to New Guinea; in Malaya a common epiphyte on old mangrove and on trees by rivers in the south and in Pahang. **Fig. 42.**

**2. *Dendrochilum Kingii*** (Hk. f.) J.J.S., Rec. Trav. Bot. Néerl. 1: 76. 1904.—*Platyclinis Kingii* Hk. f., F.B.I. 5: 708. 1890. Ridl., Flora 4: 27.—*p. sarawakense* quoad Ridl., Flora 4: 27.

Pseudobulbs close, green, about 3 cm. long and 8 mm. thick at base, narrowed to top; leaf-blade 20-30 by 1-2-2 cm., very gradually narrowed to base, more abruptly to apex, stalk 2-3 cm. long; scape 12-22 cm. long, rachis to 10 cm.; flowers greenish yellow; sepals and petals about 7 mm.

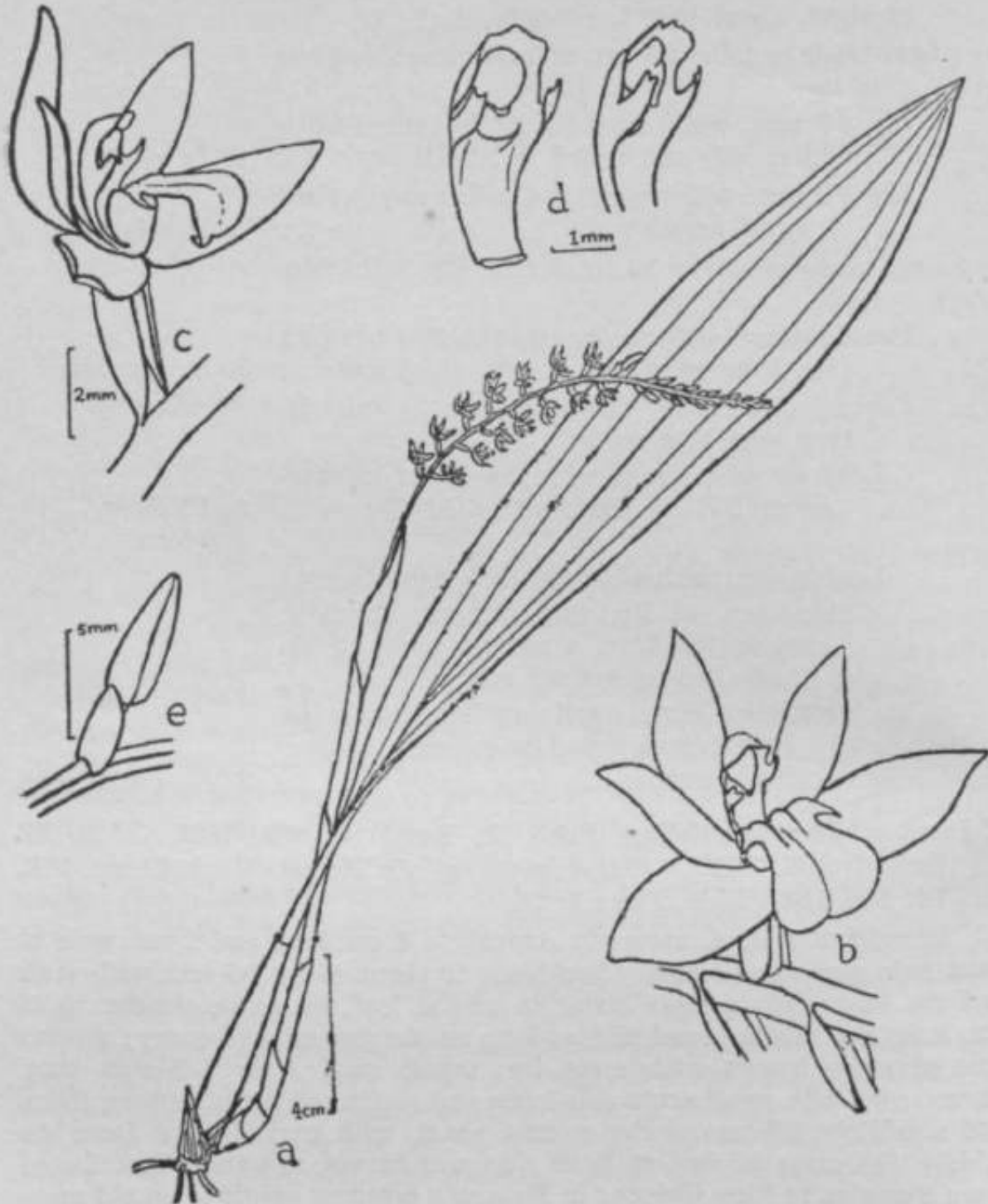


Fig. 42, *Dendrockilum longifolium*. a, plant, b, c, flowers, d, column, e, bud with bract.

long; lip about 5.5 mm. long, base 3 mm. broad including the short blunt spreading side-lobes, midlobe narrower, the apical half tapering gradually to the tip, keels 2, green, 1 mm. long, curved, near the base, their forward ends converging and touching; column 2 mm. long with very short 2-toothed arms at the base. Only known from a few specimens found on the Main Range and Taiping Hills in Perak. There is a very similar species in Sumatra,

3. **Dendrochilum simile** BL, Bijdr. 400. 1825. J.J.S., Fl. Buit. 6: 165, f. 124.—*Platyclinis linearis* Ridl., J.L.S. 32: 230. 1896.—*Dendrochilum lineare* Holtt., Gard. Bull. 11: 280. 1947.

Pseudobulbs close, to 5 cm. long and 1 cm. thick at base, tapering upwards; leaf-blade to 30 by 2-6 cm., the stalk to 8 cm.; scape nearly as long as leaf, the rachis to about 14 cm. long, curved; flowers white or pale yellow; sepals and petals 7-8 mm. long, the petals 3-veined, nearly 2 mm. wide; lip with apical half rolled under, when spread out about 6.5 by 2.5 mm., side-lobes hardly developed (edges toothed at normal position of the lobes), midlobe narrowly elliptic, blunt, little wider than base of lip; keels in basal half of lip 2, with a very short one between them; column about 3 mm. tall, top wing toothed, arms rising from near stigma taller than the column, acute, not lobed. Distributed in Sumatra and Java; in Malaya found at Cameron Highlands and on Kedah Peak. Peninsula plants have somewhat larger flowers than those from Java, and it is possible they should constitute a distinct species, in which case the name *lineare* should be used.

4. **Dendrochilum odoratum** (Ridl.) J.J.S., Rec. Trav. Bot. Néerl. 1: 80. 1904.—*Platyclinis odorata* Ridl., J.S.B.R.A.S. 39: 72. 1903. Flora 4: 26.

Pseudobulbs slender, 6-10 cm. long and under 1 cm. thick at base; leaf-blade to 23 by 3-5 cm., stalk to 5 cm.; inflorescence to about 35 cm., the scape to 18 cm., the rachis nodding; sepals and petals pale green, 5-5-7-5 mm. long; lip bent downwards but the end not rolled under, shorter than petals, 1.5 mm. wide, sides raised towards the base but not forming side-lobes, the tip bluntly pointed, with 2 green keels from the base for  $\frac{2}{3}$  total length, and a low middle one towards the apex; column 2 mm. tall, the apex toothed or deeply cleft, arms from below the middle, nearly as tall as the column. Found at Fraser's Hill, Cameron Highlands and on Taiping Hills, at 4,000-5,000 feet altitude. **Fig.** 43, c.

5. **Dendrochilum carnosum** (Ridl.) Holtt., Gard. Bull. 11: 280. 1947.—*Platyclinis carnosa* Ridl., J.F.M.S. Mus. 6: 56. 1915. Flora 4: 26.

Rhizome free from substratum, supported by stout unbranched roots, the sheaths short, not covering the mature rhizome; pseudobulbs 1.5-3 cm. apart, 1.5-2.5 cm. long, 5-7 mm. thick at the base; leaf-blade to 15 by 2 cm., elliptic, blunt, stalk to 5 cm.; scape to 15 cm., rachis to 15 cm.; flowers pale greenish, the lip with 2 brown lines; sepals and petals 6-7 mm. long; lip about 5 by 2-5 mm., the base broad, side-lobes short, triangular, midlobe widening little from a broad base, tip acute; keels in basal half of lip 2; column 4-4.5 mm. tall, arms from just below stigma shorter than column, apical wing toothed or cleft. Found on exposed mountain ridges at 4,500-7,000 feet in several localities. The flowers are very near those of *D. gracile*, but the habit differs very strikingly. The stout supporting roots only branch when they reach the substratum.

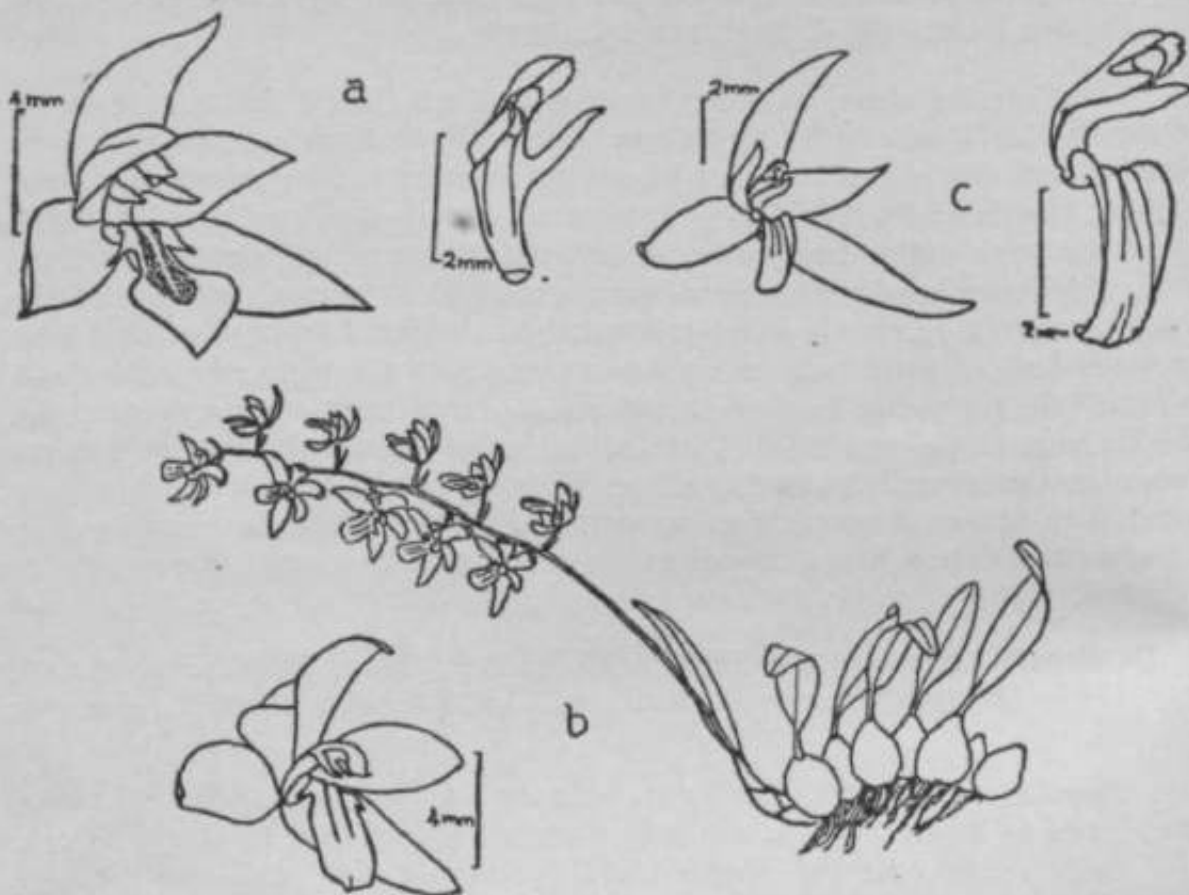


Fig. 43. *Dendrochilum*. a, *D. gracile*, flower and column, b, *D. linearifolium*, small epiphytic plant, with flower, c, *D. odoratum*, flower, column and lip.

6. ***Dendrochilum linearifolium*** Hk. f., F.B.I. 5: 782. 1890. Ic. Pl. t. 1859.—  
*Platyclinis linearifolia* Ridl., J.L.S. 32: 231. 1896. Flora 4: 25.  
 —*Platyclinis pulchella* Ridl., J.F.M.S. Mus. 6: 56. 1915. Flora 4: 26.

Pseudobulbs in regular series, about 5-8 mm. apart, ovoid, 1.5 cm. tall, orange in colour when exposed to bright light; leaf 3-5-10 cm. long, 4-8 mm. wide, with a short stalk; scape about as tall as the leaf, rachis 5-6 cm. long, nodding, with 8-12 flowers; flowers pale yellowish; sepals and petals 6-8-5 mm. long; lip to 7 by 4.5 mm., the base 3 mm. wide, side-lobes short but distinct, triangular, midlobe almost round with a short tip; keels from base of lip 2, brown, the median line between them grooved; column 3-4-5 mm. tall, with arms shorter than itself, from below the stigma, apical wing usually not toothed. Found in exposed places on mountains at 4,000-7,000 feet altitude; on G. Tahan it is common on bare rocks exposed to full sun. Epiphytic specimens with short broad leaves have been called *D. pulchellum*. In dried specimens the median vein of the lip appears to be a third keel, but it is not raised on the living flower. **Fig. 43, b.**

7. *Dendrochilum gracile* (Hk. f.) J.J.S., Rec. Trav. Bot. Néerl. 1: 69. 1904. Fl. Buit. 6: 167, f. 126.—*Platyclinis gracilis* Hk., f., F.B.I. 5: 708 1890. Ic. PL t. 2016. Ridl., Flora 4: 25.

Pseudobulbs close, 3-5-5 cm. long, at flowering 7 mm. thick at the base, tapering upwards, when mature ovoid, pale green, smooth; leaf-blade commonly about 10 by 2 cm. (occasionally to 18 by 3 cm.), elliptic, with stalk 1-5 cm.; scape 5-7 cm. long, rachis to 15 cm. or more, the flowers very close; sepals and petals pale green, 5-6 mm. long, 2 mm. wide at base; lip 5 mm. long, the base with toothed edges, side-lobes very narrow, acute, 1 mm. long, midlobe widening from a narrow base, 3 mm. wide and long, tip broadly pointed, with a brown patch at the base; 2 keels from base of lip to base of midlobe and a very short one between them; column 3-4 mm. tall, the arms nearly as tall, from below the stigma, apical wing entire or slightly toothed. Known in Java and Malaya; found on the Main Range and Taiping Hills at about 4,000 feet. At Cameron Highlands is a variety with bronzed leaves and inflorescence. Fig. 43, a.

Var. *angustifolia* Ridl., l.e. has leaf-blades to 14 by 1-2 cm., but otherwise appears identical. There may be intermediates.

8. *Dendrochilum gramineum* (Ridl.) Holtt., Gard. Bull. 11: 280. 1947.—*Platyclinis graminea* Ridl., J.F.M.S. Mus. 6: 57. 1915. Flora 4: 26.

Pseudobulbs about 1 cm. apart, 2-5 cm. long, 6 mm. thick at base; leaf-blade to 16 by 1-5 cm., stalk to 5 cm.; scape 15 cm., rachis about 10 cm. long; sepals and petals about 5 mm. long, the petals very narrow with a single vein; lip 4 mm. long, little over 1 mm. wide, side-lobes very short, toothed, midlobe widening little from base; 2 keels near base of lip; column 2-5 mm. tall, its arms from the middle, short, the apical wing toothed. Known only from a single collection from G. Kerbau, and may grow larger than above described. This species is very near *D. simile*, but appears to be smaller throughout, and to have narrower petals and lip with more distinct side-lobes; whether the midlobe is rolled under is unknown. Further collections are desired.

#### Section Eu-Dendrochilum

The Malayan plants belonging to this section are all very similar, both in their flowers and vegetatively, and it is difficult to decide how many species they represent. The basal part of a plant is rather like a *Platyclinis*, with creeping rhizome and a regular row of pseudobulbs rather close together; this bears branches which spread away from the substratum. The spreading branches have a stiff woody rhizome about 3-4 mm. thick, with several internodes between the small, usually slender pseudobulbs, which are 3-8 cm. apart. The inflorescences all appear on special branches, from the bases of the pseudobulbs, the base of each being enclosed by several overlapping sheaths; sometimes more than one inflorescence is borne at the base of one pseudobulb, and flowering is usually

simultaneous by many pseudobulbs. The whole inflorescence is usually about 10 cm. long, straight or slightly curved, the scape very short, the flowers small and crowded, usually pale greenish or nearly white; the bracts are small.

The sepals vary from 3 to 4.5 mm. in length and 1 to 1.5 mm. in width; the petals from 2 to 3.5 mm. in length and 0.6 to 1.5 mm. in width, being nearly always much narrower than the sepals, with a narrow base, the apex rounded to acute; the lip is 1.5 to 2 mm. long, and is simple, with 2 keels in the basal half, the apical half being sometimes widened and sometimes not, the whole more or less papillose; the column has arms from about the middle, the arms varying somewhat in length, the apical wing narrow or broad, entire or cleft and toothed. The lip may sometimes have a small middle keel as well as the two mentioned; there may be variation in this character.

Field study of different plants in the same locality is needed to find out the extent of variation, both in flowers and leaves. The following is a list of four species at present recognized; the first may be identical with *D. pallideflavens* of Java and Sumatra.

**Dendrochilum album** Ridl., J.L.S. 32: 287. 1896. Flora 4: 82. ? = *D. pallideflavens* Bl.—(?) *D. spathulatum* Ridl., J.S.B.R.A.S. 50: 134. 1908. Flora 4: 82.

Leaves 5 by 1 to 12 by 2.4 cm., short-stalked, narrowed evenly to base and apex; inflorescences usually paired; sepals 4-4.5 mm. long. Found in both mountains and lowlands; in exposed places the leaves are smaller and thicker than in sheltered places. *D. spathulatum* Ridl. (Fig. 44, c) should perhaps be united to this species.

**Dendrochilum angustifolium** Ridl., J.S.B.R.A.S. 39: 77. 1903. Flora 4: 82.

Leaves to 9 cm. long, usually not over 7 mm. wide, hardly stalked; otherwise apparently not different from *D. album* and perhaps the two intergrade, *D. angustifolium* being only a form found in very exposed places on mountain ridges. The extent of inter-grading needs field study. This species is often found growing in association with a curious epiphytic fern. Fig. 44, d.

**Dendrochilum crassum** Ridl., J.L.S. 32: 288. 1896. Flora 4: 82.

Leaves to 11 by 3.4 cm., almost evenly narrowed to base and apex, blunt, with stalk to 1 cm. long; petals  $1\frac{1}{2}$  nun. wide, as wide as the sepals. Only known from one collection from the Taiping Hills.

**Dendrochilum ellipticum** Ridl., J.S.B.R.A.S. 39: 77. 1903. Flora 4: 83.

Leaves to 13 by 3.2 cm., widest  $\frac{1}{3}$  from apex, tip acute, base with stalk 1 cm. long; inflorescences often paired; flowers small, sepals and petals about 3 mm. long. Found in the lowlands of Singapore, Johore and Pahang. Fig. 44, a, b.



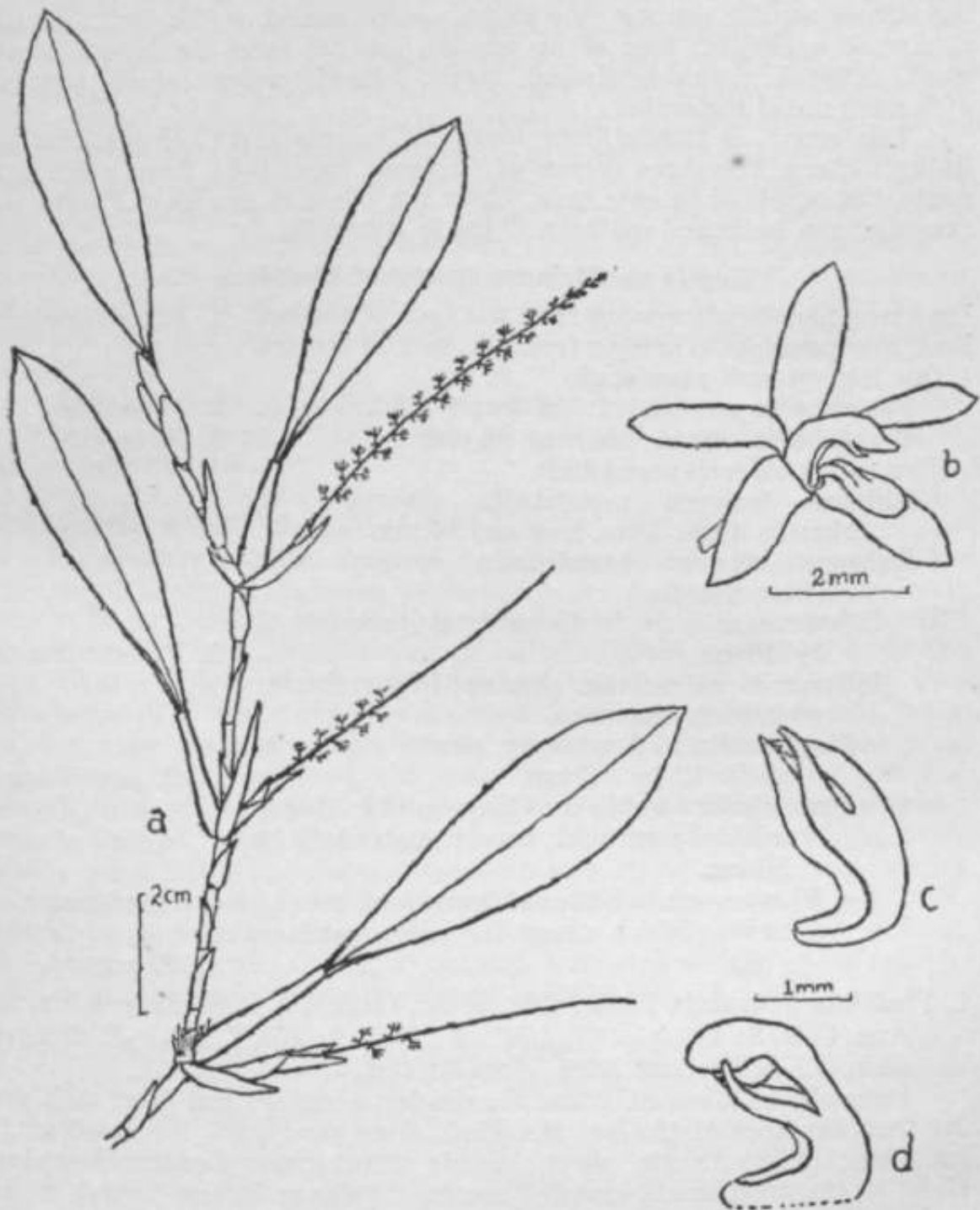


Fig. 44. *Dendrochilum*. a, *D. ellipticum*. b, *D. ellipticum*, flower (after Carr). c, *T>. spatulatum*, column (after Carr). d, *D. anffusti/oiMW*, column (after Carr).

## PHOLIDOTA

Pseudobulbs close or well-spaced, 1- or 2-leaved; inflorescence slender, bearing many small flowers alternately in 2 ranks, rachis often conspicuously zig-zag, bracts rather large, concave, persistent or falling at flowering; sepals usually concave, the laterals often keeled on the back; petals similar or narrower; base of lip saccate, distinct from the blade; blade small, deflexed, variously shaped, rarely 3-lobed; column short, with a wide wing round the anther.

This genus, as treated here, includes *Crinonia* and *Chelonanthera* of Ridley's *Flora*. The three species of *Crinonia* (nos: 6-8) form a distinct group, but hardly of generic rank. There are about 40 species of *Pholidota*, ranging from India and southern China to Australia.

Key to the Malayan species of *Pholidota*

- Each new pseudobulb arising from the apex of the last . . . 1. *P. articulata*  
 Each new pseudobulb arising from the base of the last
- One leaf on each pseudobulb
- Pseudobulbs not angled; lip deeply bilobed .. 2. *P. pallida*  
 Pseudobulbs angled; blade of lip entire .. 3. *P. longibulba*
- Two leaves on each pseudobulb
- Rhizome between pseudobulbs covered with sheaths about 5 cm. long and 15 mm. wide . . 4. *P. gibbosa*  
 Rhizome between pseudobulbs covered with smaller sheaths
- Inflorescence erect, to 45 cm. long; leaves to 45 by 10 cm. .. .. 5. *P. ventricosa*  
 Inflorescence drooping, shorter; leaves shorter and much narrower
- Pseudobulbs to 6 cm. long, slender; leaves to about 12 by 1-7 cm. .. .. 6. *P. parviflora*  
 Pseudobulbs to 4 cm. long, ovoid, fleshy, winkled when old; leaves to about 30 by 1-5 cm.
- Flowers white with red-brown anther . . 7. *P. globosa*  
 Flowers pinkish except for yellow patch on lip .. .. 8. *P. camea*

**1. *Pholidota articulata*** Lindl., Gen. et Sp. Orch. 38. 1830. King & Pantl., Ann. Calc. 8: 146, pi. 205. J.J.S., Fl. Buit. 6: 155, f. 115.—*P. decurva* Ridl., J.L.S. 32: 328. 1896. Flora 4: 139.

Pseudobulbs 2-leaved, cylindric, slender, about 10 cm. long, each rising from the apex of the last, the whole often pendulous; leaves about 10 by 4 cm., elliptic, acute, short-stalked; inflorescence slender, drooping, about 15 cm. long, bracts broad, 1 cm. long, falling; flowers 12 mm. wide, pinkish to dull brownish, sepals and petals widely spread and nearly equal; hollow basal part of lip with 5 low longitudinal yellow ridges, narrowed at its end which bears the blade; blade broader than long, slightly twisted, slightly bilobed, orange at its base. Distributed from Burma to Java; in Malaya found on the Taiping Hills and once only on the Main Range. No other Malayan orchid has the peculiar habit of this species.

2. **Pholidota pallida** Lindl., Bot. Reg. sub t. 1777. 1836.—*P. imbricata* sensu Lindl. Bot. Reg. t. 1213, non Lindl. in Hk. Exot. Fl. t. 138.

Pseudobulbs 3-6 cm. long, broadly conical, not angled, dull grey-green, each bearing a single thickly fleshy leaf of similar colour; leaf to 30 by 6 cm., acute, plicate, with stalk to 5 cm. long; inflorescence synanthous, drooping from an erect scape, the whole to 30 cm. long, with a few sheaths below the closely 2-ranked persistent floral bracts which are about 8-10 mm. long; flowers 6-7 mm. wide, not widely opening, usually pale flesh-colour; sepals broad, concave, 7 mm. long; petals shorter, narrower, pointed; lip with saccate base the sides of which rise vertically like side-lobes on either side of the column, midlobe spreading downwards, deeply 2-lobed, often with a yellow spot; column broadly winged, anther brown. Distributed from Burma and southern China to Australia, and variable in colour; common on limestone in all parts of Malaya, in sunny or lightly shaded places, and also as an epiphyte in the low country. At Fraser's Hill is a possibly distinct species of similar habit, with smaller flowers.

The name *irnbricatum*, by which this species has been generally known, was originally given by Roxburgh to a distinct Himalayan species of limited distribution.

3. **Pholidota longibulba** Holtt., Gard. Bull. 11: 286. 1947.

Pseudobulbs 1-2 cm. apart, 7-9 cm. long, 15-20 mm. wide near the base, smooth, angled, tapering gradually to the apex, each with one leaf; leaf to 30 by 5-5 cm., widest *in* the upper half, shortly acuminate, with stalk 2-5-4 cm. long; inflorescence synanthous, scape ultimately to 18 cm. long, hardly 1 mm. thick; rachis flexuous, nodding, to 18 cm. long with internodes of 4 mm.; bracts deciduous, 9 mm. long and 5 mm. wide, elliptic, apex rounded; ovary sessile, 2-5 mm. long. Flowers flesh-pink, translucent; upper sepal 4-5 mm. long, 3-5 mm. wide, ovate, tip rounded, lateral sepals concave and strongly keeled; petals 3-5 by 2 mm., acute; saccate base of lip 3-5 mm. long, 2-5 mm. wide, not keeled inside, blade entire, when flattened kidney-shaped, 3-5 mm. wide, 2 mm. long, with a broad slightly 2-lobed callus at the base; column 2 mm. long, 1-5 mm. wide, lateral wings narrow, apical wing truncate, rostellum almost vertical, anther light red-brown, broad, horizontal, occupying the top of the column. Known only from Cameron Highlands at 5,000 feet.

4. **Pholidota gibbosa** (Bl.) de Vr., 11l. Orch. t. 5, f. 1: t. 11, f. 62. 1854. J.J.S., Fl. Buit. 6: 152, f. 113.—*Chelonanthera gibbosa* Bl., Bijdr. 383. 1825. Ridl., Flora 4: 139.

Pseudobulbs slender, about 7-5 cm. long, to 10 cm. apart, the stout rhizome between them covered with overlapping sheaths 5 by 1-5 cm. or larger; leaves shortly stalked, blade to 20 by 5 cm.; inflorescence synanthous, pendulous from an erect slender scape, the whole to 30 cm. long; rachis zig-zag, internodes 6 mm. long; bracts about 1 mm. long, ovate, acute, falling; flowers opening widely, sepals and petals reflexed, faintly pinkish or greenish; sepals 8 mm. long, ovate; petals 8 by 1 mm., ends rolled backwards; lip pale pinkish, the hollow basal part 4 mm. long, blade

3-lobed, the side-lobes small, midlobe broad, deeply cleft, the halves overlapping in front; column broadly winged, edges brown, anther brown. Distributed in Java, Sumatra and Borneo; in Malaya found at Fraser's Hill, Cameron Highlands and on G. Benom, apparently not common.

5. *Pholidota ventricosa* (BL) Rchb, t, Bonpl. 5: 43. 1857. JJ-S., Fl. Buit. 6: 154, f. H4.—*Chelminmthera ventricosa* BL, Bijdr. 383, f. 51. 1825.—*Pholidota grandis* Ridl., J.S.B.R.A.S. 49: 32. 1907. Flora 4: 140.

Pseudobulbs close, to 10 cm. long, narrowly ovoid, ribbed; leaves with stalks to 15 cm. long and blade to 45 by 10 cm., plicate; inflorescence proteranthous, erect, to 45 cm. long, the scape about 25 cm., rather stout, flowers numerous, very close; bracts 15 mm. long, falling; flowers 10-12 mm. wide, the sepals greenish, concave, petals 2 mm. wide, reflexed, almost white; lip white, basal saccate part longer than wide, with a slightly reflexed edge, blade spreading, deeply cleft at the end and slightly so on each side; column 5 mm. long and as wide, very broadly winged. Distributed in Java, Sumatra and Borneo; in Malaya only found twice, at The Gap and near Batu Gajah in Perak, but perhaps not uncommon as an epiphyte in mid-mountain forest. Fig. 45.

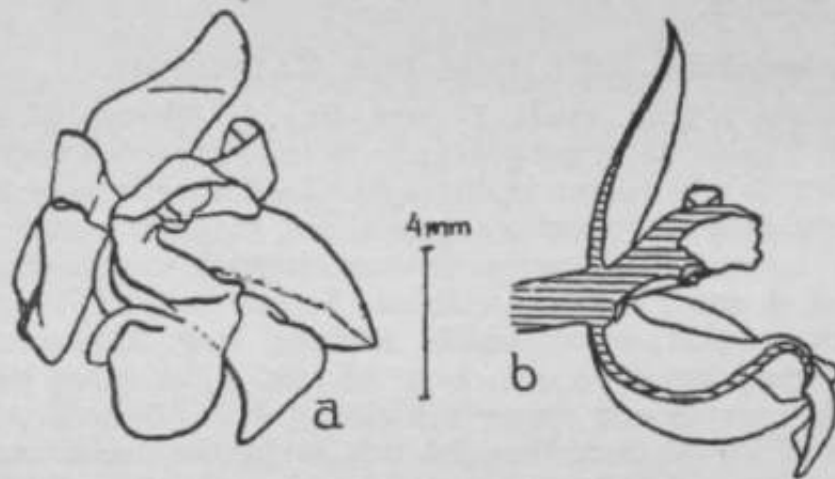


Fig. 45. *Pholidota ventricosa*. a, flower, b, section through column and lip.

6. *Pholidota parviflora* Hk. f, Ic. Pl. t. 1891. 1889.—*Crinonia parviflora* Pfitz., Pflzr. Coel. 136. 1907. Ridl., Flora 4: 137.
7. *Pholidota globosa* (Bl.) Lindl., Gen. et Sp. Orch. 36. 1830. J.J.S., FL Buit. 6: 159, f. 119.—*Crinonia globosa* BL, Bijdr. 339. 1825.—*Pholidota elizabetkia* Ridl., J.F.M.S. Mus. 6; 181. 1915.—*CWnonia elizabethiana* Ridl., Flora 4: 137. 1924.
8. *Pholidota carnea* (Bl.) Lindl., Gen. et Sp. Orch. 37. 1830. J.J.S., Ft. Buit. 6: 158, f. 118.—*Crinonia carnea* Bl., Bijdr. 339. 1825. Ridl., Flora 4: 137.

Pseudobulbs 1-5 cm. apart, differing in the characters shown in the key, the rhizome between them clothed with large sheaths; leaves differing as in the key; inflorescence synanthous, to about 20 cm. long, curved, internodes of rachis to about 4 mm., bracts falling; flowers 5-6 mm. wide,

petals much smaller than sepals; lip S-curved along its mid-line, widening from a narrow saccate base to a broadly rounded downturned blade, with 2 broad fleshy ridges at base of blade. These three species (genus *Crinonia* of Ridley's *Flora*) are very closely allied, and the precise distinctions between them need further field study. *P. parviflora* is apparently distinct in its long slender pseudobulbs and *small* leaves; its flowers are either white or pinkish. Whether the other two species are clearly distinct in flower colour, and whether there are any good vegetative distinctions between them, is uncertain. All appear to be common on high mountain ridges in rather exposed places. *P. cornea* has a very wide distribution from Sumatra to the Philippines; *P. globosa* extends also to Java; *P. parviflora* is (as at present known) confined to Malaya. **Fig. 46.**

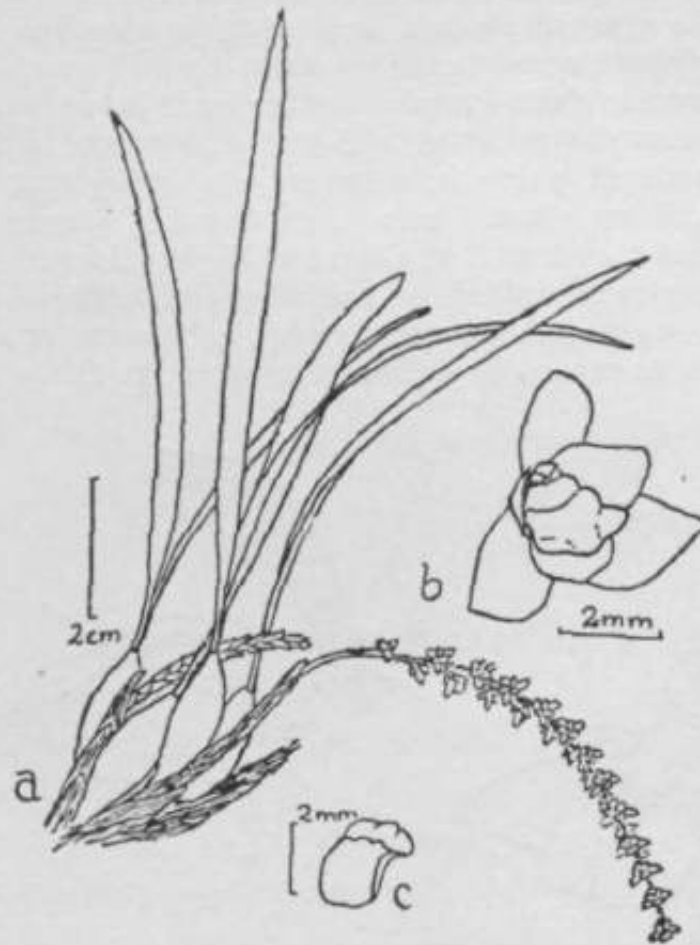


Fig. 46. *Pholidota parviflora*. a, plant. b, flower, c, lip from within.

### CHELONISTELE

Habit of *Ccelogyne*, with porterathous inflorescence; lip with narrow hollow basal portion with almost parallel sides, and at the end of this a 3-lobed blade, the side-lobes narrow, at right angles to the blade and almost in the same plane, the blade bearing two keels in its basal part, at its distal end abruptly widening to the broad midlobe.

This genus has been included in *Coelogyne* by Dr. J. J. Smith and other authors, but has a decidedly different structure in the lip, being somewhat intermediate between *Pholidota* and *Ccelogyne*. Only one species is known in Malaya, but in recent years several have been found in Borneo.

*Chelonistele perakensis* (Rolfe) Ridl., *Flora M.P.* 4: 138, 1924.—*Cwlogyne perakensis* Rolfe, *Bot. Mag.* t. 8203. 1908.

Pseudobulbs close, 4-5 cm. long, narrowly ovoid, smooth when young and wrinkled when old, one-leaved; leaf-blade firm, to 20 by 4 cm., stalk to 8 cm.; inflorescence proteranthous, erect, its base enclosed in long purplish sheaths, bearing about 12 flowers; bracts about 2 cm. long, falling; flowers 2.5 cm. wide; sepals spreading, 1.5 cm. long, narrowly elliptical, pink or very pale greenish; petals narrow, their ends rolled backwards, pale yellowish or white, side-lobes of lip about 4 mm. long and 1 mm. wide, acute, slightly curved; blade 4 mm. wide, the keels pale pinkish to orange-yellow; midlobe abruptly widened to 1 cm., pale yellow with a brown or yellow brown-bordered patch in front of the keels, deeply cleft with rounded lobes; column about 5 mm. high, broadly winged. Common on Taiping Hills, and found also at Cameron Highlands and Fraser's Hill. This species is very nearly allied to *C. sulphurea* of Java and Sumatra, and should perhaps be regarded as a variety of *C. sulphurea*. There is evidently some variation in flower-colour and more records are desirable. Fig. 47.

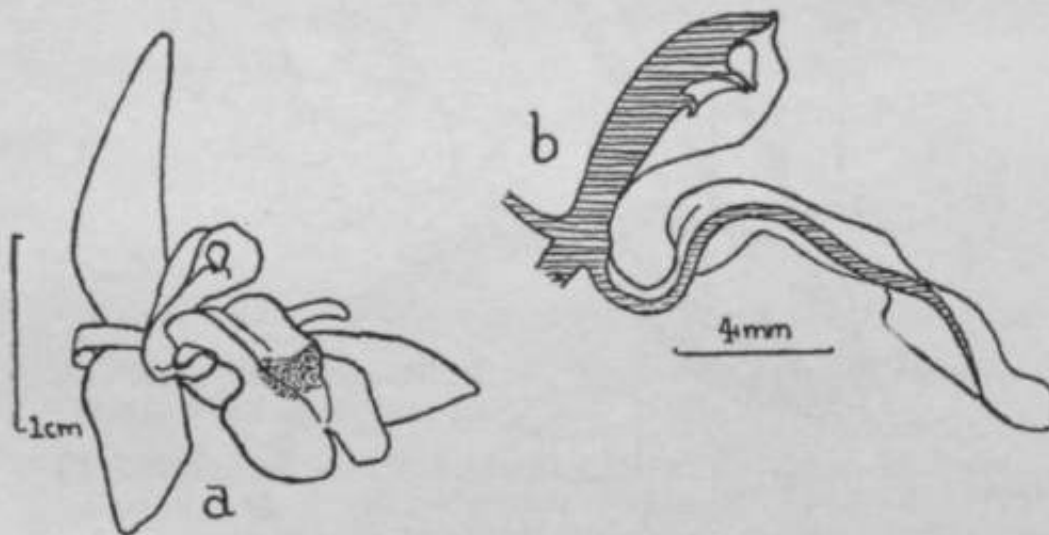


Fig. 47. *Chelonistele perakensis*. a, flower, b, section of lip and column.

*Chelonistele pusilla* Ridl., *Flora M.P.* 4: 138. 1924.—*C&logyne pusilla* Ridl., *Journ. Linn. Soc.* 32: 327. 1896.

This species has been described from the Taiping Hills but its distinctness is in doubt. It is small, and may perhaps be only a dwarf form, but may also differ in the form of the leaf and of the lip. Field study on Taiping Hills is needed to settle the question.

## CCELOGYNE

Pseudobulbs close or distant, 1- or 2-leaved; leaves broad, elliptic, plicate; inflorescence erect or pendulous, with few or many large or fairly large flowers, opening in succession or simultaneously, sometimes heteranthous; sepals often strongly concave; petals often much narrower than sepals; lip usually somewhat concave at the base, 3-lobed, the side-lobes widening gradually from the base of the lip and erect on either side of the column, the midlobe of the lip with longitudinal keels which are often papillose, toothed or warty; column long, winged round the top; anther hanging by a filament, its tip resting on the large rostellum which overarches the hollow stigma.

This is a large genus of more than 150 species, distributed from the Himalayas and southern China on the north to Ceylon and throughout Malaysia to the New Hebrides. In Malaya we have some very beautiful species, often cultivated; their flowers however are not long-lasting. There is also a group of smaller-flowered mountain species which are at present insufficiently known, and need further study.

The genus as a whole has been elaborately divided into sections, some of which do not occur in Malaya. We have however representatives of several very distinct groups, and it is convenient to sub-divide the genus, though on somewhat broader lines than in a general monograph. The following is a key to the Sections adopted here.

## Key to the Sections of Coelogyne

- Flowers opening in succession, one or a few together,  
the apex of the inflorescence enclosed by a large  
bract: leaves 1 or 2     ..     ..     ..     *Section 1*
- Flowers of any inflorescence all open together: leaves 2  
Inflorescence erect
- Flowers rather small; lip with a saccate base  
separated by a transverse fold, keels simple     *Section 2*
- Flowers large; base of lip hollow but not so  
separated; keels variously toothed     ..     *Section 3*
- Inflorescence limply pendulous, or curved over from  
an erect base     ..     ..     ..     "
- Inflorescence curved over from an erect base, pro-  
teranthous, never covered with blackish or  
brownish hairs     ..     ..     ..     *Section U*
- Inflorescence limply pendulous, usually very long,  
proteranthous or heteranthous, more or less  
covered with short dark hairs, which are  
sometimes only on the ovary     ..     ..     *Section 5*

ORCHIDS OF MALAYA

Section 1

These are mostly mountain plants, and some are quite common. In some the inflorescence bears a succession of many flowers, becoming gradually very large with a flexuous rachis, others only few flowers are produced. In some species the keels are long, and papillose, and short and beautiful flowers, including the common *C. affinis* and *C. Weibullii* and *C. I. T.* a good deal of information about some members of the section,

the

- No persistent sheaths at base of rachis or at base of inflorescence
- Pseudobulbs 1-leaved; flowers large, with papillose or toothed keels
- Keels on lip two, wavy and papillose
- Sepals 5 cm. long; keels reaching apex of lip 1. *C. cyrillus*
- Sepals 3-5 cm. long; keels not reaching apex of lip
- Keels on lip three 2. *C. tiomanensis*
- Keels on lip two, middle one extending on midlobe only
- Keels on lip two, middle one extending on midlobe only 3. *C. anthoglossum*
- Pseudobulbs 2-leaved; flowers often rather large; keels smooth or absent
- Pseudobulbs widely-spaced, thickest near base, scape not flat; flowers green 4. *C. membrum*
- Pseudobulbs 1-3 cm. apart, thickest in middle or higher; scape flattened; flowers white or pinkish
- Sepals 15 mm. long; lobes about distinct side-lobes 5. *C. prasina*
- Sepals longer, lip with distinct side-lobes
- Midlobe of lip as long as wide 6. *C. stenochila*
- Midlobe much longer than wide 7. *C. carnea*
- Persistent sheaths present at base of inflorescence or base of rachis 8. *C. stipitibulum*
- Scape flattened, 10-15 on, 1 death at its apex 9. *C. anceps*
- Scape 3-4 cm. long, almost covered by about 3 overlapping sheaths of lip fringed with hairs 10. *C. pallens*



1. *Coelogyne xyrekes* Ridl., J.F.M.S. Mus. 6: 181. 1915. Flora 4: 134.—  
*C. speciosa* quoad Ridl., Flora 4: 134, *p.p.*

Pseudobulbs close, ovoid, about 5 by 2-3 cm., one-leaved; leaves to 30 by 5-9 cm., including a stalk 4-7 cm. long; inflorescence synanthous; scape to 15 cm., slender; rachis not long, internodes 1-5 cm., bracts 3-5-4-5 cm. long; flowers appearing singly, large, petals and sepals pale salmon pink; sepals to about 5-2 by 2-1 cm.; petals as long, 2 mm. wide near base, widening to about 4 mm. near apex; lip large, salmon pink, partly tessellated with warm to dark brown, with two very dark brown much waved minutely papillose keels from base to apex, j midlobe 2-5 cm. wide. Common in mountain forests at about 4,000-5,000 feet; not known outside Malaya but nearly related to *C. speciosa* of Java and Sumatra. This is a beautiful species, but not easy to cultivate in the lowlands.

2. *Coelogyne tiomanensis* Hend., Gard. Bull. 5: 80, 1930.

Pseudobulbs close, ovoid, about 4 cm. long, 1-leaved; leaf to about 30 by 6 cm., including the stalk of 4-5 cm.; inflorescence synanthous, the scape to 15 cm. long, the rachis with few internodes about 1 cm. long; sepals very pale pinkish with yellow midrib, 3-5 cm. long; petals very narrow, longer than sepals, pale greenish or pale flesh-colour; lip 2-8 cm. long, side-lobes broad, white with brown veins, midlobe widening from base, broadly ovate, 1-6 by 1-6 cm., dark brown in centre shading to light brown edges; keels 2, waved, from base of lip to middle of midlobe. Found only at about 3,000 feet altitude on Pulau Tioman. This species is nearly related to *C. xyrekes*, but has smaller and differently coloured flowers.

3. *Coelogyne xanthoglossa* Ridl., J.F.M.S. Mus. 6: 180. 1915. Flora 4: 134.

Pseudobulbs about 3-5 cm. long, 4-angled, 1-leaved; leaf to about 18 by 5 cm., stalk 5 cm.; inflorescence 5 cm. long, 1- or 2-flowered; sepals 5 cm. long, pinkish; petals very narrow; lip canary yellow with 2 waved keels and a low straight median one, centre of midlobe orange. Known only from Gunong Tahan. The only specimen is at Kew, its single flower immature, with sepals 3 cm. long.

4. *Coelogyne membranifolia* Carr, Gard. Bull. 7: 2, pi. I. 1932.—*C. speciosa* quoad Ridl., Flora 4: 134, *p.p.*

Pseudobulbs close, ovoid, to 6 by 2 cm., 1-leaved; leaves to 30 by 10 cm., including stalk of 3 cm.; inflorescence synanthous, the slender scape to 12 cm., the rachis of few internodes, each to 2 cm. long; flowers pale yellow-green; sepals 4-5 cm. long, broad; petals as long, 3-5 mm. wide; lip with 5 keels between the side-lobes, the median and outermost stopping at base of midlobe, the other two diverging and passing on to the midlobe, keels white with a fringe of brown or orange hairs; side-lobes pale brown, spotted with white, with a white edge; midlobe nearly round, white with transverse brown bar near base and a raised triangle with a brown mark on either side. Found in moist shady forests in the lowlands of Johore and Pahang, often near the ground, on mossy tree-trunks; it is the lowland counterpart of *C. xyrekes*, with a very different lip but closely similar in general habit.

5, *Coeiogyne prasina* Ridl., J.L.S. 32: 326. 1896. Flora 4: 136.

Rhizome long, about 6 mm. thick, the sheaths short with gaps between them; roots many, long and stout; pseudobulbs 6-15 cm. apart, to 10 cm. long and 2 cm. thick, thickest 1/3 from base, tapering to narrow apex, 2-leaved; leaves to about 28 by 7.5 cm., with stalks to 4 cm. long; inflorescence synanthous, the scape slender, not flattened, 10-20 cm. long, the rachis flexuous, rarely very long, internodes about 1 cm., bracts 2-2 cm. long; flowers uniform pale green or olive-green; sepals and petals 1.2-1.4 cm. long, petals under 2 mm. wide at base, narrowed to very narrow tip; lip about same length, with high rounded side-lobes less than half its length, their ends not projecting forwards; midlobe 5-6 mm. wide, slightly widened from its base, a little longer than wide, end broadly rounded and slightly notched; keels 2, from near base of lip to middle of midlobe,

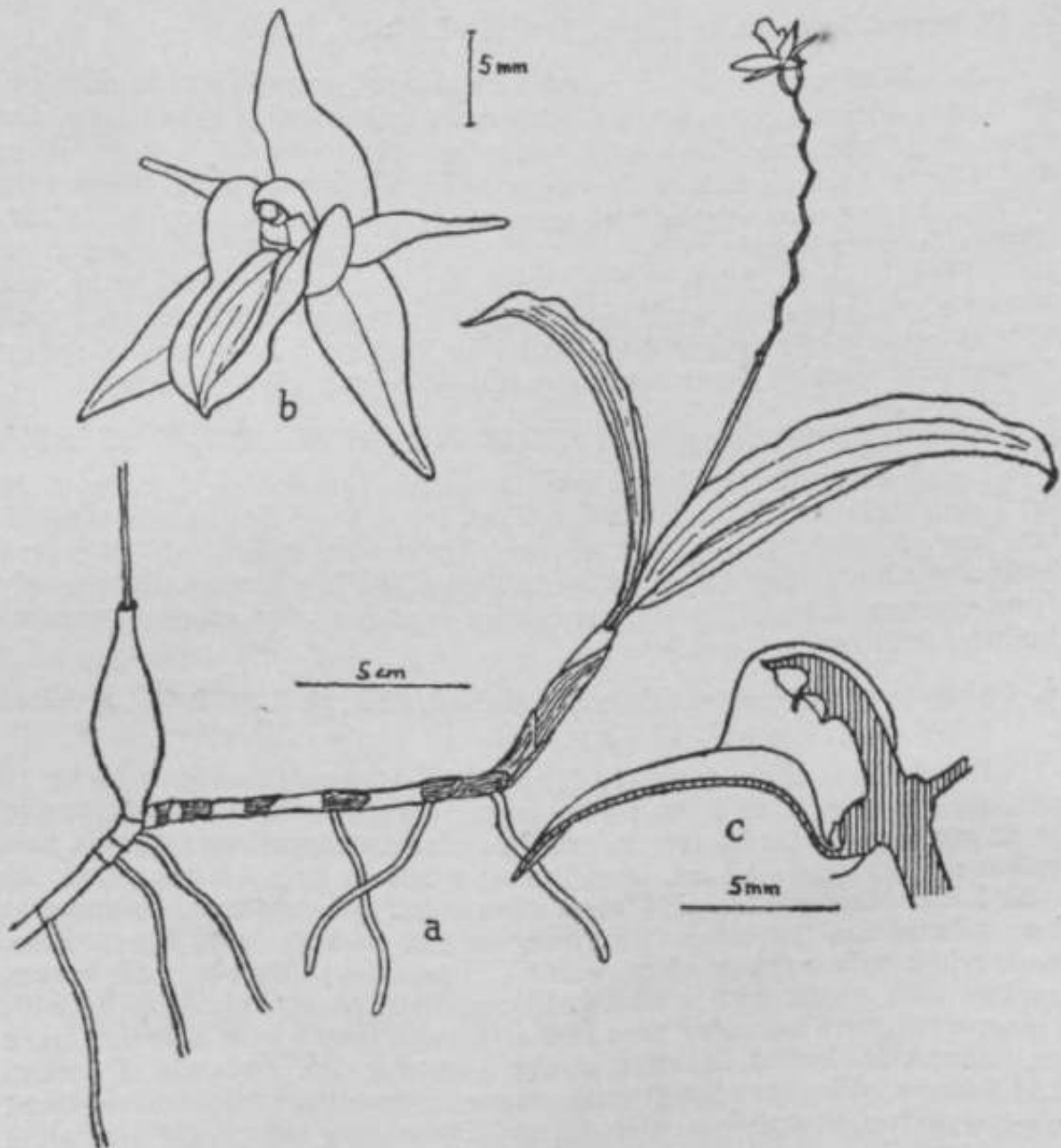


Fig. 47a. *Cmlogyne prasina*. a, plant with old leafless pseudobulb and immature flowering pseudobulb; b, flower; c, section through column and hp.

curved, smooth, not high; column less than half length of upper sepal. Not uncommon on the mountains, found at Fraser's Hill, Cameron Highlands, Taiping Hills and Kedah Peak. It is nearly allied to *C. rhizomatosa* of Celebes. **Fig.** 47, a.

6. *Coelogyne stenochila* Hk. f., F.B.L 5: 837. 1890. Ic. **Pl.** t 2106. RidL, Flora 4: 136.

Pseudobulbs 1 cm. or less apart, to 4 cm. long, widest in the middle (1 cm. wide), smooth when young, wrinkled when old; leaves two, to 15

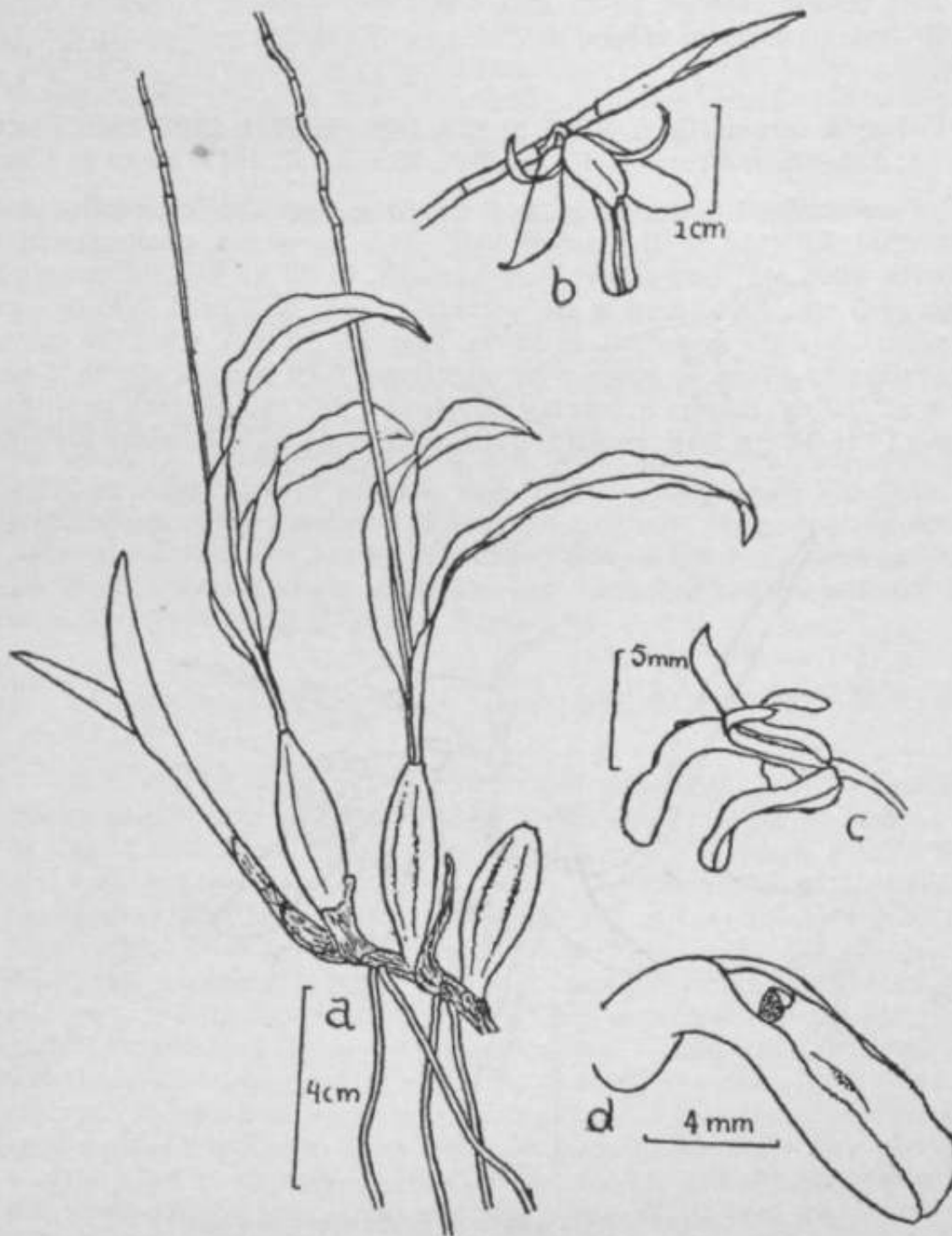
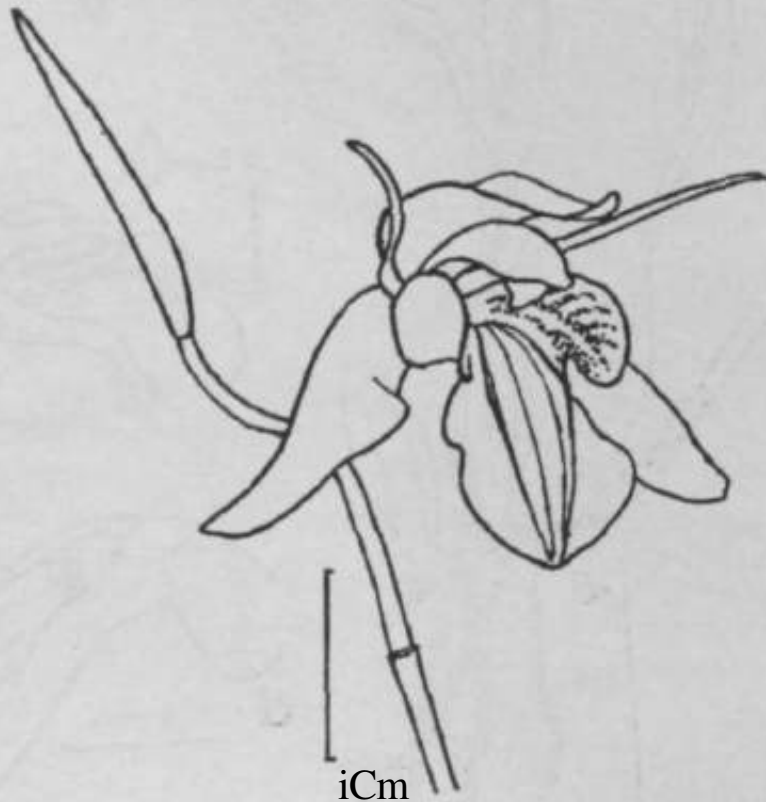


Fig. 48, *Coelogyne stenochila*. a, plant, b, apex of inflorescence, and flower, c, flower. d, lip enfolding column, midlobe not expanded.

by 25 cm. with stalk of 2 cm., evenly elliptic with crisped edges, bluntly pointed; scape flattened, to 12 cm. long and 2-5 mm. wide; rachis flexuous, elongating to 50 cm., internodes 5-8 mm., the bracts deciduous or sometimes a few (not basal) persisting, 1-5-2 cm. long; flowers pure white except for orange-yellow anther and 2 yellow-brown spots on midlobe of lip; sepals 1-5 cm. long; petals 2 mm. wide; lip unlobed or slightly lobed, saccate at base, enfolding the column closely to its apex and then bent nearly at right angles; blade with raised sides, when flattened almost round, about 7 by 7 mm., edges minutely toothed, two small keels present or not; column slender, 10-12 mm. long, apex 3-lobed. Found at about 6,000 feet, on exposed ridges, at Cameron Highlands and on G. Benom. **Fig. 48.**

7. ***Ccelogyne carnea*** Hk, f., F.B.I. 5: 838. 1890. Ic. PL t. 2107. RidL, Flora 4: 136.—*C. radicosus* Ridl., J.F.M.S. Mus. 6: 57. **1915**, Flora 4: 135.

Pseudobulbs 1-3 cm. apart, to 8 cm. long, base slender, swollen and somewhat flattened in the apical half, with numerous small irregular grooves when old; leaves two, very variable, to 20 by 2-5 cm. including stalk of 3 cm., or to 8 by 4 cm. including stalk of 1 cm.; inflorescence hysteroanthous, the scape flat, to 12 cm. long, 2-5-3-5 mm. wide, the rachis elongating to 30 cm. or more with internodes 7-10 mm., bracts to 2 cm. long, all falling; flowers appearing singly, pale dull salmon pink or white; sepals 1-7 to 2-5 cm. long; petals 1-2 mm. wide in apical half, wider towards



**Fig. 49.** *Ccelogyne carnea*, apex of inflorescence and flower.

base; lip nearly as long as sepals and petals, the brown-veined side-lobes extending to rather more than half its total length, their free ends short and broadly rounded; midlobe nearly round, widening a little from the base, 1-1.2 cm. wide, with two short but rather high smooth keels (brown at highest point) extending from just below its base to just beyond its middle, and a very short median keel near tip; column over half length of upper sepal, tip broad. Common on mountain ridges. This is a variable species both vegetatively and in size and colour of its flowers. Vegetatively there do not appear to be any distinct varieties, though such may be revealed by field study. In flower-form there is variation in size, and perhaps in the relative length of the side-lobes; as regards colour, the white-flowered variety is quite distinct, but how variable in size of flowers is not known. The pink flowers have the side-lobes veined with brown, the white flowers have the keels only pale brown. Fig. 49.

8. *Coelogyne stipitibulbum* Holtt, Gard. Bull. 11: 278. 1947.

Pseudobulbs 2-3 cm. apart, to 6 cm. long, a little over 2 cm. wide, base stalk-like, upper part swollen and bluntly 4-angled when young, longitudinally wrinkled when old; leaves 2, to 15 cm. long and 3 cm. wide, with stalk of 2 cm., edges crisped; scape 6-10 cm. long, flat, 2-2.5 mm. wide, rachis elongating to over 30 cm., internodes about 10 mm. long; bracts 2-5-2-8 cm. long; flowers entirely salmon pink; upper sepal 2-6-2-9 cm. long, 10 mm. wide; petals 2 mm. wide; lip 2-3 cm. long, side-lobes erect on either side of column, with short rounded ends, less than half total length of lip; midlobe 15 mm. long, 8 mm. wide, slightly convex, narrowly elliptic with acute apex, with 2 smooth low keels running to half its length only; column shorter than side-lobes, top broadly winged, truncate. Only known from Cameron Highlands.

9. *Coelogyne anceps* Hk. f., F.B.I. 5: 840. 1890. Ic. PL t. 2109. Ridl., Flora 4: 135.

Pseudobulbs fairly close, about 4-6 cm. long, the base slender, thickened upwards and narrowed to tip, 2-leaved; leaves to 12 by 4 cm. or larger, with short stalk; inflorescence synanthous, scape flat, 10 to 15 cm. long, nearly 3 mm. wide with thin edges, with about 4 persistent overlapping sheaths at junction of scape and rachis; flowers white (?) > sepals about 2-5-3 by 0.6 cm.; petals about 3 mm. wide; lip with narrow side-lobes extending to more than half the total length, their short free ends rounded, midlobe widening much from a narrow base, nearly round, with 2 smooth keels from just below the base to just beyond the middle; width of midlobe as great as width across side-lobes when lip is flattened; column 2/3 length of upper sepal, tip narrowed to a blunt point, anther very small. Only known from two collections made somewhere in Perak. Closely allied to *C. carnea*, but with shorter pseudobulbs, shorter stiffer and stouter scape with larger flowers. Intermediates may however occur.

**10. *Coelogyne pallens*** Ridl., J.S.B.R.A.S. 39: 81. 1903. Flora 4: 135.

Rhizome slender, covered with rather short overlapping sheaths; pseudobulbs 4-7 cm. apart, to 8 cm. long and about 1.5 cm. wide above the base; leaves 2, to 18 by 3-3 cm. including a short stalk; scape 3-4 cm. long, almost entirely covered by about 3 overlapping sheaths attached near its base, rachis elongating to 10 cm. or more, internodes about 1.5 cm. sepals and petals 2-2.7 cm. long, pale greenish or buff, the petals very narrow; lip pale buff, the side-lobes with rather long triangular forward-pointing ends, the midlobe to about 1.5 by 0.8 cm., edges of both mid and side-lobes toothed and more or less deeply fringed with dark hairs up to 1 mm. long; keels 3, brown, the lateral ones curved and extending to apex of midlobe, the median one short. Only known from Taiping and Kedah Peak. Closely related to *C. fuliginosa* from Tenasserim and Java (which is cultivated and flowers freely in Singapore), but with much smaller flowers; perhaps it may be ranked as a variety of *C. fuliginosa*. There is some variation in the width of the midlobe (it may be only 5 mm. wide) and in extent of hairiness of edges of lip; perhaps two distinct varieties exist, in which case that with the narrower lip is the typical *C. pallens*.

### Section 2

This is a small section, and it is not certainly represented in Malaya; there is however a single specimen in the Singapore Herbarium, of a plant cultivated in Singapore and thought to have been brought from the Taiping Hills. The species is *C. flexuosa*, which occurs in Java and Sumatra, and might just possibly have been brought from outside Malaya.

The characteristic features are the tall inflorescence with flexuous rachis as in Section 1 but flowers all open together, and the saccate base of the lip separated by a transverse fold from the rest. The pouch-like base so separated contains much nectar.

***Coelogyne flexuosa*** Rolfe, Kew Bull. 1892: 209. J.J.S., Fl. Brit. 6: 148, f. 110.—*C. bimaculata* Ridl., J.L.S. 32: 327. 1896.—*Ptychogyne flexuosa* Pfitz. et Krzl., Pflzr. Coel. 19. 1907.—*P. bimaculata* Pfitz. et Krzl., U. 20.

**Pseudobulb** close, about 7 cm. long, 3-5 cm. wide near the base, ovoid, ridged; leaves 2, about 25 by 5 cm. with a short stalk, tip acute, edges slightly wavy; inflorescence erect, on fully grown young pseudobulb, the scape slender, 20 cm. long, the rachis 15 cm., flexuous, bearing about 15 flowers all open together, bracts 3 cm. long, falling; flowers white, not widely opening; sepals about 1.7 by 0.6 cm.; petals 1.4 by 0.4 cm.; side-lobes of lip erect, rounded, midlobe half total length of lip, hardly widening from the base, very shortly tipped, about 6 mm. wide; keels on lip 3, toothed from near base to apex, interrupted near base where the laterals are a little longer; a yellow patch across middle of midlobe and continued back along base of side-lobes; column 7 mm. long, narrowly winged.

## Section 3

The section includes some very beautiful species. All have erect inflorescences of pure white flowers with yellow keels on the lip; the flowers are fairly large but not numerous, and may be very fragrant. The flowering of the plants is often gregarious. In most cases the plants grow in large masses on the main branches in the crown of high forest trees, and the sight of such a tree with its branches clothed with a mass of white flowers is one not to be forgotten. Unfortunately these species, in Singapore at least, do not appear to be at all free-flowering. Where they will flower freely, these plants are well worth growing. It is interesting that within this group of closely related species both heteranthous and synanthous conditions occur.

## Key to the species in Section 3

Inflorescence synanthous

Leaves to about 16 cm. long, stalked; lowlands 1. *C. Cumingii*

Leaves to about 35 cm. long, not stalked;

mountains .. .. 2. *C. longibracteata*

Inflorescences heteranthous .. .. 3. *C. Fcerstermannii*

1. *Coelogyne Cumingii* Lindl., Bot. Reg. 26: Misc. 178. 1840. Bot. Reg. 27: t. 29. 1841. Bot. Mag. t. 4645. Ridl., Flora 4: 134.

Pseudobulbs about 2-5 cm. apart, ovoid, smooth, broadly and irregularly wrinkled when old, about 4 cm. long; sheaths covering young shoots large, stiff, smooth; leaves 2, rather stiff, to about 16 by 4 cm. excluding the distinct stalk of 3-6 cm.; scape about 10 cm. long, rachis bearing 3-5 flowers; bracts very long, falling early; sepals and petals white, sepals 3 by 0.7 cm., petals 4 mm. wide; lip white except for veins in the side-lobes and the 5 yellow or orange crested keels, 3 from base to apex of lip, the other two only on the midlobe, all ending in a distinct tooth. Distributed in Borneo and Sumatra; in Malaya found in many places, in lowlands and at moderate elevations on the hills, on trees and rocks, sometimes in large masses. Fig. 50.

2. *Coelogyne longibracteata* Hk. f., F.B.L 6: 194. 1890. Ann. Calc. 5: 25, t. 39. 1895. Ridl., Flora 4: 132.

Pseudobulbs close, about 7 cm. long, smooth, with a few irregular ridges when old; sheaths very large and stiff; leaves 2, to about 35 by 4 cm., narrowed gradually to base without a distinct stalk; inflorescence and flowers as in *C. Cumingii*, the sepals and petals 2-5-3 cm. long. The proportions of the lip are said to differ in the two species, the midlobe being short in *C. Cumingii* and as long as the rest of the lip in *C. longibracteata*; this needs confirmation. *C. longibracteata* appears to be fairly common at Cameron Highlands between 4,000 and 5,000 feet, and has been also found on G. Tahan and other mountains. It is certainly very similar to *C. Cumingii* and might perhaps rank as a mountain variety.

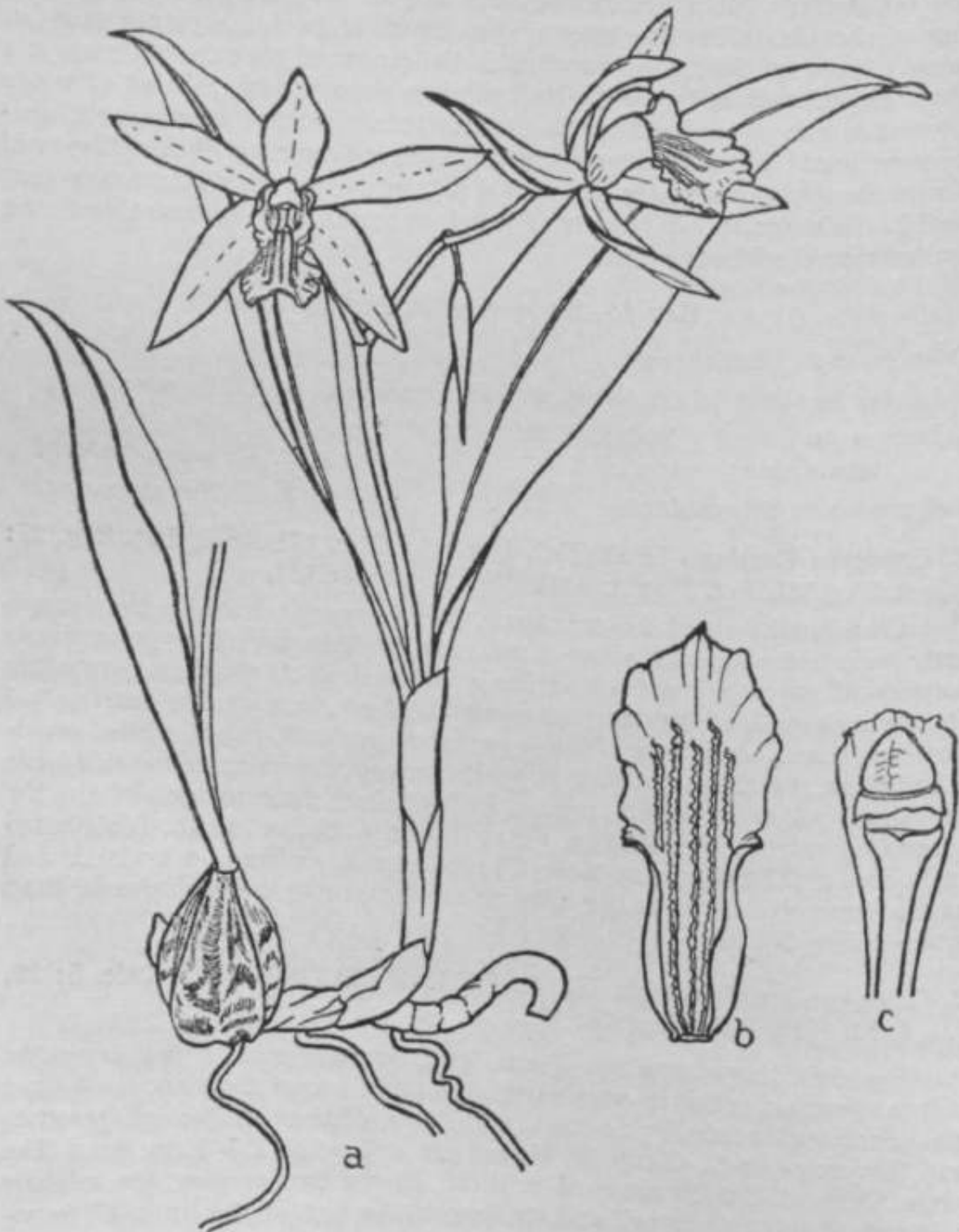


Fig. 50. *Cclogym Cumingii*, plant from Mt. Ophir, 1890 (after de Alwis)  
in flower. 6, Up. c, column.

• a, p an



3. **Ccelogyne Fcerstermannii** Rchb. f., Gard. Chron. N.S. 26: 262. 1886. Ridl., Flora 4: 132.—*C. Kingii* Hk. f., Ann. Calc. 5: 25, t. 38. 1895. Ridl., Flora 133.

Pseudobulbs narrow, to 12 cm. long, nearly cylindrical with about 10 ribs, yellow-green, to 12 cm. or more apart, the rhizome between them covered with close overlapping dark sheaths; leaves stiff and closely plicate, blade to 30 by 4.5 cm. with stalk to 8 cm.; inflorescence to 40 cm. tall, heteranthous, arising close to the base of an old pseudobulb, covered from the base when young with closely overlapping sheaths making a very regular pattern; floral bracts 4-5 cm. long, flowers up to 15, often 8 or 9; sepals 3-4 cm. long, 10-14 mm. wide, petals a little narrower; lip white with yellow central area near apex, 3 keels from base almost to apex of lip, the middle one a little shorter, and two extra short lateral keels confined to the midlobe, keels finely crisped and toothed throughout, orange-tipped. Distributed in Borneo and Sumatra; in Malaya found in the lowlands, on high trees, often abundantly, and at moderate elevations on the hills. Flowering is gregarious and often spectacular; it appears to follow about 3 months after dry weather. The flowers are strongly scented. **Fig. 51.**

The original *C. Fcerstermannii* was described in England from plants brought from Sumatra or Borneo; later Hooker described *C. Kingii* from Perak, cultivated at Calcutta. Pfitzer says the two are distinct in the shorter narrower midlobe of the lip of *C. Kingii*, but Malayan plants grown in Singapore have lips about intermediate between his two extremes, and it is improbable that a specific distinction exists between Malayan plants and those from Borneo and Sumatra.

#### Section 4

**In** this Section we have five species. They are all proteranthous, the inflorescence developing before the leaves and pseudobulbs. If any of the flowers produces a fruit, the scape increases in thickness after flowering, and often also in length; this is especially notable in the first two species which have short inflorescences. The difference in aspect between the young flowering shoot, with the base covered with sheaths and at most the tips of the leaves appearing, and the mature pseudobulb with its two leaves and a terminal scape bearing a fruit, is very striking. The Section includes *C. asperata* and *C. pandurata*, two of the best-known cultivated species of Ccelogyne.

#### Key to the species of Section 4

- Leaves **not** over 3.5 cm. wide; no sheaths between the leaves and the first floral bract
- Leaves to 3.5 cm. wide; flowers about 6, cream colour .. .. . 1. *C. cinnamomea*
- Leaves about 1 cm. wide; flowers 3 or 4, white .. 2. *C. graminifolia*,
- Leaves wider; one or two bract-like sheaths below the floral bracts
- Flowers creamy white with brown markings . .3. *C. asperata*

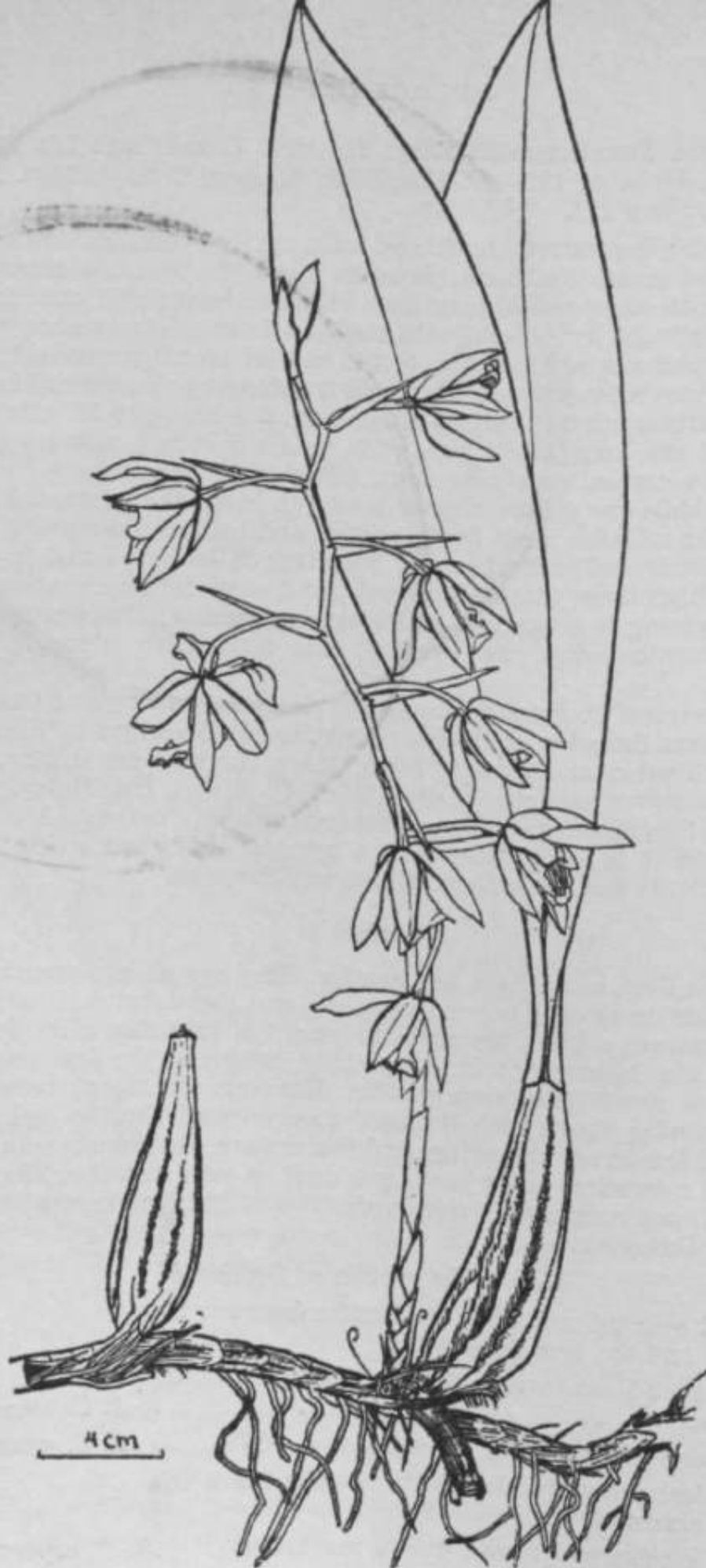


Fig. 51. *C&logyne Fcerstermannii* (after Carr),

Flowers green with black markings

Pseudobulbs much flattened; base of midlobe

narrow . . . . . 4. *C. pandurata*

Pseudobulbs only slightly flattened; base of mid-

lobe widening abruptly . . . . . 5. *C. Mayeriana*

1. **Coelogyne cinnamomea** T. et B., Nat. Tijdschr. Ned. Ind. 24: 306. 1862. J.J.S., Fl. Buit. 6: 147, f. 109.—*C. angustifolia* Ridl., J.L.S. 32: 322. 1896 (non Par. nee Wight).—*C. stenophylla* Ridl., Flora M.P. 4: 132. 1924.—*C. cinnamomea* var. *angustifolia* (Ridl.) Pfitz. et Krzl., Pflzi. IV, 50, IIB, 7: 49. 1907.

Pseudobulbs to about 3 cm. apart and up to 9 cm. long, ovoid, yellow-green, 2-leaved; leaves to 40 by 3-5 cm. including a stalk of 7 cm.; inflorescences at flowering stage 10 cm. or more long, bearing about 6 flowers; sepals and petals cream, about 2-2 cm. long, petals 2-5 mm. wide; side-lobes of lip brown, midlobe cream at base, apical part widened and turned down, 7 mm. wide, with a brown central patch; keels 3 from base to apex, with additional short lateral ones on the widened part of the midlobe, all minutely warty. Distributed to Java; in Malaya only known from Pahang, Penang and Langkawi, a lowland epiphyte. The odour of the flowers is unpleasant. When fruiting, the scape is about 30 cm. **long.**

2. **Coelogyne graminifolia** Par. et Rchb. f., Tr. L.S. 30: 146. 1873. Bot. Mag. t. 7006.

Pseudobulbs close, ovoid, ribbed, about 2-5-3-5 cm. tall, 2-leaved; leaves to about 40 by 1 cm.; inflorescence short, with 2-4 flowers; sepals and petals white, about 3 cm. long, the sepals 9 mm. wide, the petals 4 mm.; lip white except for orange-yellow base of midlobe and tips of side-lobes, dark brown veins on side-lobes and dark brown keels on midlobe; keels 3, edges crisped. Native in Burma and southwards to Perak (locality unrecorded). It flowers occasionally in cultivation in Singapore.

3. *Coelogyne asperata* Lindl., Journ. Hort. Soc. 4: 221, t. 7. 1849. Ridl., Flora 4: 131.

Pseudobulbs green, somewhat flattened, strongly ribbed, to 15 cm. long, rather broadly conical in shape, close; leaves to 60 by 12 cm., widest near the tip, stalked; inflorescence to 30 cm. or more long, curved, bearing many flowers almost to the base, with one flowerless bract a little way below the lowest flower; sepals and petals creamy white, the sepals 3-5 to 4 by 1 cm., the petals about half as wide; side-lobes of lip large, rounded, veined with light brown; middle part of lip between the side-lobes white, thick and fleshy, with 2 broad keels covered with warty processes of a warm brown colour, their forward ends diverging and widened on the base of the midlobe. Distributed from Sumatra to New Guinea; in Malaya a lowland species, on trees by streams in primitive forest, and on rocks; the flowers are pleasantly fragrant. *C. asperata* is strong-growing and

easy to cultivate, flowering well if in good growth, but not always on every new pseudobulb. The flowers unfortunately only last about 5 days, and quickly wilt when cut if not put straight into water. Fig. 52.

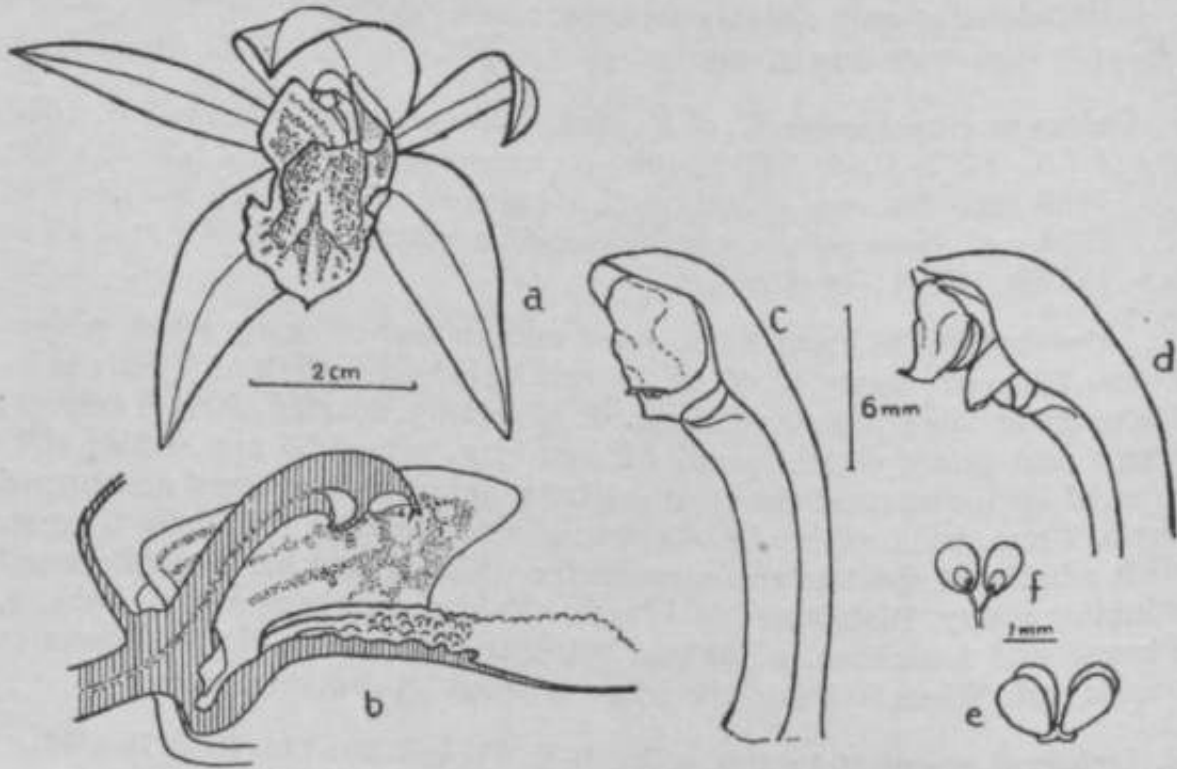


Fig. 52. *Cailogyne asperata*. a, flower, b, section of column and lip. c, column, d, top view of column, e, two pollinia, f, pair of pollinia. 2 pollinia from

4. *Crelogyne pandurata* Lindl., Fol. Oreh. Ccelosyne, 7, 1854, Bot. Mag. t. 5084. Ridl., Flora 4: 133.

Pseudobulbs flat, to about 12 cm. long, 7 cm. wide and 2-3 cm. thick, often somewhat curved, close or fairly well spaced; leaves to 50 by 7 cm. including a stalk of 6 cm., widest just above the middle, narrowed gradually to apex; inflorescence as in *C. asperata* but the flowers more widely spaced and fewer, a clear pale green with black markings on the lip; sepals and petals commonly 4-5 cm. long and sometimes longer; lip much narrowed in the middle, at the base of the midlobe, with two high thin keels between the side-lobes, and warts on the midlobe, which has crinkled edges. Native in Borneo, Sumatra and Malaya, usually on old trees by rivers in the low country. Well-cultivated plants grow very strongly and flower frequently. They are a little more troublesome than *C. asperata* owing to the spacing of the pseudobulbs.

5. *Coelogyne Mayeriana* Rchb. f., Gard. Chron. N.S. 8, 134, 1877, RidU Flora 4: 133,

Pseudobulbs 5-10 cm. or more apart, to 6 cm. long, ribbed and only slightly flattened (in shape near those of *C. asperata*); leaves to 30 by 6 cm., widest in the middle, tip acute, stalk about 3 cm.; inflorescence and

flowers similar to those of *C. pandurata*, but the flowers smaller (sepals to 3-2 cm. long) and the midlobe of the lip widening abruptly from its base; ends of keels on midlobe covered with many white warts. Distributed in Java, Sumatra and Borneo; in Malaya only found in the south, especially on old trees near the sea. It is easy to cultivate, except that its rather wide-creeping- habit makes it difficult to confine in pots. Fig. 53.

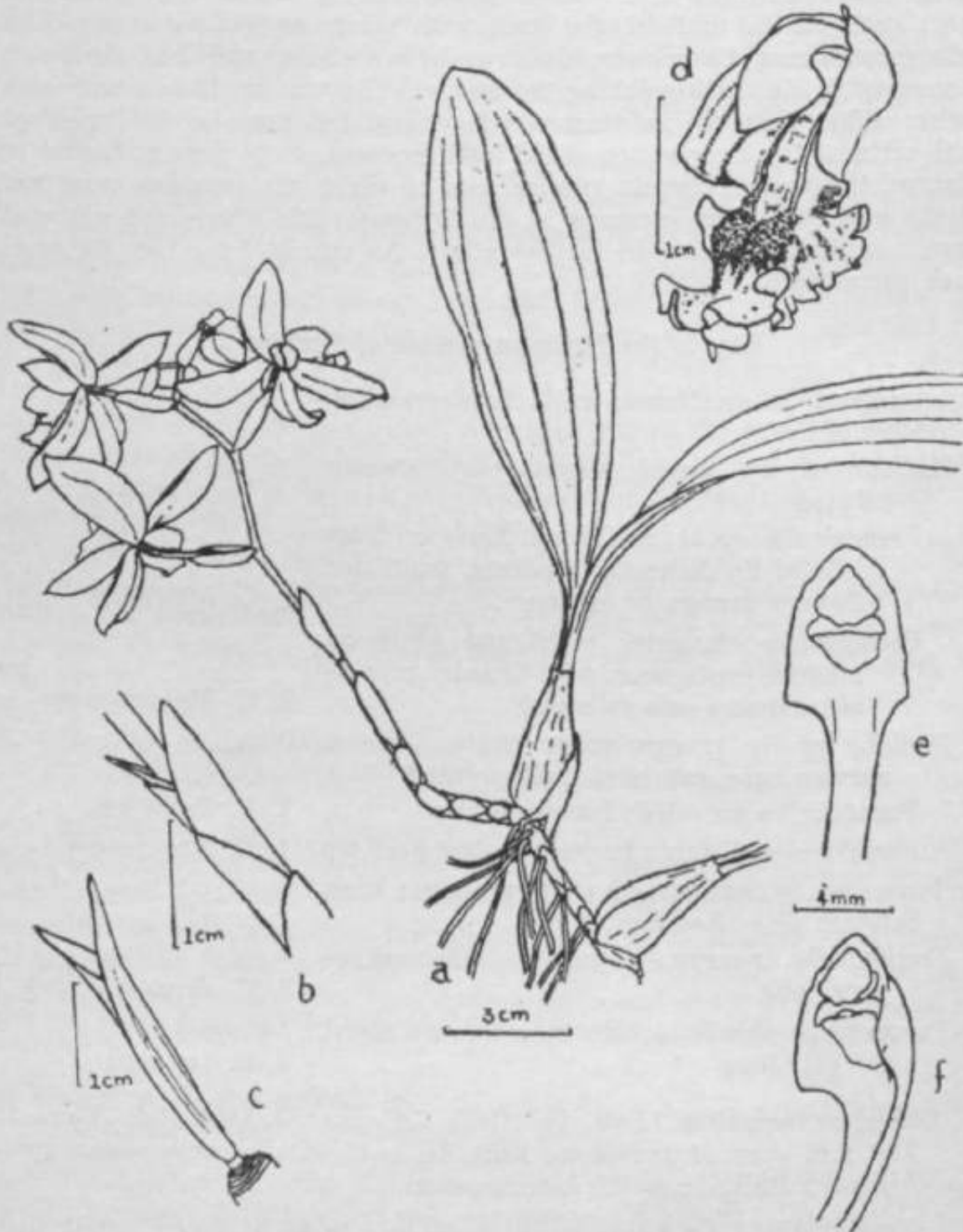


Fig. 53. *C&logyne Mayeriana*. a, plant, b, sheath at base of inflorescence, showing first foliage leaf appearing, c, sheaths at base of inflorescence removed to show the 2 foliage leaves, d, column and lip, e, f, column.

## Section 5

The species of this section all have long limply pendulous inflorescences of many flowers, the rachis and ovaries more or less covered with short black or brown hairs which are in some species not very conspicuous and may be confined to the ovaries. The bracts are usually large, and persistent. The lip has 2 or 3 keels throughout its length, with short keels on the midlobe, the keels with warty or toothed crests. The inflorescence may be proteranthous or heteranthous, and this character is very useful in distinguishing the species. The two conditions may be rather alike when the inflorescence is young, but may be distinguished with certainty by the position of old inflorescences. As at present known in Malaya, the section has six species, two of which are common mountain plants and two fairly common in the lowlands; the others are not well known in Malaya and need further study. All species have two leaves to each pseudobulb.

## Key to the Malayan species of Section 5

- Inflorescence heteranthous; keels between side-lobes of lip 3
- Midlobe of lip almost round, very shortly pointed
- Pseudobulbs ovoid; additional keels on midlobe of lip distinctly separate, papillate; flowers orange or salmon .. .. 1. *C. tomentosa*
- Pseudobulbs elongate; additional keels on midlobe contiguous, with broader processes; flowers pale yellowish .. .. 2. *C. Massangeana*
- Midlobe of lip triangular or ovate, from a narrow base, rather sharply pointed
- Pseudobulbs crowded; leaves elliptic .. 3. *C. Swaniayia*
- Pseudobulbs distant; leaves broadest near tip .. 4. *C. Rochusseni*
- Inflorescence synanthous or proteranthous; keels between side-lobes 2 or 4
- Pseudobulbs narrow, elongate; inflorescence very long .. .. 5. *C. Dayana*
- Pseudobulbs shortly ovoid; inflorescence about 20 cm. long .. .. 6. *C. testacea*

1. *Coelogyne tomentosa* Lindl., Fol. Orch. *Coelogyne*, 3. 1854. Ridl., Flora 4: 130, *p.p.*—var. *Massangeana* Ridl., I.e. = *C. Massangeana*.—var. *cyrnidioides* Ridl., I.e. = *C. Massangeana*.

Pseudobulbs 6 by 3 cm., ovoid; leaf-blade to 30 by 10 cm., stalk to 8 cm.; inflorescence 40 cm. long, rachis densely short-hairy; sepals and petals light orange or salmon, the sepals about 2.5 by 0.7 cm.; lip brown with

paler veins and yellow keels; keels 3 throughout the length of the lip and two additional short ones on either side of the midlobe, all distinctly separate and finely papillate. Originally described from a plant brought from Borneo and cultivated in England; in Malaya only known from two cultivated plants, one from Taiping Hills, one probably obtained somewhere in Perak.

2. *Coelogyne Massangeana* Rchb. f., Gard. Chron. N.S. 10: 684. 1878. Bot. Mag. t. 6979. J.J.S., Fl. Buit. 6: 143, f. 106.—*C. tomentosa* var. *Massangeana* Ridl., Flora 4: 130.—*C. tomentosa* var. *cymbidioides* Ridl. Flora 4: 130.—*C. densiflora* Ridl., J.S.B.R.A.S. 39: 81. 1903. Flora 4: 130.

Pseudobulbs about 8-10 cm. long, narrowly ovoid, when young with two opposite longitudinal ridges only, when old yellow-green and wrinkled; leaf-blade to about 50 by 8 cm. (often much smaller) with stalk to 10 cm.; inflorescences about 40 cm. long, with about 20 flowers, the persistent bracts sometimes much shorter than the pedicel and ovary; flowers pale yellowish, about 6 cm. across; side-lobes of lip brown inside with white veins, midlobe brown and pale yellow; keels 3 throughout the length of the lip, with additional short keels on either side on the midlobe, all warty and so close as not to be clearly distinct from one another. Distributed to Sumatra and Java; in Malaya not uncommon on the mountains, especially on the higher ridges, and very handsome when in full flower. The warty midlobe of the lip is characteristic. There may be some variation in the colour of the flower, and notes on this would be welcome. Young plants have ovoid pseudobulbs. *C. densiflora* was described from a plant which flowered in a condensed inflorescence shortly after being brought to Singapore.

3. *Coelogyne Swaniana* Rolfe, Kew Bull. 1894: 183. Bot. Mag. t. 7602.—*C. quadrangularis* Ridl., J.L.S. 32: 323. 1896. Flora 4: 131.

Pseudobulbs close, 4-angled, to 10 by 3-5 cm.; leaf to 25 by 6 cm.; inflorescence 30-40 cm. long; flowers white, 5 cm. across; lip light brown, white-veined with dark brown keels; keels 3 throughout the length of the lip, with one additional short one on either side of the midlobe. Distributed to Borneo and Sumatra; in Malaya only found on the Taiping Hills. The species was originally described from a cultivated plant in England, said to have come from the Philippines, but this was probably a mistake.

4. *Coelogyne Rochussenii* de Vr., 111. Orch. t. 2; t. 11, f. 6. 1854. J.J.S., Fl. Buit. 6: 144, f. 107. Ridl., Flora 4: 131.

Pseudobulbs 3-4 cm. apart, narrowly cylindrical, to 20 cm. long, strongly ribbed, slightly narrowed upwards and abruptly contracted at the top; leaves to 30 by 11 cm. including stalk of 6 cm., widest near the top which is abruptly narrowed to a short point; inflorescences from near

base of the last pseudobulb, slender, to 50 cm. or more long, with many fragrant lemon-yellow flowers; sepals to 2.5 by 0.5 cm., petals narrower; Up narrow, with yellow keels, inside of side-lobes strongly banded with brown; keels 3 throughout the length of the lip (middle one lower on midlobe) with an extra one on either side of the midlobe, their crests slightly toothed. Distributed from Sumatra to the Philippines; in Malaya one of the commonest lowland species of the genus. The shape of the pseudobulbs and the short broad leaves are characteristic; the flowers are rather small, but very graceful **Fig. 54**.

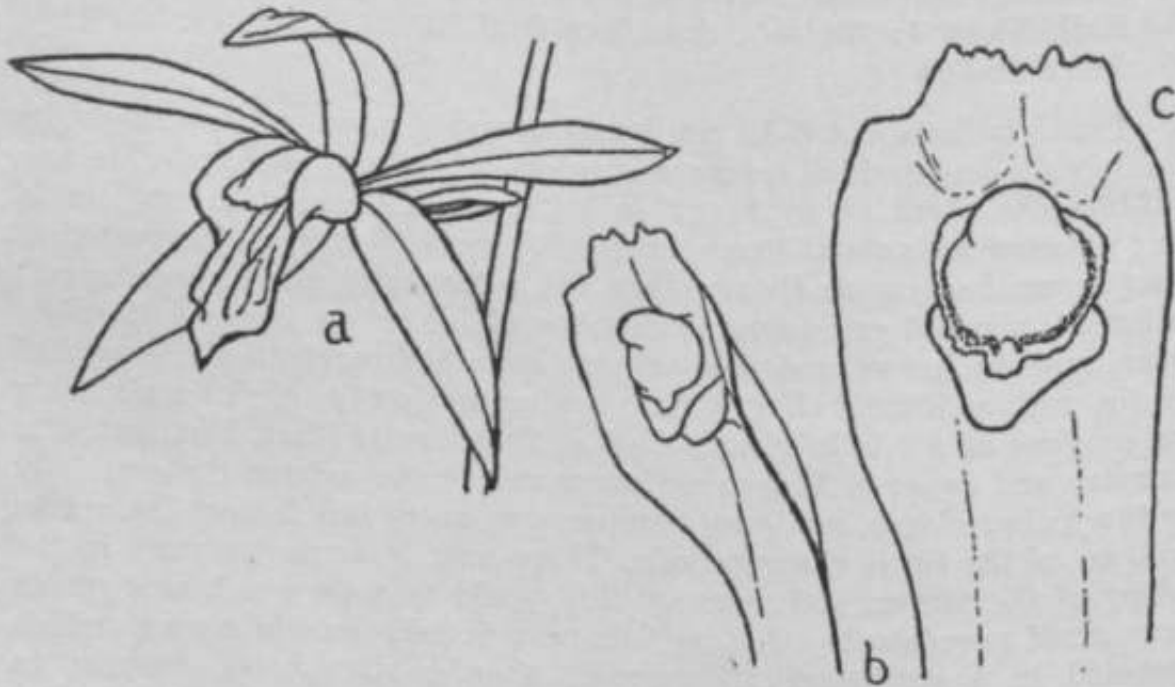


Fig. 54. *Ccelogyne Rockmaeni*. a, flower. b, column, c, top of column.

5. *Ccelogyne Dayana* Rchb. f., Gard. Chron. 1884, I: 826.—*C. t&mentosa* sensu Ridl. Flora 4: 130, p.p.

Pseudobulbs to 20 cm. or more long, narrowly conical, strongly ribbed, green; leaves with blade to 50 by 10 cm. and stalk of 10 cm.; inflorescence proteranthous, 50-100 cm. long, with many flowers, the persistent bracts longer than in *C. Massangeana*; sepals and petals pale yellowish, 3-5 cm. long; hp with white keels and edges; two keels only from base to apex of hp, with 3 extra short ones on either side of the midlobe, all distinct and not coalescing into a warty mass as in *C. Massangeana*. Distributed to Java, Sumatra and Borneo; in Malaya common on the mountains, chiefly in the valleys, not on the high ridges. It has been confused with *C. Massangeai* *UL*, but is very distinct in its proteranthous, not heteranthous, inflorescence and in having two keels on the lip instead of three. In contrast to *C. Massangeana*, it may be easily cultivated in the lowlands, but is not very free-flowering in Singapore. Photographs, showing growth-habit and a single flower of this species, and a flower of *C. Massangeana*\* were published in *Malayan Nature Journal*, Vol. 7 No. 5 (1953).



6. *Coelogyne testacea* Lindl., Bot. Reg. 1842: Misc. 34. Bot. Mag. t. 4785. Ridl., Flora 4: 129.

Pseudobulbs close, broadly ovoid, ribbed, about 6 cm. long; leaves to about 25 by 5 cm.; inflorescence about 20 cm. long, with about 10 flowers, the rachis almost hairless, ovaries slightly hairy; flowers about 5 cm. wide, dull buff to flesh colour; lip with brown side-lobes and other brown markings; keels 4, white, strongly toothed or fringed, 2 from base to near apex of lip, the other two not extending to the base but extending below the base of the midlobe. This species has apparently not been recorded as occurring outside Malaya, but is quite likely to occur in Sumatra. It has been found chiefly in the south of Malaya, and certainly to northern Pahang, on big trees overhanging rivers and also near the sea; formerly it was common in Singapore.

### Hybrids of *Coelogyne*

A few hybrids have been raised in Europe, and at least one in Java,, but none are commonly cultivated. The only hybrid known to be grown in Malaya is *C. asperata* X *pandurata* ("Stanny"), a very fine strong plant with large flowers, as large as in *C. pandurata*, in colour nearer the other parent. No hybrids between members of different sections of the genus have been reported, and attempts to cross *C. asperata* X *Fcerstermannii* and X *C. Rochusseni* in Singapore have failed. It would be very interesting to see the result of a cross between a proteranthous and a heteranthous species, if such were possible.

### Cultivation of *Coelogyne*

*Coelogyne* plants are easy to cultivate, requiring only little shade,, reasonably good drainage, and a fair supply of humus. Dakkus recommends using chiefly fern-roots for potting material. The larger species must have fairly large pots or baskets, and those which have pendulous inflorescences need to be hung so that these can develop properly. It pays to grow large *Coelogyne* plants, as these flower better than small ones; but they are apt to be cumbersome. *C. pandurata* and *C. asperata* might be grown in masses on a shady bank built up with old coral or other rocks. Once the plants are in good growth, they benefit greatly by the application of dilute liquid manure. This should especially be given when new growths are producing their new roots. The stronger a plant, the more likely it is to flower, at least in the proteranthous and synanthous species. The heteranthous species probably require some climatic stimulus for flowering; drying off and exposure to sun do not seem to be effective, and the stimulus may be one of temperature-change such as a sudden fall, or more likely a spell of cool nights. Nothing definite is known on the subject. Experiment is desirable, and also observation of wild plants, which are often gregarious: in flowering.

THE DENDROBIUM TRIBE

Plants generally epiphytic of sympodium bearing more leaves, its stem thin, or fleshy throughout. or fleshy in part only; leaves of various shape, tinted at the base; inflorescences usually lateral, of one or many flowers, which sometimes appear singly in succession from a small group of bracts; lateral sepals more or less angular shape, their bases joined to the column-foot, f. Petals either smaller or larger than the sepals, usually and narrower (often only slightly), the base often long the stem to the end of the column-foot and sometimes partly to long column-foot (thus forming a closed spur), often with is often only rarely with calli; column with a distinct foot which is usually short, with two small lateral horns or arms which are developed into additional others; anther usually attached four with a filament; Pollinia 4 in two pairs, or 8 in two groups of four, without or with short caudicles; rostellum small.

The tribe of the largest tribes in the whole family of orchids, and is the most numerous both in the native flora of Malaya and among the total number here. Some years ago, Schlechter estimated of Eria to be about 900, and the distribution of Dendrobium in the broad sense at 900, and almost the whole of the tribe. Ceylon to the Siam, China and Japan, New Zealand, Siam, and into the Pacific and to Australia and the Vanda tribe. It has not all reached to the limits of genera in who have known the limits of Schlechter, the genera in the tribe take into sections. Perhaps the tribe be sub-divided of genera, but we do not wish to raise the rank of them, and it is not very satisfactory to remove one or two sections which are a work like the present.

The flower for the most part is remarkably constant; there is contrast to the Vanda tribe. In the Vanda tribe the floral form is very varied and vegetative form much less so. Botanists always consider flower-characters more important than vegetative; they always consider flower-characters more important than vegetative. The limits of Dendrobium tribe few. But it is far wider than the Dendrobium are no more nearly related than some genera of Dendrobium of one section will often not cross with species of another. In the Vanda tribe generic crosses are common.

The genera of the Dendrobium tribe are distinguished as follows:-  
 Sepals not forming a tube; pseudobulbs or stems usually elongated

- Pollinia 4, without caudicles .. .. . 1. *Uendrobium*
- Pollinia 8, with short caudicles .. .. . c. *tuna*
- Sepals forming a tube; pseudobulbs shorter than wide 3. *Porpax*

## DENDROBIUM

The last comprehensive account of this genus was by Kränzlin in 1910. This account has been subject to much criticism, and a great deal of subsequent information has been obtained, but no later general survey of a detailed nature has been attempted. Schlechter sketched a re-arrangement of the sections, which has been followed with variations by J. J. Smith, and this scheme is adopted here in essentials. It should be emphasized however that the present writer has not been able to attempt a critical review of the whole genus, and the division below is one of convenience only, to cover the species with which we are concerned, both wild and cultivated. Each section of the genus is taken in turn, its general characters discussed, with a key to the local species, and a description of each. Regarding some species, data available in Singapore are not sufficient for full distinctive characters to be given; in other cases, the accuracy of published data is doubtful. Such cases are indicated in the text.

## Key to the Sections of Dendrobium

Leaves with no sheaths

Each branch of the sympodium ending in a pseudobulb of one internode, the next branch often or always arising at the base of this pseudobulb

Pseudobulbs 1-leaved

Pseudobulbs to 25 cm. long, slender, closely placed on a creeping rhizome .. 1. *Diplocaulobium*

Pseudobulbs much shorter, widely spaced, usually on branching stems .. 2. *Desmotrichum*

Pseudobulbs 2-leaved .. .. 3. *Sarcopodium*

Each branch of the sympodium consisting of several internodes, one or more of them swollen; the new shoot arising at the base of the whole branch

Swollen part of each branch consisting of a single internode .. .. 4. *Bolbidium*

Swollen part of each branch consisting of several internodes

Flowers solitary, from bare stem below leaves .. .. 5. *Euphlebiium*

Flowers in racemes, erect or pendulous, from axils of leaves near stem-apex

Flowers greenish, lip not hairy inside; plants of New Guinea region .. 6. *Latourea*

Flowers not greenish, lip hairy inside; plants of Burma region .. 7. *Callista*

Leaves with sheaths

Pseudobulbs or stems fleshy, or with a thickened fleshy part near the base

Stems wholly fleshy

Mentum short; lip more or less hairy within, not 3-lobed . . . . . 8. *Eugenanthe*

Mentum moderately to very long; lip not hairy within, entire or 3-lobed

Leaf-sheaths brown- or black-hairy, flowers usually close to stem-apex, large, white . . . . . 9. *Nigrohirsutse*

Leaf-sheaths not hairy

Slender many-flowered inflorescences, in most cases from near apex of still leafy stems, sometimes also on leafless old stems or at lower nodes

Petals broad, not twisted; lip papillate within, mentum of two parts at right angles . . . . . 10. *Phalxnanthe*

Petals narrow, often twisted; lip with keels, not papillate, mentum simple

Edges of lip not toothed or fringed 11. *Ceratobium*

Edges of lip toothed or fringed . . . . . 12. *Stachyobium*

Inflorescences mostly few-flowered, from axils of all leaves

Inflorescences mainly from leafless stems, flowers usually 2 or more together, fairly large, of various colours, leaves well spaced 13. *Pedilonum*

Inflorescences always from leafy stems, flowers 1-3 at a node, small, white or yellowish; leaves closely 2-ranked . . . . . 14. *Distichophyllum*

Stems fleshy near base only, fleshy portion of 1-4 internodes . . . . . 15. *Rhopalanthe*

Stems thin and wiry, often woody at the base, never fleshy or swollen

Leaves overlapping, laterally compressed, broad

Flowers successively from very short inflorescences not longer than the original covering bract . . . . . 16. *Aporum*

Inflorescences somewhat elongated, with alternate overlapping bracts; lip with a small conical wart beneath the apex. 17. *Oxystophyllum*

Leaves not or hardly overlapping; if laterally compressed, narrow

Leaves terete or laterally compressed, narrow, flowers from small groups of bracts on leafless apical portion of stem .. . • • • <sup>18</sup> « *Strongyle*

Leaves not terete nor laterally compressed, flowers on leafy part of stem

Epiphytes with long drooping or pendulous stems; leaf-sheaths not hairy; inflorescences of two flowers from a short angles **tf L Ter** .. • • • « ● *Grastidium*

Terrestrial, or rarely epiphytic; leaf-sheaths hairy; bracts otherwise .. 20. *Conostalix*

### 1. § Diplocaulobium

This Section includes about 30 species, mostly in the region of New Guinea. Only one extends to Malaya. The long tapering pseudobulbs are unlike those of any other Malayan orchid, but the inflorescence and flower-structure come near the next Section (Desmotrichum).

**Dendrobium longicolle** Lindl., Bot. Reg. 1840: Misc. 121.—*Diplocaulobium longicolle* Krzl., Pflzr. Dendr. 340. Ridl., Flora 4: 27.—*D. maluyanum* Carr, Gard. Bull. 7: 6. 1932.

Pseudobulbs closely placed, all rising from the creeping base of the plant, long and slender, distinctly flattened, narrowing upwards, 15-25 cm. long, each bearing a single leaf about 14 by 2-4 cm.; inflorescence covered by a narrow sheath 3 cm. long in the folded base of the leaf, producing flowers singly or in pairs at intervals of some weeks, the flowers lasting two days; sepals and petals about 3-5 cm. long, very narrow, yellow at the base, grading to deep purple at the tip; lip much shorter, very fragile, crinkled, light yellow, the midlobe with two crisped keels. Distributed from Sumatra to New Guinea; in Malaya only found as an epiphyte on old mangrove in the south. **Fig. 55.**

### 2. § Desmotrichum

Rhizome creeping on the substratum and rooting, bearing a series; of rootless aerial shoots which branch (except in *D. invexum*) ; **aerud** shoots erect and bushy or drooping and laxly branched, the branches of each branch being a part of one **MEMS** : flowers frag, lasting less than two together, from a group of small chaffy bracts at the base of the leaf, either in **MEMS** with 2 or 3 keels (starting from the base of the lip) which may be straight, curved, or wavy.

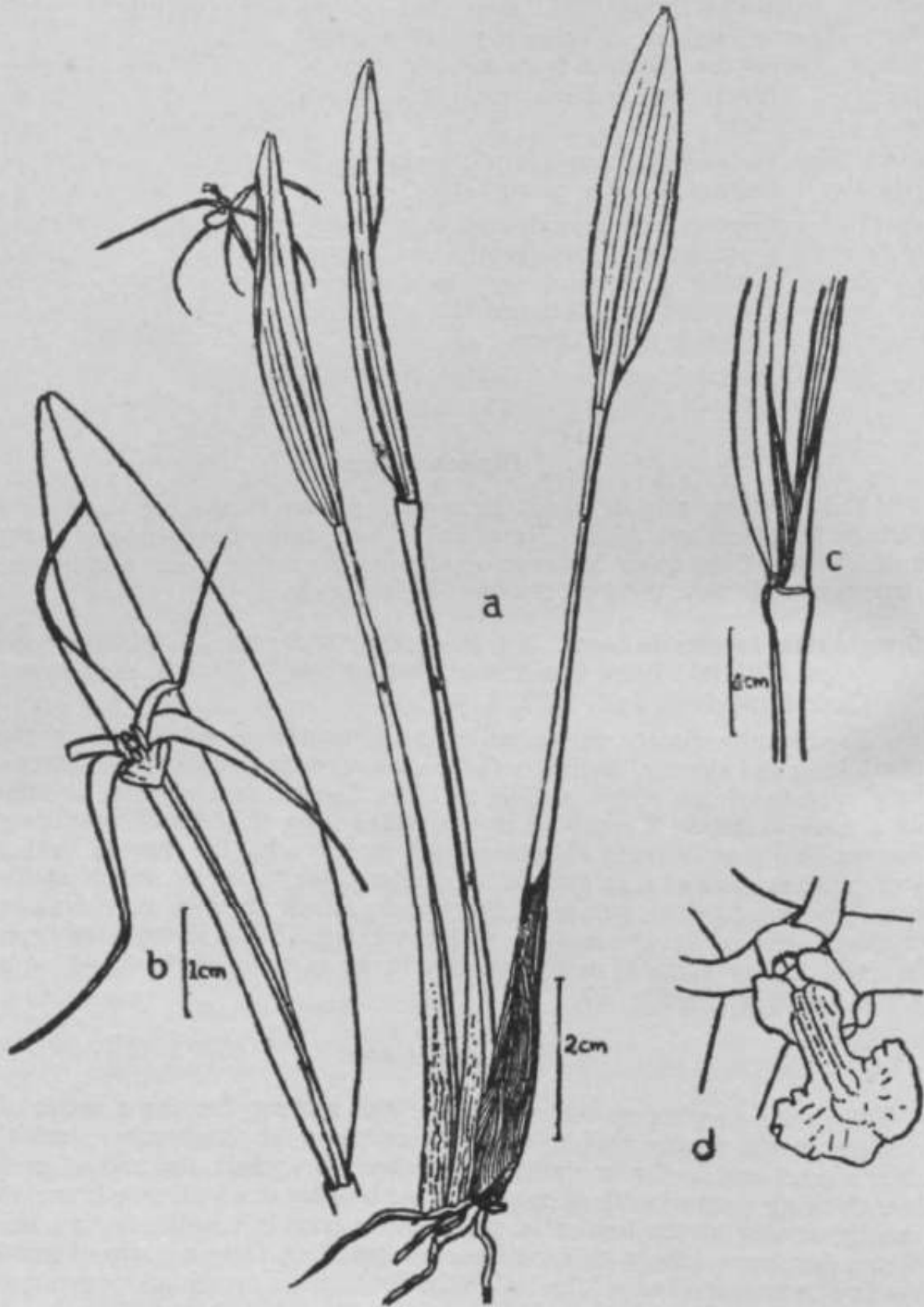


Fig. 55. *Dendrobium longicoUe*. *a*, plant. 6, leaf and flower, *e*, base of leaf and sheath covering inflorescence, *d*, column and lip, with bases of petals and sepals.

There appear to be ten species of this section in Malaya, but the records of some of them are imperfect, and more information is needed, both about the vegetative characters (habit of branching) and the flowers, dried specimens of which are very difficult to interpret. There appears to be some variation in the colour of flowers of some species. Differences of vegetative habit are in some cases quite striking, but difficult to describe. The first pseudobulbs produced by the aerial shoots are often larger than the more distal ones, and sometimes more flattened; the sizes of pseudobulbs in the descriptions below are those of the smaller branches. The plants are mostly found in lightly shaded places, especially on trees by streams or in swamp forest.

### Key to the Malayan species of § *Desmotrichum*

- Midlobe of lip bordered with spreading hairs 6  
mm. long . . . . . 1. *D. comatum*
- Midlobe of lip not bordered with such hairs
- Sides of the midlobe transversely folded
- Blade of midlobe rather abruptly widened,  
the whole lip purple-spotted . . . . . 2. *D. luxurians*
- Blade of midlobe gradually widened, side-  
lobes and base of midlobe only with pur-  
ple spots
- Petals and sepals cream . . . . . 3. *D. plicatile*
- Petals and sepals pale greenish yellow . . . . . 4. *D. lacinosum*
- Sides of the midlobe not folded transversely
- Midlobe very narrow, bearing at its apex two  
narrow lobes at right angles to the basal  
part . . . . . 5. *D. bifidum*
- Midlobe base wider, the apical blade larger,  
of different shape
- Keels on the midlobe wavy
- Basal part of midlobe narrow, the keels  
close to the edge, abruptly widened  
to the blade; pseudobulbs very thin  
and hardly twice as long as wide . . . . . 6. *D. padangense*
- Base of midlobe wider, the keels not near  
the edge; pseudobulbs about three  
times as long as wide, not very flat . . . . . 7. *D. xantholeucum*
- Keels on midlobe not wavy
- Aerial stems branched
- End of midlobe very deeply cleft . . . . . 8. *D. Kelsallii*
- End of midlobe not or slightly cleft . . . . . 9. *D. lonchophyllum*
- Aerial stems not branched, each bearing  
one pseudobulb only . . . . . 10. *D. convexum*

1. *Dendrobium comatum* (BL) Lindl. Gen. et Sp. Orch. 1830. JJ. S. v.  
 Fl. Bui. 6: 313, 1. 2ZQ, Des. *Otrichum comatum* BL, Bijdr. 230. 1825.  
 Ridl. it, a 4: *Dendrobium criniferum* Lindl., Bot. Reg. 30:  
 Misc! 41. i<sup>r</sup>844.

Stems yellowish, long and much branched - the end-joints bearing the  
 leaves hardly thicker than the rest of the stem (basal pseudobulbs only are  
 2 r, i f ! ^ load. ^ aboUt 10 by 5 cm, flowers about 25 «»• diameter;  
 M - JI! 'P yellowish with Pale Purple spots; midlobe of lip  
 border... w t ..long yellow hairs. Widely d^tributed, from Sumatra to New  
 Guinea. in Malaya chiefly collected in the lowlands of the south. The flowers  
 are very fugacious. Fig. 56.

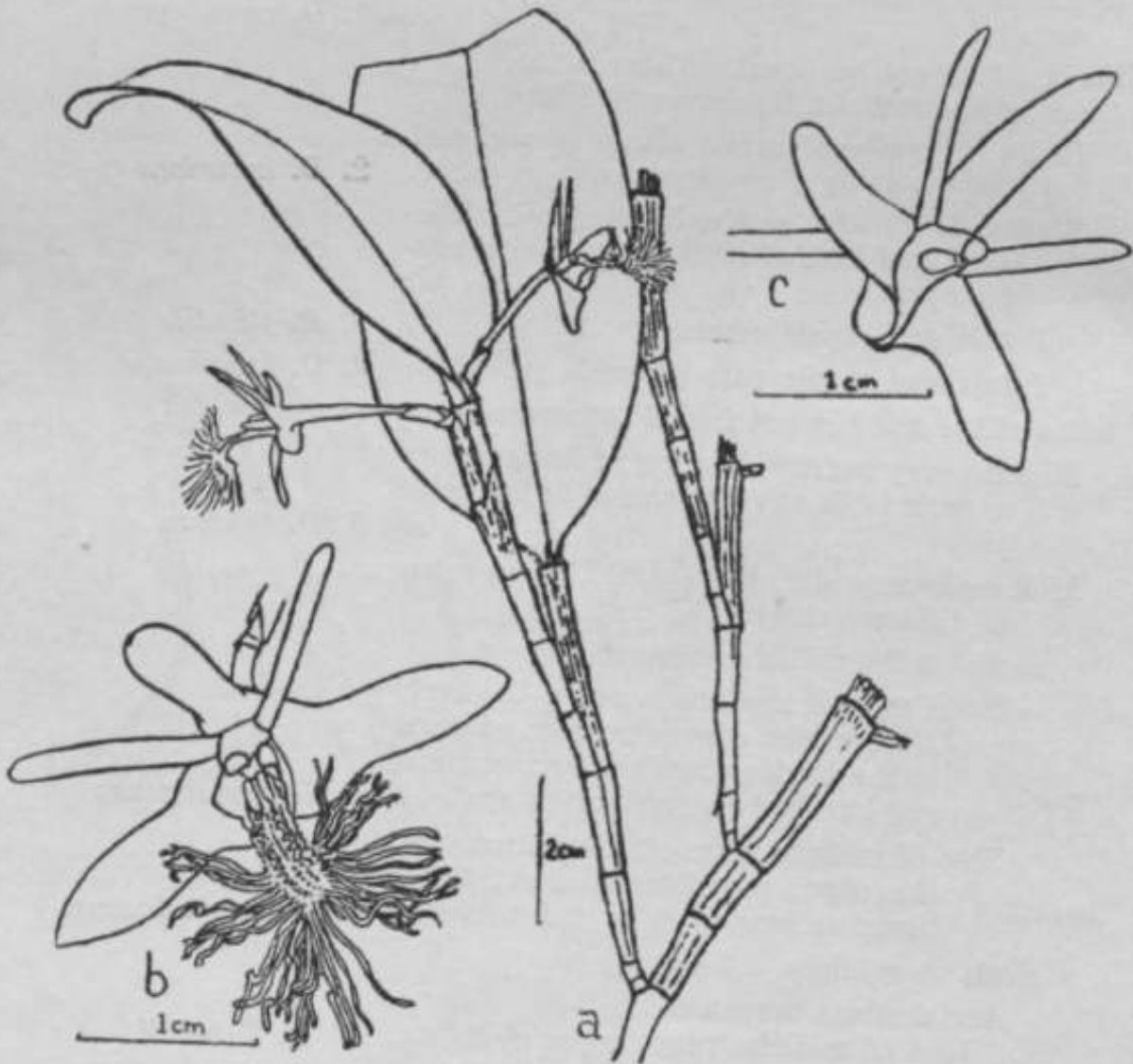


Fig. 56. *Deiidrobiwm comatum*. a, plant in flower. b, flower from front, c, flower with lip removed.



2. **Dendrobium luxurians** J.J.S., Bull. Btzg., Ser. 3, 3: 288, t. 4, II. 1921.—*Desmotrichum luxurians* Carr, Gard. Bull. 7: 9. 1932.

Stems yellowish, much branched; pseudobulbs flattened, to about 6 by 2 cm.; leaf to about 18 by 5 cm.; flowers about 2-5 cm. across; sepals and petals white with large deep purple marks at the base; lip purple-spotted all over, the midlobe irregularly quadrangular, widened abruptly from a narrow base, with the sides deeply cleft and much folded transversely, distributed in Borneo and Java; in Malaya only known from the lowlands of Pahang but probably occurring in Johore.

3. **Dendrobium plicatile** Lindl., Bot. Reg. 1840, Misc. 10.—*D. flabellum* Rchb. f., Bonpl. 5: 56. 1857. J.J.S., Fl. Buit. 6: 315, f. 287. Bull. Btzg., Ser. 2, IX: 59. Holtt., Rev. Fl. Mai. 1: 264.—*Desmotrichum fimbriatum* Bl., Bijdr. 329. 1825. Ridl., Flora 4: 30. (Not *Dendrobium fimbriatum* Lindl. 1830).

A large species, with long stout branches; pseudobulbs flattened, to about 8 by 3 cm.; leaf to 18 by 5 cm.; flowers from 2-5 to 5 cm. across; sepals and petals cream, with or without pink spots; lip pale yellow, side-lobes small, triangular, midlobe with much-folded sides, widened gradually from base to the broad apex, lateral keels wavy, middle keel straight. Distributed in Sumatra, Borneo, Celebes and Java; in Malaya found at many localities in the lowlands and at medium elevations on the hills. There are at least two distinct varieties of this species, one found in Singapore and Pahang having very large flowers, 5 cm. across, the sepals and petals unspotted; possibly other varieties exist.

4. **Dendrobium lacinosum** Ridl., J.L.S. 32: 242. 1896.—*Desmotrichum lacinosum* Krzl., Pflzr. Dendr. 346. Ridl., Flora 4: 31.

A compact species with close erect branched shoots to about 30 cm. high; pseudobulbs slightly flattened, to 5 by 2 cm.; leaf evenly elliptical, to 12 by 2-5 cm.; flowers 1-2 cm. across; sepals and petals greenish, the sepals spotted with purple outside; lip cream with purple spots on side-lobes and base of midlobe, midlobe widening from a narrow base, its edges folded, bearing two wavy keels. The original plant so named was found in Singapore, but the description was incomplete and the specimen is in poor condition. Another cultivated variety, of unknown origin, has larger flowers (upper sepal 12 mm. long), with both petals and sepals spotted. The above description is made from plants found in Perlis. Fig. 57.

5. **Dendrobium bifidum** Ridl., J.L.S. 32: 242. 1896.—*Desmotrichum bifidum* Krzl., Pflzr. Dendr. 357. Ridl., Flora 4: 31.—*Den. cystopoides* J.J.S., Fed. Rep. 29: 249. 1931. Bull. Btzg., Ser. 3, Suppl. II: t. 62, I.

Pseudobulbs flattened, about 4 by 1 cm.; leaf to 12 by 4 cm.; flowers about 2 cm. across, cream or pale yellow with small purple spots; midlobe of lip very narrow with two spreading apical lobes at right angles to the axis of the lip, these lobes 4 times as long as wide, not spotted. Known only from Langkawi; a similar species has been reported from Sumatra.

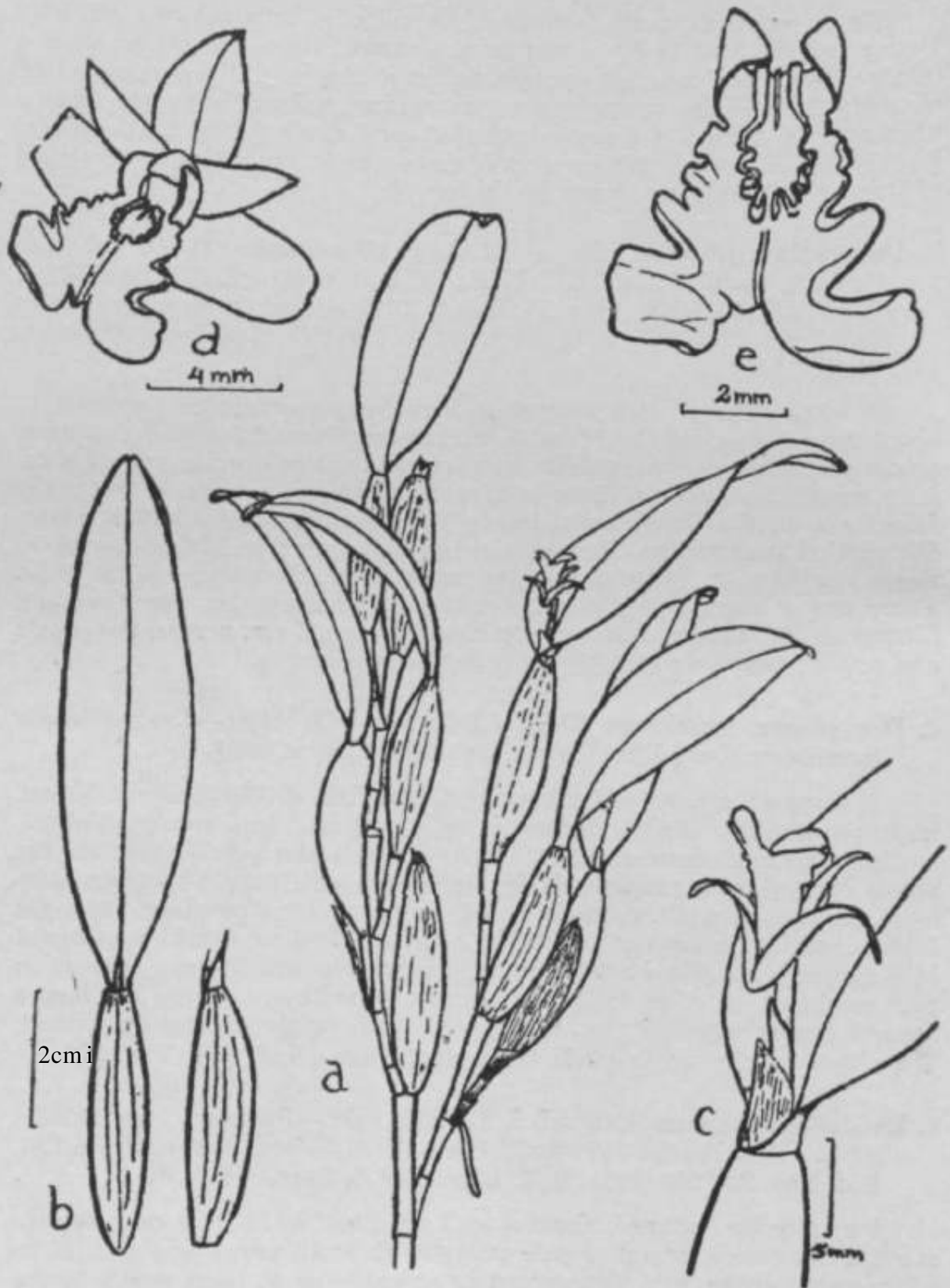


Fig. 57. *Dendrobium lainosum*. a, part of plant, b, pseudobulb from front and side\*  
 a, top of pseudobulb and a flower, d, flower, e, lip.

6. *Dendrobium padangense* Schltr., Engl. Jahrb. 45, Beibl. 104: 28. 1911.

J.J.S., Bull. Btag., Ser. 3, Suppl. II: t 62, ll.—*Desmotrichum compressibulum* Carr, Gard. Bull. 7: 7. 1932.

Fairly large plant, laxly branched; pseudobulbs to 3-5 by 2 cm., 7 mm. thick; leaf to about 8 by 3-6 cm.; flowers 1-5 to 1-8 cm. across, pale greenish with pale yellow lip, the midlobe with narrowly oblong base bearing 2 wavy keels, the apical blade deeply lobed. Found originally on the Padang Highlands of Sumatra; in Malaya found near the Gap on the Mam Range at about 3,000 feet. It is closely related to the next species. Fig. 58.

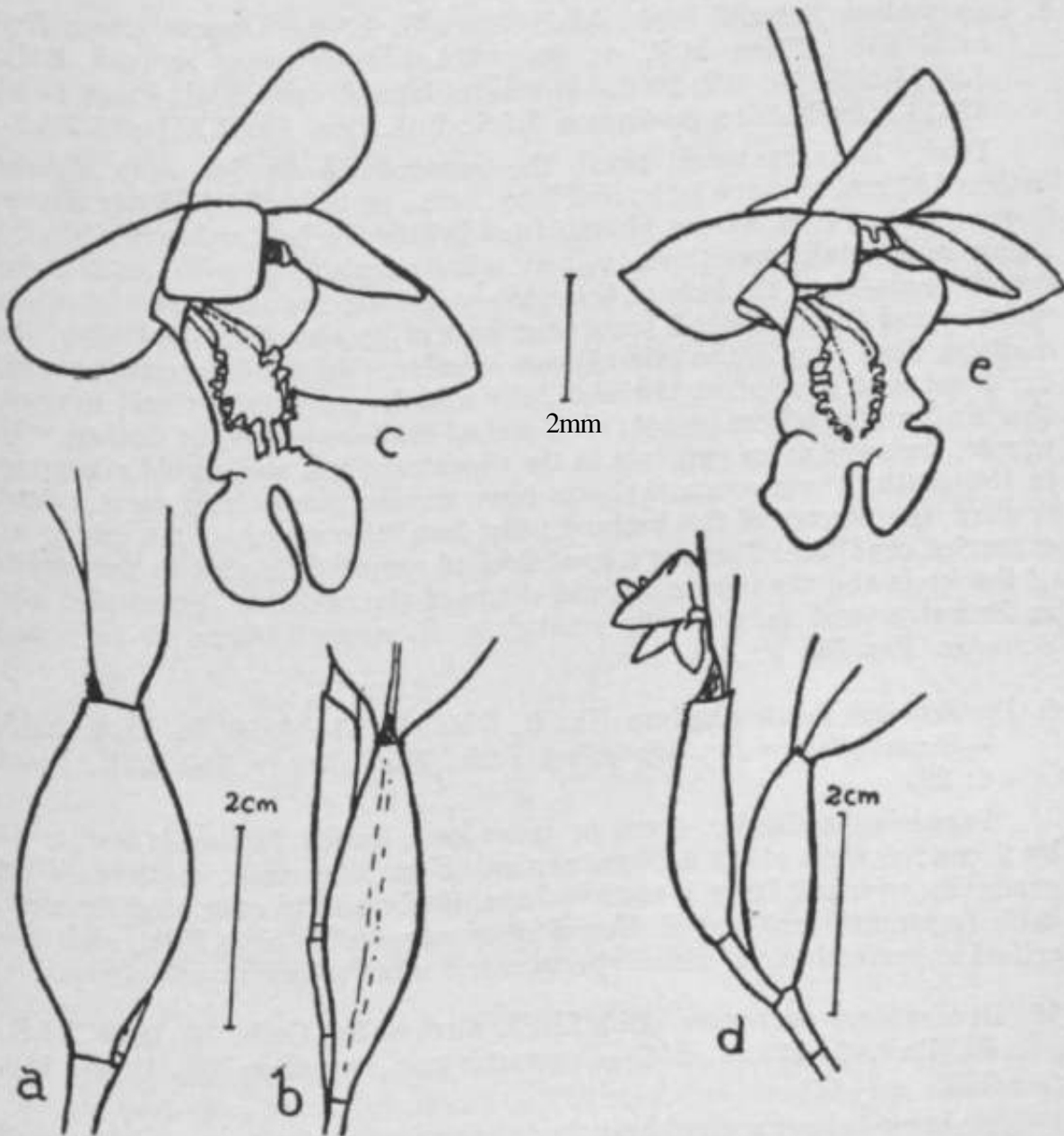


Fig. 58. *Dendrobium padangense*. a, pseudobulb from side, and b, from front, c, flower, d, pseudobulb with flower bud, e, flower. 9, Rower.

7. **Dendrobium xantholeucum** Rchb. f., Xen. Orch. 2: 73, t. 118, I. 1862. J.J.S., Fl. Buit. 6: 318, f. 239.—*D. pallidiflorum* Ridl., J.L.S. 32: 240. 1896.—*Desmotrichum pallidiflorum* Krzl., Pflzr. Dendr. 357. Ridl., Flora 4: 31.

Fairly large plant with close branching; pseudobulbs slightly flattened, to about 3 by 1 cm.; leaf ovate-acute, about 7.5 by 2.5 cm.; flowers 1.2 to 1.5 cm. wide, pale greenish yellow with lip of a deeper shade, anther bright green; side-lobes of lip short, triangular, midlobe deeply cleft, the outer edge somewhat crisped, lateral keels wavy, not close to the edge. Distributed to Sumatra, Java and Borneo; in Malaya found chiefly in the lowlands of the south and in Pahang. Fig. 58.

8. **Dendrobium Kelsallii** Ridl., J.L.S. 32: 237. 1896.—*Desmotrichum Kelsallii* Ridl., Flora M.P. 4: 30. 1924.—*Dendrobium Ardenii* Ridl., J.S.B.R.A.S. 50: 132. 1908.—*Desmotrichum Ardenii* Ridl., Flora 4: 30. 1924.—*Dendrobium bancanum* J.J.S., Bull. Dep. Ag. XXII: 23. 1909.

Bushy laxly branched plant, the pseudobulbs slender, only slightly flattened, 3 cm. or more long; leaf 7 by 1 cm., or in lowland plants larger; flowers 1.0 to 1.4 cm. across, always from behind the leaf, pale greenish, the sepals and petals sometimes veined with purple; lip with small erect rounded side-lobes, the base of the midlobe oblong, the apical part abruptly widened and deeply cleft; 3 keels from base of lip almost to the cleft of the midlobe, deep purple, the lateral ones broader, slightly divergent towards the front and pointed at the ends, the middle one straight and narrow, shorter than the others or not; cleft end of midlobe yellow, or flushed with purple. Common as an epiphyte in the mountains and also on old mangrove in the south. The mountain plants have smaller leaves and more robust flowers; the flowers of the lowland plant last little over half the day in an expanded condition. There is a good deal of variation in size, in the details of the keels and the colouring, and shape of the midlobe. Distributed also in Sumatra, and very closely related to *D. angustifolium* of Java and Sumatra. Fig. 59.

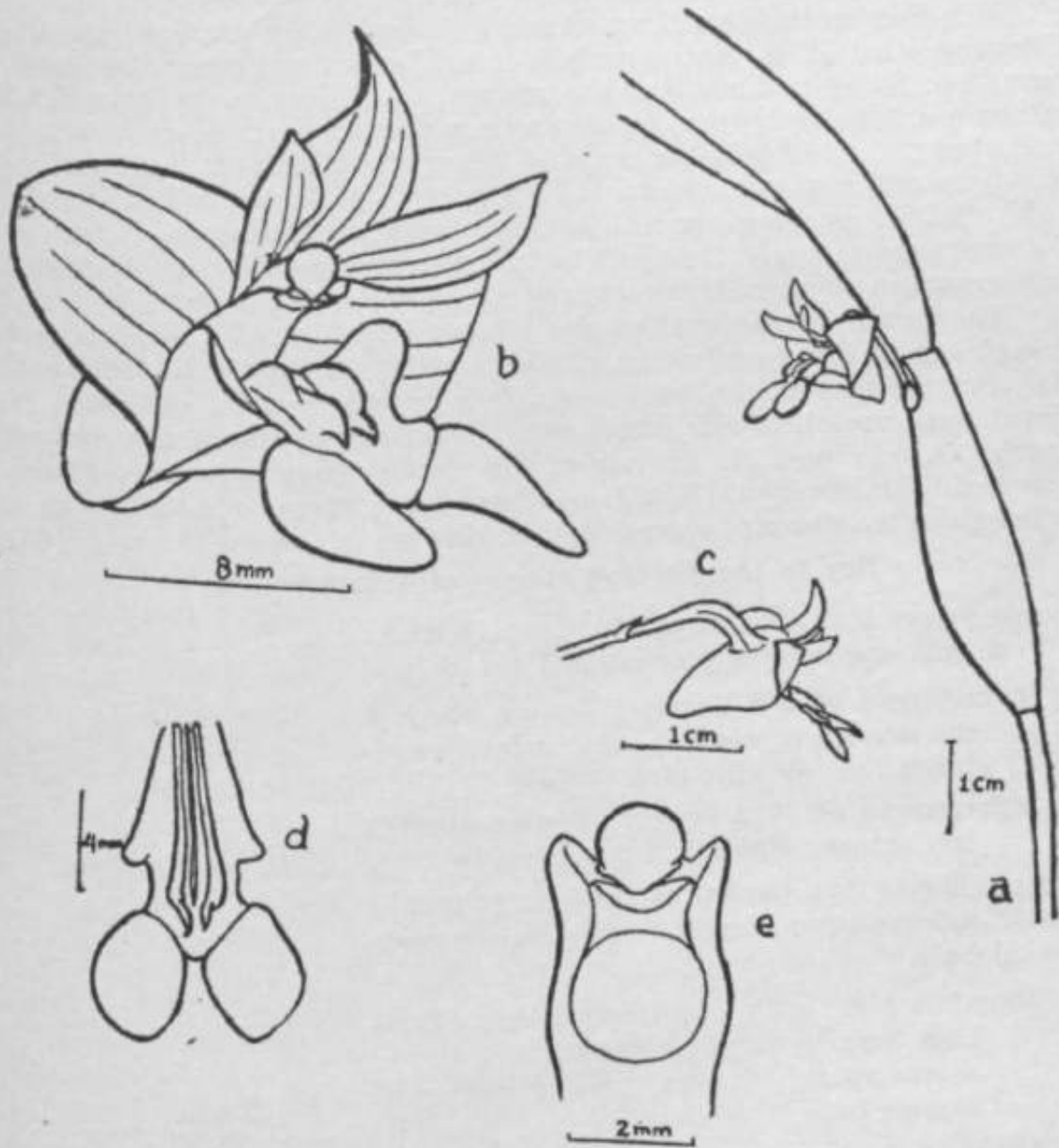
9. **Dendrobium lonchophyllum** Hk. f., F.B.I. 5: 714. 1890. Ic. Pl. t. 2018. —*Desmotrichum lonchophyllum* Krzl., Pflzr. Dendr. 350. Ridl., Flora 4: 29.

Pseudobulbs slender, 5 cm. or more long, hardly flattened; leaf to 15 by 2 cm.; flowers about 1.2 cm. across, colour uncertain; midlobe of lip gradually widened from a narrow base, its broad tip only slightly cleft, keels apparently not waved. Found originally on Taiping Hills, and described imperfectly from dried specimens; needs further investigation.

10. **Dendrobium convexum** (Bl.) Lindl., Gen. et Sp. Orch. 76. 1830. J.J.S., Fl. Buit. 6: 321, f. 242.—*Desmotrichum convexum* Bl., Bijdr. 330. 1825.

Rhizome long-creeping, branched; erect shoots short, not branched, of 2 or 3 internodes, the end one a flattened pseudobulb about 2.5 by 0.6 cm.; leaf very thick and stiff, about 6 by 1.5 cm.; flowers very similar to those of *D. Kelsallii*. Distributed in Java, Sumatra and Borneo; in Malaya only

collected certainly once, near Pontian, Johore, and apparently not common, but possibly overlooked on account of the resemblance of its flowers to *U. Kelsallii*.



leaf. *b*, flower. *c*,

flower from side, *d*, lip (base cut off). \* column.

**3. § Sarcopodium**

Pseudobulbs usually short and conical or ovoid, <sup>strongly angled when</sup> old, spaced on a woody rhizome (sometimes also on <sup>han in branches</sup>), covered when young with rather large overlapping brown sheaths, <sup>bearing</sup> two stiff leaves; inflorescence slender, arising <sup>between</sup> <sup>^ ^ ^</sup> several flowers which last many days the bracts small and Pa <sup>tent;</sup> sepals and petals narrowly elliptical, almost identical; mentum short (4-5

mm.) ; lip shorter than sepals, 3-lobed, the side-lobes erect, the midlobe oblong-acute, the area between the side-lobes bearing short fleshy keels; column rather long, foot short. The plants resemble *Coelogyne* in habit, but the flowers always have a distinct mentum.

This Section includes about twenty-five species, distributed from the Himalayas to Fiji. In Malaya only four are known at present, but eight have been found in Sumatra. The species are similar in habit, and all rather nearly related; they appear to be somewhat variable in details of colouring, and perhaps in the shape of the small keels on the lip. They are mostly mountain plants, of exposed places on high ridges, and are rarely cultivated. *D. macropodium* will however flower in Singapore, though it does not grow strongly. Owing to their long-creeping habit, the plants are best grown on pieces of fern-root or wood, or in wooden baskets.

The flowers of our local species are not large, but of a pleasing and graceful habit and long-lasting. If they could be crossed with the large-flowered Bornean *D. Treacherianum* (which is sometimes cultivated in Java) some useful hybrids might result, especially by use of the lowland species *D. zebrinum*. No hybrids in this Section have however yet been reported. The new name *Katharinea* has been proposed for this Section, when given the status of a genus (A. D. Hawkes in *Lloydia* 19: 94. 1956).

Key to the Malayan species of § *Sarcopodium*

- Scape longer than the leaves (to about 15 cm.) ;  
usually one inflorescence on each pseudobulb
- Inflorescence of 3-5 flowers; flowers about 4  
cm. across; sepals and petals white, some-  
times flushed with pink . . . . . 1. *D. longipes*
- Inflorescence of 8-12 flowers; flowers about 3  
cm. across; sepals and petals yellow .. 2. *D. macropodium*
- Scape shorter than the leaves (to 8 cm.) ; usually  
2 inflorescences simultaneously on one pseu-  
dobulb.
- Mountain plant with long freely hanging bran-  
ches bearing small pseudobulbs 5 cm. or  
more apart; flowers pale yellow with  
orange base of midlobe . . . . . 3. *D. geminatum*
- Lowland plant; rhizome creeping with all pseu-  
dobulbs arising directly from it, 3-5 cm.  
long; flowers yellow with chestnut-brown  
fleshy midlobe . . . . . 4. *D. zebrinum*

**1. *Dendrobium longipes*** Hk. f., F.B.I. 5: 713. 1890. Ic. Pl. t. 2017.—*Sarcopodium longipes* Krzl., Pflzr. Dendr. 324. Ridl., Flora 4: 28.

Pseudobulbs 2-3 cm. long; leaves varying much in size, often short and broad in plants in exposed positions, 5 by 1 to 5 by 2 cm. with a short stalk, or up to 12 by 2 cm. with a stalk of 2 cm.; scape to about 15 cm. long, rachis short with 3 to 5 flowers; pedicel and ovary 2-5 cm.; sepals and

petals 2-2-2-4 by 0-4-0-5 cm., white, sometimes flushed with pink; mentum 4-5 mm. long; lip 1-6 cm. long, side-lobes white with red-purple veins, base of midlobe yellow. A mountain species, often found on exposed ridges, on *small* trees, or on rocks or mossy ground. The rhizome sometimes grows free from the substratum, but then is supported by thick long roots.

2. **Dendrobium macropodum** Hk. f., F.B.I. 5: 713. 1890. Ic. Pl. t. 2020.—  
*Sarcopodium macropodum* KrzL, Pflzr. Dendr. 324. Ridl., Flora 4: 28.

Rhizome very stout and woody; pseudobulbs 4-5 cm. tall; leaves 10 by 2 to 18 by 3 cm.; scape about 15 cm. long or sometimes more; rachis longer than in *D. longipes*, bearing 8-12 flowers; pedicel and ovary 3-5 cm. long; sepals and petals 1-4-1-7 cm. long, dull yellow, the sepals suffused outside lightly with, purple; lip pale yellow, the side-lobes and base of midlobe suffused with red. Distributed to Sumatra; found in the same localities as *D. longipes*, perhaps more commonly; it is a larger more vigorous species, but with smaller less pleasing flowers than *D. longipes*. **Fig. 60e.**

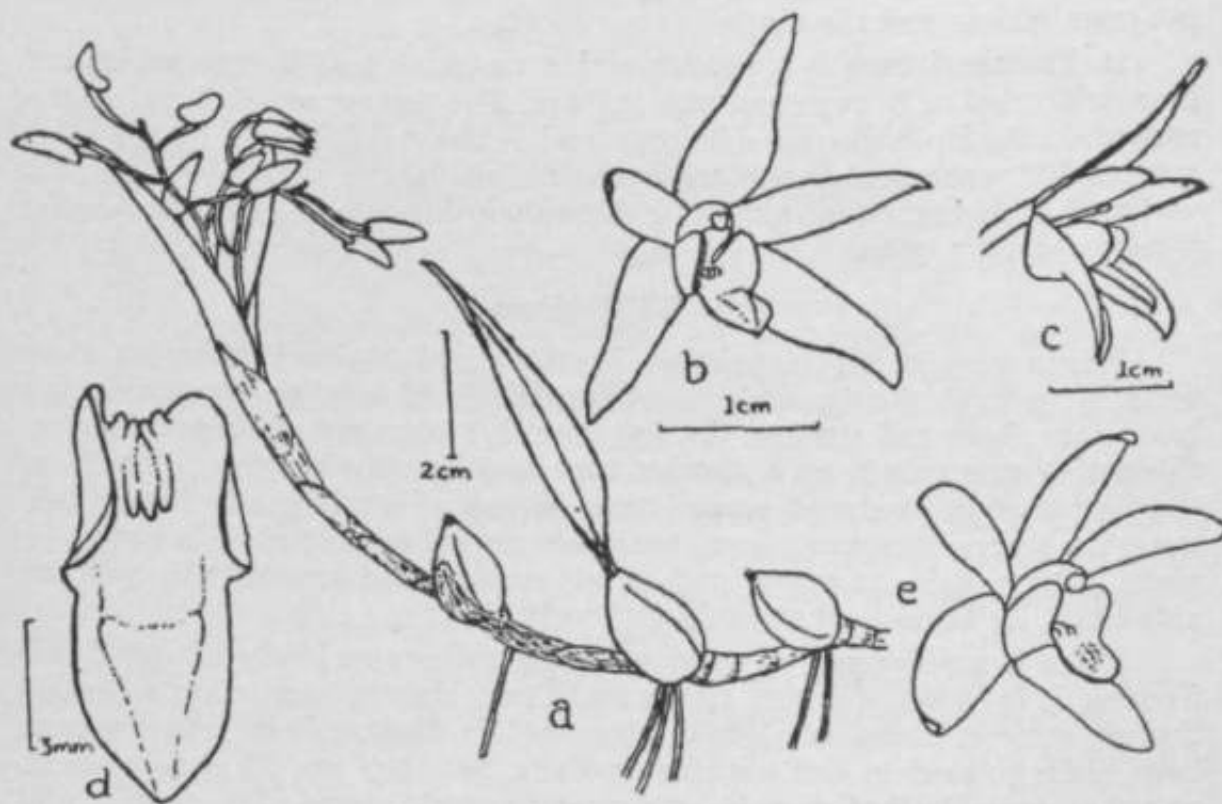


Fig. 60. *Dendrobium gertiynatum*, a, part of plant in flower, b, flower from front and c, from side, d, lip. *D. macropodum*, e, flower.

3. **Dendrobium geminatum** (Bl.) Lindl, Gen. et Sp. Orch. 77. 1832.  
*Desmotrichum geminatum* Bl, Bijdr. 332. 1825. *Sarcopodium geminatum* KczL, Pflzr. Dendr. 326. Ridl., Flora 4: 28,

Creeping- rhizome with close ovoid pseudobulbs 2-3 cm. long, bearing-spreading not-rooting branches with smaller pseudobulbs which are 5 cm. or more apart; leaves 4 by 1-2 to 12 by 2-5 cm.; inflorescences usually two-

together, from the apex of an immature pseudobulb, at flowering about 8 cm. long, the scape very short, flowers 3-6; pedicel and ovary 2 cm. long; sepals and petals 1-2-2-0 cm. long, cream or pale yellow; sepals to 5 mm. wide, petals to 2-5 mm.; mentum 4 mm. long; midlobe of lip orange at the base, side-lobes orange-brown or purplish. Described originally from Java, not yet reported from Sumatra; in Malaya found in similar situations to the two former species, at many mountain localities. Fig. 60, a-d.

4. **Dendrobiunt zebrinum** J.J.S., Ic. Bog. 2: 72, t. 113, C. 1903.—*Dendrobium citrino-castaneum* Burk., Gard. Bull. 3: 12. 1923.—*Sarcopodium citrino-castaneum* Ridl., Flora 4: 29.

Rhizome creeping; pseudobulbs 3-5 cm. long, to 8 cm. apart; leaves to 16 by 4 cm.; inflorescences usually two together, from immature pseudobulbs, each with 3-6 flowers, the scape very short at flowering, elongating later to about 8 cm.; pedicel and ovary 3 cm. long; sepals and petals about 1-7 cm. long, yellow; lip 1 cm. long, midlobe chestnut-brown, very fleshy. Distributed to Borneo and Sumatra; in Malaya only found a few times in the lowlands of Johore and Pahang. The flowers are a good colour, but do not open widely and the scape is very short.

**D. Treacherianum** is a species of the mountains of Borneo which has been cultivated in Europe and also in Java. The flowers are 6-8 cm. across, rose-pink, the lip with red side-lobes and yellow midlobe. As in the other species, the sepals and petals are narrow. This species will flower in cultivation at Kuching, Sarawak, but is difficult in Singapore, perhaps because it needs cooler nights.

#### 4. § **Bolbidium**

Plants very small (maximum height about 10 cm.), forming close tufts of upright shoots, each shoot consisting of several internodes, the basal ones short and slender, the (apparently) terminal one much longest, thickening upwards from a slender base and bearing two small leaves at the top; flowers produced singly from groups of small chaffy bracts between the leaves, white or cream, variously veined or flushed with purple or pink, 1-2 cm. long; mentum long, petals narrow and straight; lip without side-lobes, its blade bent slightly forwards.

There is a difference of opinion among authors as to the limits of this Section. It is however in any case a small one, and the plants are all small, though some of them are locally abundant in Malaya. Five species have been distinguished in this country by Carr, but they are all closely allied, and it is possible that further study may reveal intermediate forms, and that the number of really distinct species is fewer. This section is probably closely related to § Rhopalanthe, but has all internodes above the swollen one extremely short.

The species of the Section Bolbidium are like the Pigeon Orchid (*D. crumenatum*) in flowering gregariously following the stimulus of a sudden fall of temperature. The different species were observed by Carr to flower on different days; *D. quadrangulare* flowers a few days before *D. purnilum*, and *D. stnätellwm* between the two. Further observations of this kind would be of considerable interest.



Key to the Malayan species of § *Bolbidium*

- No purple markings on flowers; upper part of stems regularly 4-angled in section; apex of lip not cleft, sometimes slightly 3-lobed . . . *D. quadranguUtre*
- Flowers with purple veins or other purple markings; stems many-angled or sometimes quadrangular; lip at least slightly cleft at apex
- Lip with a small distinct yellow or greenish cushion near the tip; all parts of flower usually purple-veined . . . . . *D. pumilum*
- Lip with the whole apical part pustular or papillose; flower not uniformly purple-veined throughout
- Flowers about 1-7-2 cm. long
- Stems terete or many-angled, of about 5 internodes below the leaves, to about 7-5 cm. long . . . . . *D. striatellum*
- Stems round or quadrangular in section, of 3 internodes, to about 3 cm. long . . . . . *D. procumbens*
- Flowers about 1 cm. long . . . . . *D. ustulatum*

**Dendrobium pumilum** Roxb., Hort. Beng. 61. 1814. Ridl., Flora 4: 34.

This is a common lowland species throughout the country, growing on trees in moderately open places (such as village fruit trees). **Fig. 61, d, e,**

**Dendrobium quadrangulare** Rchb. f., Flora 69: 553. 1886. Par. ex Hk. f., F.B.I. 5: 714. 1890. Carr, Gard. Bull. 5: 3. 1929.

Carr reports that this species is also abundant in Pahang in the same positions as *D. pumilum*. These two species are very similar in habit, but are distinguished by the quadrangular stems of the former and the many-angled stems of *D. pumilum*, as well as by the flower characters given in the key. A variety of *D. pumilum* with purple lines only along the edges of the lip also occurs. More information about the occurrence of *D. quadrangulare* is desired. Both species have been found in Lower Burma, and *ZX pumilum* is reported from Sumatra, Java and Borneo. **Fig. 61, a, b, c.**

**Dendrobium striatellum** Carr, Gard. Bull. 7: 10. 1932.

Recorded only from Gua Musang in southern Kelantan. It is as large as *D. pumilum*, but its flowers are more nearly related to the following species. The lip has the veins and edges red-purple.

**Dendrobium ustulatum** Carr, Gard. Bull. 7: 13. 1932.

Recorded only from the Jeriau Valley below Fraser's Hill.

**Dendrobium procumbens** Carr, Gard. Bull. 7: 11. 1932.

Recorded only from Cameron Highlands.

These are both very small species, having flowering shoots sometimes under 2 cm. tall, with leaves about 1.5 by 0.9 cm., though sometimes larger. In both the sepals and petals are cream, faintly veined with purple, the lip veined with purple outside, inside white with a yellow-green pustular patch near the apex. *D. procumbens* has larger flowers, but perhaps intermediates may occur.

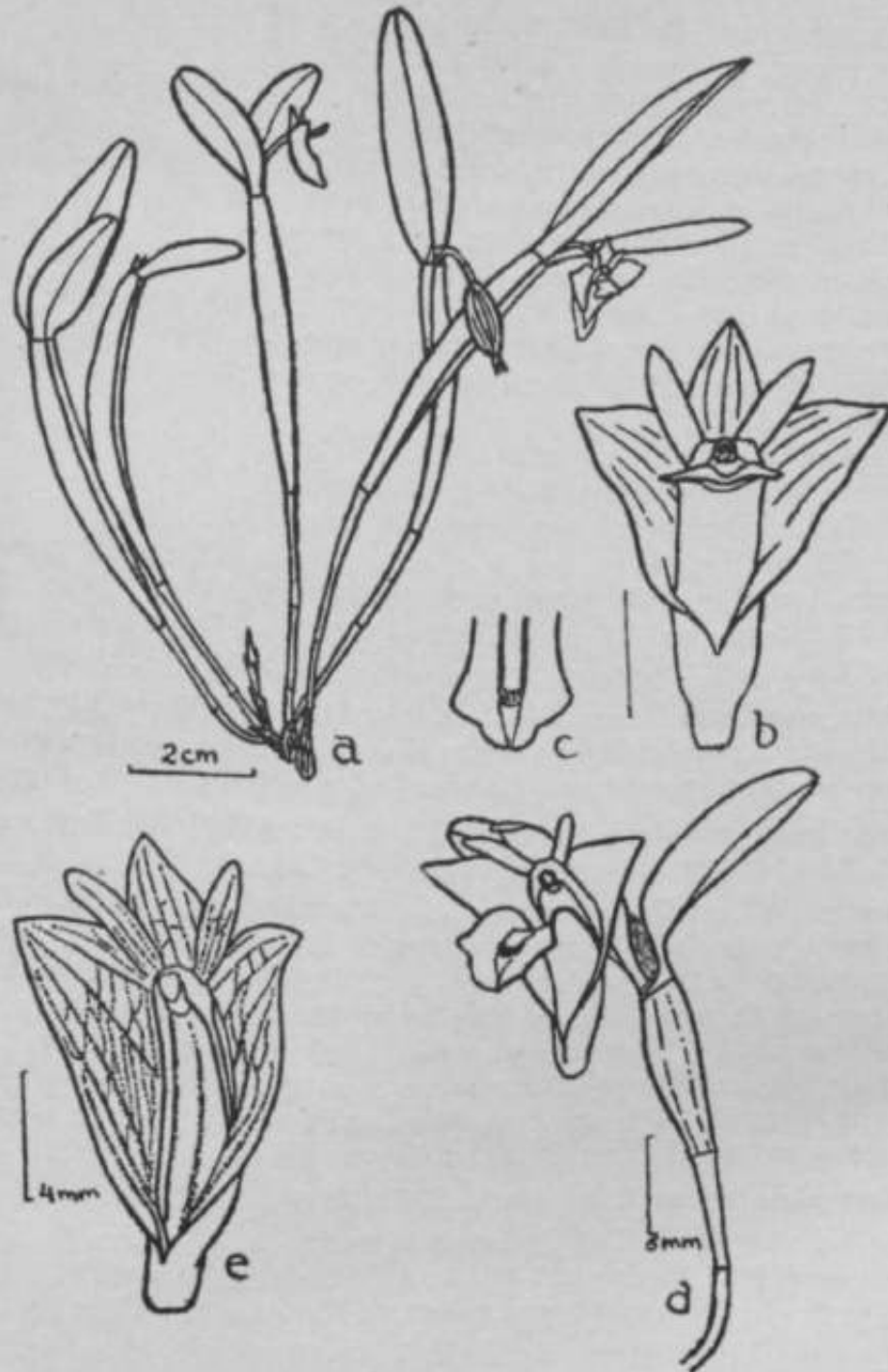


Fig. 61. *Dendrobium quadrangulare* (after Carr). *a*, plant, *b*, flower, *c*, tip of lip, *D. pumilum*. *d*, part of small plant, *e*, flower without lip.

### 5. § Euphlebia

The species of this small group are mostly found in Eastern Malaysia. In Malaya there is only one species, *D. spurium* (also known as *D. euphlebia*), which is distributed from Sumatra to the Philippines. It is common as an epiphyte in mangrove in the south of Malaya, and also on limestone rocks in Pahang and Selangor.

**Dendrobium spurium** (BL) J.J.S., Fl. Buit. 6: 343, 1 260. 1905.—*DendrocoUa spuria* Bl., Bijdr. 290. 1825.—*Dendrobium euphlebiium* Rchb. f. ex Lindl., J.L.S. 3: 7, 1854. Ridl., Flora 4: 44.

Successive shoots close together, to 30 cm. long, when young covered with overlapping thin green sheaths, when old bare with many short internodes, thickening upwards from a slender base, bearing 2 or 3 unsheathed leaves at the apex; leaves to about 12 by 2 cm., acute; flowers arising singly at the nodes of the bare stem below the leaves, lasting one day only, length and width a little over 3 cm.; sepals and petals white, spreading; mentum short; column longer than usual in *Dendrobium*; lip with a short oblong base, widening abruptly to an almost round concave blade which is slightly 3-lobed, cream or pinkish with conspicuous purple brown veins and an orange flush in the middle. Fig. 62.

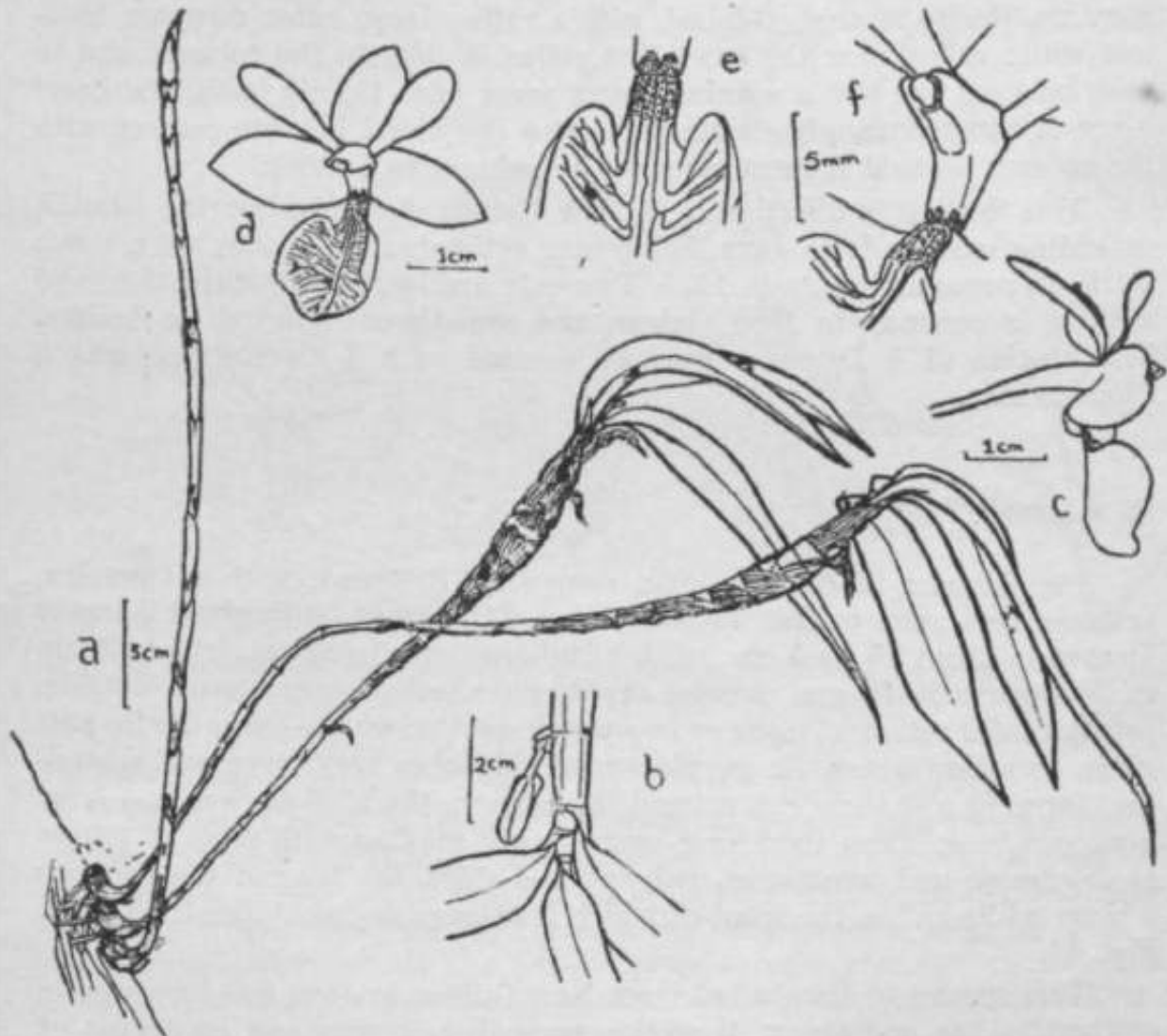


Fig. 62. *Dendrobium spurium*, a, plant with erect young stem, b, stem-apex and flower-bud, c, d, flower, e, base of lip and column-foot, f, column and base of lip.

The rhizome grows downwards, each new shoot arising below the last; the young shoots are almost erect, but as they thicken they bend over, the old ones being about horizontal with upturned tips. The plants flower at intervals of some weeks or months; the stimulus which promotes flowering is not known, but is probably dry weather following a wet period. The buds take something like a month to develop.

## 6. § *Latourea*

Pseudobulbs thickened upwards from a slender base, of several internodes, with a few leaves close together near the top, the leaves sheathless; inflorescence erect from near top of pseudobulb, usually with a number of flowers which are greenish or yellow-green, often large, with a short mentum, the lip strongly 3-lobed, with a rather large, often complex, hairless white callus near the base. The callus is close to the column, and to pass between the two a visiting insect must push the lip back; the basal hinge is rather strongly elastic and keeps the insect in close contact with the column, so that it must remove the pollinia on leaving.

This Section is distributed in New Guinea and neighbouring islands, extending eastwards to Java. Schlechter estimated that there were about thirty-five species known in 1915. Two only are in general cultivation, and a third is common in New Guinea and sometimes collected by dealers. The species of § *Latourea* may be crossed with § *Ceratobium* and § *Phalsenanthe*.

### **D. *macrophyllum***

Pseudobulbs 20-30 cm. long, somewhat flattened, with many ribs, yellow-green, more or less flushed with purple-brown, with about 3 leaves (leaves to about 15 by 5 cm., acute) ; inflorescence to 30 cm. long with up to 15 flowers 4-4.5 cm. across; sepals pale yellow-green, hairy outside, petals a little yellower, more or less purple-spotted on the back, the lip pale green or yellow-green, its purple-veined side-lobes very large and spreading, forming a shallow cup around the column, the midlobe widened from a narrow base, wider than long, more or less marked with rows of purple spots, fleshy, and sometimes with inflexed sides, the base of the lip with a large white callus, the front of which is oblong, slightly taller than wide. **Fig. 63.**

This species is distributed from New Guinea to Java and has been in cultivation for a century. It varies somewhat in size and in details of colouring. It is well known as a pot plant in Java and occasionally seen in Malaya. When in full flower it is very striking, but can hardly be called beautiful. When well tended it flowers quite satisfactorily in Singapore; it is best in light shade.

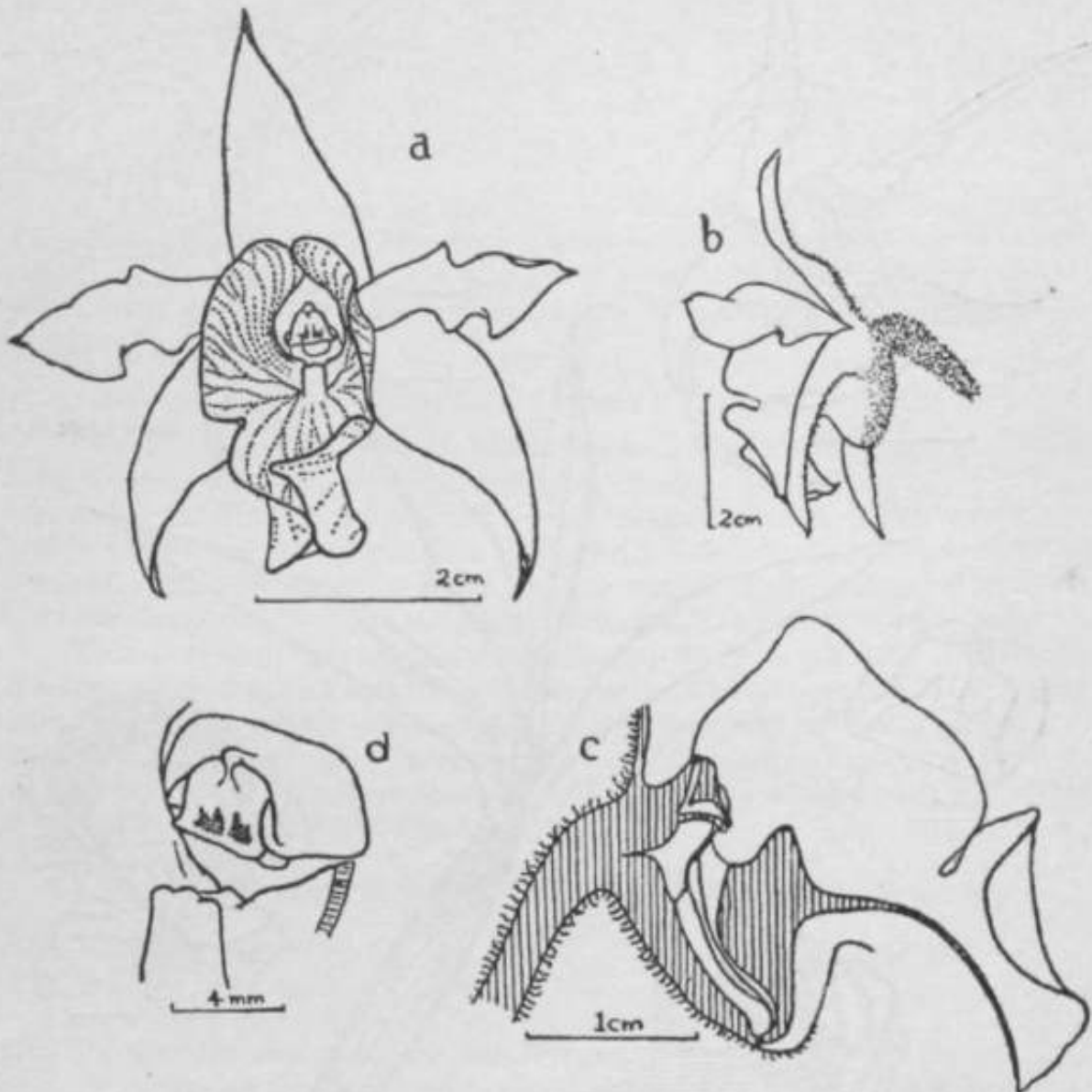


Fig. 63. *Dendrobium macrophyllum*. *a*, *b*, flower from front and side, *c*, section through column and lip. *d*, top of column and callus on lip.

#### *D* spectabile

Similar in habit to *D. macropkyllwm* but larger, with pseudobulbs up to 60 cm. long, the inflorescence with fewer larger flowers; flowers 7-8 cm. across, sepals, petals and lip all with long narrow points and edges strongly crisped towards the base, colouring somewhat brighter than in *D. maeraphyllum*, sepals and petals cream to pale greenish at the edges, with mottled dull purple veins, lip almost white towards the base, yellowish towards the tip, strongly dark-purple-veined, side-lobes as in *D. macrophyllum* but proportionately smaller, with irregularly crinkled edges, the base of the lip between the side-lobes having a large complex lobed callus, shining white with a polished surface, having 3 conspicuous rounded lobes in front; column massive, very short, anther green. Fig. 64.

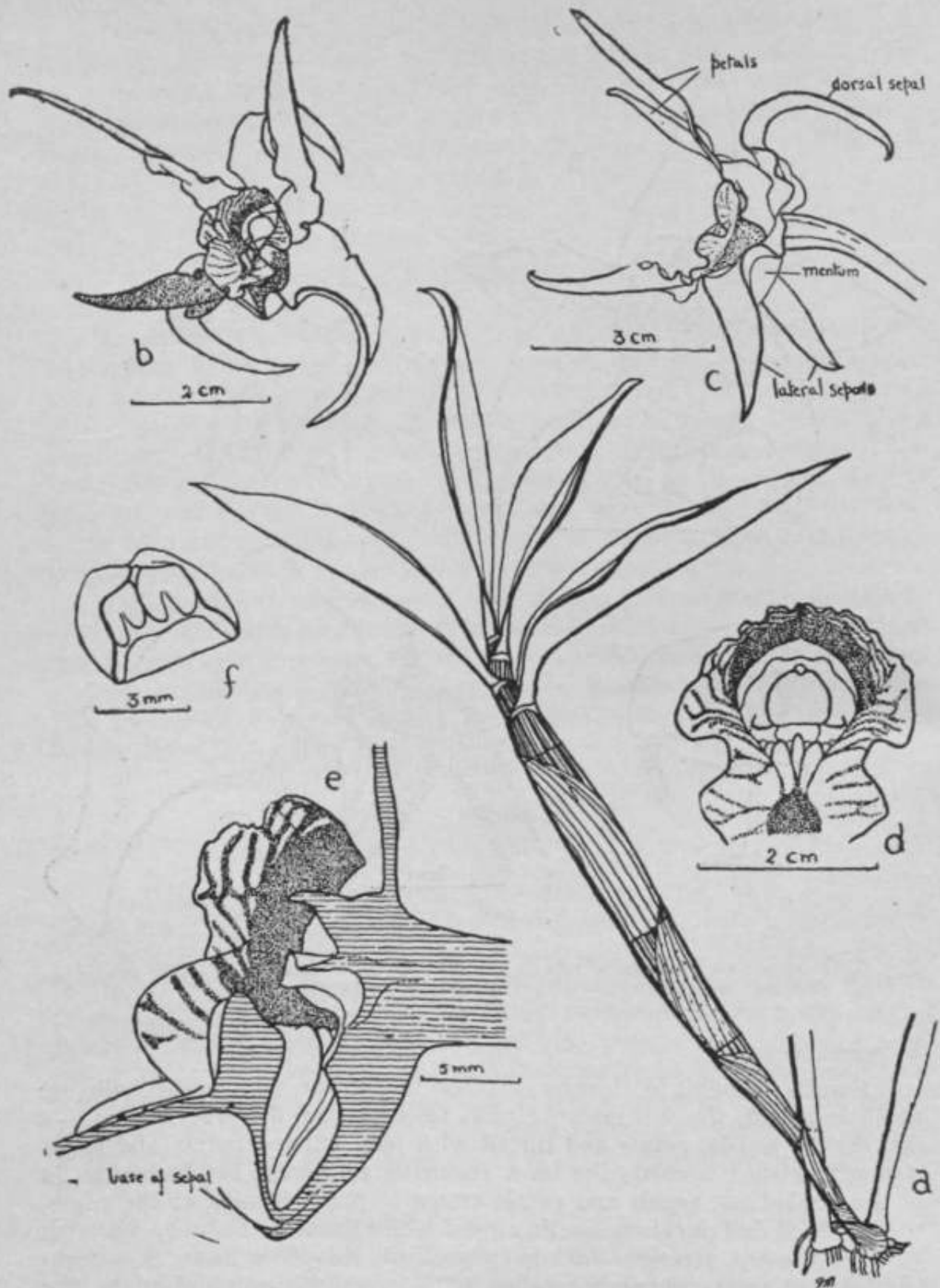


Fig. 64. *Dendrobium spectabile*. a, part of plant, b, c, flower seen obliquely from front- and back (petals and lip point forwards, sepals backwards), d, column and base of lip, from front, e, section through column and base of lip. f, anther cap removed and reversed.

This species is native in New Guinea and the Solomon Islands. It was first brought into cultivation in 1898. In Singapore it does not flower freely though it grows quite well; it probably needs a rather drier and cooler season, and should be tried in other parts of Malaya. It is handsome in a rather grotesque way, and may be useful in hybridizing. It needs the same treatment as *D. macrophyllum*, but will stand full sun if suitably hardened off.

*D. bifalce* is a more slender species than *D. macrophyllum*, usually with 2 leaves only, the inflorescence quite tall but with few flowers which are 2 cm. across, greenish, not hairy, the petals very small the lip yellow-green with purple markings. It flowers well in Singapore and might be useful in breeding.

### 7. § Callista

Pseudobulbs more or less erect, thickened upwards from a slender base, bearing a few sheathless leaves near the top; inflorescences from near top of stem, usually with short scape, many-flowered, often drooping; sepals and petals broad, mentum short, lip almost round, concave, with no distinct side-lobes, densely hairy within (in *D. aggregatum* only hairy towards the base), a distinct hollow nectary in the short column-foot.

This is a small group of species, mostly native in Burma and neighbouring countries, one coming southwards to Malaya. Nearly all are very handsome, with rather large compact inflorescences of many flowers of good size and colour. The flowers are exactly similar in essentials to those of the next Section (Eugenanthe), but the habit of the plants is quite distinct, resembling *Latourea*.

#### Key to the more important species of § Callista (\*Malayan)

- |  |                           |
|--|---------------------------|
| Pseudobulbs one-leaved . . . . .   | 1. <i>D. aggregatum</i>   |
| Pseudobulbs with several leaves  |                           |
| Flowers entirely yellow  |                           |
| Pseudobulb 4-angled; lip not fringed; inflorescence dense, drooping . . . . .                  | 2. <i>D. densiflorum</i>  |
| Pseudobulb many-angled; lip fringed; inflorescence not drooping, flowers well spaced . . . . . | 3. <i>D. chrysotoxum</i>  |
| Flowers with lip only yellow   |                           |
| Pseudobulb 4-angled, sepals and petals white or mauve . . . . .                                | 4. <i>D. Farmeri</i> *    |
| Pseudobulb not angled or with several slight ridges, sepals and petals white . . . . .         | 5. <i>D. thyrsiflorum</i> |

#### 1. *D. aggregatum*

Pseudobulbs to about 8 cm. long, narrowed to both ends, closely placed, each with a single leaf about 6 by 2 cm.; inflorescences slender, many-flowered, the base somewhat ascending and the end curved downwards; flowers fragile, pale yellow deepening with age, 3 cm. across, the lip very broad with orange bands in the throat, hairy only towards the base.

This species is native over a wide area in Burma and eastwards to southern China. The flowers are very beautiful but not long-lasting. The plants are easy to grow in Singapore, but flower rarely, perhaps chiefly on account of the even temperature. In the north of Malaya it is said to flower better. Where it will flower, it is well worth growing; it needs a fairly sunny place, and grows well on a piece of wood.

## 2. *D. densiflorum*

Pseudobulbs 4-angled, green, to 30 cm. high, with 3 or 4 leaves about 15 cm. long; inflorescences very dense, drooping, the flowers about 5 cm. across, entirely yellow, the lip a deeper shade, round, very hairy throughout inside but the edge not fringed.

Native in the foothills of the Himalayas from Nepal to Assam, at altitudes up to 3,500 feet. It does not flower well in Singapore, but might repay cultivation at our hill-stations. Dakkus says that it needs no resting period and does well in Java at elevations of 1,000 feet and over. It is similar to *D. Farmeri*, but differs in the colour of the flowers.

## 3. *D. chrysotoxum*

Pseudobulbs to 30 cm. long, much thickened in the upper half, many-grooved, yellowish when old, bearing several leaves 10-15 cm. long; inflorescence obliquely erect or slightly drooping, 20 cm. or more long, with flowers well spaced, deep yellow, to 5 cm. wide, the lip a deeper shade than the petals and sepals, its edge crisped and finely fringed. The variety *sudvissimum* has somewhat larger flowers, with two deep maroon patches inside the lip. Besides this distinct variety, the plants vary somewhat in the size and depth of colour of the flowers.

This species is native in Burma and often imported into Malaya. In Singapore if carefully tended it grows to a large size, but cannot be called free-flowering. The flowers are however very handsome and a few plants are well worth keeping for their occasional displays. Full sun is desirable (or at least full morning sun) and the plants respond well to generous manuring, being less exacting than some species in the matter of aeration of the roots.

## 4. *Dendrobium Farmeri* Paxt., Mag. 15: 241. 1849.

Pseudobulbs to about 30 cm. long, thickened and strongly 4-angled in the upper part, with 3 or 4 leaves up to 15 cm. long; inflorescences drooping, to 20 cm. long, the flowers close but less densely packed than in *D. thyrsiflorum*, about 5 cm. across, the sepals and petals a delicate lilac-mauve or white, the lip yellow, hairy. **Fig. 65.**

This most beautiful species is distributed from the Khasya Hills southwards to northern Pahang. Burmese plants differ from Malayan ones in having more solid pseudobulbs, the Malayan ones being distinctly hollowed in the sides. In Singapore, plants imported from Burma usually do not flower, but plants from Pahang and Kelantan flower usually once a year, about March or April, often freely, and occasionally at other times. Unfortunately the flowers only last a few days. The plants grow wild on large trees overhanging rivers in primitive forest. They like light shade and need plenty of moisture when in growth, and are best as hanging plants. This species is perhaps the most beautiful native Malayan orchid.



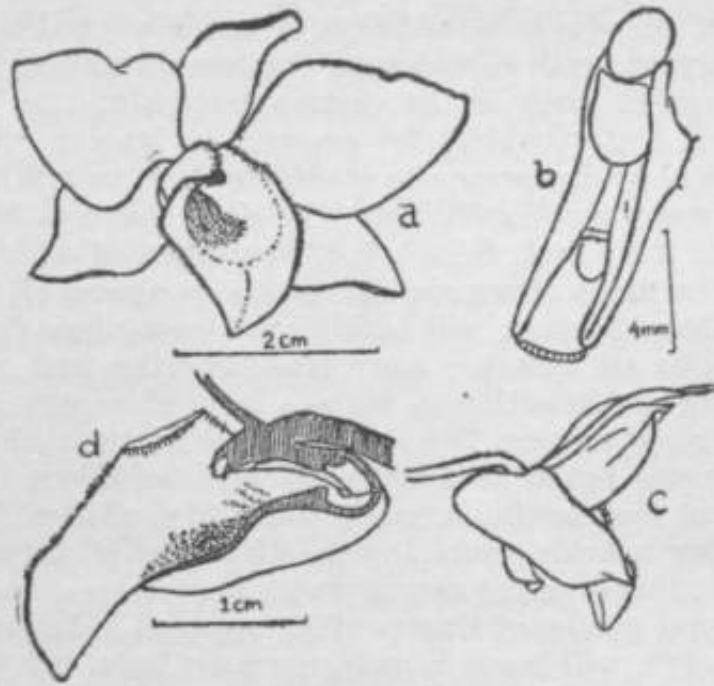


Fig. 65. *Dendrobium Farmeri*. *a*, flower from front, *b*, column and column-foot, *c*, side of flower showing mentum. *d*, section through column and lip.

#### 5. *D. thyrsoiflorum*

Pseudobulbs more slender than in *D. Farmeri* or *D. densiflorum*, quite narrow at the top, lightly grooved, green, bearing several leaves; inflorescences pendulous, dense, the flowers up to 5 cm. across, petals and sepals white, lip yellow.

This species, native in Lower Burma, grows well in Singapore when well established, but flowers rarely. It is better in the north of Malaya. It is usually treated as a basket plant, hung in a lightly shaded place. The flowers are beautiful, but not finer than those of *D. Fwrneri*.

### 8. § Eugenanche

Pseudobulbs (or successive shoots of the sympodium) evenly fleshy throughout or sometimes thickened at the nodes, short or long, erect or pendulous, with sheath-bearing leaves throughout their length; flowers usually borne from many nodes simultaneously, on the old stems after the leaves have fallen, the inflorescences short and few-flowered; flowers medium-sized to large; petals and sepals usually similar and fairly broad; mentum short; lip broad and often rounded, sometimes strongly concave, without side-lobes, usually hairy all over the inner surface, usually without any callus or keels, the column-foot with a hollow nectary.

The name *Eugenanche* is adopted by Schlechter for a part of the species called *Eu-Dendrobium* (or true *Dendrobium*) by most former authors. The Section has its principal distribution in Burma and surrounding countries, some species extending to Ceylon on the one hand and to New Guinea on the other, and north-eastwards to China and Japan. In Malaya occur a few of the Burma species at the southern limit of their range, none of them abundantly, and also a few species which are widely distributed or entirely Malaysian.

The Section includes some of the most handsome and largest-flowered species in the genus, with considerable variety of colour. Many of them have been cultivated, both in the eastern tropics and in Europe, for a century or more. Unfortunately for growers in Malaya, the majority of species need a cool or dry season to stimulate them to full flowering, with the result that many will hardly flower at all in this country and none of them are seen at their best. *D. nobile*, a good plant of which in a suitable climate flowers on many stems simultaneously at almost all the nodes, and makes a magnificent display, will hardly produce a single flower in Singapore. Some species are however more free-flowering, and much might be done by breeding and selection in Malaya to produce new hybrids which are suited to local conditions. The species of the Sections Phalsenanthe and Ceratobium however flower so much better here, with long sprays of long-lived flowers, that Eugenanthe is hardly likely to rival them in local favour. Perhaps some day hybrids combining the virtues of all three sections may be produced, but this does not appear to be easy.

Plants of some species of Eugenanthe, imported to Malaya when rested and ready to flower, will blossom quite normally here, but will never give the same display again. They might of course be made to do so if they could be grown under controlled conditions of temperature and humidity; this would be an interesting experiment, but hardly profitable.

The following key includes all the Burma species which are known to have been cultivated in Malaya, or which might be tried in the lowlands or on the hills, and also those species which are native. The native species are marked with an asterisk. The descriptions of the species are in alphabetical order.

- Flowers almost entirely yellow or yellowish, sometimes with large maroon marks on the lip
- Flowers pale or dull yellow
- Flowers 10 cm. across, pale tawny yellow with maroon patches in lip
- Leaf-sheaths purple-striped . . . . . *D. pulchellum\**
- Leaf-sheaths not purple-striped .. .. *D. moschatum*
- Flowers 4 cm. across, entirely pale yellow, waxy . . . . . *D. Friedrichsianum*
- Flowers deep yellow or orange-yellow
- Edge of lip fringed
- Flowers 8 cm. across, stems very slender, to 2 m. long . . . . . *D. Hookerianum*
- Flowers 5 cm. across, stems fleshy, to 1 m. long . . . . . *D. fimbriatum*
- Edges of lip not fringed
- Stems pendulous, flowers on leafy stems, true yellow . . . . . *D. chrysanthum*
- Stems erect, flowers on leafless stems, light orange-yellow .. .. *D. moschatum* var. *cupreum*

- Flowers only partly yellow, or with no yellow
- Flowers entirely mauve-purple
- Flowers 2 cm. across .. .. *D. linguella\**
- Flowers 5 cm. or more across
- Stems to 30 cm. long, curved, fleshy, uneven, flowers 5 cm. across .. .. *D. Parishii*
- Stems longer, even in thickness, pendulous, flowers larger .. .. *D. anosmum\**
- Flowers partly white or yellow, as well as mauve-purple
- Petals and sepals mauve, lip pale creamy yellow
- Stems with swollen nodes .. .. *D. Findlayanum*
- Stems not or hardly swollen at the nodes
- Sepals and petals twisted .. .. *D. tortile\**
- Sepals and petals not twisted
- Petals wider than sepals; end of lip rounded .. .. *D. Pierardii\**
- Petals same width as sepals (5-6 mm. wide); end of lip much wider than high .. .. *D. primulinum*
- Flowers white or greenish or cream, with purple on lip only, no yellow
- Inflorescences lateral, each of few flowers
- Sepals 3-5 cm. long, creamy white .. .. *D. heterocarpum\**
- Sepals 2-2 cm. long, creamy white .. .. *D. cretaceum*
- Sepals 10-1-5 cm. long, faintly greenish, often hardly spreading .. .. *D. tetradon\**
- Inflorescence apparently terminal, of many white flowers .. .. *D. Fytchianum*
- Purple or mauve on other parts as well as lip, variously combined with white and/or yellow
- Sepals and petals white with purple towards tips, or tinted with purple
- Stems with swollen nodes .. .. *D. crassinode*
- Stems without swollen nodes
- Lip partly white
- Lip fringed at the edge .. .. *D. devonianum*
- Lip not fringed
- Base of lip deep yellow .. .. *D. crepidatum*
- Base of lip mauve-purple .. .. *D. nobile*

Lip without any white .. .. .	<i>D. Wardianum</i>
Sepals and petals white, Up partly yellow	
Flowers 5-6 cm. across .. .. .	<i>D. Bensonim</i>
Flowers 24 cm. across .. .. .	<i>D. callibotrys*</i>
Sepals and petals purple, lip with no yellow	<i>D. lituiflorum</i>

*Dendrobium anosmum* Lindl., Eot. Reg. 21: Misc. 41. 1844.—*D. macrophyllum* Lindl. Bot. Reg. 1839: Misc. 36, non A. Rich.—*D. superbum* Rchb. f., Walp. Ann. 6: 282. 1861. Ridl., Flora 4: 52.—*D. Scortechinii* Hk. f., F.B.I. 5:741, 1890.

Stems to 120 cm. or more long; flowers 6-10 cm. across (according to variety), entirely mauve-purple, the lip with two deep purple patches in the middle, the basal part purple-veined; sepals narrow, petals broader, both up to 6 cm. long; lip projecting forwards with a more or less acute tip, very hairy within, with a fleshy thickening near the base. Distributed from Sumatra to the Philippines and New Guinea, and variable in size, the largest varieties apparently coming from the Philippines, where the species was first found by European collectors over a century ago. In Malaya *D. anosmum* has been found several times, chiefly in the north, as an epiphyte in limestone country, but it is not common or widespread. Fig. 66.

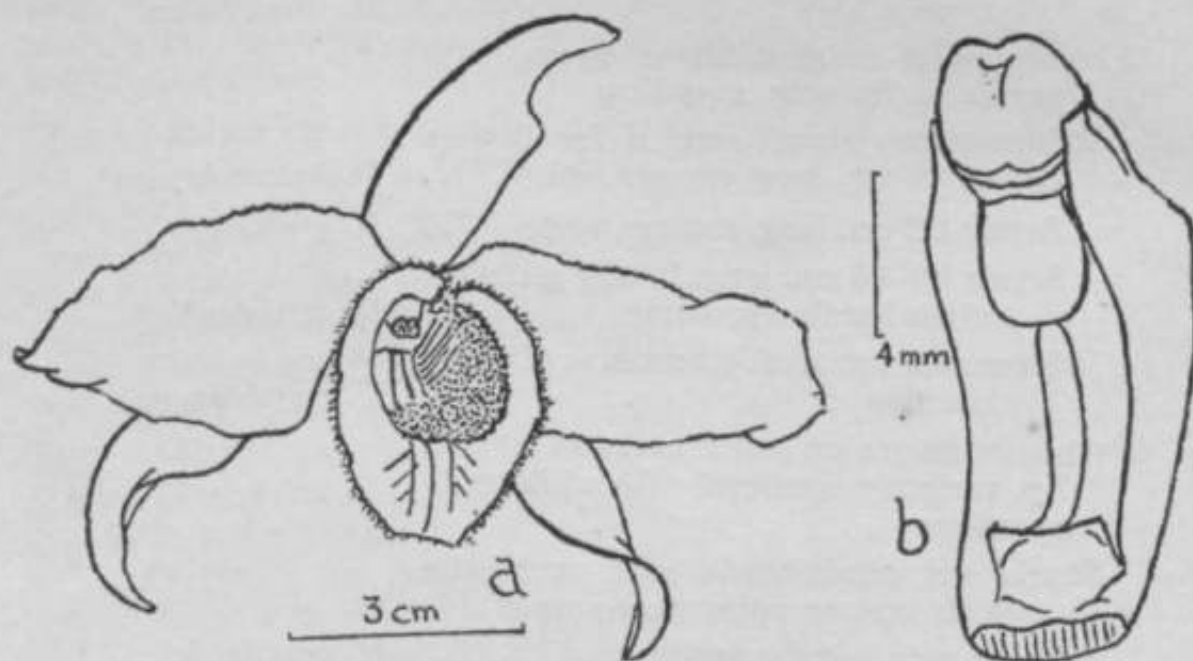


Fig. 66. *Dendrobium anosmum*. a, flower from front, b, column and column-foot.

This species is better known as *D. superbum*, but there is an older and different *D. superbum*, and so the next valid name, *D. anosmum*, must be used, though it is not appropriate, meaning scentless. It was first given to an almost scentless small variety of the species. The typical and larger varieties of *D. anosmum* have a rather powerful odour, unusual in *Dendrobium*.

*D. anosmum* is only suited to cultivation in the lowlands, and needs a regular dry season to ripen the stems in order to produce free flowering. In Singapore it rarely produces a spectacular display, but at Penang it flowers well, and good plants may attain a length of almost 200 cm. It grows best on a living tree in not too sheltered a place. Its long pendulous habit is not well suited to pot culture, but it may be grown satisfactorily in baskets. Dry cattle manure may be used. Plants are often imported from Borneo, Java or the Philippines. There is a fine variety with white sepals and petals, the lip of the usual mauve colour.

### 1). *Bensoniae*

Stems erect, 30-75 cm. long; flowers 5-6 cm. across, white with middle of lip orange-yellow and two maroon spots. Native in Burma, southwards to Moulmein, at moderate elevations; will flower in Singapore, but not freely, nor is it strong in growth.

*Dendrobium callibotrys* RidL, J.L.S. 32: 258. 1896. Flora 4: 44.

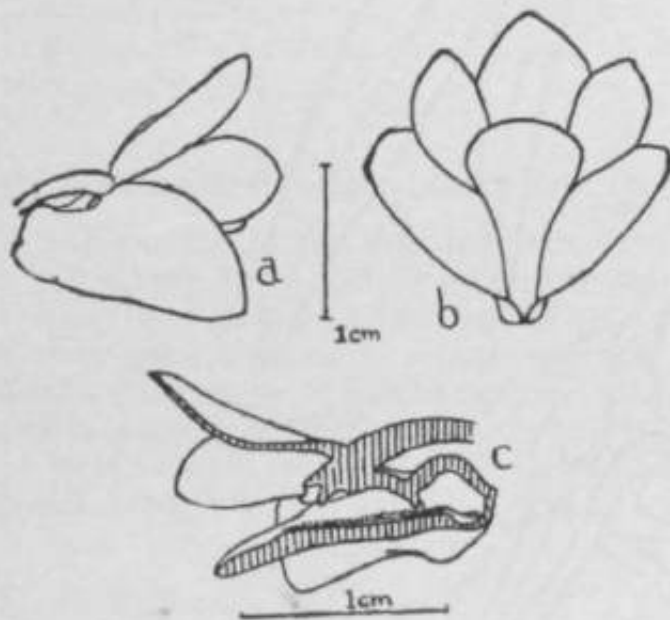


Fig. 67. *Dendrobium callibotrys*, a, b, flower from side and front, c, section through column and lip.

Stems erect, about 20 cm long and 8 mm. thick, with 2 to 7 leaves near the top only; leaves about 10 by 2 cm.; inflorescences borne at one of the upper nodes, usually just below the leaves, with up to 6 flowers; flowers fragrant, 24 cm. across; sepals and petals white; upper sepal 1.4 by 0.9 cm., with broad blunt tip; petals 7 mm. wide, tips rounded; mentum 8 mm. long, broad; lip fleshy, tip light yellow, rest white, with 5 red streaks, broadly rounded at the apex, apical part of blade densely papillose. Native in southern

Malaya and Borneo, on mangrove. The mentum is proportionately long for this section of the genus; there is a typical nectary. The leaves, though confined to the top of the stem, have sheathing bases. Fig. 67.

### *D. chrysanthum*

Stems pendulous, to 150 cm. long, flowering while leafy (at least in Singapore); flowers to 5 cm. across, golden yellow, the lip concave with two round chestnut-maroon patches. Native in the foothills of the eastern Himalayas and widely distributed in Upper Burma. Not difficult to cultivate in Singapore, but never attains anything near its full size and has only a few flowers on each new stem; the flowers last less than a week but

are a very fine colour. This would be worth trying at Malayan hill stations. The plants are best on a piece of wood, to allow their stems to hang down. Fig. 68.

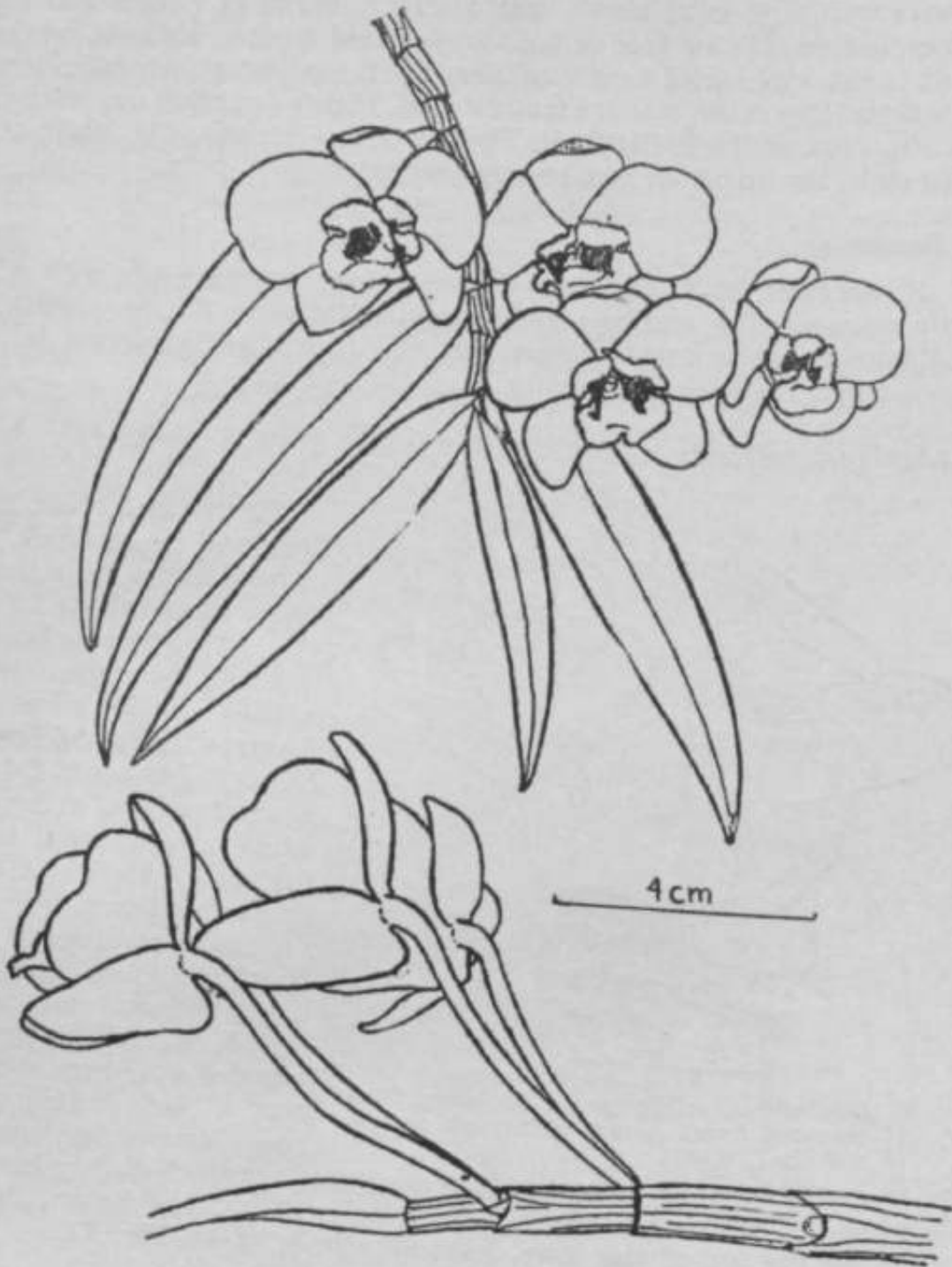


Fig. 68. *Dendrobium chrysanthum*.

*D. crassinode*

Stems 30-60 cm. long, much swollen at the nodes, flowers 5-6 cm. across, sepals and petals white with purple tips, lip yellow with a white zone, the edge purple. Native in the neighbourhood of Moulmem; can be grown in Singapore and flowers occasionally, flowers well OD Penang Hill.

*D. crepidatum*

Stems 30-45 cm. long; flowers 3-5 cm. across, waxy, white tinted with lilac, base of lip deep yellow. Native of Assam; not easy to maintain in Singapore and flowers rarely.

*D. cretaceum*

Stem 20-30 cm. long, fleshy, curved; flowers 3-5 cm. across, creamy white with the lip streaked with crimson. Native from Assam to Tenasserim; not difficult to grow in Singapore and produces an odd flower or two occasionally, never flowering freely.

*D. devonianum*

Stems pendulous, to 1 m. long; flowers 5 cm. across, sepals and petals white with purple tips, lip fringed at the edge, white with two orange-yellow patches near the base and purple at the tip. Native from northern India to southern China and southwards to Moulmein; there are several varieties differing in size and details of colouring. This species will flower occasionally in Singapore.

*Dendrobium fimbriatum* Lindl., Gen. et Sp. Orch. 76. 1830.

Stems to 120 cm. long or more, light yellow-green when old; flowers 5 cm. across, in pendulous inflorescences of 6 or more; sepals and petals rather light orange-yellow, with deep orange-yellow fringed lip. The variety *oculatum* has two large maroon patches in the base of the lip. Native from Nepal to Burma; grows easily in Singapore, but flowers rarely, and is better worth growing in the north of Malaya. This species is reported to have been found once on G. Panti in Johore, but there is no other Malayan record.

*D. Findlayanum*

Stems with the nodes much swollen, to 50 cm. long; flowers 7 cm. across; sepals and petals pale lilac, white towards the base; lip deep yellow at the base, pale at the edges. Native on the mountains between Burma and Thailand; does not grow strongly in Singapore, but has flowered occasionally.

*D. Friedrichsianum*

Stems to 50 cm. or more long, light yellowish when old, and sinuous; flowers in groups of 2 to 4, 4 cm. across, waxy, pale yellow, long-lasting, the lip a deeper shade, with crisped edges and hairs towards the base only. Native in Siam; flowers better in Singapore than many allied species, and the long life of the flowers is a useful feature.

**D. Fytchianum**

Stems erect, 30-45 cm. long; inflorescences terminal, erect, of many white flowers 4 cm. across, the small side-lobes of the lip tinted with purple. Native of the Moulmein district; a most beautiful species of unusual habit and colouring. It does not properly belong to this Section, but is nearer than to any other; it may perhaps be related to § Phalsenanthe. No trial of *D. Fytchianum* in Malaya has been reported, but it should be introduced, if only for use in hybridization. Its distinctive habit, many-flowered inflorescences and white flowers of good shape should be most useful.

**Dendrobium heterocarpum** Lindl., Gen. et Sp. Orch. 78. 1830. Wall., PL Asiat. Ear. 2: 84, t. 196. Bot. Mag., t. 4708. King & Pantl., Ann. Calc. 8: 53, t. 74. J.J.S., Fl. Buit. 6: 368, f. 281.—*D. aureum* Lindl., I.e. 77. Ridl., Flora 4: 51.

Stems 20-30 cm. long, erect; flowers in groups of 2 or 3, 6 cm. across; sepals and petals cream, spreading, comparatively narrow; lip streaked with red-purple, pointed at the tip. Very widely distributed, from northern India south-wards to Ceylon and through Malaysia to the Philippines; in Malaya only once found, on the Taiping Hills, but probably occurs elsewhere. Imported plants have flowered in Singapore. The flowers are a good shape and size; there are several varieties.

**D. Hookerianum**

Stems slender, pendulous, to 2-5 m. long; flowers in small groups, 7-10 cm. across, deep yellow with two large maroon patches inside the concave lip which has a fringed edge like *D. fimbriatum*. Native in Sikkim and Assam, in the mountains, at 1,000-5,000 feet altitude; will not grow well nor flower in Singapore, but should be successful at hill stations. This species has the largest flowers of any yellow *Dendrobium*.

**Dendrobium linguella** Rchb. f., Gard. Chron. N.S. 18: 552. 1882. J.J.S., Bull. Btzg., Ser. 3, 11: 22. 1930.—*D. hercoglossum* Rchb. f., Gard. Chron. N.S. 26: 486. 1886. Ridl., Flora 4: 45.

Stems slender, pendulous, to about 100 cm. long; inflorescences compact, of 2-8 flowers; flowers 2 cm. across, entirely pale mauve, with deep purple anther; lip hollow, hairy, with a prominent hairy callus at the base and a very short pointed tip. Widely distributed in Malaysia; in Malaya fairly common on trees by rivers in the lowlands, found in all parts of the country. **Fig. 69.**

**D. liluiflorum**

Stems 40-60 cm. long; flowers 5-6 cm. across; sepals mauve-purple, paler towards the base, petals more richly coloured; lip maroon-purple at the base, then a white zone, the edge being purple. Native in Burma and Assam; not strong in Singapore but will flower occasionally. There are several varieties.



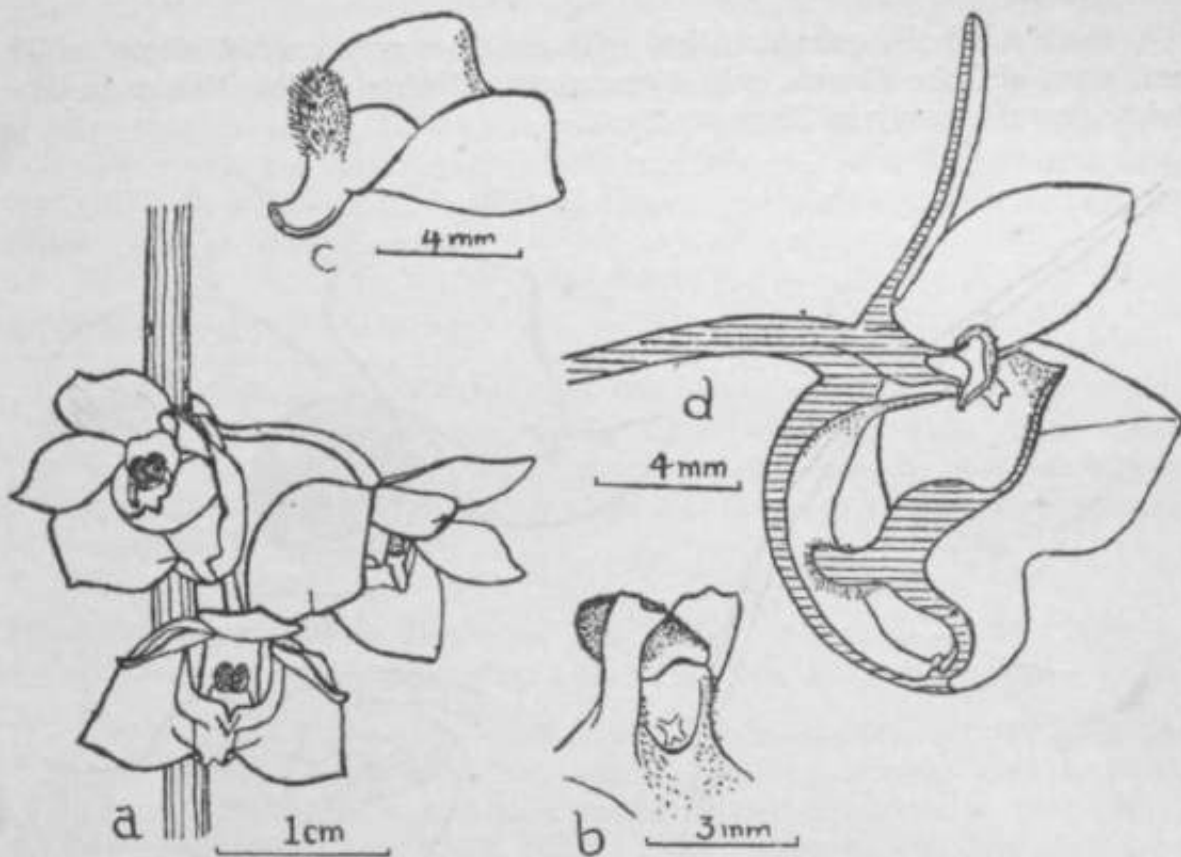


Fig. 69. *Dendrobium linguella*, *a*, group of flowers, *b*, column, *c*, lip detached, *d*, section through flower.

#### **D. moschatum**

Stems erect, to 150 cm. long or more, dark brownish when old; inflorescences pendulous, to 20 cm. long, of 8-10 flowers, from the upper part of old stems; flowers 6-8 cm. across, very pale yellow with light purplish veins, or light orange-yellow, the cup-shaped hairy lip with two large maroon patches. The light orange-yellow variety, which lacks the purplish veins, is called var. *eupreum*. Native in Lower Burma; grows well in Singapore, and old stems flower fairly often. The flowers unfortunately last only a few days. The plants need almost full sun. **Fig. 70, b, c.**

#### **1). nobile**

Stems erect, 30-50 cm. tall; flowers in small groups at all nodes, 6-7 cm. across, sepals and petals white at the base grading to mauve, lip rich maroon at the base, then a yellowish or white zone, with a mauve or purple edge. Native from north-east India to southern China, having many varieties, differing in details of colour. This is one of the longest-cultivated and best known Dendrobiums, and a plant in full flower is a fine sight, but unfortunately it will not flower in Singapore. There is no report on its behaviour in the north. It has been much hybridized in Europe, and some of its hybrids are fairly successful in Singapore. It is said to flower in the lowlands of Java if well dried off, and to need full sun.

**D. Parishii**

Rather like *D. anosmum*, **but** with short uneven curved stems, to 30 cm. long, and the flowers only 5 cm. across. Native in the Moulmein district; flowers rarely in Singapore.

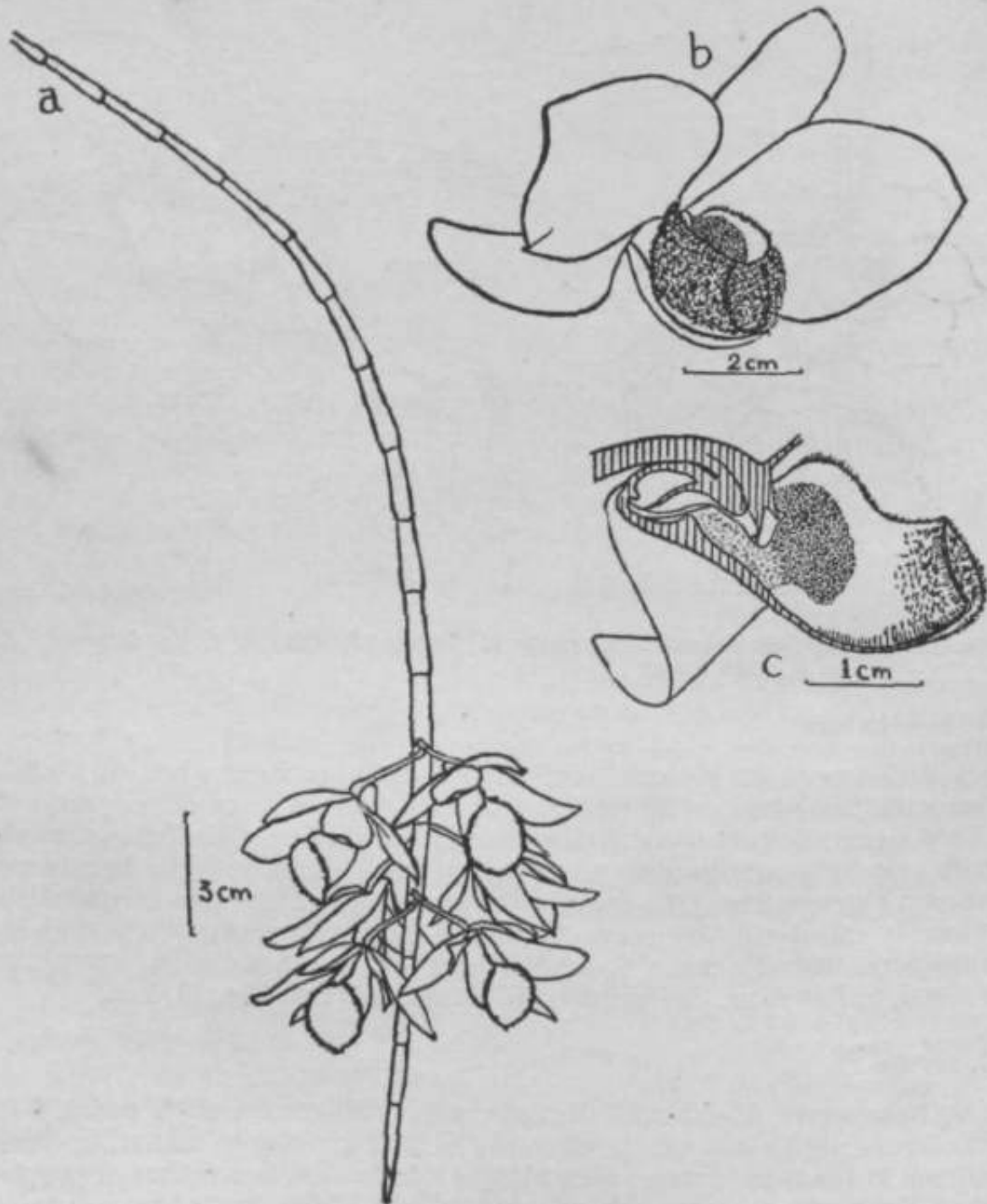


Fig. 70. *Dendrobium Parishii*. a, old pseudobulb with flowers. *D. moschellum*. b, flower from front, c, section through column and lip.

***Dendrobium Pierardii*** Roxb., Hk. Exot. Fl. t. 9. 1828, Ridl., Flora 4: 51.

Stems slender, pendulous, to 100 cm. long; flowers 5 cm. across; sepals and petals mauve; lip cream or pale yellow, veined with purple at the base,

hairy throughout the inside, protruding forwards, with a round end. Native from north-east India southwards to Malaya; found near Grik in Upper Perak and may be expected in other parts of northern Malaya. This species is often introduced to Malaya from Burma, and if imported while resting will soon produce a full display of flowers; afterwards it flowers occasionally, a few flowers at a time. It has a fragile gracefulness, with its delicate colouring. **Fig. 70, a.**

#### **D. primulinum**

Very similar to *D. Pierardii*, but the petals not wider than the sepals (both 5-6 mm. wide), and the mouth of the lip 3 cm. wide, much wider than high, the flowers fragrant of cowslips. It is said to grow at higher elevations than *D. Pierardii*, but a plant has flowered (6 flowers together) in Singapore.

**Dendrobium pulchellum** Roxb. ex Lindl., Gen. et Sp. Orch., 82. 1830. *D. Dalhousieanum* Wall, in Paxt., Mag. 11: 145. 1844. Ridl., Flora 4: 52.

Stems 100-200 cm. long, erect, the leaf-sheaths purple-striped, the old stems purplish; inflorescences pendulous, of several flowers; flowers to 10 cm. across; petals and sepals pale tawny yellow; lip concave, very hairy, with two large maroon patches. Native from Assam to Tenasserim; grows well in the lowlands of Malaya, and flowers fairly often on old well-ripened leafless stems. The flowers are large and handsome, but not long-lived. Almost full sun is needed; with proper care the plants will attain a large size. This species was once found on a tall tree in Singapore Island, but otherwise has not been reported as wild in Malaya; its occurrence is however possible. It is better known to orchid growers as *D. Dalhousieanum*; but *pulchellum* is the older name.

**Dendrobium tetradon** Rchb. f., ex Lindl., J.L.S. 3: 10. 1859. J.J.S., FL Buit. 6: 370, f. 283-285. Ridl., Flora 4: 45.

Stems pendulous, to about 30 cm. long, bearing flowers in groups of 1-3 after the leaves have fallen; sepals and petals never separating, faintly greenish white, the upper sepal and petals about 1 cm. long; mentum round, 5 mm. long; lip as long as sepals, white or greenish white with purple veins, hairy except for the narrow base which has 3 slight keels, the blade nearly round, the edge thin, slightly fringed; column with no rostellum, self-pollinating. This is a native Malayan species, found on trees in fairly open places in the lowlands. The flowers hardly open, and all set fruits. An abnormal form also occurs, in which the lip is almost like the petals, the petals and sepals are 1-5 cm. or more long, the mentum is hardly developed, and additional anthers are sometimes produced. Such flowers, in which the two-sided symmetry of the orchid flower is lost, are called *peloric*; they occur in several species. Forms intermediate between normal, and fully *peloric* have been found in Kedah.

*Dendrobium tortile* Lindl., Gard. **Chron.** 1847: 747. Ridl., Flora 4: 52.—  
*D. Haniffii* Ridl., Flora M.P. 4: 51. 1924.



Fig. 71. *Dendrobium tortile* flower.

Stems 20-30 cm, long, ascending or obliquely pendulous, yellowish, rather much thickened in the middle; flowers in groups of 2 or 3, 8 cm. across; sepals and petals narrow, twisted, lilac-mauve; lip pale yellow with purple veins at the base. Native in Lower Burma and Siam, southwards to Kedah and Kelantan; a specimen collected in Kelantan was named *D. Haniffii* by Ridley. This species grows well in Singapore and flowers occasionally but not freely. It is better in the north. Fig. 71.

#### D. Wardianum

Stems pendulous, to 60 cm. or more long, thickened at the nodes; flowers usually in pairs, up to 10 cm. across; sepals and petals white with purple tips; Up concave, yellow with two deep maroon blotches at the base and purple at the tip. Native in Assam and Burma; there are several colour varieties. There is no record of the flowering of this fine species in Singapore, but it would probably flower in the north of Malaya. Dakkus reports that in Java it only flourishes in the lowlands, and needs a dry season to induce it to flower. It is one of the finest Burmese Dendrobiums.

#### 9. § Nigrohirsutae

Stems fairly thick and often long, erect, leafy throughout, the leaf-sheaths nearly always black- or brown-hairy; inflorescences short-stalked, of few flowers, from near the apex of the still leafy stems; flowers usually large, mainly white (in a few species greenish or pale yellow), often marked or flushed with yellow, rarely with orange or red, the mentum usually slender and fairly long; lip not hairy though sometimes papillose, side-lobes often distinct but not strongly developed.

This section includes about thirty-five species, distributed from the Himalayas and southern China through Malaysia to the Philippines. Thirteen species have been reported from Borneo. In Malaya none have been found, but *D. cruentum* and *D. fimbrosium* occur only a little farther north, in Peninsular Siam, and other species are often cultivated. Nearly

all are handsome, some having very large flowers, which last for an unusually long time. In the following account, the best and most frequently cultivated species are briefly described. Schlechter used the name *Oxygenianthe* for this section.

**Key to the more important species of § *Nigrohirsutae***

Flowers yellow, lip with 3 lines bearing long slender orange teeth	..	..	1. <i>D. Lowii</i>
Flowers greenish, with red edges and other red marks on lip	..	..	2. <i>D. cmientum</i>
Flowers mainly white			
Base of lip greenish within			
Flowers about 5 cm. across	..	..	3. <i>D. Dearei</i>
Flowers about 8 cm. across	..	..	4. <i>D. Schutzei</i>
Base of lip yellow or orange			
Flowers about 10 cm. across	..	..	5. <i>D. formosum</i>
Flowers about 8 cm. across			
Petals rounded at tips	..	..	6. <i>D. infundibulum</i>
Petals strongly pointed at tips	..	..	7. <i>D. draconis</i>
Flowers about 6 cm. across	..	..	8. <i>D. ovipostoriferum</i>
Base of lip streaked with purple	..	..	9. <i>D. Sanderte</i>

1. ***D. Lowii*** is native on mountains in Sarawak. No record of its cultivation in Malaya is known. It might not flourish in our lowlands, but would be worth hybridizing on account of its yellow flowers, which are about 5 cm. across, borne in groups of 4 to 6.

2. ***D. cruentum*** has been found as far south as Setul. It has unusual pale green flowers with narrow petals (3-5 mm.), crimson keels and warts on the lip; the mentum is short and round; the flowers are 4-6 cm. across.

3. ***D. Dearei*** is one of the best known cultivated species, native in the Philippines. The flowers are not so large as in *D. Schutzei* or *D. formosum*, but a good number are borne in each inflorescence and they last a long time. The stems are 60 cm. or more long in strong plants.

4. ***D. Schutzei*** was described from cultivated plants said to have been brought from the Philippines. The stems are up to 40 cm. long, the flowers about 3 together, very large; the upper sepal acute, 3 cm. long; the petals almost round, about 5.5 by 4 cm.; the lip to 4.5 cm. long, with distinct rounded side-lobes, the midlobe widening from a narrow base, the edges of the broad apex crisped, with a short point. It is a very fine species, but appears to be rare in cultivation. Its behaviour in Malaya is not recorded.

5. ***D. formosum*** is native from the eastern Himalayas southwards to Peninsular Siam, in low country. The stems are up to 45 cm. tall, rather stout, the leaves to 12 by 3-5 cm. The flowers are very large, the petals almost rounded with wavy edges, 4 cm. wide, the lip 7 cm. long, yellow in the throat, widened from a narrow base, without distinct side-lobes, cleft for about 6 mm. at the apex, with two raised lines from base to middle. This species can be grown with care in Singapore, and flowers fairly well. It needs plenty of light, and if hardened will stand full sun.

6. *D. infundibulum* is very like *D. formosum*, but grows on the mountains at about 5,000 feet altitude, near Moulmein, and has smaller flowers with more distinct sidelobes to the lip. It might be grown at Malayan hill stations.

7. *D. draconis* is found from Tenasserim eastwards to CochinChina. It is rather similar to *D. infundibulum*, but has strongly pointed upper sepal and petals. No record of its cultivation in Malaya is known, but it might be as successful as *D. formosum*.

8. *D. ovipostoriferum* was re-described in 1934 as *D. Takahashii*? when a number of plants were imported from Borneo to Singapore. The stems are rather slender for this section, up to 50 cm. long in strong plants,

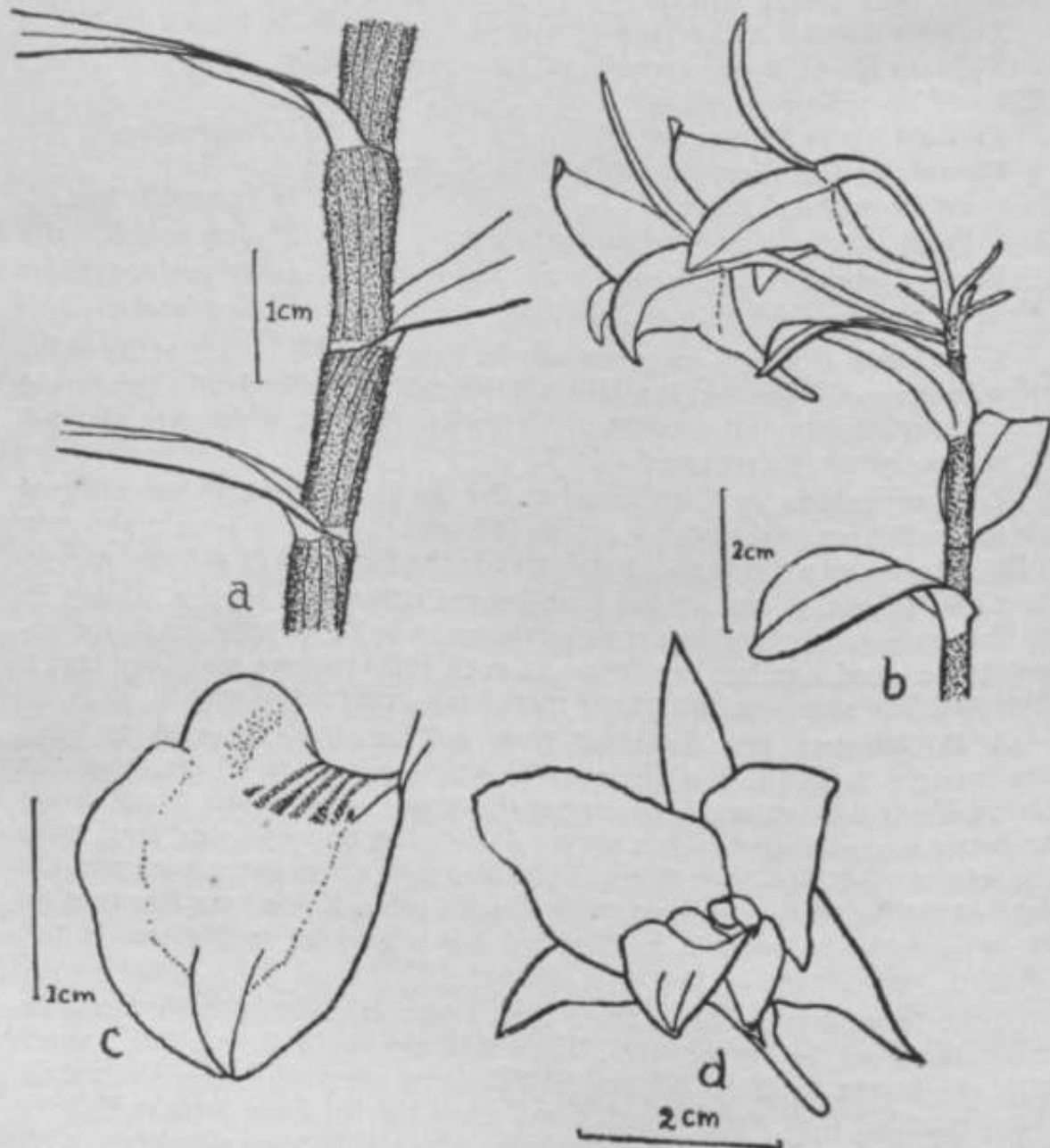


Fig. 72. *Dendrobium ovipostoriferum*. a, part of stem showing leaf bases, b, top flowering stem, c, lip, the dotted line indicating boundary of yellow area, d, flower from front.

the leaves to 7.5 by 2.5 cm.; the flowers are 2 to 4 together, the upper sepal 3 by 1 cm., petals 3.2 by 2.3 cm., the mentum long and slender; the total length of the lip is 4.2 cm.; the sepals and petals are white, the base of the lip with bright red veins, the side-lobes pale yellow with red near their tips, the central part of the lip thickened, minutely roughened, deep golden yellow. Though the flowers are not nearly so large as in *D. formosum* they are a much finer colour; a good hybrid between the two has been produced. In Singapore *D. ovipostoriferum* grows quite well, though not so vigorously as some Dendrobiums; it needs light shade. Fig. 72.

9. *D. Sanderae*, like *D. Schutzei*, was described from plants grown in England, said to have been brought from the Philippines. It has stems up to 80 cm. tall, leaves close, to 5 by 1.5 cm., inflorescences often some distance from the stem-apex, of 3 or 4 flowers, petals 3 cm. wide, midlobe of lip 2.5 cm. wide, base of lip streaked with purple. It is not so fine a species as *D. Schutzei* but the flowers are a good shape. Hybrids of this have been brought to Singapore and grown successfully.

#### 10. § Phalaenanthe

Stems fairly long, fleshy, thickened somewhat upwards from a slender base, the lower part covered with sheaths which do not develop blades, the upper half or more leafy, the leaves rather stiff and fleshy; inflorescences terminal or from near the apex of the stem while it is still leafy or after the leaves have fallen, usually long (in one species short), slender, many-flowered, with small bracts; flowers large or fairly large, purple or white, petals usually much wider than the sepals, mentum double (consisting of a slender spur and a thickened part at right angles, to which the lip is attached); lip with rounded side-lobes overarching the column and a more or less oblong midlobe, the central part of the lip papillose, sometimes thickened and fleshy, in *D. superbiens* with distinct keels which merge at their forward ends.

This Section, like the next, has its centre of distribution in New Guinea, extending westwards to the Moluccas, and south-east to the north of Queensland. It contains only a few species, but two of them are widespread and locally common, and almost all are valuable as cultivated plants. The distinctive feature is the double mentum, of two parts at right angles. The first three species agree closely together, but the fourth, *D. superbiens*, is exceptional, in other characters besides that of the lip mentioned above; it is in fact intermediate between this Section and the next, and is certainly a natural hybrid between members of the two Sections. It is included here because it shows more characters in common with Phalamanthe than with Ceratobium.

Key to the species of § Phalaenanthe usually cultivated

Flowers about 3 cm. across, white, crowded on an  
 inflorescence to about 15 cm. long . . . 1. *D. affine*

Flowers larger, rarely white, well spaced on a  
 longer inflorescence

Petals more than twice as wide as sepals

Midlobe of lip pointed, centre of lip not  
 thickened but minutely papillose .. 2. *D. phalsenopsis*

- Midlobe of lip blunt, notched, centre of lip thickened and papillose, often white . . . 3. *D. bigibbum*  
 Petals less than twice as wide as sepals, slightly twisted . . . . . 4. *Jj. superbiens*

### 1. *D. affine*

Stems to 40 cm. long, flowering when leafless; inflorescences to about 15 cm. long, with numerous flowers close together; flowers white, to 3 cm. across, shaped much as in *D. phaltnopsis*. Native in the Moluccas and Timor, and sometimes brought by dealers to Malaya. It is adapted to a climate with a strong dry season, and is difficult to maintain in a good condition in Singapore. It is hardly worth cultivating in Malaya, except for its possible use in breeding; its white flowers and compact inflorescence are useful characters.

### 2. *D. phalaenopsis*

Stems to 60 cm. or more long; leaves to about 12 by 2 cm.; inflorescence to 40 cm. long (the scape one third of this), with few or many flowers according to the strength of the plant; flowers varying in size, from 6 to 8 cm. or more across; sepals pointed; petals broadly rounded from a narrow base; lip with round erect side-lobes and forward-pointing acute midlobe; colour varying from (rarely) pure white to varying degrees of rosy mauve or purple, the lip usually with the deepest colour. Native from the Moluccas to north Queensland; known in Java as *Larat*, and in Queensland as the Cooktown orchid. **Fig. 73.**

This species, at its best, is one of the finest orchids seen in cultivation in Malaya, having graceful sprays of large shapely flowers which last for a long time. It is suited to a more seasonal climate than Singapore, but with care will grow and flower well here. It may either be grown on a piece of wood, in a hollow coconut husk, or in a pot, needing a good deal of exposure, and should if possible be dried off after it has completed the growth of a new shoot. In a pot it needs good drainage and clean potting material. When in active growth, it needs plenty of water, and should have a little manure.

There are many varieties of this species. It was originally described from plants found in Queensland by Fitzgerald in 1880. The plants imported to Malaya, usually through Java, mostly come from the Moluccas, and are the variety *Schrceдерianum*, larger than the Queensland form, but variable in colouring; the sepals are almost always paler than the petals. The finest forms have a very richly coloured lip, contrasting with the pale colour of the sepals.

Var. *hololeucum* is a name given to a pure white variety. It is likely however that white varieties of different flower-size exist; they are rare.

Var. *Rothschildianum* is a name given to an exceptionally large almost pure white variety imported to England about 1890; it had flowers 10 cm. across, and only a faint tinge of purple in the lip.

Var. *Statterianum* is another name given to plants imported to England, of particularly fine deep colour.



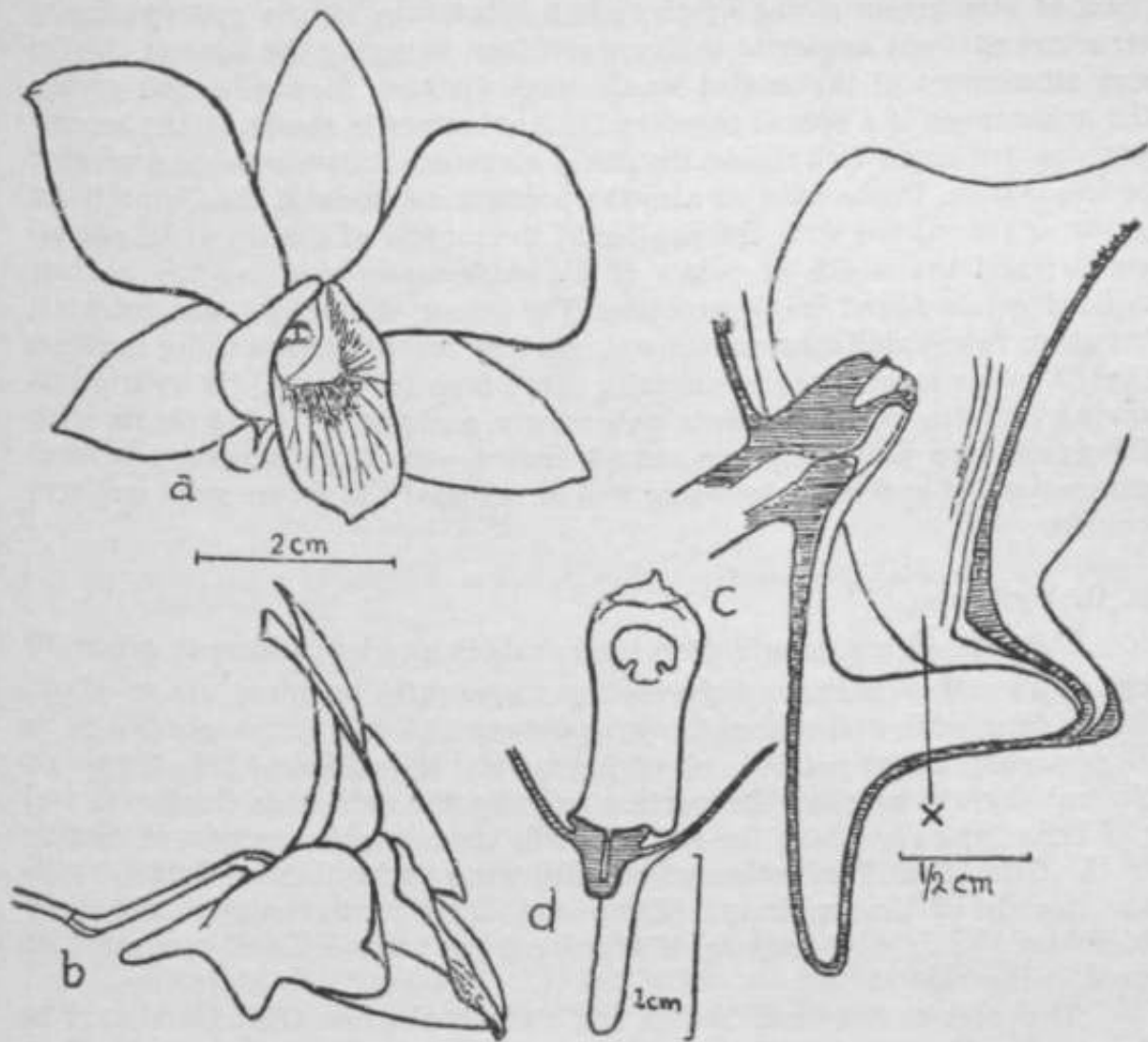


Fig. 73. *Dendrobium pfaalxnopsis* var. *Schraederianum*. *a*, flower from front, *b*, side view of flower showing double mentum. *c*, section through column, column-foot and base of lip. *d*, vertical section at X in *c* through forward projection from column-foot.

*Dendrobium phal&nopsis* has in recent years been extensively used in hybridizing. An account of *Dendrobium* hybrids will be found below on p. 344. Here some general points of interest are briefly mentioned. The species is particularly valuable because of its long-lasting flowers, of good shape, on long sprays, useful for cutting; and also because it is freely inter-fertile with the members of the section *Ceratobium*, which offer a variety of shape and colouring, often large vegetative size and great vigour of growth, combined with the same characters of graceful sprays of long-lasting flowers. The variety of ways in which the characters of *D. phal&nopsis* can blend with those of the *Ceratobium* species is of great interest.

The most distinctive feature of the Section *Phalsenanthe*, namely the double mentum, is variously modified in the hybrids, but usually appears in some degree. In *Ceratobium* we find a straight narrow mentum, the tip of which is a closed spur, formed by the union of the column-foot with the base of the lip. In *Phaleenanthe* we have the same narrow spur, but at the

point of attachment of the lip there is a substantial deeply grooved fleshy structure at right angles to the true mentum, bringing the base of the lip and attachment of the lateral sepals some distance forwards, and giving the appearance of a second mentum. This structure is shown in the accompanying drawings. In hybrids, the fleshy structure is developed to a greater or less degree. In the hybrids also the pronounced keels of the *Ceratobium* group are combined with the papillae of the middle of the lip of *D. phalsenopsis*; and the width of petals of *D. phalxnopsis* modifies the narrow twisted petals found in *Ceratobium*. The colour characters also interact, but their full exploitation must await further breeding. One thing is clear, that *D. phalxnopsis* does not usually breed true for colour; its hybrid offspring vary from deep purple to pale mauve, and even by using plants with the finest deep purple lip one cannot ensure a uniform progeny. Several generations of controlled breeding will be necessary to secure good uniform results.

### 3. *D. bigibbum*

Stems to 45 cm. long (often less), rather slender; leaves to about 10 cm. long, rather narrow; inflorescence apparently terminal, up to about 30 cm. long with well-spaced flowers; flowers to 5 cm. across, shaped as in *D. phalsenopsis*, the petals to about 2 cm. wide, the midlobe of the lip blunt, its end slightly notched, the portion between the side-lobes thickened and papillose, typically white, the rest of the flower a bright rosy purple. Native in the Cape York Peninsula and neighbouring parts of New Guinea, with the islands of that vicinity. (Rupp and Hunt have recently united *D. bigibbum* and *D. phalsenopsis*; if this done, the name *D. bigibbum* must be used, being older).

This species has been known and cultivated since 1885 (it is said to have been introduced to Kew as early as 1824 and subsequently lost). It is sometimes brought to Malaya, where it behaves much as *D. phalsenopsis*. The flowers are smaller, but of a rich bright colour, and very pleasing. In Java the species is said to grow well both in the lowlands and on the hills. A white variety has been found, but is rare in cultivation.

### 4. *D. superbiens*

Stems 60 cm. or more long (in largest plants to 120 cm.) ; leaves stiff, rather narrow, to about 10 cm. long, the sheaths with purple stripes; inflorescences slender, gracefully curved, to about 40 cm. long, with flowers well spaced; flowers to about 5 cm. across, rich violet-purple to rose-purple with pale edges to the sepals; sepals curved backwards with wavy margins, slightly twisted; petals longer, spreading, narrow at the base, with rounded tips, the edges finely crisped, slightly twisted; lip short, forward-pointing the midlobe with wavy edges and pointed tip turned downwards; five keels down the centre of the lip, from its base to the middle of the midlobe, where they diverge, are raised and widened, and covered with (usually pale) papillae, additional short papillose keels sometimes interspersed. Native in the same region as *D. bigibbum*. Fig. 74,

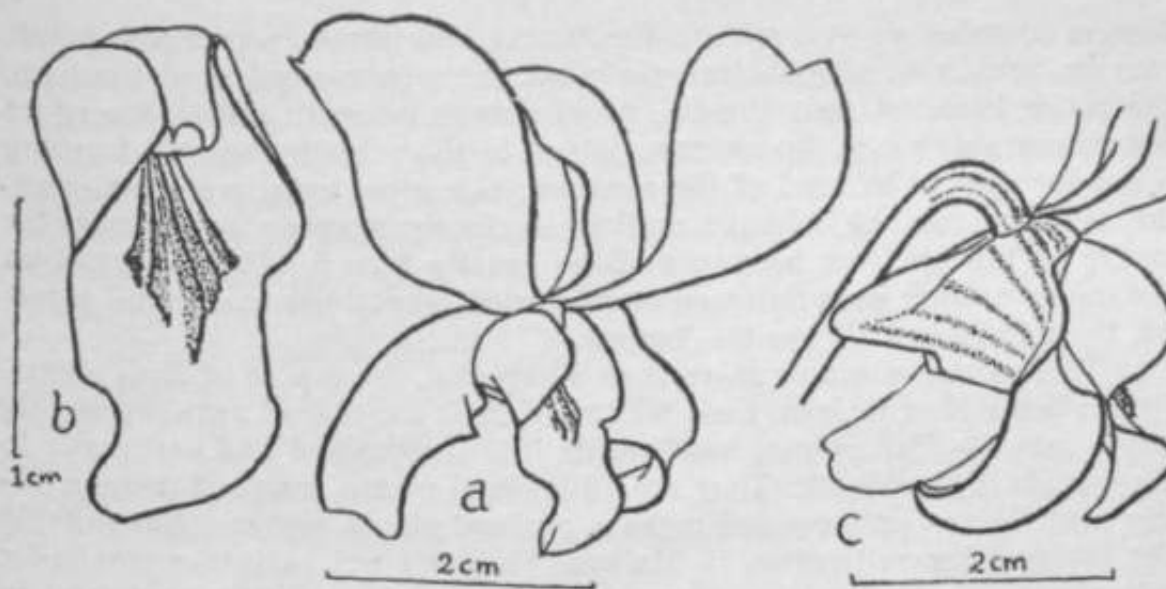


Fig. 74. *Dendrobium superbiens*. a, flower, b, lip. c, flower from side showing slight double mentum.

This is a most attractive and graceful orchid, the finest varieties of which are very richly coloured. It grows and flowers well in Singapore, but needs careful attention and plenty of light. It is treated in the same way as *D. phalxnopsis* and the species of the section *Ceratobium*.

*D. superbiens* is variable, and one of the varieties, with rather small deep-coloured flowers and many extra short papillose keels on the midlobe, was called *D. Goldei* when imported to Europe in 1878. As noted above, there can be little doubt that *D. superbiens* is a natural hybrid (or group of closely related hybrids) between species of the sections *Phalsenanthe* and *Ceratobium*. Its variability is one indication of its hybrid nature; another such indication is that artificial hybrids between members of the two sections are similar to *D. superbiens* in many respects. When *D. superbiens* is crossed with *D. phalxnopsis*, the result is a further series of varieties, the best of which have flowers as large as those of *D. phalsenopsis* with a very intense colouring; such are among the finest *Dendrobium* hybrids.

Other probable natural hybrids between § *PhaUenanthe* and § *Ceratobium* have been found. *D. Fleischeri*, from the Tanimbar Islands, is near the artificial hybrid *D. phalxnopsis* X *antennatum*; it is sometimes cultivated in Java. *D. Leeatum*, introduced to Europe with *D. phalsenopsis* in 1890, is supposed to have been a natural hybrid of that species with *D. superbiens*; but this parentage is not certain. The name *D. Leeatum* is given in Sander's list of hybrids as an equivalent for the artificial hybrid *D. phalxnopsis* X *superbiens*, but it should only apply to the wild plants to which it was originally given.

### 11. § *Ceratobium*

Stems short to long, sometimes very long, thickest a little way above the base and narrowed gradually upwards, the basal part covered with sheaths only; leaves stiff and fleshy, broad or narrow, inflorescences from near the top of the leafy or leafless stems, slender, many-flowered, the

flowers crowded or well spaced, the bracts very small; sepals and petals narrow, usually of about equal width but the sepals broadest at the base, the petals broadest near the tip, usually more or less twisted, the edges sometimes also wavy; lip narrow, joined to the column-foot and forming a slender spur at the end of the mentum; side-lobes usually oblong, erect, not over-arching the column; midlobe variously shaped; keels down the centre of the lip from base to midlobe usually 3 or 5, often enlarged on the midlobe, their ends flattened or thickened, sometimes raised and pointed, the middle one always the longest.

This section contains more than 30 species, the centre of their distribution being New Guinea, their westward limit the east of Java, extending north into the Philippines, southwards into Queensland and eastwards to the islands of the Pacific. They are all lowland plants, many of them growing near the sea, on trees and rocks in exposed places, and are thus suitable for low-country cultivation in Malaya. They are not easy to grow under greenhouse conditions in temperate climates, and are little mentioned in books on orchid culture in Europe and America. Almost all have the petals narrow and twisted, in some cases very long and stiffly erect, like antelope horns, whence the name *Ceratobium* (from *ceras*, *ceratos*, a horn).

Especially in recent years, a number of species of this group have been brought into cultivation in Java, and most of these have also reached Malaya, though only a few are at all common at present in this country. The present writer cannot claim personal knowledge of all the cultivated species, and the following account is largely taken from Dr. J. J. Smith's descriptions (of which a summary was published in the *Orchid Review*; 1935). The following key is compiled from the same descriptions, and it is hoped may be useful in naming plants of the section; the key naturally covers only the limited number of species here described, and others may occasionally be met with in imported collections.

**Key to the most commonly cultivated species of § *Ceratobium***

Flowers distinctly above the bracts, not axillary

Keels on lip 3

- |                    |    |    |    |                         |
|--------------------|----|----|----|-------------------------|
| Sepals light green | .. | .. | .. | 1. <i>D. laxiflorum</i> |
| Sepals white       | .. | .. | .. | 2. <i>D. Demmenii</i>   |

Keels on lip 5

Sepals more or less revolute but not twisted,  
with no tinge of yellow or green

Sepals white, petals light green

Midlobe of lip 18 mm. wide	..	3. <i>D. stratiotes</i>
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Midlobe of lip under 10 mm. wide	..	4. <i>D. antennatum</i>
----------------------------------	----	-------------------------

Sepals white, suffused purple, petals dark  
purple

..	..	5. <i>D. leporinum</i>
----	----	------------------------

Sepals twisted, light yellow or yellow-green,  
more or less suffused or marked with  
purple or brown

Sepals pale yellowish with 5-7 brown-violet  
streaks, blade of midlobe as broad as  
long, abruptly pointed

..	..	6. <i>D. strebloceras</i>
----	----	---------------------------

- Sepals light yellow-green, slightly marked with brown; midlobe longer than broad gradually narrowed to the pointed tip •• •• •• 7. *D. strepsiceros*
- Flowers in the axils of the bracts
- Petals dark brown or red-brown, or brown suffused with yellow
- Keels on lip 3 *S. D. taurinum*
- Sepals greenish white •• ••
- Sepals yellow outside, brown inside, base violet •• •• *ŷ. ū. cut wō*
- Keels on lip 5
- Petals much widened towards apex, 11 cm. wide •• •• 10 *D. odoardii*
- Petals not much widened towards apex 11. *D. Johanna*
- Small plant, midlobe of lip yellow ••
- Very large plant, lip midlobe with dark centre and yellowish border •• 12. *D. lasianthera*
- Petals lighter, yellowish, greenish or mauve, with or without darker markings ••
- Very small plant, stems to 7 cm. long •• 13. *D. Gouldii*
- Plant much larger
- Petals greenish or yellow-green, with or without brownish suffusion or lines
- Sepals and petals strongly twisted
- Petals 2-7 cm. long, yellow keel •• •• 14. *D. trilamellatum*
- Petals much longer, lip with 5 white keels •• •• 15. *D. undulatum*
- Sepals and petals slightly or not twisted
- Petals 1-2 cm. wide •• •• 16. *D. Schulleri*
- Petals much narrower •• •• "• ^ *Mirbehanum*,
- Petals without a greenish tinge ••
- Sepals and petals yellow, or yellow partly suffused purplish ••
- Keels 3, much raised mid-lobe •• •• 14. *D. trilamellatum*
- Keels 5, not yellow on midlobe ••
- Petals much twisted, suffused with purple except at edges •• 15. *D. undulatum*
- Petals clear yellow or spotted with violet, not or hardly twisted •• 18. *D. violaceo-flavens*
- Sepals and petals clear pale violet-mauve, the petals rarely with a faint yellow suffusion •• 19. *D. veratrifolium*

**1. *D. laxiflorum***

A fairly large species, the stems to over 100 cm. long, inflorescences to 45 cm., with well spaced flowers 7 cm. high; sepals light green; petals greenish, 5-8 cm. long; lip white, with 3 violet keels, the side-lobes finely-spotted with violet. Native of Halmaheira, not common in cultivation.

**2. *D. Demmenii***

Size and colouring as *D. antennatum* (no. 4), but the lip with 3 keels and the midlobe much broader (rather as in *D. stratiotes*) with a sharp point. Native in the Moluccas, and apparently much cultivated in Java in recent years.

**3. *D. stratiotes***

Stems to about 80 cm. long, the lowest leaves to 14 by 6 cm., the upper ones gradually smaller; inflorescence with 7-10 flowers which are almost 8 cm. high; sepals white, curved backwards with somewhat wavy edges; petals stiffly erect, twisted, very narrow, light green, 5-8 cm. long; lip large, white, side-lobes densely streaked with purple, midlobe more or less round, pointed, boldly veined with purple; 5 keels on the lip (2 lateral ones short). Native in Celebes. This is a very fine species, probably the best of the group here numbered 1-7. The flowers are very graceful and extremely long-lasting. The plants are perched well above their support on stiff strong roots, and this must be borne in mind in the care of pot plants; they must not be placed with the stems in contact with the potting material. The plants are probably best on a piece of wood or in a hanging basket, and need an airy place with plenty of light. When well tended they are very strong in growth. **Fig. 75, d, e.**

**4. *D. antennatum***

Stems to about 60 cm. long, slender, the leaves narrow; inflorescence with about 10 well-spaced flowers 6-5-7-5 cm. high, the shape much as in *D. stratiotes* but much more slender with a narrow lip; lip with 5 keels, the central one much the longest, midlobe ovate from a narrow base, concave, shortly pointed. Native on the coasts of New Guinea and adjacent islands, known since 1843 and often cultivated. There is a variety (by some ranked as a distinct species) *D'Albertisii*, native on part of the south coast of New Guinea, which is smaller in all parts but with thicker stems, the petals less twisted and the midlobe of the lip convex. *D. antennatum* is rather more delicate than *D. stratiotes* and needs greater care in cultivation. The flowers are less showy, but very graceful, and equally long-lasting. **Fig. 75, a-c.**

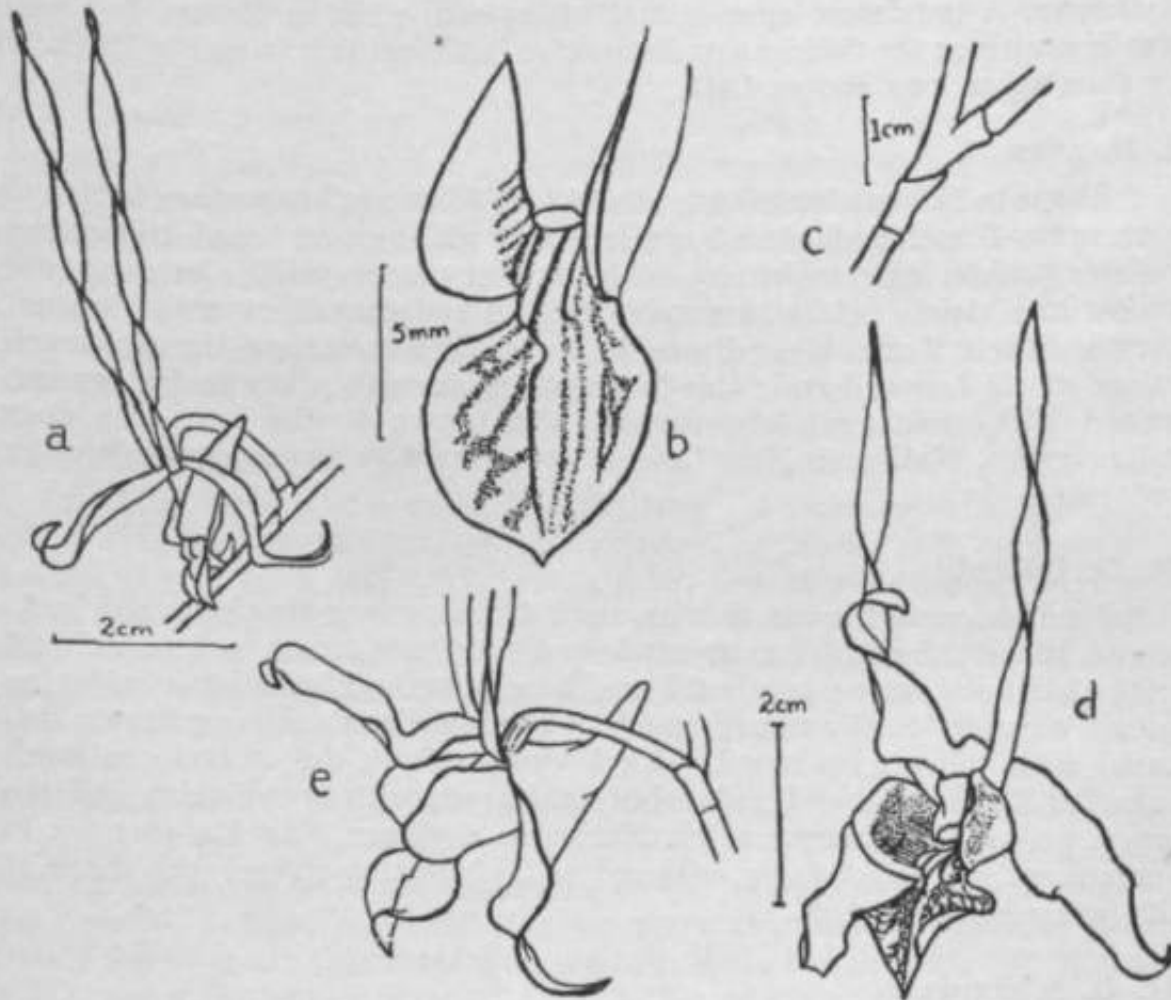
**5. *D. leporinum***

Stems to 85 cm. long; inflorescences rather short (to 20 cm.), with 4 to 6 flowers about 6 cm. tall; sepals suffused with pale mauve, the veins purple, the edges crisped; petals narrow, stiffly erect and much twisted, dark purple, sometimes greenish at the tips, to 4 cm. long; lip with greenish side-lobes, purple-streaked on the outside, the midlobe nearly white with purple veins, the 5 keels greenish. Native probably in the Moluccas and also in New Guinea, and much cultivated in Java. It is not so

fine a species as *D. stratiotes* on account of its shorter inflorescences, but the flowers, with their distinctive purple petals, are very decorative. The same treatment as for *D. stratiotes* is required.

#### 6. *D. strebloceras*

Stems to 100 cm. or more long; inflorescence 30-40 cm. long with about 10 flowers, 5 cm. high, fragrant; sepals and petals yellowish with dark violet-brown streaks; sepals curved back, twisted and with wavy edges, petals stiffly erect and twisted, 4 cm. long; lip with 5 white violet-bordered keels, the side-lobes light yellowish with violet veins, the midlobe widened from a narrow base and abruptly pointed, white with a violet edge and a few violet markings. Native in Halmaheira; not common in cultivation, flowers fairly freely in Singapore.



**Fig. 75.** *Dendrobium antennatum*, a, flower, b, lip. *D. stratiotes*. rf, flower from front, e, flower from side showing mentum.

#### 7. *D. strepsiceros*

Stem to 60 cm. long, relatively thick, leaves to 12 by 5 cm.; inflorescence erect, about 30 cm. long, with about 12 flowers 5-7 cm. high; sepals and petals light yellow-green, the sepals with brownish markings; upper sepal and petals twisted; petals erect, narrow, 4 cm. long; lip with 5 white violet-streaked keels, the middle one flattened and raised at its end

on the midlobe; side-lobes rounded, warty inside, light green veined with dark violet; midlobe large, ovate, acute, white, streaked with violet at the base. Native in the Moluccas; apparently not so often cultivated as *D. strebloceras*. A white-flowered variety flowers freely in Singapore. Its origin is unknown.

#### 8. *D. taurinum*

Stems to 120 cm. long; inflorescence erect, to 50 cm. long, with up to 20 flowers 5 to 6 cm. tall; sepals greenish, curved backwards; petals narrower, twisted, reddish brown, about 4 cm. long; lip large, 3 keels much raised on the midlobe, pale rosy-brown with darker lines. Native in the Philippines; also a variety with yellow brown-spotted flowers native in Amboyna. A handsome species, not often cultivated in Malaya but well worth growing; the flowers are distinctive in shape. It was sent to England by Cuming as long ago as 1841.

#### 9. *D. aries*

Stems to 120 cm. long, leaves to 14 by 7.5 cm.; inflorescences to 20 cm. long, many-flowered; flowers 5 cm. long and wide; sepals broad, triangular, yellow outside, brown inside, with narrow lemon-yellow border, base yellow and violet; petals narrower, twisted and curved, shining chestnut brown, nearly 3 cm. long; lip with 3 violet keels, the middle one much raised at its forward end; side-lobes yellowish with a brown border and veined with violet; midlobe round, light brown at the base, the apex yellow-green. Native in New Guinea. An attractive species but not often cultivated.

#### 10. *D. Odoardii*

Inflorescence of many flowers, each 4 cm. across; sepals curved backwards, about 2.5 cm. long, base white, upper part lemon yellow suffused with chestnut brown; petals 2.7 cm. long, narrow at the base, widening rather abruptly in the upper half to 1.1 cm., twisted, shining brown suffused with yellow; lip broad, with 5 violet ridges, the central one much raised at its forward end; side-lobes light green with brown veins, midlobe lemon yellow with brown veins. Native in northern New Guinea; not in general cultivation. A finely coloured and interesting species, the shape of the petals being unusual.

#### 11. *D. Johannis*

Stems to about 25 cm.; leaves narrow; inflorescence 24 cm. long, the flowers fairly close; flowers 3 cm. across, fragrant; sepals and petals narrow, twisted, shining dark brown; lip with 3 main ridges and a smaller one on either side of the midlobe, where all are warty; side-lobes light yellow with violet veins, midlobe rounded, yellow. Native of northern Queensland and Thursday Island. Fairly often sold by dealers, and attractive on account of its fragrance and unusual colouring (especially the clear yellow in the lip, otherwise hardly found in *Ceratobium*), but not vigorous in Singapore, and the flowers are rather small.



12- *D. lasianthera*

Stems very large, to 300 cm. tall; leaves to 15 by 6 cm.; inflorescence about 40 cm. long with 10 or more flowers; flowers 6-5 cm. tall; sepals once twisted, glossy dark brown with a red glow, bordered with yellow; Petals of similar colour but not yellow-bordered, 4-4 cm. long, 6 mm. wide near the apex; lip with 5 simple ribs ending on the midlobe, the middle part Purple, side-lobes white with purple veins at the base, entirely dull Purple upwards, midlobe with much recurved edges at the base, the centre dark, grading to light purple with a yellow border. Native in New Guinea, and sometimes known as *D. Stuberi*, after Mr. W. Stüber who first brought it into cultivation in the Netherlands Indies in 1934. Though such a large and strong plant, it does not have proportionately large inflorescences, and it seems rather difficult to maintain in Singapore. It has however been used successfully in hybridization.

13- *D. Gouldii*

Stems to 7 cm. long with 3 or 4 small leaves; inflorescence with many flowers, each about 2-6 cm. tall; sepals and petals narrow, twisted, lemon yellow, white at the base; petals 2 cm. long, a little longer than the sepals; lip light lemon yellow with 3 keels, all ending in high violet plates on the midlobe; side-lobes densely veined with dark violet, midlobe with two violet blotches. Native in Tuesday Island, and cultivated in Java. A small but pleasing species, worth hybridizing.

14. *D. trilamellatum*

Stems to 50 cm., leaves to 14 cm. long; inflorescences to 40 cm., flowers fragrant; sepals and petals narrow, twisted, light yellow or greenish yellow, with 3-6 dark brown lines, the petals crisped, 2-7 cm. long (a little longer than the sepals); lip with 3 sulphur yellow keels much raised on the midlobe; side-lobes yellow with violet veins, midlobe sulphur yellow. Native in New Guinea, and sometimes gathered by collectors. It is not so free-flowering as *D. undulatum* in Singapore.

15. *D. undulatum*

Stems to 120 cm. or more long; leaves to 15 cm. long; inflorescences to 45 cm. or more, with many flowers closely placed; sepals and petals much twisted, with the edges more or less wavy and crisped; sepals curved strongly backwards; petals oblique, slightly limp and curved, not stiffly upright, dull yellow finely stippled with purple except at the edges, longer than the sepals, to 4 cm. long or even more in some varieties; lip with 5 white keels more or less marked with violet, the three middle ones ending in raised teeth on the midlobe; side-lobes finely toothed at the edges, light yellow with short violet veins at the base; midlobe with crisped edges, the pointed tip curved downwards, light yellow. Native in northern Queensland and New Guinea; a variable species, with some varieties much larger than others, both vegetatively and in flowers, the colour varying also. The petals may be shorter or longer, much or little crisped at the edges, much or little flushed with purple. A variety from Queensland is known in Java

as var. *australiense*; it is very large, with the petals 4-2 cm. long, much twisted and crisped, rather deeply coloured. Though not brilliantly coloured, *D. undulatum* is a striking species when in full flower, strong and easy to grow in Singapore, flowering well and frequently. It has been the parent of some fine hybrids. Figs. 76, 77.

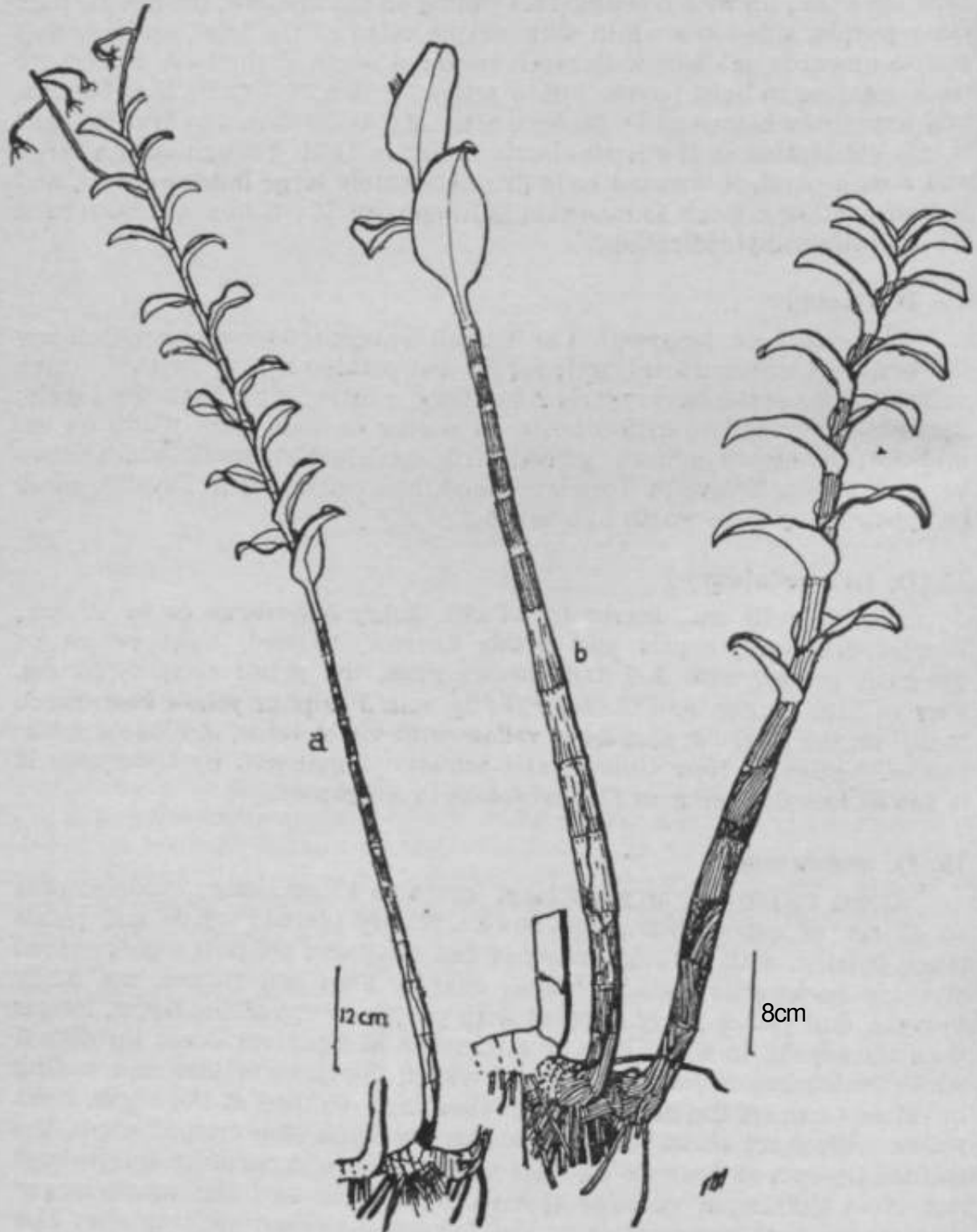


Fig. 76. *Dendrobium undulatum*, showing habit of plant.

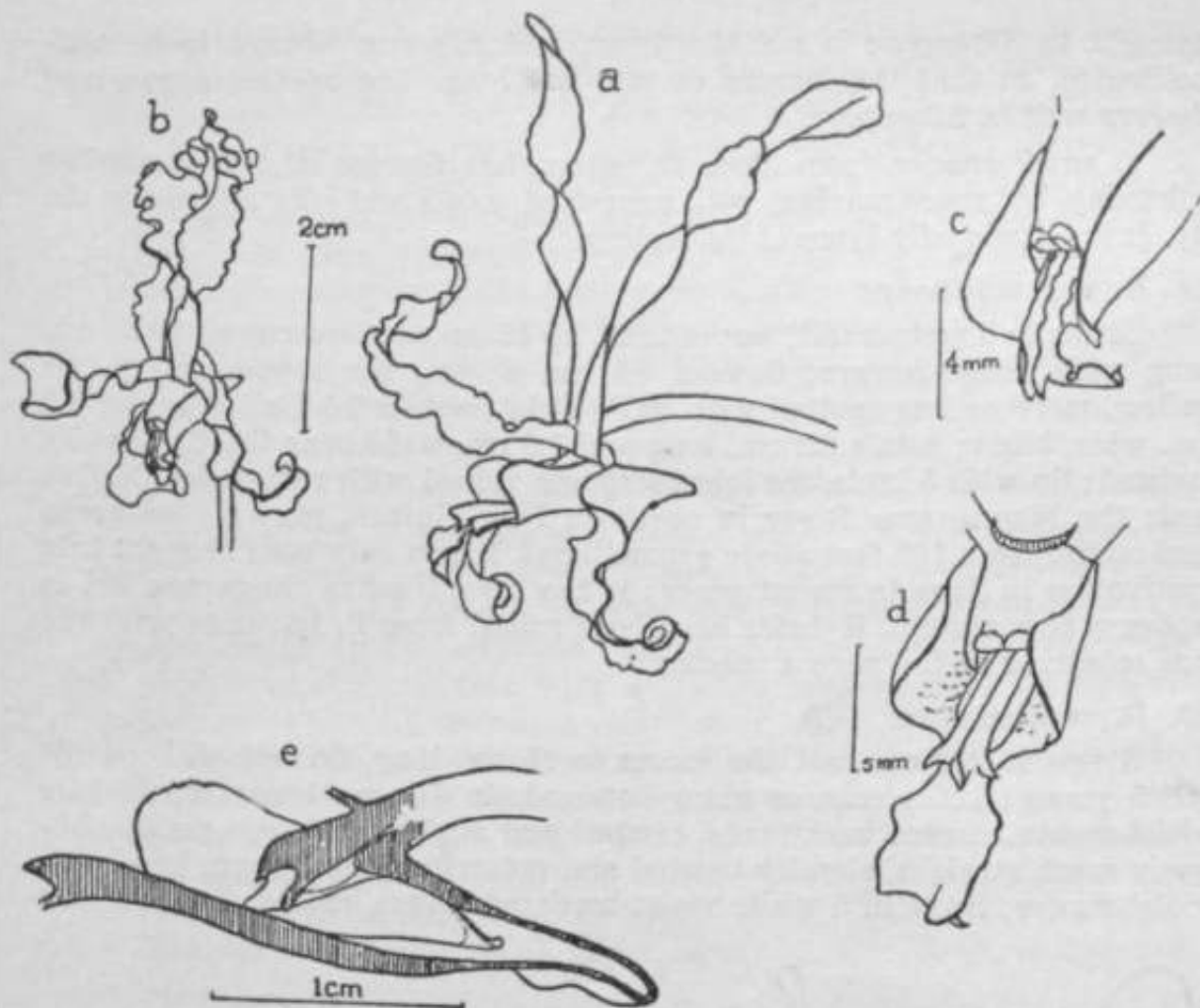


Fig. 77. *Dendrobium undulatum*. a, flower, b, flower of email variety, c, column and lip of small variety, d, column and lip of normal form, e, section through column and lip.

#### 16. *D. Schulleri*

Stems to 100 cm. long, leaves to 17 by 7 cm.; inflorescences to 50 cm. long with many flowers; flowers 6 cm. across, very pale brownish green; sepals 2-6 cm. long and 1 cm. wide at the base; petals 3-4 cm. long, widened to 1-2 cm. from a narrow base, hardly twisted; lip with 5 slightly wavy keels, greenish white with violet markings, with abruptly raised ends on the midlobe; lobes of lip light yellow-green with brownish veins. Native in northern New Guinea. A variety also exists with almost uniformly green flowers. The species is occasionally cultivated in Singapore; it is related to *D. Mirbelianum* but finer and larger, with broad petals.

#### 17. *D. Mirbelianum*

Stems usually 50-60 cm. long; leaves broad; inflorescence about 30 cm. long with about 12 flowers 4-5-55 cm. across, light yellow-green; sepals and petals finely spotted with violet-brown, the petals a little longer than the sepals, slightly twisted, 3-4 cm. long; lip with 5 keels, all lobes green, veined with dark violet-brown, the midlobe acute. Widely distributed in New Guinea, the Moluccas and neighbouring islands, and variable, some varieties finer and with larger flowers than others. The variety so far

brought to Singapore is not the finest, and it seems always to be self-pollinated, so that the flowers do not last long. The species grows and flowers well in Singapore.

A small species from Java, *D. capra*, has flowers of rather similar colouring, but much smaller, with unspotted petals and only 3 keels on the lip. It is occasionally brought by dealers.

#### 18. *D. violaceo-flavens*

Stems to 5 metres tall; leaves to 23 by 13 cm.; inflorescences to 50 cm. long with many flowers; flowers 4-5 cm. across, the sepals and petals yellow, more or less spotted with dark violet; sepals 2-5 cm. long and 1-3 cm. wide, blunt; petals 2-8 cm. long and 1-8 cm. wide near the tip, hardly twisted; lip with 5 keels, the lobes strongly veined with rich violet. Native near the Mamberamo River in northern New Guinea, growing on rocks and on tall trees 100 feet above ground level. It has only been brought into cultivation in Java in recent years; it has been tried in Singapore but is not easy to maintain. Hybrids have been raised from it, but none with the fine colouring of the parent species.

#### 19. *D. veratrifolium*

Stems to 200 cm. tall, the leaves to 15 cm. long, flushed with purple when young; inflorescences many-flowered, to 70 cm. long; sepals pale violet-mauve, curved backwards, crisped and slightly twisted; petals obliquely erect, straight, slightly twisted and not crisped, to 3.4 cm. long, pale violet-mauve; lip with 5 white violet-bordered ridges, raised and flattened

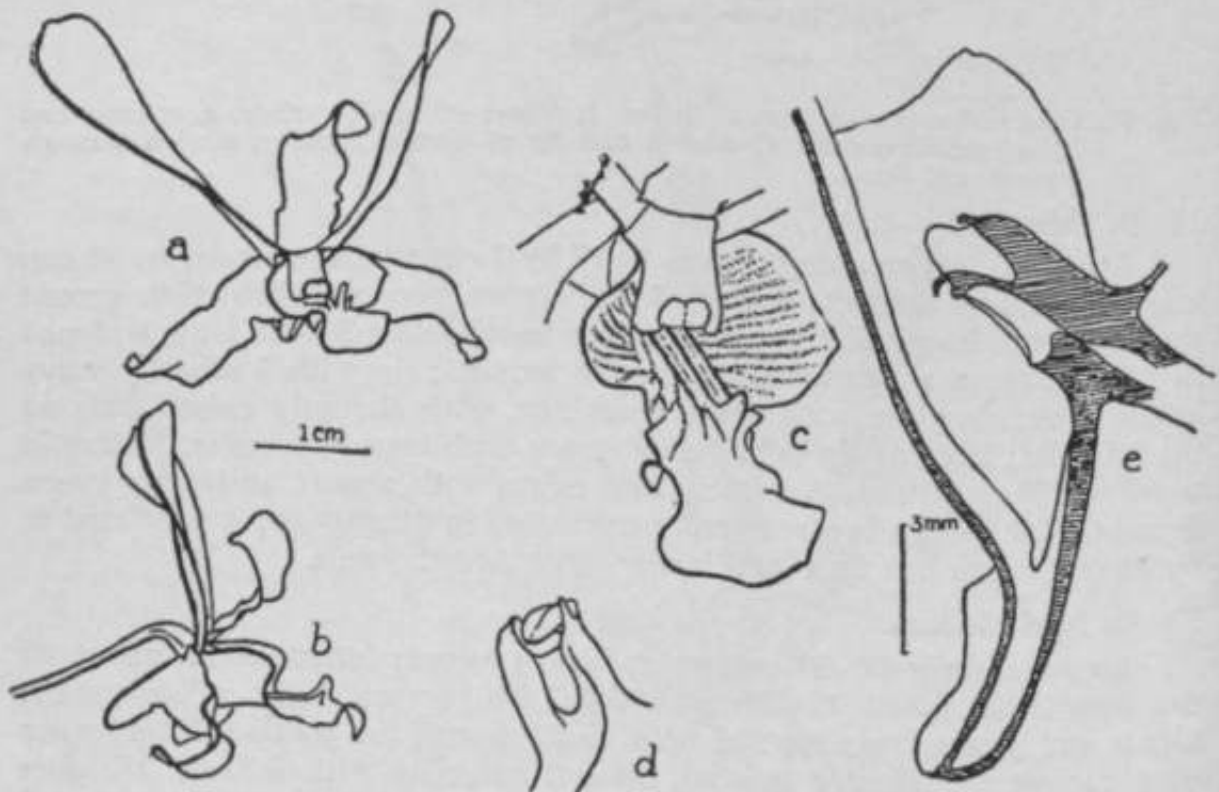


Fig. 78. *Devdrobium veratrifolium*. a, b, flower from front and from side, c, lip and column, d, column, e, section through column and column-foot.

at their ends on the midlobe; side-lobes minutely toothed at their edges, white, veined with violet, greenish at the base; midlobe small, pale violet, the tip turned under. Native on the north coast of New Guinea; somewhat variable in colouring, from very pale to rather deep lilac, the petals rarely suffused with pale yellow. **Fig.** 78.

This is probably the most commonly cultivated species of the section *Ceratobium*. The inflorescences are very graceful, and longer than those of any other species of the section. In Singapore *D. veratrifolium* flowers freely once a year, in response to the dry weather following the wet season, and a little at other times. If properly managed, the plants will grow very strongly. They need a sunny place.

## 12. § Stachyobium

Pseudobulbs rather slender, leaves thin; inflorescences several, from middle and upper nodes of leafy or old stems, spreading or ascending, rachis straight and slender, bearing several flowers. Petals pale yellow or yellow-green; lip 3-lobed, lobes toothed or fringed, middle part of lip with 1 or 3 keels; column-foot with a shallow nectary near its tip; mentum rather short, the tip usually a closed spur.

This section consists of a few species from Burma and Siam and one which is distributed to the south of Malaya.

Inflorescences 12-25 cm. long	..	..	1. <i>D. Delacourii</i>
Inflorescences 3-4 cm. long			
Mentum half as long as upper sepal	..	..	2. <i>D. flavidulum</i>
Mentum nearly as long as upper sepal	..	..	3. <i>D. eriseflorum</i>

1. ***D. Delacourii*** Guillaum.—*D. ciliatum* Parish ex Hk. 1864, not of Persoon 1807.

Stems 30-45 cm. long; inflorescences several, 12-25 cm. long with about 10-15 flowers; flowers 2-5 cm. across, pale yellow, petals narrow with truncate apex; lip streaked with red-brown, strongly fringed (fringe formed by prolongations of the veins), with 3 keels. Native in Lower Burma and Siam; cultivated in Siam and sometimes introduced to Singapore where new plants will flower, but old ones rarely.

2. ***Dendrobium flavidulum*** Hk. f., F.B.I. 6: 185. 1890. Ridl., Flora 4: 45.

Stems to about 60 cm. long; leaves to 10 by 1.5 cm., about 2-5 cm. apart; inflorescences of 4-7 flowers, scape about 2 cm., rachis 1-5 cm. long; flowers 1-2-1.4 cm. long, with broad mentum 4 mm. long, very pale greenish yellow; upper sepal 4 mm. wide, acute; petals as wide, blunt; lip 3-lobed, side-lobes acute with finely toothed edges, midlobe thickened, rather narrow, with 3 low papillose keels, and a conspicuous dark red spot on the tip. Found as an epiphyte on old mangrove trees, and on trees by rivers, in Singapore, Penang and Kelantan.

3. ***Dendrobium eriaeflorum*** Griff., Notul. 3: 316. 1851. Ridl., Flora 4: 51.

Stems erect, to 20 cm. long; leaves to 6 by 1 cm., 1.5 cm. apart; inflorescences c. 4 cm. long, each of 6-8 flowers; mentum c. 5 mm. long; upper sepal c. 6 mm.; sepals and petals greenish yellow, lip of same colour

with purple veins, with finely toothed side-lobes and a median keel. Native from Sikkim southwards to the north of Malaya, where it has been found on Bukit Wang in Kedah.

### 13. § Pedilonum

Stems uniformly fleshy (sometimes rather slender) ; leaves well-spaced, throughout the length of the stems; inflorescences borne at many nodes (rarely at all simultaneously) on the leafless stems, as in section *Eugenanthe*, usually of few flowers, but sometimes with many; mentum strongly developed and usually long-pointed, the tip sometimes a closed spur (in a few cases where the mentum is short, the lip is clearly 3-lobed) ; lip usually unlobed, sometimes with thickened ridges or small calli, but these are rarely conspicuous; flowers in most cases fairly large, varying considerably in colour.

This section is here construed rather more widely than is now usual in works on orchids; the additions are small groups which are closely related and seem hardly worth separating. No species of the section is in general cultivation, and only *D. secundum* is common as a wild lowland plant in Malaya. The only species which has been ranked as an ornamental cultivated plant is *D. sanguinolentum*, but some of the other Malayan members of the group are equally large and decorative. The total number of known local species is at present about twenty. Several of them are mountain plants, and have been little studied. A critical comparison of these, in the living state, is much needed. The present account is based largely on dried specimens, with incomplete information as to colour characters. In some cases, the information given differs from that in Ridley's *Flora*. Any such differences (especially of size of the parts of the flower) are based on examination of authentic specimens.

It seems likely that in some species (perhaps in all) there is some variation of the size of the flowers on different plants, or on plants growing under different conditions of exposure, altitude, etc. The amount of such variation is not known. The *proportions* of the parts of the flower are however much more constant, and a character of value in distinguishing the species is the relative length of the mentum as compared with the upper sepal. Another character of value, concerning which little information is available, is the shape of the base of the lip and the way it is joined to the column-foot. A remarkable instance of this is the spine-like appendage of *D. sanguinolentum*. The basal part of the lip in all species is narrow. It is convenient to have a name for this narrow part, and the term *claw* is generally used in works on orchids, though the structure is often not very claw-like. The phrase *length of flower* is here used for the length from tip of upper sepal to tip of mentum.

The species of *Pedilonum* differ from those of *Eugenanthe* in the long mentum and usually hairless lip; they differ from the *Nigrohirsutee* in the lack of hairs on the leaf-sheaths and in bearing inflorescences on the bare stems, often some distance from the stem-apex; they differ from the section *Distichophyllum* in flowering on the bare stems, in the usually larger size of the flowers, and in their more varied colouring.

**Key to the species of the section Pedilonum native in the Malay Peninsula**

- Mentum shorter, or hardly longer, than the upper sepal
- Mentum distinctly shorter than the upper sepal
- Flowers not more than about 1-6 cm. long . . . . . 1. *D. metrium*
- Flowers about 3 cm. long . . . . . 2. *D. Hughii*
- Mentum about equal in length to the upper sepal
- Lip with distinct side-lobes, base of lip with a spine-like appendage . . . . . 3. *D. sanguinolentwn*
- Lip with no side-lobes, base without such an appendage
- Blade of lip 8-10 mm. wide, apex broad and cleft
- Lip with a V-shaped thickening, point towards blade, at base of blade . . . . . 4. *D. Derryi*
- Lip without such thickening . . . . . 5. *D. calicopis*
- Blade of lip 4-5 mm. wide, apex bluntly pointed . . . . . 6. *D. brinchangensis*
- Mentum conspicuously longer than the upper sepal
- Flowers small, numerous, close together, all on one side of the inflorescence . . . . . 7. *D. secundum*
- Flowers not more than 12, spreading on all sides of the inflorescence
- Stems flattened . . . . . 8. *D. lamellatum*
- Stems not flattened
- Flowers 10-12 in an inflorescence
- Flowers medium to deep crimson-purple . . . . . 9. *D. xgie*
- Flowers greenish yellow, with or without crimson veins . . . . . 10. *D. serpens*
- Flowers 1-6 to an inflorescence
- Flowers dark red-purple, upper sepal and petals about 5 mm. long . . . . . 11. *D. tropxoliflorum*
- Flowers paler, sepals and petals 8 mm. or more long
- Flowers about 2-3 to 2-5 cm. long (tip of upper sepal to tip of mentum)
- Mentum twice as long as upper sepal . . . . . 12. *D. hymenopternm*
- Lip without side-lobes
- Lip with distinct side-lobes, mid-lobe wider than long . . . . . 13. *D. megaceras*
- Mentum proportionately shorter
- Flowers bright purple or mauve-pink
- Lip 5 mm. wide, end narrowed, entire . . . . . 14. *D. cornutum*
- Lip 10 cm. wide, end slightly retuse . . . . . 15. *D. langkawien.se*

- Flowers white, at most faintly  
flushed with pink . . . 16. *D. Foxii*  
Flowers 3 to 4 cm. long  
Flowers orange, mentum more than  
twice as long as upper sepal . . . 17. *D. crocatum*  
Flowers not orange, mentum less  
than twice as long as upper  
sepal  
Flowers cream with a yellow lip,  
4 cm. long or more . . . 18. *D. subflavidum*  
Flowers white or pink, shorter  
Lip with distinct side-lobes . . . 19. *D. exilicaule*  
Lip without distinct side-lobes 20. *D. roseatum*

1. ***Dendrobium metrium*** Krzl., Pflzr. Dendr. 219. Ridl., Flora 4: 45.—*D. modestum* Ridl., J. Bot. 1898: 211, non Rchb. f.

Stem slender, leafy except at base, to 20 cm. long, purple when old; leaves thin, about 5-5 by 0-7 cm., 2 cm. apart; inflorescence of 2 flowers on a very short scape, often on the leafy stem; petals and sepals white tinted with mauve; mentum 7 mm. long; upper sepal 8 by 4 mm.; petals about the same, acute; blade of lip elliptic, white with violet stripes, no distinct side-lobes. Only once found, on Penang Hill, on a grassy bank at about 2,000 feet altitude.

2. ***Dendrobium Hughii*** Rchb. f., Gard. Chron. N.S. 18: 764. 1882.—*D. lepidum* Ridl., Flora M.P. 4: 48. 1924.

Stems to 30 cm. long, often flexuous towards the tip; leaves close, to about 9 by 1 cm., the sheaths loose; flowers solitary on leafless stems, white or faintly pink, to about 3-5 cm. across and 3 cm. long; mentum about 1 cm. long; petals wider than sepals; lip without side-lobes, the end broadly rounded, 1-2 to 1-4 cm. wide; top of column orange. A mountain epiphyte, found at about 4,000 feet altitude on Kedah Peak, G. Raya (Langkawi), Fraser's Hill, G. Tahan and G. Benom. It is locally common and quite decorative.

3. ***Dendrobium sanguinolentum*** Lindl., Bot. Reg. 28: Misc. 62. 1842; 29: t. 6. 1843. Ridl., Flora 4: 50.—*D. cerinum* Rchb. f., Gard. Chron. 12: 554. 1879.

Stems to 60 cm. or more long, fairly thick; leaves to 8 by 2 cm. (sometimes wider), purplish when young and the sheaths purple-veined; inflorescences of 2 to 6 flowers in a close group; mentum about equal in length to upper sepal, somewhat flattened with a broad end; upper sepal about 1-4 by 0-9 cm.; petals about 1-4 by 1-2 cm., the ends broad and notched; lip with erect side-lobes, their broad free ends reflexed, midlobe 1-4 cm. wide, cleft at the end, a raised orange patch in the middle; claw of lip with a right angle bend near the base, and attached to this an orange spine-like appendage in close contact with the column-foot; the whole flower deep cream, with or without crimson-purple tips to all members. Fig. 79. **Native** in Borneo, Sumatra and Malaya; found in many parts of the



country as an epiphyte at medium elevations on the hills, in moderately exposed places; easy to cultivate and flowering occasionally, though never in quantity in the lowlands. The variety without red tips to the floral parts (known as var. *cerinum*) is apparently the more common. The shape of the claw of the lip is very remarkable. The spine is in close contact with the column-foot, there being a very small opening on either side, along which an insect can insert its proboscis; the bent base of the claw, with the sepals pressed against it on either side, forms a closed chamber containing much

nectar.

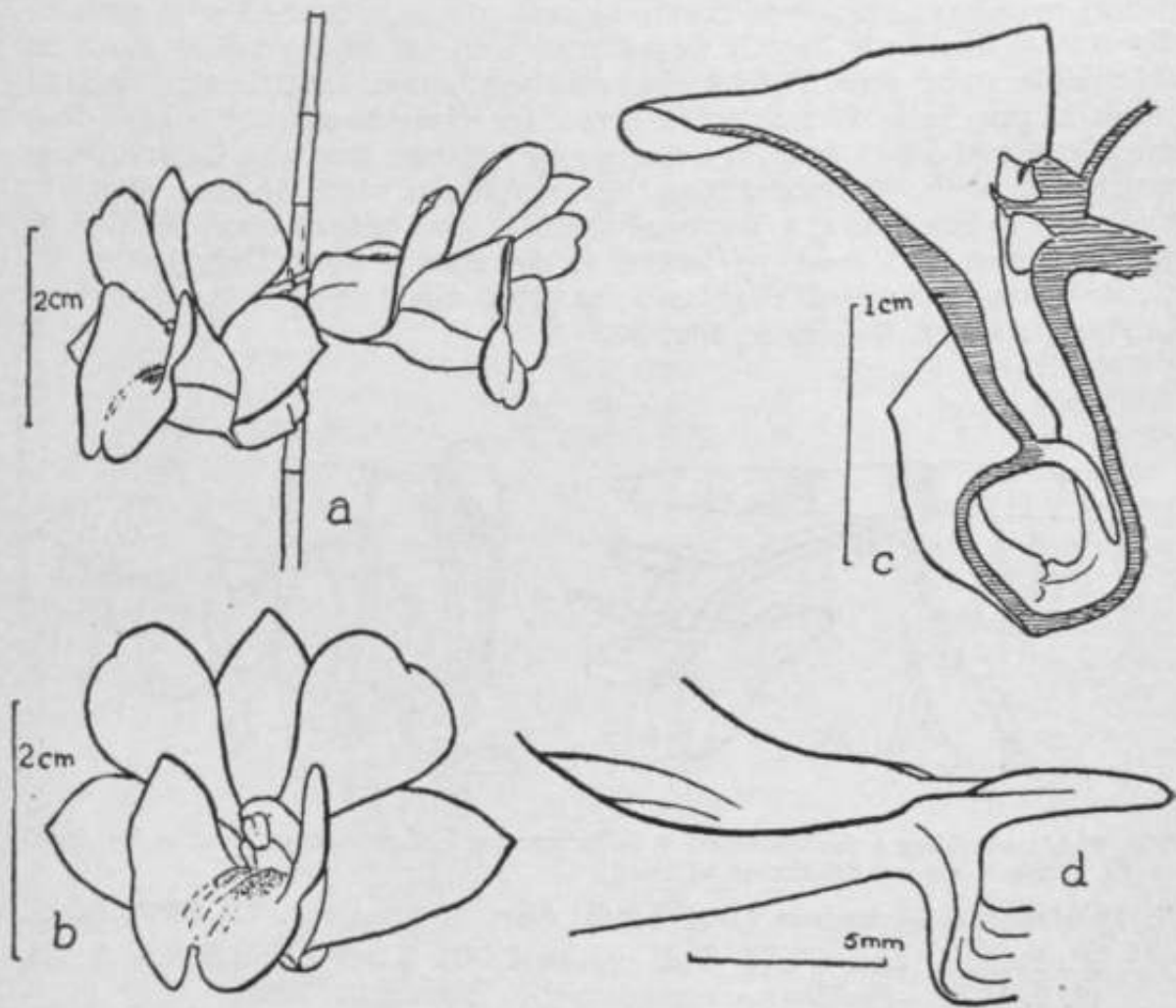


Fig. 79. *Dendrobium sanguinolentum* var. *cerinum*. a, b, flowers, c, section through column and mentum. d, appendage on base of lip.

4. ***Dendrobium Derryi*** Ridl., Mat. Fl. M.P. 1: 52. 1907. Flora 4: 47.

Stems to about 25 cm. long; leaves to 10 by 2 cm., 2-5 cm. apart; flowers solitary or in pairs; mentum 1 cm. long; upper sepal about 9-10 by 4-5 mm.; petals about equal to the sepal; lip without side-lobes, the blade 7-8 mm. wide, the end broad and cleft; a V-shaped thickening, the raised and grooved point towards the blade, at the junction of the blade and the claw; colour of flowers pale yellowish, the lip white, anther orange-  
Found on Taiping Hills, and possibly at Fraser's **Hill**.

5. *Dendrobium calicopis* Ridl., J.S.B.R.A.S. 39: 72. 1903. Flora 4: 48.

Stems slender, to about 40 cm. long; leaves to about 9 by 1.7 cm., 2-5 cm. apart; flowers 2-4 together, white, tinted with rose, the column-arms crimson (or orange ?), anther pink; mentum 12 mm. long; upper sepal about 12 by 5-6 mm.; petals about the same or a little narrower; lip blade about 13 mm. long and 10 mm. wide, with 4 raised veins, the tip broad, cleft. Found only on Langkawi Islands.

6. *Dendrobium brinckangensis* Holtt., Gard. Bull. 11: 279. 1947.

Stems to 70 cm, long, internodes 2-2.5 cm.; leaves to 13 by 1.6 cm., widest near base, narrowed evenly to apex; sheaths flushed with purple; flowers 1-3 at a node, faintly tinged with lilac, lip with a yellow patch in the middle; upper sepal 12 by 6 mm.; mentum 12 mm. long, nearly straight; petals 12 mm. long, 4.5 mm. wide, acute; lip joined to apex of column-foot for a length of 5 mm. to form a narrow closed spur, free part 17 mm. long, nearly flat, blade little wider than claw, maximum width 4.5 mm., abruptly narrowed to blunt apex, a V-shaped thickening at base of claw, the foot of the V formed by a small projection at entrance to spur. Only known on G. Brinckang, Cameron Highlands, at 5,500-6,000 feet; found flowering in April, August, December. **Fig. 80.**

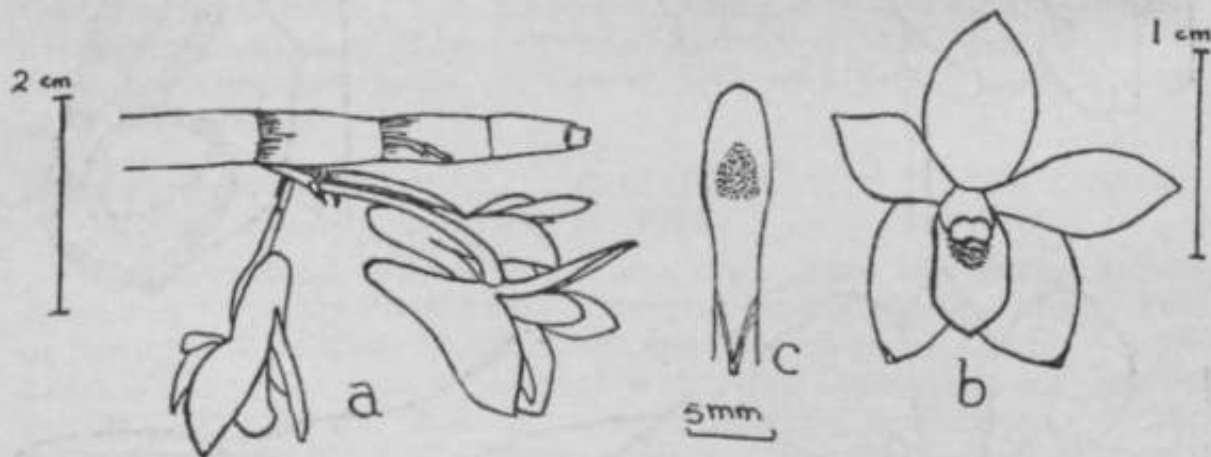


Fig. 80. *Dendrobium brinckangensis*. a, inflorescence. &, flower from front, c, lip showing V-shaped thickening at base.

7. *Dendrobium secundum* (Bl.) Lindl., Gen. et Sp. Orch. 81. 1830. J.J.S., Fl. Buit. 6: 358, f. 272. **Ridl.**, Flora 4: 46. Carr, J.M.B.R.A.S. 6: 55, pi. 9. 1928.—*Pedilonum secundum* BL, Bijdr. 322. 1825.

Stems to 100 cm. long (usually less) and 1-8 cm. through; leaves to 10 by 4 cm.; inflorescences from the upper nodes only, to about 12 cm. long, with many closely-placed small flowers all pointing to one side, bright mauve-pink (or rarely white) with orange lip; flowers to 1-8 cm. long and 0.6 cm. wide; upper sepal to 7 by 4 mm.; mentum curved; petals very narrow; lip forming a long spur at the base with the column-foot, the blade entire, with a V-shaped callus at the base. Distributed from Tenasserim and Cochin China southwards and throughout Malaysia from Sumatra to the Philippines; in Malaya a fairly common epiphyte, especially in rather exposed places near the sea, in the north. The bright colour and unusual form of the inflorescence are pleasing, but the flowers are too

small for the species to be of much value decoratively. It may have possibilities for breeding. In cultivation it needs a fairly exposed place, and is probably best on a piece of wood. Fig. 81.

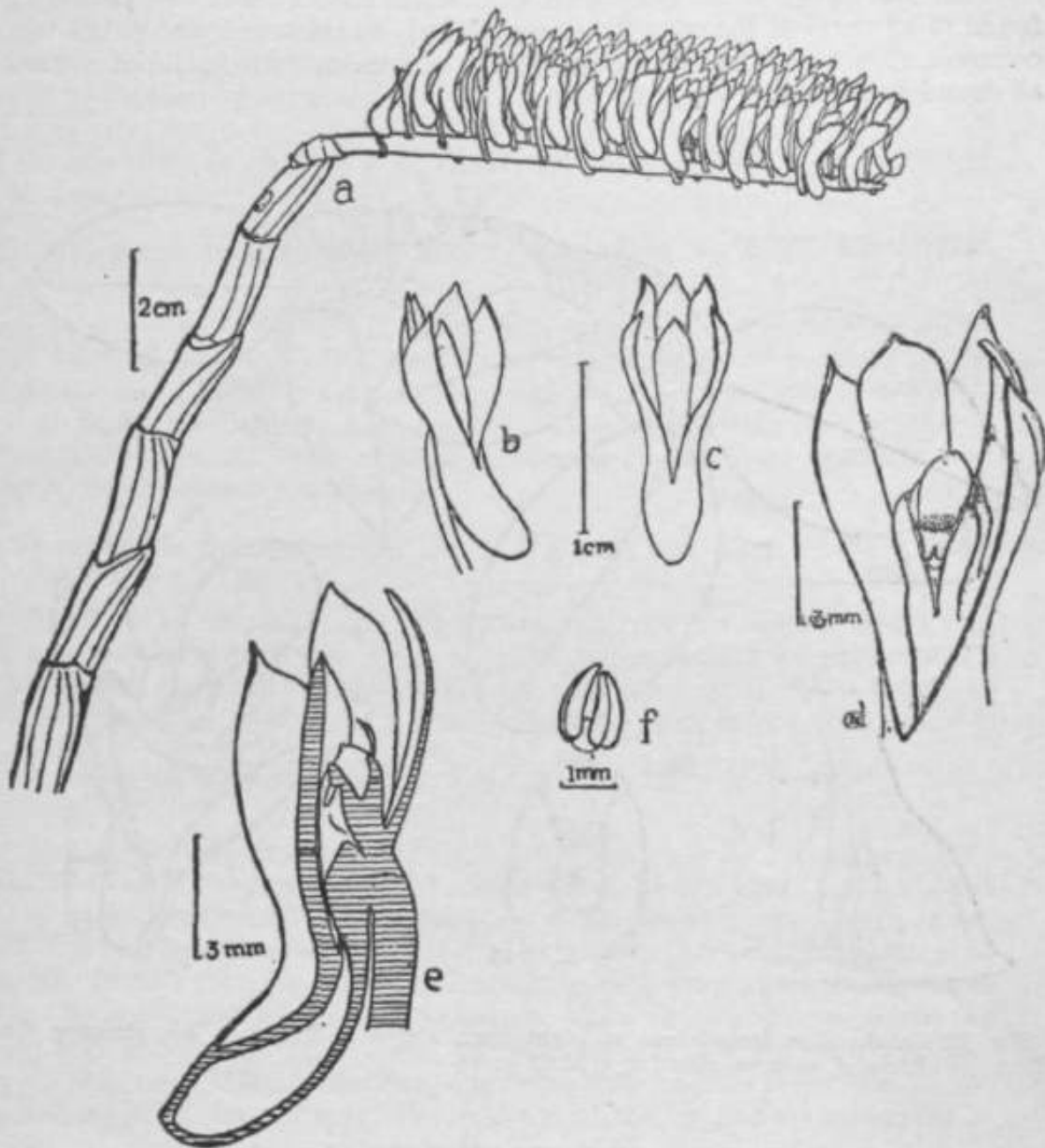


Fig. 81. *Dendrobium secundatum*. *a*, inflorescence, *b*, *c*, flowers from and from front. *d*, flower with lip removed, *e*, flower in section, *f*, pollinia.

8. *Dendrobium lamellatum* (Bl.) Lindl., Gen. et Sp. Orch. 89. 1830. J.J.S<sub>M</sub> Fl. Buit. 6: 367, f. 280. Ridl., Flora 4: 46.—*Onychium lamellatum* Bl., Bijdr. 526. 1825.

Stems to about 12 cm. long, flattened, to about 3 cm. wide and only a few millimetres thick; leaves 2 or 3, to about 7.5 by 4 cm., acute; inflorescences of about 4 flowers, from near the apex of the stem, pendulous;

flowers 2.2 cm. long, the mentum 1.3 cm.; petals and sepals at first white with a faint greenish tinge in the centre, turning yellowish when old; lip much widened from a narrow base, the almost truncate end bent into a semicircle, its edge reflexed, inside with a dull greenish patch and 3 rounded low fleshy keels. Native in Borneo, Sumatra, Java and Malaya; found in all parts of the country as an epiphyte in sheltered places, but not common. It is a member of a small group of species with flattened stems, all found in Malaysia. Fig. 82.

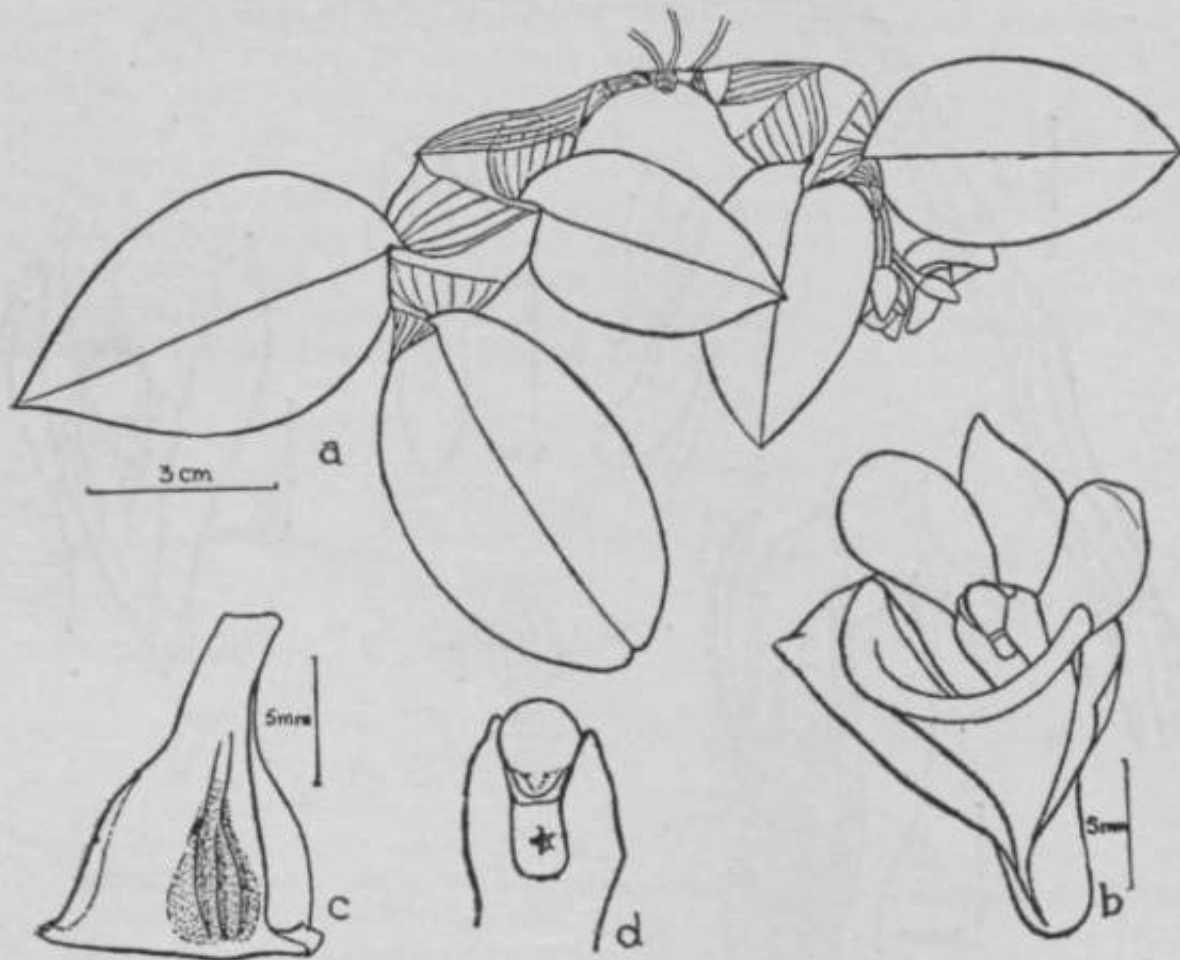


Fig. 82. *Dendrobium lamellatum*. a, plant from above. b, flower, c, lip, showing the keels, d, column, showing column arms.

9. *Dendrobium aegle* RidL, J.L.S. 32: 260. 1896. Flora 4: 47.

Stems to 60 cm. long; leaves to about 10 by 2 cm.; inflorescences of about 10 flowers very close together, the scape and rachis together less than 1 cm. long; dorsal sepal 6 mm. long, mentum 8-10 mm.; petals and sepals small, lip without side-lobes, narrow with a concave fringed rounded end, all bright crimson-purple. Found only on trees near Batu Pahat, and at 2,500 feet altitude on Taiping Hills. Attractive on account of the bright colour of its flowers, which resemble those of *D. Hasseltii* in shape, though much smaller. The dense inflorescence is also distinctive.

10. **Dendrobium serpens** Hk. f., Ann. Calc. 5: 10, t. 16. 1895. RidL, Flora 4: 47.—*D. virescens* RidL, J.L.S. 32: 259. 1896. Flora 4: 47.

Stems to 60 cm. or more long, slender; leaves thin, to about 9 by 2-2 cm.; inflorescence to about 7 cm. long, of about 12 flowers, greenish yellow, with or without conspicuous crimson veins; mentum 2 cm. long, upper sepal 7 mm. long; lip with small rounded side-lobes and a callus between them, the midlobe small, rounded, cleft, the edges with short stiff hairs. Found in Peninsular Siam and Perak; the form without crimson veins was called *D. virescens*, but appears to be identical in other characters, and should probably be regarded as a variety. More information is wanted about this species.

11. **Dendrobium tropseoliflorum** Hk. 1, Ann. Calc. 5: t. 17. 1895. RidL, Flora 4: 49.

Stems about 30 cm. long; leaves to 6 by 1-6 cm.; inflorescence about 5 cm. long, of 6 flowers; flowers 2-5 cm. long with mentum nearly 2 cm., the sepals and petals very small, deep red-purple; lip similar in shape to that of *D. serpens* but the midlobe said to be entire. Only once found, in Perak, and described from a plant cultivated in Calcutta; more information about this species is needed.

12. **Dendrobium hymenopterum** Hk. 1, F.B.I. 5: 732. 1890. Ic. PL t. 2032. RidL, Flora 4: 48.

Stems to 30 cm., leaves to 10 by 2 cm.; flowers few, white, tinted rose and greenish, about 2-5 cm. long; mentum twice as long as upper sepal; lip not lobed, the apex rounded. Collected only once, on G. Batu Puteh, at 3,400 feet, and described from a dried specimen; more information wanted.

13. **Dendrobium megaceras** Hk. f., F.B.I. 5: 731. 1890. Ic. PL t. 2031. RidL, Flora 4: 50.

Stems about 60 cm. long; leaves 3 cm. apart, to 9 by 1-5 cm.; inflorescence of about 6 flowers, scape and rachis about 3-5 cm. long; flowers about 2-4 cm. long; mentum 1-7 cm.; upper sepal 8 mm. long; lip strongly 3-lobed, side-lobes bluntly triangular, midlobe 7-5 mm. wide, 4-5 mm. long, widening abruptly from a narrow base, apex broad with a very short point, edges minutely toothed; colour of flowers nearly white or pale yellow-green, the sepals and petals with pink veins, the side-lobes of the lip brown-veined. Known only from three collections, one from Malacca, one from South-East Johore, the other from Perak. The midlobe of the lip is bent upwards.

14. **Dendrobium cornutum** Hk. 1, F.B.I. 5: 730. 1890. Ic. PL t. 2029. RidL, Flora 4: 46.— ? = *D. Hasseltii* (Bl.) Lindl.

Stems to 60 cm. long, internodes about 2 cm.; leaves thin, to 10 by 1 cm.; inflorescence of 2 or 3 flowers, bright to pale mauve-pink; upper sepal about 9-11 mm. long; mentum 14-16 mm. long; lip without side-lobes, about 5 mm. wide, with an orange patch (?), apex rounded. Found on mountains at 6,000-7,000 feet in several localities; nearly allied to *D. Hasseltii* of Java and Sumatra.

**15. *Dendrobium langkawiense*** Ridl., J.S.B.R.A.S. 54: 49. 1909

Stems 30 cm. long, leaves about 5 by 0.6 cm.; flowers apparently solitary; mentum curved, about 1.5 cm. long; upper sepal 1 cm. long; petals with broadly rounded tips; lip not lobed, the end broadly rounded and slightly notched, 1 cm. wide; flowers a fairly deep purple, the apex of upper lip having the deepest colour. Only known from a single collection in Langkawi, and a coloured drawing.

**16. *Dendrobium Foxii*** Ridl. in Journ. Bot. 38: 70. 1900. Flora 4: 49.

Stems to about 40 cm. long; leaves to 8 by 1 cm.; flowers apparently 3 or 4 together, white tinted with rose; mentum about 1.4 cm., petals 1.1 by 0.4 cm.; petals 1.3 by 0.8 cm.; lip without side-lobes, the blade 1 cm. wide, cleft at the apex. Known only from Taiping Hills.

**17. *Dendrobium crocatum*** Hk. f., F.B.I. 6: 155. 1890. Ann. Calc. 5: t. 14-1895. Ridl., Flora 4: 47.

Stems to 60 cm. or more long; leaves to 10 by 2 cm., about 2.5 cm. apart; inflorescences of 2 or 3 flowers; flowers about 4 cm. long, bright orange; mentum straight, 2.8 cm. long; lip not lobed, edges finely toothed. Found in many parts of Malaya as an epiphyte in the lowlands, especially by rivers. The bright orange flowers with very long mentum are distinct.

**18. *Dendrobium subflavidum*** Ridl., J.L.S. 38: 130. 1908. Flora 4: 49.—*D. chloroleucum* Ridl., J.S.B.R.A.S. 61: 38. 1912. Flora 4: 49.

Stems to 70 cm. long; leaves to 14 by 2.5 cm., 3-5 cm. apart; inflorescences of 1 or 2 flowers; flowers to about 4.2 cm. long; mentum curved, about 2.5 cm., its tip a closed spur; lip without side-lobes, the blade gradually widened to a rounded slightly notched end about 1.2 cm. wide. Colour of flowers cream or pale greenish-yellow, the lip yellow, with or without crimson spots near the base. An epiphyte of exposed places on mountains, found on G. Tahan, G. Tapis and G. Kerbau, at 4,500 feet or higher. A specimen from G. Padang, Trengganu, has mentum 3 cm., upper sepal 1.8 cm. long: it probably belongs to this species. Specimens from the lowlands of Kedah agree with the above description but have 6 flowers in the inflorescence and the lip to 2.4 cm. wide when flattened. They may represent a distinct species. The spur contains a V-shaped nectary.

**19. *Dendrobium exilicaule*** Ridl., Fl. M.P. 4: 50. 1924.—*D. tenuicaule* Ridl. J.S.B.R.A.S. 39: 73. 1903, non Hk. f.

Stems very slender, to 30 cm. long; leaves to about 8 by 0.8 cm.; inflorescences of 1 or 2 flowers; flowers about 3.4 cm. long; mentum curved, 2 cm. long; lip with broad erect side-lobes, the midlobe ovate, slightly cleft, the edge crisped; sepals and petals pink, the tips a deeper shade, the lip white with pink central lines. Found only on Langkawi.

**20. *Dendrobium roseatum*** Ridl., J.L.S. 32: 261. 1896. Flora 4: 48.—*D. clarissimum* Ridl., J.F.M.S. Mus. 4: 65. 1909. Flora 4: 49.

Stems to about 60 cm. long; internodes 3 cm.; leaves to 14 by 2 cm.; inflorescences of 3 to 5 flowers; flowers to about 3.3 cm. long, the mentum about 1.8 cm.; upper sepal 1.4 by 0.7 cm.; petals 1.4 by 0.9 cm.; lip without side-lobes, the blade rather abruptly widened at the base, edges slightly

toothed, apex deeply cleft, 1-1.5 cm. wide; colour of flowers white, tinged with pink, especially the apex of the petals, column-arms orange. Found on Taiping Hills and the Main Range at about 4,000 feet altitude, by forest streams. There appears to be some variation in the size of the flowers, and in the relative size of the lip, and it is possible that two species are included here.

#### 14. § *Distichophyllum*

Plants usually rather bushy, with the stems close together; stems slender, the old ones deeply grooved; internodes short, from about 0.5 to 2 cm.; leaves very regularly 2-ranked, rather short, usually oblong with unequal rounded ends, 2 to 10 cm. long, 0.5 to 2 cm. wide; flowers rather small, solitary or in groups of 2 or 3 from the leafy stems, white, cream, yellowish or dull orange; mentum conspicuous, blunt; upper sepal and petals rather narrow, curved backwards or not; lip usually but not always 3-lobed, rather fleshy, almost straight from base to apex, the base sometimes joined to the edges of the column-foot forming a spur, longitudinal ridges more or less developed.

The plants of this small section, represented by eight species in Malaya, have a rather uniform aspect, given by their closely ranked, uniform, usually spreading and comparatively short, blunt, leaves (tapering conspicuously in one species only); the leaves also are more persistent than in the section *Pedilonum*, and the flowers are always on the leafy stems. The flowers are comparatively small, and the straight middle line of the lip (the blade not turning down in front of the flower) is distinctive.

#### Key to the species of *Distichophyllum* in Malaya

- Flowers about 7 mm. in diameter; leaves about  
 1.8 by 0.4 cm. . . . . 1. *D. rupicolum*
- Flowers and leaves considerably larger  
 Leaves up to 5 cm. long  
 Midlobe of lip about 1 cm. wide . . . 2. *D. uniflorum*  
 Midlobe of lip not more than 0.6 cm. wide  
 Blade of lip flat, central part bearing  
 several more or less distinct warty  
 ridges . . . . . 3. *D. bifarium*  
 Blade of lip with sides upcurved, 3 orange  
 keels almost reaching the apex . . . 4. *D. pahangense*
- Leaves 6 to 10 cm. long  
 Leaves narrowed evenly from base to pointed  
 apex  
 Lip 1 cm. long: no powdery keels . . . 5. *D. Hosei*  
 Lip 1.7-2 cm. long with 2 white-powdery  
 keels towards base . . . . . 7. *D. metachilinum*
- Leaves oblong, only slightly narrowed to  
 broad blunt apex  
 Midlobe of lip when flattened 9 mm. or  
 more wide  
 Midlobe flat, the sides not folded down-  
 wards . . . . . 2. *D. uniflorum*

- Midlobe folded along its middle line, the two halves bent downwards .. 6. *D. revolutum*
- Midlobe of lip not more than about 5 mm. wide
- Leaves stiffly spreading, under 1 cm. wide; two keels on lip, ending at base of midlobe . . . . . 7. *D. metachilinum*
- Leaves thin, close to the stem, usually over 1 cm. wide; 3 keels on lip .. 8. *D. pandaneti*

**1. *Dendrobium rupicolum*** Ridl., J.F.M.S. Mus. 6: 174. 1915. Flora 4: 42.

Stems to about 35 cm. long; internodes 6 mm. long; leaves to 18 by 0.4 cm.; flowers solitary, about 7 mm. across, dull yellow or greenish yellow, the lip white or light yellow with dull orange central patch; petals very narrow (1 mm. wide); lip without side-lobes, the blade with a broad slightly notched end, about 4 mm. wide. A mountain species, found on G. Tahan, at Cameron Highlands and elsewhere on the Main Range. It has much the smallest flowers in the section.

**2. *Dendrobium uniflorum*** Griff., Notul. 3: 305, 1851. Ic. PL As. t. 203. Ridl., Flora 4: 43.

Stems to 40 cm. long; leaves of mountain plants to 3 by 1.2 cm., of lowland plants often larger; flowers solitary, creamy white when fresh, turning dull yellowish, with 2 longitudinal orange or crimson lines on the lip; mentum about 6 mm. long; upper sepal to 1.2 by 0.6 cm.; petals as wide; sepals and petals not turned backwards; lip 1.7-2.0 cm. long from tip of mentum, with distinct side-lobes in the same plane as the midlobe. Originally found near the top of Mt. Ophir, and later on Taiping Hills, but occurring also in the lowlands and in Sarawak; nearly related to *V. revolutum*, differing in points mentioned under that species (No. 6).

**3. *Dendrobium bifarium*** Lindl. ex Hk. 1, FBI, 5, 732, 1890. Ridl., Flora 4: 42.

Stems to 30 cm. long; internodes near top of stem under 1 cm. long; leaves to about 5 by 1.1 cm.; flowers solitary, 1.2 cm. across, white or faintly greenish, centre of lip yellow; mentum 4 mm. long; upper sepal about 7 by 3 mm.; petals 2 mm. wide; lip about 1.2 cm. long from tip of mentum, without side-lobes, the blade with several more or less confluent warty ridges, about 6 mm. wide. A fairly common epiphyte in the lowlands, found in several localities from Singapore to Penang; found also in Borneo.

**4. *Dendrobium pahangense*** Carr, Gard. Bull. 5: 126, pi. I, f. 3. 1930.

Stems to 20 cm. long; internodes less than 1 cm.; leaves to 2 by 0.6 cm.; flowers solitary; sepals and petals white, lip pale yellow with orange keels; upper sepal 7 by 3 mm.; petals 7 by 2 mm.; mentum 6 mm. long; lip 1.5 cm. long, side-lobes very small with rounded ends, midlobe with edges curved upwards, rounded with a very short point, the keels reaching the apex; two orange spots below the stigma. Known only from G. Tahan and Fraser's Hill at about 4,000 feet altitude.



5. **Dendrobium Hosei** RidL, Tr. L.S. 3: 363. 1893. Flora 4: 43. Carr, Gard. Bull. 5: 125, pi. I, f. 4. 1930.

Var. **pelor** Carr, Gard. Bull. 5: 125, pi. I, f. 5. 1930.

Stems to 60 cm. long; internodes 1-2-20 cm.; leaves to 9 by 1 cm., narrowed evenly from base to apex; inflorescence of 1 or 2 flowers; diameter of flower 1.5 cm.; mentum 5 mm. long; upper sepal 5 by 3 mm.; petals 2 mm. wide; lip 1.0 cm. in total length; side-lobes triangular, acutely pointed; midlobe abruptly widened from 3.5 to 7 mm., the apex broad with a very short point; colour of flowers greenish when first open, turning pale yellow, the midlobe of the lip yellow with orange-yellow veins, brown veins in side-lobes. A fairly common epiphyte on trees by rivers in Pahang; found also in Borneo. Some plants have a small additional anther on either side of the normal anther; they are self-pollinating. A variety also occurs—having no mentum, an abnormal lip, and a flap in front of the stigma; this is likewise self-pollinated (var. *pelor*).

6. **Dendrobium revoliium** Lindl., Bot. Reg. 1840: Misc. 51. Bot. Mag. t 6706. Ridl., Flora 4: 43.

Stems to 60 cm. long; internodes 1 to 2 cm.; leaves to 10 by 1.8 cm., narrowed very slightly from base; flowers solitary; mentum about 6 mm. long; upper sepal and petals curved backwards, about 8 mm. long; lip fleshy, about 1.7 cm. long, side-lobes distinct, blunt, the whole lip folded along its middle line, the two halves curved downwards; midlobe when flattened 9 mm. wide, the end broad, blunt; flowers white, the downturned sides of the lip dull orange, 3 bright orange keels on the midlobe. Found as an epiphyte in the lowlands of southern Malaya, and on mountains in the north. This species is very near *D. uniflorum*, differing usually in growing to a larger size, with longer leaves, and as regards the flower in the downturned sides of the lip, which are dull orange, not white. There seems to be some variation in the width of the petals, which are typically narrower than the upper sepal, but sometimes as wide. Further comparison of the two species is desirable.

7. **Dendrobium metachilinum** Rchb. f., Bonpl. 3: 222. 1855. Ridl., Flora 4: 44. Carr, J.M.B.R.A.S. 6: 53, pi. 8.

Var. **crenulatum** Carr, Gard. Bull. 7: 10. 1932.

Stems to 35 cm. long; internodes about 1 cm. long; leaves to 7 by 1.2 cm., somewhat tapering; flowers 2 or 3 together; mentum 9-10 mm. long; upper sepal 8-10 by 4-5 mm.; petals 2-2.5 mm. wide, apex acute; lip 1.7-2.0 cm. long from tip of mentum, with a long narrow claw; claw gradually widening to about 4 mm., then tapering slightly to the very small erect side-lobes; midlobe fleshy, ovate, acute, 4-5 mm. wide, with a broad warty edge; flowers greenish or pale dull orange, with brownish veins on sepals and petals, the lip brownish, the claw with two keels covered with minute white papillae except for the greenish forward end. Found as an epiphyte in the lowlands of southern Malaya and Pahang; also in Sumatra. Rather variable in colour.

8. *Dendrobium pandaneti* RidL, J.L.S. 32: 257. 1896. Flora 4: 44. Carr, J.M.B.R.A.S., 6: 52, pi. 7. 1928.

Stems to 35 cm. long; internodes 1.5-2 cm. long; leaves light green, to 9 by 2 cm., bent close to the stem; inflorescences of 2 or 3 flowers; flowers 2.1 cm. long and 2 cm. wide; mentum 9 mm. long; upper sepal 1.4 by 0.4 cm.; petals 3 mm. wide, narrowed to their tips; lip 1.8 cm. long, side-lobes with distinct small rounded ends; midlobe elliptic, fleshy; claw bearing 3 low keels ending at base of midlobe; an extra small anther usually present on each side of the normal anther; colour of flowers white with the keels and midlobe of the lip orange. A locally common epiphyte on palms (especially sago palms) and pandans in the southern half of Malaya, and also collected in Perak; found also in Java and Sumatra. The pollinia from the small lateral anthers have direct contact with the stigma, and the flowers are always self-pollinated. The plants climb some distance up the trunks of palms, often with many stems; the light green leaves, at a narrow angle with the stem, are conspicuous. Fig. 83.

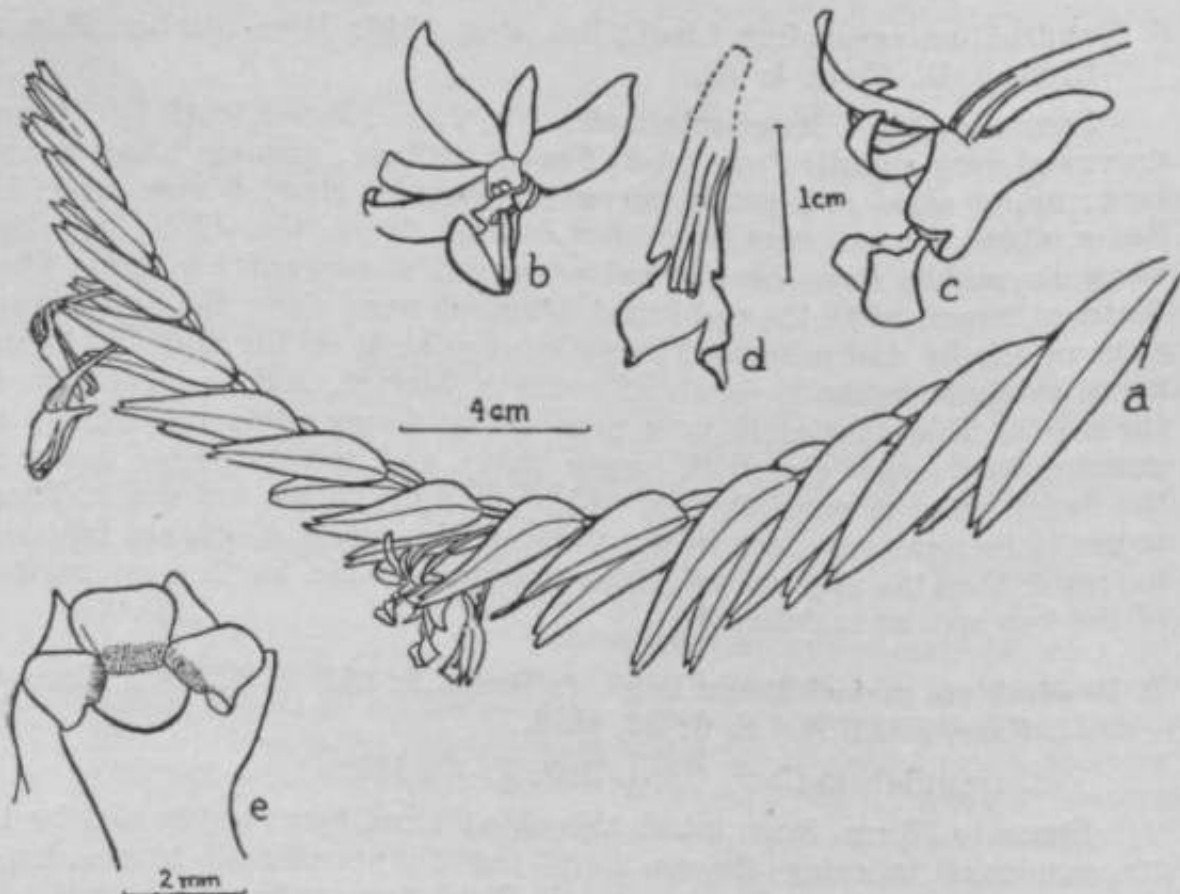


Fig. 83. *Dendrobium pandaneti* of stem with leaves and flowers, *b*, *c*, flowers from front and from side, *d*, hp. *e*, column, showing the two extra anthers.

#### 15. § Rhopalanthe

Stems thin except for a short swollen fleshy part (of 1 or few internodes) near the base; base and apex of stem bearing sheaths only, leaves confined to the middle; leaves flattened or terete; flowers borne in succession from small groups of chaffy bracts at the nodes of the leafless apical

part of the stem, short-lived, with a rather long curved mentum; lip always with well-developed side-lobes.

This section, widely distributed and including our commonest Malayan *Dendrobium* (*D. crumenatum*, already described in detail on pp. 8 and 14), is intermediate between the sections which have already been described, all with fleshy stems or pseudobulbs, and those with thin wiry stems which follow. All species have the characteristic habit of the Pigeon orchid, but some have terete leaves while in others the leaves are normally flattened. All produce their flowers in response to the stimulus of a sudden fall of temperature, but all do not take the same number of days for the flowers to develop. Some have flowers lasting more than one day. Most are lowland plants, epiphytes in moderately exposed places. In Sumatra *D. linearifolium* occurs at moderate elevations on the hills, and is as common on old trees in Fort de Kock as *D. crumenatum* is in the lowlands of Malaya, but it has not been found in this country.

. Key to the Malayan species of § **Rhopalante**

Leaves terete

Mentum bent through 2 right angles, its end on  
the front of the flower .. .. 1. *D. peculiare*

Mentum only slightly curved

Flowers white, side-lobes of lip large, square-  
ended .. .. 2. *D. setifolium*

Flowers pale greenish yellow, side-lobes  
short, rounded .. .. 3. *D. clavator*

Leaves not terete

Leaves about 3 mm. wide; swollen part of stem  
to 2 cm. long, much wrinkled when old . . 4. *D. truncatum*

Leaves 5 mm. or more wide; swollen part of  
stem longer, ribbed but not conspicuously  
wrinkled

Swollen part of stem strongly 4-ridged, dis-  
tinctly flattened, of two internodes

Midlobe of lip 2 mm. wide, with conspicu-  
ous hairs on its edges .. .. 5. *D. planibulbe*

Midlobe of lip much wider, not hairy on  
edges .. .. 6. *D. fugax*

Swollen part of stem with many ridges, not  
flattened, of about 4 internodes . . 7. *D. crumenatum*

**1. *Dendrobium peculiare*** J.J.S., Bull. Btzg., Ser. 3, 10: 58. 1928.

Stems 30 cm. long, swollen part near base of one internode, sometimes with part of a second, 2-5 cm. long and 10-12 mm. diameter, leafy part of stem 1-5 mm. diameter with internodes of 2-5 cm., leafless apical part 3-6 cm. long; leaves nearly terete, grooved above, to 9 cm. long, 1-5 mm. wide; flowers pure white, upper sepal 7 by 3 mm.; petals 6-5 by 2 mm.; mentum saccate, bent through 2 right angles so that attachment of lip is in front of flower, its back 10 mm. long; lip widening abruptly from a short narrow

claw, 4 mm. long, side-lobes erect with between them 3 purplish keels, midlobe barely 1 mm. long, truncate, with an additional small keel on each side; column 15 mm. high, the foot gradually widening distally with thickened edges, with a greenish gland just below attachment of lip. Originally found on mountains in western Sumatra, in Malaya occurring on forest trees in valleys at Cameron Highlands. Fig. 84,

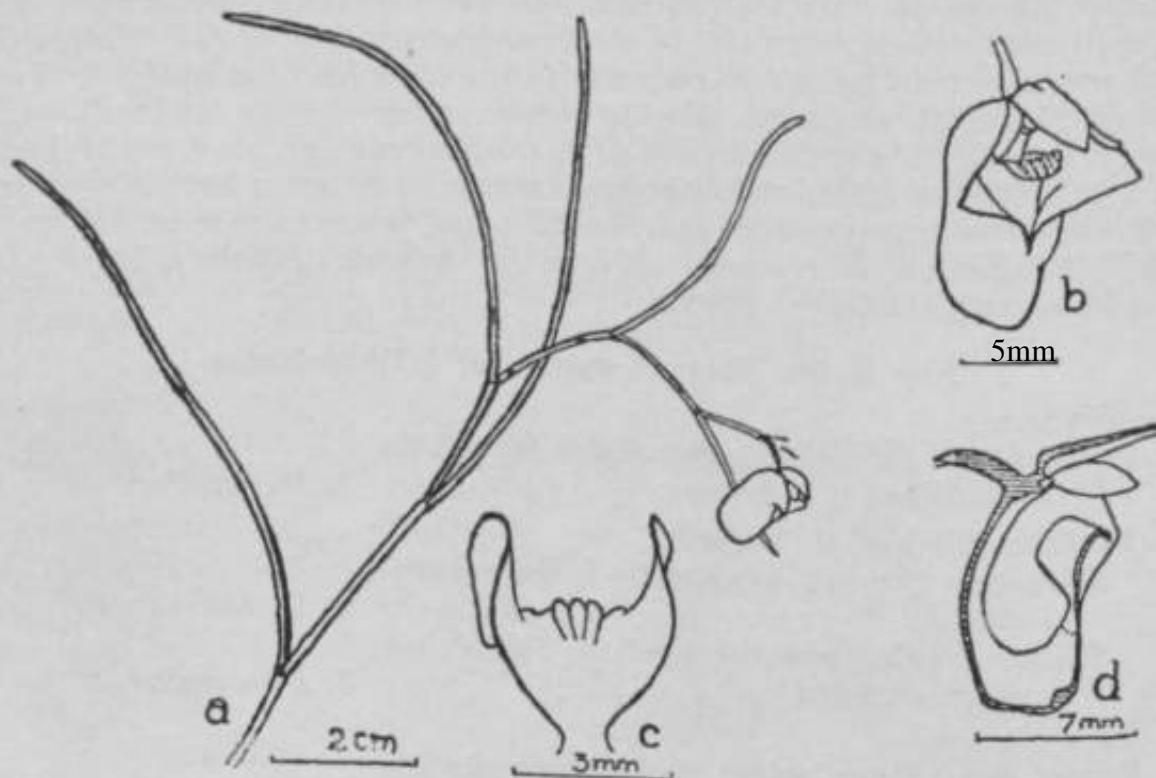


Fig. 84. *Dendrobium peeuliwre*. *a*, part of plant in flower, *b*, flower from front, *c*, inside of lip, *d*, section through flower.

2. *Dendrobium setifolium* Ridl., J.L.S. 31: 270. 1896. Carr, Gard. Bull. 5: 6. 1929.—*D. gradle* quoad Ridl., Flora 4: 41, non Lindl.

Stems to 40 cm. long, very slender; swollen part usually of one internode, up to 3 cm. long and 1.4 cm. thick; leafless end of stem short; leaves 1.5 mm. wide, terete, channelled, 7-12 cm. long, 2-4 cm. apart; flowers 1.8 cm. long, 1.5 cm. wide; upper sepal 8 by 4.5 mm.; petals 8 by 2 mm.; Hp with large side-lobes, curving upwards on either side of the column, their ends cut off square; midlobe small, bilobed, 3 mm. long, base narrow; flowers white with red veins in the side-lobes of the Up and a yellow callus 3 mm. wide at the base of the midlobe. Found at several localities, from Singapore to Peninsular Siam, but apparently not a very common species.

3. *Dendrobium clavator* Ridl., J.L.S. S2: 255. 1896. Flora 4: 41.—*D. mel-litum* Ridl., J.S.B.R.A.S. 41: 32. 1904.

Vegetatively very like *D. setifolium* but the swollen part of the stem often of 2 internodes and a little thicker, and the leaves shorter, not usually over 9 cm. long; flowers pale greenish-yellow, lasting 2 days, fragrant,



5. *Dendrobium planibulbe* Lindl., Bot. Reg. 1843: Misc. 54. RidL, Floi<sup>a</sup> 4; 41.—*D. tubcriferum* Hk. f., F.BJ. 5: 728. 1890. Ic. PL t. 2025.

Stems to 60 cm. long; swollen part of 2 internodes, flattened, to about 4 cm. long and 2 cm. wide, with a low ridge in the middle of each face; young leaves and sheaths flushed with purple; leaves to 5 by 0.8 cm., internodes 1.5-2 cm. long; flowers white with crimson veins in all parts, about 1.5 cm. long, the mentum a little longer than the upper sepal; petals narrow, pointed; lip with broad side-lobes, midlobe very narrow with conspicuous hairs on its edges, about 4 mm. long; a yellowish bilobed callus at the base of midlobe. Vegetatively very near the next species, but the swollen part of the stem shorter and more flattened. Native in Sumatra, Java and Borneo; in Malaya apparently less common than *D. fugax*, but found in Singapore, Pahang and Perak. The flowers are very fragile.

6. *Dendrobium fugax* Schltr., Bull. Herb. Boiss. Ser. 2, 6: 455. 1906. J.J.S., R. U. P. <sup>er</sup> 2, IX, <sup>h</sup> 1913 — \* > • \*' » TM « ^ ° ad J.J.S., FL Buit. B: 82V, t. ^ 48, non Lindl.

Stems to 60 cm. or more long; swollen part 4-winged, distinctly flattened (i.e., the two wings in one plane much narrower than those in the plane at right angles to it), to about 5 cm. long and 2 cm. wide, with a low ridge in the middle of each face; young leaves and sheaths purplish white faintly flushed with pink, or with distinct yellow ridges, disappearing towards the base; midlobe with the acute tip turned downwards. Native in Sumatra, Borneo and Malaya; found in Johore, Pahang and Perak as an epiphyte on trees by rivers, in less exposed places than *D. crumenatum*.

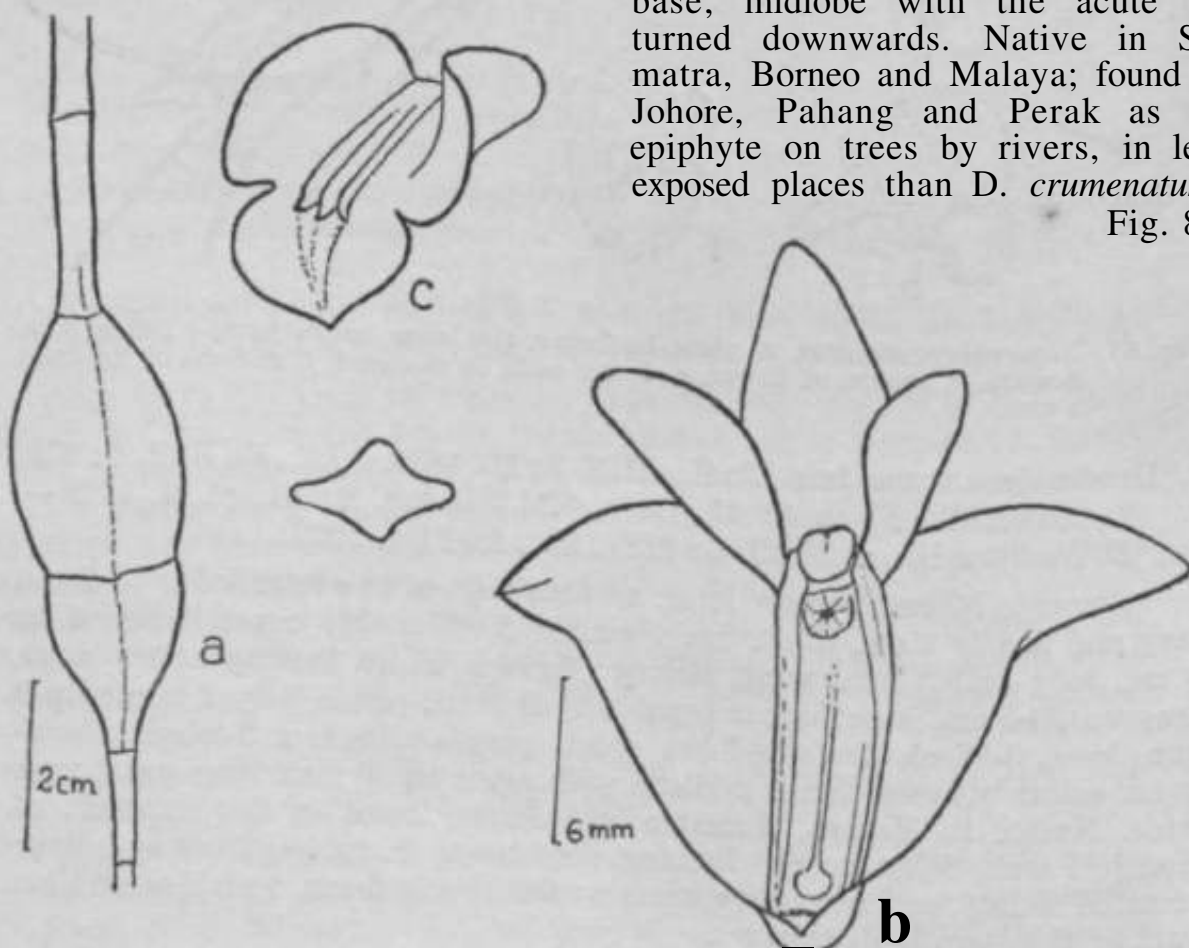


Fig. 86. *Dendrobium fugax*. a, pseudobulb and cross-section of same, b, flower with lip removed, c, lip.

Fig. 86.

7. **Dendrobium crumenatum** Sw., Schrad. Journ. Bot. 2: 237. 1799. Bot. Reg. 25: t. 22. 1839. Bot. Mag. t. 4013. J.J.S., Fl. Buit. 6: 330, f. 249. Ridl., Flora 4: 42. Carr, J.M.B.R.A.S. 6: 49, pi. 5. 1928. Burk., Gard. Bull. 1: 400. 1917. Coster, Ann. Btzg. 35: 125. 1926.

This has been described in some detail on pp. 8 and 14. It differs from *P. fugax* in the longer swollen part of the stem, which consists of several internodes, is not flattened, and when old has many longitudinal ridges; the flowers are larger, less fragile, with wider petals and five keels on the lip. It is widely distributed from India and China throughout Malaysia, including the Philippines, in the lowlands, on trees in fairly exposed places. It has a stronger fragrance than any other species in the section, and perhaps than any other *Dendrobium*, especially in the early morning. The flowers close in the afternoon.

### 16. § Aporum

Stems thin, flattened, short or rather long; leaves laterally flattened (as if the whole shoot had been put into a press), thick and fleshy, broad, overlapping each other at the base, very regularly alternate in two rows, jointed at the base and falling when old; stem leafy to the end, or the upper leaves reduced to sheaths only (as in § Rhopalanthe); inflorescences as in § Rhopalanthe, the flowers in succession from a group of small chaffy bracts which never increases in length, from any node, or only from the leafless stem-apex in species 1-3; flowers small, white or greenish yellow, variously marked with purple or crimson, rather fragile, the lip 3-lobed or simple, without a tubercle on the lower surface.

This group includes some very common lowland epiphytes, all of very similar appearance, and almost all with very small flowers; one of them (*D. aloifolium*) has probably the smallest flowers in the genus *Dendrobium*. The section is most nearly like § Oxystophyllum in general appearance, differing in the characters mentioned under that section. It is however more nearly related to § Strongyle, which in turn is related to § Rhopalanthe. § Aporum is sometimes united to § Strongyle, but seems sufficiently distinct, at least in Malaya, to maintain as a separate section. *D. Mannii* however has flowers very closely resembling those of *D. kentrophyllum*, which is placed in § Strongyle.

#### Key to the Malayan species of Aporum

- Stems with the apical floriferous part bare of normal leaves; flowers white, or white more or less flushed with purple  
 Flowers 4-5 mm. long and wide  
 Flowers white, upper sepal and petals curved back . . . . . 1. *D. aloifolium*  
 Upper sepal, petals and column flushed with purple; sepal and petals erect . . . . . 2. *D. rhodostele*  
 Flowers about 10 mm. long, flushed with purple in all parts . . . . . 3. *D. rosellum*

Stems leafy to apex; flowers yellowish or greenish yellow, sometimes veined with crimson

Lip with distinct side-lobes

Midlobe bilobed; calli not horn-like

Sepals and petals with median purple flush at base

Sepals and petals with several purple streaks

Midlobe entire; calli horn-like

Lip without distinct side-lobes

A large bilobed callus at base of blade of lip

At most a small unlobed callus on lip

Blade of lip 8 mm. wide

Blade of lip 4 mm. wide

Stems prostrate, rooting at short intervals, leaves under 1 cm. long

Stems not prostrate, leaves 1.5-2 cm. long

4. *D. grande*

5. *D. quadrilobatum*  
*D. lobatum*

6. *D. indivisum*

7. *D. Mannii*

8.

9. *D. prostratum*

10. *D. leonis*

1. *Dendrobium aloifolium* (Bl.) Rchb. 1, Walp. Ann. 6: 279. 1861.-*Mastromium aloifolium* Bl., Bijdr. 335, f. 37. 1825.-*Aporum serra* Bl. 1839. *Quesada* P. or Ch. 71, 1859. *Dendrobium serra* Lindl., 3. US. 6. 1859. Kidl., Flora 4: 35.

Stems to about 45 cm. long, the apical part (up to 15 cm.) with sheathing leaves only; leaves to 25 cm. long (outer edge) and 7 mm. white & 4 mm. long and wide; upper sepal under 2 mm. long, 1 mm. Petals bent backwards; lip 35 mm. long, their ends cut off abruptly, the midlobe bilobed, about 1 mm. wide; anther green. Sumatra and Java, & Malaya a common epiphyte throughout the country, in the lowlands. Fig. 87, 88, i.

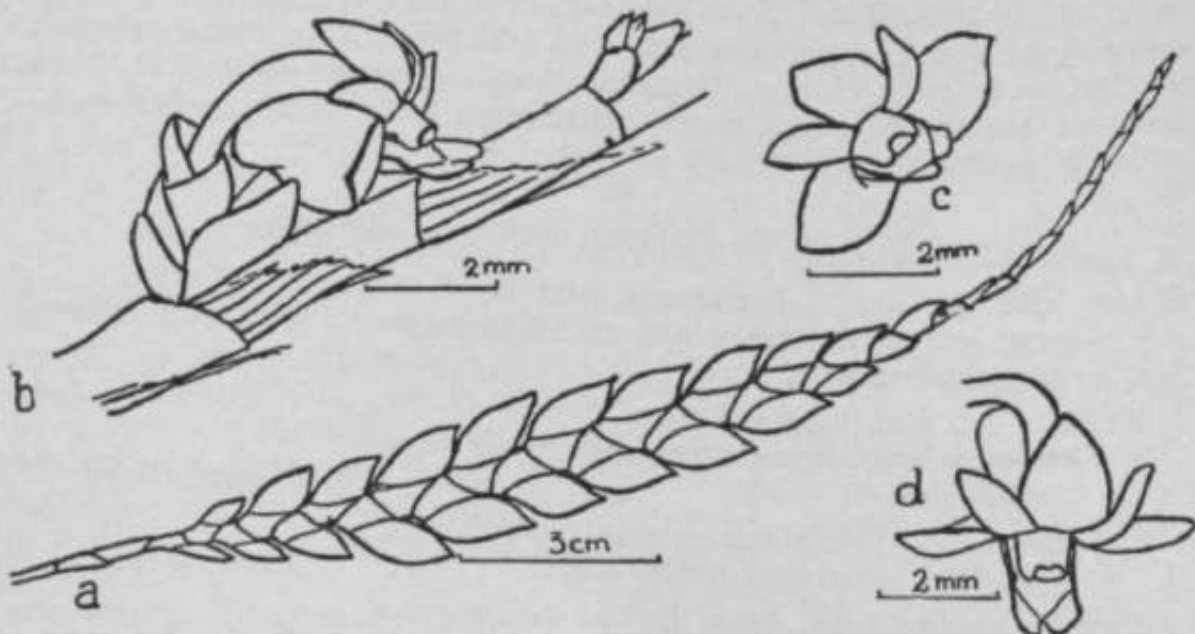


Fig. 87. *Dendrobium aloifolium*. a, a young stem, b, inflorescence, c, d, flowers.



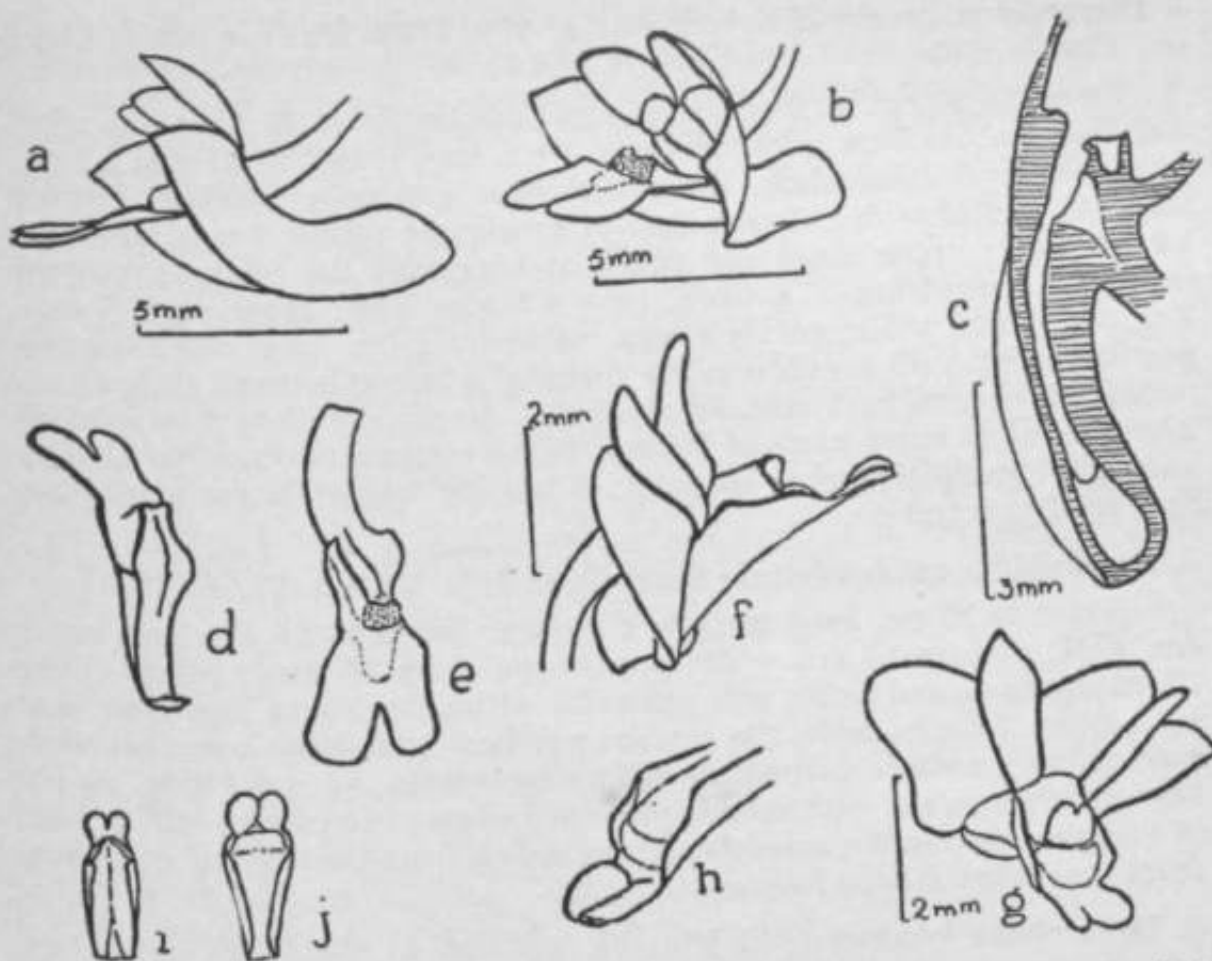


Fig. 88. *Dendrobium rosellum*. a, b, flowers. c, section through column and column-foot. *D. aloifolium*. d, e, flowers. f, g, flowers. h, lip. j, lip from above. *D. rhodostele*. f, g, flowers. h, lip. j, lip from above.

2. *Dendrobium rhodostele* Ridl., Tr. L.S. 3: 360. 1893. Flora 4: 35.

Like *D. aloifolium* in general appearance, but the flowers upper sepal and petals flushed purple, erect or curved backwards, column also purple instead of white, anther cream side of lip curved gently down to the midlobe, midlobe in general outline, deeply cleft. Common on trees by rivers in Pahang, growing with *D. aloifolium*, *D. rosellum* and other species. **Mg.**

3. *Dendrobium rosellum* Ridl., J.L.S. 31: 238. 1896. Flora 4: 35.

Very near to *D. aloifolium* in vegetative characters; flowers long and 7 mm. wide, white, flushed or finely mottled with purple in parts; mentum 5 mm. long, curved backwards towards ovary; sepal and petals curved over column; claw of lip about 7 mm. long, with 3 ridges converging yellow callus at the base of the blade; blade 3 mm. long cleft half the two halves oblong, diverging maximum width 4 mm. epiphyte on trees by rivers in south-east of the Malay Peninsula; its base of the column-foot is peculiar; its end is joined for a short distance to the base of the upper lip, forming a sac-shaped spur, full of nectar, in a pretty bright rose-purple. Fig. 88, a-e.

4. **Dendrobium grande** Hk. f., F.B.I. 5: 724. 1890, Ic. Pl. t. 2024. Ridl., Flora 4: 36.

Stems to 50 cm. or more long, pendulous, leafy to the apex, the stem with leaves about 5 cm. wide; leaves to 6 cm. long (outer edge) and 1.5 cm. wide, acute, oblique, close, the apical ones gradually smaller; flowers yellowish, tinted with red near base of sepals and petals, 9 mm. wide and 1.2 cm. long; upper sepal and petals arching over the column; mentum curved in a quadrant of a circle, nearly 7 mm. long; upper sepal 5 mm. long and 4 mm. wide; petals 2 mm. wide; lip 1 cm. long, side-lobes triangular, erect, with a yellow callus forming a bridge between their bases, midlobe 7 mm. wide, 3 mm. long, elliptic, deeply cleft into two rounded lobes. Found in many parts of Malaya, to the extreme north, often high up on trees, apparently never common; it has the largest leaves among the species of this section.

5. **Dendrobium quadrilobatum** Carr, Gard. Bull. 5: 4, t. IV, A. 1929.

Stems to 30 cm. long, leafy to the apex; leaves to 2.5 cm. long and 1 cm. wide; flowers 1.1 cm. wide; upper sepal 5 by 4.5 mm.; petals 4.5 by 2.5 mm.; sepals and petals pale yellowish with conspicuous purple stripes; hp 3-lobed, 7.5 mm. wide, the surface papillose; side-lobes erect, rounded, pale yellow; midlobe turned abruptly downwards, 5.5 mm. wide, deeply bilobed, lobes yellow with minutely toothed edges; two orange calli at base of midlobe between the side-lobes. Only known from the original collection, from the Tahan River, Pahang,

6. **Dendrobium lobatum** (Bl.) Miq., Fl. Ind. Bat. 3: 631. 1850. Ridl., Flora 4: 36.—*Ayurum lobatum* Bl., Bijdr. 334. 1825.

Stems long, pendulous, branching, to 100 cm. or more long, the stem with leaves about 2.5 cm. wide; leaves flushed with purple when young, to 3 cm. long (outer edge) and 5-8 mm. wide, oblique, acute, more spaced than in most other species, flowers pale greenish yellow, flushed with purple in centre of petals and under the claw of the lip, 7 mm. wide; upper sepal 3 mm. long, ovate, obtuse; petals narrower; mentum 5 mm. long, straight; hp with claw 3.5 mm. long and blade sharply turned down in front; blade broader than long, 5 mm. wide, with narrow acute side-lobes, the broad midlobe between them much shorter, 3 mm. wide and under 1 mm. long; callus of two yellow horns curved forwards and diverging. Distributed in Sumatra, Java and Borneo, and found in all parts of Malaya, in the lowlands, especially on trees by rivers, often abundant. **Fig. 89, a-d.**

7. **Dendrobium indivisum** (Bl.) Miq., Fl. Ind. Bat. 3: 630. 1859. J.J.S., FL Buit. 6: 338, f. 257. Bull. Botz., Ser. 2, IX: 62. 1913.—*Aporum indivisum* Bl., Bijdr. 334, f. 39. 1825.—*Dendrobium eulophotum* Lindl., J.L.S. 3: 5. 1859. Ridl., Flora 4: 35.

Stems to 30 cm. long, leafy throughout, stem with leaves about 2 cm. wide; leaves to 2.5 cm. long (outer edge) and 6 mm. wide, acute, oblique, distinctly separated; flowers at many nodes, about 8 mm. wide, pale greenish, the sepals and petals with crimson veins; upper sepal 3 by 2 mm.; petals 1 mm. wide, all bent forwards over column; claw of lip 3 mm. long; blade short and broad, curved downwards in front and shortly tipped,

4 mm. wide; a broad pale callus at the base, in contact with the column. Distributed in Borneo, Sumatra and Java; found in all parts of Malaya in more exposed places than some species of this genus, often flowering at many nodes simultaneously. The flowers may vary from 7 to 9 mm. in width.

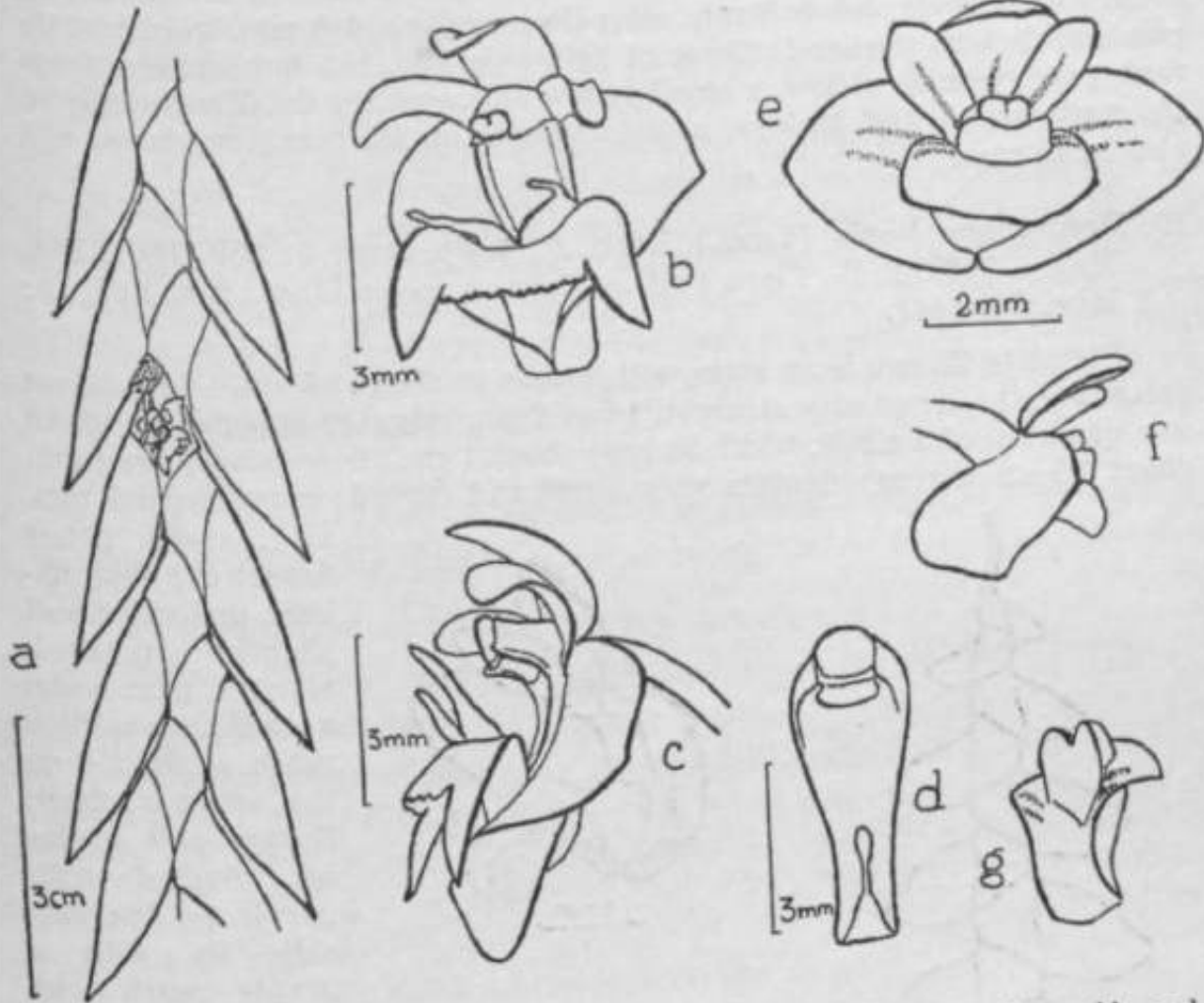


Fig. 89. *D. Mannii*

a, stem and leaves; b, c, flower from side and from side; d, sepal; e, f, flower from front and from side; g, inside of lip without base.

8. **Dendrobium Mannii** Ridl., J.L.S. 32: 246. 1896.-D. *terminata* quoad  
 Ridl., Flora 4: 36, non Par. et Rchb. f.

Stems to 15 cm. long; leaves to about 2 by 0.8 cm. sometimes from leafless old stems, often in pairs, pale yellowish; upper sepal 7 by 3.5 mm.; petals 2 mm. wide, curved, 13 mm. long; lip widening gradually from narrow base, 8 mm. wide, hardly 3-lobed, slightly cleft at the apex, with a bright yellow or orange spot in the centre. Only known from Mt. Ophir, and one from the Sedih River. The specimen has a pair of flowers from the middle of a leafless stem; the Sedili Plant (a smaller one) a solitary flower from the top of a stem retaining



## 17. § Oxystophyllum

Leaves regularly alternate and laterally compressed as in § Aporum, but proportionately narrower, more overlapping at the base; stems always leafy to the apex; inflorescences apparently terminal (sometimes several together) or at any node, distinctly elongating with a succession of regularly alternating bracts; flowers yellowish or dark purple, rather thick in texture; lip narrow, without side-lobes, bent forwards at an obtuse angle at about the middle, fleshy, with a small conical wart on the lower surface near the tip.

This section is distributed throughout Malaysia. The species are all rather similar, and careful descriptions are necessary to distinguish them - they need further study. There appear to be at least five species in Malaya, in both lowlands and mountains, but recorded data at present are insufficient to enable a satisfactory account of them to be written. In Ridley's *Flora*, the name *D. atropurpureum* is used, apparently to cover two distinct species; but the name was originally given to a New Guinea plant which is different from those in Malaya.

## Key to § Oxystophyllum as at present known in Malaya

Flowers 1-1-1-2 cm. long

- Flowers yellow, or orange-yellow . . . . . *D. sinuatum*  
 Flowers entirely deep red-purple . . . . . *D. atro-rubens*

Flowers 8-9 mm. long

- Flowers yellow or pale greenish, with or without slight flush of purple  
 Lip with purple V-shaped fleshy swelling forming a narrow band just within the edges at the apex . . . . . *D. excavatum*  
 Lip with the whole apical area on the upper surface swollen and finely papillose . . . . . *D. carnosum*  
 Flowers deep red-purple . . . . . *unidentified*

**Dendrobium sinuatum** (Lindl.) Lindl., *Rchb. f.*, *Walp. Ann.* 6: 280. 1861. *Ridl.*, *Flora* 4: 37.—*Aporum sinuatum* Lindl., *Bot. Reg.* 27: Misc. 1. 1841.—*Dendrobium paniferum* J.J.S., *Bull. Btzg.*, Ser. 2, XIV: 34. 1914 (?).

**Dendrobium atrorubens** *Ridl.*, *J.L.S.* 32: 247. 1896. *Flora* 4: 37.

*D. sinuatum* and *D. atro-rubens* differ also in the following points; *D. atro-rubens* has broader leaves, larger inflorescences (often a group at the stem-apex) and a narrower lip (about 3-5 mm. wide as against 5 mm. for *D. sinuatum*). *D. atro-rubens* is apparently only found in the mountains, *D. sinuatum* also in the lowlands. Both have the lip slightly cleft at

the end, and a fleshy swelling on either side of a median groove near the apex on the upper surface; both have numerous small notches in the edge of the blade. *D. sinuatum* probably occurs also in Java; *D. atro-rubens* is only known in Malaya. Fig. 91, i.

*Dendrobium excavatum* (Bl.) Miq., Fl. Ind. Bat. 3: 644. 1859. J.J.S., FL Buit. 6: 341. Bull. Btzg., Ser. 2, XXVI: 37. 1918; Ser. 8, 9: t. 5. 1927. —*Oxystophyllum excavatum* Bl., Bijdr. 336. 1825.—*D. atropurpureum* quoad RidL, Flora 4: 37, p.p.

A species known in Java, Borneo and Sumatra; it occurs on old *Dacrydium* trees on Penang Hill and is common at Cameron Highlands. The sepals and petals are pale green with or without a slight purplish flush.

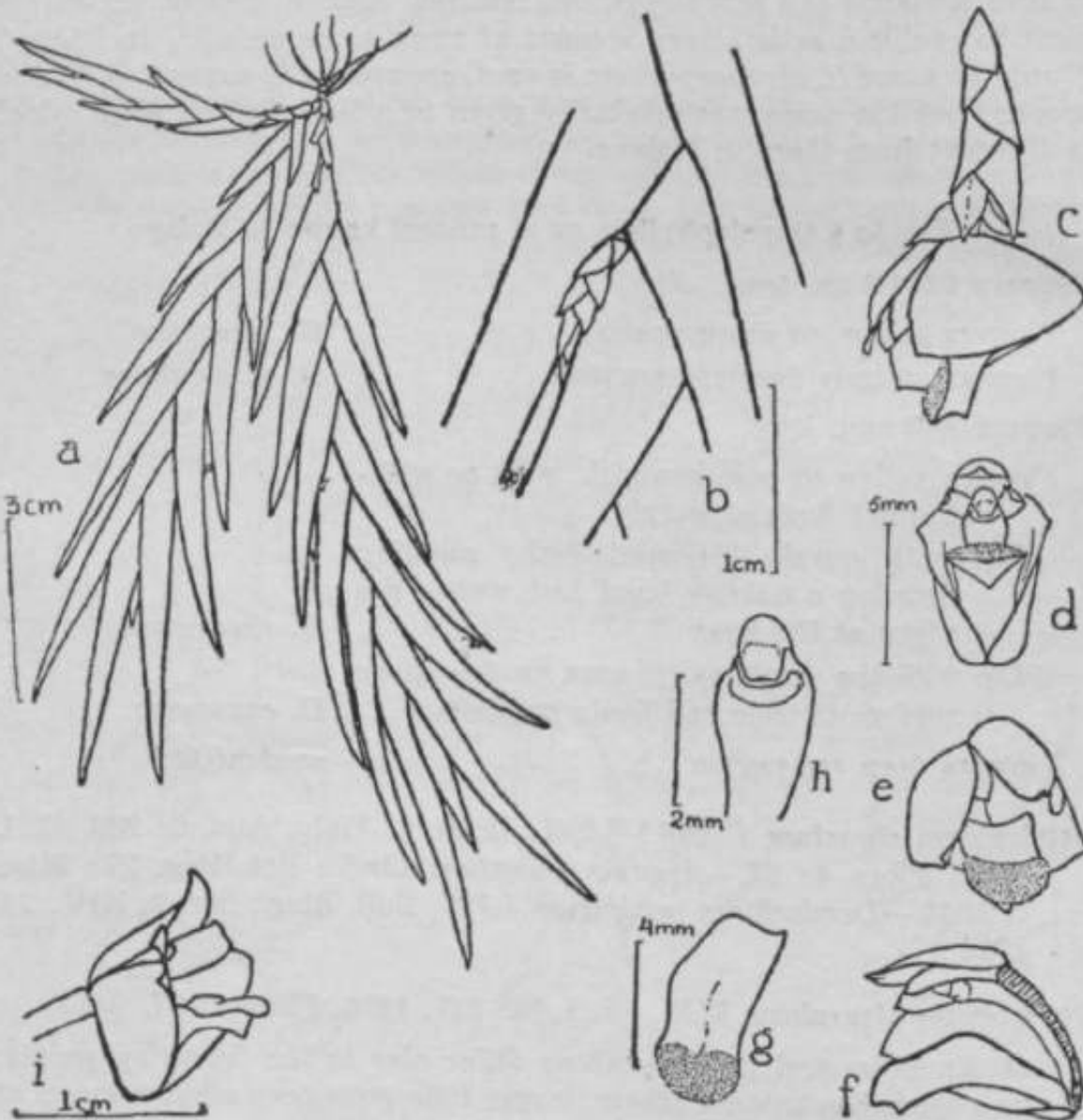


Fig. 91. *Dendrobium carnosum*. a, habit of plant, ft, inflorescence bracts, c, flower with its bracts, d, e, flower from front and from above. f, side view of flower with one sepal removed, g, upper surface of lip. h, column. *D. atropurpureum*. i, flower from side.

**Dendrobium carnosum** (Bl.) Rchb. f., Walp. Ann. 6: 280. 1861. J.J.S., FL Buit. 6: 342, f. 259.—*Oxystophyllum carnosum* BL, Bijdr. 335. 1825.. —*D. atropurpureum* quoad Ridl., Flora 4: 37, p.p.

Very similar to *D. excavatum* in its leaves. It has clear yellow or pale green flowers, sometimes finely purple-spotted. It is a lowland species, found also in Java and Sumatra. Fig. 91, a-h.

The unidentified species is apparently very near *D. carnosum*, but with purple flowers. No details except the flower-colour have been reported, and further information is required.

### 18. § Strongyle

This section is rather intermediate between § Rhopalanthe and § Aporum. The stems are thin throughout, lacking the basal swelling of § Rhopalanthe; they usually have a leafless terminal part, bearing flowers from small groups of chaffy bracts, exactly as in § Rhopalanthe, but the leafless part is in one case very short. The leaves are terete, or laterally compressed as in § Aporum but much narrower, usually longer, and not overlapping at the base. The flowers are small, or rather small, usually lasting a day; the lip may have conspicuous side-lobes, or not. Several species have very similar flowers; in these, vegetative distinctions are more important than floral ones.

#### Key to the Malayan species of § Strongyle

- Flowers 2-5 cm. long, leaves to 10 cm. long . . . 1. *D. teres*  
 Flowers to 1-7 cm. long, leaves to 5 cm. long  
 Flowers from leafless upper portion of stem  
 Leaves spreading, curved  
 Leaves 3-5 cm. long; flowers about 1-2 cm.  
 long . . . . . 2. *D. acerosum*  
 Leaves under 2 cm. long; flowers about 8  
 mm. long . . . . . 3. *D. subulatum*  
 Leaves at a very small angle to the stem .. 4. *D. flexile*  
 Stem leafy to top, flowers' apparently terminal,  
 or lateral near top of leafless stems .. 5. *D. kentrophyllum*

**1. Dendrobium teres** Lindl., Bot. Reg. 29: Misc. 111. 1840. Hk. f., Ann. Calc. 5: t. 11. 1895. Ridl., Flora 4: 38.

Stems to 40 cm. or more long; leaves to 10 cm. long, terete, slightly curved, about 3 mm. thick; flowers 2-5 cm. long, not opening widely, rather fleshy, white with orange veins and keels on the lip; upper sepal 1-4 by 0-7 cm.; mentum 9 mm. long, acute; petals 4 mm. wide; lip 1-7 cm. long; side-lobes broad, erect on either side of the column, with rounded ends; midlobe concave with a fleshy narrowly triangular tip and 3 low hairy orange keels. This species has been found chiefly in Singapore and Johore; also on

Maxwell's Hill, Taiping. It probably occurs in other parts of Malaya as an epiphyte under fairly moist conditions, but is evidently not common. The curious, slightly-opening flowers face downwards. Fig. 92.

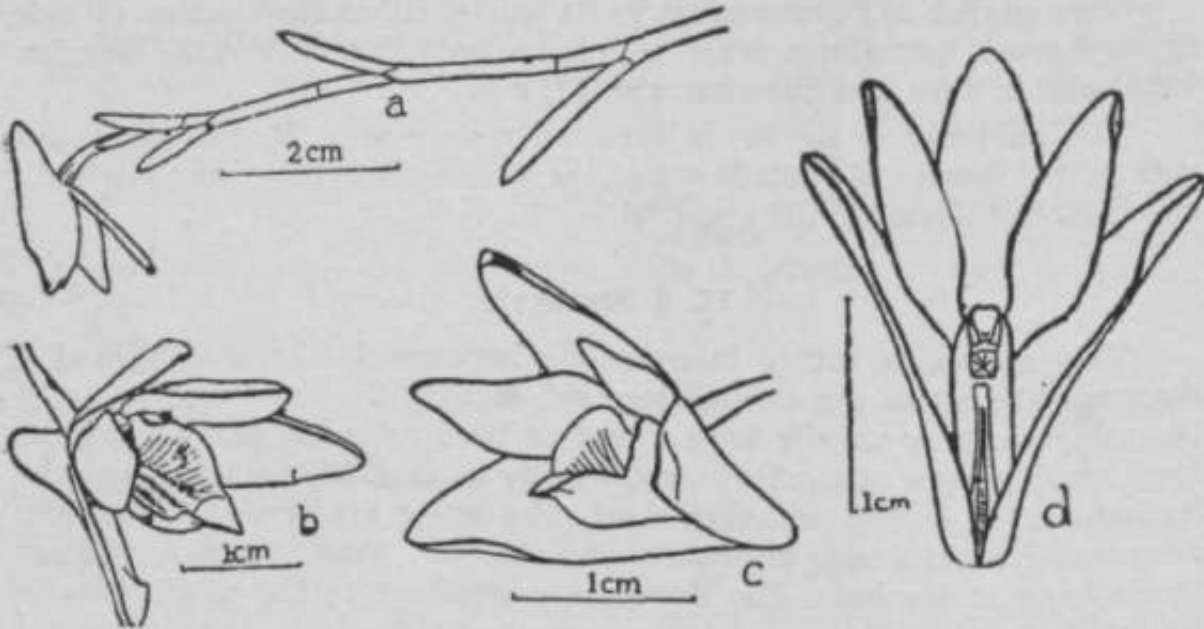


Fig. 92. *Dendrobium teres*. a, stem and flower in natural position, b, c, flower from front and from side, d, flower with lip removed,

2. *Dendrobium acerosum* Lindl., Bot. Reg. 30: Misc. 86. 1841. Ridl., Flora 4: 38.

Stems flexuous, to 25 cm. long, the basal half to two-thirds leafy; leaves 7 to 10, curved, 3-4 cm. long, laterally flattened, up to 4 mm. wide,

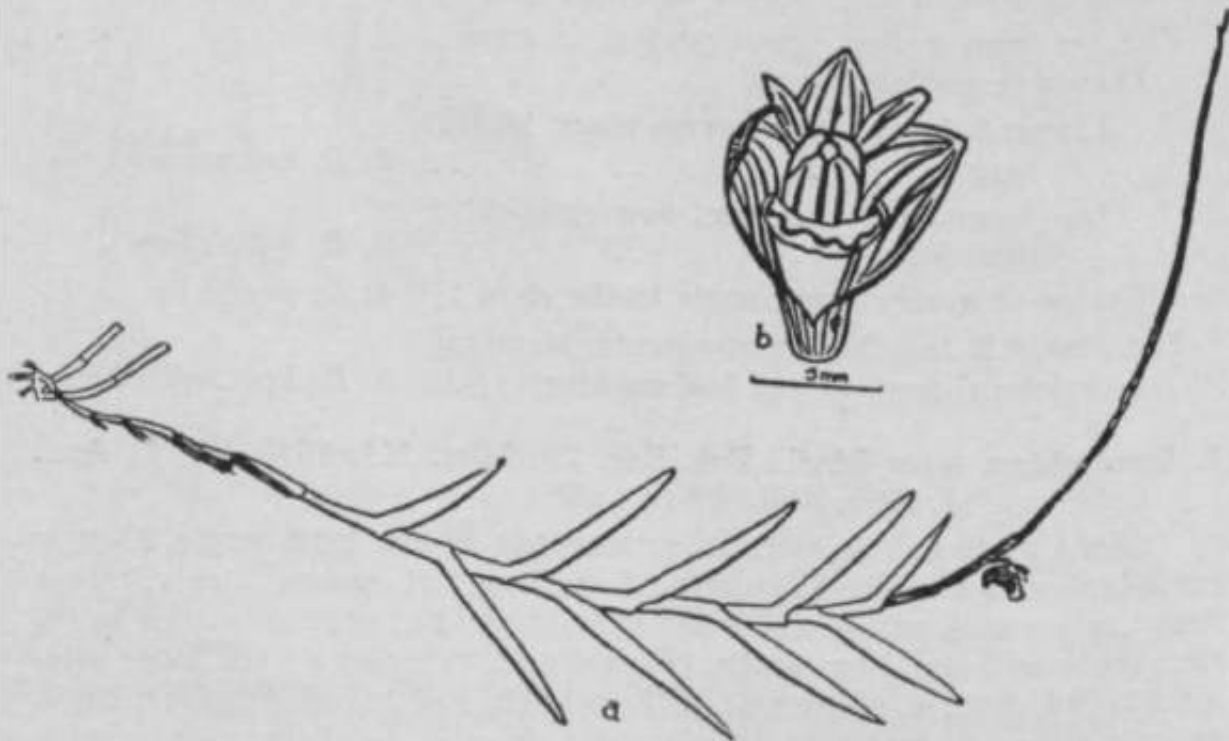


Fig. 93. *Dendrobium acerosum*. a, plant, b, flower from front.



with a sharp tip; flowers pale greenish yellow, about 1-2 cm. long and 1 cm. wide; upper sepal 3 mm. long and wide; mentum long, curved forwards; petals 1 mm. wide; sepals, petals and column-foot all with strong purple veins; lip without side-lobes, the end curved forwards, cleft, 5-5 mm. wide, the middle hardly thickened, with an orange spot. A variety with very pale veins also exists. In Borneo this species may have flowers 1½ cm. long, apparently otherwise the same, and such a large-flowered variety possibly occurs in Malaya. *D. acerosum* is found as an epiphyte in moderately open places in all parts of Malaya; it is undoubtedly a variable species, needing more study. Fig. 93.

3. *Dendrobium subulatum* (Bl.) Lindl., Gen. et Sp. Orch. 71. 1830. J.J.S., Fl. Buit. 6: 334, f. 252. Ridl., Flora 4: 39.—*Onychium subulatum* Bl., Bijdr. 328. 1825.

Very like *D. acerosum*, but smaller in all parts; the stems flexuous, with spreading curved leaves up to 1-5 cm. long, internodes about 5 mm. long; leafless apex of stem comparatively long and slender; flowers about 8 mm. long, shaped and coloured as in *D. acerosum*. Native in Sumatra, Java and Borneo; found in the lowlands in many parts of Malaya, on old trees in sheltered places. This species needs study in comparison with *D. acerosum*. A possibly distinct species, near *D. subulatum*, occurs at Cameron Highlands.

4. *Dendrobium flexile* Ridl., J.L.S. 32: 251. 1896. Flora 4: 39.

Stems to about 12 cm. long, the upper 3 cm. bare of leaves; leaves to about 1-6 cm. long, slender, acute, terete, close to the stem; internodes 6-10 mm. long; flowers 1-2 cm. long; mentum curved, 8 mm. long; upper sepal 3 mm. long; petals very narrow; lip hardly lobed, the blade 7 mm. wide, with a raised central band ending in an orange spot, flowers otherwise white. Only known from Singapore and Johore, on trees by rivers and in old mangrove.

5. *Dendrobium kentrophyllum* Hk. f., F.B.I. 5: 725. 1890. Ic. PL t. 2021, —*D. albicolor* Ridl., J.L.S. 32: 250. 1896. Flora 5: 337.—*D. capitellatum* J.J.S., Ic. Bog. 3: 12, t. 206. 1906.

Stems to 20 cm. long, leafy to the end; leaves oblique, slightly curved outwards, flattened, acute, to 3-5 cm. long and 6 mm. wide; flowers apparently terminal, often in a small group (one from each of several short inflorescences), or from nodes near the end of leafless stems; flowers 1-7-1-9 cm. across, pale greenish yellow, sometimes flushed with pink outside; mentum about 1 cm. long, curved; upper sepal to 8 by 3-5 mm.; petals narrower; lip without distinct side-lobes, the end cleft, to 8 mm. wide, with a median yellow band; column-foot flushed with pink near junction with the lip. Native in Tenasserim, Sumatra and Borneo; in Malaya found on Taiping Hills, at Cameron Highlands and Fraser's Hill at about 4,000 feet altitude.

## 19. § Grastidium

Plants with long slender stems and rather long, thin, often grass-like leaves, well spaced; inflorescences usually at many nodes, always of two flowers, the bracts short, stiff, sheathing and flattened, at right angles to the stem, of very characteristic appearance; flowers rather small, with relatively short broad mentum, lasting one day.

This is a small group of species, extending throughout Malaysia; in the Peninsula three are found. They are easy to recognize from their slender, usually pendulous stems and rather grassy leaves, and by their peculiar bracts. The species are distinguished as follows:—

- |   |         |                            |
|---|---------|----------------------------|
| Petals and sepals about 12 cm. long, strongly curved and very narrow; lip short, with distinct side-lobes | .. .. . | 1. <i>D. pensile</i>       |
| Petals and sepals shorter, not strongly curved; lip without side-lobes                                    |         |                            |
| Petals and sepals gradually narrowed to their tips  | .. .. . | 2. <i>D. indragiriense</i> |
| Petals and sepals rather suddenly narrowed near tips  | .. .. . | 3. <i>D. salaccense</i>    |

**1. *Dendrobium pensile*** Ridl., J.L.S. 32: 253. 1896. Flora 4: 40.

Stems to 120 cm. or more long, pendulous; leaves to about 10 by 2 cm., gradually narrowed to a blunt tip; flowers pale yellow; sepals and petals 1-2 cm. or more long, the sepals 2 mm. wide above the base, the petals narrower; sepals strongly curved forwards, petals similarly backwards, not twisted; lip short, with rather acute triangular side-lobes; midlobe turned downwards, ovate, acute; a broad central band in the basal part of the lip flushed with red. Found on trees by rivers and in old mangrove in Singapore, Johore and Pahang, rarely flowering. A new description is needed, the size and arrangement of the floral parts as above specified being a little uncertain.

**2. *Dendrobium indragiriense*** Schltr., Fed. Rep. 9: 164. 1911.—*D. inconspicuiiflorum* J.J.S., Bull. Btzg., Ser. 2, XXV: 42. 1917. Carr, Gard. Bull. 5: 6, pi. IV, B. 1929; and 7: 14. 1932.—*D. gemellum* quoad Ridl., Flora 4: 40 (non Lindl.) *p.p.*

A very slender species, stems to 100 cm. long, leaves to 13 by 0.7 cm.; flowers about 1-2 cm. long, pale yellow with a raised orange band down the centre of the lip; petals and sepals with long slender spreading tips; mentum short and broad; lip without side-lobes, curved forwards, the end with slightly crisped edges and a few hairs on three raised veins. Found in Sumatra, and at several localities in Malaya. The flowers appear to respond to the same stimulus as *D. crumenatum*, but records are few. **Fig. 94.**

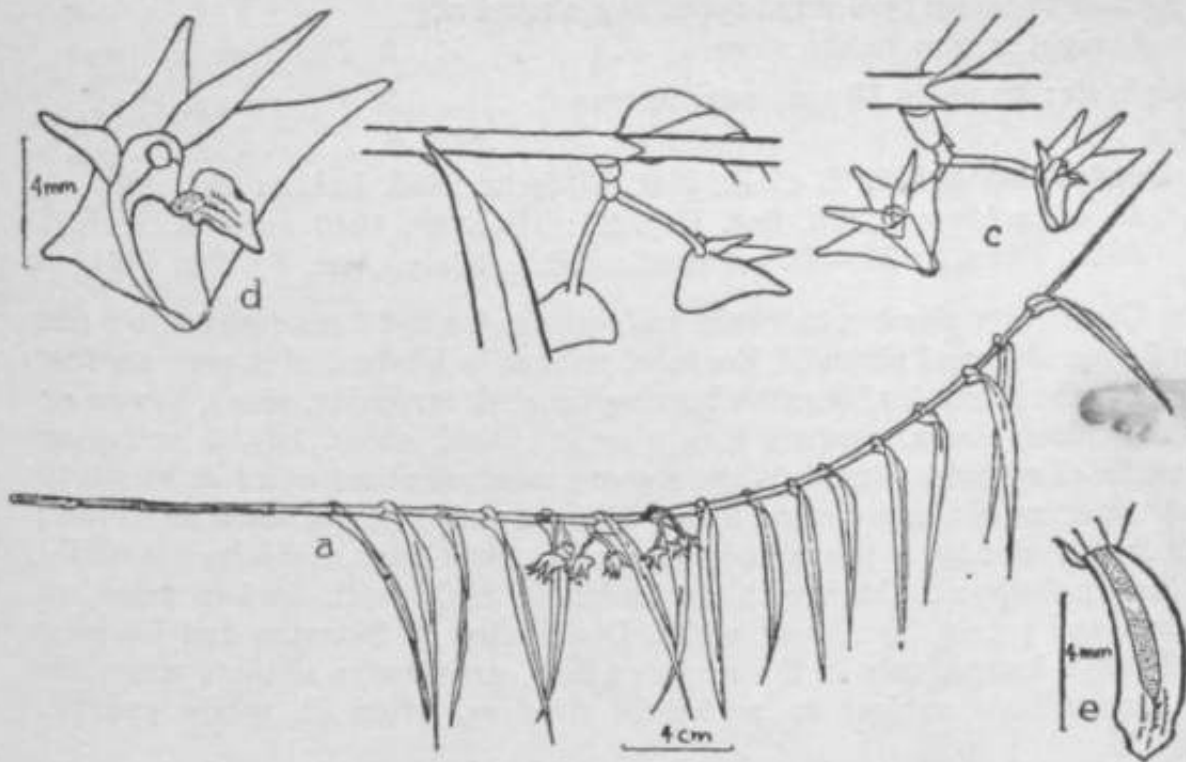


Fig. 94. *Dendrobium indragiriense*\* a, stem and inflorescences, b, c, inflorescence from side and from front, d, flower from front, e, lip pulled down.

3. *Dendrobium salaccense* (Bl.) Lindl., Gen. et Sp. Orch. 86. 1830. J.J.S., Fl. Buit. 6: 348, f. 264. Bull. Botz., Ser. 2, IX: 67. 1913. Carr, Gard. Bull. 5: 6. 1929; 5: 128. 1930. *Grastidium salaccense* Bl., Bijdr. 335. 1825.—*Dendrobium gemellum* quoad Ridl., Flora 4: 40, p.p., non Lindl.

Much like *D. indragiriense* in habit, but rather stouter, the leaves wider (to 1.7 cm. wide), the flowers white or pale yellow, about the same size, but sepals and petals not pointed, and lip with a narrow central yellow band (or brownish with a white band?), not reaching the tip. A large variety is reported from Java, having flowers 1.8 cm. wide. The species has been found in several parts of Malaya, from extreme north to south. The extent of colour variation is uncertain.

#### 20. § Conostalix

This small section is very near to § *Distichophyllum*, and should perhaps be united to it; but § *Conostalix* species have slender wiry stems, with narrower leaves and hairy leaf-sheaths, by which they are easily distinguished. The flowers appear singly or in pairs from any node on the leafy stems, as in § *Distichophyllum*, and are of similar smallish size and dull colouring. The base of the lip is joined to the sides of the column-foot to form a closed spur. The three species are distinguished as follows:—

Terrestrial; leaves to 6 cm. long and 6 mm. wide

Leaves to 6 cm. by 5 mm., at a very narrow

angle to the stem . . . . . 1- *D. Lobbii*

Leaves to 5 cm. by 6 mm., spreading almost at  
 right angles to the stem .. .. . 2. *D. melanochlamys*  
 Epiphytic; leaves to 10 cm. long, narrower .. . 3. *D. pachyglossum*

1. **Dendrobium Lobbii** T. et B., Nat. Tijdschr. Ned. Ind. 5: 491. 1853.—  
*D. calcaratum* Lindl., Bot. Reg. 27: Misc. 89. 1840 (non A. Rich.).  
 Ridl., Flora 4: 39.—*D. conostalix* Rchb., Walp. Ann. 6: 292. 1861.

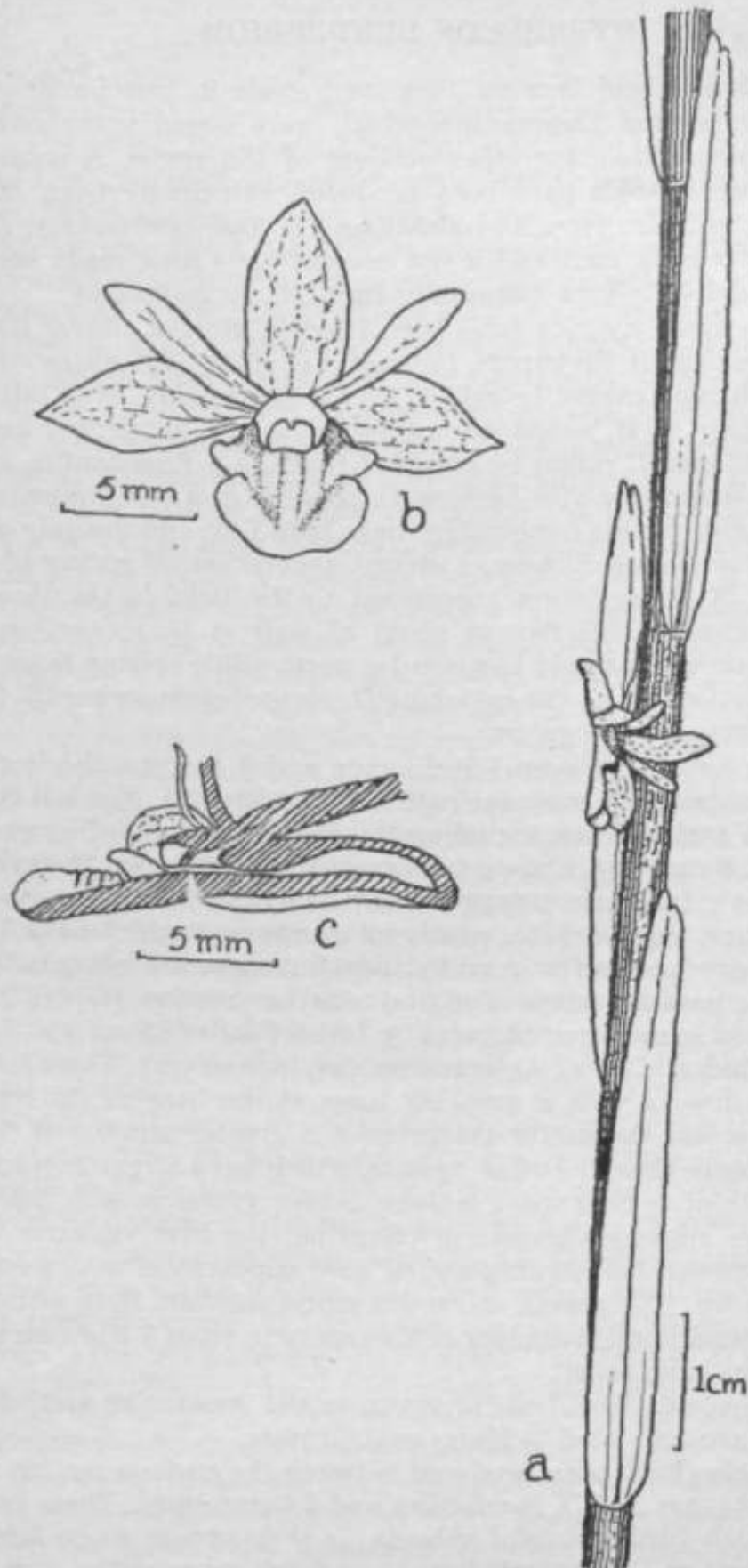
Stems very slender, to 70 cm. tall, internodes to 2-5 cm.; leaves to 6 cm. by 5 mm. stiff and straight, the apex unequally bilobed, at a very narrow angle to the stem; leaf-sheaths bearing twisted, irregular, short, brown or nearly black hairs; flowers singly or in pairs, about 1-4-1-5 cm. long (length of mentum plus lip), the slender mentum about equal in length to the upper sepal; upper sepal about 7 by 3-5 mm.; petals much narrower; lip fleshy, straight, the side-lobes small, tooth-like, mid-lobe roundish, notched; flowers light brown (greenish in bud) with darker veins on sepals and petals, lip almost white. Distributed in Sumatra and Borneo; in Malaya known only in the southern half, growing in shallow water, or in stream-beds subject to periodical flooding, often in sandy ground. **Fig. 95.**

2. **Dendrobium melanochlamys** Holtt, Gard. Bull. 11: 280. 1947.—*Dendrobium villosulum* Wall., Hk. f., F.B.I. 5: 728. 1890. Ridl., Flora 4: 40 (not *D. villosulum* Lindl. 1852).

Stems to about 100 cm. tall, a little thicker than in *D. Lobbii*, internodes 1-2 cm. long; leaves spreading almost at right angles to the stem, to 5 cm. by 6 mm., tapering to the unequally bilobed apex; sheaths conspicuously black-hairy; flowers solitary, yellowish with pale red veins, about 1-5 cm. long; mentum slender, about equal to the upper sepal in length; lip with narrow erect blunt side-lobes, midlobe rounded, yellow. Found in lightly shady places, in a litter of decaying leaves, in several localities from Kedah Peak in the north to Singapore; said to be locally abundant on Mt. Ophir; not reported outside Malaya.

3. **Dendrobium pachyglossum** Par. et Rchb. f., Tr. L.S. 3: 149. 1873. Hk. f., Ann. Calc. 5: 8, pi. 12. Ridl., Flora 4: 40.—*D. abietinum* Ridl., J.L.S. 32: 252. 1896.

Stems pendulous, distinctly flexuous, to about 50 cm. long; internodes 1\*5 to 2-5 cm. long; leaves grass-like, to 10 cm. long and 2-5 mm. wide, spreading obliquely, curved, the sheaths bearing black or dark brown hairs; flowers in pairs, about 9 mm. long, the proportions much as in the two preceding species, pale greenish or pinkish with light purplish veins; lip pale yellowish green, side-lobes small, erect, their forward ends rounded, midlobe only slightly projecting beyond them, slightly cleft; two keels from base of lip to base of midlobe. Found in Tenasserim, and southwards to G. Raya (Langkawi), Kedah Peak and Taiping Hills.



Fig, 95, *Dendrobium. Lobbi* L. a, part of stem with leaves and flower, b, flower from front, c, flower in section.

## HYBRIDS OF DENDROBIUM

The earliest hybrid Dendrobiums were made in Europe by crossing species of the section Eugenanthe, which were found more suitable to greenhouse culture than the other sections of the genus. A considerable number of such hybrids have been produced, principally from *D. nobile* and its allies, and also from *D. pulchellum* (*D. Dalhousieanum*), *D. anosmum* (*D. superbum*) etc.; and a few crosses have been made between § Eugenanthe and § Callista (especially from *D. chrysotoxum*).

A few of these hybrids have been tried in Malaya. Royal Sovereign flowers occasionally in Singapore, but never at more than one or two nodes simultaneously, and cannot be said to give a fine display. It is fairly clear that the progeny of *D. nobile* are on the whole not floriferous under our climatic conditions. It might be expected that the § Eugenanthe X § Callista hybrids would do better here, as *D. chrysotoxum* will flower in Singapore, but hybrids of this combination have been few, and the only one tried in Singapore is Gatton Sunray, a second generation off-spring of *D. pulchellum* and *Z. chrysotoxum* (presented to the Botanic Gardens by Sir Jeremiah Colman). This flowers about as well as *D. pulchellum*, but is hardly so vigorous. It would however be worth while raising more hybrids of this nature locally, as the colour of *D. chrysotoxum* is hardly found in any other species of the genus.

A single hybrid between § Pedilonum and § Eugenanthe is reported, namely *D. anosmum* X *sanguinolentum* (Rhodostoma). For hill culture in Malaya more such crosses, including the larger local § Pedilonum species and the best Burmese § Eugenanthe species, would be worth trying. It is not known how far these groups are inter-fertile.

The section Nigrohirsufce, nearly all members of which have fine white flowers, has produced a few good hybrids, but these are not greatly different from the parent species. The first was Lawrencece (*Lowii* X *formosum*), followed in more recent years by Isabel Sander (*Sanderse* X *Dearei*) and Nelly Sander (*Dearei* X *formosum* var. *giganteum*). These latter have large white flowers with a greenish tinge at the base of the lip; the *D. Dearei* parent has the useful character of a greater number of flowers in one inflorescence than the other species, which have larger flowers. A new hybrid produced in Singapore is John Nauen (*formosum* X *takahashii*), which proves slightly variable in colouring, the best varieties having a large white flower, long-lasting and of good appearance, with a fine orange flush in the lip. The plants are much more vigorous than either parent under local conditions. Attempts in Singapore to cross § Nigrohirsutse with § Ceratobium have failed.

A few hybrids have been produced in the Australian section Dendrocoryne, but are not suited to Malayan conditions.

A few also have been produced between the curious section Latourea (*D. macrophyllum* and *D. spectabile*) and § Ceratobium. These two groups should furnish further useful hybrids, as they appear to be freely inter-fertile. A plant of *D. macrophyllum* X *undulatum* has grown well in Singapore, but for many years failed to flower.

From the Malayan point of view, by far the most important hybrids are those within the sections Phalsenanthe and Ceratobium, with *D. phalxnopsis* as the central species. All these hybrids grow and flower much better in Malaya than the Eugenanthe hybrids; and their long slender graceful sprays of long-lasting flowers are most decorative and useful for cut-flower purposes. These species are not easy to grow in glass-houses in Europe, and their flowers cannot compare in size or showiness with the Odontoglossums and Cymbidiums which are so popular. Hence it is not surprising that Phalaenanthe-Ceratobium hybrids have been little raised in temperate regions, and it is only since 1931 that any number of them have been produced. Apart from Louis Bleriot (*superbiens* X *phalsenopsis*), the earliest of these hybrids was Pauline (*phalxnopsis* X *undulatum*) which was actually flowered for the first time in New York in October 1931 and in England in January 1932. This was quickly followed by a considerable number of other hybrids in Java, Singapore and Ceylon.

This group of hybrids has one drawback, namely the almost uniform mauve and purple colour, without any clear yellow flowers. If the true yellow of *D. chrysotoxum* could be combined with the desirable characters of the Ceratobium group a fine new series would result, but this has so far failed of success. The Eugenanthe and Callista sections are not freely inter-fertile with § Ceratobium and § Phalsenanthe, but further attempts are worth making. Meanwhile, the developments within Ceratobium-Phalsenanthe are towards richly coloured deep purple-violet flowers, or flowers with a contrast between a deeply coloured lip against white or pale other parts, or white flowers (still rare) ; and as regards shape a variation from the formal *stratiotes*-type or the lax and crisped *undulatum* to forms with broad petals more or less twisted and crisped, more or less erect or spreading. The species with the most striking colouring, *D. violaceo-flavens*, has not yet produced hybrids showing its distinctive characters at their full value. We have however a great variety of form, and though the maximum size of flowers is not great as compared with some other groups of orchids, the other valuable characters of these plants assure them of a place of honour in Malayan gardens.

Below are brief notes on Malaysian-raised hybrids and a few others\* No attempt has been made to deal with the *D. mobile* group, but it is hoped that no important Phalsenanthe-Ceratobium hybrid has been omitted. The descriptions are based partly on published data in *De Orchidee* and other journals. It should be remembered that in second generation hybrids the plants from a single sowing may vary much, and only one variety may have been described. It is possible also in some cases that records of parentage have not been accurately made. In addition to the hybrids listed below, several others have been raised in Hawaii in recent years.

**Anita** (Louisas X *phalsenopsis*). Ceylon, 1940

Inflorescence of 10 flowers, 7 cm. diameter, shape much as in *D. phalxnopsis* but lip narrower; sepals and petals greenish-yellow at the base, the lip greenish-yellow in the throat with keels of this colour; sepals otherwise light crimson, petals crimson with deeper veins, lip midlobe deep crimson.

**Arcuatum** (*violaceo-flavens* X *phalxnopsis*). **Java, 1939**

This hybrid has flowered in Singapore. It shows the distinctive form of the lip of *D. violaceo-flavens*, but not the colouring.

**Bali** (*phalxnopsis* X *taurinum*). **Java, 1936**

Also called Sander's Crimson and Bangkok. Several varieties, varying in colour, have been raised. Inflorescence to 50 cm. long; flowers about 6 cm. diameter; sepals bent backwards, not twisted, paler than the petals which in the best varieties are a very bright clear violet-purple, slightly twisted, the ends fairly broad, blunt; lip deep purple, the erect side-lobes with their forward edges sloping down on to the midlobe which is shaped much as in *D. phalxnopsis*. This is one of the most attractive hybrids of the *Ceratobium* group.

**Bangkhen** (*stratiotes* X *Schulleri*). **Bangkok, 1951****Brisbane** (*superbiens* X *veratrifolium*). **Java, 1940**

Inflorescence to 50 cm. long; flowers 5 cm. diameter; sepals with crisped edges, white with purple markings; petals slightly twisted, of similar colouring; lip side-lobes purple-veined on a greenish ground, keels white, midlobe violet-purple with wavy white edges.

**Caesar** (*phalxnopsis* X *stratiotes*). **Java, 1937**

Inflorescence more or less horizontal, with 6 or more flowers; flowers to 9 cm. high; sepals slightly twisted and curved back, petals long and straight, rather widely diverging, widening gradually from the base to near the apex (1.5 cm. wide), then evenly to a pointed tip; lip with erect side-lobes, opening a little forwards; midlobe shaped almost as in *stratiotes* with dark veins; general colour of flowers purple-mauve, the lip most intensely coloured; some varieties with pale or white sepals and petals. A fine hybrid.

**Caprice** (*undulatum* X *macrophyllum*). **Java, 1939**

Pseudobulbs to 60 cm. long, very stout, with few leaves, the lowest sheathed, the upper without sheaths (as in § *Latourea*); inflorescence to 60 cm. long with over 20 flowers closely placed; sepals and petals greenish-yellow, marked with brown; lip yellow with strongly-marked brown veins; sepals bent backwards, edges wavy; petals slightly twisted, edges wavy. Curious rather than beautiful; an interesting combination. Old plants of this now flower freely in Singapore.

**Clara Cooper** (*strebloceras* X *phalxnopsis*). **Sander, 1946**

This has been imported to Singapore, and has flowered. The petals have longitudinal purple streaks.

**Constance** (*undulatum* X *lasianthera*). **Singapore, 1941**

Pseudobulbs flowering at 100 cm. high or less, but not immediately growth has finished; inflorescences erect, 40 cm. or more long with flowers close together; flowers 6.5 cm. high; sepals twisted, with wavy edges; petals 4 cm. long, narrow, stiff, much twisted but not crisped, slightly divergent, shining, cinnamon brown to deep purple brown (according to



variety) ; lip with wide-spreading side-lobes and rather long narrow mid-lobe with crisped edges and pointed end turned down; whole lip except keels a very rich deep maroon. A fine hybrid, flowering frequently in Singapore. **Fig. 96.**

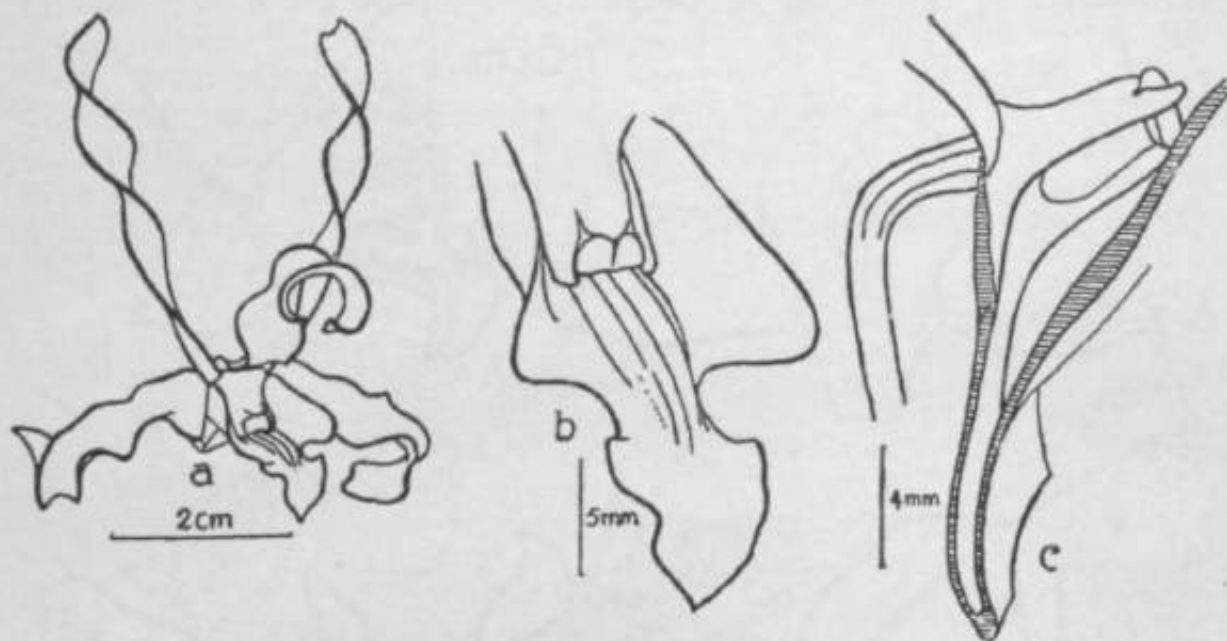


Fig. 96. *Dendrobium Constance*, a, flower from front, b, lip. c, section through spur (the lip joined to the column-foot).

**Curlylocks** (*undulatum* X *Constance*). Singapore, 1949

Inflorescence many-flowered. Petals more twisted than in *Constance*, light chocolate with yellow edges.

**Dang Toi** (*Goldei* X *undulatum*, small yellow variety). Singapore, 1941

Near *D. superbiens*, but the plants with taller pseudobulbs, petals longer, more pointed, twisted and wavy, in fact showing more of the *undulatum* character; colour variable from plant to plant, from deep purple to a pale mauve. The best varieties are very fine.

**Engeline** (Louis Eleriot X *lasianthera*), Java, 1940

Flowers deep magenta-purple, sepals paler at the base; shape much as in *Pauline* but stiffer, the petals not crisped at the edges. The extent of variation is not described, but all plants should have a rich colour.

**Goliath** (*veratrifolium* X *taurinum*). Java, 1940

Inflorescence of 16 flowers; flowers 7 cm. wide; sepals white with wavy edges, the ends turned back; petals widely spreading, widened towards the apex, twisted a little more than in *veratrifolium*, purplish, deeper in shade towards the base; lip with spreading side-lobes, the mid-lobe wider with down turned end, mauve with white margins.

**Gracia Lewis** (*macrophyllum* X *superbiens*). Java, cult. Singapore

At first wrongly ascribed to parentage *macrophyllum* X *phalxnopsis*. **Fig. 97.**

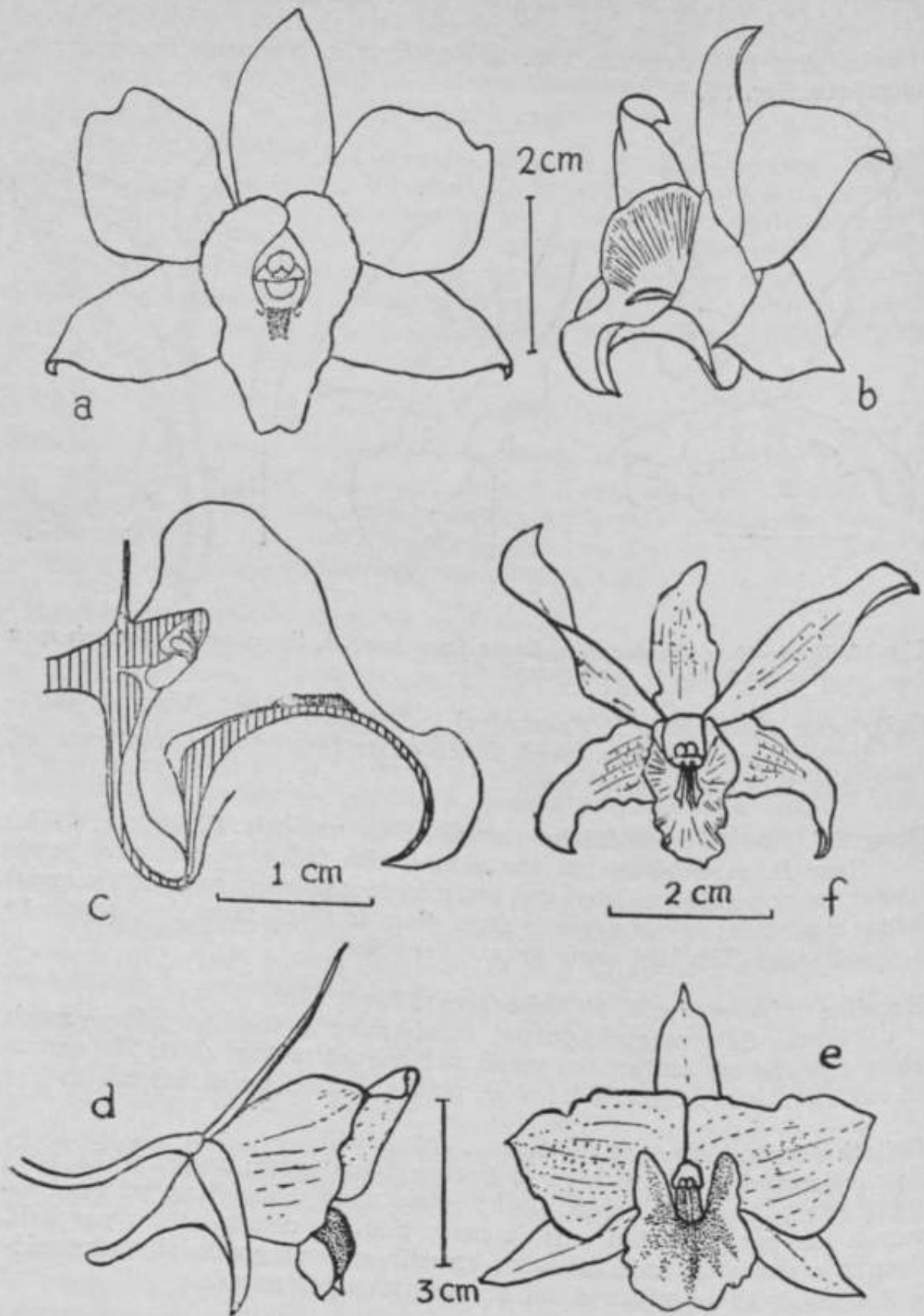


Fig. 97. *Dendrobium Grada* Lewis, a, b flower from front and from side, c section through column and column-foot, d, e, flower from side and from front. DeZobler, *Dendrobium* *Jan Naue*, f, flower from front. Parkstanz.

**Helen Park** (*bigibbum* X *veratrifolium*). Singapore, 1940

Stems to 100 cm. long, rather slender, the young leaves flushed with purple; inflorescence to more than 50 cm, long, curved gracefully and drooping towards the end, from recently grown (leafy) or old leafless stems; flowers to 40 in an inflorescence, to 4.2 cm. high and 6.5 cm. diameter, medium to deep rosy-purple, the sepals with paler edges; petals diverging widely with almost rounded ends, hardly twisted but gracefully curved; lip with side-lobes just meeting above the column, their forward ends diverging, midlobe broad, the end downturned, slightly pointed; 5 divergent papillose keels present. A very graceful, free-flowering, though not large-flowered hybrid. Fig. 98.

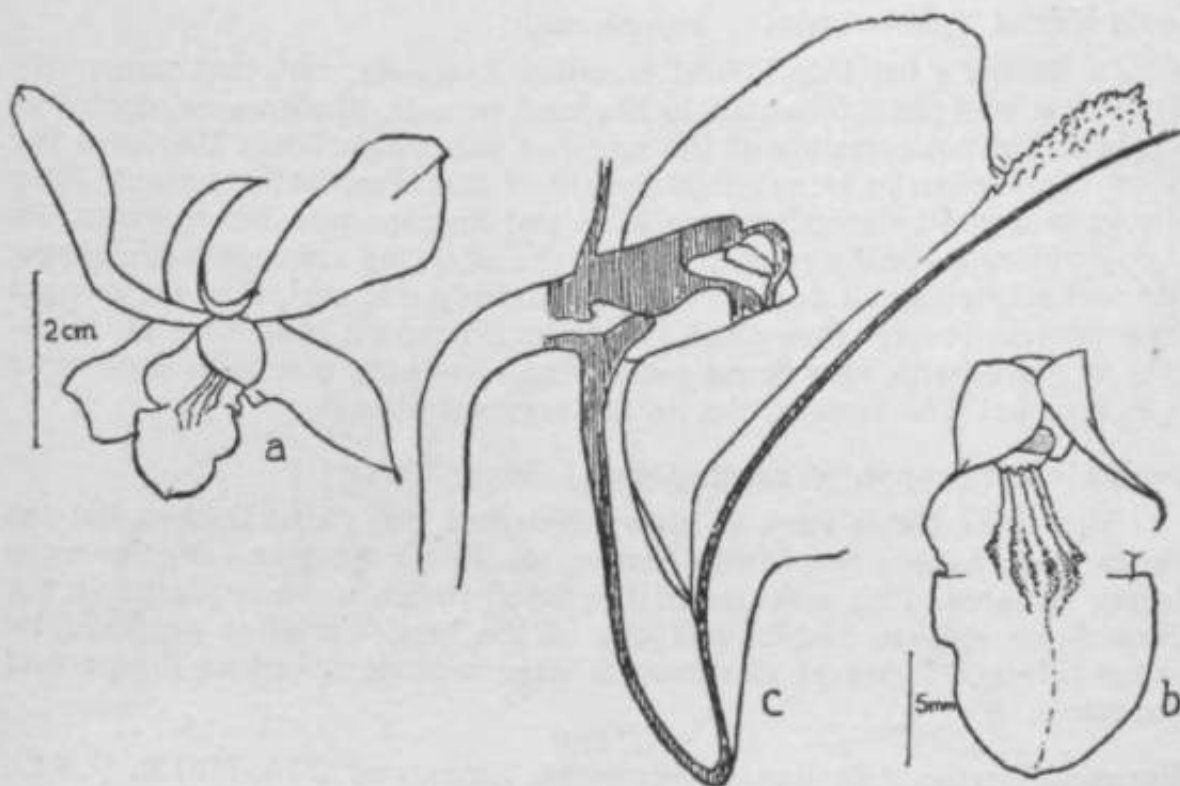


Fig. 98. *Dendrobium Helen Park*. *a*, flower from front, *b*, lip. *c*, section through column, column-foot and base of lip.

**Henriette** (*pkalzmopsis* var. *Statterianum* X *taurinum*). Java, 1935

This should be regarded as a variety of Bali, which it resembles in general characters. Batavia is a synonym.

**John Nauen** (*formoswn* X *Takahaskii*). Singapore, 1948

See note on this hybrid above, in the general discussion. A plant of *Dendrobium John Nauen* was awarded the cup for the best Singapore-raised hybrid, at the Singapore Flower Show, 1952. Fig. 97.

**Karlan** (Bali X *phalamopsis* var. *Statterianum*). Java, 1940

The original variety had sepals much as in *D. pkalstmopsis*, petals not so wide, lip with spreading broad side-lobes and broad short downturned midlobe; flowers 7 cm. wide; colour magenta-purple, the lip deeper.

Kukui (*phalxnopsis* X *moschatum* var. *cupreum*). Hawaii, 1946

This appears to be the only hybrid reported between a species of section *Ceratobium* and a species of section *Eugenanthe*. If the parentage is truly given, it is a most important hybrid, and should be the forerunner of a new series.

**Liliha** (Pauline X *phalxnopsis*). Hawaii, 1949

Lily Doo (*macrophyllum* X *phalxnopsis*). M.O.R. 1950, p. 51

Similar to Gracia Lewis, but with a less complex callus. The flowers show none of the colouring of *macrophyllum*.

Louis Blériot (*phalxnopsis* X *superbiens*)

In Sander's list this hybrid is called *Leeanum*; but that name was given to a wild plant imported to England with *D. phalxnopsis*, doubtless a hybrid, but not certainly of the specified parentage. Louis Blériot is the oldest name given to an artificial hybrid of this combination; plants have also been raised independently in Java and Singapore in recent years. As *D. superbiens* is itself a natural hybrid, the offspring are variable in shape, size and colouring; all are attractive and richly coloured, the best being a deep intense purple. One plant raised in Singapore resembled *D. bigibbum* in shape, with very broad petals, but something nearer to *siiperbiens* is more usual. The keels on the lip are very variable.

Louisa? (*phalxnopsis* X *veratrifolium*). Java, 1934

Very near Helen Park as above described, the stems thicker and the plants more robust, the flowers larger, the lip in the best varieties more deeply coloured. This was one of the first hybrids to be produced in the *Ceratobium* section, and is still one of the best. Varieties produced by using different forms of *phalxnopsis* have been described as Boelan and Puppchen.

**Margaret Paxton** (Pauline X *johannis*). Singapore 1950, M.O.R. p. 44

The base of the lip, and its large keels, are clear yellow.

Medusa (*violaceo-flavens* X *undulatum*). M.O.R. 1949, p. 13

The inflorescences are short, and the flowers, though fine, show little of the characteristics of *violaceo-flaveTis*.

Morgenster (*stratiotes* X *iriolaceo-flavens*). Java, 1940

Inflorescence of 6 flowers, near *stratiotes* in form but petals slightly spreading, less twisted, wider, the midlobe of the lip with wider and more richly coloured violet veins; petals white, greenish at the tips. A handsome plant.

**Owen** (Bali X *undulatum*). Hawaii, 1942

**Parkstance** (Helen Park X Constance). M.O.R. 1950, p. 45. Fig. 97.

This hybrid has long inflorescences of very richly coloured flowers.

**Pauline** (*phalaenopsis* X *undulatum*). England, 1932.

This hybrid was actually first flowered in New York in October 1931, but was not published; the first publication was by Stuart Low, at London, in 1934. Owing to variation in both parent species, the hybrid flowers are especially in colouring the best, but are a little less brightly coloured than the other forms of this hybrid. The petals are: widely twisted and waved at the edges, giving the flower a shape than in *Lousi\**, but very graceful. The best forms will always be popular. **Fig. 99.**

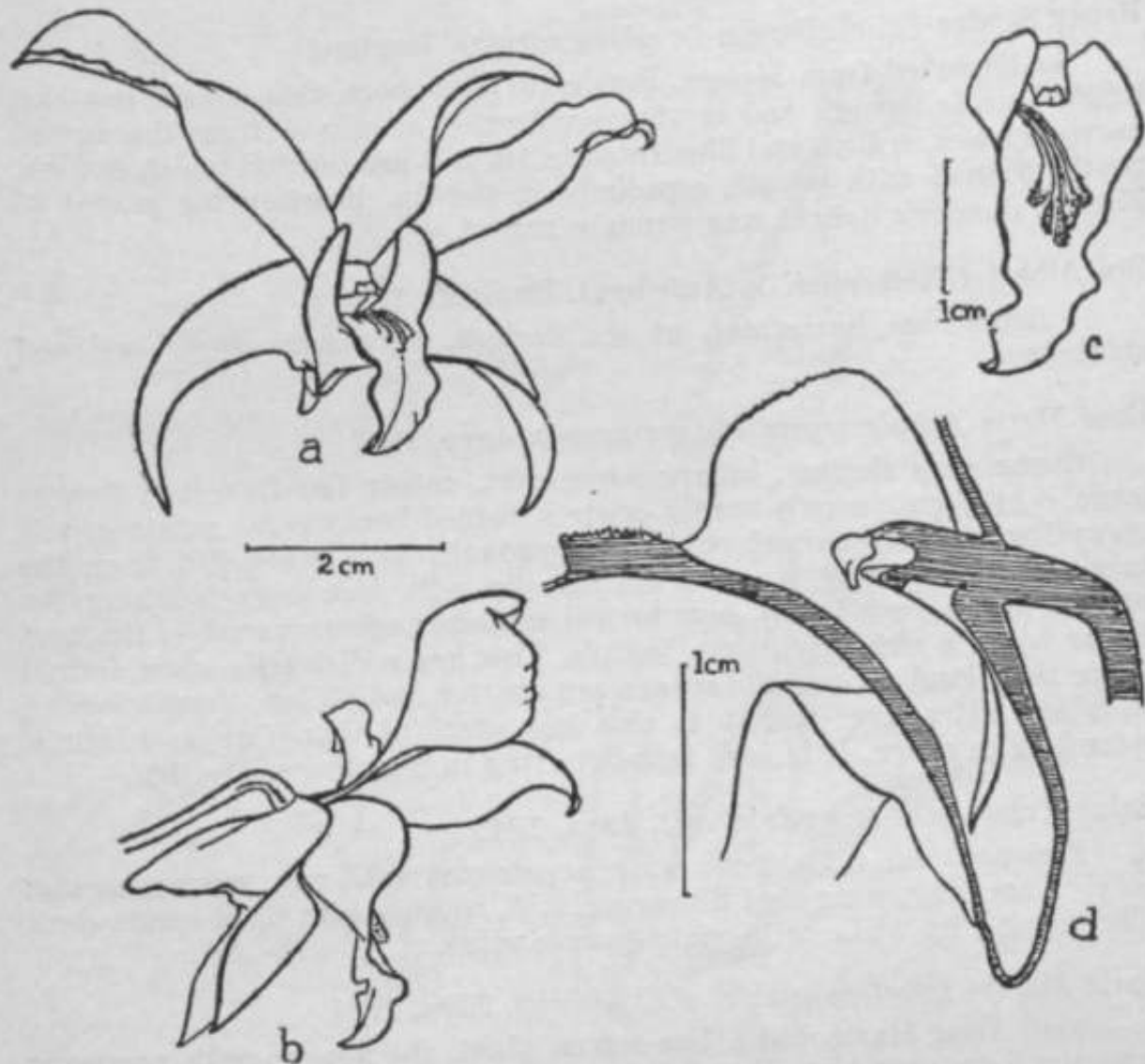


Fig. 99. *Dendrobium Pauline*. a, b, flower from front and from side. c, lip. d, section through column, column-foot and base of lip.

**Phyllis** (*violaceo-flavens* X *superbiens*). Singapore, 1949

Shape and size of flowers as *violaceo-flavens*, colour of *superbiens*; flowers of good substance and long-lasting.

**Pompadour** (Louis Blériot X *phalxnopsis*). Java, 1937

This is very near *phalsenopsis*; flowers 7 cm. diameter; sepals with white margins; lip and petals a very rich colour. No doubt variable; the best forms should be very fine, larger than Louis Blériot, fuller in shape, and as rich in colouring.

**Queensland** (*superbiens* X *stratiotes*). Java, 1940

Inflorescence 40 cm. long, with 10 flowers, 7-5 cm. high; sepals with white margins, waved, twisted and recurved, mauve with darker veins; petals 5 cm. long, oblique, stiff, much twisted, colour as sepals; lip side-lobes white with purple veins, midlobe with wavy edges, white with dark violet-purple veins.

**Roger Sander** (*mirbelianum* X *phalsenopsis*). England

As imported from Messrs. Sander to Singapore, this hybrid has rich bright purple flowers and is very handsome; as raised from the named parent species in Java and illustrated in 1939, it has light greenish flowers, partly flushed with purple, especially in the lip. Possibly the parent of Messrs. Sander's hybrid was wrongly named.

**Roi Albert** (*d'Albertisii* X *Antelope*). England, 1938

Inflorescence horizontal, of six flowers, very near *Demmenii* and *stratiotes*.

**Rose Marie** (*pJialxnopsis* X *leporinum*). Java, 1937

Stems very slender; inflorescence erect, rather few-flowered; flowers large, 8 by 7 cm.; sepals hardly crisped, turned backwards; petals widely spreading, slightly curved, widening gradually to a point 2/3 from the base, then narrowing to an acute tip; lip with side-lobes touching the column and a very broad downturned midlobe; colour variable, the best forms being a rich bright rosy purple. This has a distinctly more formal shape than Pauline, and the sprays are shorter and stiffer; though larger, it is less attractive; and it is also less graceful than Caesar, which it resembles in shape. It is very free-flowering in Singapore. **Fig. 100.**

**Salak** (*stratiotes* X *undulatum*). Java, 1940

Flowers 7 cm. high, 5 cm. wide; sepals rosy with pale wavy margins; petals 5 cm. long, somewhat diverging, stiff, twisted with three bends, dark lilac-mauve; lip white with violet-purple veins.

**Sarie Marijs** (*phalxnopsis* X *d'Albertisii*). Java, 1937

Near Rose Marie, but a less robust plant, the flowers with narrower sepals and narrower lip; the colour is variable. This is more graceful than Rose Marie.

Sunda Islands (*stratiotes* X *veratnfoUum*). Hawaii, 1949

Tan Chye Siam (*veratrifolmm* X *Uwmthera*). M-O-R- 1949, p. IS

This has pseudobulbs 11 feet tall, and mflorescences a yard long, flowers of good size and delicately coloured.

Tang

p. 45

Cæsar,

with pale petals and a lip richly veined as in *stratiotes*,

**Ursula** (*veratnfoUum* X *unduUttum*). Singapore 1948

Intermediate between the two parents - variable in colouring. Has the graceful form of *veratnfoUum* with vigour.

**Varsity** (*taurinum* X *stratiotes*). Hawaii, 1949

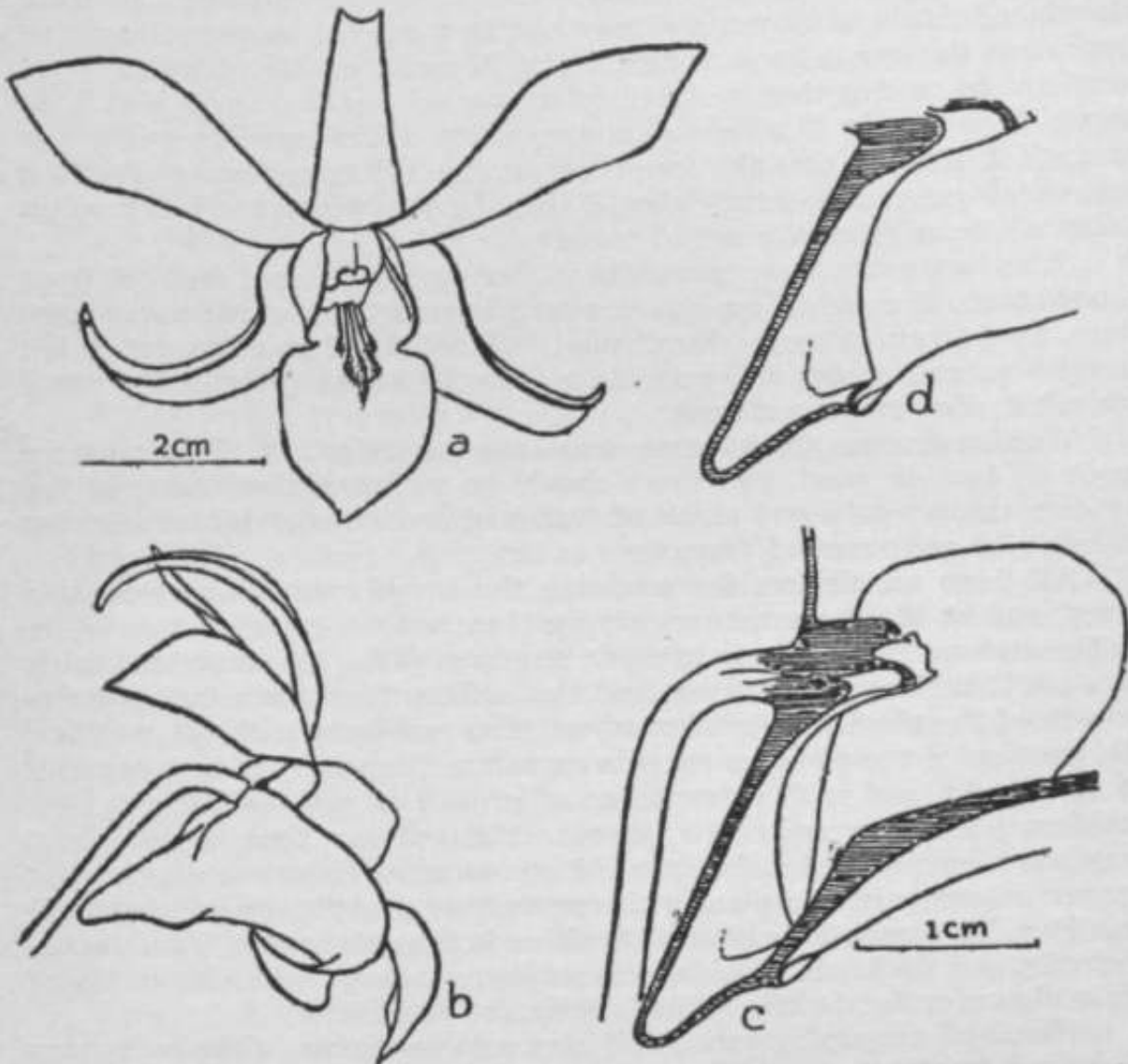


Fig. 100.

b, flower from front and from side. c, section and base of lip. d, section through column-foot,

the lip having been removed.

**Wilhelm Stttber** (*lasianthera* X *phalxnopsis*). Java, 1937

Named in honour of the man who first brought *D. kisanthera* and *D. violaceo-flavens* into cultivation. Plants very robust, with thick narrow leaves; inflorescence almost erect, carrying as many as 16 flowers of a deep purple, less brilliant than in Louis Blériot; sepals recurved; petals only slightly twisted, gracefully curved, the edges not crisped near that of *D. phalxnopsis* in shape with the side-lobes not meeting the column and the midlobe narrower. A very handsome hybrid, of good size and substance.

### CULTIVATION OF DENDROBIUM

The species which have pendulous stems, such as *D. anosmum* (better known as *D. superbum*) and others of the section *Eugenanthe*, are best grown on pieces of wood, slabs of tree-fern roots, coconut husks, or vertical wooden frames. If the plant is tied to a piece of wood, one may also use good-sized pieces of unwashed root of the bird's-nest fern; these absorb and retain moisture, and may also be made the means of applying manure to the orchid by soaking them with manure-water. The fern-roots must not be so tied that it smothers the orchid roots. A good plan is to attach it so that it is close to existing roots, which may grow through it. After a time the fern-roots become rotten and covered with a growth of green algae; they should then be renewed, care being again taken not to smother the orchid roots.

Tree-fern roots decay more slowly, but they also need renewal from time to time. The orchid can obtain a certain amount of nourishment from them, by the help of mycorrhizal fungi, but additional nourishment in the form of manure water will promote more satisfactory growth. The same remark applies to coconut husk.

Wooden frames are in many ways more satisfactory. They must be made of durable wood, and there should be sufficient room between the upper cross-bars to insert pieces of fern-root or coconut husk, which may be removed and renewed from time to time.

All these are devices for confining the orchid roots to a certain space, and at the same time supplying them with a reserve of moisture and enough nutrient salts to promote strong growth. The important thing is to see that the roots have air, and also sufficient moisture during the growth of the plant. The amount of watering will vary with the position of the plant as regards exposure, the water-holding capacity of its support, and with its condition of growth or rest. In Malaya, *Dendrobium* plants can make new growth at almost any time; a new shoot may start development before the old one is mature, or new shoots may appear on one part of a plant while on another part the growth is declining. For this reason it is often difficult or impossible to rest *Dendrobium* satisfactorily, and the kinds which make continuous new growth without losing their vigour or floriferous qualities are most satisfactory.

Plants of a more upright habit may also be grown in the same way if desired, but they are usually more convenient to handle in pots or baskets which stand on a bench. Some kinds seem to thrive better if their pots are hung; such for example are *D. Farmeri* and *D. striatipes*.



*D. Farmeri* needs light shade and fairly moist conditions; *D. stratiotes* needs more light and will stand much more drought. *D. stratiotes* also will not tolerate having its roots entirely embedded in the potting material. Its nature is to have the whole of its stems supported a few centimetres away from the substratum, the strong roots forming stilts on which the whole plant is supported. The allied species *D. antenniferum* and *D. leporinum* also behave in the same way.

For potting Dendrobium plants, the usual mixture is clean freshly broken bricks and charcoal in the proportion of about four parts to one. Large pieces of brick should be placed at the bottom of the pot, then smaller pieces, and the top layer of quite small pieces, say an average of 1 cm. diameter or somewhat less. The plant has now to be fixed firmly on to this pot-full of loose material, and at the same time only its roots must penetrate below the surface. There are various ways of dealing with this problem. The plant may first be tied to a piece of wood and hung up in the shade until it has attached itself firmly by roots, and then the wood fixed firmly into the potting material so that the stems of the plant are all freely exposed to the air. Or a stick may be put into the pot and fixed firmly in place as the filling of broken bricks is carried out, the plant being tied afterwards to the stick. When the plant begins to produce roots, these will penetrate the potting material and bind it together, making a firm support.

A newly potted plant needs to be kept in shade and sprayed with water sufficiently to keep it just moist, until its new roots begin to grow. It may then be watered more liberally, with small doses of liquid manure every week or so, and the exposure gradually increased. In the case of species and hybrids of the section *Ceratobium*, full exposure to sun is possible, or at least full exposure all morning. With other species of Dendrobium, less exposure may be preferable. Plants should be moved about until the best conditions are found, but should not be changed suddenly from shade to a very exposed place.

Some kinds of Dendrobium, notably *D. chrysotoxum*, will stand much more moist organic matter around their roots than others. Most kinds will not tolerate much, and it is most unwise to manure them with pieces of dry cattle-manure or any such material; manures in solution are much more satisfactory. But even such liquids may in time cause fouling of the potting material, by promoting the growth of green algae, bacteria, etc. The Dendrobium plants will show sooner or later that this condition is unsatisfactory, and then the potting material must be renewed. At the same time it will be found that many roots from the older parts of the plant are dead, and there is a danger of these forming a decaying mass which will cause rot of the other parts of the plant. So in general it is a good rule to re-pot Dendrobiums at least every two years.

When re-potting, the dead roots should be cut away, but care taken not to damage the living roots unnecessarily. It is best to re-pot a plant when a new bud has begun growth; the new roots on this growth will then immediately come into contact with the new potting material. If the plant has branched, so that it has more than one growing-point, it may if desired be divided, to make two or more new plants. If the plant is not to be divided, it may be sufficient to remove part of the old potting material

and cut out dead roots, and work in new bricks, etc., without entirely removing the plant from the pot or cutting its living roots. The maintenance of good clean potting material is the essential thing, and vigorous new root-growth will soon show the value of this.

Badly-potted Dendrobiums, which have the base of their stems buried or which are showing signs of rotting at the roots, often produce buds on the upper part of their stems, instead of the normal buds for continuing sympodial growth from the base of the plant. These buds grow into new small plants, with their own roots, and may be removed and potted off when they are big enough. It is a good plan to tie some well-washed fern-roots round the growing roots, to keep them in a compact condition so that the young plants will be easier to handle when they are cut off.

Old leafless stems of Dendrobium plants, if cut off and suitably treated, will also produce new small plants from lateral buds, and this is the best method of propagation. The bases of the old stems are wedged between pieces of tightly packed coconut husk which are kept constantly moist.

### ERIA

Each branch of the sympodium short or long, slender or thick and fleshy, with a long or short creeping basal portion, the erect part composed of one or more joints, bearing one or more leaves, leafy throughout or near the apex only, the basal part always covered with sheaths; inflorescences lateral or apparently terminal, with one to many flowers, hairy or hairless, the bracts small or large; flowers usually rather small; flower-structure as in Dendrobium but the base of the lip never forming a spur by uniting with the edges of the column-foot; pollinia 8, with caudicles, in two groups of four, the anther-cap often so shaped as to expose part of the pollinia.

Eria is a smaller genus than Dendrobium, but still a very extensive one; it is represented by about 60 species in Malaya. As in Dendrobium, there is a great range of vegetative form, and it is possible to divide the genus into easily recognizable sections on vegetative characters. These sections are dealt with separately, and are arranged according to the scheme adopted by Dr. J. J. Smith, except that two sections have been united. The sections *Trichotosia* and *Callostylis* (as *Tylostylis*) have been ranked as separate genera by some authors, but they have no more claim to such separation than some of the other sections.

Erias are not usually ranked among decorative orchids, though some are very attractive when in full flower. Anyone who wishes to cultivate them for their botanical interest will find them easy to handle, except that naturally the mountain species will not thrive in the lowlands. Nearly all need light shade, and some flower quite frequently.

#### Key to the Malayan Sections of Eria

(*Stem* means a branch of the sympodium, whether long or short, fleshy or thin)

Leaves, or at least their sheaths, hairy; hairs

usually red-brown .. .. . 1. *Trichotosia*

- Leaves and sheaths not hairy
- Stems not fleshy, usually long, leafy throughout their length except the very base
- Inflorescence terminal, branched, with many flowers .. .. 2. *Dilochiopsis*
- Inflorescence not branched, terminal or not
- Inflorescences terminal, with many small flowers; powdery calli on lip .. 3. *Mycaranthes*
- Inflorescences lateral, few-flowered, without such calli .. .. 4. *Cylindrolobus* (part)
- Stems fleshy or not, short or long, leaves few or single, near apex of stem only, lower part covered with sheaths
- Inflorescence short, hairy, flowers opening singly in succession; lip hinged to column-foot .. .. 5. *Callostylis*
- Not these characters
- Inflorescences arising in the same way as vegetative shoots, from the base of short fleshy pseudobulbs .. 6. *Dendrolirium*
- Inflorescences apparently terminal, or lateral, not basal in origin
- Inflorescences to about 60 cm. long, sepals and petals narrow, about 2.5 cm. long .. .. 7. *Goniorhabdos*
- Not this combination of characters
- Inflorescence of 1-3 flowers
- Inflorescence glabrous, or nearly so 4. *Cylindrolobus* (part)
- Inflorescence conspicuously short-hairy .. .. 8. *Strongyleria*
- Inflorescence of many flowers
- Lip with saccate base below its attachment to the column-foot; flowers very small, in distinct whorls .. .. 9. *Cymboglossum*
- Not these characters
- Lip unlobed, nearly straight, shorter than the combined length of column plus column-foot .. .. 10. *Aeridostachya*
- Lip usually 3-lobed, longer, the apex distinctly curved forwards
- Side-lobes of lip at its very base, free or united; mid-lobe clawed, spatulate .. 11. *Urostachya*
- Side-lobes of lip not at the very base .. .. 12. *Hymeneria*

1. § *Trichotosia*

Stems long or short, leafy throughout except at the base, hairy throughout (usually with rather stiff red-brown hairs), or at least on the leaf-sheaths and\* on the inflorescences; inflorescences lateral, from any node, piercing through the leaf-sheath, short and few-flowered or long, pendulous and many-flowered; bracts hairy, at right angles to the rachis, rather large, concave; flowers usually not opening very widely, red-hairy on the outside of the sepals, greenish, cream or faintly pink within, the lip with rather low side-lobes or none, with or without keels, sometimes partly papillose.

This is a fairly large section, and in Malaya includes some common epiphytes of both lowland and mountains. The largest species are very large, with pendulous stems up to 3 m. (10 feet) long. The smallest species are very small, with creeping rhizome and short leafy stems, the leaves barely 1 cm. long; these small species have almost white hairs, but nearly all the others have red-brown or red hairs, sometimes stiff and long. Of the twelve species here described, three are known from one collection only.

Key to the species of *Eria* § *Trichotosia* in Malaya

- Stems usually more than 100 cm. long; inflorescences pendulous, 10-40 cm. long  
 Inflorescences 30-40 cm. long, chiefly lowland plants  
 Upper sepal about 10 cm. long; hairs throughout plant pale brown, rather short . . . . . 1. *E. Teysmannii*  
 Upper sepal over 2 cm. long; hairs throughout plant stiff, red-brown, longer . . . . . 2. *E. vestita*  
 Inflorescences to about 10 cm. long, mountain plants . . . . . 3. *E. ferox*  
 Stems much less than 100 cm. long (except in *E. poculata*); inflorescences short, not pendulous, flowers close together  
 Creeping plants with short erect stems bearing broad fleshy leaves not more than 1 cm. long  
 Erect stems to 10 cm. long with 10 or more leaves . . . . . 4. *E. microphylla*  
 Erect stems very short, bearing only about 4 crowded leaves . . . . . 5. *E. rotundifolia*  
 Stems usually close together, to more than 10 cm. long, leaves to at least 2 cm. long  
 Leaf-blades distinctly hairy  
 Leaves to about 2 cm. long, hairs long and spreading  
 Leaves spreading almost at right angles to the stem, about 6 mm. wide, flowers 1-5 cm. long . . . . . 6. *E. aporina*  
 Leaves not spreading, only about 3 mm. wide, flowers under 5 mm. long . . . . . 7. *E. hispidissima*

- Leaves to 7 cm. or more long, hairs shorter  
 Leaves shortly and densely velvet-hairy;  
 upper sepal oblong, apex blunt . . . 8. *E. velutina*  
 Leaves with longer sparser hairs; upper  
 sepal narrowed gradually to acute  
 apex . . . . . 9. *E. cristata*  
 Leaf-blades not hairy; hairs only on leaf-  
 sheaths and inflorescences  
 Stems to about 20 cm. long, leaves to about  
 5 by 0.8 cm. or exceptionally wider . . . 10. *E. gracilis*  
 Stems attaining much greater length,  
 leaves to 12 cm. long  
 Flowers 5 mm. long . . . . . 11. *E. poculata*  
 Flowers about 1.7 cm. long . . . . . 12. *E. monticola*

1. **Eria Teysmannii** J.J.S., Bull. Dep. Ag. XXII: 29. 1909. Bull. Btzg., Ser. 3, Suppl. II: t. 58, *L—Trichotosia Teysmannii* Krzl., Pflzr. Eria 145. 1911. Carr, Gard. Bull. 7: 35. 1932.

Stems to 200 cm. or more long, pendulous, internodes 3.5 to 4.5 cm.; leaves to 20 by 5 cm., covered with rather short light-brown hairs, rather sparsely on the blades and densely on the sheaths; inflorescences to more than 30 cm. long, limply pendulous, covered with spreading light brown hairs, bracts to about 1.2 cm. long; flowers not opening widely; upper sepal 1 cm. long; mentum short; petals 9 by 3 mm.; lip 7 mm. long, with erect sides which are hardly separated as lobes, the midlobe wider than long, with a forward-pointing triangular thickening. Distributed to Borneo and Sumatra; in Malaya only known as an epiphyte on the Neram trees which border the rivers in Pahang and Kelantan, and from the Sedili River in Johore (where it is rare).

2. **Eria vestita** Lindl., Bot. Reg. 30: Misc. 76. 1844. Bot. Reg. 1845: t. 2. Bot. Mag. t. 5807.—*Trichotosia vestita* Krzl., Pflzr. Eria 151. 1911. Ridl., Flora 4: 100.

Resembling *E. Teysmannii* in habit, but covered with red-brown hairs, the leaves rather smaller (to 14 by 3 cm.), the inflorescences not usually over 30 cm. long, the bracts to 1.5 cm. long, and the flowers much larger; upper sepal to 2.5 cm. long; petals narrow, their tips slightly projecting and spreading from between the sepals; lip white, side-lobes erect and angled at their forward ends, midlobe rounded, with red edges, widened from a narrow base; three ridges between the side-lobes, continuing forwards on to the midlobe as a single hairy swelling. Distributed in Borneo and Sumatra; in Malaya found in many parts of the country, in the lowlands, and at moderate elevations on the mountains. It is a very striking species.

3. **Eria ferox** (Bl.) Bl., Mus. 2: 184. 1856. J.J.S., Fl. Buit. 6: 383, f. 290.—*Trichotosia ferox* Bl., Bijdr. 342. 1825. Ridl., Flora 4: 101.—*Eria pyrrhotricha* Ridl., J.F.M.S. Mus. 5: 48. 1914.—*Trichotosia pyrrhotricha* Ridl., Flora 4: 101.

Resembling *E. vestita* in habit but with longer, stiffer hairs (3 to 5 mm. long) and shorter inflorescences (10 cm. long); bracts 10-1.5 cm.

long; upper sepal about 1 cm. long; mentum 8 mm. long; lip with erect side-lobes, the broad midlobe extending only a little beyond them, its end turned down and cleft; 3 more or less definite lines of hairy warts down the centre of the lip. Found in exposed places on the mountains of Sumatra, Java and Borneo; in Malaya collected at many mountain localities. This is also a most striking species. The character of the hairiness varies slightly, and also the size of the bracts and flowers. Comparative observations are needed to establish the extent of variation, especially in the lip.

4. **Eria microphylla** (Bl.) Bl., Mus. 2: 184. 1861. J.J.S., Fl. Buit. 6: 386, f. 292.—*Trichotosia microphylla* Bl., Bijdr. 243. 1825. Ridl., Flora 4: 102.

Rhizome slender, creeping, bearing erect leafy shoots at intervals of about 12 cm.; shoots to about 10 cm. long, with 10 or more small leaves closely arranged in two rows; leaves fleshy, to about 10 by 4 mm.; flowers solitary, the sepals very hairy, about 1 cm. long, with a long broad mentum; lip undivided, tongue-shaped, with a conical projection beneath near the tip (as in *Dendrobium*, section *Oxystophyllum*). Distributed in Java, Sumatra and Borneo; only once recorded as found in Malaya, at Fraser's Hill.

5. **Eria rotundifolia** Ridl., J.S.B.R.A.S. 39: 78. 1903.—*Trichotosia rotundifolia* Krzl., Pflzr. Eria 144. 1911. Ridl., Flora 4: 102. = ? *E. dasyphylla* Par. et Rchb.

Similar in habit to *E. microphylla* but smaller, with very short erect shoots, the leaves broader (to 10 by 6 mm.) with rounded tips; flowers white-hairy, about 7 mm. long; lip almost entire, bent downwards towards the tip, fleshy, the tip rounded and slightly cleft, olive green with two rows of small purple spots. This remarkable small species has been only once collected, apparently on rocks, on Penang Hill. It is however very nearly related to a species known in Burma, and might prove identical.

6. **Eria aporina** Hk. f., F.B.I. 5: 808. 1890. Ic. PL t. 2081.—*Trichotosia aporina* Krzl., Pflzr. Eria 150. 1911. Ridl., Flora 4: 102.

Stems to 15 cm. long, with rather long spreading red-brown hairs throughout; leaves to 2 by 0.6 cm., closely 2-ranked, spreading almost at right angles to the stem; inflorescences very short, usually with a single flower; flowers very pale greenish yellow, 1.5 cm. long and 1.1-2 cm. wide; upper sepal 8 by 3 mm.; petals narrower; lip white, with short erect side-lobes, the midlobe 6 mm. wide, rounded with a cleft tip, an orange-yellow spot in the middle; 2 keels between the side-lobes and a longer lower yellow median one extending on to the midlobe. Known only from Fraser's Hill, Taiping Hills and Cameron Highlands (common).

7. **Eria hispidissima** Ridl., Journ. Bot. 34: 213. 1898.—*Trichotosia hispidissima* Krzl., Pflzr. Eria 136. 1911. Ridl., Flora 4: 102.

About the same size as *E. aporina*, but even more hairy, with leaves not spreading, only 2-3 mm. wide; hairs fine, 2 mm. long; inflorescences slender, about 1 cm. long, with several very small flowers, the bracts 2 mm. long. This species was collected at Ulu Langat, Selangor, in 1896, and has not been found again.

8. *Eria velutina* Lindl., Bot. Reg. 26: Misc. 86. 1840—*Trichotosia velutina* fczl., Pflzr. Eria 140. 1911. Ridl., Flora 4: 101.

Stems to 40 cm. long; leaves to 9 by 2 cm. (to 10 by 3 cm. ?), very fleshy, covered densely with very short red-brown hairs, apex blunt; monoscences about 2 cm. long, with about 6 bracts; bracts to 7 mm. long, strongly concave; flowers 1.6 cm. long, not wide-opening; mentum 6 mm. long; upper sepal 9 by 3 mm.; lip 1.2 cm. long, 5 mm. wide at apex, with small side-lobes, the midlobe short, notched, the edges turned down; flowers cream or pale pink, lip pink at base, midlobe white or yellowish. A fairly common lowland epiphyte, found in all parts of Malaya, and in Sumatra. Fig. 101.

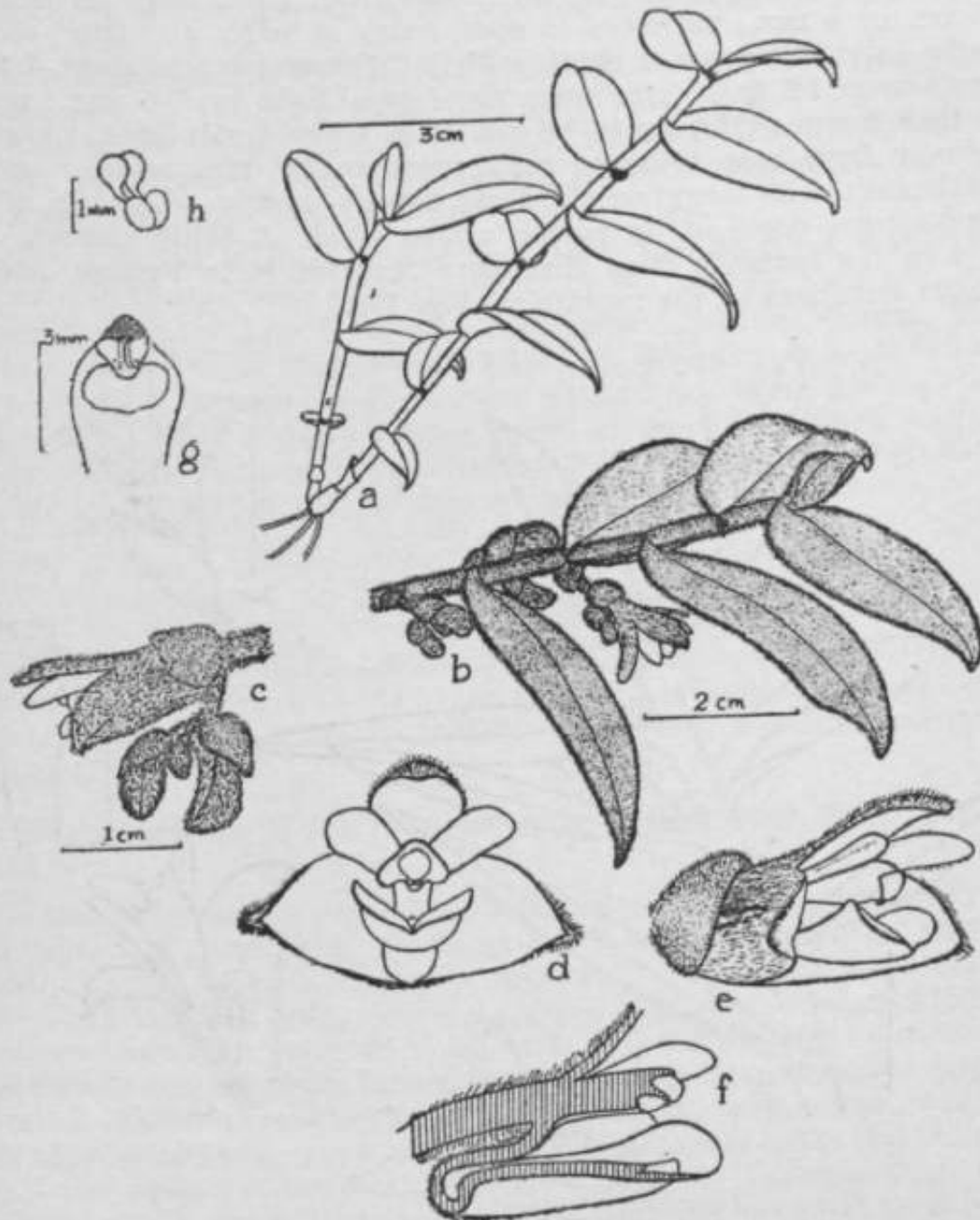


Fig. 101. *Eria velutina*. *a*, habit of plant, *b*, leaves and inflorescence, *c*, inflorescence, showing bracts, *d*, *e*, flower from front and side. *f*, flower in section, *g*, column, *h*, 4 out of the 8 pollinia.

9. *Eria cristata* RidL, J.S.B.R.A.S. 39: 78.1903.—*Trichotosia cristata* Krzl., Pflzr. Eria 140. 1911. RidL, Flora 4: 101.

Very near *E. velutina*, differing in the longer, sparser hairs, possibly in having less fleshy leaves, and in the flowers having narrowly pointed upper sepal and narrower petals. Known only from Penang and Langkawi; further comparison of living plants with *E. velutina* is desirable.

10. *Eria gracilis* Hk. f., F.B.I. 5: 806. 1890. Ic. PI t. 2078.—*Trichotosia gracilis* Krzl., Pflzr. Eria 143. 1911. Ridl., Flora 4: 104.—*Eria oligantha* Hk. f., F.B.J. 5: 807. 1890. Ic. PI. t. 2079.—*Trichotosia oligantha* Krzl., I.e. 155. Ridl., Flora 4: 103.

Stems to 20 cm. long, with internodes about 1 cm. long; leaves stiff, to 5 cm. by 8 mm., narrowed to apex, hairy on edges and front of the sheaths only; inflorescence short, with 1-3 flowers; bracts about 7 mm. long; flowers 1-2 to 1.5 cm. long; upper sepal 8-10 by 3-5 mm.; petals less than 2 mm. wide; lip to 1-3 cm. long, without side-lobes, widening gradually from base to apex; apex papillate, 3-5 mm. wide, rounded, slightly cleft with downturned edges; flowers creamy white, tip of lip yellow-orange, edges of lip purple, anther black. A fairly common epiphyte in the lowlands from Singapore northwards to Penang, and at medium elevations on the mountains. Fig. 102.

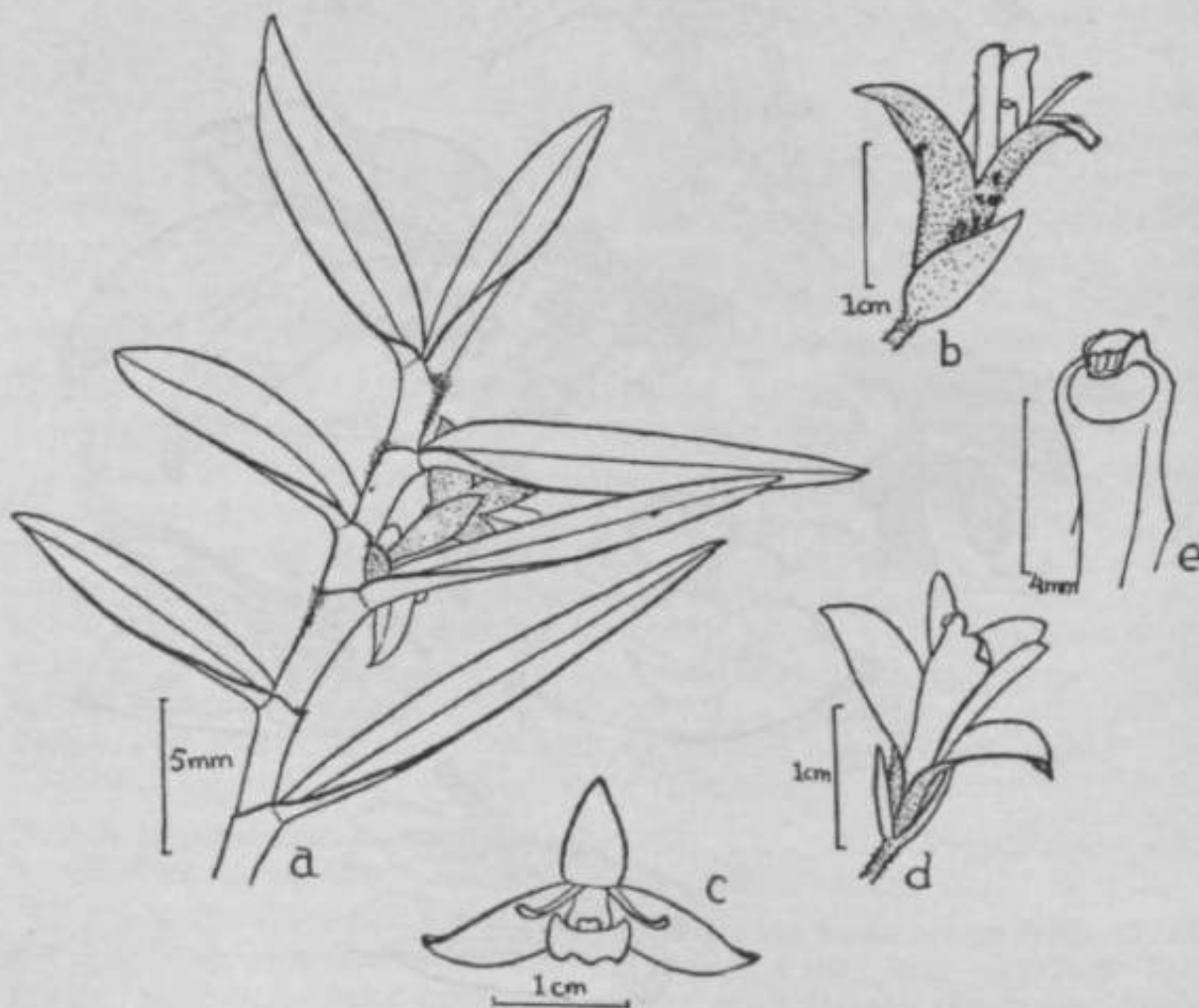


Fig. 102. *Eria gracilis*. a, stem and inflorescence. b, flower, showing bract, c, d, flower from front and from below, e, column.



11. **Eria poculata** Ridl., J.L.S. 32: 305. 1896. J.J.S., Bull. Boteg., Ser. 3, Suppl. II: t. 58, *U*.—*Trichotosia poculata* Krzl., Pflzr. Lna 14<sup>^</sup>. Uii. Ridl., Flora 4: 103.

Stems to 100 cm. long, 5 mm. thick, internodes to 4 cm. long; leaves stiff, to 12 by 1.5 cm., tapering to apex; inflorescences very short and dense (usually not over 1 cm. long); bracts 5 mm. long, broad; flowers 5 mm. long, 5 mm. wide; mentum short and broad; lip with hardly distinct side-lobes, the midlobe rounded, turned down, cleft with a thickening just above the cleft; flowers green and red-hairy outside, cream within, the lip orange at the base, white at the tip. Distributed in Borneo and Sumatra; in Malaya general on the mountains at about 3,000 feet.

12. **Eria monticola** Hk. f., F.B.I. 5: 806. 1890.—*Trichotosia biflora* Griff., Notul. 3: 331; Ic. PL Asiat. 3: t. 315. 1851. Ridl., Flora 4: 103.—*Eria biflora* Lindl., J.L.S. 3: 56. 1859 (non Griff. 1851).—*E. tuberosa* Hk. f., F.B.I. 5: 807. 1890. Ic. PL t. 2080.—*Trichotosia tuberosa* Krzl., Pflzr. Eria 143. 1911. Ridl., Flora 4: 103.

Stems slender, slightly swollen at the very base, to 45 cm. long; internodes about 2.5 cm.; leaves stiff, to 12 by 1.2 cm., narrowly pointed; inflorescences short, of 1 or 2 flowers; basal bract short, cup-shaped, floral bracts pointed, 1.5 cm. long; flowers 1.5-1.7 cm. long; upper sepal to 1 cm. long; lip almost straight, tongue-shaped, without side-lobes; flowers white, lip purple at base, a hairy orange patch at the tip. A fairly common epiphyte in the mountains at 3,000-4,000 feet, distinguished from *t. poculata* by its smaller size and larger flowers.

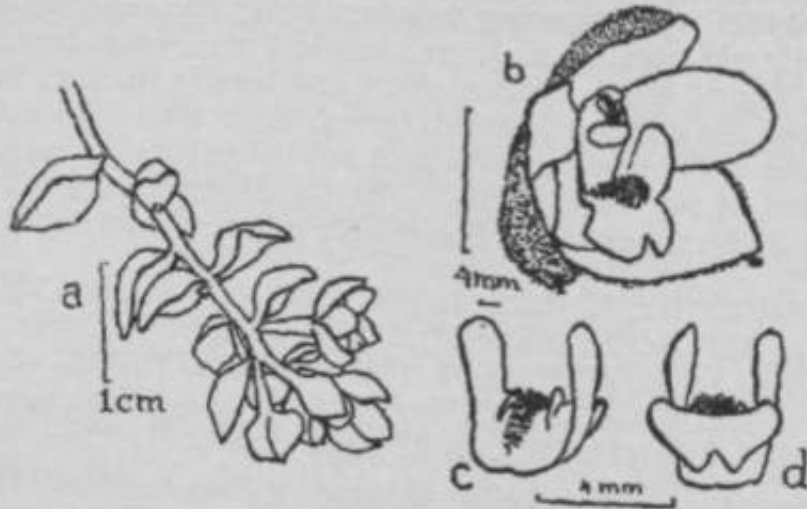
## 2. § Dilochiopsis

This peculiar section consists of a single species, *E. Scortechinii* which is very distinctive in the genus in having a branched inflorescence, resembling closely the form of *Dilochia Cantleyi*, 2L terrestrial orchid of the Arundina group.

- Eria Scortechinii** Hk. f., F.B.I. 5: 809. 1890. Ic. PL t. 2082. Ridl., Flora 4: 88.

Stems to 120 cm. or more long, rather slender, leafy throughout, the internodes 2 to 5 cm. long; leaves rather thin, to about 12 by 1.8 cm., widest near the base; inflorescence apparently apical, the main branch to about 16 cm. long with several alternate lateral branches, the larger ones branched again; branches in the axils of broad concave white bracts, progressively smaller from base to apex of the inflorescence, the largest bracts 1.5 cm. or more long; flowers about 9 mm. wide, white, with all parts edged with pink; ovary shorter than bract, rusty-hairy like the outside of the sepals; upper sepal 8 by 4 mm., hooded; mentum short and broad; lip short, about 3.5 mm. long, with high narrow erect deep pink or purplish side-lobes (4 mm. high from base of lip and 2.5 mm. wide), the short broad midlobe turned sharply down in front, the middle part of

the lip with a longitudinal keel bearing fine spreading lilac hairs along its crest, and two shorter smooth keels, one at the base of each side-lobe. Fig. 103.



103. *Eria Scortechinii*. a, branch of inflorescence showing bracts. b, flower from front. c, lip from back. d, lip from front.

This species is found as on mountains at 5,000-6,000 feet. It has not been reported outside Malaya. The inflorescence is to Dilochia hairy flowers and a quite slender structure.

3- § Mycaranthes

Stems fairly long, not fleshy throughout, the leaves relatively long and narrow, apparently terminal, usually 3 or 4 together, erect, with short woolly hairs, bearing very small flowers; column-foot fairly long; and sepals widely spreading; lip with wide developing a powdery median ridge, usually ending in a large powdery callus on the midlobe.

This is a rather small group of species, but includes some quite common mountain epiphytes. The flowers are always small, and are not clearly observable in preserved specimens, alcohol. The specimens which under the present arrangement species *E. latifolia* and *E. Ridleyi* have been assigned to seven supposedly distinct species; but the differences cited are very small and cannot be considered as valid. The species *E. latifolia* and *E. Ridleyi* in both Borneo and Sumatra whether they can be sub-divided into distinct species.

**Key to the Malayan species of the section Mycaranthes**

- Stems slender, about 10 cm. long; leaves and inflorescences about 10 cm. long; lowland plants . . . 1. *E. obliqua*
- Stems longer, stout; leaves and inflorescences longer; mountain plants
- Leaves to 50 cm. long and 3-5 cm. wide, overlapping at base . . . . . 2. *E. latifolia*
- Leaves to 20 cm. long, not overlapping, well spaced
- Leaves distinctly stalked above the sheath; flowers lemon yellow with faint purple marks on lip 3. *E. citrina*
- Leaves broad at the base; flowers pale greenish yellow with conspicuous dark purple marks on the lip . . . . . 4. *E. Ridleyi*

**1. *Eria obliqua* Lindl., J.L.S. 3: 55. 1859. Ridl., Flora 4: 86.**

Stems to about 10 cm. long, bearing 4 or 5 leaves; leaves to 9 by 0.5 cm., rather fleshy, inflorescences white-hairy, 1-3 at the stem-apex; scape to 5 cm. long, rachis to 5 cm.; flowers translucent, greenish white, about 5 mm. wide and 4 mm. high; lip barely 2 mm. wide, the side-lobes with purple spots on the edge, their free forward ends curved and sharply pointed, the midlobe downturned between them, hardly extending further forwards; a longitudinal powdery ridge, cream-colour, extending from base to apex of the lip, ending with a callus on the midlobe. This small and rather inconspicuous species occurs on mangrove trees and by streams in the south of Malaya, southern Sumatra and Borneo. It is very much smaller than the mountain species of this section, but essentially similar in the structure of the flowers. **Fig. 104, a-c.**

**2. *Eria latifolia* Rchb. f., Bonpl. 5: 55. 1857. J.J.S., Fl. Buit. 6: 394, f. 298. Bull. Dep. Ag. XLIII: 55. 1910.—*E. bidens* Ridl., J.L.S. 32: 289. 1896. Flora 4: 86.—*E. iridifolia* Hk. f., F.B.I. 5: 790. 1890. Ic. PL t. 2067. Ridl., Flora 4: 86.—*E. longispica* Rolfe, Bot. Mag. t. 8171.**

Stems stout, to 30 cm. high, with up to 10 leaves; leaves close together and overlapping at their bases, to 50 by 4.5 cm., stiff; inflorescences 3 or 4, 30 cm. or more long, bearing many crowded flowers, covered with short brownish hairs, the flower-buds dark purplish; flowers 8-9 mm. wide; upper sepal 4 mm. long, hooded; petals 3 by 1 mm., spreading; lateral sepals widely spreading, joined to the straight column-foot which is 4 mm. long; lip forward-pointing, 5 mm. long and wide, the sides rising gently so as to form a broadly channel-shaped blade; forward ends of side-lobes broadly rounded, short; midlobe short, deflexed, deeply cleft, about 2 mm. wide; a central powdery keel from base to apex, ending in a powdery callus at the base of midlobe; on either side of the powdery keel a smooth ridge, the three joining at the base to form a 3-lobed powdery callus; sepals greenish at base, more or less pink-spotted, sometimes dark red at tips; petals greenish yellow with red spots; lip pale green-yellow with pink to red-brown spots, powdery keel and calli white. Distributed

in Java, Sumatra and Borneo; in Malaya found on most mountains at 4,000 feet altitude and over. The plants are very stout and usually bear a group of stems. The flowers vary in detail. Fig. 104, d-e.

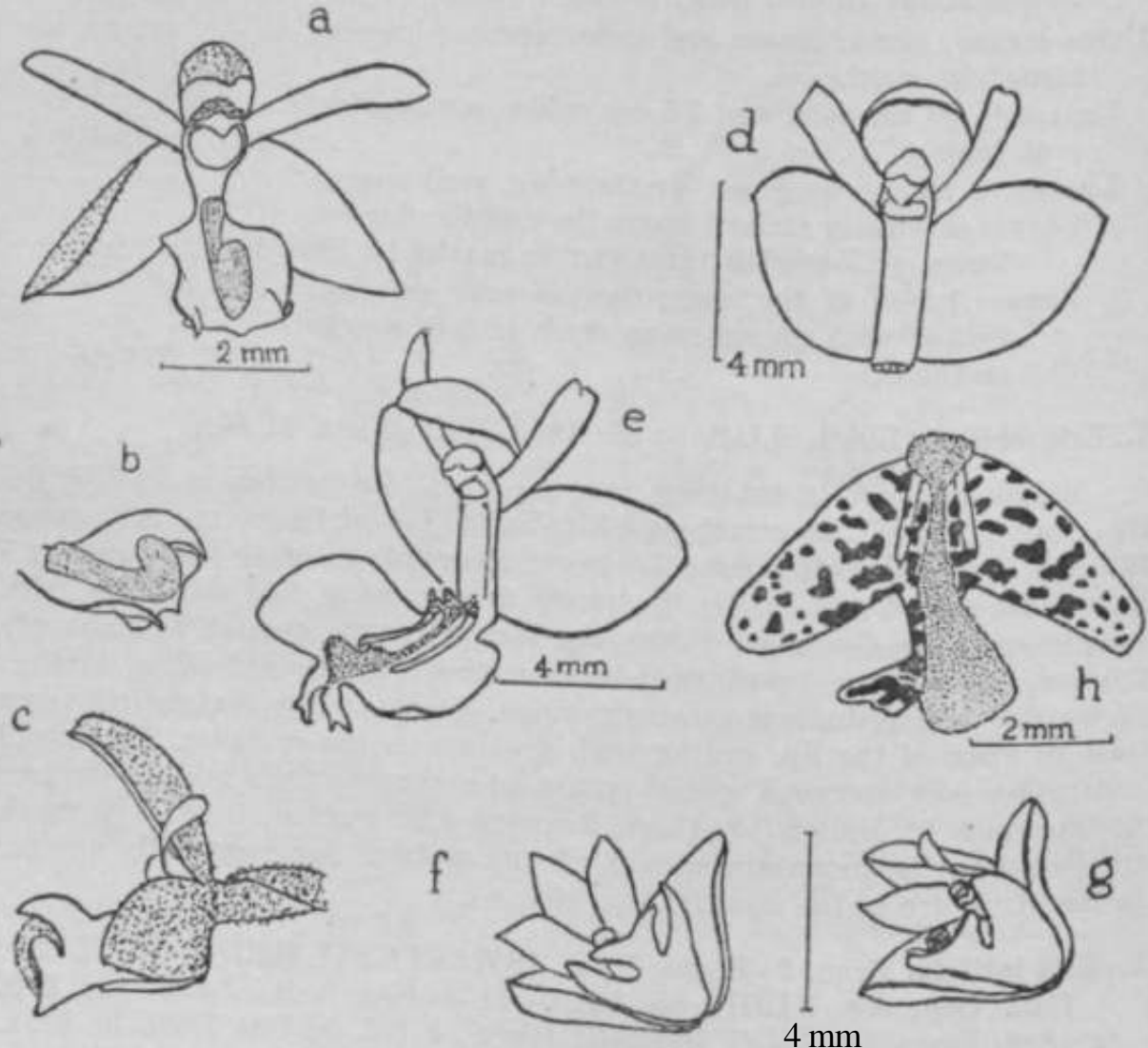


Fig. 104. *Eria obliqua*. a, flower from front, b, lip, showing mealy callus. \* flower from side. *E. latifolia*. d, flower with lip removed, e, complete flower. *E. Ridleyi*. f, g, flower from front and from side, h, lip.

3. *Eria citrina* Ridl., Kew Bull, 1924. 204. Flora 4- 87.

?n hf 9<sup>m</sup>S t0 ?b?Ut .1° om\ Ull > internode « 4 to 6 cm. long; leaves to about 20 by 2 cm, distinctly stalked at the base; inflorescences 2 or 3, to about 20 cm. long bearing many flowers; flowers similar to *E. Ridleyi* in shape *TrL^S* 1J ? yel r With Only faint P<sup>ur</sup>P<sup>^</sup> markings on the lip; upper sepal 3 mm. long, lip 5 mm. long. Known onl<sup>y</sup> from G<sup>g</sup>uno<sup>ng</sup> Kerbau and G. Benom; a much more attractive species than the others.

4. *Eria Ridleyi* R<sup>o</sup>lf<sup>e</sup>, J.L.S. 42: 150. 1914. Ridl., Flora 4: 97, -ff. *major* Ridl<sup>e</sup> Mat. Fl. M.P. 1: 90. 1907 (not of Tr. L.S. 4: 237).—*E. Kingii* Hk. f., F.B.I. 5: 790. 1890 (non F. von Muell.). Ic. Pl. t. 2066.—#• *tahanerms* Ridl., J.F.M.S. Mus. 6: 177. 1915. Flora 4- 87—tf. *callosa* ?<sup>e</sup> S / f<sup>l</sup> M<sup>S</sup> MUS 13: 225 ld27 ~*E. torutensis* Ridl., Flora M-P.

Stems to about 50 cm. tall, internodes 2-5-4 cm.; leaves variable, to about 20 by 3 cm., but sometimes long and narrow, sometimes short and broad; inflorescences 2 to 4, to about 30 cm. long or sometimes more; flowers very numerous, hairy on the outside; sepals and petals very pale yellow-green, lip shining pale yellow or white with dark red-purple spots, the powdery keel and calli white; flowers about 6 mm. high and 8 mm. wide; lateral sepals with a shorter base and less wide-spreading than in *E. latifolia*; lip 4-5 mm. long, the side-lobes together forming a crescent with the ends pointing forwards; midlobe widening from a narrow base, much wider than long, more or less cleft, with uneven reflexed edges; a small powdery callus at the base of the lip and a much larger one on the midlobe, connected together by a powdery keel; a low smooth keel on either side, ending at the sinus between side and midlobes. Found on mountains at 4,000-6,000 feet in all parts of Malaya; variable in shape of leaves, size of flowers and shape of lobes of the lip. It is probable that distinct varieties exist. Fig. 104, f, g, h.

4. § *Cylindrolobus*

Stems long or short, leafy almost throughout or on the apical part only (the base covered with sheaths), not hairy, inflorescence <sup>1</sup> terminal (penetrating the leaf-sheaths) or apparently terminal, short or of a few flowers, almost hairless, usually with conspicuous fleshy, reddish or yellowish spreading bracts; mentum relatively short and broad, lip 3-lobed, usually with smooth longitudinal keels.

This group is represented by 8 species in Malaya. Ena & Rolfe, Kew Bun. 1909: 336. Ridl., Flora 4: 95 found in Setul Paps also belongs here; it has a terminal inflorescence of about 4 flowers on a scape

The section is usually divided into species with all flowers <sup>10</sup> **apparently** terminal, and those with lateral inflorescences at many nodes; the latter is *Cylindrolobus* proper, and contains several species with long leafy stems, somewhat reminiscent of the sections *Distichophyllum* and *Grastidmm* of *Dendrobium*. The species with solitary terminal flowers (nos. 1-3) are often placed in a section called *Nutantes*. This section is undoubtedly closely related to § *Hymeneria*, with flowers of closely similar form. Hybrids have been produced in Singapore by crossing *E. leptocarpa* with *E. xanthocheila*.

Key to the species of *Cylindrolobus* in Malaya

Flowers only terminal, leaves only near apex of stems

Midlobe with a smooth central keel ending in a separate tooth; stems to 60 cm. long; leaves to 20 by 3 cm. . . . . 1. *E. nutans*

Midlobe with a waved and warty central keel; stems to 15 cm. long; leaves to 12 by 1-7

cm. Flowers flushed with pink; upper sepal about 13 mm. long . . . . . 2. *E. neglecta*

- Flowers mainly yellowish-white; upper sepal about 10 mm. long . . . . . 3. *E. diluta*
- Flowers in lateral inflorescences; stem long and leafy throughout, or short with a few apical leaves
- Stem leafy almost throughout
- Stem slender; midlobe of lip covered with yellow papillae . . . . . 4. *E. pilifera*
- Stem stout; midlobe of lip otherwise
- Stem erect; leaves rather thin, to 20 by 2 cm.; inflorescence of 4 to 6 flowers . . . . . 5. *E. leptocarpa*
- Stem drooping; leaves thick, to 12 by 1 cm.; flowers solitary . . . . . 6. *E. rigida*
- Stems short, leafy near apex only
- Stems close together, flattened near apex; leaves to about 9 by 1.8 cm. . . . . *I.E. biflora*
- Stems 12-18 cm. apart, not flattened; leaves to about 18 by 5 cm. . . . . 8. *E. longe-repens*

**1. *Eria nutans*** Lindl., Bot. Reg. 26: Misc. 83. 1840. Ridl., Flora 4: 94.

Stems somewhat thickened towards the apex, covered with red-brown sheaths; leaves 3 to 5, up to 20 by 3 cm., secondary veins in addition to the midrib clearly visible on the lower surface; flowers solitary, from the axil of a short terminal sheath; bract dull purplish-pink, about 1.5 by 1.2 cm.; sepals white with a tinge of pink at the tips, petals white with a tinge of greenish-yellow at the tips; lip with the middle part flushed greenish-yellow; diameter of flowers when open about 2.2 cm.; upper sepal 1.5 by 0.8 cm., blunt, hooded; mentum 6 mm. long; petals 1.3 by 0.5 cm., concave; lip curved, in natural position 1 cm. long; side-lobes erect, the ends narrowly rounded and projecting well forwards; midlobe 1 cm. wide and 0.5 cm. long, the apex broad; one high flat partly yellow keel from base to apex of lip, ending with a separate tooth, and two short white keels also at the base of the midlobe; a minutely papillate brownish callus, with a straight upper edge, at the end of the column-foot. Distributed in Borneo and Sumatra; in Malaya found throughout the country in the lowlands and at moderate elevations, most commonly on trees by rivers.

**2. *Eria neglecta*** Ridl., J.L.S. 31: 283. 1896. Flora 4: 95.

Very like *E. nutans* in general appearance, but smaller, the stems to about 15 cm. long, covered with dull brown sheaths; the leaves narrower and with no conspicuous veins besides the midrib; the floral bracts only 8 mm. long, not flat, thin and pale; the flowers a little smaller (upper sepal 1.3 by 0.5 cm.), flushed with pink throughout except for the midlobe of the lip and the anther, which are cream; the petals only 2 mm. wide; the keel on the midlobe thickened, irregularly warty, the midlobe itself as long as wide, the sides wavy and folded, very thin in texture; the end of the column-foot with a short fleshy extension at right angles, to which the lip is joined. Occurring in Borneo and Malaya, throughout the lowlands, and especially on trees by rivers and old mangrove in the south. **Fig. 105.**

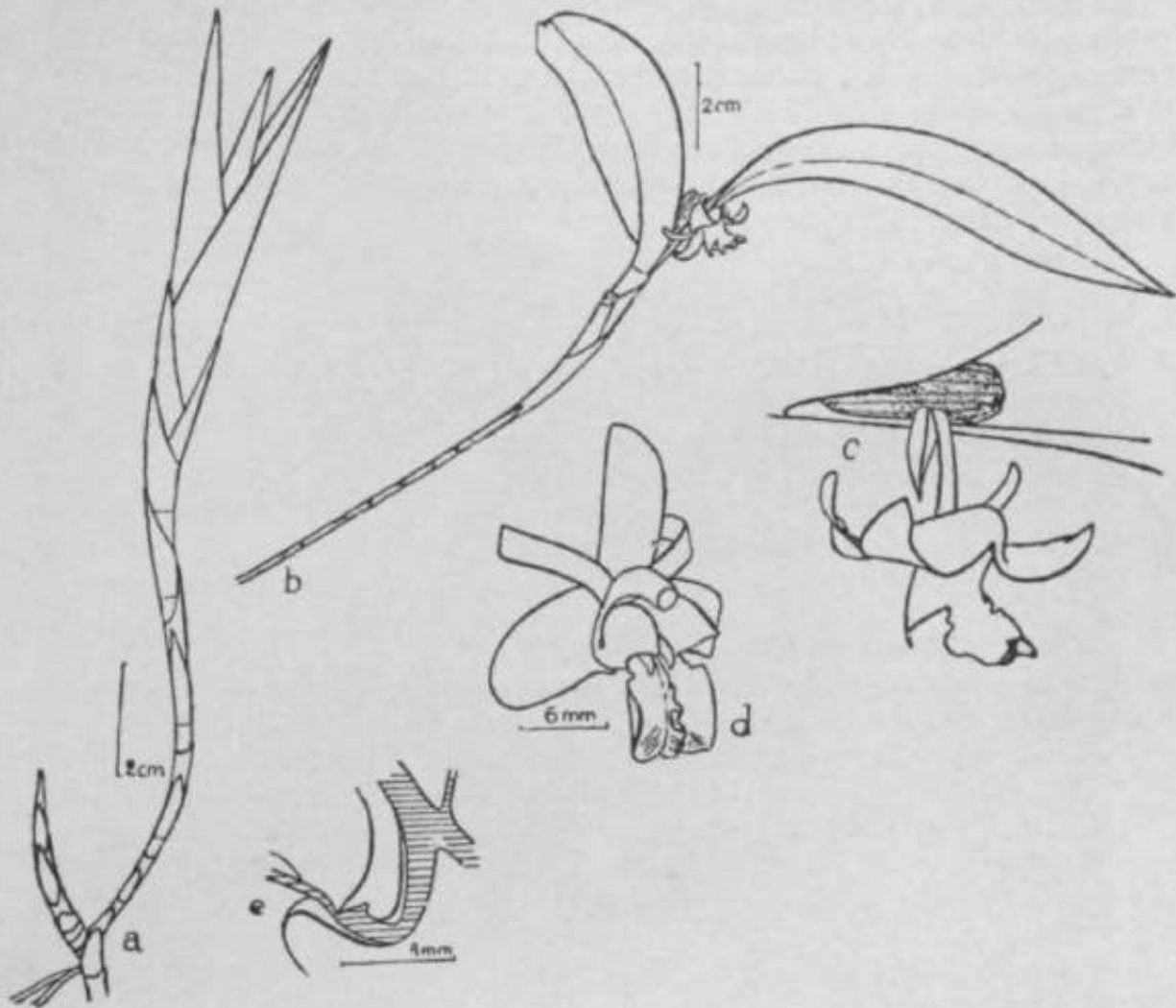


Fig. 105. *Eria neglecta*. a, young: stem, b, leaves and inflorescence, c, flower and bract in natural position, rf, flower from front, e, section of base of column and column-foot showing attachment of *Up*,

3. *Eria dilute* Ridl, J.F.M.S. Mus. 7: 52. 1916. Flora 4: 95.

Resembling *E. neglecta* in habit, with slender stems 10 cm. long (in the only known specimen) and leaves to 10 by 1-2 cm.; bracts narrow, about 9 mm. long; flowers 2 or 3 together, 'yellowish white, with lip and column tinged with brownish pink'; upper sepal about 10 mm. long, mentum 4 mm. long; midlobe of lip 4-5 mm. long and wide, with a median high keel throughout and two short low ones near the base, the front part of the median keel apparently warty. Only known from 3,000 feet on Kedah Peak. Living plants of this and *E. neglecta* should be compared.

4. *Eria pilifera* Ridl., J.L.S. 32: 299. 1896. Flora 4: 89. J.J.S., Bull. Btzg., Ser. 3, 8: 359. 1927. Ser. 3, Suppl. II: t. 55, III.

Stems slender, drooping, to about 50 cm. long; leaves thin, to about 7-5 by 1 cm., tapering to the apex; flowers usually solitary, with 3 or 4 narrow pale yellow-orange bracts about 5 mm. long; flowers white with lemon-yellow papilae covering the midlobe of the lip, about 1-7 cm. wide

when fl open; mentum about 5 mm long; upper sepal 1.1 by 0.35 cm.; petals a little smaller; side-lobes narrow, extending abruptly at the base of the short midlobe. *Sinaraja* distributed in Java and Sumatra from Taijau to Eraser's Hill, at 3,000 ft. but probably more widely distributed on the mountain. Fig 101.

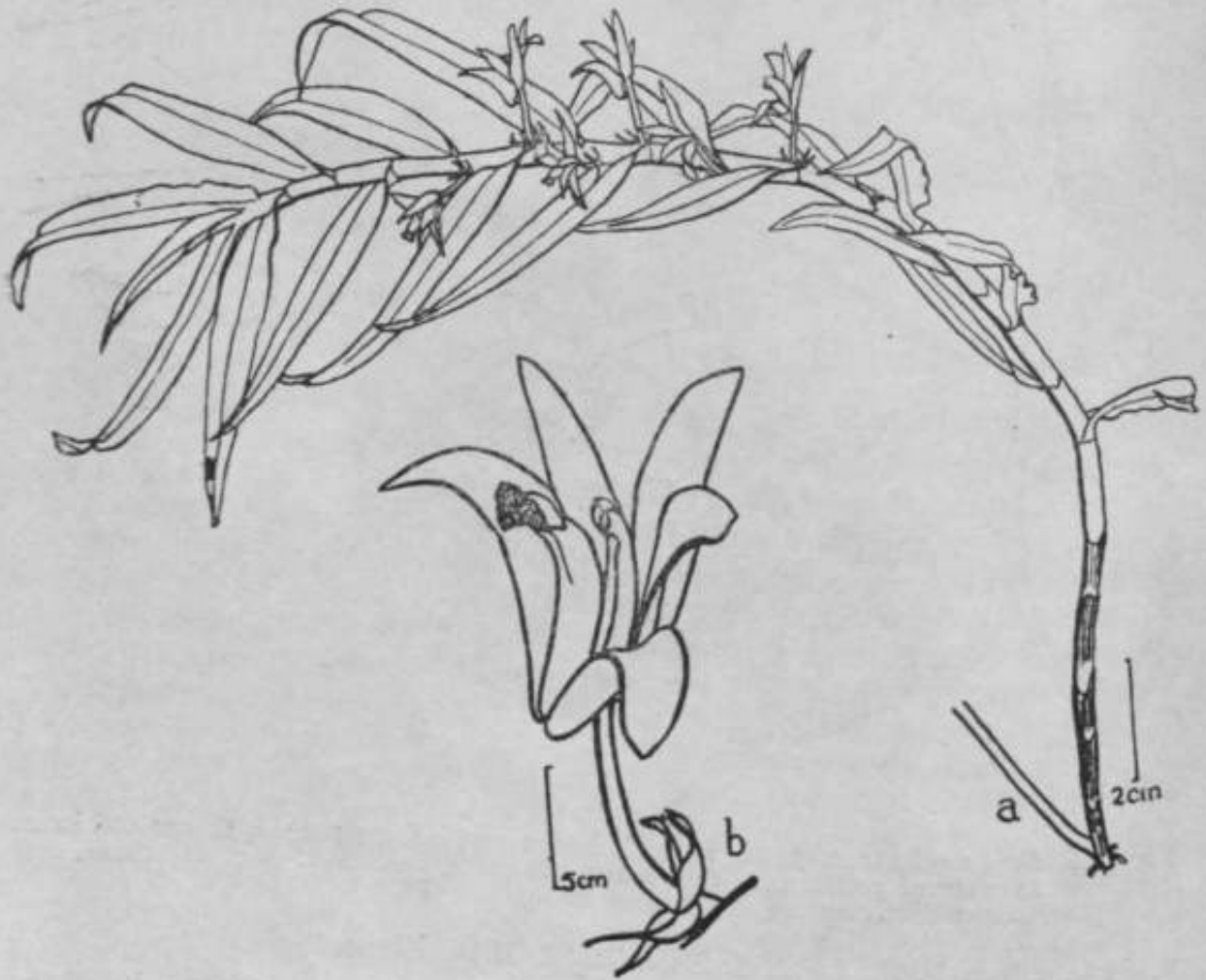
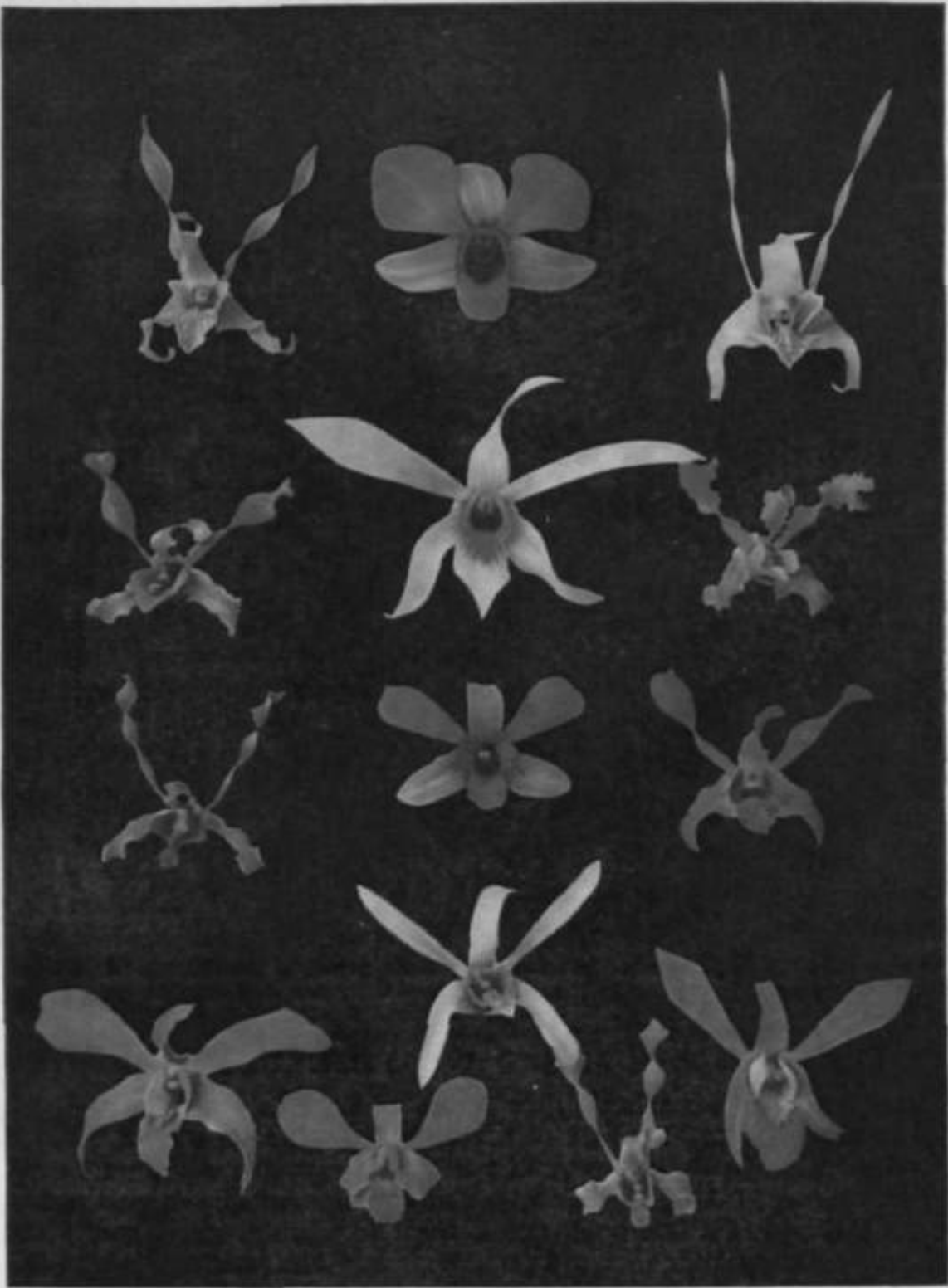


Fig. 106. *ErU, viHfera*. a, habit of plant. b, flower.

5. *Eria leptocarpa* Hk. f., F.B.I. 5: 805. 1890. Ic. Pi. t. 2077. Eidl., Flora 4: 88.

Stems close, stout, erect throughout; leaves light green, apex gradually narrowed; inflorescences of 2 to 6 flowers, simultaneously from many nodes; bracts pale yellow-green, to about 1.2 by 0.4 cm.; flowers about 1.8 cm. wide, very pale yellowish. with backs wards with a few scattered pale purplish spots; lip bent at right angle in the middle; side-lobes erect, pointed, pale mauve with deeper mottling; mid-lobe rounded, minutely papillate, concave, almost white with a few





Dendrobium

X Queensland

X Champagne

X Constance

X Pauline

X Bali

X Caesar

X Louise

X Tanglin

X Helen Park

X Ursula

stratiotes

undulatum,  
small variety

X Parkstance

X Rose Marie



edges; 3 smooth keels from base of lip to base of midlobe, the central one a little longest; fruit slender, to 8 cm. long. Distributed to Borneo in Malaya, only known in the lowlands of Perak, as an epiphyte. This is one of the largest local species of Eria.

6. *Eria rigida* BL, Mus. 2: 183. 1851. J-J-S, Bull. Botz. Ser. 3. Suppl. II: t. 54, V.-E. *pendula* Kidl., J.S.B.R.A.S. 39: 78. 1903. Flora 4. 89.

Stems to 100 cm. or more long, curved, pendulous; leaves rather tough and thickened, dark green, to about 12 by 1 cm. curved acute, bases lateral, many, usually of one flower; bracteoles 5, to 8 by 5 mm., base broad, narrowed evenly to apex, dull red; <sup>fl?</sup> J ^ J J J ^

white, the lateral sepals <sup>the</sup> upper sepal 1.4 by 0.7 cm.; petals as wide, concave; lip barely 9 mm. long, without claw, the side-lobes wide, erect, obtusely angled at their forward ends, the midlobe 3 mm. long and 5 mm. <sup>the very</sup> <sup>out-</sup> <sup>is at</sup>

column-foot at right angles to the column, its end bent upwards and bearing an erect broad flattened callus covered with <sup>the</sup> <sup>shaped</sup> Papilla. Distributed in Borneo and Sumatra; <sup>m</sup> J ^ a found in many places in the lowlands, both on trees by rivers and on limestone rock, as far north as Langkawi. Fig. 107.

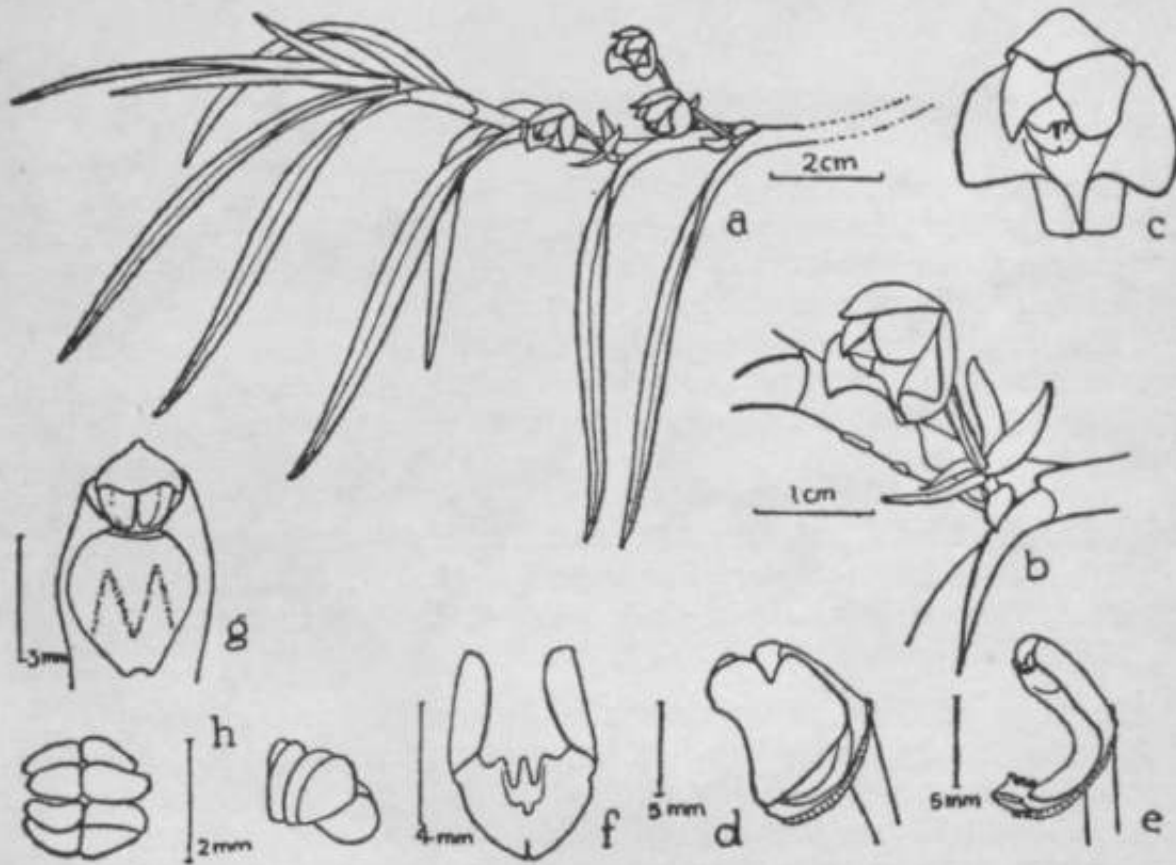


Fig. 107. **Mi; 2** <sup>it of plant and</sup> <sup>column-foot.</sup> *b.* inflorescence, *c.* flower from front, *d.* <sup>Up</sup> column-foot, *e.* lip from above, *f.* lip from above, *g.* lip from above, *h.* lip from above.

7. **Eria biflora** Griff., Notul. 3: 302. 1851. King & Pantl., Ann. Calc. 8: t. 160. J.J.S., Fl. Buit. 6: 390, f. 295.

Stems to about 15 cm. long, widened and flattened at the apex which bears 3 to 5 leaves; leaves to 9 by 1.8 cm.; flowers in pairs (or threes) with 3 broad yellow bracts 6 by 4 mm.; pedicel and ovary 4 mm. long; flowers hardly opening, pale yellowish; upper sepal 6 by 2.5 mm.; petals narrower; lip hinged to the column-foot, curved, barely 4 mm. long in natural position, without side-lobes; 2 smooth keels from base to apex of lip, near the edges, and a short median one near the tip; edges of the lip near the tip papillose. Distributed from Sikkim southwards to Sumatra and Java; in Malaya only found once, at Gua Musang in southern Kelantan. **Fig. 108.**

8. **Eria longe-repens** Ridl., J.L.S. 31: 282. 1896. Flora 4: 95.

Rhizome long-creeping, fleshy, bearing erect stems 10 cm. long at intervals of 12 to 18 cm.; stems bearing 3 or 4 leaves to 18 by 5 cm., elliptical and distinctly stalked; inflorescences on the stem below the leaves, bracts pink, 1.5 by 0.8 cm.; sepals and petals pinkish yellow with darker median lines; upper sepal 1.4 cm. long; lip white, unlobed, with a broad tip. Only found in southern Malaya and Sarawak, on mangrove. Further information about this curious species is desired.

### 5. § **Callostylis**

Rhizome slender, creeping, with well-spaced short erect pseudobulbs, each bearing 2 or 3 leaves; inflorescences short, erect, bearing many flowers in succession, only one open at a time; no mentum; column relatively long, column-foot short, the undivided almost round lip hinged to it.

This section has only one Malayan species, *E. ptdchella* (sometimes separated as a distinct genus, when it is called *Tylostylis rigida*), distributed from Sumatra to Celebes; in Malaya throughout the country as a lowland epiphyte.

**Eria pulchella** Lindl., Bot. Reg. 27: Misc. 52. 1841.—*Callostylis rigida* BL, Bijdr. 341. 1825.—*Tylostylis rigida* BL, Fl. Jav. N.S. prsef. vi. 1858. Ridl., Flora 4: 104.—*Eria rigida* Rchb. f., Bonpl. 5: 55. 1857 (non Bl. 1851). J.J.S., Fl. Buit. 6: 397, f. 300.

Erect pseudobulbs at intervals of 6-10 cm., to 6 cm. long and 2 cm. wide, somewhat flattened, wrinkled and yellow-green when old, consisting apparently of a single internode below the 2 or 3 closely placed leaves; leaves to about 12 by 3 cm., rather thin in texture; inflorescences shorter than leaves, covered with short white woolly hairs; bracts 4 mm. long, reflexed, almost round with recurved edges; flowers fleshy, dull orange-yellow; sepals about 15 by 6 mm., short-hairy on the back, petals a little

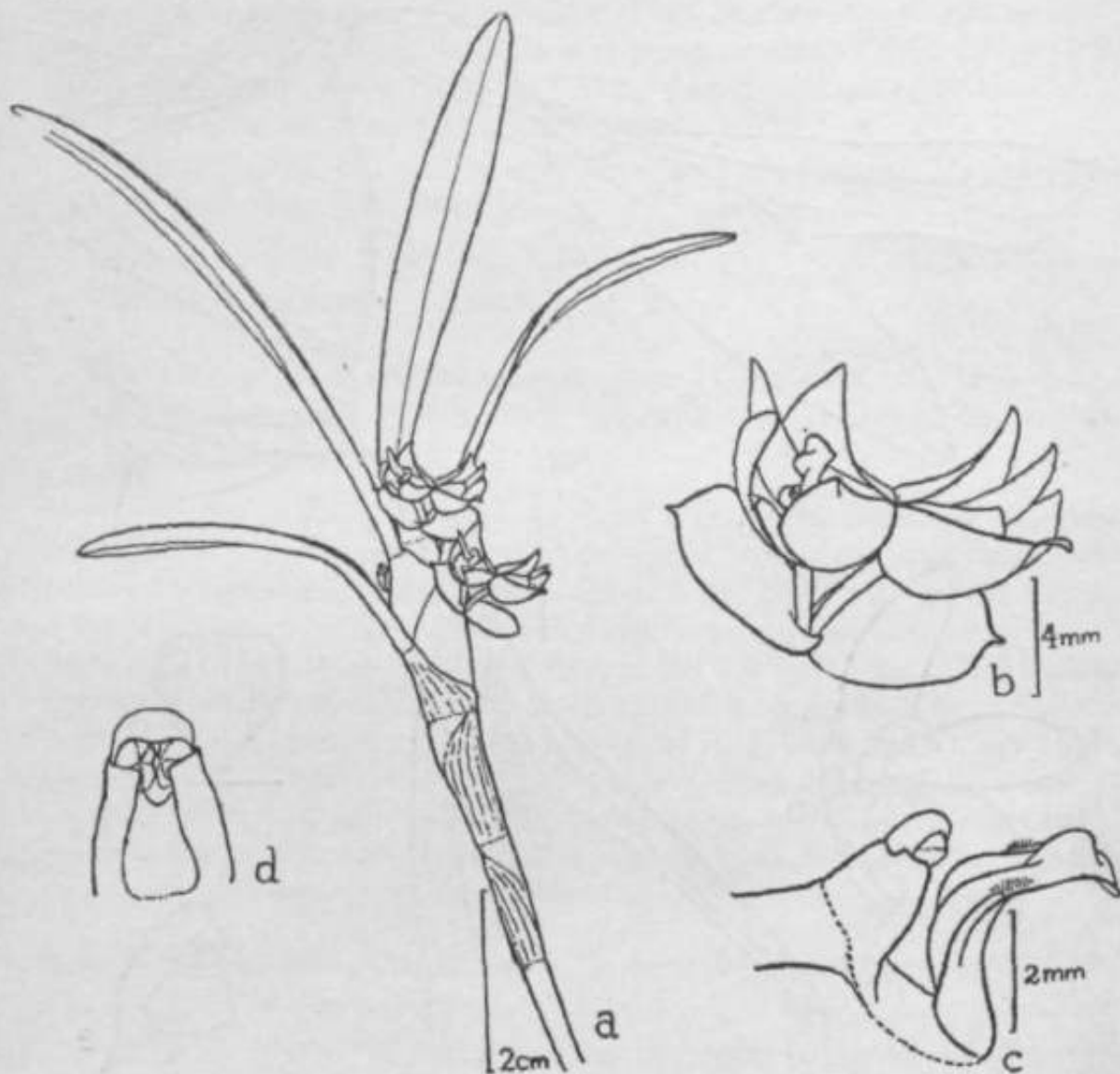


Fig. 108, *Eria biflora*. *a*, leaves and inflorescence, *b*, inflorescence showing the 2 flowers with their bracts, *c*, column, column-foot and lip from side, *d*, column.

smaller; lip almost round, 6 mm. long, fleshy, shining chocolate brown, paler at the sides and covered with short dull yellow hairs, base slightly 3-ridged, the ridges divided by two yellow lines; column slender, curved, 7 mm. long; foot 3 mm. long, with a dark brown callus. Owing to the column being curved backwards, the foot projects in the same direction as the bases of the lateral sepals and so no mentum is formed. Fig. 109.

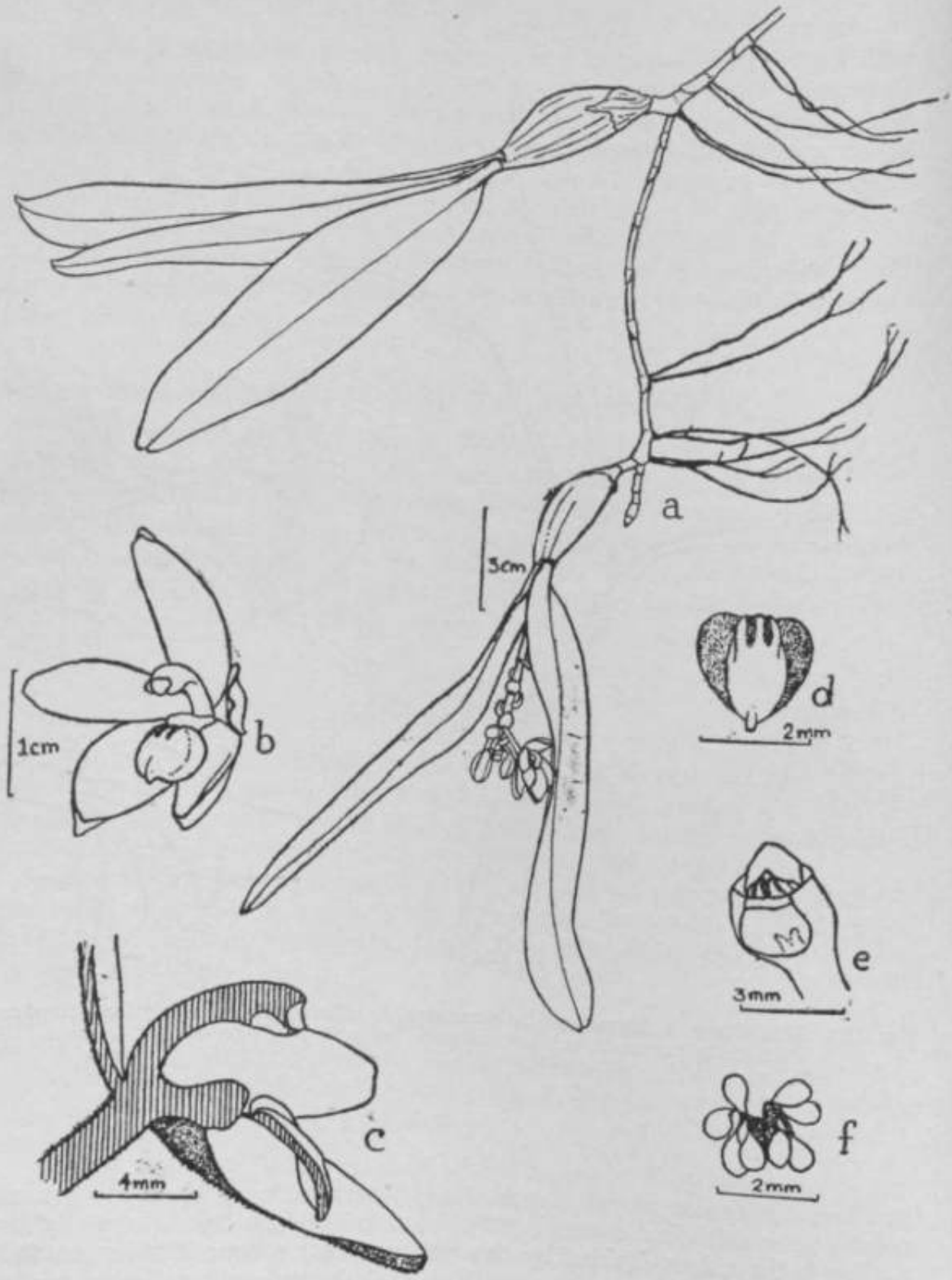


Fig. 109. *Eria pulchella*. *a*, part of plant in flower, *b*, flower *c*, column-foot and lip. *d*, lip from above, *e*, top of column, *f*, lip from side.

## 6. § Dendrolirium

Rhizome slender, bearing at intervals short thick pseudobulbs, each with a few leaves, the inflorescence arising in the same way as a vegetative shoot from the very base of a pseudobulb and bearing several rudimentary leaves at the base (which is often somewhat swollen); inflorescence-axis hairy, with rather large bracts and many flowers, not all open simultaneously, the apex continuing to grow for some weeks.

This is a small but widely distributed Section. The two Malayan species are distinguished as follows:—

Bracts to about 2 cm. long, pale green	. . .	1. <i>E. albido-tomentosa</i>
Bracts much larger, bright orange	. . .	2. <i>E. ornata</i>

1. **Eria albido-tomentosa** (Bl.) Lindl., Gen. et Sp. Orch. 66. 1830. J.J.S., Fl. Buit. 6: 382, f. 289. Ridl., Flora 4: 98.—*Dendrolirium albido-tomentosum* BL, Bijdr. 345. 1825.

Pseudobulbs 5-7 cm. apart, to about 6 by 4 cm., distinctly flattened, bearing 3 or 4 leaves; leaves curved outwards, to about 20 cm. long; inflorescence white woolly-hairy; bracts about 2 cm. long, pale green; flowers 3 cm. wide, hairy on the backs of the sepals, pale green turning yellowish when old; upper sepal 1.5 by 0.6 cm.; petals 1.4 by 0.4 cm.; lip pointing forwards, white and dull purple, about 1.6 cm. long, 3-lobed, the side-lobes small, rounded, erect, the midlobe as wide as long, blunt, with wavy edges, the middle part fleshy with 3 short parallel white ridges. Distributed in Java and Sumatra, and from Perak northwards to Tenasserim and Siam. An interesting but hardly beautiful species, easy to cultivate, standing more exposure than most Erias. Fig. 110.

2. **Eria ornate** Lindl., Gen. et Sp. Orch. 66. 1830. Bot. Mag. t. 8642. J.J.S., Fl. Buit. 6: 380, f. 288.

In habit similar to the preceding, but with larger pseudobulbs (to 11 by 4 cm.) with 4 or 5 leaves; leaves yellow-green, fleshy, the sheaths with yellow veins; inflorescence to 45 cm. long, covered with red-brown hairs, the bracts orange, up to 8 by 2.5 cm., the flowers small, not wide-opening (the ends of the sepals only separating); upper sepal 1.3 cm. long, greenish yellow; petals distinctly smaller, pale greenish with red median streak; lip 1.3 cm. long, slightly lobed, with 3 longitudinal ridges, the middle one strongest, grooved down the midlobe and reaching the apex; midlobe pointed, 4.5 mm. wide, reddish with darker crisped edges. Distributed from Sumatra to the Philippines; in Malaya found only in the extreme north, but not difficult to cultivate in the south. The large orange bracts are striking, but the plant cannot be classed as a fine decorative orchid. On plants cultivated in Singapore all flowers are self-pollinated.

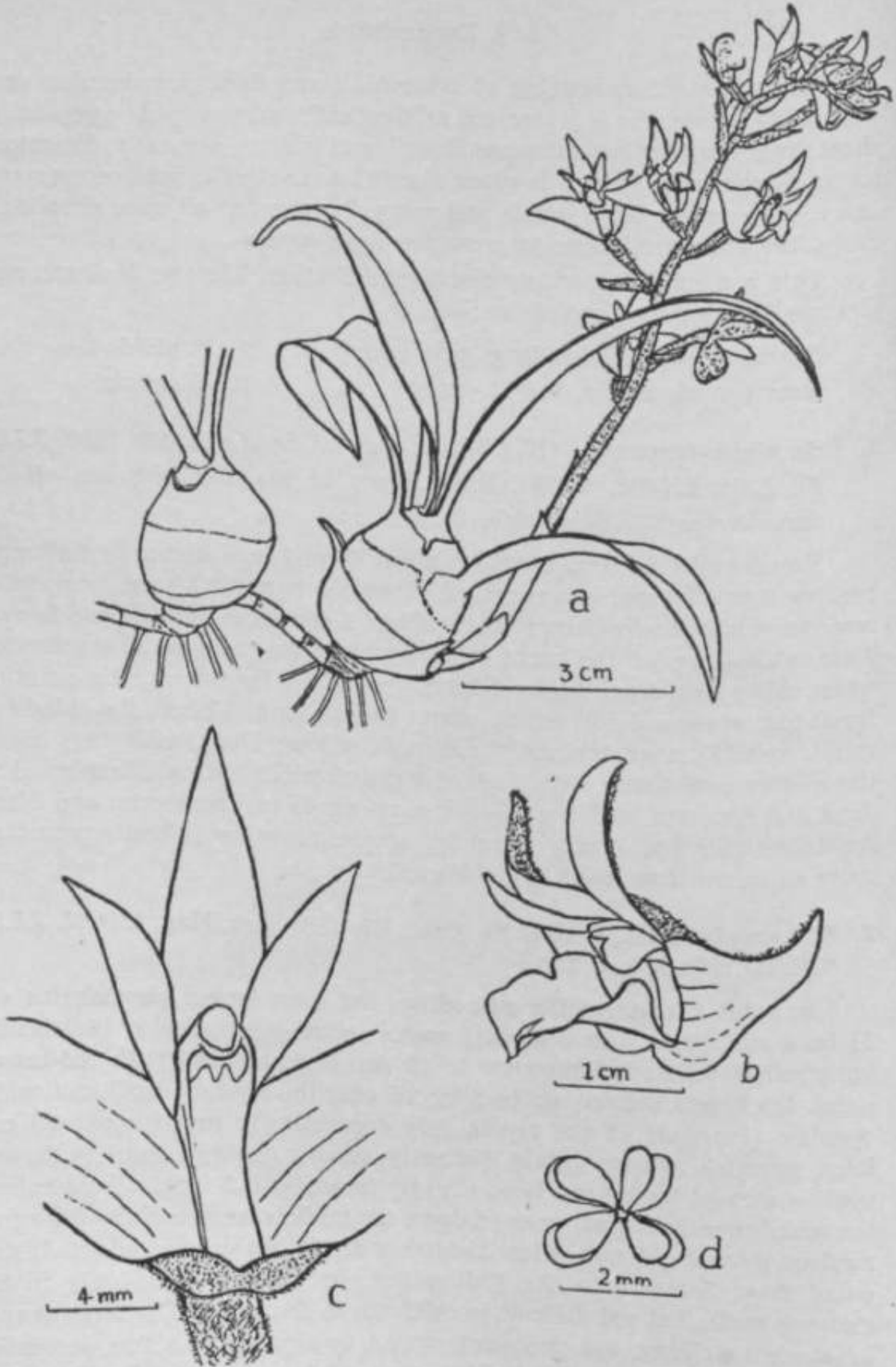


Fig. 110. *Epidendrum tomentosum*. a, plant in flower. b, flower from side. c, flower with pollinia. d, pollinia.



## 7. § Gonorhabdos

*Eria javanica* (Sw.) Bl., Rumphia 2: 23. 1836. J.J.S., Fl. Buit. 6: f. 287.—*Dendrobium javanicum* Sw., K. Svensk. Vet. Ak. N. Handl. 21: 247. 1800.—*Eria rugosa* Lindl., Gen. et Sp. Orch. 66. 1830. J.J.S., Fl. Buit. 6: 378.—*Eria stellata* Lindl., Bot. Reg. 11: t. 904. 1825. Ridl., Flora 4: 96.—*E. striolata* Rchb. f., Gard. Chron. 3rd Ser. 3: 554. 1888. Ridl., Flora 4: 96.—*Dendrobium perakense* Hk. f., F.B.I. 5: 712. 1890.

Each new shoot of the sympodium producing first a stout creeping portion 3 to 6 cm. long, and then an erect ovoid pseudobulb 5 to 7 cm. tall, bearing two large foliage leaves and several scale-leaves; leaves erect, fleshy, to about 50 cm. long and 6 cm. wide, the tip acute, the sheathing bases joined to the pseudobulb; inflorescence arising near the top of the pseudobulb, erect, to about 60 cm. long, with flowers almost to the base; scape, rachis and bracts usually hairy but sometimes almost hairless; bracts narrowed to an acute tip, 1-5 cm. long; flowers facing in all directions, about 4 cm. wide, fragrant, almost white or pale yellowish, often with purple veins; sepals and petals very narrow, pointed; upper sepal 2-8 cm. long, 5 mm. wide at the base; petals a little smaller; mentum short; lip somewhat hinged to the column-foot, 1-5 cm. long, 3-lobed, the side-lobes erect, short, midlobe long, oblong with a short tip, with 3 strongly marked ridges throughout, the middle one yellow. Distributed from Sumatra to the Philippines; in Malaya not uncommon as an epiphyte in the lowlands, in all parts of the country, often forming large plants, and flowering frequently. The form with striped sepals and petals has been called *E. striolata*. There is also a form which is self-pollinated, the flowers not opening properly. Fig. 111.

This species is peculiar in the genus *Eria* in several ways. The leaves are convolute when folded in the bud; that is, the edges of a leaf overlap each other. All other *Erias*, and all *Dendrobiums*, have duplicate leaves, the edges of which may meet when folded in the bud but do not overlap. The distinction may appear trivial, but it is very constant over large groups of orchids, and was used by Pfitzer as a main dividing character in classifying the family; exceptional cases, with convolute and duplicate leaves in the same genus or group of genera, are rare. The very tall inflorescence of *E. javanica*, with its rather large flowers is also distinctive, and the 1-jointed pseudobulbs to which the leaf-sheaths are fused. The leaves are conspicuously jointed just above the base.

Owing to its tall inflorescence and quite attractive fragrant flowers, this is one of the few *Erias* that are sometimes cultivated; but the flowers are short-lived. Cultivation is easy; a moist shady place is required, and a basket filled with pieces of fern-root, or coconut husk, and charcoal.

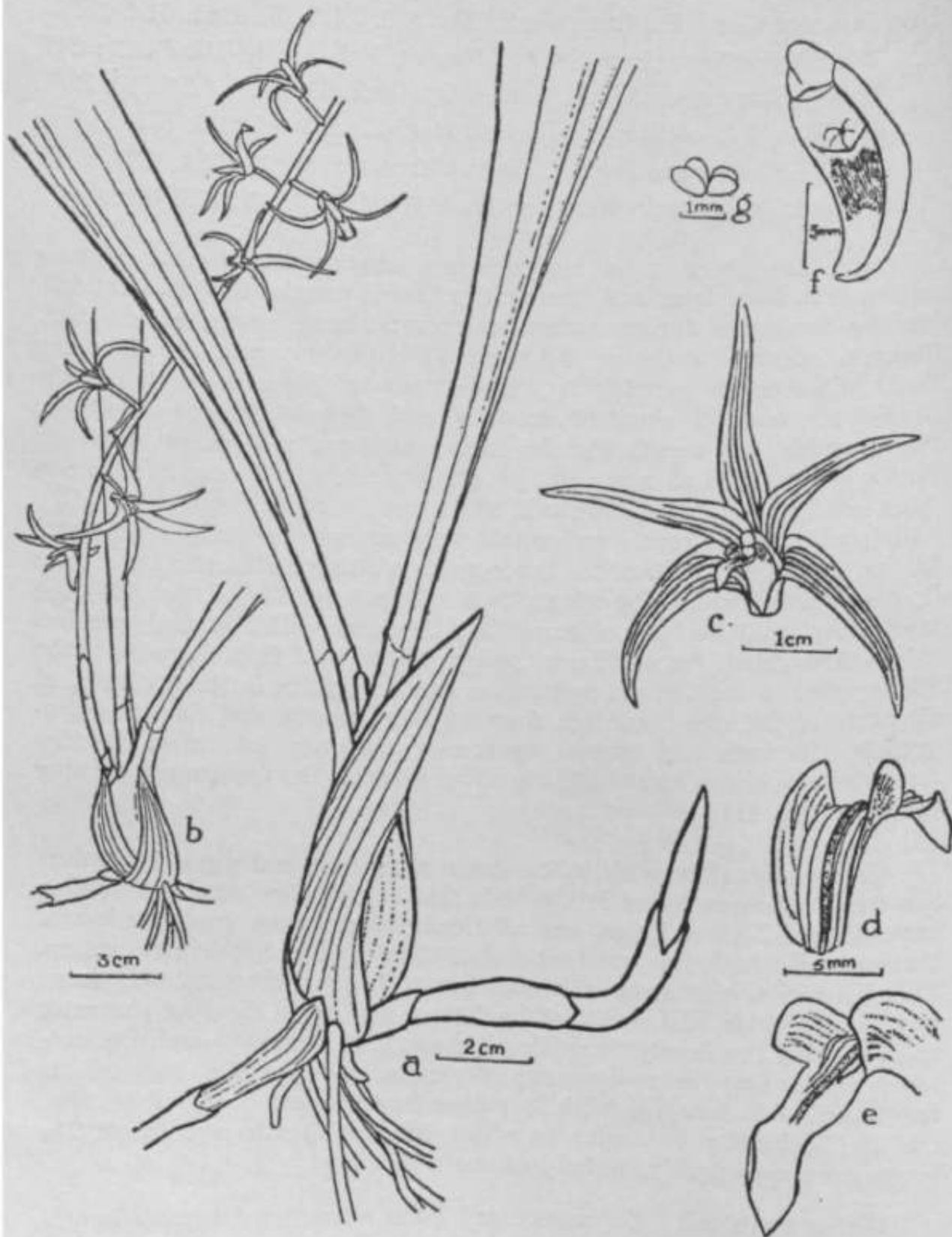


Fig. 111. *Eria javanica*. a, part of plant showing pseudobulb, leaf bases »nH leaves, b, inflorescence from near top of pseudobulb. c flower fr<sup>TM</sup> scale front  
d, e, lip. f, column and column-foot, g, 4 of the pollinia'

## 8. § Strongyleria

Plant with creeping rhizome bearing close or distant short erect shoots each composed almost entirely of a single joint, with thin basal sheaths and 1-3 leaves near the top; leaves terete and fleshy, or flat; inflorescences from the top of the stems, short, of 1-3 flowers, covered with short woolly hairs; flowers fairly large, with a mentum more than half as long as the upper sepal, and undivided curved rather fleshy lip.

There are three Malayan species of this distinctive group, one of them found in the north only; the flowers are rather like those of the section *Dendrolirium* in structure, but the lip is simpler. The two sections were united by Hooker and Ridley, but vegetatively are very different.

Key to the Malayan species of the Section *Strongyleria*

- Leaf solitary, terete; inflorescence as long as leaf 1. *E. teretifolia*  
 Leaves 2-3, terete or flat, inflorescence shorter  
 than leaves  
 Leaves to 2.5 cm. wide, young shoots brown-  
 hairy . . . . . 2. *E. leiophylla*  
 Leaves terete or slightly flattened, young shoots  
 white-hairy .. . . . 3. *E. panned*

1. ***Eria teretifolia*** Griff., Notul. 3: 298; Ic. Pl. Asiat. t. 300. 1851. Ridl., Flora 4: 99.—#. *pellipes* Hk. f., F.B.I. 5: 802. 1890.

Shoots close together, each consisting of a pseudobulb 0.8 to 1.5 cm. high and to 7 mm. wide near the base, narrowed upwards, and bearing a single terete leaf; leaf 4 to 15 cm. long and 3-5 mm. thick, grooved on one side near the base only; inflorescence with 1 to 3 flowers, the scape 2 to 5 cm. long, a thin sheathing leaf 1.5-2.5 cm. long at the base; flowers 1.5-1.8 cm. wide, pale lemon yellow; upper sepal 10 by 0.35-0.5 cm., tapering to a narrow apex; lateral sepals similarly pointed; petals 2-3 mm. wide; lip 1.2 cm. long, slightly fleshy, bent forwards just below the middle, widened gradually from the base which is slightly grooved on the upper surface, 4 dull red stripes near base or on middle of lip, greatest width 3-4.5 mm., apex also grooved, broadly pointed to retuse with a tooth in the sinus; column-foot with 2 small orange spots or flushed with orange near the tip. This is a common epiphyte on mountains up to about 4,000 feet in all parts of Malaya. It is sometimes much dwarfed in exposed places. There is much variation in size of pseudobulbs, width of petals, width and shape of tip of lip, and colouring of lip, but no distinct varieties have been distinguished. Two closely allied species, which might be united with *E. teretifolia*, have been found in Sumatra.

2. ***Eria leiophylla*** Lindl., J.L.S. 3: 57. 1859. Hk. f., F.B.I. 5: 809. Ridl., Flora 4: 99.

Rhizome rather stout, the erect shoots about 6 cm. apart; sheaths of growing shoots covered with red-brown woolly hairs; shoots to about 9 cm. long, 1-2 cm. thick at the base, the upper part quite slender, bearing 2 leaves; leaves to about 15 by 2.5 cm., elliptic-oblong; inflorescences very short, of 1 or 2 flowers, near the top of young shoot, covered throughout (including flower-buds) with short red-brown hairs; sepals and petals

pale yellow, the sepals brown-hairy on the back; upper sepal 1.2-1.5 by 0.6 cm.; petals 4 mm. wide, sparsely hairy; mentum 7 mm. long, very broad; lip fleshy, 1.2-1.4 cm. long, bent almost at right angles in the middle, the sides raised, maximum width (not pressed flat) 6 mm., gradually narrowed to the tip, with a central fleshy thickening which is wide at the base, narrowed upwards and joined to a triangular fleshy area at the apex. Distributed in Sumatra, Borneo and Celebes; in Malaya only known on Penang Hill and Taiping Hills. It is an attractive species, with unusually large flowers for the genus. Fig. 112, e.

3. *Eria pannea* Lindl., Bot Reg. 28: Misc. 64. 1842. King & Pantl., Ann. Calc. 8: 39. 1961. J. S. BUIK Bot Ztg. Ser. 3, SUPPL. n: \*\* 45, V, RM 11.

Rhizome slender, young parts covered with white-hairy sheaths; erect shoots 3-5 cm. apart, not fleshy, the old leafless ones 1.5 cm. long; leaves 2-3 to each shoot, 7-15 cm. long, slightly flattened laterally, 5 mm. wide; scape about 2 cm. long, the inflorescence bearing 1-3 flowers, fragrant, pale yellow-green with very dark purplish fleshy lip; flowers 1.6 to 2 cm. wide, the upper sepal 0.9 by 0.5 cm., narrowly pointed; petals 2 mm. wide; mentum curved, nearly 1 cm. long; lip shaped much as in *E. leiophylla* but smaller, the basal and apical thickened areas (both yellowish) not connected. Distributed from the eastern Himalayas and southern China southwards to Malaya and Sumatra; in Malaya a common lowland epiphyte, especially in the south, of attractive appearance, the flowers with a strong scent of Vanilla. Fig. 112, a-d.

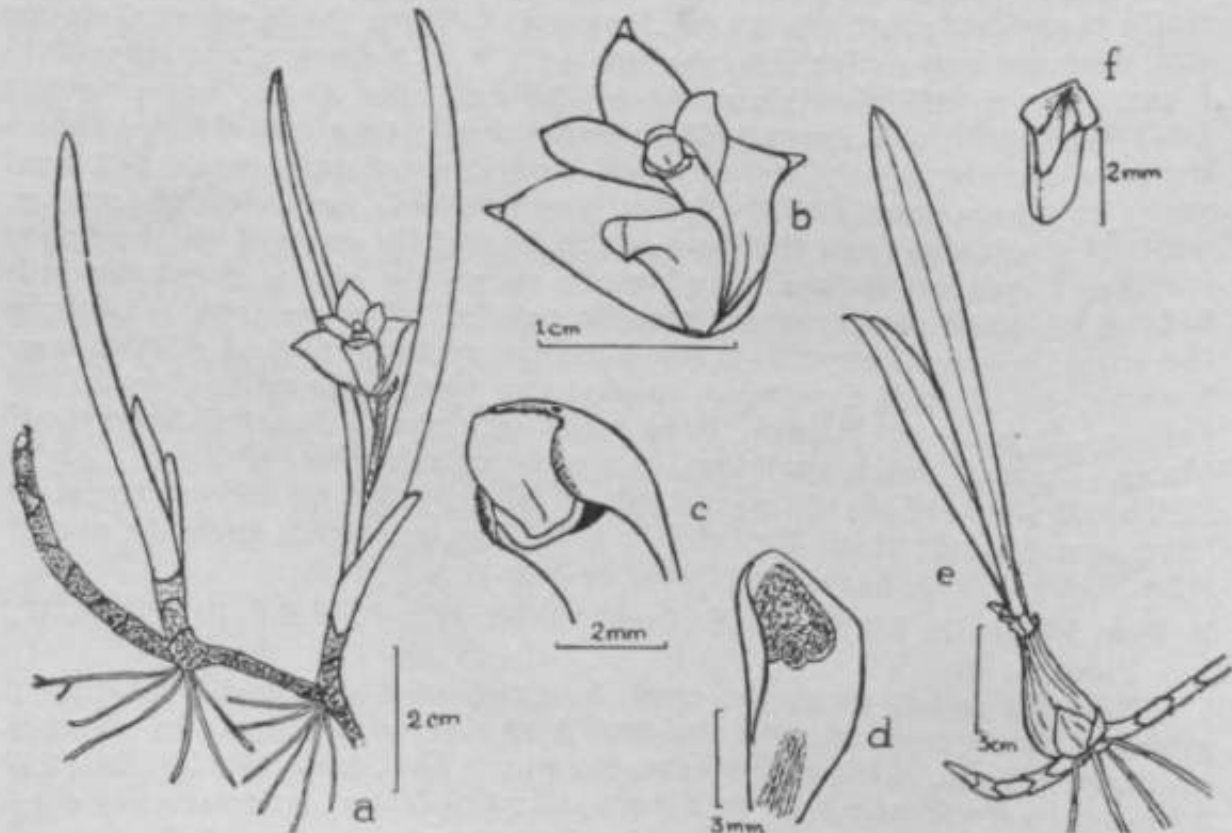


Fig. 112. *Eria pannea*. a, plant in flower. b, flower. c, column. d, lip. *E. leiophylla*. e, plant with old inflorescence. *E. longifoba*. f, *Up.*

9. § *Cymboglossum*

This Section contains a single species, characterized by the bell-shaped base of the lip (whence the name *Cymboglossum*). The species is fortunately quite easy to recognize from its vegetative characters and from the arrangement of the flowers in distinct whorls.

***Eria longifolia*** Hk. f., F.B.I. 5: 790. 1890. Ic. PL t. 2068. J.J.S., **Bull. Btzg.**, Ser. 3, Suppl. II: t. 50, I. Ridl., *Flora* 4: 88.

Stem to about 25 cm. long, rather slender, covered with long thin pale sheaths, with two leaves at the apex; leaves to 25 by 1-2 cm., narrowed to each end; inflorescences 1 or 2 from near the top of the stem, erect, about 16 cm. long including a scape of 6 cm., the flowers very small, white, in whorls about 5 mm. apart, about 10 flowers in each whorl; length of flower 4 mm., width about 3 mm., the sepals not widely separating; column-foot quite short, the lip extending below it in the form of a cup surrounded by the lateral sepals which thus appear to form a normal mentum; the whole lip forming almost a hollow cylinder, with a short tip, slightly hairy within. Distributed in Borneo and Sumatra; in Malaya found on the mountains at many localities at about 4,000 feet altitude and over. **Fig. 112, f.**

10. § *Aeridostachya*

Stems close together, short, rather thick, the base covered with overlapping thick short sheaths, with 1-3 leaves at the apex; leaves relatively long and narrow, tough or fleshy in texture; inflorescences erect, from near the stem-apex, covered with short scurfy brown hairs; scape long; flowers very numerous, about 7 mm. long; mentum about equal in length to the upper sepal; lip unlobed, shorter than the column with its foot, to which it is closely pressed, except for the tip which curves forwards.

This very distinctive Section includes several species in the Malaysian region; all are very much alike in general appearance and floral structure, and to discriminate clearly between them is not easy. The number of species occurring in Malaya is not certain; there are certainly two, and perhaps more. Like many other groups of Malayan orchids, they need more field study. It appears that the two commonest species may be thus distinguished:—

Leaves to 40 cm. long; inflorescences not or  
hardly longer than leaves .. . . 1. *E. robusta*

Leaves to 15 cm. long, inflorescences much  
longer than leaves . . . . 2. *E. crassipes*

1. *Eria robusta* (Bl.) Lindl., Gen. et Sp. Orch. 69. 1830.—*Dendrolirium robustum* Bl., Bijdr. 347. 1825.—*Eria seridostachya* Rehb. f., ex Lindl., J.L.S. 3: 48. 1859. Hk. f., F.B.I. 5: 809. 1890. Ridl., *Flora* 4: 96.—*E. falcata* J.J.S., Fl. Buit. 6: 404, f. 306.—*E. britnea* Ridl., J.L.S. 32: 296. 1896. *Flora* 4: 97.—*E. linearifolia*, Ridl., *Flora M.P.* 4: 97. 1924.—*E. lorifolia* Ridl., J.L.S. 32: 296. 1896. *Flora* 4: 98.

This is widely distributed in Malaysia. It is a common mountain epiphyte in this country, and also occurs at sea-level in the south. The leaves

are 3 to 5 cm. wide, the flowers cream with short rusty hairs on backs of sepals and ovary. Fig. 113.

2. *Eria crassipes* Ridl., JX.S. 38: 327. 1908. Flora 4: 97.—*E. crassifolia* Ridl., J.F.M.S. Mus. 6: 55. 1915. Flora 4: 98.—*E. reptans* Ridl., J-L<sup>s</sup>-38: 327. 1908. Flora 4: 97. (?).

This has short fleshy leaves, to about 15 by 1\*5 cm., with inflorescences 30 cm. long; it is found in exposed places on mountains only, and is not certainly known to occur outside Malaya, though it may be identical with one of the Sumatran species.

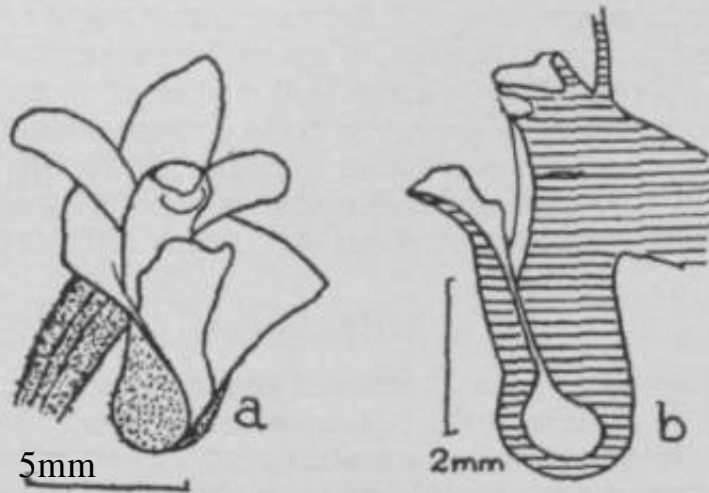


Fig. 113. *Eria robusta*. a, flower, b, section through column, column-foot and lip-

### 11. § Urostachya

Stems fleshy, with a few leaves near the top only; inflorescences slender, of many small crowded flowers, from the upper half of the stem, shortly hairy; flowers with well-developed mentum, the lip close to the column-foot; side-lobes of lip at the very base, often joined together into a separate small 2-lobed blade, the midlobe with a rather long claw, its blade more or less spatulate or fan-shaped; top of column and stigma deeply coloured, in contrast with the rest of the flower which is white or pale.

The lip of the flowers of this Section is quite peculiar, and at once distinguishes them from all other *Erias*. In Western Malaysia there are a number of closely allied species, of which five have been found in Malaya, two of them so far not known outside this country. *Eria saccata* Ridl., J.S.B.R.A.S. 61: 39. 1912. Flora 4: 90, was also placed here by Ridley, but it belongs to § Hymeneria; its flower is much like that of *E. saceifera* [Hk.] f- There are other species in Sumatra which may quite possibly occur also on our mountains.

## Key to the Species of § Urostachya in Malaya

- Small species, stems to about 10 cm. long, thickened at the apex; leaves under 1 cm. wide
- Leaves under 3 mm. wide, edges raised to form a narrow channel, 15 cm. long . . . 1. *E. cepifolia*
- Leaves about 6 mm. wide, not so channelled, 6 cm. long . . . . . 2. *E. earine*
- Plants much larger, stems thickened more or less evenly throughout, leaves wider
- Inflorescences to about 8 mm. wide, flowers 5 mm. high, side-lobes of the lip free . . . 3. *E. pachystachya*
- Inflorescences about 1.5 cm. wide, flowers 7-8 mm. high, side-lobes of the lip joined together into a 2-lobed blade across base of lip
- Stems very thick (2-3 cm.) ; flowers 8 mm. high; lobes of basal lip-blade acute . . . 4. *E. densa*
  - Stems to 1 cm. thick; flowers 7 mm. high; lobes of basal lip-blade rounded . . . 5. *E. floribunda*

1. *Eria cepifolia* Ridl., J.L.S. 31: 382. 1896. Flora 4: 90.

Stems about 8 cm. long, slender at base, thickened and flattened at the apex which has 3 or 4 leaves; leaves to 15 cm. long, very narrow, the upper surface deeply channelled; inflorescences almost erect, to 15 cm. long, the scape 2 cm.; flowers very small and crowded, white-hairy, the inflorescence with flowers barely 1 cm. in diameter; flowers 5-5 mm. high, white, the column pale violet, base of lip yellow; upper sepal nearly 3 mm. long, erect, 1.5 mm. wide; mentum 2 mm. long, at right angles to the ovary; lateral sepals hardly spreading, enclosing the lip; lip straight, 3 mm. long, side-lobes joined to form a small basal blade with two points separated by a short sinus; midlobe widening gradually with a broad shortly-pointed tip. This species was first found in Borneo; in Malaya it is known only from two collections, one from the limestone of southern Kelantan and one from Perak.

2. *Eria earine* Ridl., J.F.M.S. Mus. 6: 178. 1915. Flora 4: 88.—*E. oberonii-flora* J.J.S., Bull. Botz., Ser. 3, 2: 52. 1920. Suppl. II: t. 50, IV.

Stems much as in *E. cepifolia*; leaves about 6 cm. long and 6 mm. wide, fleshy, narrowed to both ends; inflorescences erect from near apex of stem, to 15 cm. long, the basal 6 cm. or more flowerless, hairs reddish; floral bracts 1 mm. long; flowers very small (apparently about 3 mm. long), white, column purple; lip 2 mm. long, side-lobes separate, short, triangular, spreading. Known from G. Tahan and G. Beremban at Cameron Highlands, and apparently the same as a Sumatran species named *E. oberonii-flora*.

3. *Eria pachystachya* Lindl., J.L.S. 3: 60. 1859. J.J.S., Bull. Btzg., Ser. 3, 9: 485; Suppl. II: t. 51, I.—*E. multiflora* Lindl. var. *Hasseltii* J.J.S. Fl. Buit. 6: 400, f. 302.—*E. myriantha* Kzrl., Pflzr. Eria 107, f. 2A A-F. 1911.—*E. schildiana* Schltr., Engl. Jahrb. 45, Beibl. 104: 40, 1911. J.J.S., Bull. Btzg., Ser. 3, 3: 285. 1921.

Stems to about 30 cm. long, 1 cm. thick or rather more; leaves 4 to 6, to 20 by 2 cm., evenly elliptical, thin; inflorescences obliquely ascending, to 12 cm. long, basal 2 cm. flowerless, hairs brown; diameter of inflorescence about 8 mm.; flowers small, very crowded, barely 5 mm. high, with faint pink suffusion on the lip, anther very dark red (almost black); margins of stigma dark purple; upper sepal 2-5 mm. long, 1-5 mm. wide, mentum at a very small angle to ovary, 2 mm. long; lip 3 mm. strongly curved, the basal side-lobes free, small, curved towards each other, the midlobe abruptly widened, its end rounded and sides curve inwards. Distributed to Sumatra and Java; evidently common on mountains at medium elevations in Sumatra; in Malaya found both at Fraser Hill and Cameron Highlands at about 4,000-5,000 feet. A graceful species.

4. *Eria densa* Ridl., J.L.S. 31: 281.1896; 32: 290.1896. Flora 4: 90. Bull. Btzg., Ser. 3, Suppl. II: t. 51, III.

Stems very stout and fleshy, somewhat flattened, to 30 cm. tall and 3 cm. thick, with large sheaths; leaves 3 to 6, to 30 by 4 cm. (some plants with short, broad leaves to 18 by 5 cm.); inflorescences spreading horizontally or rising somewhat, slightly curved, 10 cm. long or exceptionally to 20 cm., densely crowded with flowers to the base; flowers 8 mm. long, white or pale pink, the sepals with darker edges, the top of the column and anther dark red; upper sepal 4 mm. long, very broad and petals 2 mm. wide, spreading; mentum at about 45° to ovary; late sepals gaping slightly and showing the lip; lip 4-5 mm. long; blade by side-lobes 2-5 mm. long and wide, deeply bilobed with two acute ending points; midlobe broad, shortly pointed, nearly 3 mm. wide. in Sumatra and Borneo; in Malaya found in the mountains at many at 4,000 to 6,000 feet altitude, and quite a striking species when in flower.

5. *Eria floribunda* Lindl., Bot. Reg. 29: Misc. 43; 1843; 30: t. 20. 1844. Ridl., Flora 4: 89. Carr, J.M.B.R.A.S. 6: 58, pi. 11. 1928.

Stems to 30 cm. or more long, of even thickness, 1 cm. or a little more thick; leaves 4 to 6, elliptical, thin, varying much in shape and size, commonly about 12 by 1-8 cm., but up to 30 by 3-5 cm., short leaves quite wide; inflorescences spreading horizontally from the upper part of the stem, often several at the same time, usually about 10 cm. long, exceptionally to 20 cm.), 1-5 cm. in diameter, bearing flowers to the base, densely crowded, pale-brown-hairy; flowers white, faintly tinged with pink, top of column and stigma deep purple; height of flower 7 mm., width across petals 6 mm., shape much as in *E. densa*; side-lobes of lip form a separate deeply 2-lobed blade across the base, as wide as the midlobe, the two halves rounded, apex of midlobe 2-5 mm. wide, slightly 2-lobed. Distributed in Borneo and Sumatra; in Malaya a common lowland



epiphyte, found also up to 3,000-4,000 feet elevation in the mountains in the northern half of the country; very attractive when in full flower. This species and *E. densa* are nearly related, but appear to be quite distinct. Fig. 114.

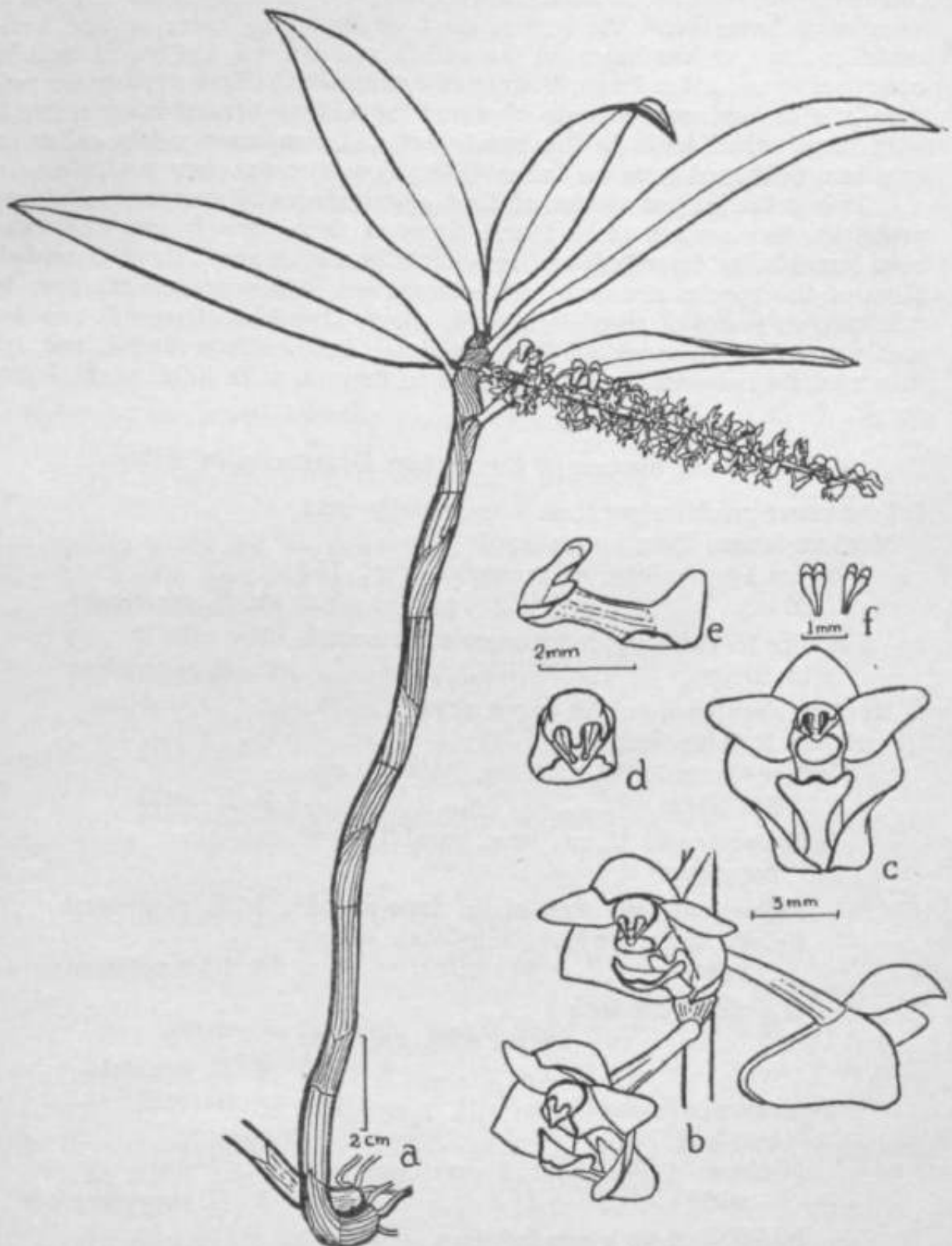


Fig. 114. *Eria floribunda*. a, plant in flower, b, inflorescence, c, flower from front, d, column, e, lip, f, pollinia.

## 12. § Hymeneria

Stems more or less fleshy, sometimes quite thick, short or to about 0.5 cm. long, with a few (rarely one) leaves near the apex, the basal part covered with sheaths, loose or not; inflorescences from near the apex, sometimes from below the leaves, erect or spreading more or less horizontally, more or less hairy on the rachis and ovaries, the bracts usually conspicuous and often large; flowers rather small, the lip variously shaped, usually with distinct erect side-lobes and the midlobe turned down in front with longitudinal keels in the basal part and sometimes a low callus or papillose thickened area on the midlobe; flower colour very variable.

This is the largest section of *Eria*, and includes 20 species in Malaya, probably more remain to be found. Some of those already recorded have been imperfectly described, and further information about them is needed. Most of the species are quite attractive when in flower, and are easily cultivated on pieces of wood in a shady place. Hybrids between *E. xanthiocheila* and *E. leptocarpa* (§ *Cylindrolobus*) have been produced, and are intermediate between the two parents in flowers, with habit of *E. leptocarpa*.

## Key to the species of the section Hymeneria in Malaya

- Inflorescence much longer than stem, usually erect
- Mentum longer than upper sepal
- Flowers 10 cm. long, inflorescence erect, 15-20 cm. . . . . 1. *E. saccifera*
- Flowers 1-7 cm. long, inflorescence horizontal, to 15 cm. . . . . 2. *E. suaveolens*
- Mentum shorter than the upper sepal
- Bracts to 2 cm. long
- Inflorescence to 30 cm. long, basal 10 cm. flowerless . . . . . 3. *E. elata*
- Inflorescence to 15 cm. long, basal 3-4 cm. flowerless
- Petals and side-lobes of lip dark purple . . . . . 4. *E. atrovinosa*
- Petals almost white, side-lobes of lip light purplish . . . . . 5. *E. bractescens*
- Bracts under 1 cm. long
- Pseudobulbs 1 cm. apart, with only one leaf . . . . . 6. *E. punctata*
- Pseudobulbs close, each with more than one leaf . . . . .
- Midlobe of lip about 1 mm. long and wide . . . . . 7. *E. appendiculatci*
- Midlobe of lip much larger
- Inflorescence brown-hairy, upper sepal 4 mm. long . . . . . 8. *E. dasystachys*

- Inflorescence white-hairy, upper sepal  
7 mm. long . . . . . 9. *E. hyacinthoides*
- Inflorescence about equal in length to the stem,  
or little longer
- Leaves to about 8 cm. long
- Midlobe of lip green, side-lobes white .. 10. *E. Maingayi*
- Midlobe of lip pale pink, side-lobes deep  
purple . . . . . 11. *E. clavata*
- Leaves about 20 cm. long
- Inflorescence about 15 cm. long
- Mentum shorter than upper sepal . . 12. *E. recurvata*
- Mentum longer than upper sepal .. 2. *E. svxweolens*
- Inflorescence much shorter
- Upper sepal 6 mm. long, side-lobes purple 13. *E. bicristata*
- Upper sepal 3 mm. long, midlobe flushed  
purple . . . . . 14. *E. pudica*
- Inflorescence much shorter than stem, usually  
horizontal
- Stems to 10 cm. long, inflorescences 3-4 cm.,  
erect .. .. 15. *E. land folia*
- Stems to 15 cm. or more long, inflorescences  
longer than 3-4 cm., horizontal
- Bracts to 4 mm. long, lip not 3-lobed, under  
2 mm. wide . . . . . 16. *E. tenuiflora*
- Bracts longer, lip 3-lobed, wider
- Bracts 6-7 mm. long
- Midlobe of lip yellow, mentum about as  
long as upper sepal . . . . . 17. *E. xanthocheila*
- Midlobe of lip pink, mentum barely half  
as long as upper sepal .. 18. *E. ramulosa*
- Bracts 1-2 cm. or more long
- Mentum not over 5 mm. long
- Bracts to 2-4 cm., upper sepal to 1-3  
cm. long . . . . . 19. *E. Braddonii*
- Bracts to 1-2 cm., upper sepal to 8  
mm. long . . . . . 20. *E. jagoriana*
- Mentum 9 mm. long . . . . . 21. *E. flavescens*
- 1. *Eria saccifera*** Hk. f., F.B.I. 5: 797. 1890. Ic. Pl. t. 2071. Ridl., Flora 4r  
92. J.J.S., Bull. Btzg., Ser. 3, Suppl. II. t. 48, IV. *E. saccata* **Ridl.**,  
I.e. 90.

Stems about 7 cm. long, not much thickened (?), with several loose sheaths; leaves 2 or 3, to 30 by 4 cm. or larger, narrowed at the base to a stalk 5 cm. long; inflorescences erect, 15-20 cm., the scape 5 cm.; flowers

not crowded; bracts rather narrow, 6 mm. long, the pedicel **and** ovary 6 mm.; flowers 1 cm. long, the mentum twice as long as the upper sepal, curved back parallel to the ovary; lip with a narrow base, the blade hardly 3-lobed, fan-shaped when spread out, with two low diverging keels from the base and a rather broad papillose area within the margin; colour dull pink with purple markings (probably the side-lobes) and probably a yellow midlobe. Distributed in Borneo and Sumatra; in Malaya only known from G. Batu Puteh and G. Kerbau.

2. **Eria suaveolens** Ridl., J.L.S. 32: 292. 1896. Flora 4: 91.

Stems to about 12 cm. long, thickly fleshy, with about 3 leaves; leaves to 30 by 5 cm., widest towards apex, basal 2-3 cm. narrowed to a stalk; inflorescence horizontal, curved, to 15 cm. long, the scape 3 cm., bearing a few bracts; bracts broad, to 1 cm. long, pale yellowish or flushed pink; flowers fragrant, about 1.7 cm. long; upper sepal 7 mm. long; mentum longer, parallel to ovary; lip 8 mm. long, gradually widening from base, side-lobes small with rounded ends, each with a short keel; midlobe very short, turned down, rounded; sepals and petals pale pink, or white edged with pink, lip with dull purple side-lobes and yellow fleshy centre to midlobe; midlobe and forward parts of side-lobes dull yellowish, minutely warty and tumid. Found at several localities by rivers in Pahang and Johore, and also on G. Bujong Malacca.

3. **Eria elata** Hk. 1, Ic. Pl. t. 1848. 1889. F.B.I. 5: 794. 1890. Ridl., Flora 4: 96.

Stems about 8 cm. tall, thickly fleshy; leaves about 3, about 16 by 3 cm. (? to 30 cm. long), stalked; inflorescence erect, to 30 cm. tall, the scape 10 cm.; bracts 2 by 0.8 cm., acute; flowers on short pedicels, about 1.5 cm. wide; upper sepal 1.3 cm. long, mentum short; lip with erect rounded side-lobes the ends of which curve forwards slightly, the midlobe very short, rounded, downturned, papillose; 3 keels on basal part of lip. Only known from two collections from the Main Range in Perak and Selangor; colour of flowers not recorded.

4. **Eria atrovinosa** Carr, Gard. Bull. 5: 14, pi. 7, B. 1929.

Stems 5-8 cm. long, to 1.7 cm. thick, fleshy; leaves 2-3, to about 18 by 2 cm.; inflorescence erect, to 15 cm., scape 3 cm., bearing about 4 empty bracts; bracts to 2.2 by 1.0 cm., spreading, cream (upper ones smaller); ovary and pedicel to 2.2 cm.; upper sepal curved back, 1.2 by 0.4 cm., white, pink towards tip; lateral sepals also recurved, all sepals with deep purple hairs on backs; mentum short; petals 1.0 by 0.35 cm., white at base, rest dark purple; lip 9 mm. long, curved throughout, with 3 purple keels; side-lobes erect, curved forwards, deep purple except for base; midlobe 3 mm. long, 3-5 mm. wide, slightly cleft, white suffused with pale pink. Only known from the original collection made at Mentakab, Pahang.

5. **Eria bractescens** Lindl., Bot. Reg. 27: Misc. 18. 1841; 30: t. 29. 1844. King & Pantl., Ann. Calc. 8: t. 166. Ridl., Flora 4: 91.

Very near to the preceding, usually somewhat smaller vegetatively than above described; sepals not so much curved back; petals and sepals

all white or only faintly pinkish; side-lobes of lip light purple, keels pinkish, midlobe cream, papillose. Distributed from Sumatra to the Philippines; found on old mangrove or trees by rivers or the sea in the south of Malaya, and on mountains up to 3,500 feet in the north. A very attractive species when in flower but not very free-flowering in cultivation in Singapore. Fig. 115.

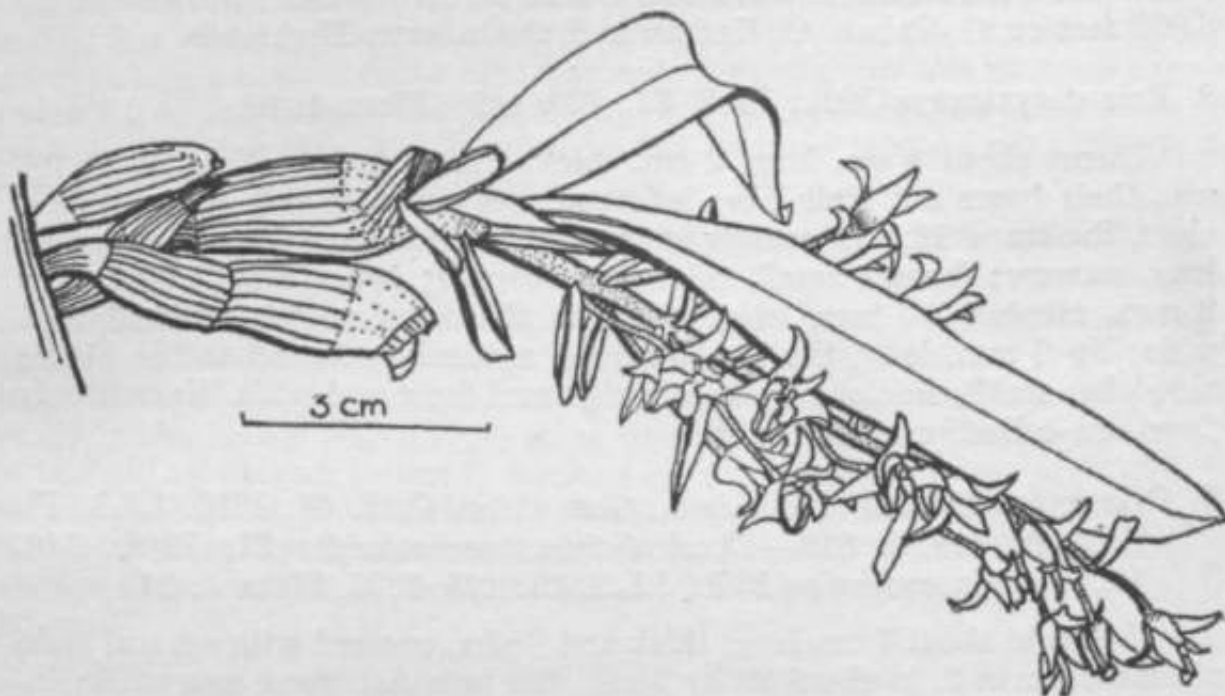


Fig. 115. *Eria bractescens*.

6. *Eria punctata* J.J.S., Bull. Dep. Ag. XIII: 38. 1907. Bull. Btzg., Ser. 3, 6: t. 3, IV. 1924. Carr, Gard. Bull. 5: 14, 144.

Rhizome creeping, the pseudobulbs 1 cm. apart, 3 cm. long and 1 cm. thick, bearing one leaf; leaf rather thick, erect, to 20 by 4 cm., stalked; inflorescence erect, about 11 cm. long, the scape 4 cm. f with about 8 flowers; bracts broad, 4-5 mm. long; pedicel and ovary 1 cm.; flowers hardly expanding, upper sepal hooded, 7 by 4 mm.; mentum 4-5 mm.; lip 6 mm. long, the broad base embracing the column-foot, hardly lobed, the forward edges in a plane at right angles to the column-foot, a low keel on either side of the mid-line; the apex shortly pointed, fleshy; sepals and petals greenish-yellow with brown veins; centre of lip white with purple spots, tip yellow. Distributed in Java and Sumatra; in Malaya found once at Fraser's Hill. A curious and distinctive species.

7. *Eria appendiculata* (Bl.) Lindl., Gen. et Sp. Orch. 69. 1830. J.J.S., Fl. Buit. 6: 408, f. 310. Bull. Btzg., Ser. 3, 9: 47.—*Dendrolirium appendiculatum* Bl., Bijdr. 352, f. 69, D, 1825,—*Eria carunculata* Ridl., J.L.S. 38: 326. 1908. Flora 4: 94.

Stems about 6 cm. long, fleshy; leaves 2 to 4, to 15 by 2 cm., narrowed to a stalk-like base; inflorescence erect, 15 cm. long, the scape 3-4 cm.,

shortly hairy throughout, the flowers pale yellowish, crowded; bracts reflexed, to 6 by 3 mm.; upper sepal 5 mm. long, broad, hooded; mentum under 2 mm., curved back parallel to the ovary; petals narrow, spreading; lip 5 mm. long, maximum width (about the middle) 3 mm., the sides raised but hardly distinguishable as lobes, narrowed towards the tip which is suddenly contracted into a small lobe of irregular shape about 1 mm. long and wide. Distributed in Java and Sumatra; in Malaya found at about 6,000 feet on G. Tahan, G. Kerbau and at Cameron Highlands.

8. *Eria dasystachys* Ridl., J.L.S. 32: 296. 1896. Flora 4: 98.

Stems about 8 cm. long, 2 cm. thick, with 4 leaves about 25 by 2.5 cm., their bases not stalk-like; inflorescences about as tall as the leaves, erect, the scape 12 cm., densely brown-hairy throughout; bracts 6-7 mm. long, narrow; flowers small, colour unrecorded; upper sepal about 4 by 2 mm., mentum 2.5 mm. long, at 45° to the ovary; petals under 1 mm. wide; lip 6 mm. long, the base narrow, suddenly widened to the blade; side-lobes small; midlobe ovate, about 3 mm. long and wide. Known only from one collection near Pekan.

9. *Eria hyacinthoides* (Bl.) Lindl., Gen. et Sp. Orch. 66. 1830. J.J.S., Fl. Buit. 6: 410, f. 312.—*Dendrolirium hyacinthoides* BL, Bijdr. 346. 1825.—*Eria endyndon* Ridl., J.L.S. 32: 295. 1896. Flora 4: 91.

Stems to about 7 cm. long, thick and fleshy, covered with several loose sheaths; leaves 2, to about 20 by 3 cm., the base narrowed to a stalk; inflorescences erect, about 15 cm. long including scape 5 cm., white-hairy; bracts small; flowers white, 1.5 cm. long; upper sepal about 8 by 4 mm.; mentum 6 mm. long, the lateral sepals spreading; petals as wide as upper sepal; lip with broad base, high erect narrow violet-purplish side-lobes (3 mm. high, 1 mm. wide), the midlobe turned down, heart-shaped, 5 mm. wide at the base which has a raised fleshy area on each side; basal part of the lip with two low keels with free toothed forward ends. Distributed in Java and Sumatra; in Malaya found in Singapore, at the Gap in Selangor, and on the Taiping Hills. This is a very attractive species, the inflorescence very much resembling a slender white-flowered hyacinth.

10. *Eria Maingayi* Hk. f., F.B.L 5: 708. 1890. Ic. PL t. 2072. Ridl., Flora 4: 92.

Stems 3 cm. long, thick and fleshy, with thin close sheaths; leaves 2 or 3, rather thick, to about 8 cm. long and 8 mm. wide; inflorescence erect, about 5 cm. long; bracts 8 mm. long, pale green; flowers 6-8; pedicels as long as bracts; flowers 1.2 cm. wide, white, the midlobe of the lip green with a purple patch at the base; upper sepal about 7 by 2.5 mm., lateral sepals wide-spreading; mentum short; petals much smaller than sepals; lip curved evenly from base to apex, the side-lobes erect, on a long base with short rounded forward ends, midlobe widening from its base, rounded, 3 mm. wide; 3 keels on lower part of lip. A very pretty little plant, only found on Penang Hill and at Fraser's Hill.

11. *Eria clavata* Holtt., Gard. Bull. 11: 280. 1947.

Stems about 4 cm. long and 1 cm. thick, bearing 2 leaves about 7 by 14 cm.; inflorescence erect, 4 cm. high, with about 8 flowers; bracts pale green, 8 by 4 mm.; sepals and petals white, pale pink at tips; lip with dark purple side-lobes and keels, midlobe pale pinkish; upper sepal 8 by 3-5 mm.; mentum 4 mm. long, at 60° to the ovary; lip curved throughout, 3 keels in the lower part, the central one prolonged on to the midlobe and ending in a small semi-circular callus; midlobe with the tip turned under, slightly cleft, a central fleshy papillose area widening towards the base and extending to the base of the lip. Found only at Fraser's Hill; similar in habit to *E. Maingayi*, but distinct in the broader leaves and different shape and colouring of the flowers.

12. *Eria recurvata* Hk. f., F.B.I. 5: 797. 1890. Ic. Pl. t. 2070. RidL, Flora 4: 92.

Stems stout, fleshy, to 15 cm. long; leaves to about 20 by 5 cm., with a stalk-like base; inflorescence oblique, from below the leaves, to 15 cm. long, the scape 4 cm.; bracts 1-2 cm. long, broad, acute, yellowish; flowers 1-6 cm. wide, yellow with purple veins, the lip mauve with a yellow patch on midlobe; sepals all reflexed; mentum shorter than the upper sepal; lip with small side-lobes, the midlobe widened from a narrow base, rounded, thickened down the centre; two keels between the side-lobes. Only known from a single collection from Perak and cultivated many years ago at Calcutta.

13. *Eria bicristata* (Bl.) Lindl., Gen. et Sp. Orch. 67. 1830. J.J.S., Fl. Buit. 6: 411, f. 313.—*Dendrolirium bicristatum* BL, Bijdr. 346. 1825.

Stems 7 cm. long, 1 cm. thick, with several loose sheaths; leaves 2, to 20 by 3-5 cm., base stalk-like, 2-5 cm. long; inflorescence 6-5 cm. long with about 10 flowers; bracts 5 mm. long, pedicels the same; flowers with spreading lateral sepals, 1-0 cm. wide; upper sepal 6 by 2-5 mm.; petals as wide; mentum 4 mm. long, slightly curved; lip very strongly curved, basal part in contact with column-foot, midlobe down-turned and facing forwards; side-lobes erect, triangular, 1-5 mm. high, joining straight on to midlobe which narrows gradually from its base, 3 mm. long and 2-5 mm. wide; 3 keels from base of lip to base of midlobe, the lateral ones much largest; flowers white with dark purple side-lobes. Distributed in Java and Sumatra; in Malaya only known from one collection from the Sat River in Pahang.

14. *Eria pudica* RidL, J.L.S., 32: 394. 1896. Flora 4: 85.

Stems 4 cm. high, 1 cm. thick, with one leaf (or rarely 2); leaf to 20 by 3-5 cm., widest in upper part, the base narrowed to a stalk, inflorescence 4 cm. high, erect, with about 10 white flowers on the upper half; flowers about 5 mm. high and 6 mm. across, the sepals and petals spreading; lip saccate at the base, the side-lobes small, erect, hardly separate from midlobe, a short keel at the base of each, the midlobe downturned, triangular, flushed with purple. Only known on old mangrove trees and by rivers in Singapore and southern Johore, where it is not uncommon. **Fig. 116.**

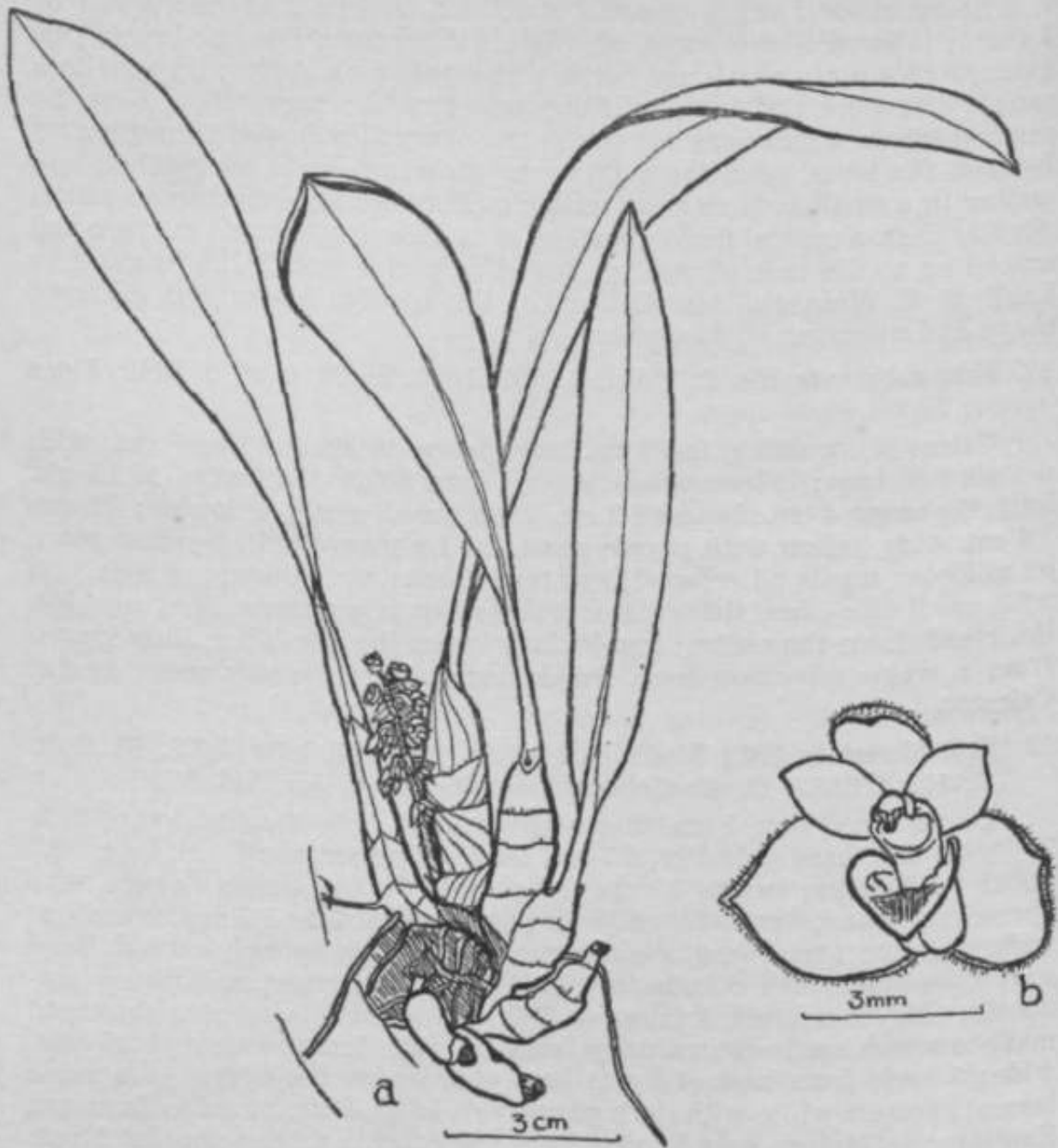


Fig. 116. *Eria pudica*. *a*, plant in flower, *b*, flower from front.

**15. *Eria lancifolia*** Hk. 1, F.B.I. 5: 804. 1890. Ic. Pl. t. 2075. Ridl., Flora 4: 85.

Stems to 10 cm. long, slender, flexuous, covered with about 6 large thin sheaths; leaves 2, to 22 by 3 cm., widest in the upper half, the lowest 2-3 cm. stalk-like; inflorescences 3-4 cm. long, erect, with 7-10 flowers; bracts 3 mm. long; flowers 9 mm. wide, the lateral sepals widely spreading; upper sepal 5-6 by 2-5 mm.; mentum 4 mm.; side-lobes of lip small, erect; midlobe bent down, nearly 3 mm. wide; sepals and midlobe cream, petals white,



side-lobes purple with white margins, keels dark purplish. The flowers of this are rather like *E. pudica* but larger, with lip differently coloured. Found by rivers in Johore, Pahang and Perak.

16. *Eria tenuiflora* Ridl., J.L.S. 32: 291. 1896. Flora 4: 90. J.J.S., Fl. Buit. 6: 407, f. 309.

Stems to 18 cm. long, 8 mm. thick, pale green with very thin close sheaths; leaves 3 or 4, thin, to 16 by 2 cm., evenly elliptical; inflorescences spreading horizontally below the leaves, about 6 cm. long, very slender, pale cream colour throughout; bracts 3-4 mm.; pedicels 8 mm. long, very slender; upper sepal 7-8 by 2 mm.; mentum 1 mm.; lip not lobed, the sides slightly raised, maximum width (in middle) under 2 mm., the tip acute, the basal part deep purple. Distributed in Java, Sumatra and Borneo; in Malaya not uncommon in the lowlands in the south, and found also on mountains further north, to 3,500 feet altitude. The delicate inflorescences develop very rapidly.

17. *Eria xanthocheOa* Ridl., Mat. Fl. M.P. 1: 102. 1907. Flora 4: 91. J.J.S., Bull. Btzg., Ser. 3, 9: 45, t. 8, IV.

Stems 20 cm. or more long and rather more than 1 cm. thick, with 3 or 4 leaves; leaves to 20 by 3-5 cm., thin, almost evenly elliptic; inflorescences spreading horizontally from near top of the stem, about 7 cm. long, with flowers to the base; bracts reflexed, 7 mm. long, broad, pale greenish; pedicels 1-5 cm., slender; flowers 1-6 cm. wide (the lateral sepals wide-spreading), 1-3 cm. high; upper sepal 9 by 4 mm., hooded, mentum 8 mm., at 60° to the ovary; lip bent at a right angle in the middle, the side-lobes erect, at the bend, 3 mm. long and 1-5 mm. wide; midlobe widening from its base, 4 mm. long and 6 mm. wide, the apex notched; 3 keels in basal part of lip, the middle one just extending on to the midlobe; sepals and petals cream-yellow, side-lobes purple, midlobe lemon yellow. Distributed in Java, Sumatra and Borneo; in Malaya found in the lowlands, by rivers, chiefly in the southern half of the country. This is an attractive species, easy to cultivate and flowering frequently. A plant collected by the Sat River in Pahang had slightly smaller flowers with the sepals and petals pink-veined (upper sepal 7 mm. long, midlobe 4-5 mm. wide). Fig. 117.

18. *Eria ramulosa* Ridl., J.S.B.R.A.S. 61: 39. 1912. Flora 4: 94.

Stems 15 cm. long, slender; leaves 2, to at least 8 by 1-5 cm. and probably larger; inflorescences 5 cm. long, horizontal, with about 6 flowers, pale flesh colour with pink nerves, the lobes of the lip darker at the tips; bracts 6 mm. long, cream; pedicels 6 mm.; upper sepal 6 mm. long, mentum 2-5 mm.; lip with small erect side-lobes and a rounded midlobe notched at the tip; base of lip with a central purple keel, and two shorter keels in a purple V at the base of the midlobe. Known only from a single collection from the Taiping Hills; further information about the flowers is desired.

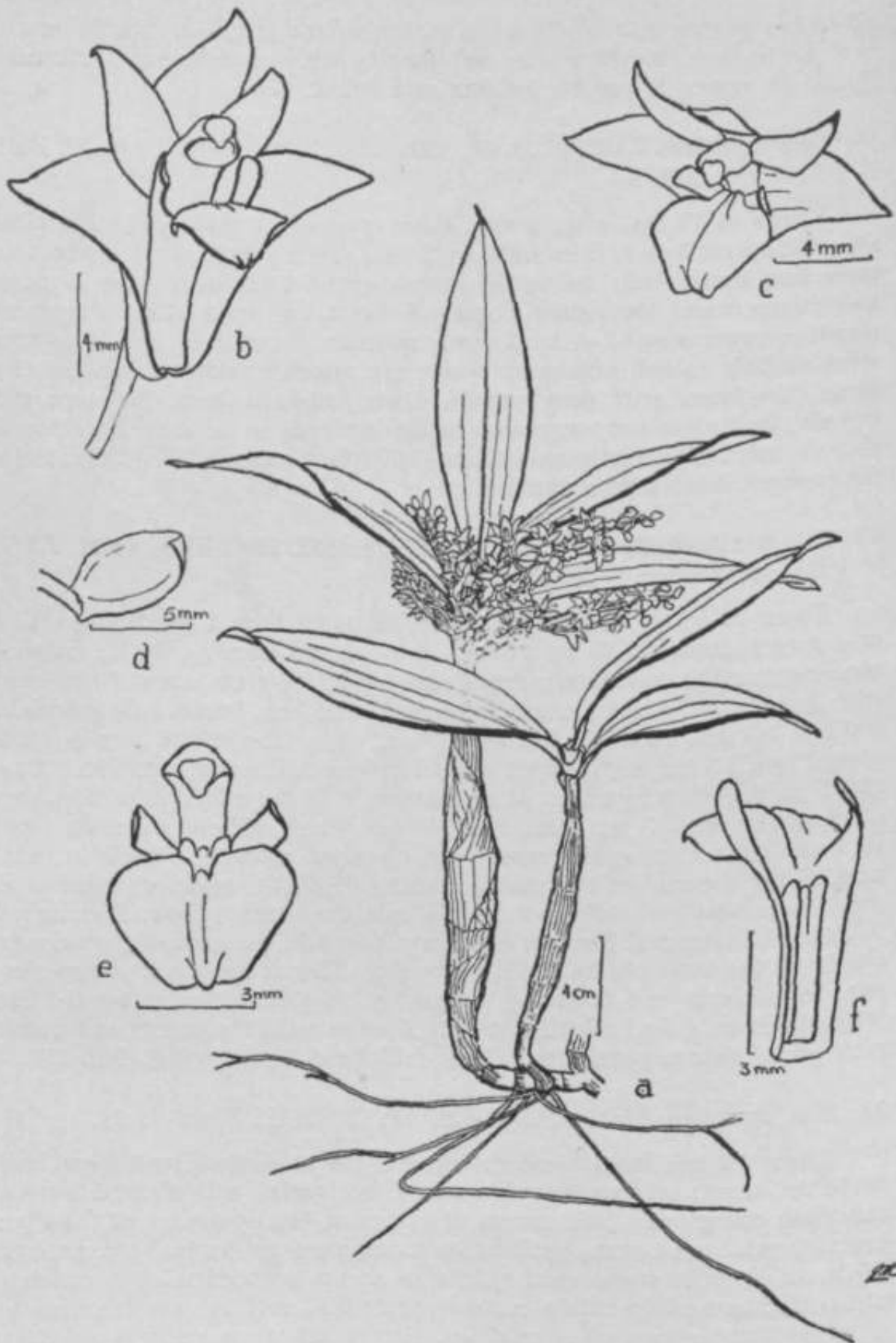
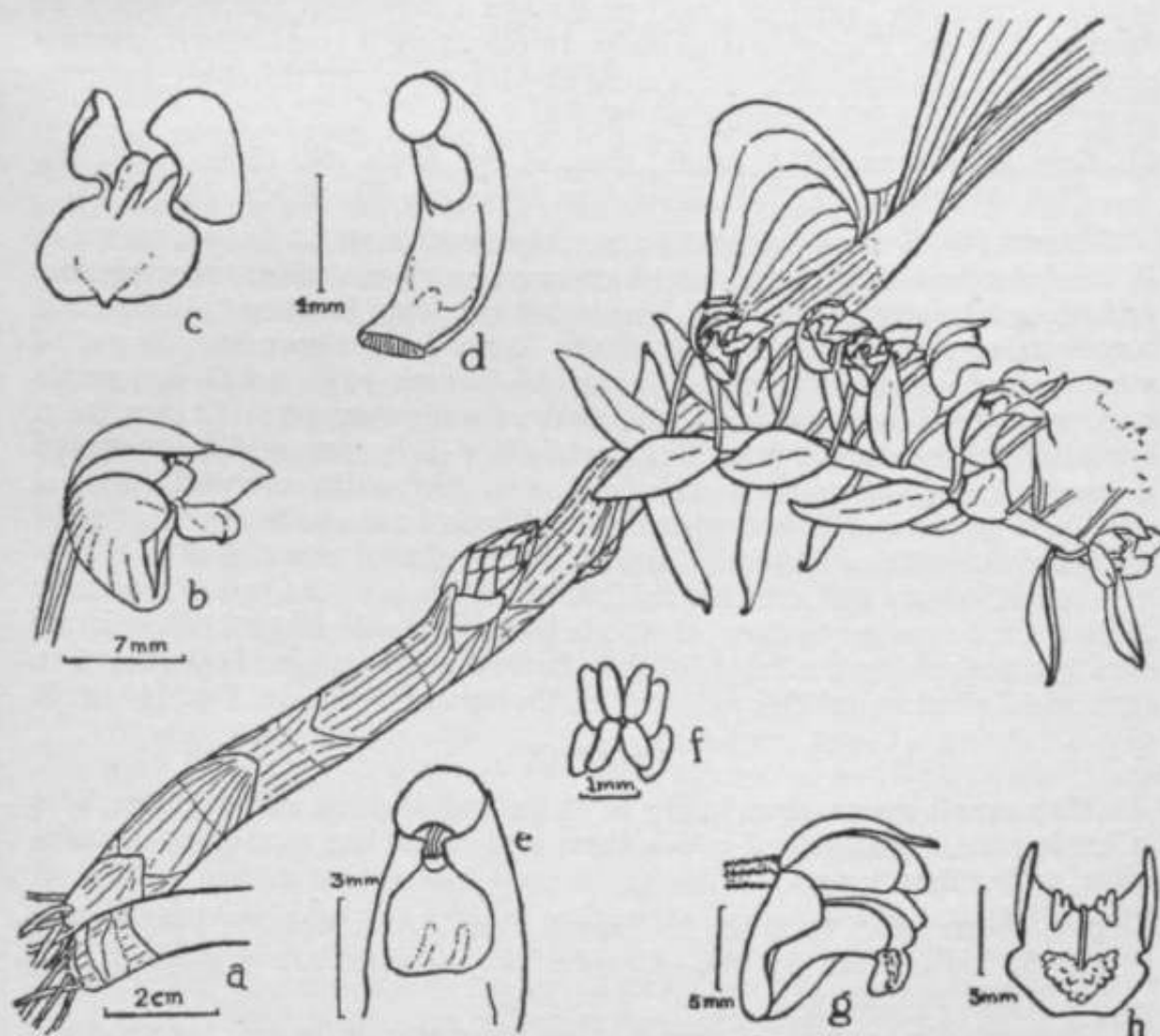


Fig. 117. *Eria xanthochvila*. a, plant in flower, b, c, flower from front and from above. d, a bract, e, lip and column. f, inside of lip from back.

19. *Eria Braddonii* Rolfe, Orch. Rev. 15: 248. 1907. Ridl., Flora 4: 92.—  
*Eria latibracteata* Ridl., J.L.S. 32: 293. 1896 (non Rolfe 1895).

Stems to 20 cm. long, rather slender; leaves 3 or 4, to 20 by 4 cm. or wider, evenly narrowed to both ends; inflorescences horizontal, 9 cm. long, the basal 2-3 cm. flowerless; bracts sulphur yellow, to 2.4 by 1.1 cm., pedicels to 2 cm.; upper sepal 1.3 by 0.5 cm.; petals 1.1 by 0.4 cm., tips curved back; mentum 5 mm.; lip curved throughout, with long erect side-lobes which in front are 3 mm. high; midlobe rounded, 5 mm. wide, the sides turned back, the central part fleshy; 3 keels (middle one low) in basal part of lip; sepals and petals almost white, veined with red in their lower parts; midlobe of lip pale yellow with a red-brown patch towards the base, side-lobes pinkish, middle part white with dark red keels. Distributed to Borneo; in Malaya found in the lowlands of Negri Sembilan and Pahang, and on the Main Range at Fraser's Hill. The mountain plants have narrower leaves. This species has the largest flowers of any *Hymeneria* in Malaya. Fig. 118, a-f.



Fig<sup>1</sup>. 118. *Eria Braddonii*, a, plant in flower, b, flower from side, c, lip. *d*, column and column-foot, *e*, column, *f*, pollinia. *E. flavescens*. *g*, flower from side, *h*, lip from front.

20. **Eria lamonganensis** Rchb. fil., Bonpl. 5: 55. 1857.—*E. jagoriana* Krzl., Engl. Bot. Jahrb. 44, Beibl. 101: 24. 1910. J.J.S., Bull. Botz., Ser. 3, 3: 285; 6: t. 3, f. 5. Holtt., Rev. Fl. Mai. 1: 393.—*E. earned* Ridl., J.F.M.S. Mus. 4: 68. 1909. Flora 4: 93.

Stems to 25 cm. long, slender; leaves 3 or 4, to 15 by 2-8 cm., the basal part stalk-like; inflorescences to 10 cm. long, spreading horizontally; bracts yellow, to 1-2 by 0-7 cm., deflexed; rachis and ovaries with short P<sup>ur</sup>P<sup>^</sup> hairs; pedicels 1 cm., slender; flowers 1 cm. wide; upper sepal 7-5 by 2-5 mm., curved forwards; petals as wide; mentum 3 mm. long, at right angles to ovary; lip curved throughout so that the tip is slightly <sup>tur</sup> n f\* under; side-lobes gradually widening from base of lip to a maximum <sup>h e ^</sup> of 1-5 mm., their ends curved forwards; midlobe 4 mm. wide, rounded, widening from base, the tip slightly cleft; base of lip with 3 keels, the lateral ones curved, the middle one ending at the base of the midlobe in an arrow-head-shaped callus, the barbs of which almost touch the lateral keels; sepals and petals pale yellow with purple veins at the base; side-lobes of lip purplish with pale yellow tips, midlobe yellow, the callus purple. Originally found in Java; in Malaya a mountain species, found at Fraser's Hill and Cameron Highlands. In colouring it resembles *E. xanthocheila*, but is distinguished by its more slender stem, and the short mentum, as well as in details of the lip.

21. **Eria flavescens** (Bl.) Lindl., Gen. et Sp. Orch. 66. 1830. J.J.S., Fl. Buit. 6: 408, f. 311.—*Dendrobium flavescens* BL, Bijdr. 344. 1825.

Stems 10-15 cm. long, 10-12 mm. thick, with about 3 leaves; leaves to 17 cm. long, including a stalk of 1-5 cm., and to 3-3 cm. wide; inflorescences spreading laterally, scape short, rachis 5-8 cm. long, bearing 7-12 flowers, bracts pale greenish, lower ones almost 2 cm. long, upper ones about 10 mm.; pedicel and ovary purplish hairy, 15-20 mm. long; sepals and petals very pale greenish, sometimes with pink veins; upper sepal 12 mm. long, 5 mm. wide; mentum 9 mm. long; petals 3 (-4 ?) mm. wide; lip curved throughout, side-lobes erect, nearly 3 mm. high with rounded forward ends, pale green or suffused with pink; midlobe 5 mm. wide at base, nearly semi-circular with reflexed tip, upper surface almost covered with a crescent-shaped warty dull crimson thickening which is at the end of a narrow median keel running to base of lip; between the side-lobes 2 other keels, each grooved along the crest, anther flushed with purple. Distributed in Java and Sumatra; in Malaya found at Cameron Highlands. **Fig. 118, g, "**

### PORPAX

This small genus, found only in India and Malaya, differs from *Eria* in having the sepals joined into a tube, and in having very short pseudobulbs, wider than long.

- Porpax meirax** (Par. et Rchb. f.) King & Pantl., Ann. Calc. 8: 114, pi. 158. 1898. Ridl., Flora 4: 104.—*Cryptostylis meirax* Par. et Rchb. f., Tr. L.S. 30: 148. 1874.

Pseudobulbs round, flat, barely 1 cm. diameter, 2-leaved; leaves about 2-5 cm. long, narrowly elliptic, acute; flowers dull brown, solitary, almost stalkless, from the apex of leafless pseudobulbs, with a single bract twice

as long as the ovary; tube of flower about 1-2 cm. long, only the tips of the sepals free and spreading slightly; petals shorter than sepals, entirely enclosed in the tube; lip short, rather indistinctly 3-lobed, side-lobes erect and rounded, midlobe oblong, bluntly pointed; column short, the curved foot twice as long as the column. Found on the Sikkim Himalayas and in Tenasserim; in Malaya only on Kedah Peak at nearly 4,000 feet and on G. Tahan at 3,000 feet, on rocks and trees.

## BULBOPHYLLUM

*Rhizome* usually long, creeping or hanging, sometimes short, bearing a series of pseudobulbs, each of a single joint and bearing one leaf at the tip; *pseudobulbs* close or distant, varying much in size, sometimes erect and sometimes prostrate on the rhizome; *leaves* also varying very much in size, from very small to quite large; *inflorescences* of one to many flowers, the scape usually arising at the base of a pseudobulb but sometimes at another node of the rhizome, short or long, the rachis short or long, the flowers in a close head, an open umbel, a fan or circlet, or a short or long raceme; *flowers* very small to fairly large; *sepals* almost equal or the lateral much longer than the upper; *lateral sepals* joined to the column-foot to form a usually short mentum, often much longer than wide, free or with their edges more or less joined; *petals* nearly always much smaller than the sepals, rarely about equal to the sepals; *lip* hinged to the end of the column-foot, in most cases exceedingly mobile, often of complex structure, usually fleshy and more or less tongue-shaped, straight or curved, the sides usually somewhat raised at the base but not usually developed into distinct side-lobes as in the lip of most orchids, the whole or part of the lip often papillose or warty or sometimes hairy; *column* short, usually with conspicuous arms or wings, which often rise like a pair of slender horns high above the small anther; *anther* 2-chambered, containing 4 pollinia in pairs, the members of each pair sometimes more or less united, without appendages but sometimes attached to a fleshy disc; *column-foot* usually curved forwards beyond its junction with the bases of the sepals, forming a pedestal in the centre of the flower upon which the lip is hinged.

This is one of the largest of all orchid genera, and has more species than any other in Malaya. Probably about 1,000 species are at present known, including many in tropical America and Africa; but the majority of species are found in Asia, and especially in Malaysia. The genus extends northwards to Japan, and southwards to Australia and New Zealand.

Though the rhizome appears to be continuous, and the pseudobulbs to rest upon it, the plant is sympodial in structure, as in *Dendrobium*. Each new branch of the sympodium begins as a bud at the base of a pseudobulb, grows horizontally as a rhizome for a short or long distance, according to its nature, ending with a new pseudobulb with a leaf upon it.

The pseudobulbs are usually quite conspicuous, and give a distinctive appearance to the plants, so that they are easy to recognize as belonging to this genus; but sometimes the pseudobulbs are very small, so small as to need very careful inspection to detect them. The only other orchids which are easily confused vegetatively with *Bulbophyllum* are species of *Dendrochilum*, which differ in having no column-foot and so no mentum.

In such a large genus, there is a wide range of vegetative form and floral structure, and it is possible to divide the species into sections, as in *Dendrobium* and *Eria*. But here the sections are on the whole less distinct; there are more intermediate species which connect sections together in various ways. Thus it is rather difficult to make a satisfactory key to distinguish the sections. Some sections also are represented in Malaya by very few species, and for practical purposes in the present account they have been united with others which seem nearest to them. A full survey of the genus, and a comparative account of the various sections, based on modern knowledge, has still to be written. Though some sections are not easy to limit, others are very distinct, notably *Epicrianthes* (section 5) with the very curious development of petals and lip, and *Dialeipanthe* (section 1) which has flowers singly in succession on the same inflorescence.

Though the species of *Bulbophyllum* are rarely cultivated, many of them are very graceful and attractive (though others are foul-smelling) and they are of great interest to the field botanist. Though some are common and well-known, many are known only from one or two collections, and there is very much still to be discovered about them. Their peculiar floral structure, and their relations with insects, also need further investigation. Some flower rarely, some more frequently; little information as to the relation of their flowering to climatic change has been recorded.

The following imperfect account is based on the material and information available in Singapore. The data given, especially as regards size and colour of the parts of flowers, are not always complete or reliable. There is liable also to be variation in some species, and the extent of the variation is often not known.

### Key to the Malayan sections of *Bulbophyllum*

Flowers solitary

Flowers one at a time in succession on the same  
inflorescence .. .. . *Section 1*

Each inflorescence bearing only one flower

Lateral sepals much longer than the upper  
sepal, twisted at the base so that their  
upper edges meet or nearly meet, or  
with their tips joined .. .. . *Section 2*

Lateral sepals, if longer than the upper sepal,  
not so twisted or joined

Upper sepal long and narrow, with fringed  
edges .. .. . *B. Blumei (Section 2)*

Upper sepal not fringed

Upper sepal 1-5-5 cm. long, usually rather  
broad; pseudobulbs usually at  
least 2 cm. long

Lip at top of flower .. .. . *Section 3*

Lip at bottom of flower .. .. . *Section U*

- Upper sepal rarely more than 1.5 cm. long, if longer always rather narrow; plant small with pseudobulbs never more than 1.5 cm. long
- Petals with several narrow appendages, or lobed like the fingers of a hand .. .. . *Section 5*
- Petals not lobed, without appendages
- Lateral sepals with lower edges joined almost throughout, flowers mainly dark purple .. *Section 6*
- Lateral sepals with lower edges free; flowers rarely dark purple
- Rhizome almost covered by the pseudobulbs, which are appressed to it and flattened .. *Section 7*
- Pseudobulbs distinctly spaced, usually not appressed to the rhizome
- Rhizome pendulous; pseudobulbs to 2 cm. apart, 3 mm. long, appressed to rhizome .. .. . *B. sessile (Section 11)*
- Rhizome creeping, pseudobulbs with at least the apical part erect, usually larger *Section 8*
- Flowers at least 2 on an inflorescence
- Flowers all joined to the rachis close together, usually on slender pedicels and well separated in a fan or umbel, never in a close compact head
- Lateral sepals much longer than upper sepal, their upper edges usually joined *Section 2*
- Lateral sepals not greatly longer than the upper sepal, their upper edges not joined
- Flowers large; upper sepal 1.2 to 12 cm. long .. .. . *Section U*
- Flowers small; upper sepal not over 1.2 cm. long except where it ends in a slender tail
- Flowers with some purple markings; lip with rather long hairs .. *Section 9*

- Flowers yellowish or orange, without  
purple markings; lip not long-hairy  
Pseudobulbs very small, hardly notice-  
able .. .. . *Section 10*
- Pseudobulbs distinct, large or small *Section 11*
- Flowers in a more or less elongated, though  
sometimes compact, inflorescence, not all  
joined to the rachis at nearly the same  
level
- Flowers always with some purple, pink or  
crimson markings .. .. . *Section 12*
- Flowers white, yellowish or orange, without  
purplish markings  
Pseudobulbs very small .. .. . *Section 10*
- Pseudobulbs distinct .. .. . *Section 11*

### Section 1 (§ *Dialeipanthe*)

The species of this small section are very distinct in the form of the inflorescence. The scape is long (usually 20-30 cm.) and bears a succession of many flowers, one after the other, at intervals of several weeks. The old inflorescence bears a succession of bracts, close together. The flowers are fairly large, with narrow sepals and usually a fairly long lip. Vegetatively they are plants of moderate size, with well-developed pseudobulbs, often close together, and medium-sized leaves. They are found in the lowlands and at moderate elevations on the mountains.

#### Key to the species of the section *Dialeipanthe* in Malaya

- Pseudobulbs strongly angled, the surfaces smooth;  
sepals spotted .. .. . 1. *B. lumbriciforme*
- Pseudobulbs not angled, wrinkled when old; se-  
pals more or less striped but not spotted  
Sepals about 2.5 cm. long; petals with a hair-  
like point .. .. . 2. *B. cleistogamum*
- Sepals 3.5 to 4.5 cm. long; petals not hair-  
pointed .. .. . 3. *B. stella*

1. ***Bulbophyllum lumbriciforme*** J.J.S., Bull. Btzg., Ser. 3, 2: 94. 1920. Suppl. II: t. 99, II.—*B. stella* quoad Carr, Gard. Bull. 5: 138, pi. II, f. 4. 1930. (non RidL).

Pseudobulbs close, conic, 4-sided, to 2 cm. long and nearly as wide; leaf elliptic, acute, to 20 by 4 cm., including the stalk of 2 cm.; scape dark



purplish, nearly 30 cm. long; floral bracts triangular, about 1 cm. long and wide; pedicel and ovary 1.6 cm.; flowers lasting several days, widely expanding; upper sepal erect, 2.3 by 0.6 cm., dull yellowish, densely red-spotted; lateral sepals keeled on the back, the keel projecting a little beyond the end of the blade, about 2.5 by 0.7 cm., coloured as upper sepal; petals strongly recurved, about 2 by 2 mm., triangular, shortly pointed; lip slightly curved, 1.6 by 0.6 cm., grooved at the base, finely warty towards the acute tip, yellow spotted red. Found at about 3,000 feet altitude on G. Tahan and Kedah Peak; also in Sumatra. There is some doubt whether the Peninsular plants belong to the same species as the Sumatran ones; the name *B. lumbriciforme* was given to the latter. If the Peninsular plants are distinct, they need a new name.

2. **Bulbophyllum cleistogamum** Ridl., J.L.S. 31: 277. 1896. Flora 4: 69. Carr, Gard. Bull. 5: 139, pi. II, f. 5. 1930.

Pseudobulbs close, conical, curved, longitudinally wrinkled when old, to about 3 cm. long and 1 cm. wide at the base; leaf narrowly elliptic, acute, to about 23 by 3 cm., including a stalk of 2 cm.; scape to 30 cm. long; bracts triangular, about 9 by 7 mm.; flowers widely expanded, or sometimes hardly opening; sepals yellow-green tinted with red, the veins and edges deep red; upper sepal 2.5 by 0.8 cm., long-triangular; lateral sepals deeply concave, 1 cm. wide near the base, spreading and curving downwards, gradually narrowed to the tip; petals 6 by 3.5 mm., the blade only 3 mm. long, narrowed suddenly and bearing a hair-point 3 mm. long; lip curved downwards beyond the middle, 1.5-2 cm. long and 7 mm. wide, dark red, roughened except in the basal hollow; rostellum reduced to a small central portion, so that the pollinia have direct access to the stigma, the flowers being self-pollinated and sometimes not opening. Distributed in Borneo and Sumatra; in Malaya found in the lowlands of Singapore, Johore and Pahang, and in Perak.

3. **Bulbophyllum stella** Ridl., J.L.S. 31: 297. 1896. Flora 4: 69.—not *B. stella* quoad Carr, Gard. Bull. 5: 138, pi. II, 4, which is *B. lumbriciforme* J.J.S.

Pseudobulbs close, ovoid, finely wrinkled when old, to about 1.8 cm. long; leaf to 25 by 3 cm., narrowed gradually to both ends, shortly stalked, apex acute; scape horizontal, to about 30 cm. long; rachis elongating to 7 cm., bracts broad, triangular, 7 mm. long, not persistent; flowers wide-opening or not; upper sepal 3.5 to 4.5 cm. long, 5 mm. wide, yellow at the base grading to purplish at the tip, with purple veins, the lateral sepals to 5 cm. long and 10 mm. wide, with tips turned downwards; petals 3.5-5 mm. long, similarly coloured, broadly triangular, blunt; lip purplish, nearly as long as sepals, basal half 8 mm. wide, base with 2 yellow keels and a deep groove between them, distal half 1 mm. wide; column 4 mm. high. Found in the lowlands of Singapore and Johore. It seems possible that this species also is sometimes self-pollinated. More observations are needed. **Fig. 119.**

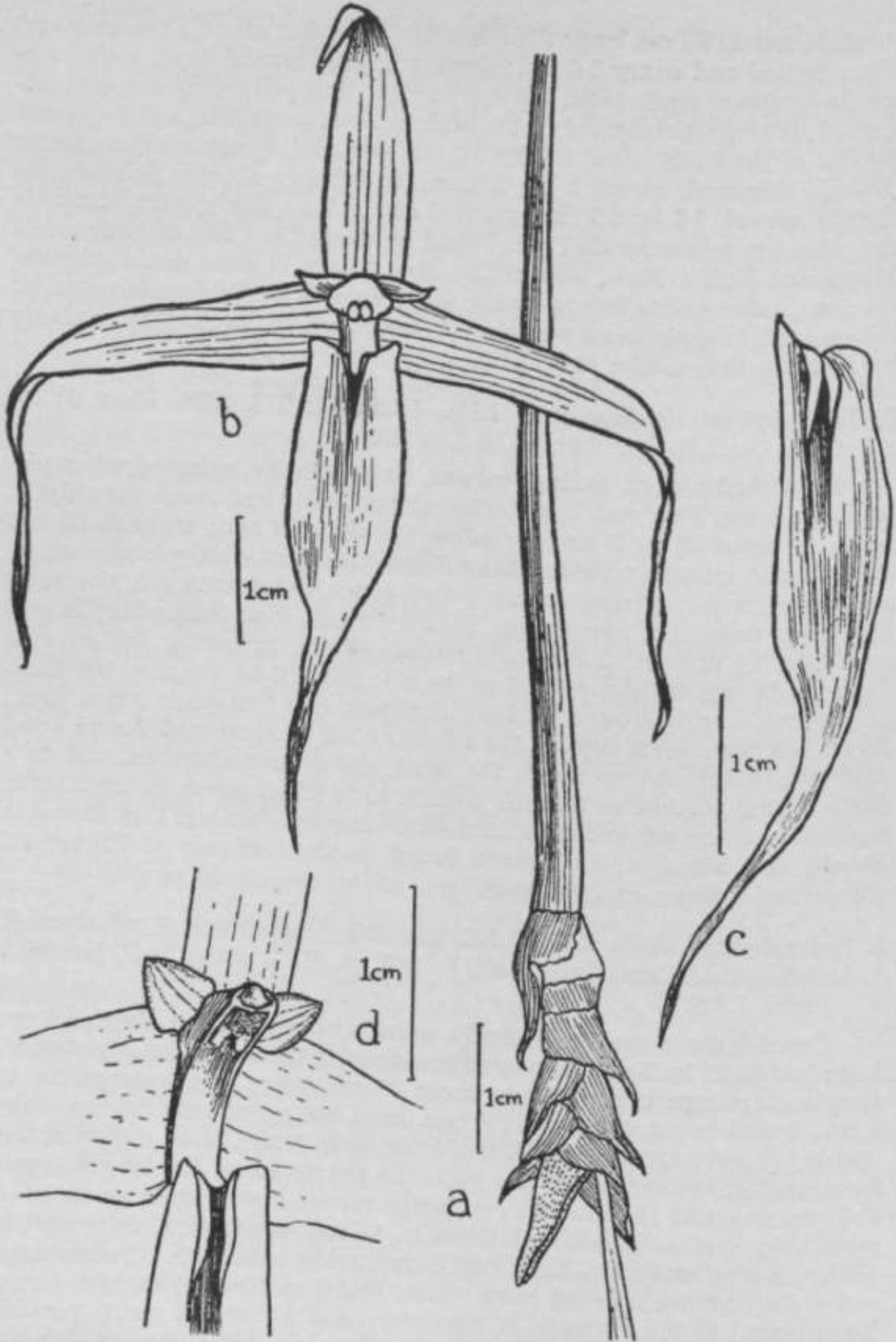


Fig. 119. *Bidbophyllum stella*. *a*, apex of inflorescence with bracts, *b*, flower in face view, *c*, lip, *d*, column and base of ovary and bases of sepals.

Section 2 (§ *Cirrhopetalum*)

This includes the sections usually known as *Cirrkopetalum* and *Ephiphim*. The former has sometimes been treated as a separate genus, but its limits are not clearly defined. The latter is so nearly related that its inclusion is not unnatural.

There is no single character by which the section is distinguished from all others, but most of the species have a characteristic appearance which depends on the form of the inflorescence and the shape of the flowers. The most important characters are:—

- (1) inflorescence of a whorl or circlet of flowers, all joined to the axis close together, the whole often fan-shaped;
- (2) upper sepal and petals with edges fringed with relatively long (usually purple) hairs;
- (3) lateral sepals much longer than the upper sepal, twisted near the base so that their upper edges meet, from which point they are joined, their lower edges sometimes joined also (thus forming a tube).

Of these, the only character possessed by all species of the group is the greater length of the lateral sepals, which are always much longer than wide.

Though most species have a fan-shaped group of flowers, a few have single flowers, or a pair; some of these have both characters 2 and 3; but *B. breviscapum* has neither, its lateral sepals being twisted so that their upper edges come near together without being joined. *B. Blumei* has the upper sepal fringed but the laterals hardly twisted. *B. purpurascens*, though having the typical fan of flowers, has neither character 2 nor 3.

The pseudobulbs are always well developed though never very large; the leaves are never very large, usually rather fleshy, and hardly stalked; the scape is nearly always slender and usually 10-20 cm. long; the flowers are of moderate size, never minute and never large; their colour is very varied. The species are nearly all very graceful and attractive when in flower, and some of them are quite common.

Key to the Malayan species of *Bulbophyllum*, Section 2

- Pseudobulbs flattened, appressed to the rhizome      1. *B. planibulbe*
- Pseudobulbs not or hardly flattened, not appressed to the rhizome
- Flowers 1-3 on each inflorescence
- Flower solitary
- Lateral sepals not over 5 cm. long
- Tips of lateral sepals joined                      ..    2. *B. restrepia*
- Tips of lateral sepals not joined
- Upper sepal with fringed edges              . .    3. *B. Blumei*
- Upper sepal not fringed                      . .    4. *B. breviscapum*
- Lateral sepals 13 cm. or more long              . .    5. *B. fascinator*

- Flowers 2 or 3
- Lateral sepals 7 cm. long .. .. 6. *B. biflorum*
- Lateral sepals much shorter
- Pseudobulbs distant, scape about 2 cm. long .. .. 7. *B. chekaense*
- Pseudobulbs not over 2 cm. apart, scape longer
- Upper sepal fringed, laterals 3.0 cm. long .. .. 8. *B. Annandalei*
- Upper sepal not fringed, laterals about 1 cm. long .. .. 9. *B. tenerum*
- Flowers 5 or more in one inflorescence
- Lateral sepals 4 cm. or more long, narrowed to thread-like tips .. .. *B. gracillimum*
- Lateral sepals red, about 4 cm. long .. 10.
- Lateral sepals usually much longer, not red
- Lateral sepals 7 cm. long, pale yellow; upper sepal with hairy edges .. 11. *B. vaginatum*
- Lateral sepals about 12 cm. long, white or with pink spots; upper sepal without hairs .. .. 12. *B. medusa*
- Lateral sepals under 4 cm. long, ends not thread-like
- Upper sepal and petals without a fringe of hairs
- Sepals very pale yellowish, laterals not joined .. .. 13. *B. purptirascens*
- Sepals not entirely pale yellowish, laterals joined
- Scape barely 15 cm. long .. 14. *B. yoksunense*
- Scape much longer
- Upper sepal round, 5 mm. diameter, with a hair-point 2 mm. long from the notched tip .. 15. *B. cyclosepalon*
- Upper sepal otherwise
- Lateral sepals to 1.6 cm. long, almost white with pink spots; leaf to 3 cm. wide .. 16. *B. fenestratum*
- Lateral sepals 1.8 cm. long, otherwise coloured; leaf to 1.2 cm. wide
- Petals triangular, narrowly pointed .. .. 17. *B. perakense*
- Petals almost round .. 18. *B. Skeatianum*
- Upper sepal and petals with a fringe of hairs
- Hairs yellow, lateral sepals 3-7 cm. long 19. *B. Makoyanum*

- Hairs brownish or purplish, lateral sepals not over 3 cm. long  
 Upper sepal and petals brown-purple; lateral sepals clear pale yellow except at base  
 Lateral sepals 25 mm. long, outer edges recurved; upper sepal with slender tip 2 mm. long . . . 20. *B. Brienianum*
- Lateral sepals not over 20 mm. long, nearly flat; narrow tip of upper sepal 0.5 mm. long . . . 21. *B. Gusdorffii*
- Flowers otherwise coloured  
 Pseudobulbs 4 mm. tall, leaf to 4.5 by 1.6 cm. . . . . 22. *B. microbulbum*
- Pseudobulbs much longer, leaf longer  
 Pseudobulbs 2-6 cm. apart, leaf to 15 cm. wide . . . 23. *B. acuminatum*
- Pseudobulbs not over 3 cm. apart, leaf wider  
 Lateral sepals to about 1.3 cm. long  
 Petals fringed with rather coarse dark purple hairs, suddenly narrowed to slender apex; lateral sepals strongly curved . . . 24. *B. corolliferum*
- Petals fringed with fine brownish hairs, gradually narrowed to slender apex; lateral sepals slightly curved . . . 25. *B. pulchellum*
- Lateral sepals 2.5 to 3 cm. long  
 Flowers spreading like a fan in one plane  
 Upper sepal 8 mm. long, the hair-like tip 5 mm.; laterals 2.5 cm. long . . . . . 26. *B. lepidum*
- Upper sepal 6 mm. long, the hair-like tip 2 mm.; laterals 3 cm. long . . . . . 27. *B. ochraceum*
- Lateral sepals all hanging down vertically, the whole inflorescence in the form of a bell . . . 28. *B. campanulatum*

1. **Bulbophyllum planibulbe** (Ridl.) Ridl., Mat. Fl. M.P. 1: 79. 1907. Flora 4: 1&.—*Cirrhopetalum planibulbe* Ridl., Tr. L.S. 3: 364, t. 65. 1893.

Rhizome slender; pseudobulbs 3-5 cm. apart, horizontal, flattened, 1-5 cm. long, 0.6 cm. wide; leaf to 2.5 by 10 cm., stalkless, blunt; scape purple, 9 cm. long, bearing 2 to 5 flowers; upper sepal 10 by 0.4 cm., the base broad, concave, the apex long-pointed, pale yellow, suffused and spotted <sup>le n the</sup> back and edges; lateral sepals <sup>A</sup> 1\* by 0.3 cm., long-pointed, the edges not touching, colour as upper sepal; petals 3 mm. long, broad, with a very short tip, yellow; lip short, strongly curved, sharply <sup>tributed in</sup> Sumatra; in Malaya found only in Pahang <sup>lowlands</sup> > creeping on trees. This is not a typical member of the section, but the flowers are shaped much as in *B. purpurascens*. its vegetative habit, with flattened pseudobulbs appressed to the slender rhizome, is quite peculiar.

2. **Bulbophyllum restrepia** Ridl., Tr. L.S. 3: 365. 1893. Flora 4: 75.

Pseudobulbs 1 cm. or less apart, to 1 cm. long, curved; leaf to 7 by <sup>2.5</sup> <sup>it</sup> <sup>widest near its</sup> rounded tip, narrowed gradually to base, hardly stalked; scape to 6 cm.; pedicel and ovary to 2.5 cm.; upper sepal 1.5 cm. long, the basal 5 mm. erect, greenish yellow with red edges, 2.5 mm. wide, above this narrowed and bent forwards at almost a right angle, the apical part yellow, fleshy, 2 mm. thick; lateral sepals 2.5 cm. long, pointing forwards, curved, their fleshy tips joined, maximum width 6 mm. a little above the base, yellowish, the lower half dotted with crimson, the edges crimson, tips bright yellow; petals 4 mm. by nearly 2 mm., acute, erect on either side of the column, edges dark red; lip strongly curved, with broad base and slender tip, length in natural position under 3 mm., yellow-green, minutely spotted with purple. This peculiar species has only been found in the lowlands of Singapore, Johore and Pahang, on trees by rivers and in mangrove.

3. **Bulbophyllum Blumei** (Lindl.) J.J.S., Fl. Buit. 6: 459, f. 351. 1905. Ridl. Flora 4: 74.—*Cirrhopetalum Blumei* Lindl., Gen. et Sp. Orch. 59. 1830.—*Ephippium ciliatum* BL, Bijdr. 309, f. 65. 1825.

Rhizome creeping, 3 mm. thick; pseudobulbs 2-5 cm. apart, 2 to 3.5 cm. or more tall, oblique, narrowly conical; leaf to 12 by 2 cm., elliptic, apex blunt, base narrowed to stalk 1 cm. long; scape as long as leaf, one-flowered; pedicel and ovary 1.5 cm.; upper sepal erect, 2.2 by 0.4 cm., narrowed to a slender tip, edges finely white-fringed towards base, the blade suffused with red, most deeply on the veins; lateral sepals spreading, 30 cm. or more long and 5 mm. wide above the base, more or less deep wine red with yellowish edges and tips; petals hooded over the column at their base, narrowed to slender tips, 5 by 2 mm., curved, suffused and partly spotted and veined red, the edges shortly fringed; lip <sup>6</sup> mm. long, bent at a right angle just above the broad base, then narrowed, the greater part of the length slender, curved, barely 0.5 mm. wide, dark red-brown. Found in Java, Borneo and Sumatra; in Malaya chiefly in the south, in lowlands on old mangrove and by rivers. In Java the lateral sepals are reported as being sometimes as much as 5-8 cm. long.

4. *Bulbophyllum breviscapum* (Rolfe) Ridl., Mat. Fl. M.P. 1: 78. 1907. Flora 4: 74.—*Cirrhopetalum breviscapum* Rolfe, Bot. Mag. t. 8033. 1905.

Rhizome slender; pseudobulbs about 3 cm. apart, 1.5 to 2 cm. high, 4-ridged; leaf to 5 by 2 cm., fleshy, blunt; scape 3.5 cm. long, purple-spotted, bearing one flower; upper sepal purple, erect, about 1.8 by 0.6 cm., edges not hairy; petals similar in size and colouring; lateral sepals 2.5 cm. long, twisted at the base so that their upper edges nearly meet in the middle, yellow with large crimson spots; lip 1 cm. long, the broad base deeply cleft, slightly curved, obtuse, purple, with long purple hairs on the edges. Known only from a plant sent from Perak to Dublin in 1903, and there cultivated in the Glasnevin Gardens. The colouring of the flower is unusual and striking. The lateral sepals show the twist at the base characteristic of *Cirrhopetalum*, but do not actually touch.

5. *Bulbophyllum fascinator* Rolfe, Bot. Mag. t. 8199. 1908. Ridl., Flora 4: 74.

Pseudobulbs close, ovoid, about 2 cm. long; leaf thick, blunt, to 5 by 3 cm.; scape 10 cm., bearing one flower; flower pale green with crimson markings; upper sepal 2.5-3 cm. long, ovate, pointed, the edges fringed with long purple hairs; lateral sepals 13-18 cm. long, the ends drawn out into long slender tails, both edges joined for the greater part of their length, the ends free; petals 2 cm. long, curved downwards and fringed; lip strongly curved, with two high keels from base to apex, purple. Distributed from Annam southwards to Setul, as a lowland epiphyte; it may occur also in Kedah.

6. *Bulbophyllum biflorum* T. et B., Nat. Tijd. Ned. Ind. 3: 397. 1855. J.J.S., Fl. Buit. 6: 469, f. 359.—*Cirrhopetalum biflorum* J.J.S., Ic. Bog. 2: 104, t. 120B. 1903.—*Bulbophyllum geminatum* Carr, Gard. Bull. 5: 12, pi. 6. 1929.

Pseudobulbs 1-1.5 cm. apart, strongly 4-angled, yellow, about 4 by 1.2 cm.; leaves to 12 by 3 cm., rather oblong, the apex blunt, base shortly narrowed; scape 7-10 cm. long, erect, 2-flowered; flowers 7 cm. long, the edges of sepal and petals not fringed; blade of upper sepal to 8 by 4.5 mm., brown-purple, concave at the base and then reflexed, bearing at the tip a slender tail 1.3 cm. long, the apex thickened; petals asymmetric, 5 by 4 mm., the blunt apex bearing a very short tail; lateral sepals 7 cm. long, 5.5 mm. wide at the widest part, the upper edges joined almost throughout, and the lower edges also in the apical half, which is gradually narrowed, colour yellow-green, the basal half purple-spotted, with 5 rows of spots towards the base on the lower surface; lip 5 by 1.5 mm., bent at a right angle, dull yellow, purple-spotted. Distributed in Java and Sumatra; in Malaya found only once, at Krambit in Pahang. The details of size and colouring of the parts of the flower vary somewhat; the Malayan variety found at Krambit has been called *B. geminatum*. The tail of the upper sepal, with its thickened end, is remarkable.

7. **Bulbophyllum chekaense** Carr, Gard. Bull. 7: 31. 1932.

Pseudobulbs close, to 2.5 cm. long, 1.2 cm. wide, angled, narrowed and often curved towards the apex; leaf to 7 by 2.2 cm., tip blunt, base narrowed; scape to 2.5 cm. long, bearing 2 flowers; sepals and petals not fringed; upper sepal 4.5 by 3 mm., recurved from the base, widest in the upper half, very shortly pointed, yellowish, veined and spotted with pink; petals 2 by 1 mm., colour as upper sepal, curved, very shortly pointed; lateral sepals 1.4 cm. by 4 mm., the upper edges joined, the tips free, pale yellowish, darker towards the tips, minutely spotted with dull pink, inside with 3 short dark purple streaks at the base; lip curved, 3 by 1 mm., yellowish with small brown-purple dots. Only found once, by the Cheka River in Pahang.

8. **Bulbophyllum Annandalei** Ridl, Flora M. P. 4: 78. 1924.

Pseudobulbs close, 1.5 cm. long; leaf thick, blunt, 10 by 1.8 cm.; scape 9 cm. long, bearing 2 deep crimson flowers, faintly striped with pale brown; upper sepal 1.2 cm. long, sparsely fringed, ovate, acute; lateral sepals 3 cm. long, free above the broad dilated bases, greatest width above the base 7 mm.; petals 7 mm. long, ovate, with fringed edges; lip curved, narrow, about 7 mm. long. Only found once, in Lower Siam; more details are required.

9. **Bulbophyllum tenerum** Ridl., J.S.B.R.A.S. 39: 75. 1903. Flora 4: 65.

Pseudobulbs to 2 cm. apart, broadly ovoid, barely 1 cm. long; leaf 3.3 by 1.2 cm., widest in the upper half, apex rounded, narrowed to base but not stalked; scape 4 cm. long; flowers 3 (or perhaps 2); upper sepal 4 mm. long, laterals nearly 1 cm., purple, the bases greenish; petals 3 mm. long, green; lip small recurved, acute, purple; sepals and petals not fringed. Only known from one collection, from Langkawi Islands. The original description is imperfect, and the only specimen also. It is quite possible that the plants may grow larger.

10. **Bulbophyllum gracillimum** (Rolfe) Rolfe, Kew Bull. 1907: 412.—*Cirrhopetalum gracillimum* Rolfe, Kew Bull. 1895: 54.—*Cirrhopetalum psittacoides* Ridl., J.L.S. 32: 280. 1896. Schltr., Orch. (1915) 334, f. 106.—*Bulbophyllum psittacoides* J.J.S., Orch. Amb. 84. 1905. Ridl., Flora 4: 76, f. 165.

Pseudobulbs 2 cm. or more apart, to 2 cm. long, ovoid; leaf to 12 by 2.3 cm., elliptic, blunt; scape slender, purple, to 30 cm. long; flowers 8-9 in a whorl, the general colour bright crimson; upper sepal ovate, hooded, nearly 1 cm. long with a long slender tail, the basal part red-fringed on the edges; petals narrower at the base, about as long as the upper sepal, similarly tailed and fringed; lateral sepals 4 cm. or more long, both edges joined together in the basal part (without a gap for the lip), the long-tailed curved ends free; lip under 2 mm. long, violet-purple. Distributed from Sumatra to New Guinea; in Malaya, not uncommon as a lowland epiphyte.



11. *Bulbophyllum vaginatum* (Lindl.) Rchb. f., Walp. Ann. 6: 261. 1861. J.J.S., Fl. Buit. 6: 432, f. 327. Ridl., Flora 4; 7Q.—*Cirrhopetalium vaginatum* Lindl., Gen. et Sp. Orch. 59. 1830. Bot. Reg. 1842, sub t. 12; 1843, subt 49.

Pseudobulbs 3 to 5 cm. apart, about 2 cm. long, ovoid, angled; leaf thick and stiff, to 12 by 2.5 cm., oblong, apex blunt and slightly cleft, base shortly stalked; scape to 10 cm. long, with several sheaths, bearing about 15 long-tailed pale yellow flowers; upper sepal 9 mm. long, the edges shortly fringed; lateral sepals 4-7 cm. long, fringed towards the base, both edges joined near the base, the ends free; petals 3 mm. long, fringed; lip 2 mm. long\* Distributed in Borneo and Sumatra, In Malaya often abundant on old trees in fairly exposed places, flowering gregariously. Fig. 120.

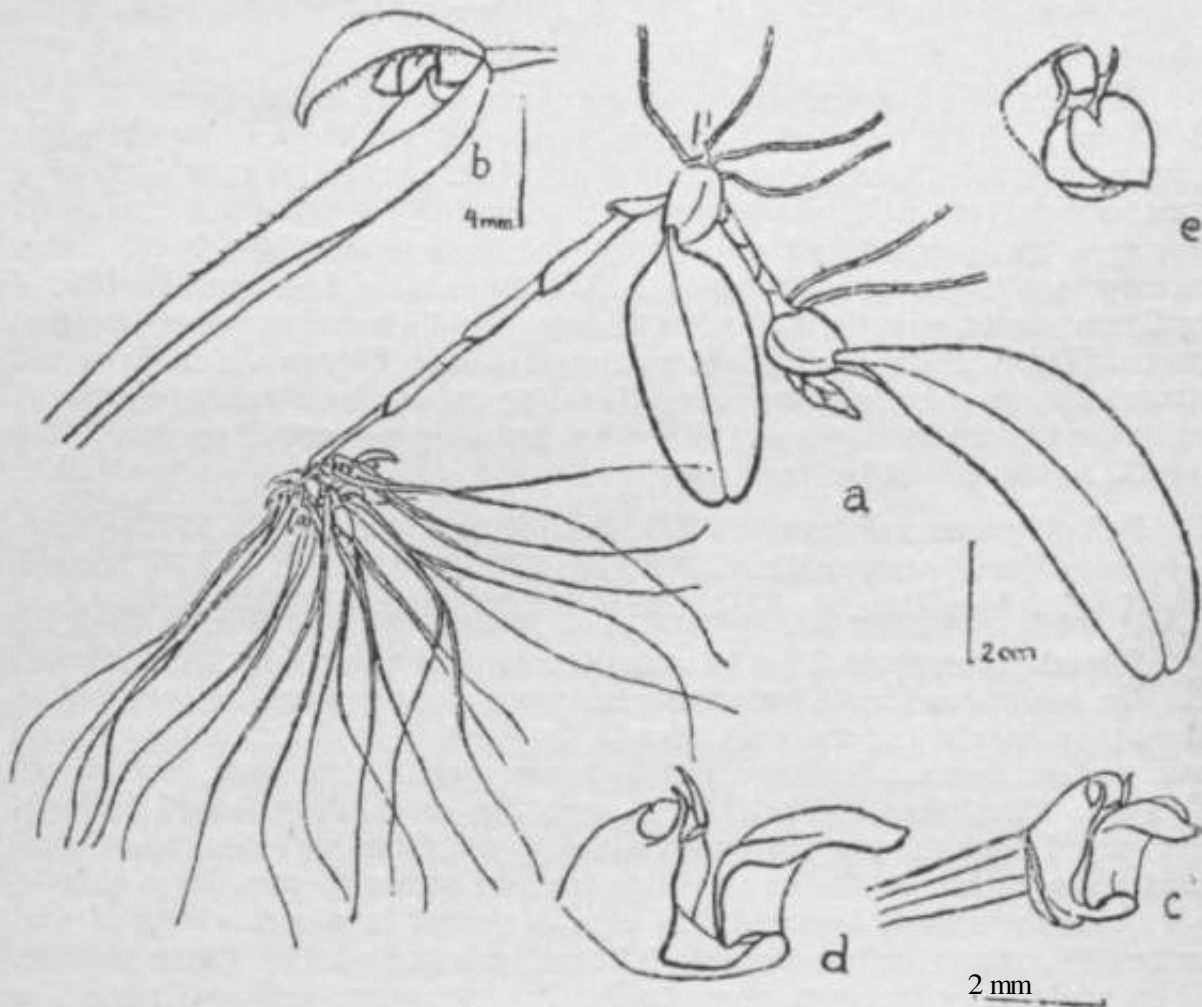


Fig. 120. *Bulbophyllum vaginatum*. a, plant in flower, b, flower from side, c, flower with sepals and petals removed, d, column, column-foot and lip. e, column and lip from above.

12. *Bulbophyllum medusae* (Lindl.) Rchb. 1, Walp. Ann. 6: 262. 1861. Ridl., Flora 4: 75.—*Cirrkopetalum medusx* Lindl., Bot. Reg. 28: t. 12. 1842. Bot. Mag. t. 4977.

Rhizome rather stout; pseudobulbs about 3 cm. apart, 2-3-5 cm. long, conical, angled; leaf 10-20 by 2.5 to 4.5 cm., shape as in *B. vaginatum*; scape erect, 10 to 20 cm., bearing several loose sheaths and a head of

many long-tailed flowers like a mop; bracts conspicuous, cream, the outer ones to 3 cm. long and 5 mm. wide; pedicel and ovary 5-6 mm. long; flowers white, or white with pink spots; upper sepal 3 cm. long, a short basal part 5 mm. wide, the rest a slender tail; petals triangular with slender points, 5 mm. long; lateral sepals to 12 cm. long, the blade about 1 by 0.3 cm., the rest a very slender tail; lip small, yellowish. This is very like *B. vaginatum* both vegetatively and in the shape of the flowers; the lateral sepals are much longer in *B. medusx* and differently coloured, and the sepals and petals are not fringed. Distribution as *B. vaginatum*, but probably less common.

- 13. *Bulbophyllum purpurascens*** T. et B., Nat. Tijdschr. Ned. Ind. 24: 308. 1862. J.J.S., Fl. Buit. 6: 472, f. 362. Ridl., Flora 4: *IS*.—*Bulbophyllum Curtisii* Ridl., J.S.B.R.A.S. 39: 76. 1903.—*B. rhizophoreti* Ridl., Flora 4: 77.

Pseudobulbs 1-2 cm. apart, 1-2 cm. long, ovoid; leaves fleshy, 5-9 by 2-3-5 cm., bluntly rounded at the tip, narrowed to the base, purple when young; scape 6-18 cm. long; flowers about 12; bracts purplish, about 4 mm.; sepals very pale yellow or nearly white; upper sepal 5-6 mm. long, concave, long-pointed but not fringed; lateral sepals 1-3-1.9 cm. long, narrow, acute, straight, diverging a little from each other; petals about 4 by 2 mm., acute, slightly toothed at the base; lip 1.5 mm. long, blunt, yellow-green. Widely distributed in Java, Sumatra and Borneo; in Malaya not uncommon as a lowland epiphyte. The flowers are in a spreading whorl as in the typical members of the section, but they are not fringed, and the lateral sepals are quite free.

- 14. *Bulbophyllum yoksunense*** J.J.S., Bull. Btzg., Ser. 2, 8: 29. 1912.—*Cirrhopetalum brevipes* Hk. f., F.B.I. 5: 777. 1890. Ic. PL t. 2056. King & Pantl., Ann. Calc. 8: 88, t. 122. (Not *B. brevipes* Ridl.).

Pseudobulbs about 2 by 1-2 cm., distant; leaf about 6 by 2 cm., fleshy, elliptic, blunt, hardly stalked; inflorescence no longer than the pseudobulb, the scape barely 1.5 cm. long; bracts to about 6 by 3 mm.; pedicel and ovary about 9 mm.; flowers about 7; upper sepal 6 mm. long, hooded, not fringed; lateral sepals about 1-2 cm. long, the lower edges joined throughout except near the tip, the upper edges joined from near the base, apical part strongly keeled, the narrow tips curved; petals 4-5 mm. long, elliptic, very shortly tipped, 3-veined; lip curved almost in a semi-circle of diameter 2-5 mm., maximum width 1.5 mm., grooved on the upper surface, blunt; column with short erect teeth. One specimen, gathered near The Gap (Selangor) agrees very closely with this species, originally found in the Sikkim Himalayas, except that the petals have not hairy edges as described for the Himalayan plant. No colour notes were made of the Gap specimen; the Himalayan plant has yellowish sepals with rows of pink spots, the petals pink with purple veins, the lip purple.

- 15. *Bulbophyllum cyclosepalon*** Carr, Gard. Bull. 7: 33. 1932.

Rhizome long-creeping, 3 mm. thick, internodes 1-2 cm. long; pseudobulbs 8-14 cm. apart, to 3-5 cm. long and 1-5 cm. wide, conic, 4-angled, shining bright green; leaf fleshy, to 18 by 3 cm., the apex blunt, the base

distinctly stalked; scape to 20 cm. long with several conspicuous sheaths, flowers about 14 or more in a whorl; upper sepal almost circular, hooded, 3-5 mm. diameter, with a hair-point 2 mm. long in a notch in the apex, greenish yellow with crimson spots and edges; lateral sepals 1.5-2 by 0.3-0.5 cm., the upper edges joined from near the base to within 3 mm. of the acute apices, pale yellow with darker base, within spotted dull purple (large spots) in the basal third, outside entirely spotted rose-purple; petals 5 by 2 mm., curved-oblong, the apex blunt, carrying a hair-point 1 mm. long, margins irregularly and finely toothed, greenish yellow spotted dark red; lip about 2.5 by 1 mm., pale yellow spotted dark red. Known from Gua Tipus, Pahang, and Jor, Perak. Vegetatively this species is very like the next, but differs in all the floral parts.

16. **Bulbophyllum fenestratum** J.J.S., *Bull. Dep. Ag. XIII: 48. 1907. Bull. Btzg., Ser. 3, 6: t. 10, III. 1924. Carr, Gard. Bull. 7: 33. 1932.*—*B. rupicolum* Ridl., *J.S.B.R.A.S. 59: 194. 1911. Flora 4: 77.*—*B. punctatissimum* Ridl., *Flora 4: 77. 1924.*

Rhizome, pseudobulbs and leaves as in *B. cycloseyalon*; scape to 12 cm., dull purple, with about 10 flowers; upper sepal almost round with a very short tip, edges toothed towards tip, 7 by 6.5 mm., whitish with dull purple spots; lateral sepals with upper edges joined in their apical halves,, their tips narrowly pointed, total length 1.6 cm., greatest width 5.5 mm., white with small purple spots which are larger towards tips; petals 4 by 3 mm., ovate, tips rounded, edges very short-hairy, surfaces papillose, densely covered with small purple spots; lip curved, 3.5 mm. long, greenish with fine purple spotting; column with very long slender erect teeth. Distributed in Java, Borneo and Sumatra; in Malaya especially on limestone, both on trees and on the rocks.

17. **Bulbophyllum perakense** Ridl., *J.S.B.R.A.S. 39: 76. 1903. Flora 4: 77.*

Pseudobulbs 12 cm. long, conic; leaf 5 to 7.5 by 1.2 cm., elliptic; scape 7-10 cm.; flowers many, crowded, petals not fringed; upper sepal ovate, acute; lateral sepals much longer (1.8 cm. long), joined for half their length, their tips narrowed; petals nearly as long as the upper sepal, but narrowed from the base to the pointed tip; column arms broad, more or less triangular. Only known from one plant found in Perak; details are lacking.

18. **Bulbophyllum Skeatianum** Ridl., *J.F.M.S. Mus. 6: 177. 1915. Flora 4: 78.*

Pseudobulbs about 1 cm. apart, 1-2 cm. long, purple, ovoid or long-ovoid; leaf to 6.5 by 0.9 cm., purplish beneath, apex blunt, base gradually narrowed but hardly stalked; scape purple, about 10 cm. long; flowers about 10, in a fan; pedicels orange-scarlet, 9 mm. long; upper sepal 5 mm. long, hooded, blunt, suffused and striped with deep red-purple; lateral sepals 1.8 cm. long, upper edges joined almost throughout, the lower edges towards tips only, bright orange-red with yellow tips; petals nearly as long as the upper sepal, almost round, colour as upper sepal; lip tongue-shaped, yellow, the tip crimson; column yellow, the arms slender, curved, rising-

a little above the anther. Common on the ridge of G. Tahan (Skeat's Ridge) at 3,500-5,500 feet; otherwise only found once at Cameron Highlands. A brightly coloured and attractive species.

19. *Bulbophyllum Makoyanum* (Rchb. f.) Ridl., Mat. Fl. M.P. 1: 81. 1907. Flora 4: 19.—*Cirrhopetalum Makoyanum* Rchb. f., Gard. Chron. «'» I: 234. Bot. Mag. t. 7259.

Pseudobulbs 2 cm. apart (?), 2 cm. long, broadly ovoid, ridged when old; leaf 7 by 21 cm., widest near rounded cleft apex, narrowed to a very short stalk; scape purple, about 20 cm. long, with 10 flowers in a terminal circle; upper sepal 5 mm. long, the base broadly ovate, the apex produced to a thread, the edges with yellow hairs 1 mm. long; petals longer, narrowed more evenly from the base, with similar hairs; lateral sepals 3-7 cm. long, narrow, both edges joined for the greater part of their length; lip tongue-shaped, 2-5 mm. long, blunt, finely purple-spotted; upper sepal and petals reddish with darker spots and veins; lateral sepals pale yellow with purple spots in the basal half and a few towards the apex. Only known from Singapore; distinct in the yellow fringe of the petals and the long lateral sepals.

20. *Bulbophyllum Brienianum* (Rolfe) J.J.S., Fed. Rep. 32: 306. 1933.—*Cirrhovetulum Brienianum* Rolfe, Kew Bull. 1893: 62.—*C. Makoyanum* var. *Brienianum* Ridl., J.L.S. 32: 285. 1896.—*W. W. Makoyanum* var. *Brienianum* Ridl., Mat. Fl. M.P. 1: 81. 1907.—*Cirrhopetalum brunnescens* Ridl., J.L.S. 31: 279. 1896.—*Bulbophyllum brunnescens* J.J.S., Bull. Btzg., Ser. 2, VIII: 26. 1912.

Pseudobulbs 2-3 cm. apart, to 2 cm. long, rather narrowly ovoid and strongly ridged; leaf to 12 by 2 cm. or even wider, widest about the middle, apex blunt, stalk short; scape purple, 10-20 cm. long, flowers in a fan; upper sepal 5 mm. long, ovate, with a slender tip 1 mm. long, red-brown to dark brown-purple with fine yellow to brown-purple hairs on the edges; petals similar in size, slender apex, colour and hairs; lateral sepals 2-5 cm. long, narrow, the upper edges joined almost throughout, outer edges recurved, clear pale yellow except at the base which is partly dark-purple-flushed; lip dark purple; column pale yellow with few purple spots, the arms small, rounded. Distributed in Borneo and Sumatra, in Malaya only found in Johore (twice) and in Perak.

21. *Bulbophyllum Gusdorfii* J.J.S., Bull. Btzg., Ser. 2, XXV: 79. 1917, var. *johorensis* Holtt., Rev. Fl. Mai. 1: 409.

Pseudobulbs close, about 2-5 cm. long, ovoid, slightly 4-angled; leaves to 14 by 3-5 cm.; scape 8-9 cm. long, pinkish; bracts pale; flowers 6 to 8; upper sepal 4 mm. long, nearly 3 mm. wide, convex, purple-brown with pale greenish tip 0.5 mm. long, edges fringed with light brown hairs 1 mm. long; lateral sepals 18-19 mm. long, joined almost throughout along their upper edges, nearly flat, together forming a narrow ellipse 7 mm. wide, clear pale yellow flushed with purple near base; petals almost 4 mm. long, 1-75 mm. wide near base, tip blunt, whole surface densely

papillose, deep purple-brown except for yellow tips, edges fringed as upper sepal; lip 3 mm. long, curved, tongue-shaped, grooved towards base, tip green, rest flushed with purple; column pale greenish yellow, without anther 2 mm. high, top 3-toothed at back, a tooth of equal height each side in front; column-foot 3 mm. long, base purplish, tip white. Type collected in southern Sumatra; the variety above described, differing in shape of column, and in petals being papillose throughout, once collected in southern Johore. Fig. 121, a, b, c.

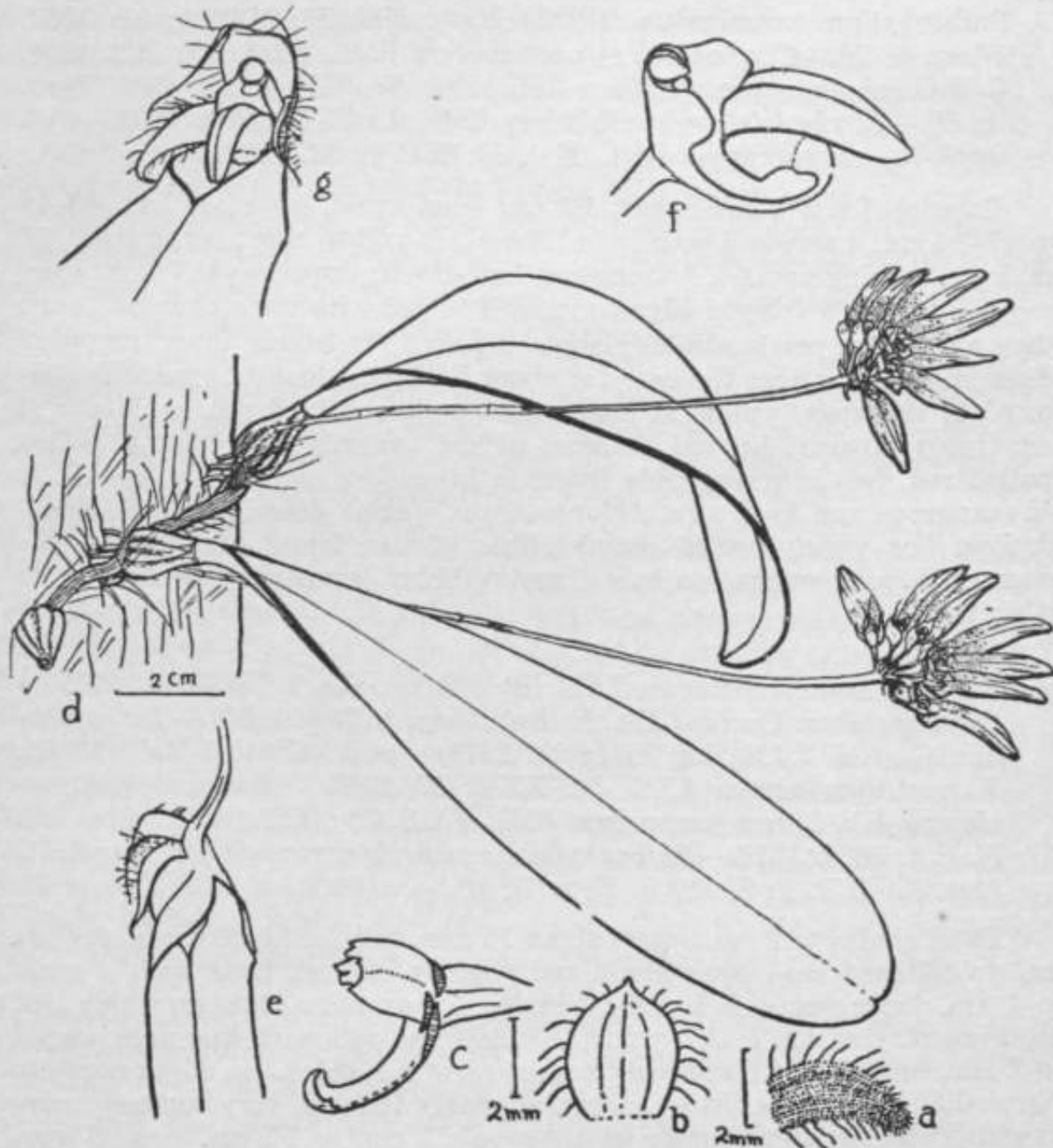


Fig. 121. *Bulbophyllum Gusdorfii* var. *jokorenses*. a, petal, b, upper sepal from back, c, column and column-foot, the anther having been removed. *B. lepidum*. d, plant in flower, e, flower. f, column, column-foot and lip from side, g, flower from front.

22. **Bulbophyllum microbulbon** (Ridl.) Ridl., Mat. Fl. M.P. 1: 82. 1907. Flora 4: 79.—*Cirrhopetalum microbulbon* Ridl., J.L.S. 32: 283. 1896.

Pseudobulbs 2 cm. apart, 4 mm. long, rounded; leaf about 4.5 by 1.6 cm., elliptical, tip blunt, slightly notched; scape 12 cm., flowers about 8 in a fan, pink; upper sepal about 4 mm. long, the basal half hooded, the apical half thread-like, edges fringed; petals as long, narrowed more evenly; lateral sepals 1.4 cm. long, narrow, the upper edges joined except at the base. Only known from Singapore.

23. **Bulbophyllum acuminatum** (Ridl.) Ridl., Mat. Fl. M.P. 1: 82. 1907. Flora 4: 79.—*Cirrhopetalum acuminatum* Ridl., J.L.S. 32: 282. 1896.—*Bulbophyllum stenophyllum* Ridl., Mat. Fl. M.P. 1: 83. 1907. Flora 4: 80.—*Cirrhopetalum semibifidum* Ridl., J.L.S. 32: 284. 1896.—*Bulbophyllum semibifidum* Ridl., Mat. Fl. M.P. 1: 82. 1907. Flora 4: 79.

Pseudobulbs 2-6 cm. apart, 1-2 cm. long, ovoid, grooved; leaf 4.5-13 by 0.7-1.5 cm., narrowed equally to bilobed tip and to base; scape about 16 cm. long, bearing about 5 flowers in a half-circle; upper sepal 7 mm. long, long-pointed with fringed edges, greenish to red with dark crimson veins, edges and hairs; petals similar; lateral sepals 1.8 to 3.0 cm. long, the upper edges joined from near the base for about half their length, gradually narrowed to the apex, yellow at base, more or less veined red, middle part red, tips yellowish; lip red at base, yellow towards tip—column yellow spotted red, foot crimson. Only found in Singapore and Johore, chiefly in old mangrove and by rivers. A form of the species described as *B. stenophyllum* has widely-spaced pseudobulbs; it was found growing on the bases of Nibong palms, its long-creeping habit being perhaps due to its habitat.

24. **Bulbophyllum corolliferum** J.J.S., Bull. Botz., Ser. 2, XXV: 80. 1917.—*Cirrhopetalum Curtisii* Hk. f., Bot. Mag. t. 7554. 1897.—*Bulbophyllum Curtisii* J.J.S., I.e. VIII: 23. 1912 (not *B. Curtisii* Ridl. 1903). Var. *atropurpureum* J.J.S., I.e. XXV: 82. 1917.—*Cirrhopetalum concinnum* Hk. f. var. *purpureum* Ridl., J.L.S. 32: 282. 1896. Rolfe, Bot. Fl. S.S. 1910.—*Bulbophyllum pulchellum* var. *purpureum* Ridl., Mat. Fl. M.P. 1: 83. 1907. Flora 4: 80.

Pseudobulb to 2 cm. tall, ovoid, wrongly angled; leaf 1.5 by 0.7 cm., and slightly bilobed at base with a stalk to 1 cm. long, bearing 12 or more flowers which (in Malayan Peninsula) are except the yellowish lip; upper sepal to 7 mm. long, hairy; petals narrowed below the short apex; lateral sepals near the base to the blunt tip the whole of a circle when seen from the typical form of the species has white flowers with more or less coalesced

purple veins and is found in Borneo; in Lower Siam is a variety (*C. Curtisii*) which has the upper sepal and petals rosy mauve and also the bases of the lateral sepals, the ends of which are white. The lateral sepals are shorter and more curved than those of *B. pulchellum*, which differs also in the shape of the upper sepal and petals and in having finer hairs.

25. **Bulbophyllum pulchellum** Ridl., Mat. Fl. M.P. 1: 83. 1907. Flora 4: 80 (excl. vars.)—*Cirrhopetalum concinnum* Hk. f., F.B.I. 6: 190. 1890. Ic. PL t. 2060B (not *Bulbophyllum concinnum* Hk. f. 1890).

Pseudobulbs to 2 cm. apart and 1.5 cm. long, ovoid; leaf to 16 by 2.5 cm., widest in the upper half, the apex bluntly pointed, base gradually narrowed, hardly stalked; scape 5-7 cm. long, bearing about 10 flowers in a drooping fan; upper sepal hooded, 5 by 2.5 mm., long-pointed, edges finely fringed; petals a little shorter, gradually narrowed to a long-pointed tip; lateral sepals about 1.3 cm. long, 2.5 mm. wide, widening slightly from the base to a point beyond the middle, their upper edges joined from near the base to the apex, the ends shortly bluntly pointed, curved backwards slightly; sepals and petals pale yellowish, densely red-spotted; lip purple with a yellow tip. Found as an epiphyte in the southern part of Malaya, in the lowlands, and also near Fraser's Hill.

26. **Bulbophyllum lepidum** (Bl.) J.J.S., Fl. Buit. 6: 471, f. 361. 1905.—*Ehippium lepidum* BL, Bijdr. 310. 1825.—*Bulbophyllum Griffithianum* Par. et Rchb. f., Tr. L.S. 30: 153. 1874. Ridl., Flora 4: 80.—*Cirrhopetalum gamosepalum* Griff., Notul. 3: 296. 1851.

Pseudobulbs to 2 cm. (rarely 3 cm.) apart, about 1.5 cm. tall, ovoid; leaves to 16 by 3 (-6) cm., apex blunt, base gradually narrowed to a short stalk; scape to 20 cm. long, bearing 7-10 flowers; upper sepal yellow, 8 mm. long, the basal 3 mm. broad and hooded, the apical 5 mm. a slender tip, edges purple-hairy; petals 5-6 mm. long, gradually narrowed, the hair-like tip shorter than in upper sepal; lateral sepals about 2.5 cm. long, 4 mm. wide, narrowed gradually from the middle to the blunt tips, the upper edges joined almost from the base, cream, suffused with rosy mauve towards the base; lip dull olive-brown; column pale greenish with purple spots, the side-arms broad and large. Found in Sumatra, Java and Borneo; in Malaya a common epiphyte in the south of the country in the lowlands, flowering fairly often. The shape of the lateral sepals seems a little variable; sometimes they are broader towards the tips. **Fig. 121, d-g.**

27. **Bulbophyllum ochraceum** Ridl., Mat. Fl. M.P. 1: 84. 1907. Flora 4: 81.—*Cirrhopetalum ochraceum* Ridl., Journ. Bot. 1898: 212.—*B. lepidum* quoad Carr, Gard. Bull. 5: 143. 1930.

Pseudobulbs 1 cm. or less apart, 2 cm. tall; leaves to 16 by 2 to 3 cm., usually rather oblong, sometimes widest above the middle; scape 10 to 20 cm. long, with 8-10 flowers in a fan; upper sepal hooded, about 6 by 3 mm., narrowed to a slender tip under 2 mm. long; petals 4.5 by 1.8 mm., narrowed evenly to the tip, the edges hairy; lateral sepals with their

upper edges joined almost throughout, the tips only just separate, 3 cm. long, the two together forming a blade 9 mm. wide which is narrowed to the tip; lip 3 mm. long; column-arms broad, but shorter than in *B. lepidum*; upper sepal reddish with darker veins; petals dark crimson; lateral sepals orange or yellowish, suffused or spotted red toward the base; lip olive-green. Found in the lowlands of Pahang and Selangor. This species is similar to *B. lepidum*, but has larger more brightly coloured flowers, differing in the shape of the upper sepal.

28. ***Bulbophyllum campanulatum*** Rolfe, Kew Bull. 1909: 62. Bot. Mag. t. 8281. Ridl., Flora 4: 18.—*Cirrhopetalum auratum* Kidl., J. i. s. o. 284. 1896 (non Lindl.).

Pseudobulbs about 1 cm. apart, ovoid, grooved, dark olive, 2 cm. long; leaf purplish, about 12 by 2.5 cm., apex bluntly pointed, base narrowed to a stalk 1 cm. long; scape 15 cm., purplish, bearing about 8 flowers in a whorl, the flowers all drooping so that the whole is in the form of a umbel; upper sepal 6 mm. long, ovate with slender tip and fringed edges, yellow with crimson veins; petals similar but narrower at the base; lateral sepals 2.5 to 3 cm. long, the basal 7-8 mm. free, for the rest the upper ones joined, the combined blade almost oblong, the end a little curved backward; pale yellow with pink veins and finely spotted pink throughout; upper lip crimson. Occurring in Sumatra; in Malaya only recorded from the coast of Selangor, in mangrove, but doubtless occurring elsewhere. Probably not common, or perhaps not free-flowering.

### Section 3 (§ *Stenochilus*)

This is a small section, of habit similar to some of the larger single-flowered species of section 4, but differing always in having the lip with the lip at the top (that is, the ovary not twisted). They agree together in the following characters: rhizome creeping, the sheaths breaking down to groups of bristles (including the large sheaths cover the young pseudobulbs); pseudobulbs of moderate size, well spaced; flowers fairly large, fragrant; petals and sepals almost equal in size; usually rather small, very mobile; pollinia without disc.

#### Key to the Malayan species of *Stenochilus*

- |  |                          |
|--|--------------------------|
| Lip $\frac{1}{2}$ as long as petals .. .. .  | 1. <i>B. megalanthum</i> |
| Lip less than half as long as petals         |                          |
| Lateral sepals close together, erect .. .. . | 2. <i>B. macranthum</i>  |
| Lateral sepals widely diverging .. .. .      | 3. <i>B. patens</i>      |

1. ***Bulbophyllum megalanthum*** Griff., Notul. 3: 286. Ic. PL As. t. 292. 1851. Ridl., Flora 4: 57.

Rhizome 4 mm. thick, the sheaths short, producing slender bristles when old; pseudobulbs 6-10 cm. apart, under 1 cm. tall; leaf to about 15 by 3 cm., oblong, apex blunt, bilobed, base narrowed to a stalk to 2 cm.



long; scape about 1 cm. long, with several small sheaths; pedicel and ovary about 3 cm.; flower 3-5 cm. long, the sepals and petals not spreading, the petals almost equal in length to the sepals but narrower; upper sepal 8 mm. wide at the base; mentum 9 mm. long, broad; lip equal to  $\frac{1}{2}$  of the length of the petals, very narrow except for the base which has well developed side-lobes; sepals and petals pale flesh-colour, or the sepals greenish, the petals with small purple spots closely all over, the sepals with dull orange spots, the narrow part of the lip deep purple-crimson, the basal part coloured as the petals but with smaller spots. Found on islands and sea coast at a few localities on both east and west of Malaya: Cape Rachado, Pulau Besar (Malacca) Pulau Kapas (Trengganu).

2. **Bulbophyllum macranthum** Lindl., Bot. Reg. 30: t. 13. 1844. Ridl., Ann. Bot. 4: 328, t. 22. Flora 4: 57. Bot. Mag. t. 7208. J.J.S., Bull. Btzg., Ser. 2, IX: 91. 1913.

Rhizome stout, the sheaths producing conspicuous overlapping groups of fibres 2 cm. or more long; pseudobulbs about 10 cm. apart, 3 cm. long; leaves to 30 by 7 cm., usually widest near the blunt bilobed apex, the base narrowed to a stalk 3 cm. long; pedicel to 4-5 cm.; flowers wide-opening; upper sepal 2-5 by 10 cm.; lateral sepals of the same size, fleshy, their adjacent edges close together except for a gap at the base through which the lip can swing; petals spreading; upper sepal and petals whitish with dense purple spots; lateral sepals ochre yellow spotted with purple towards the base on the outer halves only (i.e. the halves away from the lip); lip about 7 mm. long, with short divergent side-lobes at the base. Distributed in Java, Sumatra and Borneo; in Malaya a lowland species found in many parts of the country.

The pollination of this species is very interesting, and has been described by Ridley and Carr. An insect alighting on the upper sepals and searching for food slips on the smooth surface and so lands on the lip, which tips it neatly on to the column, tail first; in pulling itself out, by holding on to the side-lobes of the lip, the hinder part of the insect's body is brought into contact with the rostellum, and it removes the pollinia, which it will deposit on to the stigma when it repeats the process with another flower. Sometimes flies are found stuck fast on to the stigma, evidently not strong enough to pull themselves away.

3. **Bulbophyllum patens** King ex Hk. f., F.B.I. 6: 187. 1890. Ic. PI. t. 2054. Ridl., Flora 4: 57.

Rhizome about 5 mm. thick, fibres of the sheaths conspicuous; pseudobulbs up to about 8 cm. apart, often much closer, 0.6 to 2.5 cm. long; leaf to about 14 by 4.5 cm.; pedicel and ovary about 4 cm. long; flowers widely opening, pale yellowish, densely purple-spotted throughout; upper sepal 2-2 by 0.6 cm.; lateral sepals wider, the mentum 5 mm. long; lip fleshy, 10 mm. long, very finely spotted with purple, without distinct side-lobes. Distributed in Sumatra; in Malaya found in the lowlands, in many parts of the country. **Fig.** 122, f-h.

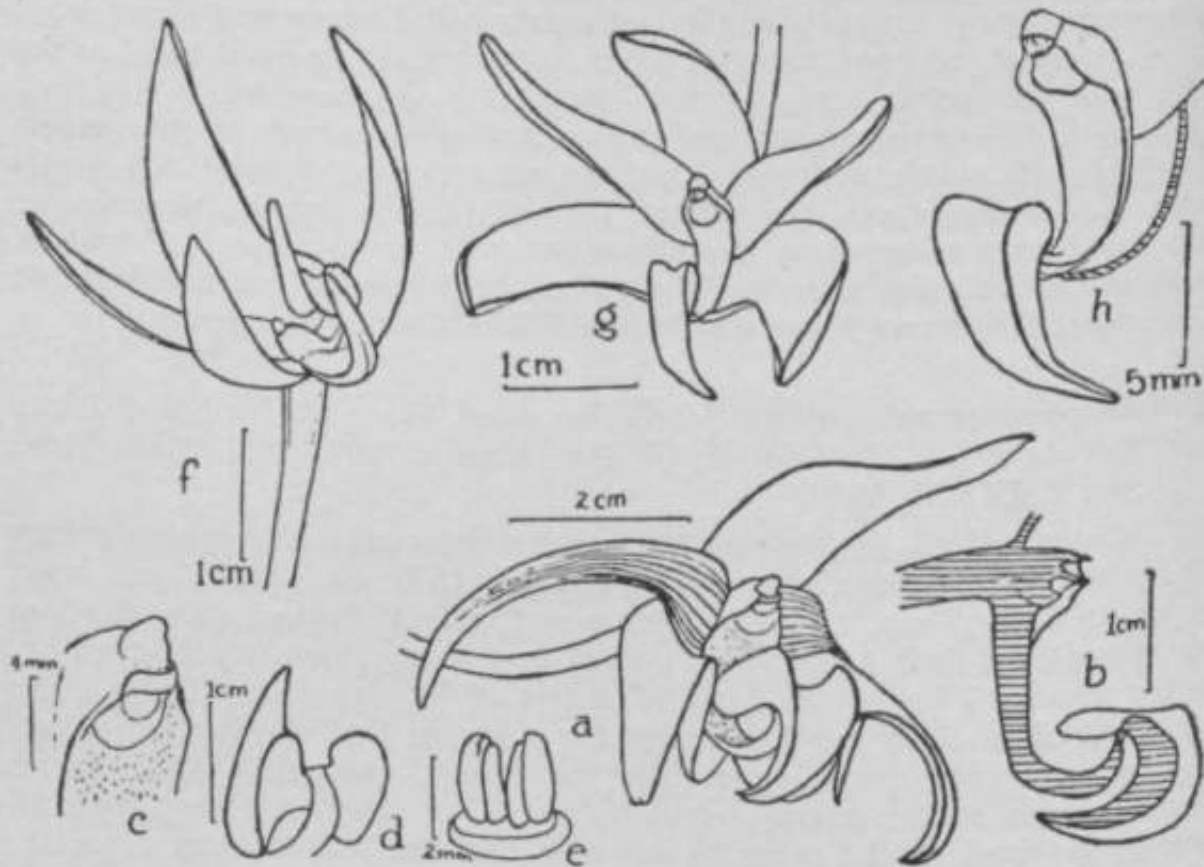


Fig. 122. *Bulbophyllum Lobbii*. a, flower. b, section through column, column-foot and lip. c, column, rf, lip tipped towards column, d, pollinia. *Bulbophyllum patens*. f, flower in natural position, g, flower turned upside down, with lip underneath, h, column and lip.

#### Section 4 (§ Sestochilus)

This group consists of the greater part of the section Sestochilus as recognized by Dr. J. J. Smith. The species omitted are those with many flowers disposed in an elongated inflorescence.

The Section as thus limited contains all the large single-flowered species of *Bulbophyllum*, and also those with flowers of similar character which have a few flowers borne together at about the same level. It would be convenient to limit the group to those with single flowers only; but one species, *B. uniflorum*, may have either one or two flowers; and *B. subumbellatum*, which is nearly related, has two or three, so that we are bound to admit species of more than one flower. The distinction between this and Section 12, which contains the species with elongated inflorescences, is not at all sharp, but sufficiently distinct for practical purposes.

The species of the section are nearly all large vegetatively, and some very large, both in pseudobulbs and leaves. The finest species have very attractive flowers of good size; unfortunately these are all mountain plants and not easy to grow and flower in the lowlands. Some species have foul-smelling flowers.

Key to the Malayan species of the section *Sestochilus*

- Flowers solitary
- Pseudobulbs not more than 2 cm. apart; leaf thin, shortly pointed
- Upper sepal nearly 4 cm. long, white with yellow veins .. .. . 1. *B. reticosum*
- Upper sepal not over 3 cm. long, yellowish or greenish, with or without purple spots or veins
- Sepals and petals with purple stripes or spots
- Mentum at 135° to the ovary; lateral sepals with lower edges in contact; lip warty at tip .. .. . 2. *B. membranifolium*
- Mentum at 90° to the ovary; lateral sepals not so; lip not warty at tip 3. *B. pustulatum*
- Sepals and petals without stripes or spots 4. *B. rugosum*
- Pseudobulbs more than 2 cm. apart
- Leaf to about 10 by 2 cm. .. .. . 5. *B. mic7\*oglossurn*
- Leaf much larger
- Leaf narrow, to about 21 by 2-8 cm., lip large, very warty .. .. . 6. *B. Evansii*
- Leaf proportionately wider, lip not very warty
- Petals 6 cm. long, longer than sepals .. 7. *B. longiflorum*
- Petals shorter, not longer than sepals
- Pseudobulbs to 10 cm. long and 1 cm. thick .. .. . 8. *B. uniflorum*
- Pseudobulbs shorter and proportionately thicker
- Upper sepal about 2.0 by 0.7 cm., dull yellow, without spots or streaks of another colour .. 9. *B. pileatum*
- Upper sepal much larger, spotted or streaked either on back or front
- Pseudobulbs distant, to 7 cm. long; flowers spotted, not streaked .. .. . 10. *B. polystictum*
- Pseudobulbs 3-8 cm. apart, to 5 cm. long, flowers yellowish with purple veins on petals 11. *B. Lobbii*
- Inflorescence of more than one flower
- Scape 1.5 cm. long .. .. . 12. *B. cuspidipetalum*
- Scape much longer
- Sepals 10-12 cm. long .. 13. *B. maximum*

Sepals much shorter

Pseudobulbs 3.5 cm. long; petals 8 mm.,  
tailed . . . . . 14. fl. *subumbellatum*  
Pseudobulbs 10 cm. long; petals longer . . . . . 8. *B. uniflorum* var.  
*pluriflorum*

**1. *Bulbophyllum reticosum*** Ridl., J.L.S. 31: 273. 1896.

Pseudobulbs close together, about 1.7 cm. long, narrowly ovoid; leaf about 12.5 by 3 cm., elliptical, apex acute, base with stalk 1.7 cm. long; peduncle very short, pedicel with ovary 6.5 cm.; upper sepal to 4 by 1.2 cm., arching over the column, white with yellow veins and some purple cross-markings; mentum at more than a right angle to the ovary; lateral sepals spreading, their lower edges strongly curved with the tips pointing downwards, white with two irregular broad purple stripes in the lower half; petals to 2.8 by 0.5 cm., spreading, coloured as the upper sepal; lip short and broad, narrowed evenly to the tip, the sides strongly raised at the base, which has a pair of narrow appendages 5 mm. long pointing back towards the column, dark purple-red; column and foot with purple edges and a median purple streak. Originally found in Borneo; in Malaya known only from G. Belumut and G. Pulai in Johore. The appendages at the base of the lip are unusual; they play a part in balancing it on its hinge.

**2<sub>m</sub> *Bulbophyllum membranifolium*** Hk. f., F.B.I. 5: 706. 1890. Ic. Pl. t. 2034.

Ridl., Flora 4: 60. J.J.S., Blumea 5: 744. 1945.

Rhizome slender; pseudobulbs 1.2 cm. apart, narrowly ovoid, to 2.8 cm long and about 1 cm. wide at the base; leaf thin, to 20 by 4.5 cm., widest in the upper half, basal 2.3 cm. a stalk; peduncle and pedicel together about 5 cm. long; flower widely opened; upper sepal 2.0 by 0.9 to 2.9 by 1.3 cm.; mentum at about 135° to the ovary, the lower edges of the lateral sepals continuing in the same direction, their tips only diverging, the upper edges of these sepals widely separating; petals 1.7 by 0.7 to 2.3 by 0.8 cm., shortly pointed; lip strongly curved, 5.7 mm wide at the base which has a central groove, the apex turned under, minutely warty; column with forward-pointing narrow arms 2.5 mm. long; flowers pale yellow to pale olive-green or pale orange, with streaks or spots of purple on the outside or inside of the sepals and petals, the lip pale yellow or deep crimson. Distributed in Sumatra; in Malaya found at about 4,000 feet at Cameron Highlands and Fraser's Hill, and southwards to G. Panti in Johore. The colour of the flowers seems very variable, and also the size, but the shape is very constant. Possibly several distinct colour-varieties exist. *B. pvistulatum* is very nearly related, but the shape of the flower is different. More observations on these species are needed to establish their relationship.

**3. *Bulbophyllum pustulatum*** Ridl., J.S.B.R.A.S. 39: 74. 1903. Flora 4: 60.

Rhizome about 4 mm. diameter; pseudobulbs to 2 cm. apart, 2 cm. long and 1 cm. wide at the base, somewhat flattened; leaf to about 14 by 4 CLX, shaped as in *B. membranifolium*; flowers opening at early dawn and closing again (on several days) 3½ hours later; upper sepal 1.9 by 0.8 to 2.2 by 1.0 cm.; petals to 1.8 by 0.85 cm.; mentum 8 mm. long, at a right

angle to the ovary, the lower edges of the lateral sepals at an angle to the mentum, not continuing in the same line, the upper edges widely diverging when fully expanded; lip strongly curved, base 6 mm. wide, narrowed to the apex which is not warty, papillose beneath; sepals and petals yellow or pale orange veined with purple, the lateral sepals most deeply (towards their tips) ; lip deep crimson-purple. Found at various localities in Johore, from Mount Ophir southwards, at low altitudes. This species is nearly related to *B. membranifolium*, and may perhaps also have colour variation.

4. ***Bulbophyllum rugosum*** Ridl., J.L.S. 32: 266. 1896. Flora 4: 60.

Pseudobulbs about 2 cm. apart, to 4 cm. tall and 1 cm. diameter; leaves to about 15 by 3.5 cm., shaped as in *B. membranifolium*; flower opening very slightly; upper sepal 2.1 by 0.6 cm., the veins on the upper surface raised; petals almost the same size as the upper sepal, narrowed gradually to the tip; lip shaped as in *B. membranifolium*, with warty tip; column-arms shorter than in *B. membranifolium*; colour of flowers pale dull yellow, the lip purple-pink. Only found in Singapore. This species is nearly related to the last two, but seems to be quite distinct in the narrower sepals, the petals being equally wide, and in the colouring. Further information about it is needed.

5. ***Bulbophyllum microglossum*** Ridl., J.L.S. 38: 325. 1908. Flora 4: 60.

Rhizome 3 mm. thick; pseudobulbs 6 cm. or more apart, nearly 2 cm. long and 1.3 cm. wide, ovoid; leaf stiff, elliptic, blunt, to about 10 by 2 cm., hardly stalked; peduncle and pedicel together about 4.5 cm. long; flowers wide-opening; upper sepal ovate acute, 1.5 by 0.9 cm., pale yellow-green with purple tessellation; mentum 8 mm. long, broad; lateral sepals spreading, colour as upper sepal; petals 9 by 3 mm., veined with purple; lip strongly curved, 5 mm. wide at the base, effective length 6 mm., narrowed to the tip, purple-pink; column yellowish, the arms hardly developed. Found on G. Tahan and at Cameron Highlands; vegetatively the smallest species of this section.

6. ***Bulbophyllum Evansii*** Hend., J.F.M.S. Mus. 13: 224. 1927.

Rhizome 3 mm. diameter, covered with short thin sheaths; pseudobulbs 5-6 cm. apart, 2-3 cm. long, 1 cm. wide at the base, smooth; leaf to 21 by 2.8 cm., evenly elliptical, acute, base narrowed to a stalk 2 cm. long; peduncle and pedicel together 7-10 cm. long; sepals and petals dull deep purplish-red, dull yellow at tips; upper sepal to 3 by 1.4 cm., acute; lateral sepals rather shorter and wider, concave; petals 2.6 by 1.1 cm.; lip very fleshy, strongly curved, effective length 1.8 cm., apex shortly pointed, the upper surface with irregular warty folds of cream colour, with purple ii? the grooves between the folds. Only known at about 6,000 feet elevation on G. Brinchang and G. Benom.

7. ***Bulbophyllum longiflorum*** Ridl., J.L.S. 32: 368. 1896. Flora 4: 59, f. 164.

Rhizome 3 mm. diameter; pseudobulbs 4-5 cm. apart, to 4 cm. long and 1 cm. thick at the base, narrowed slightly upwards; leaf to 21 by 6 cm., widest above the middle, apex shortly acute, base narrowed to a stalk 2 cm. long; peduncle and pedicel together 7 cm. long; flower large, pink with darker veins, the sepals and petals widely spreading but the lateral

sepals with their adjacent edges close together; upper sepal to 5.3 by 0.9 cm., gradually narrowed to the tip; lateral sepals somewhat wider; petals to 6.3 by 0.6 cm.; lip 1 cm. long, 6 mm. broad at the base, narrowed to the apex, papillose and warty on the upper surface, pale orange. A fine species, only found on Kedah Peak and Penang Hill.

8. **Bulbophyllum uniflorum** (Bl.) Hassk., Cat. Bog. 39. 1844. J.J.S., Fl. Buit. 6: 443, f. 556.—*Ehippiurw uniflorum* Bl., Bijdr. 309. 1825.—*B. galbinum* Ridl., J.L.S. 32: 267. 1896. Flora 4: 58. Bot. Mag. t. 8216. Var. **rubrum** Carr, Gard. Bull. 7: 29. 1932. Var. **pluriflorum** Carr, Gard. Bull. 7: 30. 1932. Var. *variable* (Ridl.) Carr, Gard. Bull. 7: 29. 1932 (err. *variebile*).—*B. variabile* Ridl., J.S.B.R.A.S. 39: 74. 1903. Flora 4: 59.

Rhizome 5 mm. thick, with short close sheaths; pseudobulbs 7-10 cm. or more apart, to 10 cm. long and about 1 cm. thick, somewhat flattened; leaf to 27 by 9 cm., broadly elliptic, the tip shortly pointed, the base narrowed to a stalk 4 cm. long; peduncle to 12 cm. long with several conspicuous sheaths; flowers 1 or 2, their pedicels 1.5-3 cm., wide-opening, large; upper sepal to 4.5 by 1.5 cm., long-pointed; lateral sepals rather suddenly narrowed above a broad base, their long-pointed ends diverging; petals to 2.5 by 0.9 cm., suddenly narrowed to a fine tip; lip strongly curved, narrowed to an acute tip, 1-1.3 cm. wide at the base, effective length 1.21 cm., sepals and petals pale olive-yellow, lip red with yellow at base <sup>an(\* ^P'</sup> Widely distributed in Java and Sumatra; in Malaya common on the Main Range and Taiping Hills at 3,000-5,000 feet, and variable in colour. It may be that more colour varieties exist than those noted below. Fig. 121 A.

Var. *variabile*. Sepals and petals yellow with lines of red spots, the lip yellow, spotted red. Taiping Hills.

Var. *rubrum*. Sepals and petals reddish, spotted with dark red at base, lip deep crimson. Taiping Hills, growing with var. *variable*.

Var. *pluriflorum*. Up to 5 flowers on one peduncle; flowers somewhat smaller; sepals yellowish tinged with red-pink, petals spotted deep purple; lip red-orange with darker spots; foetid odour. Found at Cameron Highlands.

9. **Bulbophyllum pileatum** Lindl., Bot. Reg. 30: Misc. 73. 1844. Ridl., Flora 4: 57.

Rhizome slender, 3 mm. diameter; pseudobulbs 4-8 cm. apart, slender, 1.5-2.5 cm. long; leaf to 15 by 50 cm., widest near the blunt apex, narrowed gradually at the base to a stalk 1.5 cm. long; flower solitary on a stalk (peduncle + pedicel) 6 cm. long, wide-opening, dull yellow with a broad purple line on either side of the base of the lip; upper sepal 2 by 0.7 cm., shortly pointed; lateral sepals as long, their bases spreading, their ends curving downwards towards each other; petals 1.6 by 0.5 cm., shortly pointed; lip 1.4 cm. long, 6 mm. wide near the base, tip blunt, a narrow central groove at the base; column nearly 5 mm. long, slender, without arms. A lowland species, found in Sumatra and in Malaya at many places from Penang to Singapore. A flowering specimen from Penang has leaves only 8 by 1.8 cm.

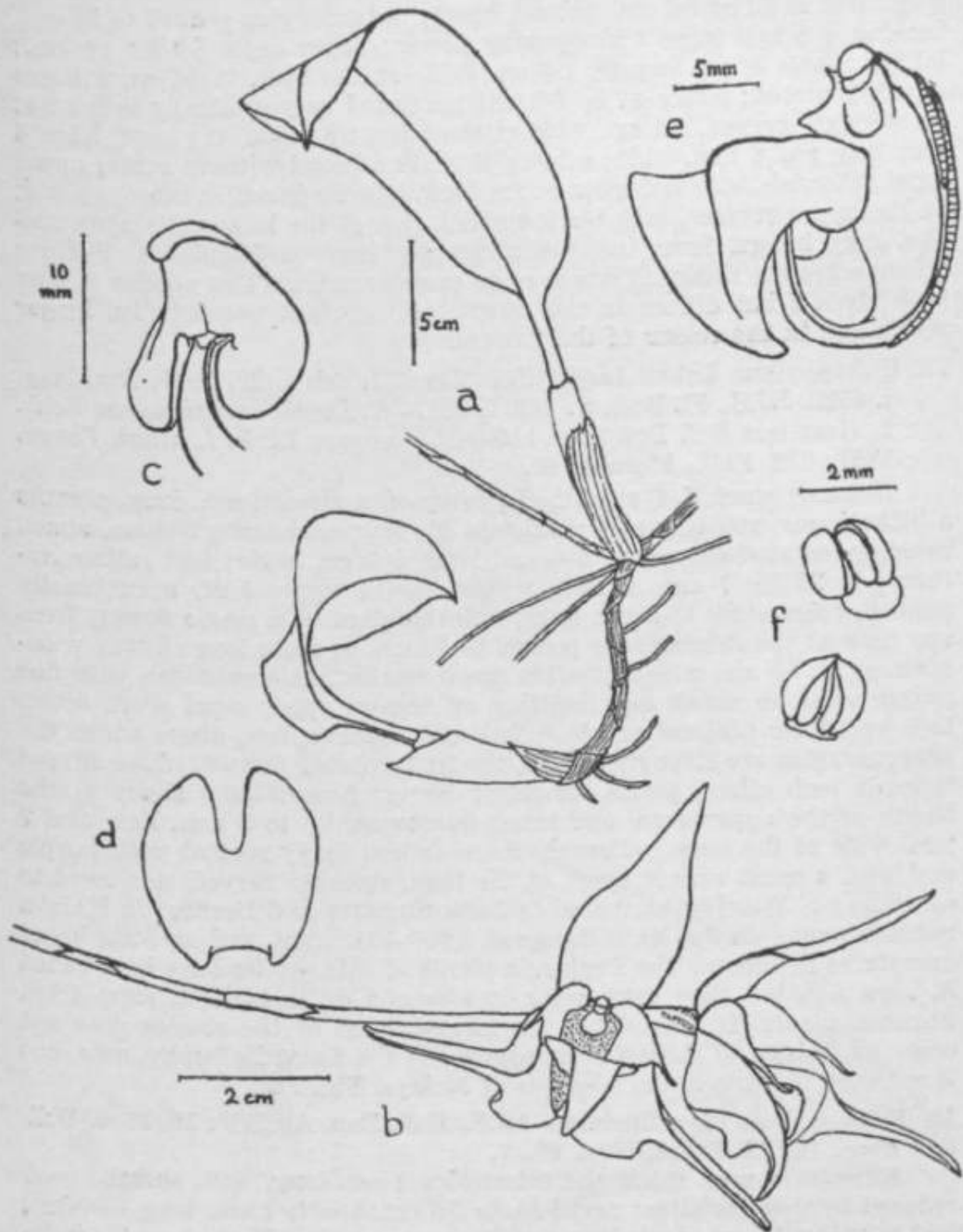


Fig. 121A. *Buibophyllum uniflorum*. *a*, part of plant showing scape from base of old pseudobulb. *b*, inflorescence, *c*, lip from below, showing hinge, *d*, lip from above, *e*, column and lip. *f*, pollinia from front and back.

**10. *Bulbophyllum polystictum*** Ridl., J.F.M.S. Mus. 4: 65. 1909. Flora 4: 59.

Rhizome stout; pseudobulbs distant, to 7 cm. long and under 2 cm. wide; leaf to 32 by 6.5 cm., oblong, blunt; peduncle plus pedicel to 16 cm., bearing a single large wide-opening flower; upper sepal 5.0 by 1.6 cm.; lateral sepals 4 cm. long by 2-3 cm. wide at the base, their lower edges strongly curved; petals 4.7 by 0.9 cm., narrowed very gradually to the tip; lip strongly curved, 1.3 cm. wide at the base, tip acute, the basal lobes 4 mm. long and 6 mm. wide; column short and broad without arms; upper sepal yellowish, with red spots on the back, laterals greenish below, reddish on the upper surface, both black-spotted. One of the largest Malayan species, only known from two collections at Cameron Highlands. Further colour notes are needed; there may be some variation. This species is near to *B. Lobbii* but differs in the larger more distant pseudobulbs, longer petals and in the colour of the flowers.

**11. *Bulbophyllum Lobbii*** Lindl., Bot. Reg. 33: sub t. 29. 1847. Bot. Mag. t. 4532. J.J.S., Fl. Buit. 6: 446, f. 338.—*B. Lobbii* var. *Siamese* Rchb. f., Saunders Ref. Bot. 2: t. 116.—*B. siamense* Rchb. f., Gard. Chron. 1867: 572. Ridl., Flora 4: 60.

Rhizome stout, 5-6 mm. thick; internodes about 1 cm. long, sheaths a little longer, splitting into persistent fibres; pseudobulbs 3-8 cm. apart, ovoid, smooth when young, 3-5 cm. long, 2-3 cm. wide; leaf rather leathery, to 25 by 7 cm., usually widest in the upper half, apex bluntly pointed, basal stalk to 3 cm. long; inflorescences of a single flower, from any node of the rhizome, the pedicel to 10 cm. or more long; flower wide-opening, to 7.5 cm. wide but often much smaller, pale yellowish with fine purple veins on petals and mottling on sepals; upper sepal erect, acute, to 5 by 1.2 cm.; lateral sepals with broad concave base, above which the lower margins are strongly curved, the tips pointing downwards or <sup>curved</sup> towards each other; petals spreading almost horizontally, about  $\frac{1}{2}$  the length of the upper sepal and much narrower; lip to 9 mm. long and 7 mm. wide at the base, yellowish, more or less finely spotted with purple and with a small orange mark at the base, strongly curved, narrowed to an acute tip. Widely distributed in Java, Sumatra and Borneo; in Malaya not uncommon on the Main Range at 4,000-5,000 feet, and on some <sup>low</sup> mountains in Johore. The Peninsula plants of this species have been called *B. siamense*, but they vary much in size and differ little in form from Bornean plants. It seems that the largest form of the species does not occur in Malaya. *B. Lobbii* certainly one of the finest *Bulbophyllums*, but is not easy to grow in the lowlands of Malaya. **Fig. 122.**

**12. *Bulbophyllum cuspidipetalum*** J.J.S., Bull. Dep. Ag. XV: 16. 1908. Bull. Btzg., Ser. 3, Suppl. II: t. 95, V.

Rhizome 4 mm. thick, the internodes 1 cm. long, with sheaths soon reduced to short bristles; pseudobulbs 15 cm. apart, 4 cm. long, slender; leaf to 21 by 4.5 cm., including a stalk 3 cm., evenly elliptical acute; inflorescence short, the scape 1.5 cm., bearing flowers in a close group of about 12; pedicel and ovary 1 cm., slender; flowers opening widely, foul-smelling; pale yellow-green with deep purple markings; upper sepal 1.2 by 0.7 cm.,



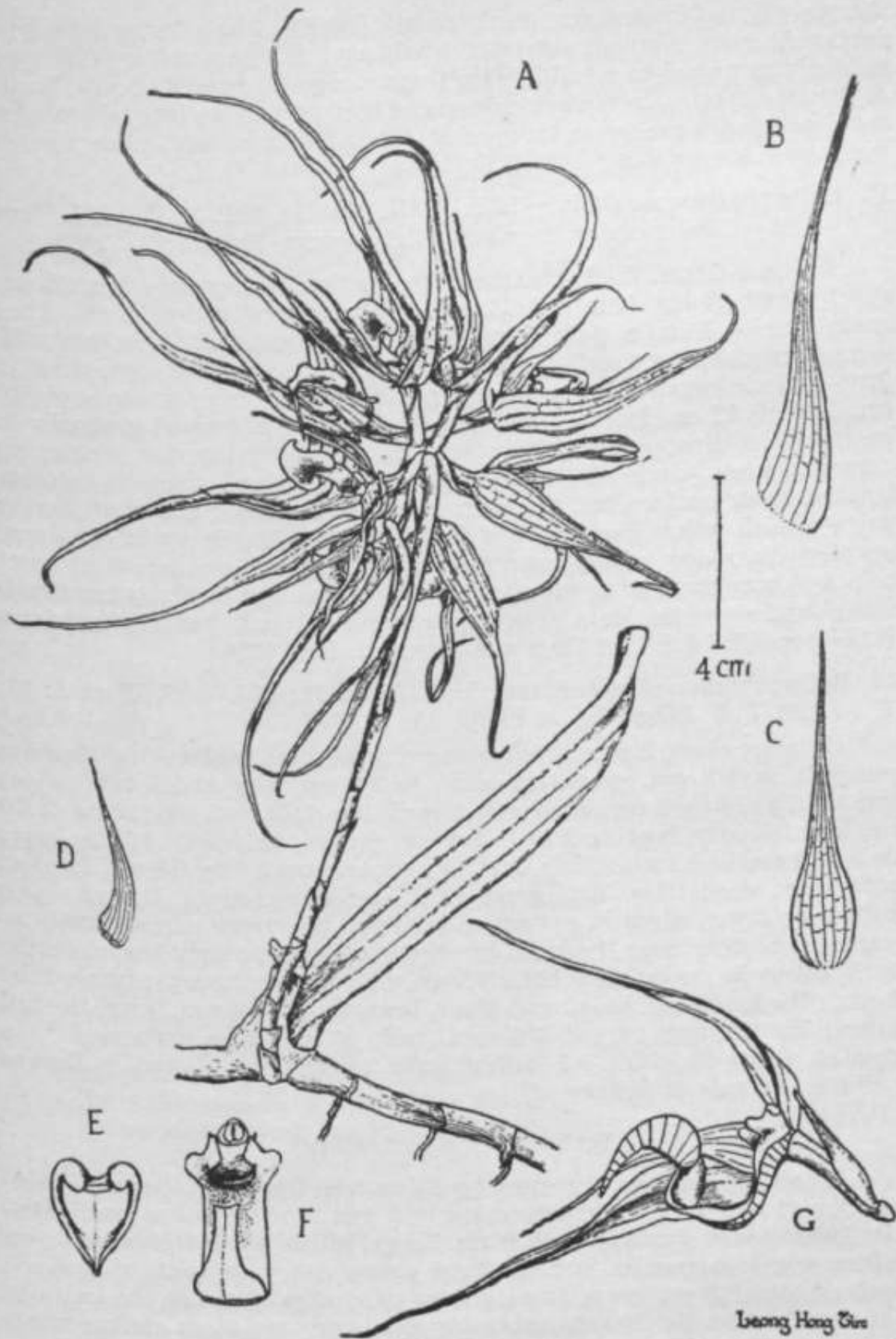


Fig. 122A.

Leong Hong Tin  
 b and rhizome. b, lateral  
 f, column and foot. g,  
 flower; lateral sepal, petal and half lip removed, e, f, g enlarged.  
 After C. E. Carr.

sharply pointed, apical part dark purple; lateral sepals larger, the tips decurved, colour similar; petals 10 by 0.4 cm., the base oblong, the apex suddenly narrowed to a tail-like tip 3 mm. long; lip curved, fleshy, blunt. A Bornean species, in Malaya only once found on G. Pantii in Johore. The tail-tailed petals are similar to those of *B. subumbellatum*, but longer, though the flowers are smaller.

13. ***Bulbophyllum maximum*** (Ridl.) Ridl., Mat. Fl. M.P. 1: 79. 1907. Flora 4: *Sl.—Cirrhyetalum, maximum* Ridl., Journ. Bot 38: 70. 1900.

Rhizome 6 mm. thick, sheaths close, overlapping; pseudobulbs 20 cm. apart, about 14 cm. long and 1-2 cm. thick; leaf to 30 by 12 cm., acute, basal 4-5 cm. a stalk; scape to 28 cm. long, slender, the base several overlapping sheaths; flowers about 6, in a whorl, spreading to form a circle nearly 30 cm. across; pedicels 3 cm. long; upper sepal 12 cm., laterals 12 cm. long, 1-5 cm. wide at the base, narrowed gradually to long tail-like tips; petals 5-2 by 1-2 cm., narrowed like the upper sepal to a curved in a semi-circle, the base 1-3 cm. wide, narrowed evenly to an acute tip, the upper surface flat, the sides raised at the base; colour of the lip pale greenish yellow, the centre of the lip purple, its edges white; the lip purple with yellow edges, bearing broad arms with slender slender snout-like points. A very striking species, found in Sumatra, and in Malaya at high rate elevations on the Main Range, near streams. Possibly not distinct from *B. Binnendijkii* J.J.S. of Java and Sumatra. **Fig. 122A.**

14. ***Bulbophyllum subumbellatum*** Ridl., J.L.S. 31: 274. 1896. Flora 4: 61. J.J.S., Bull. Botz., Ser. 3, Suppl. 11: t. 96, I.

Rhizome about 2 mm. thick, covered with close overlapping sheaths; pseudobulbs 4-7 cm. apart, cylindrical, to 3-5 cm. long and 5 mm. wide; leaf thin, to 15 by 4 cm., distinctly tipped, the stalk to 2 cm.; scape 10 cm. long, slender, bearing 2 or 3 flowers; pedicel and ovary 1-5 cm. high, flowers 2 cm. high, not widely opening; upper sepal 1-7 by 0-7 cm., with short slender tip, olive green with lines of red spots; lateral sepals with their lower edges in contact throughout, the upper edges curved towards each other near the base, the tips receding, strongly keeled on the back, colour as upper sepal but suffused with red at the tips; petals 6 mm., the basal half broad and blunt, bearing a tail 4 mm. long, the tip green; lip strongly curved, 3-5 mm. wide at the base, narrowed to a pointed warty tip, dark red with a paler median line. Found in Borneo and the lowlands of Johore.

#### Section 5 (§ *Epicrianthes*)

Rhizome pendulous, the growing end curved forwards, the small pseudobulbs (1 to 1.5 cm. long) appressed to it and bearing rather small elliptic fleshy leaves (usually 3 to 5 cm. long) which project alternately on either side in a regular manner, thus giving the impression of a single leafy shoot—inflorescences from groups of chaffy bracts at the bases of the pseudobulbs almost equidistantly; petals with a broad base, the blade cleft into two diverging markings;

lobes almost to the base, each lobe bearing several <sup>M ^ .</sup> appendages, usually dark gray in colour, on delicate stalks, or more rarely the appen- dages stiffly stalked or more or less joined together, one •W endage often arising from the sinus (gap) between the two lobes; hp.o f elaborate construction, narrow and almost straight, fleshy red ^ « ^ f \* \* Z at least covered with small round glistening vesicles, which secrete small drops of nectar.

This is a small group of species which are very much alike both in their vegetative form and in their very peculiar flowers. They are nearly all lowland epiphytes, only one of the seven at present known, being a mountain plant. Most have been found on very few occasions. T , , T t £ observations on them are needed. Their floral structure is adapted to the visits of small flies, which are brought into contact with the anther by the movement of the lip, as in many other *Bulbophylla*.

Each flower lasts a day, and flowering is fairly frequent. The appen- dages to the petals are in most cases very mobile, moving with the slight air movement. Presumably they help to attract pollinating insects. Prob- ably no other orchids have such an elaborate petal-form. It is int e r e s s i n g that *Bulbophyllum mirum* of Sumatra (and Java), a member of the *Cirrhopetalum* group has petals with similar appendages. The West African *B. barbigerum* has very numerous delicately-stalked appendages on the upper lip, these also are very sensitive to air-movement.

Key to the Malayan species of the Section *Epicriantes*

6 sepals 1 cm. long

Lip blunt; an appendage in the sinus of each

petal .. .. . I. *B. papillosofilum*

Lip acute; no appendage in the sinus •• 2. *B. mobilifilum*

Sepals 5-5-7-5 mm. long

Lobes of petals hardly diverging, the appen- dages all close together and more or less joined .. •• 3. *B. cheiropetalum*

Lobes of petals diverging, the appendages separate to their bases

Appendages rigid .. .. . 4. *B. Commersonii*

Appendages mobile

No appendage in sinus of petals •• 5. *B. Haniffii*

An appendage in the sinus of each petal  
One lobe of each petal with 5, the other with 2 appendages .. •• 6. *B. eptcristanthus*

Both lobes with 3 or 4 appendages .. 7. *B. abbrevilabium*

1. *Bulbophyllum papillosofilum* Carr, Gard. Bull. 5: 9, pi. 5, A. 1929.

Sepals yellowish, suffused with dark red at the base inside, 10 by 0.45 cm.; petals white at the base, the lobes pink, each with 4 appendages and one in the sinus; appendages unequal, to 5 mm. long, densely <sup>dense</sup> <sup>lv</sup> <sup>r</sup> <sup>p</sup> <sup>ap</sup> <sup>u</sup> <sup>n</sup> close; lip 6 mm. long, obtuse, curved, short-hairy almost throughout. Found at Kuala Teku in Pahang and Batu Kurau in Perak.

2. **BulbophyUum mobilifilum** Carr, Gard. Bull. 5: 7, pi. 4, C. 1929.

Sepals dull yellow-green outside, inside shining, suffused with dark red, 10 by 0.4 cm.; petals white at base, the lobes pink, one lobe with 3 appendages, the other with 3 or 4, none in the sinus; appendages 5 mm. long, gray-papillose; lip 8 by 2 mm., acute, the greater part covered with dark red hairs. Only found at Kuala Lipis (on a fruit tree in the town) and at Krambil in Pahang.

3. **BulbophyUum cheiropetalum** Ridl., Kew Bull. 1926: 477.

Sepals about 6 mm. long, olive-green densely spotted with red-brown; petals at the base olive-green with a few red spots, not deeply lobed to the base, the appendages of unequal size and partly joined together, rather like the fingers of a hand, greenish yellow at the base, yellow at the tip; lip as long as the petals, blunt, yellow, shiny, the sides spotted dark red. Found on Kedah Peak and at Fraser's Hill at 3,000-4,000 feet elevation.

4. **BulbophyUum Corneri** Carr, Gard. Bull. 7: 16. 1932.

Sepals pale yellowish or yellow-green, spotted and suffused with pink inside except at the edges, 5.5 by 3 mm.; petals lobed almost to the base with a broad sinus, bright pink, the lobes diverging, each with 3 stalked appendages and one in the sinus; appendages rigid, gray, to 2-5 mm. long, their stalks **very** short, white; lip nearly 4 mm. long, dark red, ovoid, acute, entirely very-short-hairy except the basal third. Found once only, on old mangrove at Chua Chu Kang, Singapore.

5. **BulbophyUum Haniffii** Carr, Gard. Bull. 7: 20. 1932.

Sepals 6.5 by nearly 3 mm.; petals lobed almost to the base, the lobes diverging, one with 3, the other with 4 appendages, no appendage in the sinus; appendages to 3 mm. long; lip nearly 4 mm. long, ovoid, acute. Found at Pulau Tikus, Penang. **Fig. 123.**

6. **BulbophyUum epicrianthes** Hk. f., F.B.I. 5: 753. 1890. Ridl., Flora 4: 64. Carr, J.M.B.R.A.S. 6: 56, pi. 10. 1928. (*Not* *Epicrianthes javanica* Bl.).

Sepals about 6-7.5 mm. long, yellow or yellow-green, flushed with dark red at the base; petals white at the base, the diverging lobes pink, one with 5, the other with 2 appendages, and one long-stalked appendage in the sinus; appendages pale gray; lip acute bright green with red markings, more than 3 mm. long, the vesicles red and green. Found at Tembeling in Pahang, Mawai in Johore, and in Perak; the earliest known and perhaps the commonest species.

7. **BulbophyUum abbrevUabium** Carr, Gard. Bull. 7: 18. 1932.

Sepals yellowish, densely suffused with dark red, about 5.5 by 3.5 mm. ; petals pink at the base, the divergent lobes white, each with 3 or 4 appendages and one in the sinus; appendages 2-5 mm. long, gray, their stalks very slender, 0.5 to 1 mm. long; lip dark red, under 3 mm. long, blunt. Found on trees overhanging the Sat River in Pahang.

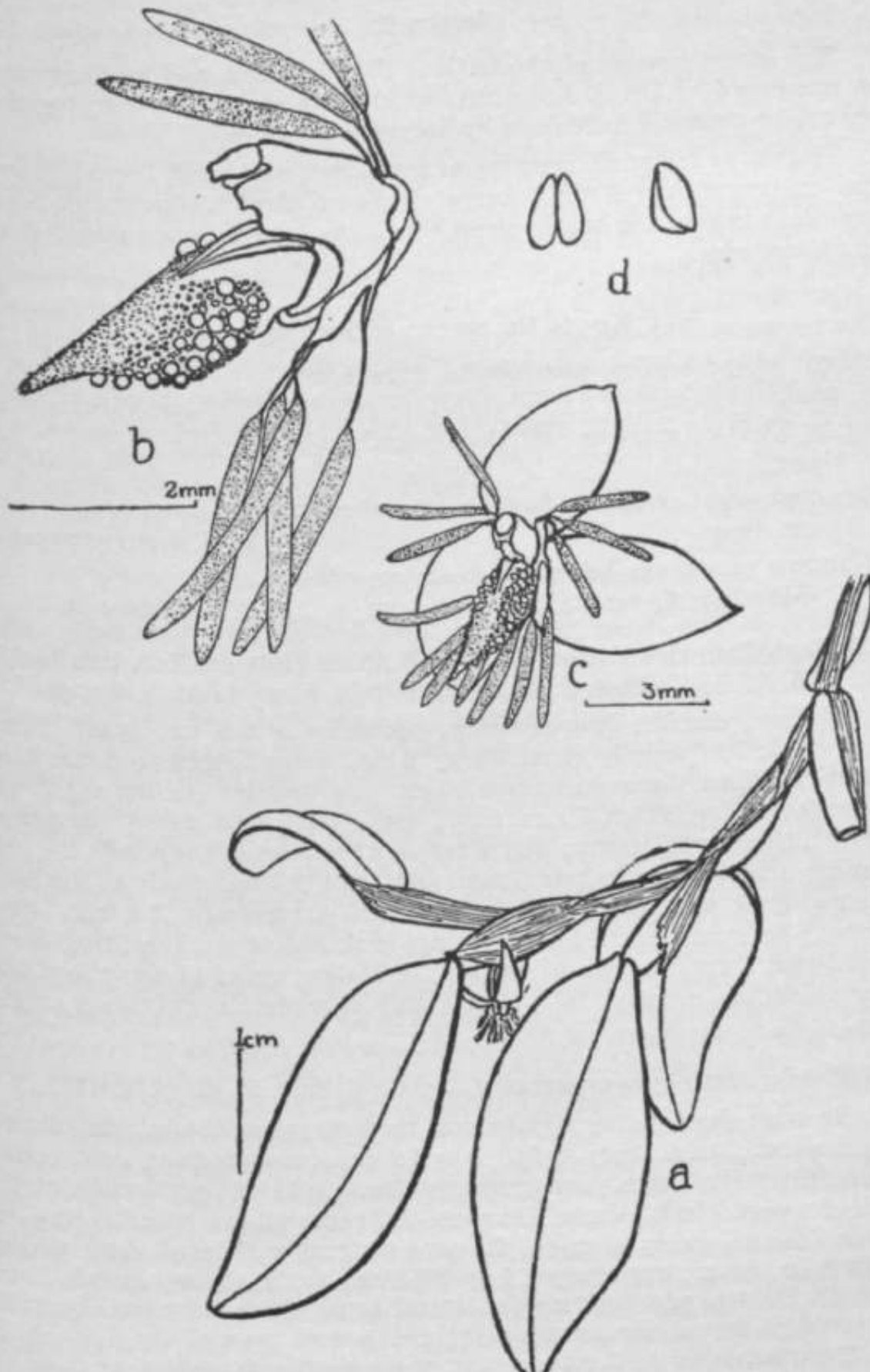


Fig. 123. *Bulbophyllum Hanffli*. a, part of plant in flower, b, column, lip, and one petal, c, flower in face view- d, pollinia from front and from side.

## Section 6

This group consists of the sections Polyblepharon and Scyphosepalon (as recognized by Dr. J. J. Smith), which have similar flowers; together they are represented in Malaya by only three species.

The plants are small, creeping or pendulous, with small flowers (upper sepal not more than 6 mm.) borne singly on short stalks, mainly deep purplish in colour, the sepals about equal, the lateral sepals joined along their lower edges.

## Key to the species of Section 6

- Rhizome long-creeping, pseudobulbs 2 to 5 cm.  
 apart . . . . . 1. *B. membranaceum*
- Rhizome short-creeping or pendulous, pseudobulbs  
 closer
- Rhizome short-creeping, flower-stalks about 2  
 cm. long . . . . . 2. *B. nigropurpureum*
- Rhizome pendulous, leaves alternate on either  
 side of it; flower-stalks 3 mm. long . . . . . 3. *B. tortuosum*

1. **Bulbophyllum membranaceum** T. et B., Nat. Tijdschr. Ned. Ind. 3: 397, 1855. J.J.S., Fl. Buit. 6: 465, f. 356. Ridl., Flora 4: 64.

Rhizome slender, long-creeping; pseudobulbs 2-5 cm. apart, 1 cm. long, ovoid; leaf usually about 3-5 by 2 cm., exceptionally to 6 cm. long, widest near base, tip acute; scape 5 mm. long, bearing one flower; flower not wide-opening, about 6 mm. long; upper sepal pale yellow (deeper at the tip), 5 by 2 mm., acute; lateral sepals with lower edges joined, the pair forming a boat-shaped whole 6 mm. long, each 2-5 mm. wide at the base, shining, dark wine-red; petals very small, translucent, 1-5 mm. long, pointed; lip small, acute, 1-7 mm. long, dark red at the base, tip yellow. Distributed from Sumatra to Celebes; in Malaya found at many localities throughout the country, in lowlands and at moderate elevations on the hills.

2. **Bulbophyllum nigropurpureum** Carr, Gard. Bull. 7: 22, pi. 2. 1932.

Rhizome short, rising a little from the base; pseudobulbs close, almost round, about 2 mm. long; leaf to 4 by 1-2 cm., broadest near apex, rather fleshy, the stalk 3 mm.; inflorescences from tufts of dry sheaths at the base of a pseudobulb, several from one tuft; scape 2 cm. long, bearing one flower; flower widely opening, the sepals strongly reflexed, dark purple, whitish in centre; upper sepal 6 by 2-5 mm., acute, edges minutely hairy towards the tip, papillose inside; lateral sepals joined together by their lower edges except for a very short distance at the tip, together 5-5 by 3-5 mm.; petals 4-5 by 2 mm., acute, edges shortly fringed near tips; lip almost straight, 3-5 by 1 mm., edges with short clubbed hairs. Found by rivers in Pahang and on old mangrove in Singapore.

3. **Bulbophyllum tortuosum** (Bl.) Lindl., Gen. et Sp. Orch. 50. 1830. J.J.S., Fl. Buit. 6: 450, f. 342. Bull. Dep. Ag. XIII: 45. 1907. Carr, Gard. Bull. 7: 21. 1932.—*Diphyes tortuosa* Bl., Bijdr. 311. 1825.

Rhizome pendulous, in large plants much branched, the roots running along it; pseudobulbs appressed to rhizome, the tips raised, more or less alternating on either side (the leaves thus taking two ranks), 1 cm. long; leaves to 5 by 1 cm., elliptical, tip acute, base not stalked; inflorescences many, very short, covered with sheathing bracts, one-flowered; scape 3 mm. long; pedicel very short; flowers small, red-purple and yellowish; upper sepal 3 by 1.5 mm., triangular, edges with short purple hairs, red-purple with pale yellow base; mentum pointing forwards at an obtuse angle to the ovary; lateral sepals with lower edges joined except for the tips, 3.5 mm. long, yellow outside, red inside except at the base, tips thickened, edges hairy; petals very small, almost round, whitish; lip small, little over 1 mm. long, dark red, with hairs on sides; column with slender curved arms. Distributed in Java and Sumatra; in Malaya only found on trees by the Sat River in Pahang.

#### Section 7 (§ Monilibulbum)

This section consists of small, often very small, species, with slender creeping rhizome upon which the more or less flattened pseudobulbs lie horizontally, touching or almost touching, their tips usually bent slightly upwards or outwards, bearing small leaves which are erect or more or less oblique; the flowers are small, borne singly on very slender stalks, nearly always yellow, sometimes with red or purple markings, the lateral sepals nearly always longer than the upper one, the petals and lip much smaller than the sepals, the lip hollow at the base and convex at the tip, the column with long slender curved erect arms, often as long as the column itself. The name *Monilibulbum* (*monile* means a necklace) was given to this section by Dr. J. J. Smith; the pseudobulbs look like beads on a string.

It should be realized that the plants have a sympodial structure like all other *Bulbophylla*, each element of the sympodium being formed from a bud that arises at the base of a pseudobulb. The new shoot (protected by sheaths) grows first horizontally as a short length of slender rhizome underneath the last (horizontal) pseudobulb, producing a new pseudobulb as its terminal joint, and then a leaf at the end.

The slender flower-stalks consist clearly of two parts, scape and pedicel; a curious cup-shaped bract is found at the place where the pedicel is borne on the scape. For convenience, the length of the two together is given in the following descriptions of the species.

These dainty plants with their very attractive little flowers are not uncommon on mossy trees in moist shady mountain forests, and to a less extent on trees by rivers in the lowlands. They appear to be unusually abundant in Malaya, as only 6 species have been reported from Sumatra, whereas here we have thirteen (or perhaps only twelve) certainly recorded already, and probably there are more. Most of our species are not known outside Malaya, and it is quite likely that they are peculiar to the country.

However, there is undoubtedly still much more to be discovered about such small plants in both Borneo and Sumatra, and one cannot at present speak with any certainty.

**Key to the Malayan species of *Bulbophyllum*, Section 7**

- Lateral sepals 2 cm. or more long
- Leaf to about 2 cm. long .. .. 1. *B. tristriatum*
- Leaf to about 6 cm. long
- Upper sepal 1-2-1-5 cm., laterals 2 cm. long 2. *B. Hodgsoni*
- Upper sepal 3 cm. or more long, laterals a little longer
- Petals 2-5 mm. long with dark red spots near apex .. .. 3. *B. Umgistelidium*
- Petals 5 mm. long, without such spots .. 4. *B. araniferum*
- Lateral sepals not more than 1 cm. long
- Leaves not more than 5 mm. long
- Lip (as seen from above) elliptic, acute, yellow and orange .. .. 5. *B. minutulum*
- Lip with broad blunt convex midlobe, dark red or red-purple
- Midlobe longer than broad, uniformly papillose all over .. .. 6. *B. malleolabrwn*
- Midlobe broader than long, irregularly warty all over .. .. 7. *B. carunculzelabrun*
- Leaves to at least 1-2 cm. long
- Flower-stalk to about 1-5 cm. long
- Sepals yellow; pseudobulbs oblique, alternating in two rows .. .. 8. *B. biseriale*
- Sepals yellow with flame-coloured veins; pseudobulbs horizontal, in a single row .. .. 9. *B. ignevenosum*
- Flower-stalk 2-5-4 cm. or more long
- Length of lateral sepals not more than twice their width
- Leaves to nearly 4 cm. long .. 10. *B. tinea*
- Leaves to 2 cm. long .. .. 11. *B. ovalifolium*
- Lateral sepals more than twice as long as wide
- Upper sepal 6 mm. long, laterals 10 cm.; petals with rounded tips .. 12. *B. titania*
- Upper sepal 8-5 mm. long, laterals slightly longer; petals widest near trilobed apex .. .. 13. *B. tekuense*



1. **Bulbophyllum trisriatum** Carr, Gard. Bull. 5: 128, pi. II, 1. 1830.

Pseudobulbs oblong, to 8 by 4 mm., the apex curved outwards and upwards; leaf to 2.0 by 0.7 cm., elliptic, acute, the stalk 3 mm. long; scape and pedicel to 7 cm.; upper sepal 2.0 by 0.25 cm., pale yellow with 3 short red stripe\* at the base, long-pointed; lateral sepals spreading, curved, 2.2 to 3 cm. long, 2-3 mm. wide, coloured as upper sepal; petals 2.5 by 1 mm., oblong, blunt, whitish with dark red central stripe; lip 5 mm. long, bent near the base, the side-lobes curved downwards, the midlobe narrow, blunt, dull red-purple; column with long slender arms hooked at the tips. Only found by the Tahan River, Pahang, at Kuala Teku.

2. **Bulbophyllum Hodgsoni** Hend., J.M.B.R.A.S. 5: 269. 1927.

Pseudobulbs oblong, as seen from above 10-13 mm. long and 9-10 mm. wide; leaf to 7 by 1.1 cm., elliptic, apex acute, base distinctly stalked; scape and pedicel to 9 cm. long; lateral sepals reddish brown, 1.5 by 5 mm., upper sepal 12-15 by 3 mm., translucent with 3 orange veins; petals 3 mm. long, oblong, blunt, translucent; lip 8 mm. long, dull crimson, ending in a blunt fleshy orange point 3 mm. long; column arms very long. Found on trees at Robinson's Falls, Cameron Highlands. **Fig. 124, c, d, e.**

3. **Bulbophyllum longistelidium** Ridl., Flora M.P. 4: 64. 1924.

Pseudobulbs about 10 by 0.4 cm., oblong and appressed to the rhizome except for the upcurved tip; leaf to 6.0 by 0.7 cm., widest in the upper half, blunt, shortly stalked; scape and pedicel 5.5 cm. long; flowers orange, in the bud shading to a paler tint at the tips of the sepals; upper sepal 5 to 5.5 mm. wide, long-pointed; lateral sepals a little longer and wider; petals 2.5 by 1.3 mm., oblong, tips rounded with dark red spot; lip papillose, with almost round blade strongly bent in the middle, the tip very shortly pointed; column arms longer than the column. Found at Fraser's Hill and Cameron Highlands.

4. **Bulbophyllum araniferum** Ridl., J.F.M.S. Mus. 5: 47. 1914. Flora 4: 61.

Pseudobulbs oblong, flattened with ends upcurved, about 1.2 cm. long; leaf to 6.5 by 0.8 cm. including the stalk of 1 cm., apex acute; scape and pedicel 7.5 cm. long; colour of flowers unknown except for orange lip; upper sepal 8.8 cm. long, very narrow; lateral sepals a little longer; petals oblong, blunt, about 5 mm. long, bent in the middle at an obtuse angle, narrowed gradually to the blunt tip, 5 mm. long; column arms erect, slender, straight, a little taller than the anther. Known only from G. wengkuang Lebah, at 5,000 feet, on the Main Range in Selangor.

5. **Bulbophyllum minutulum** Ridl., Flora M.P. 4: 62. 1924.

Pseudobulbs oblong, flattened, about 2.5 mm. long; leaf to 5 by 2 mm., evenly elliptic, acute; scape and pedicel to 1.5 cm. long; flowers wide-opening by day, closing at night, for several days; upper sepal 3 to 3.5 mm. long and a little over 1 mm. wide, shortly narrowed to tip, pale yellow at tip, pale orange at base with 3 raised orange veins at the base; lateral sepals slightly curved, a little longer and wider, colour as upper sepal;

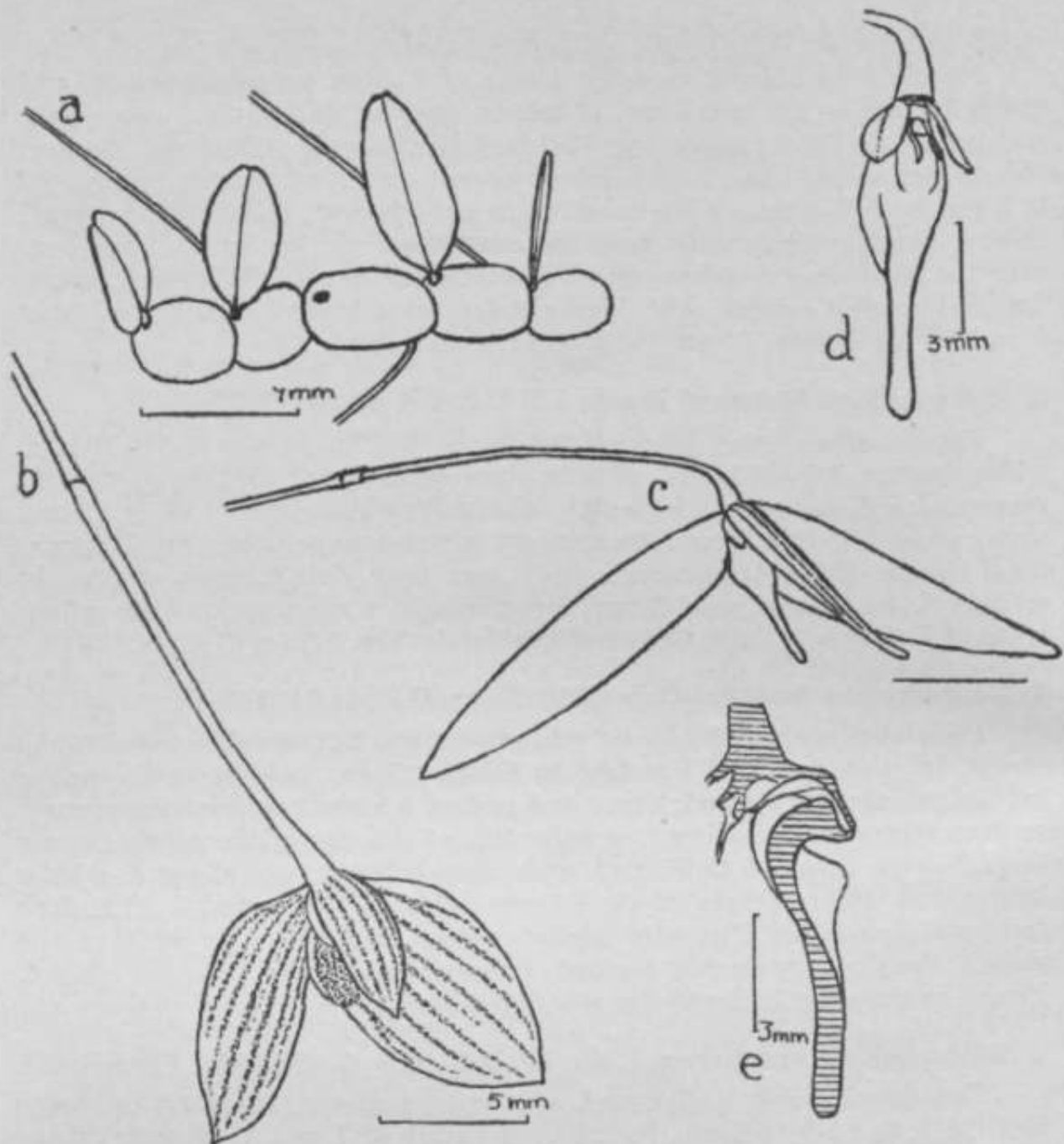


Fig. 124. *Bulbophyllum ovalifotium*, a, pseudobulbs and leaves, b, flower. *B. Hodgsoni* c, flower, d, flower with sepals removed, e, section through column, column-foot and lip.

petals oblong, shortly pointed, 1.5 by 0.5 mm., pale yellowish; lip 2 by 0.8 mm., as seen from above elliptic with acute tip, slightly curved, yellow with orange base and orange spot near tip; column arms curved, taller than anther. Found only at Fraser's Hill.

6. *Bulbophyllum malleolabrum* Carr, Gard. Bull. 7: 24. 1932.

Pseudobulbs ovoid or ellipsoid, flattened above, the apex slightly curved outwards, 2.4-5 by 1.5-3 mm.; leaf 2.1 by 1.5-3 mm., ovate, obtuse; scape and pedicel to 1.3 cm.; upper sepal 4.5 by nearly 2 mm, laterals 5.3 by 2.8 mm., elliptic, acute, edges minutely toothed towards the tips, pale orange, darker towards the base, the upper sepal slightly darker with

faint veins; petals elliptic, 1.7 by 0.8 mm., dark red-orange; lip 2 mm. long, the side-lobes triangular, curved outwards and downwards on either side at the base, the midlobe convex, blunt, minutely papillose all over, reddish purple; column arms longer than the column. Only known from Cameron Highlands at about 4,600 feet altitude.

7. **Bulbophyllum carunculaelabrum** Carr, Gard. Bull. 7: 25. 1932.

Pseudobulbs flattened above, as seen from above almost round, 1.5 to 4 mm. long and wide, 1 mm. thick; leaf to 4 by 3 mm., spreading horizontally; scape and pedicel about 1.5 cm. long; upper sepal elliptic, acute, concave, edges minutely toothed towards apex, pale yellow, edges red, veins raised on back orange, 3.5 by 2.5 mm.; lateral sepals 5 by 4.2 mm., broadly elliptic, colour as upper sepal; petals very small, 1.2 by 0.7 mm., oblong, obtuse, red; lip nearly straight, dark red, 2 mm. long, side-lobes turned outwards and downwards at the base, midlobe convex, blunt, minutely and irregularly warty throughout, broader than long; column with narrowly triangular slightly curved arms reaching the apex of the petals. Found by the Sedili River, Johore, as an epiphyte on Pandans, and at Bukit Kajang, Kemaman, at 70 feet above ground on a tall tree.

8. **Bulbophyllum biseriale** Carr, Gard. Bull. 5: 131, pi. II, f. 2. 1930.

Pseudobulbs rather oblique to the rhizome, alternately curved to one side and the other so that they are in two rows, 2 to 4 mm. long, 1.5-2 mm. diameter; leaf erect or somewhat oblique, to 3.0 by 0.3 cm., acute; scape and pedicel about 1.5 cm. long; upper sepal about 5 by 2 mm., acute, widest 1/3 from the base, yellow; lateral sepals hardly spreading, 5.5 by 2.5 mm., yellow; petals 1.5 by 0.2 mm., oblong, blunt; lip nearly 3 mm. long, orange red, blunt, the side-lobes curved downwards; column arms long, curved, slender. Only known from Gunong Tahan at 5,500 feet altitude.

9. **Bulbophyllum ignevenosum** Carr, Gard. Bull. 5: 130, pi. I, f. 6. 1930.

Pseudobulbs prostrate on the rhizome, as seen from above oblong, about 5 by 4 mm., 1.5 mm. thick, upper part recurved; leaf erect, to 1.2 by 0.3 cm.; scape and pedicel 1.6 cm.; upper sepal 3 by 1.5 mm., rather oblong, blunt, yellow with flame-coloured raised veins; lateral sepals similarly coloured, 4 by 2.3 mm., shortly pointed; petals less than 2 by 1 mm., elliptic, blunt, yellow with one orange vein; lip 2.5 mm. long, the side-lobes raised, the midlobe shortly triangular, blunt, dull red; column arms slender, curved, as long as the column. Only known from 4,800 feet altitude on Gunong Tahan, found in quantity on a mossy tree trunk.

10. **Bulbophyllum tineae** Ridl., J.F.M.S. Mus. 4: 66. 1909. Flora 4: 62.

Pseudobulbs narrowly oblong, to about 8 mm. long, appressed to rhizome with upcurved tips; leaf to 3.8 by 0.45 cm., widest in the upper half, apex blunt, narrowed to the base; scape and pedicel to 7 cm. long; upper sepal 4.5 mm. long, rather narrow, laterals 7.5 mm. long, broader, all orange yellow with darker streaks; petals barely 2 mm. long; lip 2 mm. long, papillose, reddish-purple, blunt. Found once on G. Berumban at Cameron Highlands. There is some doubt whether this plant is really

distinct from *B. ovalifolium*, but it has much longer leaves than usual in that species.

11. *Bulbophyllum ovalifolium* (Bl.) Lindl., Gen. et Sp. Orch. 49.1830. J.J.&" Fl. Buit. 6: 455, f. 347. Carr, Gard. Bull. 7: 27. 1932.—*Diphyes ovalifolia* BL, Bijdr. 318. 1825.—*B. catenarium* Ridl., Tr. L. S. 4: 2#> 1894. Flora 4: 61.—*B. xylocarpi* J.J.S., Bull. Btzg., Ser. 3, 9: 48. 1 ^' - Carr, Gard. Bull. 7: 27. 1932.

Pseudobulbs oblong, flattened, with raised and diverging ends, about 5 mm. long; leaf 0.8 to 20 by 0.4-0.5 cm., the apex blunt, the base narrowed gradually to a short stalk; scape and pedicel 2.5 to 6 cm. long; sepals orange yellow with crimson veins; upper sepal to 5 by 2.5 mm., laterals to 10 by 5 mm., apex broadly rounded and very shortly tipped; petals less than 2 by 1 mm., oblong; lip 2-3 mm. long, grooved at the base, smooth in the groove, rest papillose, dark crimson. This species is widely distributed in Java and Borneo; in Malaya it occurs both on trees on mountain ridges at 5,000 feet, by streams at about 3,500 feet altitude, and also in Singapore. In Java, Dr. J. J. Smith records flowers of much larger dimensions than those given above, which are taken from Malayan specimens; plants from Singapore have smallest flowers. Java measurements are: upper sepal to 7.7 mm., laterals to 1.8 cm. long. In shape and other characters the Java flowers agree. Fig. 124, a, b.

12. *Bulbophyllum titania* Ridl., J.L.S. 38: 325. 1908. Flora 4: 62.

Pseudobulbs flattened, as seen from above ovate, about 6 by 3 mm.; leaf to 1.5 by 0.45 cm., evenly elliptic, blunt; scape and pedicel 5 cm. long; flowers orange, deeper on lip and column; upper sepal 6 by 2 mm., widest 1/3 from the base, narrowed evenly to tip, minutely papillose; lateral sepals 10 by 0.45 cm., elliptic, bluntly pointed, papillose; petals 1.5 by 0.7 mm., tip rounded; lip 2-3 by 10 mm., bent in the middle, blunt, warty above all over; column arms slender, curved, nearly as long as the column. Found only on the upper part of Gunong Tahan.

13. *Bulbophyllum tekense* Carr, Gard. Bull. 5: 132, pi. I, 7. 1930.

Pseudobulbs about 6 by 3 mm., the apex slightly curved upwards; leaf erect, to 1.7 by 0.5 cm., acute; scape and pedicel about 4 cm. long; upper sepal 8.5 by 2.5 mm., basal half oblong, narrowed to tip; lateral sepals slightly curved, a little longer (barely 9 mm.) and wider, more <sup>sho</sup>TM<sup>y</sup> pointed; petals 2.5 by 1.7 mm., widest near apex which is almost trilobed; lip curved, thickly fleshy, obtuse, minutely papillose throughout, about 6 by 1 mm.; column short with short erect tooth-like arms. Found only once at Kuala Teku on the Tahan Pwiver. No information on the colour of the flower is available. In its nearly equal sepals this species is near to section 8, but its vegetative habit is that of section 7.

#### Section 8 (§ Micromonanthé)

The species of this section are in many ways similar to those of section 7. They are small, with small mainly yellow flowers singly on slender stalks, and are mostly found in mountain forests on mossy trees. They differ in having longer rhizomes with the pseudobulbs distinctly spaced and not appressed to the rhizome except to some extent at the base;

also in having sepals almost equal, never more than about 1 cm. long, and the arms of the column not always so much elongated.

One species (*B. dryas*) has very small pseudobulbs, as small as in the species of section 10; but it is in other respects much nearer to the other members of the present section than to section 10, and so is included here.

Key to the Malayan species of *Bulbophyllum*, Section 8

- Pseudobulbs barely 1 mm. long, leaf thickly  
fleshy . . . . . 1. *B. dryas*
- Pseudobulbs much longer, leaf not thickly fleshy  
Apical half of sepals a narrow straight tail . . . . . 2. *B. striatellum*
- Blade of sepals not tailed
- Flowers mainly dark red-purple
- Scape to about 5 mm. long, lip with short  
hairs . . . . . 3. *B. ciliatum*
- Scape about 2.5-4 cm. long, lip not hairy
- Leaf 3 mm. wide . . . . . 4. *B. cenense*
- Leaf about 1 cm. wide . . . . . 5. *B. pan*
- Flowers mainly yellow or greenish
- Pseudobulbs about 1-15 cm. long, petals  
nearly round with dark spots on edges
- Upper sepal 5-5 mm. long; petals with 5  
spots . . . . . 6. *B. tenuifolium*
- Upper sepal 9-10 mm. long; petals with  
3 spots . . . . . 7. *B. nigromaculatum*
- Pseudobulbs about 4 mm. long, petals  
without dark spots
- Flowers pale green . . . . . 8. *B. nematocaulon*
- Flowers yellow . . . . . 9. *B. oreas*

1. *Bulbophyllum dryas* Ridl., J.F.M.S. Mus. 6: 175. 1915. Flora 4: 62. Carr, Gard. Bull. 5: 136, pi. II, f. 3.

Pseudobulbs about 2.5 cm. apart, barely 1 mm. long; leaf thickly fleshy, to 15 by 0.7 cm., elliptic, blunt, grooved on the midrib above; scape from any node of the rhizome, with the pedicel to 4 cm. long; sepals and petals rather pale yellow; upper sepal nearly 1 cm. long, 4-5 mm. wide, blunt; lateral sepals of almost same size, a little widened on the lower side at the base, not widely spreading; petals 3-5 by 2 mm., widest in upper half, tip blunt; lip hardly curved, ovate, acute, pale yellow or suffused with dull red, 4 by 2-5 mm.; column with short broad forward-pointing arms, without erect teeth. Found on trees in rather open places on Gunong Tahan and at Fraser's Hill and Cameron Highlands, at 4,000-4,500 feet altitude; a very attractive little species.

2. *Bulbophyllum striatellum* Ridl., Ann. Bot. 4: 335. 1890. Flora 4: 62.

Pseudobulbs about 1 cm. apart, curving upwards from the base, 7-9 mm. long, 3-4 mm. wide at base; leaf to 4.5 by 0.6 cm., erect, evenly elliptical, shortly pointed and hardly stalked; scape and pedicel 6 cm. long; flowers not wide-opening, pale yellow-green with 3 dark purple veins on

sepals and petals; sepals about equal, 1 cm. long, the basal half an ovate blade 3 mm. wide, apical half very narrow throughout, dark red-purple? petals about 4.5 by 3 mm., sometimes with an extra short purple vein on each side, making 5 in all; lip nearly 4 mm. long, curved, blunt, edges short-hairy, yellow with red tip; column with erect flattened slightly twisted and hooked arms rising above the anther. Found in old mangrove and on trees by rivers in Singapore and southern Johore. Fig. 125.

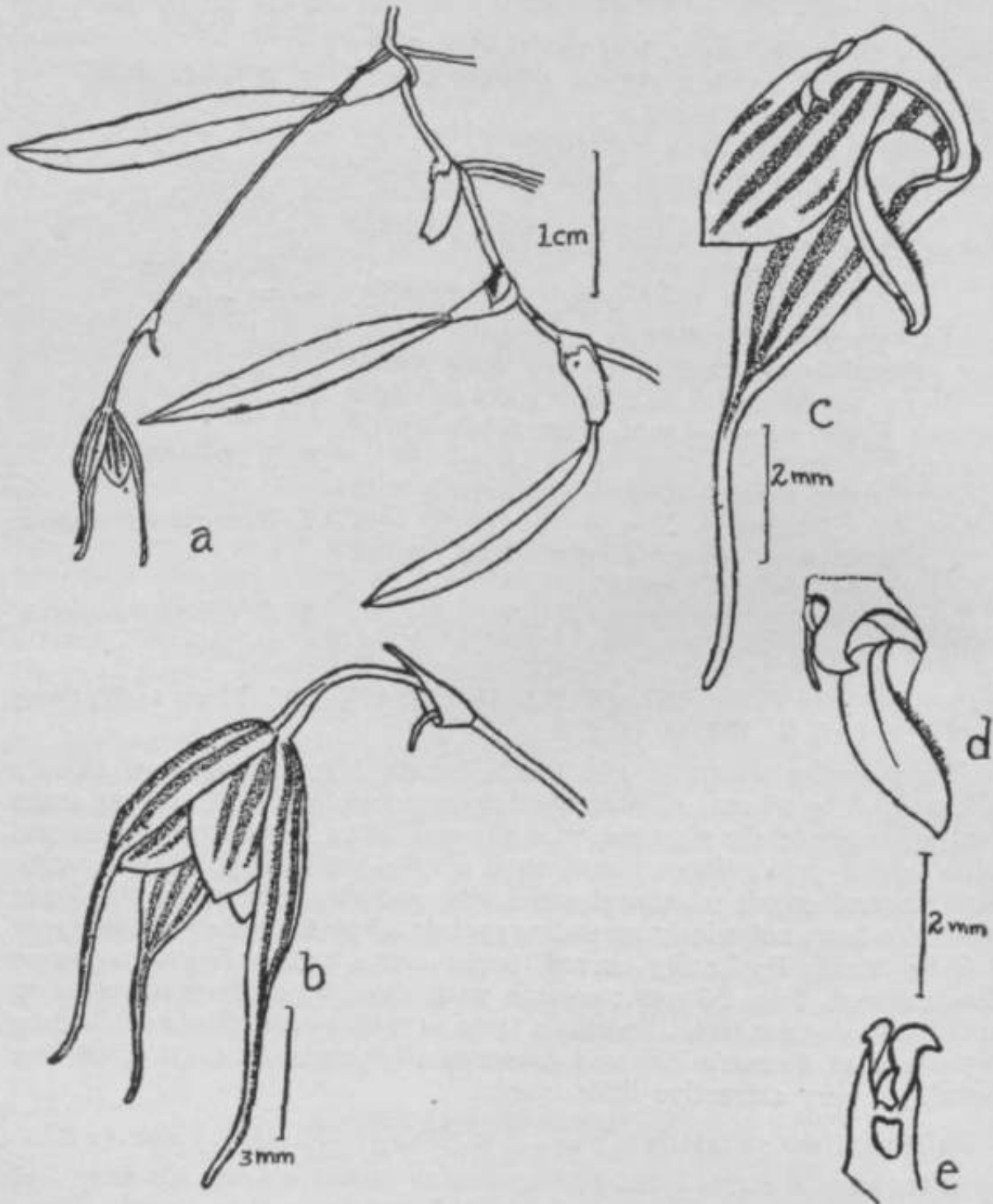


Fig. 125. *Bulbophyllum striatellum*. a, plant in flower. b, flower, c, flower with one petal and two sepals removed to show column and lip, d, lip, column and column-foot, e, column.

3. **Bulbophyllum ciliatum** (Bl.) Lindl., Gen. et Sp. Orch. 48. 1830. J.J.S., Fl. Buit. 6: 457, f. 349. Carr, Gard. Bull. 7: 29. 1932.—*Diphyes ciliata* BL, Bijdr. 317. 1825.

Pseudobulbs to 1.5 cm. apart, angled, base appressed to rhizome, upper part curved upwards, about 4.5 by 2.5 mm.; leaf 1.6-3.5 by 0.4-0.8 cm.; scape and pedicel 3-5 mm.; flowers deep reddish mauve, base of sepals and petals white; upper sepal 4 by 1 mm., narrowed from near base to apex; lateral sepals 4 by 1.5 mm., slightly curved, blunt; petals 1.5 by 0.8 mm., base oblong, shortly pointed; lip nearly straight, 2 by 0.3 mm., sides fringed with hairs, end blunt, papillose; column with narrowly triangular long oblique arms. Originally found in Java; in Malaya only reported once, from Cameron Highlands. The above description is taken from the Malayan plant.

4. **Bulbophyllum ceneum** Ridl., Flora M.P. 4: 63. 1924.

Pseudobulbs 1-2 cm. apart, basal 14 appressed to rhizome, rest curving upwards, conical, 8 mm. long, 4 mm. wide at base; leaf 3-6 cm. by 3 mm., tip shortly pointed; scape and pedicel 2.5-4 cm. long; flowers dark reddish purple, paler or greenish between the veins of sepals and petals; upper sepal 5 by 1.5 mm., laterals 5.5 by nearly 2 mm., all long-pointed; petals a little over 2 mm. long, shortly pointed; lip about 2.5 by 1 mm., slightly curved, blunt, tip greenish, base purple; column arms as long as column, broad, flattened, curved. Found at Fraser's Hill and Cameron Highlands. **Fig. 126.**

5. **Bulbophyllum pan** Ridl., J.F.M.S. Mus. 6: 176. 1915. Flora 4: 63.

Pseudobulbs 1 cm. apart, 1.5 cm. long, narrow, slightly decumbent at the base; leaf erect, to 7.5 by 1.1 cm., evenly elliptic, bluntly pointed, base shortly stalked; scape and pedicel 7-8 cm. long; sepals 8-9 mm. long, laterals 3 mm. wide at base, upper sepal narrower, all red with darker stripes; petals 2.5 mm. long, edges toothed, very dark red at tips; lip deep purple, 5 mm. long, bent below the middle, tip blunt; column with long very slender erect arms, as long as the column. Found only on Gunong Tahan.

6. **Bulbophyllum tenuifolium** (Bl.) Lindl., Gen. et Sp. Orch. 50. 1830. J.J.&, Fl. Buit. 6: 462, f. 353. Carr, Gard. Bull. 7: 29. 1932.—*Diphyes tenuifolia* BL, Bijdr. 316. 1825.

Pseudobulbs to 1.5 cm. apart, oblique, 4-angled, to 10 by 0.8 cm.; leaf erect, to 3 by 1 cm., blunt; scape and pedicel to 2.5 cm.; flowers yellow, wide-opening; upper sepal 5.5 by 2.5 mm., elliptic, acute, with three interrupted dark red streaks; lateral sepals as long and a little narrower, slightly curved, not streaked; petals round, minutely papillose, with about 5 almost black spots on their edges; lip 4 mm. long, bright yellow, slightly

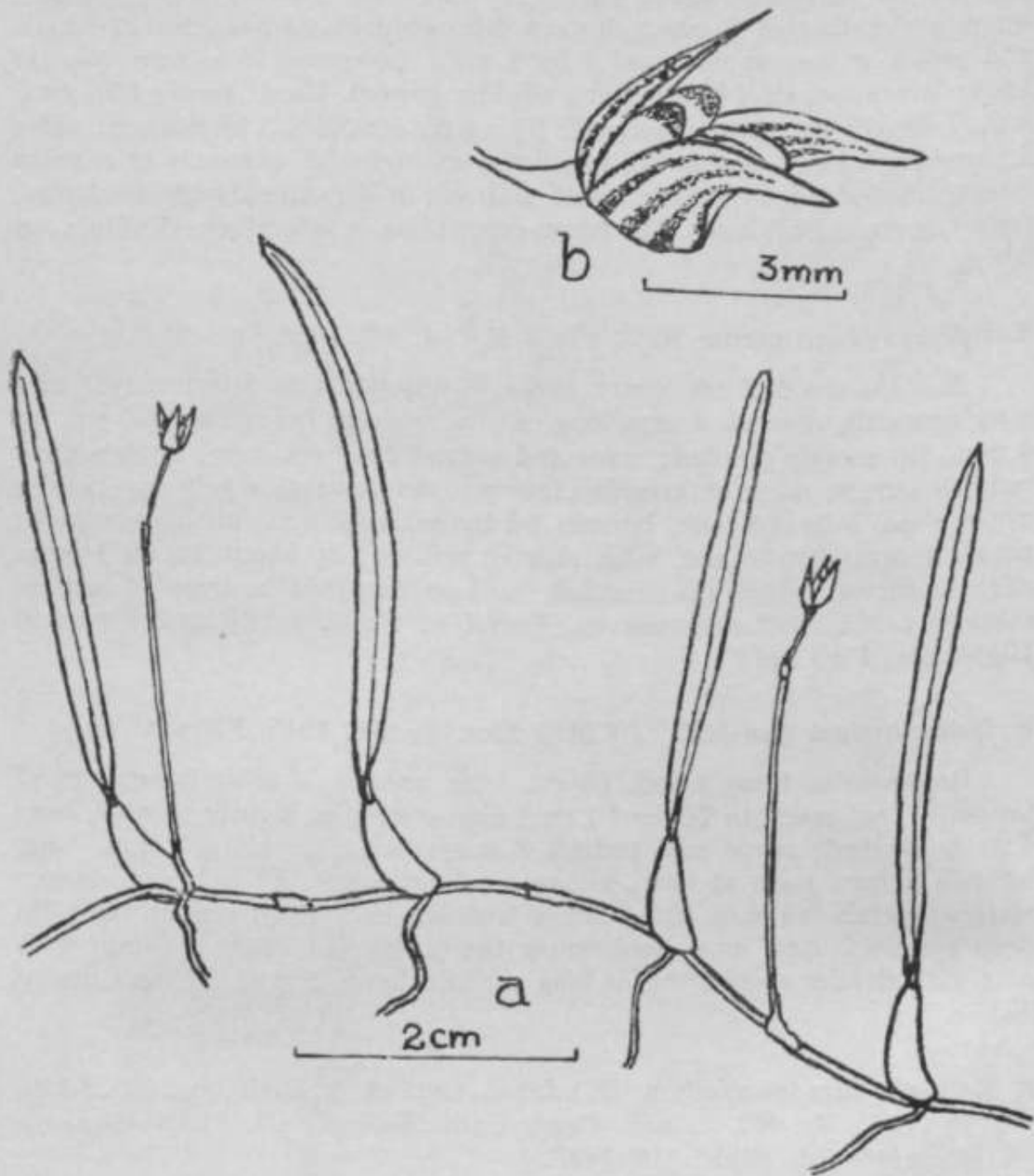


Fig. 126. *Bulbophyllum ceneum*. a, plant in flower, b, flower from side.

curved, tongue-shaped, blunt; column with curved slender erect arms a little taller than the anther. Found in Java, and also by the Sediii River, Johore, and on old mangrove in Singapore. **Fig. 127.**



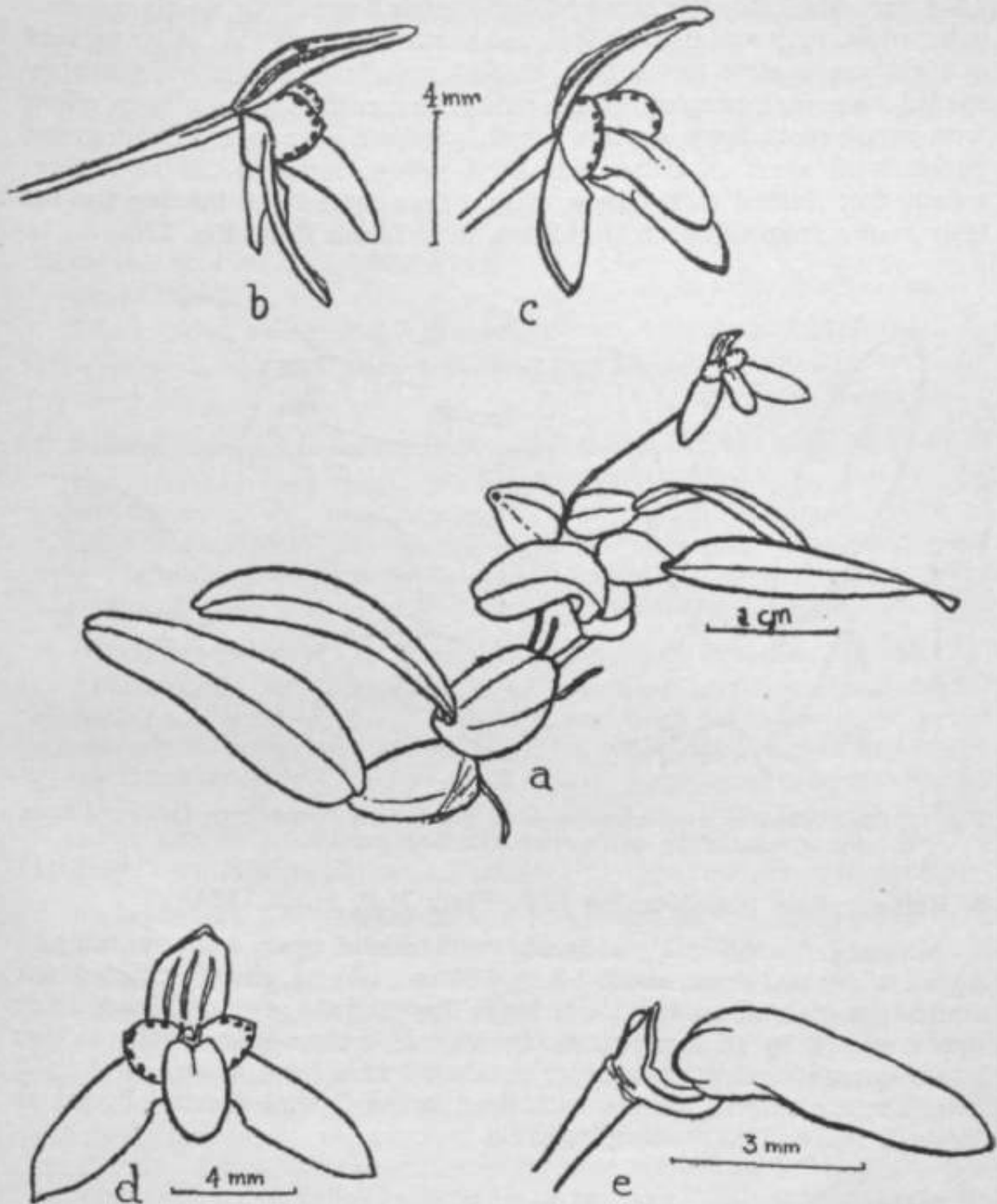


Fig. 127. *Bulbophyllum tenuifolium*. a, plant in flower, b, c, flowers, showing spots on edges of petals, d, flower from front, e, column, column-foot and lip, from side.

7. *Bulbophyllum nigromaculatum* Holtt., Gard. Bull. 11: 276. 1947.

Pseudobulbs almost touching, ovoid, to 1.5 cm. long, flushed with purple; leaf to 6 by 1.5 cm., hardly stalked, the base flushed with purple; scape 2 cm., pedicel 3-5 cm. long; sepals pale green, laterals slightly flushed with purple along the veins, upper with 3 green veins, all 9-10 mm. long,

4-5-5 mm. wide, abruptly short-pointed; petals 3 mm. long, nearly circular, pale yellow, with apical black spot and another on each side of it; lip bent at right angles close to the base, blade 7 mm. long, 3 mm. wide, tongue-shaped, base dark purplish with a pale yellow median groove, apex yellow with purple spots, lower surface purple, papillose near base; column green, anther with arms on either side of it yellow, arms as tall as anther; column-foot flushed with purple, with a free curved end bearing the lip. Only known from Cameron Highlands, near Tanah Rata. Fig. 128.

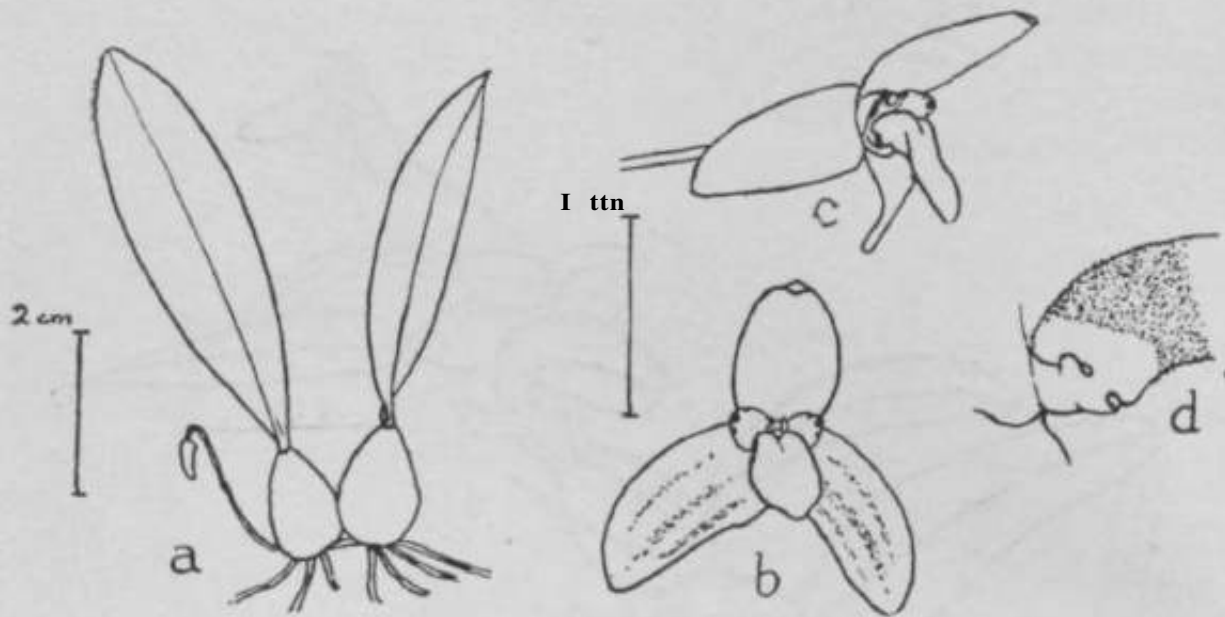


Fig. 128. *Bulbophyllum nigro-maculatum*, a, plant. b, c, flower from front and from side, d, base of lip and column-foot from beneath.

8. *Bulbophyllum nematocaulon* Ridl., Flora M.P. 4: 63. 1924.

Pseudobulbs 0.5 to 1 cm. apart, ovoid, almost erect, 3-4 mm. tall and 3 mm. wide; leaf erect, about 1.3 by 0.35 cm., oblong, shortly pointed, not stalked; scape and pedicel 1 cm. long; flowers pale green, wide-opening; upper sepal 6 by 1.5 mm., turned backwards, narrowed gradually to tip; lateral sepals similar, spreading; petals 2.5 mm. long, acute; Up 4 by 2 mm., acute, straight; column with short broad 2-pointed arms. Found at Fraser's Hill and on the Taiping Hills.

9. *Bulbophyllum oreas* Ridl., Flora M.P. 4: 63. 1924.

Pseudobulbs about 1 cm. apart, curved upwards from a prostrate base, about 4 mm. long; leaf to 1.2 cm. long, barely 2 mm. wide; scape and pedicel about 1.5 cm.; flowers yellow; upper sepal about 5 by 1 mm., long-pointed; lateral sepals a little longer, 1.5 mm. wide at the base, long-pointed; petals under 2 mm. long, ends rounded with a short tip; lip 3 mm. long, narrow, acute; column arms broad, obliquely rising, each with 2 points. Found only on Gunong Tahan. This species is very near to *B. nematocaulon*, and may be identical.

## Section 9

**This** is a section of three species having small flowers (upper sepal not more than 6 mm. long), few in number, brown or with purple markings, the petals and lip with comparatively long hairs. Two of the species are known only from single dried specimens, which are at Kew, and one drawing.

## Key to the species of Section 9

- Flowers 1 or 2 on each inflorescence  
 Sepals brown .. . . . 1. *B. cincinnatum*  
 Sepals white, veined and tipped purple . . . 2. *B. hirtulurw*  
 Flowers up to 6, pale yellow with dark red veins  
 and edges .. . . . 3. *B. trichoglottis*

**1. *Bulbophyllum cincinnatum*** Ridl., J.S.B.R.A.S. 39: 75. 1903. Flora 4: 65.

Pseudobulbs very small; leaf elliptic, blunt, about 10 by 4 cm.; scape slender, about 5 cm. long; flowers 2, 6 mm. long; sepals almost equal, rather narrow, pointed, brown, hairy; petals brown, narrow, curved, blunt, hairy; lip oblong, blunt, with long white hairs; column short, arms short. Known only from a single collection from Batu Tujoh, Perak.

**2. *Bulbophyllum hirtulum*** Ridl., Journ. Bot. 1900: 71. Flora 4: 65.

Pseudobulbs round, close, hardly 6 mm. long; leaf 5 by 1.2 cm., blunt; scape 5 cm.; flower 1, 6 mm. long; upper sepal narrowly ovate, acute; lateral sepals wider, curved, hairy; all sepals white, veined and tipped purple; petals narrow, shorter than sepals, white with brown veins and fringed edges; lip straight, deep red, hairy; column arms very short, rounded. Known only from one collection from Penang Hill at 2,000 feet altitude. This may be only an unusually small plant of the next species.

**3. *Bulbophyllum trichoglottis*** Ridl., J.F.M.S. Mus. 4: 66. 1909. Flora 4: 67. Carr, Gard. Bull. 5: pi. 5, B. 1929. J.J.S., Bull. Btzg., Ser. 3, 2: 98. 1920.

Pseudobulbs very close, conical, 5 mm. high; leaf to 15 by 3.5 (exceptionally to 18 by 5.5) cm., widest in the upper half, tip bluntly pointed, base gradually narrowed to a short stalk; scape to 10 cm. long, bearing up to 6 flowers, all near together; sepals and petals pale yellow with dark red veins and edges; upper sepal 5-6 by 2.5 mm., acute, edges with very short hairs; lateral sepals a little shorter and broader, spreading, similarly hairy; mentum 2 mm. long; petals 3.5 by 12 mm., 3-veined, with spreading-hairs to 1 mm. long on edges; lip with short erect fleshy basal part and blade at right angles to this, dark purple with stiff forward-curving hairs nearly 1 mm. long on its edges. Found at Fraser's Hill and Cameron Highlands, and also in Sumatra.

## Section 10

This section contains almost all species of *Bulbophyllum* with very small pseudobulbs. Most of them are usually included in the section called

*Aphanobulbum* (meaning bulbs not apparent), but for the sake of convenience are added here a few which differ in habit of growth and are not strictly members of that section. All have pseudobulbs, but these are so small that careful examination is necessary to detect them. Other characters which distinguish most species are as follows.

The pseudobulbs may be close or distant; the leaves are usually neither very small nor very large, comparatively narrow and conspicuously stalked; the inflorescences are erect, nearly always from the base of a pseudobulb, the scape long or short, partly covered by sheaths, the flowering portion usually fairly long, bearing numerous small whitish or yellowish flowers with narrow bracts (usually longer than the pedicels), rather narrow sepals, sometimes long-pointed, the three almost equal in length, the petals much smaller, often papillose.

A few species have quite small leaves, and one has broad leaves; a few have short inflorescences with few flowers; two have pendulous stems with drooping leaves and short inflorescences that are not erect. All these have flowers of similar general character to the others, and also very small pseudobulbs.

The section *Aphanobulbum* is represented by numerous species in Malaysia. In Sumatra no less than 30 are known, which is more than twice as many as here recorded for Malaya. It is quite likely that more remain to be discovered. Many of the species are closely related, and for clear discrimination a very careful examination of the flowers is necessary.

The flowers of this section are very similar to those of section 11; but in that section there are always conspicuous pseudobulbs, and the inflorescences are as a rule short with few flowers, which often have the sepals tipped with bright orange.

#### Key to the Malayan species of *Bulbophyllum*, Section 10

Leaves not more than 6 cm. long

Stem hanging; leaves drooping on either side  
of it

Leaves blunt; inflorescence of 2 flowers 1. *B. mutabile*

Leaves acute; inflorescence of about 8 flowers 2. *B. minimibulbum*

Stem long-creeping, not hanging; leaves more  
or less erect

Leaves to 12 cm. or more apart and 1-7 cm.  
wide .. 3. *B. viridescens*

Leaves to 1-5 cm. apart and 0-7 cm. wide . . 4. *B. vermiculare*

Leaves much longer

Leaves 4 cm. or more apart

Inflorescences much shorter than the leaves 5. *B. apodum*

Inflorescences nearly as long as leaves, or  
longer

Leaf gradually narrowed to its stalk; upper  
sepal gradually narrowed to apex . . 6. *B. odoratum*

Leaf suddenly narrowed to its stalk, upper  
sepal widest in the upper half .. 7. *B. vaginulosum*

Leaves 1 cm. or less apart

Sepals with tails 2 cm. or more long .. 8. *B. arachnites*

Sepals without, or with much shorter tails

Scape about 15 cm. long

Scape with 2 large sheaths with free

blades 3 cm. long .. •• 9. *B. selangorense*

Scape with several much smaller sheaths 10. *B. gibbosum*

Scape not more than about 6 cm. long

Upper sepal about 3-5 mm. long

Leaf to 16 by 14 cm. .. .. 11. *B. linearifolium*

Leaf to 11 by 2-2 cm. .. .. 12. *B. armeniacum*

Upper sepal 6 mm. or more long

Upper sepal 1-1 cm. long, apical half  
thread-like .. .. 13. *B. leptosepalum*

Upper sepal 6-8 mm. long, more gra-  
dually narrowed to tip .. 14. *B. adenopetalum*

**1. *Bulbophyllum mutabile* (Bl.) Lindl., Gen. et Sp. Orch. 48. 1830. J.J.S.,**

Fl. Buit. 6: 431, f. 326.—*Diphyes mutabilis* BL, Bijdr. 312. 1825.

Rhizome hanging, branched, covered with keeled tubular sheaths; pseudobulbs 1 cm. or less apart; leaves 3 by 0.7 cm., elliptic, blunt, hardly stalked, at an acute angle to the rhizome; inflorescence 2-flowered; scape 5 mm. long; flowers pale yellow-brown; upper sepal 5 by 1.5 mm., narrowed gradually to acute tip; lateral sepals 3 mm. wide at the base; petals 2.5 by less than 1 mm., elliptic; lip bright orange-brown, 3.5 by 15 mm. This species is more near to Section 11 in its habit and inflorescence, but owing to the very small pseudobulbs is included here. It is found in Java, Sumatra and Borneo; in Malaya it has only been collected at Fraser's Hill-

**2. *Bulbophyllum minimibulbum* Carr, Gard. Bull. 5: 10, pi. 7, A. 1929.**

Rhizome slender, pendulous, to 50 cm. long, the young parts covered with pale loose overlapping sheaths; pseudobulbs 1-2 cm. apart, 1.5 mm. long and 1 mm. wide; leaf to 4.5 by 0.7 cm., pendulous, at an acute angle to the rhizome, widest near the base, apex sharply pointed, stalk 3 mm. long; inflorescence in all 2 cm. long, including the scape of 1 cm.; flowers about 8, small, pale yellowish, not widely opening; upper sepal 3.5 by 1.2 mm., widest 1/3 from base, acute; lateral sepals nearly as long as the upper sepal, broadly triangular, forming a broad mentum, 2.8 mm. wide, apex curved, acute; petals elliptic, acute, nearly 2 by 1 mm.; lip bent at a right angle in the middle, tip blunt, 2-2 mm. long when straightened; column with short broad wings. Found at Fraser's Hill only.

**3. *Bulbophyllum viridescens* Ridl., J.L.S. 38: 325. 1908. Flora 4: 73.**

Rhizome long-creeping, slender, rooting at all nodes; pseudobulbs to 12 cm. or more apart; leaves fleshy, about 3.5 by 1.7 cm., the basal 3 mm. a stalk, the apex rounded and slightly cleft; inflorescence from base of a leaf or from any node of the rhizome, about 6.5 cm. long, the scape 4 cm.; flowers about 8, pale greenish-yellow with orange or brownish lip; bracts 2 mm. long, a little shorter than the pedicels; upper sepal 4 mm. long,

"blunt; lateral sepals narrowed above a broad concave base, the mentum over 2 mm. long; petals about 3 mm. long; lip 3 mm., tongue-shaped, blunt, papillose, channelled. Only known from one locality, at about 3,300 feet -altitude on G. Tahan. This is not a typical member of the section, but is rather like a Sumatran species with even fewer flowers. The above-stated dimensions of the floral parts may not be entirely correct.

4. **Bulbophyllum vermiculare** Hk. f., F.B.I. 6: 188. 1890. Ridl., Flora 4: 71.

Rhizome slender, long-creeping; pseudobulbs 1 to 1.5 cm. apart; leaves to 6 by 0.9 cm., often narrower, apex blunt, base with a stalk 1 cm. long; inflorescence usually a little shorter than the leaves, the flowers well spaced, about 2 to 6 in number, pale greenish yellow with yellow lip; upper sepal about 4 mm. long; laterals somewhat larger, swollen at the base (forming a broad round mentum); petals about 2 by 0.5 mm., oblong, blunt; lip almost as long as the sepals, slightly curved, bluntly pointed, hairy. Found in the lowlands of Malaya, from Singapore to Perak, and also in the mountains.

5. **Bulbophyllum apodum** Hk. 1, F.B.I. 5: 766. 1890. Ic. Pl. t. 2043. Ridl., Flora 4: 73.

Rhizome 3-4 mm. thick; pseudobulbs 4-10 cm. apart; leaves to 23 by 3-5 cm., including a stalk to 6 cm., the apex suddenly narrowed, blunt, the base gradually narrowed; inflorescence to 12 cm. long, the scape 3 cm., the flowers all opening together; flowers cream, sepals and lip yellow-tipped; bracts 3-4 mm. long, a little longer than the pedicels; upper sepal 5 by 1.5 mm., oblong when flattened, rather suddenly short-pointed, the tip thickened; lateral sepals narrowed above the swollen base, gradually narrowed to a thickened and keeled tip; petals 2.5 mm. long, blunt, elliptical; lip bent at a right angle, the sides raised at the base, the tip shortly pointed, 3 by 1 mm.; column arms with narrow triangular teeth. Distributed in Borneo and Sumatra; in Malaya a not uncommon epiphyte in the lowlands of the southern half of the country. Vegetatively it is very near *B. odoratum*. Fig. 129, d.

6. **Bulbophyllum odoratum** (Bl.) Lindl., Gen. et Sp. Orch. 54. 1830. J.J.S., Fl. Brit. Ind. 318. 1825. *Bulbophyllum odoratum* (Bl.) Lindl., J.J.S., Fl. Brit. Ind. 318. 1825. *Bulbophyllum odoratum* (Bl.) Lindl., J.J.S., Fl. Brit. Ind. 318. 1825.

Pseudobulbs usually about 4 cm. apart; leaves to 40 by 4.5 cm., including stalk 10 cm., shape as in *B. apodum*; inflorescence as long as the leaves or longer, the flowerless scape quite short, covered with overlapping sheaths; flowers very numerous, at first golden yellow, soon fading to almost white, the basal ones opening first; bracts 5 mm. long, considerably longer than the pedicels; upper sepal 4 by 1.5 mm., fleshy, the basal half broad, the rest gradually narrowed to a thick tip; lateral sepals similar; petals little over 1 mm. long; lip small, strongly bent in the middle; column with broad arms with a narrow tooth on each. Distributed in Borneo, Sumatra and Java; in Malaya a lowland epiphyte, found on trees by rivers in Pahang, Kelantan and Perak. This species is very similar to *B. apodum*, but larger, with a longer inflorescence and smaller flowers, which do not open all simultaneously. Fig. 129, a-c.

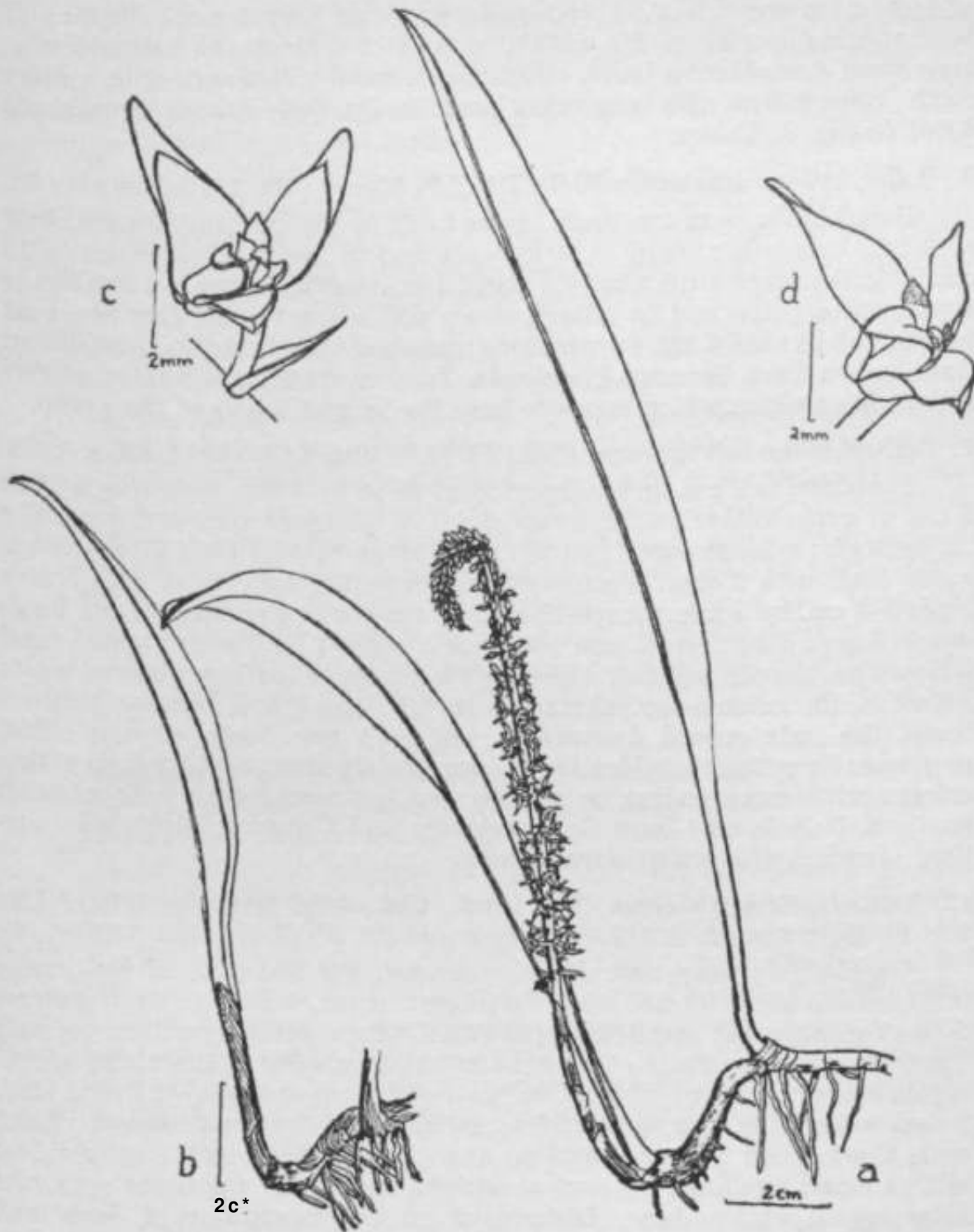


Fig. 129. *Bulbophyllum odontum*. *a*, *b*, habit of plant, the inflorescence not fully expanded, *c*, flower. *B. apodwm.* *d*, flower.

7. *Bulbophyllum vaginulosum* Carr, Gard. Bull. 5: 140, pi. IV, L 1930.

Pseudobulbs widely spaced; leaf thick, to 18 by 26 cm. including a stalk of 5 cm., blade widest near base which is suddenly narrowed to the stalk, apex bluntly pointed; inflorescence about 20 cm. long, the scape 8 cm.; bracts 6 mm. long; flowers pale yellow; upper sepal 5.5 by 2 mm.,

widest in the apical half, shortly pointed; petals 3 by 1 mm., elliptic; lip bent at a right angle in the middle, with erect sides at the base, 3-5 mm. long when straightened, blunt, column with small wings each with a short tooth; column-foot with a swelling near its tip. Only known from about 6,000 feet on G. Tahan.

8. *Bulbophyllum arachnites* Ridl., J.F.M.S. Mus. 4: 67. 1909. Flora 4: 73.

Pseudobulbs close together; leaves to 22 by 2-3 cm., including a stalk of 3 cm., evenly narrowed to acute apex and to base; inflorescence to 20 cm. long, the scape 7 cm.; flowers about 1 cm. apart; bracts 5-6 mm. long; sepals white, petals and lip yellow; sepals with a short broad base produced to a thread-like tail 2 cm. or more long; petals short, blunt; lip short, blunt. Only known from Cameron Highlands. Further details are wanted of this interesting species, which seems to have the longest sepals of the group.

9. *Bulbophyllum selangorensis* Ridl., J.F.M.S. Mus. 5: 47. 1914. Flora 4: 73.

Pseudobulbs 1 cm. or less apart; leaf to 30 by 4 cm., including a stalk 6 cm. or more, rather suddenly narrowed to the blunt apex and gradually to the stalk; inflorescence from the same large basal sheath (7 cm. long) as the leaf, with 2 other sheaths on the scape, the uppermost with a free blade 3-4 cm. by 5 mm.; scape 15 cm., flower-bearing portion 10 cm. long; bracts 5 mm. long; sepals and petals pale yellow, lip deeper; upper sepal 6 mm. long, shortly pointed, widening a little above the base; lateral sepals joined to the column-foot almost to its tip, broad and concave at their bases, the ends curved downwards; petals 4 mm. long, elliptic, acute, papillose; lip with erect sides at the base, the tip blunt, and 3 raised veins; column with arms ending in narrow points; column-foot with a small swelling. Only known from G. Mengkuang and Cameron Highlands; perhaps identical with a Sumatran species.

10. *Bulbophyllum gibbosum* (Bl.) Lindl., Gen. et Sp. Orch. 54. 1830. J.J.S., Fl. Buit. 6: 422, f. 317.—*Diphyes gibbosa* Bl., Bijdr. 312. 1825.

Vegetatively very near *B. selangorensis*, the leaves to 27 by 3 cm.; inflorescence about 30 cm. long, including a scape of 15 cm. bearing about 6 short sheaths, not overlapping; bracts 6 mm., much longer than pedicel; upper sepal 6-5 by 2 mm., fleshy, narrowed gradually to the apex; lateral sepals narrowed above the swollen base, upper edges straight, 7 mm. long, <sup>3</sup>  $\wedge$ TM"  $\wedge$ de at the base; petals 2.5 by 1.2 mm. <sup>L</sup> > blunt > almost oblong; column with short broad forward-pointing arms, each with a tooth; column-foot with a small swelling; lip bent at a right angle near the blunt apex, the sides raised at the base. Distributed on the mountains of Java and Sumatra; in Malaya only found once, at Cameron Highlands. It is nearly related to *B. selangorensis*, but differs in the sheaths of the scape.

11. *Bulbophyllum linearifolium* King & Pantl., Journ. As. Soc. Beng. 66: 586. 1897. Ridl., Flora 4: 72.

Pseudobulbs 1 cm. or less apart; leaves to 16 by 0.8 to 1.4 cm., the apex shortly pointed, the base gradually narrowed to a stalk 2-3 cm. long; inflorescence to 12 cm. long, the scape 3 cm.; flowers many, small, not densely crowded; bracts about 3 mm. long; sepals 3 to 3.5 mm. long; shape



of flowers about as in *B. odoratum* but the sepals not so narrowly pointed; flowers yellowish. Found at Fraser's Hill, on Taiping Hills and Kedah Peak. Further information is needed about the details of the flowers.

12. *Bulbophyllum armeniacum* J.J.S., Bull. Botz., Ser. 2, XXV: 70. 1917.  
Carr, Gard. Bull. 7: 14. 1932.

Pseudobulbs close; leaf 6-10 by 1.6 to 2.6 cm., the stalk 1.5 to 3 cm.; inflorescence to 10 cm. including scape of 5 cm.; flowers densely crowded, cream; bracts 2.5 mm. long; upper sepal 3.5 by 1.5 mm., oblong blunt; petals 1.5 by 0.5 mm.; lip 1 mm. long; column with broad wings and acute teeth. Once collected at Fraser's Hill; known from Sumatra.

13. *Bulbophyllum leptosepalum* Hk. f., F.B.I. 5: 767. 1890. Ic. Pl. t. 2045.  
Ridl., Flora 4: 72.

Pseudobulbs close; leaves to 16 by 1.5 cm., narrowed gradually to the stalk of 3 cm.; inflorescence to 10 cm. long, including the scape of 2 cm., flowers about 16; bracts 5.5 mm. long, twice as long as the pedicels; flowers pale yellowish, almost white, the tails of the sepals a deeper yellow; upper sepal 1.1 by 0.18 cm., basal third oblong, suddenly narrowed to tail-like apical half; lateral sepals also tailed, 1.4 by 0.25 cm., curved; petals hardly 3 by 1 mm., elliptical, papillose; lip nearly 4 mm. long, 2 mm. wide, bent at a right angle in the middle, basal part grooved, edges hairy towards the blunt tip; column with short broad arms each with an ascending tooth. Found in the lowlands and at moderate elevations on the hills in various parts of Malaya.

14. *Bulbophyllum adenopetalum* Lindl., Bot. Reg. 1842: Misc. 85. Ridl., Flora 4: 71. Perhaps identical with *Diphyes flavescens* Bl.—*B. montigenum* quoad Ridl., Flora 4: 72.

Pseudobulbs close; leaves to 24 by 2.7 cm., the apex shortly pointed, narrowed to a stalk 5 cm. long; inflorescence 10 to 20 cm., including a scape of 2 to 6 cm.; flowers many, not densely crowded; bracts 4 mm. long; flowers yellowish, the lip tipped with pale orange; upper sepal 6-8 mm. long, laterals somewhat longer, all narrowed gradually to apex; petals elliptic, papillose, about 2.5 by less than 1 mm.; lip bent in the middle, 3 by 1 mm.; column arms short with erect teeth. Found at many mountain and lowland localities in Malaya; perhaps identical with *B. flavescens*, which is widely distributed in Java, Sumatra and Borneo.

### Section 11

This section consists of small or moderate-sized plants, with long-creeping or hanging rhizome, distinct though rarely very large pseudobulbs, and usually short inflorescences bearing a moderate number of flowers, more or less at the same level, or in a few cases on an elongated rachis as in section 10; the flowers small, pale greenish or more or less yellow or orange (the sepals of some species tipped with bright orange), never marked with purple, the sepals usually narrow.

As in section 10, many species are nearly related together, and we have not enough information about all of them to make exact distinctions

possible. It is probable that further collections and observations, especially from our Hill Stations, will considerably modify the present account.

Two species are included which perhaps do not naturally belong to the group, as they seem to fit here better than in any other. One of them is *B. sessile*, with solitary flowers, and the other is *B. diplantherum*, with two flowers.

### Key to the Malayan species of *Bulbophyllum*, Section 11

- Inflorescences elongated, flowers not all at the same level
- Pseudobulbs almost round, 8 mm. diameter . . 1. *B. globulus*
- Pseudobulbs conical, to 4.5 cm. tall
- Sepals unequal in length, petals 2 mm. long 2. *B. flammuliferum*
- Sepals equal in length, petals 3-5 mm. long . . 3. *B. xanthum*
- Inflorescences having flowers all at about the same level, or flowers solitary
- Flowers solitary . . . . 4. *B. sessile*
- Flowers 2 or more
- Scape at least 3 cm. long, bearing a head of 12-20 flowers; pedicels 2 cm. long
- Scape 10-12 cm.; sepals 1 cm. long . . 5. *B. laxiflorum*
- Scape about 3 cm.; upper sepal barely 7 mm. long . . . . *B. laxiflorum* var»  
*taluense*
- Scape at most 3 cm. long; flowers usually fewer; pedicels shorter
- Pseudobulbs not over 6 mm. long; flowers 2 . . . . 6. *B. diplantherum*
- Pseudobulbs to 2 cm. or more long; flowers more than 2
- Rhizome long-creeping, not pendulous
- Leaf to about 5 cm. long and 5 mm. wide . . . . 7. *B. modestum*
- Leaf much wider, in some cases longer
- Scape to 1.5 cm. long; sepals pale yellow or nearly white
- Pseudobulbs 1.5-2.5 cm. apart to 2 cm. long . . . . 8. *B. brevipes*
- Pseudobulbs 3-5 cm. apart, to 3 cm. long . . . . 9. *B. mtdtiflorum*
- Scape to 3 cm. long; sepals yellowish with orange tips . . 10. *B. concinnum*
- Rhizome pendulous
- Lip longer than wide . . . . 11. *B. angustifolium*
- Lip wider than long . . . . 12. *B. parvilabium*

1. **Bulbophyllum globulus** Hk. f., F.B.I. 5: 767. 1890. Ic. Pl. t. 2047. Ridl., Flora 4: 73.

Rhizome rather stout, creeping; pseudobulbs almost round, close, about 8 mm. diameter; leaves elliptical, about 5 by 1.6 cm., apex blunt, very shortly stalked; inflorescence taller than the leaves, the scape about half the total length; flowers about 10, fairly well spaced, small; sepals narrow, about 4 mm. long; petals half as long; lip narrow, short, curved; colour not known. Described from a single collection made in Perak about 1885. The flowers of this plant were imperfect, and the above meagre details may not be very accurate, but the vegetative habit seems distinct.

2. **Bulbophyllum flammuliferum** Ridl., J. Bot. 36: 211. 1898. Flora 4: 74.

Rhizome stout, long-creeping; pseudobulbs 3-6 cm. or more apart, to about 4.5 cm. high, oblique at the base and curved upwards, a little flattened, narrowed to the apex; leaf to 21 by 3.2 cm. (commonly about 12 by 2.8 cm.), oblong, apex rounded, base with a stalk to 5 mm. long; inflorescence 5 to 12 cm. tall, the scape to 2.5 cm., covered with sheaths; flowers yellow, with orange tips to sepals and lip; upper sepal about 6 mm., laterals 7-8 mm. long, narrow with thickened tips; petals ovate, acute, 2 by 1 mm.; lip bent near the base, 2.5 mm. long, nearly 1 mm. wide at the base, blunt; column arms short, erect, pointed. Found on limestone at Batu Caves and Kota Glanggi (Pahang); probably occurring also in the lowlands away from limestone. Further information about the distribution of this species is desired. It has the longest inflorescences in the group.

3. **Bulbophyllum xanthum** Ridl., Flora M.P. 4: 68. 1924.

Rhizome 2-3 mm. diameter; pseudobulbs 4-6 cm. apart, 2-4.5 cm. tall, slender, smooth; leaves 6-21 by 1-3 cm., apex shortly bluntly pointed, base narrowed to a stalk up to 10 mm. long; scape 3-4 cm. long, rachis about 5 cm. long bearing about 15 flowers; bracts 4-5 mm. long, 1 mm. wider flowers orange and yellow; upper sepal 5.5 by 1.5 mm., acute; lateral sepals as long, 3 mm. wide at base; petals 3-5 mm. long, more than 1 mm. wide, narrowed evenly to the tip; lip 4 mm. long, widest near the base; column with short erect arms. Collected once only, at Langkawi, on rocks.

4. **Bulbophyllum sessile** (Koen.) J.J.S., Fl. Buit. 6: 448, f. 340. 1905.—  
*Eptidendrum sessile* Koen., Retz. Obs. 6: 60. 1791. *Bulbophyllum clandestinum* Lindl., Bot. Reg. 27: Misc. 77. 1841. Ridl., Flora 4: 69.

Rhizome slender, hanging, much-branched; internodes 4 mm. long; pseudobulbs 1.5-2 cm. apart, 3 mm. long, ovoid, appressed to rhizome; leaf very fleshy, about 2 by 0.7 cm. (rarely to 4 cm. long), apex blunt with a tip, narrowed to a stalk 2 mm.; flowers solitary, borne at all nodes of the rhizome from conspicuous sheaths, the stalks very short (2 mm.); sepals 3-5 mm. long, including a narrow 3-angled tip 2.5 mm. long, tip pale yellow, base cream; petals 1-1.5 mm. long, colour as base of sepals; lip as long as petals, yellow-green; column short with triangular pointed arms. Widely distributed in Java, Sumatra and Borneo and northwards to Ienerassim; in Malaya locally abundant as an epiphyte on trees in rather open places (such as old fruit trees), often in considerable masses. **Fig. 130.**

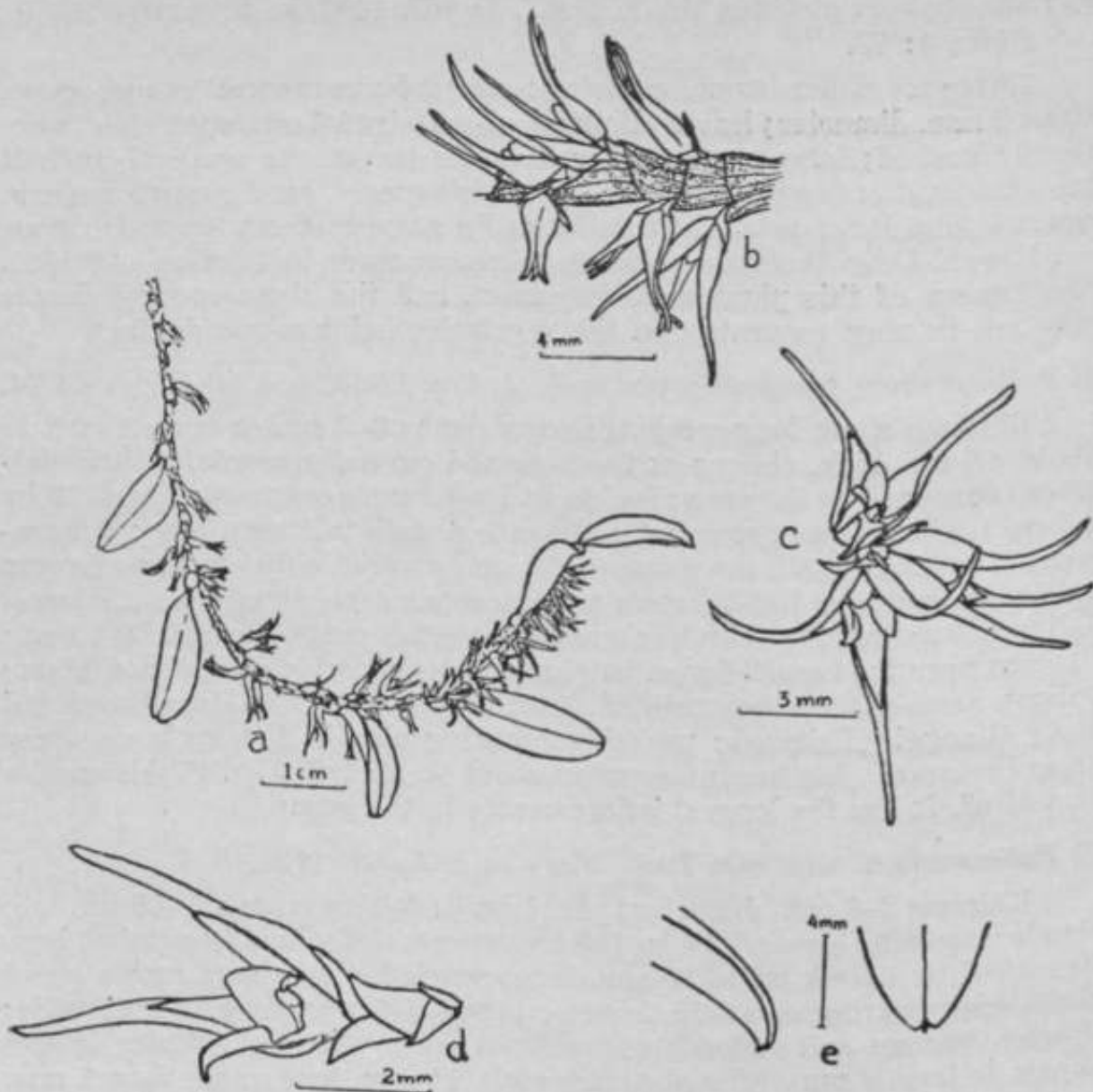


Fig. 130. *Bmbophyllum sessile*, a, plant in flower, b, c, inflorescences, d, flower with bracts; one lateral sepal and one petal removed, e, leaf-tip.

**5. *Bulbophyllum laxiflorum*** (Bl.) Lindl., Gen. et Sp. Orch. 57.1830. J.J.S., Fl. Buit. 6: 434, f. 329. Carr, Gard. Bull. 7: 22. 1932.—*Diphyes laxiflora* Bl., Bijdr. 316. 1825.

Rhizome creeping, much branched; pseudobulbs 0.5 to 1.5 cm. apart, long-ovoid, 2.5 cm. or more tall; leaf to about 12 by 2.5 cm., including a short stalk, elliptic, acute, scape 10-12 cm. long, bearing a head of 12-20 flowers, all joined to the axis close together; pedicels slender, nearly 2 cm. long; flowers white or pale yellowish, with orange lip; sepals about 1 cm. long, narrow, spreading equally; petals 6 mm. long, narrow, very short-hairy; lip very small, pointed, barely 2 mm. long; column arms long and slender. Distributed in Java and Sumatra; in Malaya found only at Fraser's Hill. Dr. J. J. Smith reports that the flowers vary in size, the sepals being from 0.9 to 1.6 cm. long.

**Var. taluense J.J.S., Bull. Botz., Ser. 3, 9: 170. 1927.-S. taluense Carr,**  
Gard. Bull. 7: 22. 1932.

Pseudobulbs about 2 cm. long, more slender than in the typical form; leaves to 12 by 1.5 cm.; scape about 3 cm. long; sepals barely 7 mm. long. This is a lowland plant found at Kota Glanggi, Pahang, and in P<sup>rh</sup> in both cases on limestone (also in western Sumatra). It appears to differ little from the typical form of the species except that it is smaller in all parts. There are however other minor differences, and if these prove constant, and there are no intermediate stages, this may be ranked as a distinct species.

**6. Bulbophyllum diplantherum Carr, Gard. Bull. 7: 27. 1932.**

Rhizome slender, creeping; pseudobulbs to 8 mm. apart, lying obliquely with base on the rhizome, apex curved upwards, to 6 by 4.5 mm.; leaf rising obliquely or horizontal, ovate-elliptic, to 1.2 by 0.6 cm.; inflorescence with 2 flowers, the scape 8 mm. long, pedicels very short; flowers not widely opening, the lip uppermost, pale greenish, 1 cm. long; upper sepal 4.5 by 1.5 mm., apical half narrow; lateral sepals 10 by 0.15 cm., very narrow above the short triangular base, ends curved; petals elliptic, blunt, 1.4 by 0.7 mm.; lip slightly curved, blunt, 1.5 by 0.7 mm., papillose; column with short erect arms little higher than the anther. Known only from the original collection from the Cheka River, Pahang.

**7. Bulbophyllum modestum Hk. f., F.B.I. 5: 759. 1890. Ic. PL t. 2038B. RidL,**  
Flora 4: 71.—*B. paullum* RidL, J.S.B.R.A.S. 61: 38. 1912. Flora 4:  
70.—*B. ochranthum* RidL, J.S.B.R.A.S. 39: 76. 1903. Flora 4: 71.

Rhizome long-creeping, slender; pseudobulbs 2-3 cm. apart, base somewhat appressed to rhizome, to about 12 cm. long, narrow; leaf to about 5 cm. by 5 mm., oblong, blunt, the base narrowed abruptly to a short stalk; scape about 3 cm. long, from base of a pseudobulb or from any node in the rhizome; flowers 3-5, close together, very pale yellow, tips of sepals and lip bright yellow; upper sepal to 6 by 2 mm., concave at base, thin, the tip thickened; lateral sepals to 7 mm. long, with narrow thickened tips; petals 2.5 by nearly 1 mm., oblong, blunt; lip very small, strongly curved, about 1 mm. wide; column arms slender, curved, erect. Distributed in Sumatra; in Malaya found at several localities on the Main Range, Taiping Hills and G. Tahan.

**8. Bulbophyllum brevipes RidL, J.S.B.R.A.S. 39: 75. 1903. Flora 4: 70.**

Rhizome creeping; pseudobulbs 1.5 to 2.5 cm. apart, curving upwards from an almost prostrate base, to 2 cm. long and about 5 mm. thick; leaf to 5 by 1.2 cm., elliptic, acute, hardly stalked; scape about 12 cm. long, bearing 5 or 6 flowers; flowers pale yellow, the sepals about 8 mm. long the lip short, curved, blunt, the column with long slender pointed erect arms. Only known from the original collection from G. Bujang Malakka, at 4,000 feet altitude.

9. *Bulbophyllum multiflorum* (Breda) Krzl., Gard. Chron. N.S. 19: 294. 1896. J.J.S., Fl. Buit. 6: 435, f. 330.—*Odontostylis multiflora* Breda, Gen. et Sp. Orch. t. 4, f. 2. 1827.

Rhizome long-creeping; pseudobulbs 3-5 cm. apart, about 3 cm. long and 5 mm. wide, cylindric, flattened near top, oblique, ribbed; leaf to 8 by 1-7 cm., oblong, short-pointed, hardly stalked; inflorescences from any node of the rhizome, often many, the scape 1 to 1-5 cm. long; flowers about 5, the sepals almost white with pale yellow tips; upper sepal 4-5 by 1-5 mm., narrowed to a long tip; lateral sepals 5-2 mm. long, narrower, the mentum very small; petals 2-5 by 1 mm., tips hooded, elliptic; lip pale orange-buff, 1-5 by 0-6 mm., blunt, nearly straight with tip slightly bent down and hollow beneath. Distributed in Java and Sumatra; in Malaya found at Kota Glanggi (Pahang), and in Perak and Kedah. This species is near *is. continuum*, but differs in the characters mentioned in the key, and also in longer pseudobulbs, broader lip and larger petals.

10. *Bulbophyllum concinnum* Hk. f., F.B.I. 6: 189. 1890. Ic. Pl. t. 2038A. Ridl., Flora 4: 70.

Rhizome slender, long-creeping, rooting at all nodes, the nodes 4-0 mm. apart; pseudobulbs curved upwards from a short prostrate base, cylindric, to 2 by 0-4 cm., 3-6 cm. apart; leaf about 4 by 1-3 cm., narrowed abruptly to both base and apex, shortly stalked (exceptionally to 2 cm. wide); scape 2-5 to 3 cm. long, with 5 or 6 flowers near together, the whole inflorescence to 4 cm. long, from any node of the rhizome; flowers yellowish with orange tips to sepals and orange lip; upper sepal 3 mm., laterals 4 mm. long, narrow, long-pointed; petals half as long as upper sepal, very narrow, oblong, acute; lip narrow, 12 mm. long, barely 0-5 mm. wide at the base, almost straight, narrowed to downturned blunt tip; column with slender curved erect arms. Found on old mangrove and by rivers in Singapore and Johore, and also in Sumatra.

11. *Bulbophyllum angustifolium* (Bl.) Lindl., Gen. et Sp. Orch. 57. 1830. J.J.S., Fl. Buit. 6: 439, f. 334.—*Diphyes angustifolia* Bl., Bijdr. 314. 1825.

Rhizome with creeping base and pendulous branches along which the roots run closely; pseudobulbs lying on rhizome or at a small angle to it, 3-4 cm. apart, cylindric, about 2 cm. by 5 mm. or sometimes larger; leaf to 9 by 1-5 cm., sometimes wider, oblong-elliptic, the base narrowed but hardly stalked; scape 1-5 to 3 cm., bearing about 5 flowers; sepals pale yellowish with bright orange tips; upper 0-6 to 1-1 cm. long, narrowed to a long thickened tip; lateral sepals a little longer, and wider at the base; petals 2 to 6-5 mm. long, elliptic, blunt, the tips orange; lip 1-2 mm. long, ovate, strongly curved, orange with yellow edges; column with slender curved arms rising just above the anther. Originally found in Java; in Malaya apparently not uncommon in exposed places on the mountains. The

dimensions of the floral parts are copied from Dr. J. J. Smith's work; Malayan plants are probably smaller than the upper limits given. It is possible that more than one species is included here; more field observations are needed. The plants formerly reported as *B. capitatum* mostly belong here; *B. capitatum* is a Java species with pale flowers.

12. ***Bulbophyllum parvilabium*** Schltr., Engl. Bot. Jahrb. 45, Beibl. 104: 52. 1911.

Rhizome pendulous with roots appressed to it; pseudobulbs 1-2 cm. apart, to 2-5 cm. long and 5 mm. thick, cylindric, parallel to the rhizome and close to it; leaf elliptic, obtuse, to 7.5 by 2 cm.; inflorescence of 2-4 flowers on a scape under 1 cm. long; flowers orange, paler at bases of sepals; sepals long-pointed, about 7 mm. long; petals hardly 3 mm. long, blunt; lip curved, hardly 2 mm. long, 2-5 mm. wide in the middle; column arms reaching little above the anther. This species was originally found in the Padang Highlands of Sumatra. It is very near *B. angustifolium*, and further field observations upon it are needed. The two species appear to grow side by side on our mountains. *B. parvilabium* has also been reported from Penang Hill.

### Section 12

Here are included all those species with more or less elongated inflorescences which are not in sections 10 and 11; that is, those which have not entirely yellowish or orange flowers. Plants, inflorescences and flowers vary a good deal in size. On the one hand, there are rather large-flowered species which do not differ in essentials from those of section 4, and are usually included in the section *Sestochilos*; some of these are foul-smelling, and most of them have rather compact inflorescences, the flowers close together, with short pedicels. These lead on, with no very clear division, to species with smaller flowers and very compact inflorescences, more or less elongated, usually more or less drooping downwards, the flowers lying close to the axis, their lateral sepals side by side with inner edges often joined. Some of these plants have quite small pseudobulbs, but usually fairly large leaves. One species only is very small, *B. botryophorum*.

Included in the section also, for the sake of convenience, are two species (*B. tahanense* and *B. Wrayi*) which have rather open inflorescences, the flowers not large, on relatively long slender pedicels. They have less purple colour than most of the rest of the species in the section.

### Key to the Malayan species of *Bulbophyllum*, Section 12

- Sepals and petals with coarse hairs on edges .. 1. *B. hispidum*  
 Sepals and petals without such hairs  
   Scape not more than 3 cm. long  
     Pseudobulbs hardly distinguishable, leaf to  
       2-5 by 1-3 cm. .. .. 2. *B. botryophorum*

- Pseudobulbs at least 5 mm. long, leaf larger  
Pseudobulbs under 1 cm. long, rather close  
Rhizome pendulous, leaves 8 by 4 cm. . . 3. *B. salaccense*
- Rhizome not or very shortly pendulous;  
leaves proportionately narrower  
Lip 4 mm. long . . . . . 4. *B. trifolium*
- Lip hardly over 2 mm. long  
Lip 0.5 mm. wide, edges not hairy 5. *B. sp.*
- Lip 1 mm. wide, edges hairy . . . 6. *B. pcekilon*
- Pseudobulbs at least to 2 cm. long, well  
spaced . . . . . 7. *B. singaporeanwrn*
- Scape longer (often much longer)  
Scape about 50 cm. long . . . . . 8. *B. elongatum*
- Scape shorter  
Flowers in a very compact inflorescence,  
with short pedicels  
Lateral sepals about twice as long as  
upper sepal . . . . . 9. *B. lilacirvwm*
- Lateral sepals not greatly longer than  
upper sepal . . . . . 10. *B. limbatum*
- Pseudobulbs 17 mm. diameter, wider  
than tall . . . . . 11. *B. fctidolens*
- Pseudobulbs taller than wide  
Pseudobulbs widely spaced, to 5 cm.  
tall . . . . . 12. *B. coniferum*
- Pseudobulbs to 1 cm. apart, not  
over 1 cm. tall  
Upper sepal about 2 mm. long 13. *B. musciferum*
- Upper sepal at least 4 mm. long  
Petals with a tuft of short  
dark red hairs on their  
tips . . . . . 14. *B. alcicorne*
- Petals without such hairs-  
Pseudobulbs 4 mm. long;  
rachis 4 cm. long; bracts  
1 mm. long . . . . . 15. *B. apiferum*
- Pseudobulbs 1 cm. long; ra-  
chis 15 mm. long; bracts  
3-5 mm. long . . . . . 16. *B. lasianihum*
- Inflorescence rather open; pedicels slender,  
1 cm. or more long  
Flowers dark purplish, upper sepal 3-5  
cm long . . . . .



- Flowers not dark purplish, smaller  
 Inflorescence to 40 cm. long; upper  
 sepal 6 mm. long .. . . 17. *B. Wrayi*  
 Inflorescence to 15 cm. long; upper  
 sepal 1 cm. long .. . ., 18. *5. tahanense*

1- **Bulbophyllum hispidum** Ridl., J.L.S. 32: 268. 1896. Flora 4: 61.

Rhizome 5 mm. thick, internodes about 1.5 cm., sheaths short; pseudobulbs to 8 cm. apart, 2-5 cm. long, ovoid-conical, the base 1.5 cm. wide; leaf to 20 by 5 cm., evenly elliptical with stalk 2 cm. long; scape 15 cm. long; flowers about 8 in a close group, deep red; pedicels about 1.5 cm. long; upper sepal 1-2 by 0.7 cm.; lateral sepals partly joined together along their lower edges; sepals and petals with coarse dark curved hairs along their edges; lip tongue-shaped, warty, with two tooth-like processes near the base. Only known from the original collection, from Kedah Peak at 4,000 feet altitude.

2. **Bulbophyllum botryophorum** Ridl., J.L.S. 32: 275. 1896. Flora 4: 69.

Rhizome less than 2 mm. thick, creeping and branching; pseudobulbs very small, hardly distinguishable; leaves alternate on either side of the rhizome, 6-7 mm. apart, to 2.5 by 1.3 cm., elliptical with rounded tip, fleshy; inflorescence about 3-5 cm. long, the scape 2-5 cm., the flower-head drooping, very compact; flowers about 5 mm. long; upper sepal 4 by 2 mm., long-pointed, hooded over column, pale greenish with purple veins and edges; lateral sepals broader, their upper edges diverging, blunt, purplish with 3 dark purple veins; petals 2 by 1.3 mm., white with single dark purple vein, and dark purple toothed edges and elongated tip; lip olive-yellow, suffused with purple towards the base, papillose all over, 3 mm. long. Found only on old mangrove and on trees by rivers in Singapore, Johore and Pahang.

3. **Bulbophyllum salaccense** Rchb. f., Bonpl. 5: 57. 1857. J.J.S., Fl. Buit. 6: 430, f. 325.—*Cochlia violacea* Bl., Bijdr. 320, f. 59. 1825.

Rhizome hanging, the younger parts covered with large overlapping sheaths which hide the small pseudobulbs; pseudobulbs 8 mm. long, narrow, appressed to the rhizome; leaves alternating on either side of the rhizome, broad, to 8 by 4 cm., widest near base which is hardly stalked, apex bluntly pointed; scape to 3 cm. long, bearing a close head of several flowers; pedicel and ovary 2 mm. long; flowers small, fleshy, violet-purple; upper sepal 3-5 by 2 mm., tip broad, rounded; lateral sepals similar; petals very small, 1.5 by less than 1 mm., widest at tips which are broadly rounded and papillose; lip under 2 mm. long, papillose, the tip rounded. Distributed in Java, Sumatra and Borneo; in Malaya only found at Fraser's Hill, at about 3,500 feet altitude.

4. **Bulbophyllum trifolium** Ridl., J.L.S. 32: 278. 1896. Flora 4: 68.

Pseudobulbs very close, ovoid, about 5 mm. long; leaf to 15 by 2.5 cm., broadest in the upper half, shortly pointed, narrowed gradually to a short stalk; scape 2-5 cm. long, the flower-head dense, to 2 cm. long; bracts 3 mm. long, narrow; upper sepal 6 by 2 mm, hairy on the back, acute,

white with pink veins; lateral sepals 7 mm. long, hairy on backs, ends acute and diverging, colour as upper sepal; petals nearly 3 by 1 mm., more or less oblong, ends blunt; lip about 4 by 1.5 mm., blunt, white with pink spots and a central groove, papillose towards base. Known only from the lowlands of Singapore, Johore and Pahang, on trees by rivers.

5: *B. sp.*

Rhizome pendulous (?), short; pseudobulbs 5 mm. long, appressed to the rhizome, rather close; leaf to 7 by 2.2 cm., widest in upper half, apex a right angle, base gradually narrowed, not stalked; inflorescence about 1.5 cm. long (including scape) with many crowded flowers; upper sepal 4 mm. long, narrow, long-pointed; lateral sepals 5.5 mm. long, close together, their ends only diverging, hairy on the back; petals barely 2 by 0.5 mm., oblong, acute; lip barely 2 by 0.5 mm., basal third narrowed, rest oblong, apex blunt; column arms curved upwards obliquely, 2-toothed. Only known from G. Panti, Johore, 1,700 feet (Carr 434).

6. *Bulbophyllum pcekilon* Carr, Gard. Bull. 7: 15. 1932.

Pseudobulbs close, prostrate, flattened, 6 mm. long, 4.5 mm. wide; leaf elliptic, fleshy, suffused with purple, to 3.5 by 1.8 cm., stalk very short; inflorescence very short, the scape 5 mm., rachis 5 mm. long; flowers about 12, densely clustered, hardly opening, bracts 4 by 3 mm., acute, much longer than pedicel and ovary; sepals and petals pale greenish, densely and irregularly spotted with deep red inside; upper sepal about 5 by 2 mm., acute; lateral sepals 5.3 by 3.3 mm., curved, acute, the lower edges in contact almost throughout, papillose and short-hairy on both sides; petals 3 by 1 mm., base narrow, widest in the middle, blunt; lip 2.2 by 1 mm., greenish with red spots, edges short-hairy; column with short broad wings. Found only at Fraser's Hill; a curious little species.

7. *Bulbophyllum singaporeanum* Schltr., Fed. Rep. 9: 165. 1911.—*B. densiflorum* Ridl., J.L.S. 32: 277. 1896. Flora 4: 68 (non Rolfe).

Rhizome about 4 mm. thick, covered closely with sheaths; pseudobulbs to 10 cm. apart, to 5 cm. long and 6 mm. wide, a little flattened; leaf to 30 by 4 cm., narrowed equally to base and apex, the basal 2 cm. a stalk; scape 1.5 cm. long, covered with several sheaths; flowering portion of inflorescence 4 cm. long, with many flowers which are very pale purplish green with darker purple spots, foul-smelling, not wide-opening; pedicel and ovary 5 mm.; upper sepal hooded, 10 by 5.5 mm., acute, keeled on the back; mentum 4 mm. long, at an obtuse angle to the ovary; lateral sepals 1.4 cm. long, their lower edges continuing almost in the line of the mentum, diverging slightly, apical portion strongly keeled, acute; petals 7 by 3 mm., shortly pointed; lip 6 mm. long, 4 mm. wide at the base, strongly curved, tip pointed, upper surface deeply grooved almost to the tip. Found as an epiphyte by rivers in the lowlands of Singapore and Johore. Fig. 131.

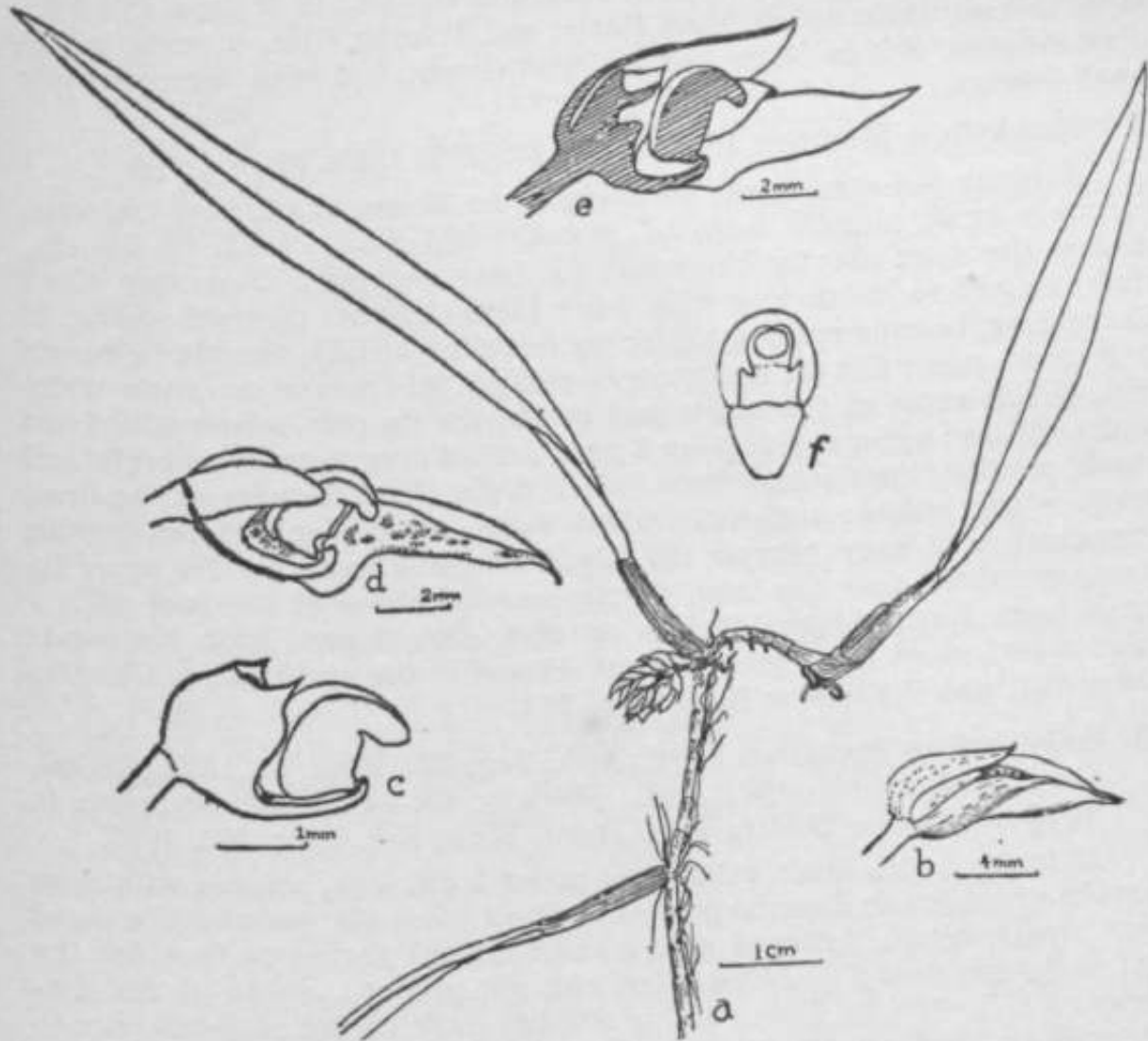


Fig. 181. *Bulbophyllum singaporeanum* a, part of inflorescence, b, flower from side, c, column and lip from side, d, column and lip from side, e, section through column and lip, f, column and lip from above.

8. *Bulbophyllum elongatum* (BL) Hawk. Cat. Bo. 39. 1844. JJAj, 67.

Buit. 6: 426, f. 321. - wmm elong. Z? U- 67

*Bulbophyllum gigas* RidL, JX.S. 32: 277. 1896. Flora 4-67

Rhizome to 1 cm. thick, internodes 3 cm. long, sheaths not fibrous; pseudobulbs 15 cm. apart, cylindrical, about 1 cm. long and wide; leaf to about 60 cm. long, including a stalk of 15 cm. and 16 cm. wide, widest near the apex, very shortly pointed, narrowed gradually to the stalk; inflorescence to about 60 cm. long, the scape 50 cm. covered with many sheaths up to 7 cm. long; flowering portion cul. ve d somewhat downwards, bearing many flowers; bracts 1 cm. long, the pedicel long, the ovary fine red and ovary; flowers white with purple spots, the lip yellow with fine red spots; upper sepal 18 by 0.4 cm.; petals 3 by 0.3 cm. late in the year; twisted at the base so that they are almost in the same plane; upper sepal; petals 14 by 0.15 cm., upper lip 5 cm. long, narrowed, blunt, centre grooved; column with erect WCT

lateral wings very short. Found in Java and Borneo; in Malaya at 3,500-4,500 feet elevation on the Main Range and Taiping Hills, in moist places near streams. A fine large species vegetatively, but with comparatively small flowers.

9. **Bulbophyllum lilacinum** Ridl., J.L.S. 32: 276. 1896. Flora 4: 68.

Rhizome 3-4 mm. thick; pseudobulbs to 12 cm. apart, to 6 cm. long, narrowly ovoid, slightly 4-angled, smooth; leaf fleshy, to 27 by 3-5 cm., oblong, the apex shortly blunt-pointed, base narrowed to a very short stalk; scape 5 to 10 cm. long with a few large sheaths; rachis drooping, to 15 cm. long, bearing many overlapping flowers which lie close to it; bracts to 8 by 2-5 mm.; flowers not widely opening, pale mauve or nearly white with purple spots on the sepals and petals, the lip pale yellow with faint pink mottling; upper sepal 5-5 by 3 mm., arched over column, acute; lateral sepals parallel, their inner edges joined for a short distance at the base, acute, warty outside and with raised veins, 0-9-1-1 by 0-45 cm.; petal triangular with very narrow tip, blade 2-5 by 1 mm., tip 1-5 mm., strongly curved near the base, deeply grooved above at the base with small erect forwards-pointed lobe on each side, 3 mm. long, tip blunt; column with short erect pointed arms. Found in the north only, in Kea Langkawi, and Peninsular Siam. **Fig. 132.**

10. **Bulbophyllum limbatum** Lindl., Bot. Reg. 26: Misc. 74. 1840. Burki, Gard. Bull. 2: 441. 1921. Ridl., Flora 4: 65.—Probable synonym, *oblepharosepalum* Schltr., Bull. Herb. Boiss. Ser. 2, 6: 462. 1906.

Rhizome 4 mm. thick, internodes under 1 cm. long, covered with close sheaths which break down to groups of fibres when old; pseudobulbs 8 cm. apart, round, flattened with a short central projection to which leaf is joined, finely wrinkled when old, not grooved, about 1-7 cm. diameter; leaf to 12-5 by 3 cm., evenly elliptic, stalk 1-5 cm.; inflorescence 18 cm. long, the scape 13 cm., flowering portion not drooping, flowers 14; bracts 2 mm. long, acute; upper sepal 7 by 4 mm., blunt, finely wrinkled hairy on the edges, yellowish, edges and veins dark red; lateral sepals widely diverging, blunt, colour as upper sepal; mentum curved forwards; petals 4 by 2 mm. oblong with rounded tips, 1-veined, colour as upper sepal; lip 6 by 3-5 mm., fleshy, the rounded tip a little narrower than at base, a central basal hollow smooth, rest densely papillose, deep yellow at the base, brown towards apex; column yellowish with 2 short erect teeth, anther papillose, yellow. Found only in Singapore and south-eastern Johore; perhaps also in Sumatra. The peculiar pseudobulbs are unlike those of any other local species.

11. **Bulbophyllum foetidolens** Carr, Gard. Bull. 5: 135. 1930.

Rhizome about 4 mm. thick, covered closely with sheaths; pseudobulbs 6 cm. apart, to 5 cm. long and 6 mm. wide, a little flattened; leaf to 22 by 3-2 cm., narrowed equally to base and apex, the basal 2 cm. a stalk; scape dark red-purple, erect, about 13 cm. long, bearing a drooping inflorescence 5 cm. long with many flowers close together; bracts 4 by 3 mm.; pedicel and ovary 7 mm. long; upper sepal 7-5 by 3 mm., densely spotted and suffused with purple; lateral sepals similar, slightly drooping; petals

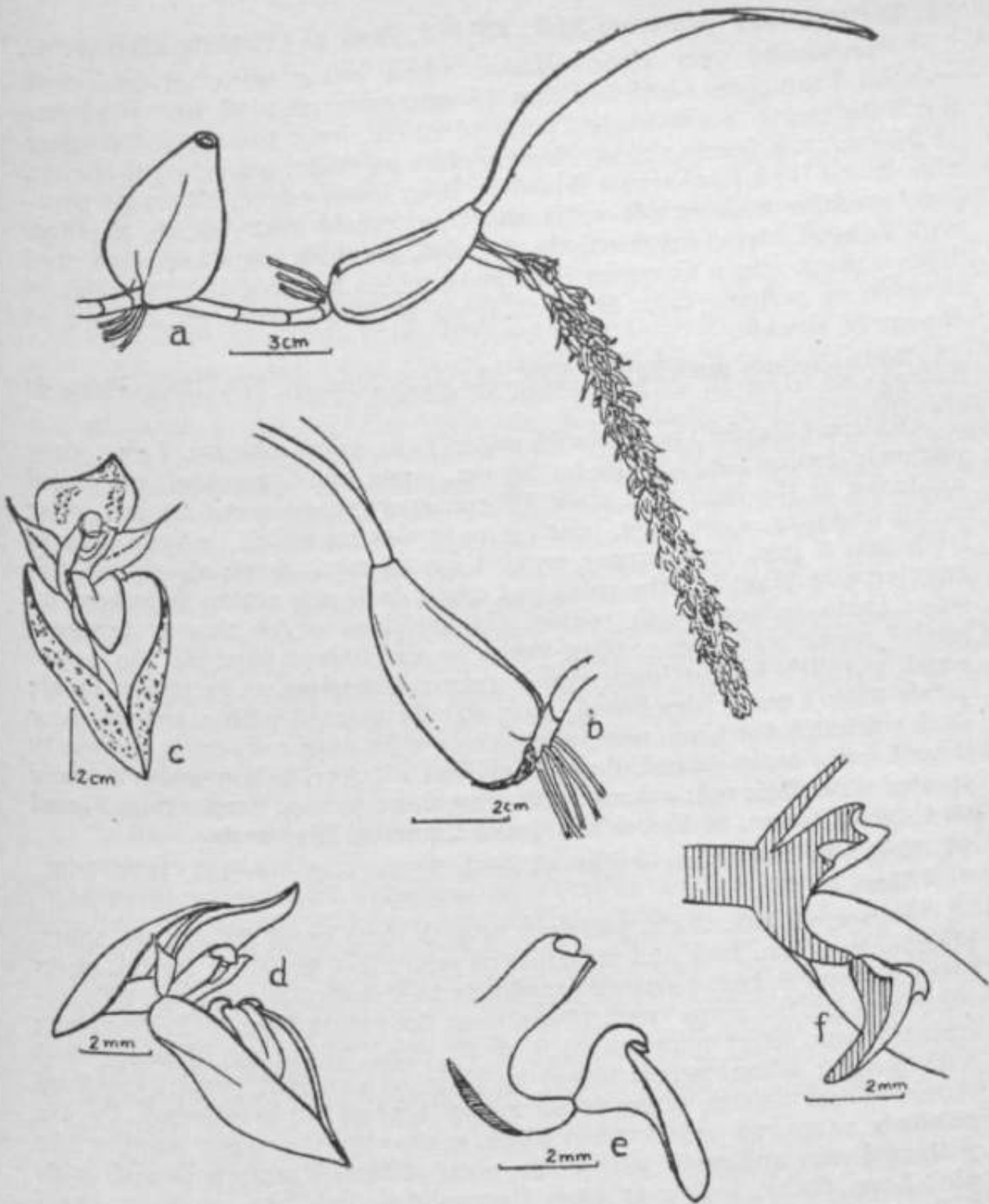


Fig. 132.

rescence. *b*, a pseudobulb. *c*, flower column, column-foot and lip.

lip. /, section through column, column-foot and lip. spreading, 5 by 1 mm., upper half white, basal half purple; lip curved, margins at the base narrowed to a mm. long and under 2 mm. wide brown-purple. feet on Gunong Tahan; vegetatively very similar with a much longer scape and smaller flowers, wmcn smelling.

12. **Bulbophyllum coniferum** RidL, J.F.M.S. Mus. 4: 67. 1909. Flora 4: 67.

Pseudobulbs very close, oblique, when young quite covered with sheaths, 7 mm. long; leaf to 15 by 3-5 cm., apex rounded, narrowed gradually to shortly stalked base; scape to 20 cm. long, the rachis drooping, to 2-5 cm. long, bearing many flowers close together; upper sepal about 2 mm. long (?); lateral sepals joined by their lower edges; all sepals papillose, greenish with purple veins and tips; petals ovate, acute, papillose with fringed edges; lip short, tip rounded, greenish, papillose. Described from a plant, origin Cameron Highlands, which flowered in cultivation in Singapore; perhaps only different from *B. musciferum* on account of change of climate.

13. **Bulbophyllum musciferum** RidL, J.F.M.S. Mus. 6: 176. 1915. Flora 4: 66.

Rhizome slender; pseudobulbs under 1 cm. apart, oblique, 7 mm. long narrowly conical; leaf to 16 by 3-5 cm., apex blunt, rounded, gradually at the base to a stalk 1-5 cm. long; scape about 20 cm. long, rachis drooping, 4 cm. long, bearing many flowers which lie very close together; bracts 2 mm. long; upper sepal 4 by 2-5 mm., 3-veined, almost triangular with blunt tip, the veins and edges dark red, centre yellow; outer parts suffused with purple, tip papillose, edges shortly fringed; lateral sepals narrower, yellow-green in the halves towards the upper sepal, purplish by the lower edges, colour otherwise as in upper sepal; petals 2 by 1 mm., base broad, apex shortly pointed with a tuft of dark red hairs, the blade pale yellow-green with dark red edges; lip 2 by 1 mm., heart-shaped, fleshy, papillose all over, yellow-green spotted with dark red; column with very short pointed erect arms, on Gunong Tahan, at Fraser's Hill and Cameron Highlands.

14. **Bulbophyllum alcicorne** Par. et Rchb. f., Tr. L. S. 30: 151. 1874. Ridley, Flora 4: 66.

Rhizome 3 mm. thick; pseudobulbs with their bases about 1 cm. apart, oblique, to 4 mm. long and not quite so wide; leaf to 16 by 1-5 cm., bluntly rounded, base narrowed gradually to a stalk 2-3 cm. long; pseudobulb slender, the scape erect, 10 cm. long, the rachis 4 cm. long, drooping; bracts 1 mm. long; upper sepal 6 by 2-2 mm., white, tipped and veined with purple; lateral sepals joined by their inner edges, curved down on either side of the lip, pink; petals 2-8 by 1 mm., the base broad, the tip suddenly narrowed with toothed edges, erect near the upper sepal, white with mid-vein and teeth purple; lip about 4 by 1-5 mm., yellowish with pink base, fleshy, hollow at base, tip rounded, papillose except in the middle; column with short 2-pointed arms projecting forwards. Distributed from Tenasserim southwards to Johore; several times collected on Penang Hill.

15. **Bulbophyllum Holttumii** Hawkes, Lloydia 19: 93. 1956. *B. apiferum* Carr, Gard. Bull. 5: 133, pi. III, f. 3. 1930 (not of Schltr.).

Pseudobulbs close, oblique, the apex turned upwards, 1 cm. long, ovoid; leaf erect, stiff, to 20 by 2 cm., tip rounded and very shortly pointed, base narrowed to a stalk 4 cm. long; scape slender, to 14 cm. long, bright red-purple; rachis drooping, at an obtuse angle to the scape about 1-5 cm.

long, bearing about 14 flowers; bracts 3-5 mm. long, broad; flowers without pedicels, not widely opening, pale pink, veined with dull red-purple, the lip minutely spotted with purple; upper sepal 7 by 4 mm., oblong, shortly pointed; lateral sepals with inner edges close together, diverging, together making a background for the lip; petals 3-5 by 1 mm., blunt; lip bent at a right angle near the base, the blade 5-5 by 4 mm., papillose; column with narrow erect triangular arms. Found on Gunong Tahan and G. Brinchang at Cameron Highlands.

**16. *Bulbophyllum lasianthum*** Lindl, Gard. Chron. 1855: 53. Ridl., Flora 4: 65. J.J.S., Bull. Bot., Ser. 3, Suppl. II: t. 95, IV.

Rhizome about 8 mm. thick; pseudobulbs 10-15 cm. apart, to 7-5 cm. long and 1-5 cm. thick, slightly flattened; leaf to 40 by 10 cm., including a stout stalk 4-5 cm., the blade elliptical, bluntly pointed; scape stout, 10-30 cm. long, the base covered with numerous sheaths 1-5 to 2-5 cm. long; flowers about 12, close together, dark red-purple, not widely opening, foul smelling, the sepals hairy outside; bracts greenish, narrow, about as long as pedicel; pedicel 2-5 cm. long; upper sepal 3-5 by 0-6 cm., concave, hair-pointed; lateral sepals 1 cm. wide at the base; petals 2-5 by 0-3 cm., hair-pointed; lip fleshy, strongly curved near the base, the rest straight, 1-7 cm. long, grooved at the base, narrowed evenly to a rather abrupt tip; column with broad arms and slender teeth. Distributed in Java, B<sup>o</sup>T<sup>M</sup> and Sumatra; in Malaya a lowland species, found in all parts of the country, on trees and rocks in moist shady forest.

**17. *Bulbophyllum Wrayi*** Hk. f., F.B.I. 5: 766. 1890. Ic. PL t. 2044. Ridl., Flora 4: 66.

Rhizome 4-5 mm. thick; pseudobulbs 4-5 cm. apart, when young covered by long sheaths, somewhat oblique, to 3 cm. long and 2 cm. wide at the base; leaf to 35 by 6-5 cm., apex bluntly pointed, base more gradually narrowed to a stalk 10 cm. long; inflorescence to 40 cm. long, the scape 2-5 cm.; bracts 3 mm. long, pedicel and ovary 1 cm.; flowers 1 cm. long and wide, greenish with pink spots; upper sepal 6 mm. (or 1 cm. ?) long, somewhat hooded, blunt; lateral sepals diverging and curved downwards; petals about 3 mm. long, oblong with rounded tips; lip narrow, blunt, bent at a right angle in the middle. Found on Taiping Hills, at Cameron Highlands and at Eraser's Hill; but full information about this species is not yet available.

**18. *Bulbophyllum tahanense*** Carr, Gard. Bull. 5: 142, pi. III, 1. 1930.

Rhizome 3-5 mm., thick, internodes 4-6 mm. long; pseudobulbs 1-3 cm. apart, basal part prostrate, curved upwards from the middle, narrowly conical, 1-2 cm. long; leaf erect, stiff, to 8-5 by 1-7 cm., apex bluntly pointed, base shortly stalked; inflorescence to 15 cm. long, the scape 8 cm., the flowers well spaced; bracts 1 mm. long; pedicel and ovary 1 cm. long, flowers pale yellow with dark red lip, fairly widely opening; upper sepal 10 by 3 mm., laterals about the same; petals 5 by 3 mm., elliptic; lip strongly curved with apex turned back, 3-5 by 2 mm.; column with short erect tooth-like arms. Found only at about 5,000 feet altitude on Gunong Tahan.

## Cultivation of Bulbophyllum

Few Bulbophyllums are in general cultivation. A small proportion only have large and attractive flowers, and of these most are mountain plants, or are shy of flowering. But many species are not difficult to cultivate, and some of the section Cirrhopetalum especially (section 2) are very graceful and attractive.

The majority of Bulbophyllums need a shady place (not too dark) and fairly moist conditions. Owing to their creeping habit, they are usually best grown on pieces of wood or tree-fern root. These need renewal from time to time as they become rotten. Many species grow well if pieces of root of the bird's nest fern are attached to their supports; this fern root also needs renewal every few months, and should never be placed so that it smothers the orchid roots.

Dakus gives particulars of a few large-flowered species of Bulbophyllum, chiefly from Borneo and New Guinea. Some of these are mentioned briefly below. Of the Malayan species, *B. Lobbii*, *B. uniflorum*, *B. maximum* and a few others are very handsome, but are mountain plants and not easy to grow or flower in the lowlands. Probably the species of section 2 are those best worth growing.

*B. Beccarii* is a Bornean species which has leaves to 40 by 20 cm. and very large inflorescences of rather small (1 cm. diameter) very foul-smelling flowers. It is not easy to grow in Singapore, and is in any case curious rather than beautiful.

*B. fritillariiflorum* is a very remarkable New Guinea species with single large flowers, the upper sepal 7 by 5 cm., erect, the laterals as long, joined together and pointing forwards, pale green-yellow marbled with red-brown. It appears to be rare in cultivation.

*B. grandiflorum* occurs in south Sumatra, Celebes, the Moluccas and New Guinea. It has an upper sepal 10-13 by 4-5 cm., and laterals rather more than half the size, curiously curved and twisted, the petals and lip very small; again a curious rather than beautiful species. Well-grown plants will flower in Singapore. Fig. 133.

*B. Lobbii* and *B. Dearei* from Borneo are both more attractive. The former is very variable, the finest forms being very handsome. *B. Dearei* is rather near to *B. reticosum* (section 4). Both can be grown in the lowlands, but not easily.

*B. Fletcherianum* from New Guinea has large pseudobulbs and very large pendulous leaves, but the flowers are neither very large nor very beautiful.

*B. ornatissimum* from Burma, a single-flowered Cirrhopetalum with long flowers, does quite well in Singapore.

## CATTLEYA and related Genera

This group of orchids, native in the American tropics, provides some of the largest and most handsome flowers in the whole family, so much so that Cattleya is the typical orchid for most people. Besides Cattleya, there are six other genera related to it, so closely related that species of Cattleya have been hybridized with species of all the other genera, and most of these



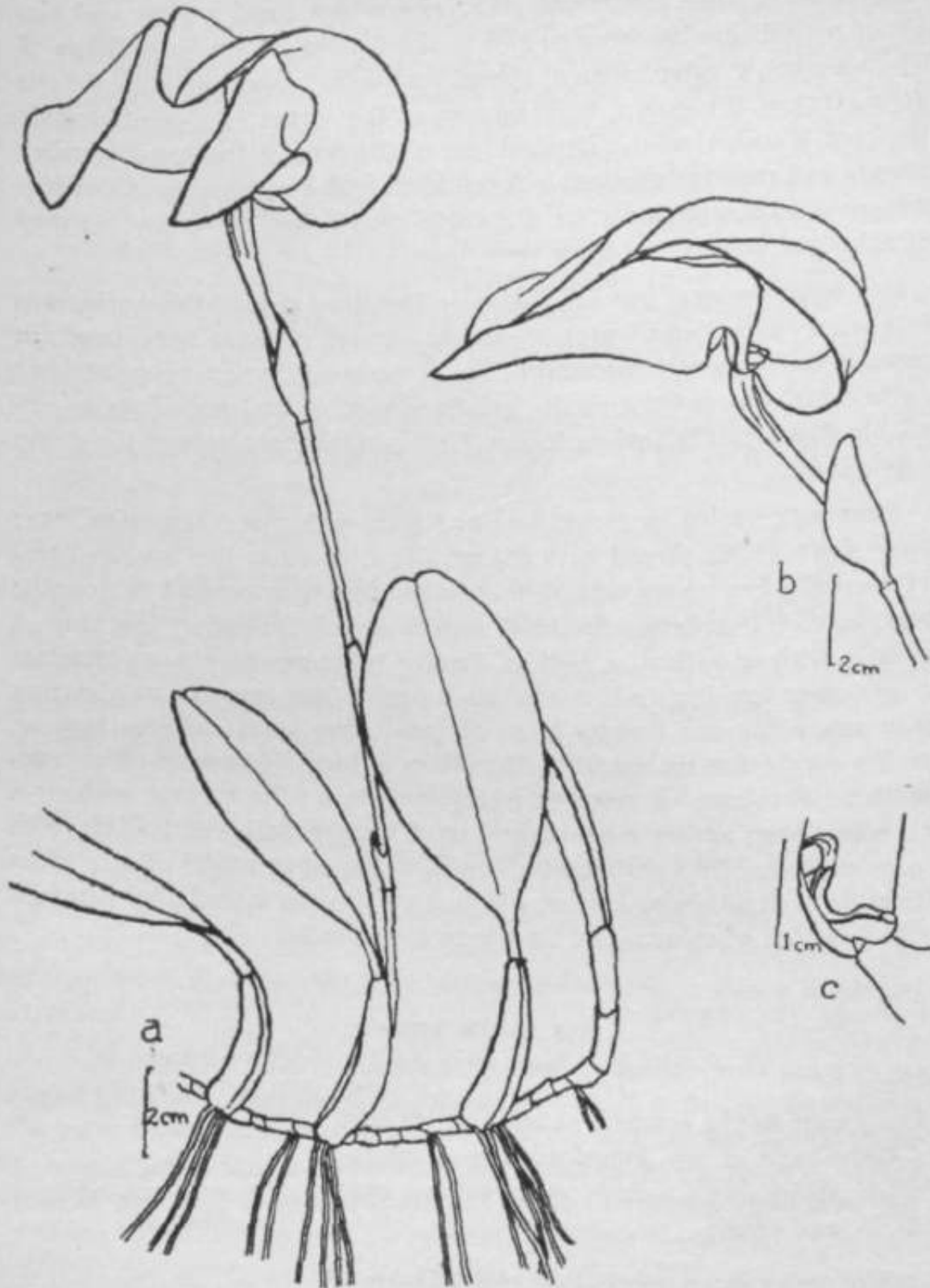


Fig. 133. *Bulbophyllum grandiftomm*. *a*, plant in flower, *b*, flower, *c*, column and a petal, with the bases of the lip and sepals.

with each other also. A number of hybrids have been produced with ultimate parents in three different genera, and a few even are derived from four genera. Though none of these other orchids have flowers so large a&

*Cattleya labiata*, they contribute other characters besides size, and the result of hybridizing has been to add to the distinctive size and shape of *Cattleya* a much greater range of colour, and some variation in the details of form. One of the group, *Epidendrum*, is the largest genus of orchids in the New World, rivalling *Dendrobium* of the Asiatic tropics in number of species and range of vegetative form. Most of the species, as of *Dendrobium*, are small-flowered, and hardly worth cultivating, but a few are very decorative and well worth growing.

In a large group of species, native on the other side of the world, it is natural that only a small proportion are grown, or have been tried, in Malaya. A comprehensive account of the group is not here appropriate, but we give below descriptions of the principal species, and such data as are available about their behaviour locally. The general characters of the group are as follows.

Stem very varied in form, long and thin with many leaves or more usually short and thickened with one or a few leaves at the top, the basal part covered when young with thin sheaths, always sympodial in growth; leaves more or less fleshy, flattened or cylindrical, jointed at the base of the blade, with or without a distinct sheath; inflorescence always terminal<sup>1</sup> (in rare cases forming itself a separate branch of the sympodium) bearing one or many flowers; flowers large or small, the petals usually broader than the sepals, the lip usually larger than either; lip usually either surrounding the column or more or less joined to it; the column without a foot, often long; anther containing 4 or 8 usually flattened pollinia with slender caudicles (if 8 pollinia, the caudicles joined in pairs) ; ovary often with at its apex a tubular hollow, which is continuous with the tube formed by the junction of column and lip where such occurs.

### Key to the genera

#### Pollinia 4

Lip joined to the column, at least at its base

Only base of lip joined to the column; a conspicuous hollow neck between ovary and sepals . . . . . • •

*Broughtonia*

Lip and column more fully joined; top of ovary without a conspicuous hollow neck

*Epidendrum*

Lip free from the column

Lip flat, with two hollow protuberances near the base on upper side .. . . . • •

*Diacrium*

- Lip more or less completely enfolding the column (except in *Cattleya bicolor*), without such protuberances
- Side-lobes of lip quite distinct from midlobe, their free ends standing above the anther .. .. *Epidendrum*
- Side-lobes of lip joined to midlobe for the greater part of their length, without conspicuous free ends .. *Cattleya*

## Pollinia 8

- Stigma a hollow in the front of the column
- Base of lip gradually merging into blade
- Lip surrounding the column, sepals and petals with edges not wavy .. *Lselia*
- Lip not surrounding the column, edges of sepals and petals conspicuously wavy *Schomburgkia*
- Base of lip tightly enclosing the column, suddenly broadened into the blade .. *Brassavola*
- Stigma of two arms raised above the anther .. *Sophronitis*

## BROUGHTONIA

This is a small genus, closely related to *Epidendrum*, differing in the points noted in the key. The hollow neck is present, to a lesser extent, in some species of *Epidendrum*. The genus is by some authors united to *Epidendrum*.

The only species known to have been tried in Malaya is **B. sanguinea**, native of Cuba and Jamaica. This thrives quite well in Singapore, treated in the same way as *Cattleya*. The pseudobulbs are short and broad, up to 5 cm. long, strongly flattened, bearing two leaves 10-12 cm. long; the scape is about 20 cm. long, slender, and bears a succession of flowers, one or two at a time, the flowering lasting some weeks. The flowers are a bright crimson-purple, the petals twice as wide as the sepals, the lip still wider, without side-lobes, with a yellow central band or basal patch, clear or veined with orange; the diameter of the flowers is about 2.5 to 4 cm. Though small, these flowers are attractive on account of their unusual colour. Fig. 134.

## EPIDENDRUM

As noted above, this is a very large genus; at least 700 species are known. Many of them resemble *Cattleya* in habit, with more or less thickened pseudobulbs bearing a few leaves at the top; in these species, the leaves have no sheaths, as in the sections *Callista* and *Latourea* of *Dendrobium*, which they much resemble in habit. Other species of *Epidendrum* have thin stems, sometimes quite long, with many leaves, the leaves having sheaths. One of these, *E. radicans*, has roots at intervals all up the stem, thus having very much the habit of *Arachnis* or some other member of the *Vanda* tribe; but the *Epidendrum* always has terminal inflorescences, and the new growth of the plant must be from a lateral branch, though this does not always come right from the base, as in most sympodial orchids.

Some species (but not all) which have the same growth-habit as *Cattleya* have also a lip almost free from the column. The species in the present account which have this combination of characters are *E. atropurpureum* and *E. Hanburii*. They are further distinct in having narrow projecting side-lobes on their lips, and they have been placed in a separate genus *Encyclia* by Schlechter and some other botanists. But intermediates exist, including some with the column joined to the lip for half its length, and there is a species named *E. aurantiacum* by Bateman, which has a free lip lacking projecting side-lobes and only distinct from *Cattleya* in the small size of its flowers. Ames places this last species in *Cattleya*, but remarks that the separation of *Cattleya* from *Epidendrum* is maintained largely on grounds of expediency. It is in fact difficult to define precisely the limits of sections within the genus *Epidendrum*, and also the limits of genera in the whole of this tribe of orchids, and authors have differed in their judgement of these matters.

Some of the best *Epidendrum* species need cooler or more seasonal conditions than provided by the lowlands of Malaya. A few have been proved to grow and flower well, but more should be tried; and efforts made to produce locally hybrids of *Epidendrum* and *Cattleya* and other genera, so that by local trials the best for local conditions may be discovered. Below are notes on the species which have been tried locally.

***E. atropurpureum***

Pseudobulbs 4-5 cm. long, with 2 or 3 leaves and a terminal inflorescence of several flowers on a scape to 30 cm. long; sepals and petals 3-3 cm. long, 11 mm. wide, widest 1/4—1/3 from tip, dark maroon with greenish suffusion; lip white or tinged with rosy mauve, the basal part close to the front of the column but not joined to the column, midlobe 3-3 cm. long, almost circular when flattened. Native in Central America and the West Indies. There are several varieties, at least two of which have flowered in Singapore, but have not proved easy to manage; probably they would be better at Malayan hill-stations.

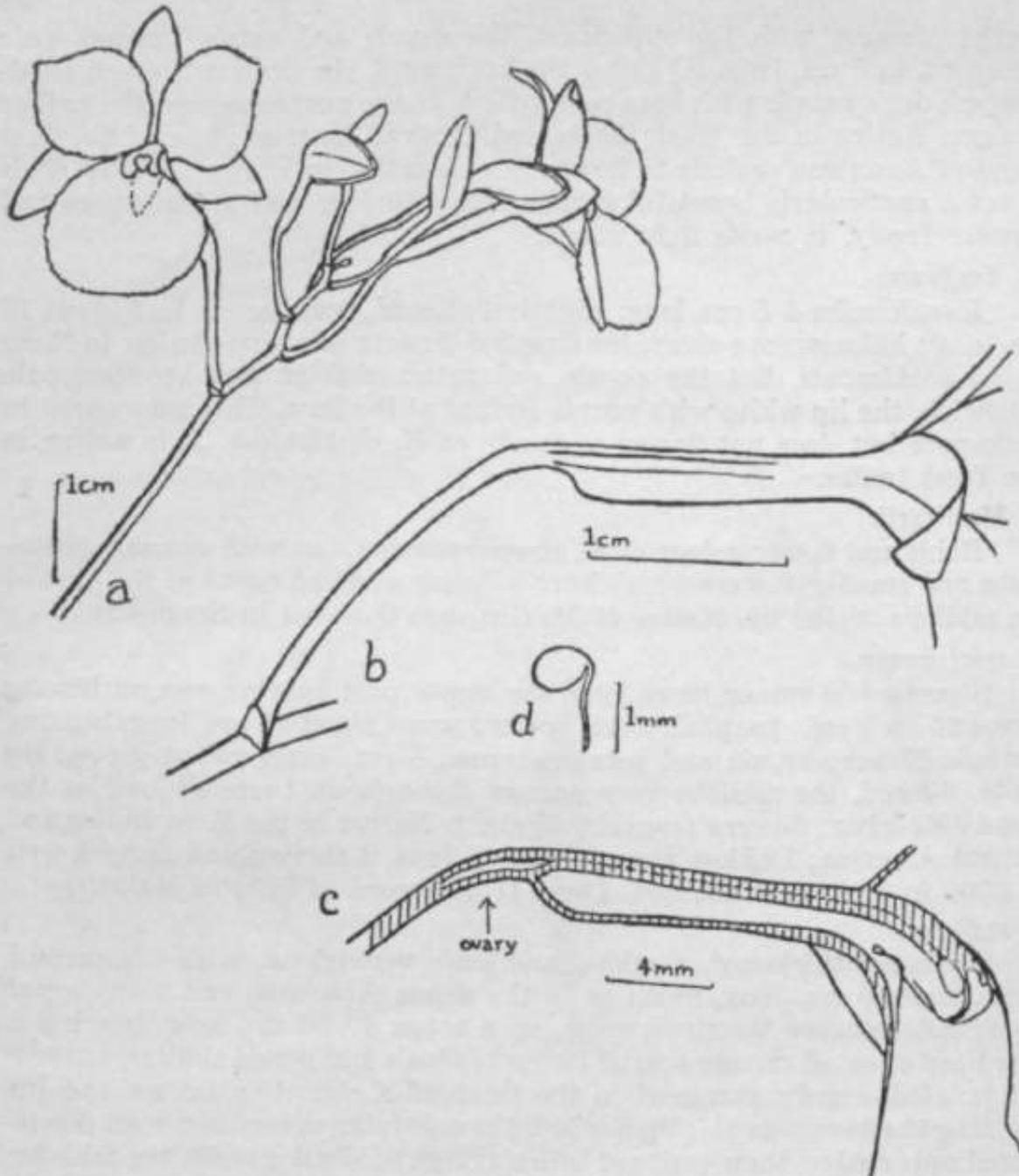


Fig. 134. *Broughtonia sanguinea*. a, inflorescence, b, base of flower and pedicel, c, section through same, d, a pollinium.

#### *E. ciliare*

Stems short and slender, each bearing a single leaf about 15 cm. long; inflorescence to 25 cm. long, bearing 4-8 flowers; flowers pale yellowish-green with a white lip, the sepals and petals about 6 cm. long, narrow, spreading, the lip deeply 3-lobed, the side-lobes deeply cut into fine threads along the edges, the midlobe long and narrow with two yellow swellings at the base. This species does fairly well in Singapore but does not flower freely. It is native in Central America and the West Indies.

#### *E. cochlea turn*

Pseudobulbs rather thick in the middle, somewhat flattened, to 10 cm. long, bearing two leaves; leaves to 20 cm. long; inflorescence short, produce one or two flowers at a time, and continuing floriferous for a few

weeks; flowers with lip uppermost, greenish, shaped, d orange. Native in tropical American is not a particularly beautiful species, flowers freely. It needs light shade.

the Sepals and Petals, pale, the lip short, erect, hood-shaped. Purple-veined, the anther in Central America; one of the first in Europe (1787). This thrives well in Singapore and

*E. fragrans*

*Pseudobulb* m. long; inflorescence short, bearing one leaf about 15 cm. long; flowers of shape similar to those of *E. cochleatum*, but the sepals and petals shorter and broader, pale yellowish, the lip white with purple stripes at the base. This grows well in Singapore but does not flower so freely as *E. cochleatum*. It is native in the West Indies.

*E. Hanburii*

flowers of *E. atropurpureum*, the midlobe of the lip. Na Tit of Mexico & deeply grooved callus at the base of

*E. nocturnum*

leaves the upper part bearing several leaves; a single flower white-lobed the broad side of the lip. Fragrant at night. Native in the West Indies and

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at 1' 000 to 2' 000 ft. altitude. Reports that in Java it grows and flowers well

*E. radicans*

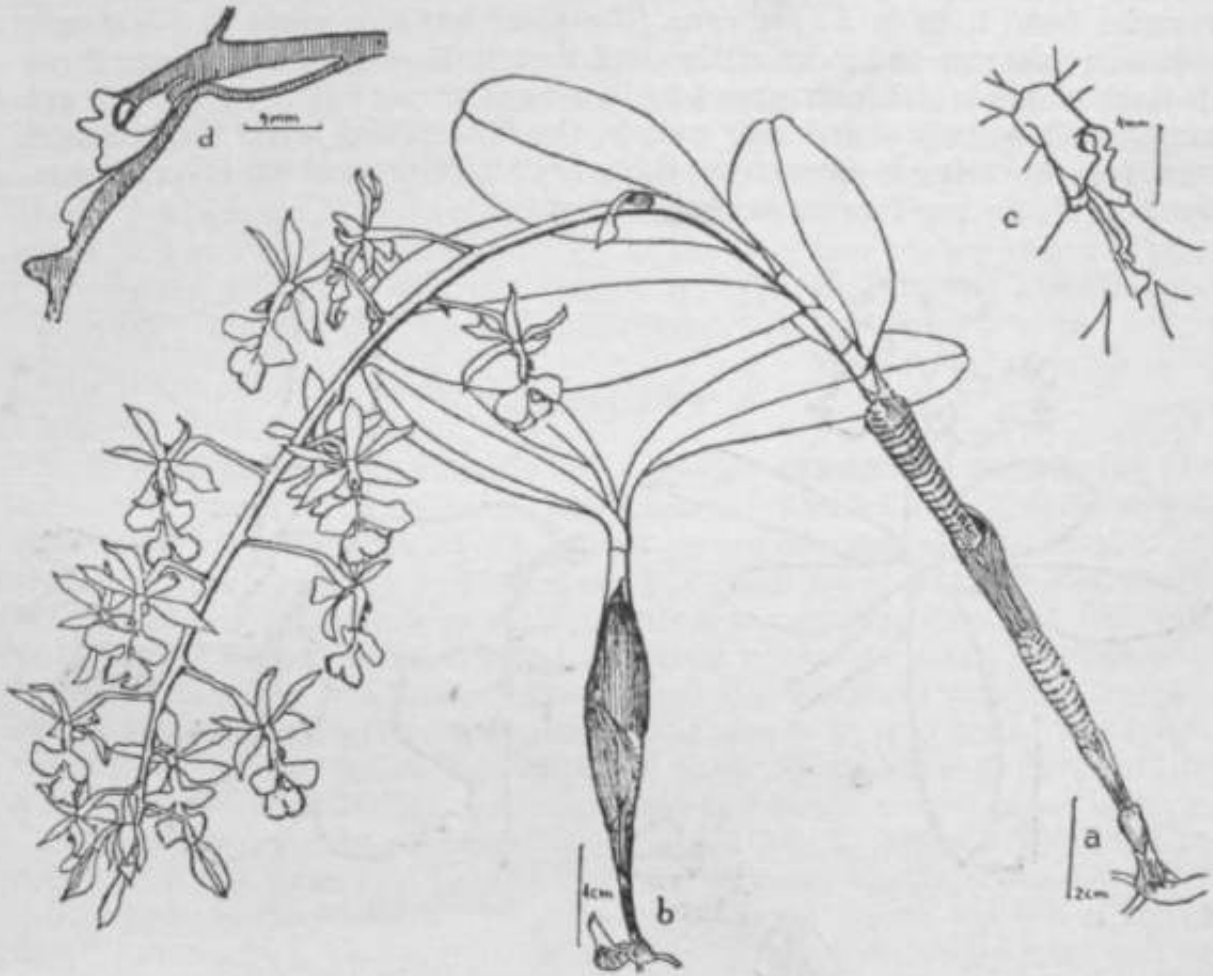
leaves climbing and leafy throughout, with two-ranked roots. Inflorescence terminal, erect, on a scape 30-50 cm. long, bearing a column and lip. Flowers: sepals and petals similar, narrow, the column and lip narrower. The midlobe spreading, with downy fringed ends. The midlobe narrower. Guatemala. This species grows and flowers freely in the hills in Malaya, about 4,000-5,000 feet, in can be 5-6 dm. tall. It grows well but the flowers are not so fine. It is native in Malaya.

It is native in Malaya, but does not grow so tall, as each new growth must be lateral. Hybrids have been made from this species, as mentioned below.

*E. Stamfordianum*

3 or 4 leaves, thickened in middle, bearing shoot from the base of a pseudobulb (sometimes however with normal bearing many closely-placed flowers all open together, sepals and petals spreading white, the lip large, with broad side-lobes and a clear pale yellow-green midlobe. the

column green and purple, with small purple calli at the base of the lip near it. Native in Guatemala. This species grows well in Singapore, but needs careful managing, as it is evidently suited to a seasonal climate. When in full flower, it is very attractive; the colours are dainty but not brilliant. It is said to thrive at Colombo; Dakkus does not mention it. **Fig.** 135.



*Fig.* 135. *Ejridendruni Starn.fordidnum*. *a*, young shoot with inflorescence, *b*, an old shoot to show development of pseudobulb. *c*, column and base of Up. *d*, section through column and base of lip.

#### *E. variegatiim*

Pseudobuibs about 15 cm. long, 2- or 3-leaved; leaves about 20 cm. long; inflorescence about 20 cm. long, bearing about ten small flowers in an open raceme, the lip pointing upwards; petals and sepals 1 cm. long, greenish yellow with brown spots; lip rather small, heart-shaped, white; the flowers fragrant. Native in Brazil. Dakkus reports that this species grows well in Java from sea level to 1,000 feet, it needs to be kept rather dry during its resting period. We have no report of trial in Malaya.

#### Hybrid Epidendrum

A number of hybrids have been made, both within the genus *Epidendrum* and between species of *Epidendrum* and *Cattleya*, *Lselia* and other genera. Few of these have been brought to Malaya, and few new hybrids

raised here. The most important hybrids so far tried are derived from *E. radicans*. The first to be produced was *E. Obrienianum*, (*E. radicans* X *E. 'evectum'*), in 1888 (Fig. 13S). This is described as having flowers of a brilliant carmine colour, about the same size as those of *E. radicans*, but with the lip uppermost, the side-lobes of the lip spreading straight outwards, the midlobe broader and more toothed; the flowers are also in a rounder head than in *E. radicans*. The plant has few roots on its stems, which are shorter and more stiffly erect than in *E. radicans*. We have three distinct plants which correspond to this description, but their flowers are orange-yellow, yellow and rosy purple, the first-named being the best and most free-flowering in Singapore; it has been back-crossed with *E. radicans*, the hybrids having flowers variously oriented.

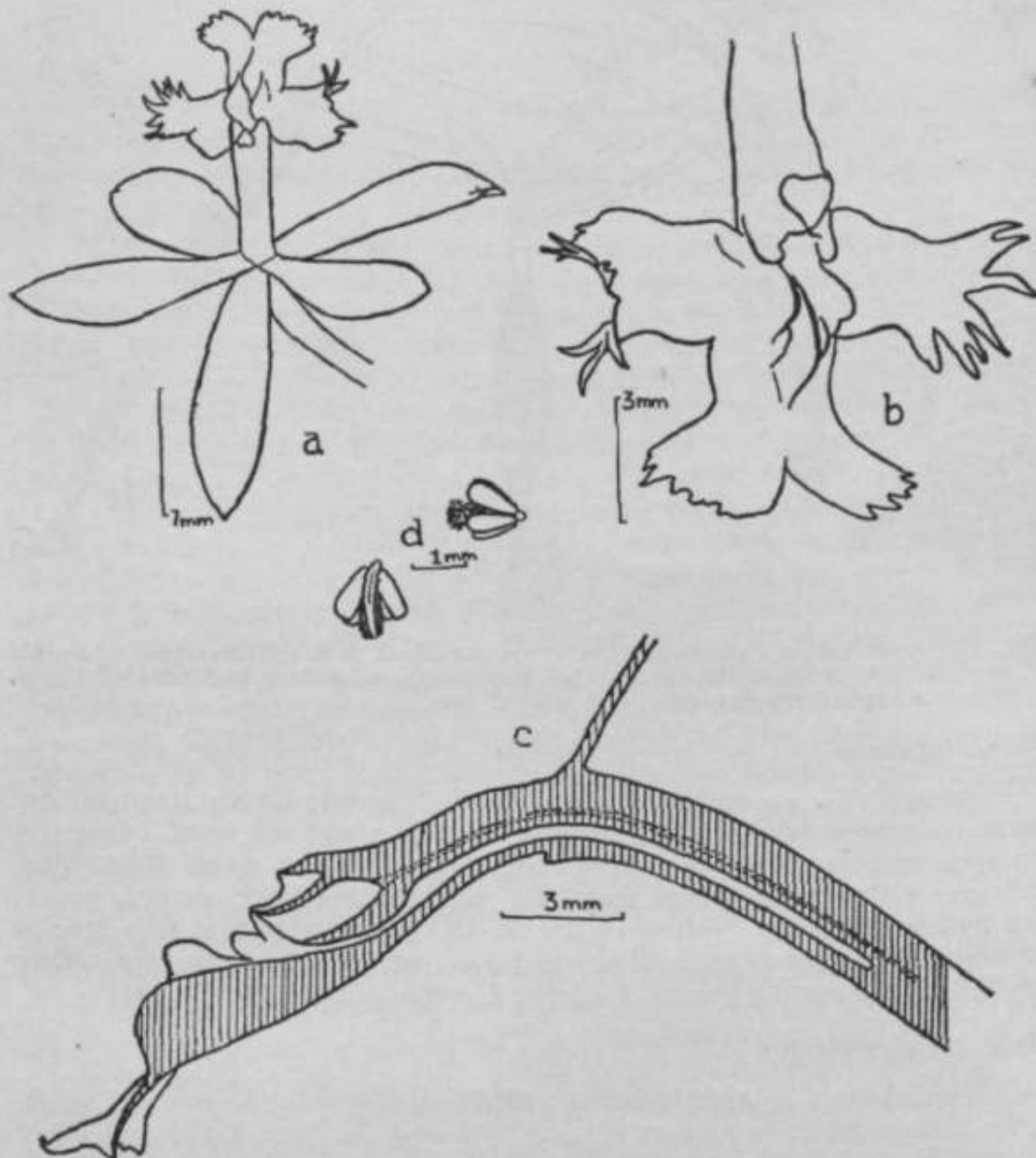


Fig. 136. *Epidendrum Obrienianum*. a, flower in natural position, b, lip and column. c, section through column and base of lip. d, pollinia.



## DIACRIUM

This small genus, nearly related to Epidendrum, is native in the north of South America. Of its few species, one has been tried in Malaya, and grows and flowers fairly well in the lowlands. It is however suited to a rather more seasonal climate, and is not easy to maintain in Singapore. The species is called *D. bicornutum*, the name referring to the two horn-like processes at the base of the lip.

**D. bicornutum** has stout hollow pseudobulbs about 20 cm. long, bearing 4 or 5 leaves near the top. The inflorescence is up to 30 cm. long, bearing a succession of flowers, a few open at a time, the whole lasting for several weeks. The flowers are white, 6 cm. diameter, the sepals and petals fairly broad, pointed, the lip with small purple spots, 3-lobed, the pointed midlobe much longer than the side-lobes, with at the base two hollow yellow divergent conical protuberances. The species is native in Trinidad and Guiana. The hollow pseudobulbs are ant-inhabited when the plant is wild.

## CATTLEYA

The genus *Cattleya* extends from Mexico to southern Brazil, for the most part in the mountains at elevations of 2,000-5,000 feet, in areas where there is a pronounced but not too severe dry season. The number of species is reckoned at 30 to 40; but some of them are so variable that there is difference of opinion as to what constitutes a species. The first *Cattleya* to be known to horticulturists and botanists in Europe was *C. Loddigesii*, in 1815. The genus was named in honour of Mr. William Cattley of Barnet, one of the foremost growers of rare exotic plants at that time. The finest species, *C. labiata*, which has so many varieties in various parts of its wide range of distribution, was imported to Europe a few years later.

Cattleyas have pseudobulbs of moderate length, usually thickened in the middle and narrowed to both ends, fairly close together, covered with thin sheaths when young, bearing one or two fleshy leaves, the leaves fairly large, jointed at the base, without sheaths; the inflorescences have one to ten flowers; the sepals are almost equal and evenly spreading; the petals are nearly always wider, and sometimes much wider, than the sepals; the lip in nearly all species has broad side-lobes which curve over and enfold the column, the midlobe being fairly broad and spreading, its edges often waved and crisped; the junction of side and midlobes is sometimes not distinct, and in a few species the side-lobes are small or wanting; the column is rather long, slightly curved, the anther 2-celled with 4 pollinia, in pairs; the pollinia are disc-shaped, each with a long curved slender caudicle.

Several hundred hybrids have been produced between the various naturally occurring species and varieties of *Cattleya*, and a large number more between these and species of *Laelia* and *Brassavola*. To provide keys and descriptions by which all these could be recognized is impossible; there are too many, and the differences are often in colour distribution on the lip, which can hardly be conveyed in words. It is possible however to give a key to the most important natural species and varieties. Such a key is to be found in Bailey's *Standard Cyclopaedia of Horticulture*. Here we give a

summary, with key to the varieties of *C. labiata* under that species. It should be noted that nearly all species have one or more colour-varieties.

No side-lobes to lip; column freely exposed	..	<i>C. bicolor</i>
Lip with side-lobes quite enfolding the column		
Pseudobulbs 1-leaved	.. .. .	<i>C. labiata</i> <i>C. Lawrenceana</i> <i>C. maxima</i>
Pseudobulbs 2-leaved		
Scape pendent, flower single, yellow	..	<i>C. citrina</i>
Scape erect, flowers 2-10, colour various		
Background colour of sepals and petals		
white or mauve	<i>C. violacea</i>	<i>C. amethystoglossa</i>
	<i>C. Loddigesii</i>	<i>C. Bowringiana</i>
	<i>C. Harrisoniana</i>	<i>C. Skinneri</i>
	<i>C. intermedia</i>	<i>C. Victorix-reginse</i>
Background colour of sepals and petals		
brown	.. .. .	<i>C. Leopoldii</i>
Background colour green	<i>C. Schilleriana</i>	<i>C. granulosa</i>
	<i>C. Forbesii</i>	<i>C. guttata</i>

Not all these have been tried in Malaya, and of those which have been tried the records are imperfect. We give below such information as is available about behaviour in Malaya and Java, and other data from European publications. This may be some guide to the possible behaviour of hybrids. General notes on cultivation will be found at the end of the section on *Cattleya*.

### **Cattleya bicolor**

Pseudobulbs long and slender (40 cm. or more) with two leaves; inflorescence bearing 2-6 flowers of diameter 10-12 cm.; sepals and petals greenish yellow, sometimes purple-spotted; lip folded round the column at the base only, the blade spreading and waved at the edges, red-purple, deeper at the base than at the apex, which has a narrow white or yellowish border. Native near Rio de Janeiro at 2,000 feet altitude. This species is adapted to a climate with pronounced cool and dry season; it may however succeed on the hills in Malaya if watering is carefully managed. Owing to its combination of two colours, and to the peculiar shape of the lip, it has been successfully used in producing distinctive hybrids. Some of these have grown well in Malaya, in the lowlands, but the colours of the flowers are far more brilliant at 4,000 feet.

### **C. Lawrenceana**

Pseudobulbs about 20 cm. long, spindle-shaped, flattened, bearing one leaf which has a reddish flush; inflorescence of 3-7 flowers, of diameter to 12 cm.; sepals and petals pale mauve, petals about twice as wide as sepals; lip rather narrowly cylindrical, rolled round the column, the edges of the blade waved and crisped, the blade rose-purple at the end, white

lower down. Native at 4,000 feet in British Guiana. It is near *C. labiata* but has proportionately narrower petals, a more narrowly cylindric lip and no yellow.

### *C. maxima*

Habit of *C. Lawrenceana*, but the tube of the lip more funnel-shaped, the purple of the blade rather copiously streaked with a darker colour, with a yellow median band almost to the tip. Native in Ecuador and N. Peru. There are two varieties, one with paler, one with deeper purple colour on the lip. The name *maxima* is inappropriate, as other *Cattleyas* have larger flowers.

### *C. labiata*

Pseudobulb spindle-shaped or laterally compressed, 12-25 cm. or more long, bearing one leaf 15-25 cm. long; inflorescence of 2-5 flowers of diameter 12-15 cm. or more; sepals and petals usually pale mauve, exceptionally yellowish; petals three times as wide as sepals, their edges wavy; lip very large, the sides overlapping above the column and then opening out to the wide blade, the edges of which are waved and frilled, the tip deeply cleft; colour of the lip very varied. Distributed from Guiana and Colombia to south-eastern Brazil. About *twelve principal varieties* have been discovered, and *many sub-varieties* of these. The principal varieties are localised geographically, and are by some authors ranked as distinct species, but they are all similar in essentials, and it is convenient to group them together. The following key is based mainly on that found in Bailey's *Cyclopaedia*. It is not very satisfactory, and the present writer cannot claim personal knowledge of all varieties, but no other key of the kind seems to have been published.

- Sepals and petals yellow, midlobe entirely purple  
with gold veins . . . . . v. *Dowiana*
- Sepals and petals pale mauve or white
  - Lip with large orange blotch in centre, surrounded by circles of white and purple . . v. *Eldorado*
  - Lip otherwise coloured
    - Lip as wide as petals, or wider
      - Tube of lip yellow, sepals and petals white v. *Rex*
      - Tube of lip not yellow
        - Midlobe with a rather broad white or pale mauve border . . . . . v. *Mossix*
        - Midlobe without a broad white or pale border
          - Throat with a yellow or white patch on each side
            - Tube pale like sepals and petals . . v. *Luddemanniana*,
            - Tube and blade both bright purple v. *Warscewiczii*
            - Throat of lip yellow right across . . v. *Mendelii*
  - Lip narrower than petals
    - Blade much shorter than tube; edges less crisped than in most varieties . . v. *Trianse*

Blade about as long as tube, edges much crisped

Throat with a golden patch on each side *labiata vera*

Throat without such golden patches

Edges of blade different in colour from centre

Petals longer than sepals and lip, flowers to 12.5 cm. diameter . . v. *Percivaliana*

Petals about same length as sepals and lip, flowers 15-17 cm. diameter . . . . v. *Gaskelliana*

Edges of blade not different in colour from centre . . . . v. *Warneri*

Var. *Dowiana*. This is one of the finest varieties, and has produced many magnificent hybrids. It is native on the mountains of Costa Rica facing the Pacific, apparently at no great altitude. It flowers and grows well in the lowlands of Java, but is not easy to maintain in Singapore. The sub-variety *aurea*, with more yellow colour on the lip, is found in Colombia.

Var. *Eldorado* comes from the Rio Negro in the centre of Brazil. Its behaviour in Malaya is not reported.

Var. *Rex*. Blade of lip with a pale edge next to which is a broad band of purple variegated with deeper veining, and beyond this into the throat a large yellow area strongly marked with crimson. A very handsome plant, native on the Andes of Peru and Brazil.

Var. *Mossix*. Native in Venezuela, one of the largest varieties, with flowers to 20 cm. in diameter. The lip is very large with strongly crisped edges to the blade; there are many sub-varieties differing in details of colour. The blade nearly always has a yellow central band, running from the base; the centre of the free part of the blade is rich purple, mottled and veined with paler shades, the edges having a broad pale or white band. Dakkus reports this as growing and flowering well in Java, but it is not one of the easiest *Cattleyas* in Singapore. Many fine hybrids have been produced from it.

Var. *Luddemanniana*. Blade of the lip pale or deep purple, with a pale yellow or white blotch on either side at the entrance to the tube; between the blotches are lines of purple diverging from the base of the lip. Native in Venezuela. Though not one of the finest varieties, this is better suited than most to the lowlands of Malaya, as it always produces an inflorescence as soon as each pseudobulb is fully grown, not waiting for a rest. The lip is not always wider than the petals.

Var. *Mendelii*. Midlobe with the edges much crisped, rich crimson-purple to the edges, this colour on the basal side being sharply separated from the entirely yellow throat, which is traversed by diverging reddish streaks. Native in Columbia. Dakkus reports that this only grows well in the hills in Java. It is a very handsome variety.

Var. *Warszewiczii*. Native in New Grenada, growing in rather sunny places. Dakkus states that this variety does best with considerable exposure, and that it grows and flowers well at Buitenzorg (700 feet altitude).

Var. *Trianse*. End of blade of lip rich purple-crimson, or paler; above this towards the throat usually orange-yellow, often prolonged to the base of the lip in a broad band, sometimes streaked with pale purple or white. Native in New Grenada (Pacific coast of northern S. America). This is moderately successful in the lowlands of Malaya.

*C. labiata vera*. Blade of lip rich magenta-purple (sometimes paler) with a narrow mauve band round the edge; in the throat a central yellow patch, sometimes with some yellow veins radiating from it. This original form of the species was found on the Organ Mountains, 60 miles north of Rio de Janeiro, in 1818. It is not so well suited to the Malayan lowlands as some other varieties which are of origin nearer the equator.

Var. *Percivaliana*. Midlobe crimson-purple, more or less variegated in tone, the edge pale lilac; throat of tube and base of side-lobes rich tawny yellow right across, passing to orange streaked with red-purple deeper in the throat. Native in Venezuela at 4,000 feet. A handsome variety which has produced fine hybrids.

Var. *Gaskelliana*. Pseudobulbs rather short and flattened, ribbed when old. Midlobe with pale rosy mauve crisped edge, and next to this a broad purple-mottled zone; then the main central part light orange or yellow veined with deeper orange. Native in Venezuela. Grows and flowers well in Singapore.

Var. *Warneri*. The whole forward part of the midlobe rich purple, the throat white, yellow-veined in the centre. This is very near the original *C. labiata*, and comes from the same part of southern Brazil.

### **Cattleya citrina**

Pseudobulbs about 5 cm. long; leaves 2, about 20 cm. long; inflorescence pendulous, bearing one or two flowers; flowers fragrant, deep lemon yellow, the lip with a paler edge; sepals and petals about 6 cm. long, but the flower not opening very widely. This species is native in Mexico, and needs a cool climate; in Java it is only successful at above 5,000 feet. On account of its entirely yellow colour, it has been used in hybridizing.

### **Cattleya amethystoglossa**

Pseudobulbs 60 cm. or more high, 2-leaved; inflorescence of about 8 flowers, in a short scape; flowers white with large elliptical purple blotches on sepals and petals, which are all about equal, midlobe of the lip broader than long, entirely rich deep purple, the tube white. Native in Bahia, Brazil; often regarded as a variety of *C. guttata*, and probably would behave as that species.

### **Cattleya Skinneri**

Pseudobulbs to 23 cm. long, somewhat flattened, 2-leaved; leaves to 20 cm. long; inflorescence of 5-9 flowers or even more, each 10-12 cm. diameter, pale rose-purple, petals twice as wide as sepals; the blade of the lip with almost smooth (not crisped) edges, with a broad deep purple zone, behind which the throat is white. Native in Guatemala. This species grows and flowers reasonably well in the lowlands of Malaya, and is quite useful, though not so fine as **the** *labiata* varieties.

**Cattleya Victoriae-reginae**

Pseudobulbs rather long, hardly thickened, with 1 or 2 leaves; flowers 2-4, 12 cm. diameter; petals twice as wide as sepals, little waved at the edges; sepals and petals mauve flushed with pale yellow, giving an almost salmon tone, with fine red veining; lip strongly 3-lobed, the side-lobes meeting above the column and almost enfolding it, their ends slightly diverging, rich crimson purple, the rest being white; midlobe very broad with crisped edges, bright crimson, with pale yellow veins radiating into it from the throat. Native in Pernambuco; possibly a natural hybrid between *C. labiata* and *C. Leopoldii*. One of the handsomest of the group having flowers of this shape.

**C. Bowringiana**

Young shoots with spreading cup-shaped basal sheaths. Pseudobulbs 20-25 cm. long, swollen in the middle; leaves 2, 15 cm. long; inflorescence of 5 to 10 flowers of diameter 8-10 cm.; sepals and petals pale rose-mauve; lip shaped as in the *labiata* group but smaller, the end of the midlobe deep purple, with or without a yellow patch in the throat. Dakkus reports that this grows and flowers well in Java from about 700 feet altitude and over, and that it likes almost full sun; it flowers well in Singapore.

**Cattleya intermedia**

Pseudobulbs about 25 cm. long, slender, 2-leaved; leaves about 12 cm. long; inflorescence of 5-12 flowers, of diameter 12 cm.; sepals and petals pale rose to almost white; petals about same width as sepals; lip very strongly 3-lobed, midlobe mainly rich purple, rest as petals, the throat sometimes with a yellow patch; part of lip between side-lobes with several longitudinal ribs. Native in Brazil. This flowers quite well in the lowlands of Malaya but is much stronger on the hills. A variety has white petals.

*Cattleya violacea* (*C. superba* Schomb.)

Pseudobulbs to 30 cm. long; leaves 2, 8-12 cm. long, rather broad; inflorescence of 3-5 flowers, fragrant; sepals 5-6 cm. long; shape of flower very near *C. Victorix-reginx* but without the yellow flush, the tube of the lip darker, the midlobe narrower, the whole in various shades of purple; throat of the lip white with yellow veins. Widely distributed in northern S. America.

**Cattleya Loddigesii**

Pseudobulbs cylindric, to 30 cm. long, 2-leaved; leaves about 12 cm. long; flowers 3 to 6, diameter about 10 cm.; sepals and petals pale mauve, the petals not twice as wide as sepals, their edges waved a little towards the base; lip clearly 3-lobed, the midlobe almost square with crisped edges, light purple, the throat yellow, with two raised lines. Native in Brazil.

**Cattleya Harrisoniana**

Pseudobulbs cylindric, 30-40 cm. long, 2-leaved; leaves 12-15 cm. long; flowers 2-5, 10 cm. diameter; sepals and petals rosy-mauve, the petals with waved edges, less than twice as wide as sepals; lip with pale pink side-lobes meeting above the column, their forward ends somewhat

reflexed, broad and crisped, pale yellow; midlobe crisped, a deeper shade of rosy-mauve than the sepals; throat of lip entirely pale yellow with raised longitudinal lines. Nearly related to *C. Loddigesii* and by some considered a variety.

#### *Cattleya Leopoldii*

Pseudobulbs 40-80 cm. long; leaves 3, 15-20 cm. long; scape a little longer than the leaves, with 15-25 flowers, fragrant, 8-10 cm. diameter; sepals warm brown with purple spots; petals similar in colour, a little wider, with blunt tips and crisped edges; lip strongly 3-lobed, the side-lobes acute at their ends, their upper edges meeting above the column, pale outside, rosy along the edges; midlobe spreading, with crinkled edges, bright rose-purple, with a papillose surface. This is sometimes reckoned a variety of *C. guttata*, but has more flowers.

#### *Cattleya granulosa*

Pseudobulbs 30-50 cm.; leaves 2, 12-15 cm. long; flowers 5-8, diameter 8-10 cm. or sometimes more; sepals olive green with dark purple spots, the laterals curved downwards on either side of the lip; petals wider, edges much waved and crisped, colour as sepals; lip 3-lobed, the side-lobes short, white outside, yellow inside; the midlobe with a narrow basal part equal in length to the wider terminal blade, the narrow part yellow with orange markings, the blade purple with a broad white band round the crisped edge. Native in Guatemala; related to *C. guttata*, but distinct in the short side-lobes and narrow basal part of the midlobe.

#### *Cattleya guttata*

Pseudobulbs 45-50 cm. long, 2-leaved; leaves 20 cm. long; flowers 5-10, 10 cm. in diameter; petals wider than sepals and with waved edges, all yellow-green with purplish marks; lip strongly 3-lobed, side-lobes rose or white, midlobe wide-spreading, white with purple spots and streaks. Native in southern Brazil. Dakkus reports that this species can be grown successfully in the lowlands in Java, and that it needs a strong light, almost full sun.

#### *Cattleya Schilleriana*

Pseudobulbs 6-15 cm. long; leaves 2, 15 cm. long; flowers 1-2, 10 cm. diameter; sepals and petals olive green with dark purple spots; lip 3-lobed, side-lobes pale yellowish veined rose-purple, midlobe spreading, rose-purple, veined deeper, a narrow white edge, throat yellow. Native in Bahia, Brazil.

#### *Cattleya Forbesii*

Pseudobulbs slender, 30 cm. long, 2-leaved; leaves 12 cm. long; inflorescence of 2 to 5 flowers, of diameter 10 cm.; sepals and petals greenish yellow, the petals with slightly wavy edges; lip 3-lobed, the side-lobes meeting over the column, their outer surfaces yellow with red veins, the midlobe small, yellow with white edges, more or less purple-veined. Native in southern Brazil.

**HYBRID CATTLEYAS.** As noted above, a very large number of hybrid Cattleyas have been produced, and also hybrids between Cattleyas and species of *Laelia*, *Brassavola*, etc. Of hybrids within the genus *Cattleya*, most first generation hybrids are of the varieties of *C. \*o\*«\*»* are quite strong-growing and reasonably free-flowing especially hybrids of var. *Dowiana* which are among the finest. *C. Mangards* second and later generation hybrids, no rule can be but many are quite successful. *Laelio-Cattleya* hybrids, no doubt owing to the fact that most of the *Laelia* plants cannot be grown successfully in our lowland. *Brassavola* hybrids are strong-growing, though not always Mr. Mungpark grew and flowered *Brassavola* hybrids (in which the four genera *Cattleya*, *Laelia*, *Brassavola* and *Sophronis* are combined) at Kuala Lumpur. *Cattleya* hybrids grow and flower better in hills than in the lowlands 2000-4,000 feet being probably the best altitude.

Cultivation of Cattleyas

Cattleyas are long-suffering, and most of them will live under almost as long as their roots have enough air; but to maintain them in a flourishing state careful treatment is necessary. The essentials are: clean potting materials, & closely packed rooting material with good drainage beneath it, carefully controlled watering, and a fairly bright light.

For re-potting, the essentials are: the pot must be firmly fastened so that it will not move, and the whole of the rhizome and pseudobulb must be used to the air on top of the potting mixture, only the roots entering this.

Pots should not be too large. They should have good-sized holes that water cannot stand in them. Top of air and drainage holes arranged so factory, especially for large plants: Hard-wood baskets are also satisfactory. they should be no larger than necessary.

tries. Under glass-house conditions in temperate countries climates than Malaya. Cattleyas are potted in a *Wendlandia* fern root and sphagnum moss. In Malaya this holds too much water, and cannot be used. There is not a local fern which has roots so satisfactory to be used. There is not a local fern which has decaying-but tree-ferns—firm, flexible, not too coarse, and slow-common Bird's-nest fern (*Asplenium nidus*), if well washed. Fern roots and charcoal used in potting, and small pieces of clean broken brick. The bottom of the potting layer. In any case be filled with fairly large pieces of broken brick packed so as to give good drainage but not loosely-



Above this an intermediate layer of smaller pieces of brick and charcoal is necessary. The top layer (its thickness varying with the size of the pot) should consist of small pieces of brick and charcoal, or of fern-root, and charcoal, packed tightly; the top may well be dome-shaped, the middle rising above the level of the rim of the pot.

*Re-potting.* Plants should be re-potted when a new bud has grown so far that its new roots are just beginning to appear. If the plant has several growing-points (called 'leads') it may be divided into two or more parts if desired, a growing-point to each; or it may be re-potted without dividing, into a larger pot or basket, with the object of developing a large 'specimen plant\*.

The plant (or part) to be re-potted should have all old dead roots removed. Living roots should be handled carefully to prevent damage. If (as is probably the case) there are not enough roots to hold the plant firmly in position with its rhizome above the potting mixture, some means must be provided for fastening it in position. This is best done by wedging a small piece of wood firmly between the bricks when putting in the bottom layer; the wood should be tall enough to permit one of the pseudobulbs to be tied to it. The back end of the rhizome may also be wired to the edge of the pot; it should in any case be near the edge, the growing point pointing to the middle, so that it has plenty of room for new development. Whatever method of fixing is used, *the rhizome must be wholly exposed to the air* and not buried in the potting mixture.

If the plant has roots, the upper layer of potting material must be worked well in among these, and packed tightly; this is especially important if fern-root is used. In the case of small broken bricks, these should be well packed also, so that there will be no subsequent movement to damage growing roots. As soon as the roots are well grown they will hold the bricks firmly in position.

Bricks and charcoal are good because they will absorb a good deal of moisture and give it off slowly, at the same time allowing free passage of air. After a time, the bricks may become covered with a growth of dark green algae; this is not good, and the bricks should be renewed. Renewal can often be effected without removing the plant from the pot. If desired, the old bricks can be used again after burning.

Some people put pieces of coconut husk in with the bricks when potting Cattleyas; this is not recommended, as the coconut husk rots rather quickly and then may start a rot of the orchid roots. It is less harmful in baskets, where, being near the surface, it may be removed and renewed easily.

*Watering.* In their native country, all Cattleyas have alternate phases of growth and rest. They need a good deal of water in the growing period, and little during the resting period. In Malaya, where our dry seasons are slight and irregular, Cattleyas tend to grow almost continuously, and new growths may begin before the old are well matured, or one part of a plant may have a new shoot while others are resting. Unless cover from rain

is provided, regular resting is impossible. The best way therefore is probably to grow plants under cover from rain; this also protects their flowers from rain-damage. If under cover, plants can be watered according to their condition of growth. Further, a closer potting is possible if watering can be controlled in this way, but in such case over-watering must be guarded against. On the whole, more harm can be done by over-watering than under-watering.

Plants will however grow quite well when fully exposed to rain. At such conditions, all that can be done is to water growing plants in dry weather, and refrain from watering those which are not in active growth. In very wet weather, it is best to bring resting plants to a place sheltered from rain.

Newly potted plants should in any case be put under cover, and watered only lightly until their new roots appear, when watering may be gradually increased.

*Exposure.* Cattleyas need a fairly bright light; if they have too much shade they will not flower so well. Full sun for the early part of the morning, and after that broken shade, is probably best for most. Some will stand, and benefit by, even more exposure. If a house with a slatted roof is used, the gaps should be about equal to the width of the slats, and the latter should be arranged so that their shadow is constantly moving as the sun runs its daily course; that is, they must run more or less north and south. A flat slatted roof is just as good as a ridged one, unless it has to support glass.

*Manuring.* As with most other orchids, Cattleyas will benefit by a little manure in solution while they are in active growth. The liquid from rotting organic materials such as ground-nut cake, rotten fish or prairie dust is good, or from fresh cattle manure; or diluted urine. A solution of a mixed artificial fertilizer is also satisfactory. The chief thing is, that the manure is in dilute solution, without suspended matter which will clog the potting material and prevent proper aeration. Plants which have been recently potted, or which are not in active growth should on no account be manured.

### L/ELIA

The only constant difference between the genera *Lselia* and *Cattleya* is that *Lselia* has 8 pollinia, whereas *Cattleya* has only 4. The pollinia of *Lselia* are joined in pairs by their caudicles. Some species of *Lselia* are very similar in general aspect to *Cattleyas* of the *labiata* group, but generally of more slender habit, with longer scapes; some of them are however quite different from the typical *Cattleyas*. *Lselias* have the same general distribution in the American tropics as *Cattleyas*, but on the whole they are adapted to cooler conditions, higher in the mountains, and some of them can be grown successfully in the lowlands of Malaya. They can however be grown at our hill stations. The following information is taken from *Flora of Malaya*

*L. Dormaniana* will grow at altitudes above 500 feet, but is at its best at about 1,500 feet. It is not one of the finest species.

*L. flava* will grow at elevations above 1,000 feet. The flowers are not large, but a fine colour, with orange-yellow sepals and petals.

*L. Gouldiana* does well at 1,000-2,000 feet.

*L. grandis* grows well from 350 feet altitude upwards. It has large flowers with brown yellow sepals and petals and purple lip.

*L. Perrinii* grows well and flowers from sea-level upwards; Dakkus especially recommends this, and its hybrids should also be good.

*L. pumila* is not successful below 1,600 feet altitude. The inflorescence has only one or two flowers, but these are very richly coloured and fragrant. Several varieties exist.

*L. purpurata* can be grown at 300 feet and over. It is a fine species and has produced many hybrids. There are several varieties. One has flowered in Singapore.

*L. superbiens* (also called *Schomburgkia superbiens*) has been grown and flowered successfully by Dr. Quaife at Cameron Highlands. It has a very tall inflorescence.

*L. xanthina* grows and flowers well in Java above 1,000 feet. The flowers are small but of an attractive orange-yellow colour.

*HYBRID LMUAS.* Hybrids within the genus *Lselia* have probably been little tried in Malaya; they are likely to be successful in the hills. More *Laelio-Cattleya* than *Laelia* hybrids have been produced. As above noted, these are on the whole less free-flowering than *Cattleya* hybrids in the plains of Malaya. They are on the whole not so large as the *Cattleyas*, but often more graceful. Dakkus notes that some *Lselio-cattleyas* flower regularly twice a year in Java.

## SCHOMBURGKIA

This genus is closely related to *Lselia*. The flowers are in most cases not large, though there are a few fine species; they are at once distinguished by the crisped edges of the petals. The scape of the inflorescence is in some cases very long. All species require a seasonal climate to flower regularly, for which reason they are not well suited to the south of Malaya where it is difficult to give them proper rest.

*S. crispa* is said to flower regularly in Batavia. It will flower in Singapore, but rarely. It has numerous rather small brownish-yellow flowers on a scape 60-100 cm. long. The stem and leaves are like a *Cattleya*.

*S. tibicinis* flowers well in Java at 1,000 feet and over, in a bright light. In Singapore it grows quite well but flowers very rarely. The stems are not thickened in the middle but are narrower upwards, hollow, with about 3 very stiff broad leaves at the top. The inflorescence is 100-150 cm. long or even more. The flowers are 6 cm. in diameter and attractively coloured.

*S. undulata* grows and flowers well in the lowlands of Java, in full sun, but needs a dry season to rest it properly. It will also flower in Singapore. The habit is like *S. crispa* but the flowers are dark purple-brown with mauve lip; petals and sepals are very glossy. Fig. 137, a.

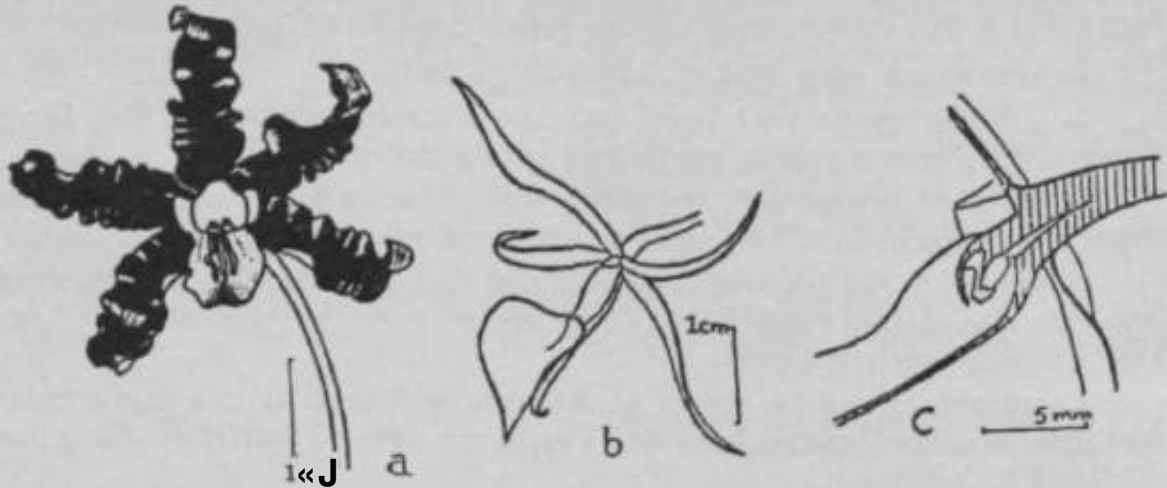


Fig. 137. *Schomburgkia undulata*. a, flower. *Brassavola cordata*, b, flower, c, section through column.

*Hybrid Schomburgkias.* *Schomburgkia* species have been crossed with both *Cattleya* and *Lselia*. Dakkus mentions the hybrid *S. tibicinis* X *C. labiata* var. *Mossix*, but does not say how it behaves in Java. It has the habit of the *Schomburgkia* but with larger flowers. Such hybrids are called *Schombocattleya*. Similarly, the hybrids with *Lselia* are called *Schombo-Lselia*, *Schomburgkias* have however been much less hybridized than the other genera of the *Cattleya* group.

### BRASSAVOLA

This is a small genus of the same general geographic distribution as *Cattleya* and *Lselia*. Typical *Brassavolas* have slender stems bearing almost cylindrical (terete) leaves, with flowers having narrow petals and sepals, the base of the lip tightly enfolding the column, the blade suddenly opening out from this basal tube. Besides these typical species of *Brassavola*, there are two others, *B. Digbyana* and *B. glauca*, which have leaves and lip like *Laelia*, and are in fact often included in the genus *Lselia*. Schlechter remarks that the only way in which they differ from *Lselia* is in having a long neck at the end of the fruit, like all species of *Brassavola*. For horticultural purposes, these two species are always included in *Brassavola*.

#### B. Digbyana

Pseudobulbs about 15 cm. long, somewhat thickened and flattened, one-leaved; leaves about 20 cm. long; inflorescence of one or two flowers \ sepals and petals narrow, about 6 cm. long, cream; lip wide, almost funnel-shaped, with deeply and finely fringed and crisped edges, also cream. Native in Central America; grows and flowers quite well in the lowlands of Malaya. This is the principal species used to produce *Brassocattleya* hybrids, its white colour and large finely fringed lip being very valuable characters. Many of its hybrids grow strongly and flower well in the lowlands of Malaya.

**B. glauca**

Like *B. Digbyana* in habit and shape of flower, but the edges of the lip waved, not fringed. Native in Mexico and Guatemala; its behaviour in Malaya is not reported. This species has also been used in hybridizing.

**B. cordata**

Stems slender, to 15 cm. or more long, each bearing a single more or less erect semi-terete leaf to 25 cm. long; inflorescence of several flowers (up to 12), with narrow pale greenish sepals and petals about 4-5 cm. long; base of lip closely enfolding the short column, apical half of lip a heart-shaped blade, cream in colour, with entire or slightly waved edges. This species, as imported from Jamaica, grows and flowers well in Singapore. There is some doubt as to the distinctions between it and *B. Perrinii* or *B. fragrans*; different authors give different accounts of these plants. *B. Martiana* is also closely allied. Fig 137, b. c.

*B. acaulis* is very similar to *B. cordata*, but with very short stems (only 3 cm. long) and fewer flowers, which have longer sepals and petals.

*B. nodosa* is a closely allied species.

*B. cucullaia* has a similar habit to *B. cordata*, but solitary large flowers, the sepals and petals to 10 cm. long, narrow, tinged with pink, the lip 8 cm. long, narrowed to a long point from a broad base, the edges toothed. The behaviour of this species in Malaya is not reported.

*Brassavola Hybrids.* Few hybrids within the genus *Brassavola* have been made, and there is no record of any trials of such in Malaya. The principal hybrids raised from this genus are the *Brassocattleyas*, with *B. Digbyana* as chief parent. As noted above, many of these grow strongly and flower well in the lowlands of Malaya. Hybrids of the typical species of *Brassavola* (*B. cordata*, etc.) have not been tried. It would be worth while raising some locally, as they would probably be strong and free flowering, though perhaps not so spectacular as the range of offspring of *B. Digbyana*.

**SOPHRONITIS**

A small genus, confined to south-eastern Brazil, on mountains at 4,000-6,000 feet. The species chiefly cultivated and most hybridized is *S. coccinea* (or *S. grandiflora*) which has bright scarlet flowers 3-5-5 cm. in diameter. This colour has been introduced in varying degrees into the hybrids, some of which may be grown in the lowlands of Malaya, though the species itself cannot. The stigma of *Sophronitis* is peculiar in the *Cattleya* tribe; it is situated on two erect concave column-arms, very much in the same way as in *Ceratostylis*.

Hybrids of *Sophronitis* with *Cattleya* are called *Soprocattleya*; with *Lselia*, *Sophroltelia*; with *Epidendrum*, *Epiphronitis*. Hybrids of three genera have been formed as follows:—

*Sophrolseliocattleya*,

*Rolfeara* (*Brassavola*—*Cattleya*—*Sophronitis*),

*Lowiara* (*Brassavola*—*Laelia*—*Sophronitis*).

The four-genera hybrid *Brassavola*—*Cattleya*—*Lselia*—*Sophronitis* is called *Potinara*. A *Potinara* has been grown and flowered successfully at Kuala Lumpur.

### THE AGROSTOPHYLLUM TRIBE

This is a group of mainly small-flowered orchids, some of them quite common in Malaya. The group as a whole extends from the islands of the Indian Ocean to the Pacific, and includes about 200 species. In Malaya we have the three genera *Agrostophyllum*, *Ceratostylis* and *Sarcostoma*, the last-named consisting of one species only.

*Agrostophyllum* and *Ceratostylis* are very different in appearance. The former has fairly long stems with many regularly 2-ranked leaves, the latter usually very short one-leaved stems, sometimes borne at intervals on a pendulous rhizome (young plants may have several leaves on a very short stem). The feature the two genera have in common is a terminal inflorescence consisting of small flowers borne in a dense cluster, or successively, among a group of small bracts. There is almost always a distinct mentum, and the edges of the lateral sepals are sometimes joined for part of the way up the front of this. In *Agrostophyllum* the mentum contains the saccate base of the lip, in *Ceratostylis* the curved narrow base of the lip; the column-foot is never very long. The column is short; in *Ceratostylis* it is deeply cleft. The anther contains 4 or 8 pollinia, which are united to a small sticky disc, without any stipes.

#### Key to the genera of the *Agrostophyllum* Tribe

Stem of many (rarely few) internodes; lip sac-shaped					
at the base	..	..	••	..	<i>Agrostophyllum</i>
Stems of one internode; base of lip narrow				·	
Pollinia 8	..	..	..	..	<i>Ceratostylis</i>
Pollinia 4	..	..	..	..	<i>Sarcostoma</i>

### AGROSTOPHYLLUM

Stems 15 to 100 cm. or more long, usually of many internodes, often flattened; leaves 2-ranked, narrow, rather thin, with overlapping sheaths; inflorescences in terminal heads, usually of many small flowers; sepals and petals similar, the petals narrower; lip sac-shaped at the base, the hollow divided from the blade by a transverse partition, sometimes fleshy, the blade flat or concave; column short or relatively long, the foot hardly developed; anther with 2 chambers; pollinia 8, all attached to a single disc.

A genus of about 60 species, extending from the Seychelles to the islands of the Pacific; in Malaya 7 species, some of them common epiphytes, both in lowlands and mountains. Several of them have very similar vegetative appearance but quite distinct flowers. Owing to this similarity they have been insufficiently studied. Mountain plants, especially of the habit of *A. majus*, need careful examination, which may yield much further knowledge of the genus in Malaya.

Key to the species of *Agrostophyllum* in Malaya

- Leaves at right angles to the stem, not over 3 cm. long; flowers few
- Leaf-sheaths with slender appendages on either side at the base of the blade . . . . . 1. *A. bicuspidatum*
- Leaf-sheaths without such appendages . . . . . 2. *A. Hasseltii*
- Leaves at an acute angle to the stem, much longer; flowers many
- Stem not over 20 cm. long; leaves to 50 cm. long, about 4 on each side of the stem . . . . . 3. *A. glumaceum*
- Stem much longer; leaves shorter, more numerous
- Midlobe of lip ovate, flat or with the tip turned down
- Leaves to 40 cm. long; lip 5 mm. long; midlobe of lip more or less flat, pointed . . . . . 4. *A. longifolium*
- Leaves to 18 cm. long; lip not over 3 mm. long; midlobe turned down, its tip rounded . . . . . 5. *A. majus*
- Midlobe of lip more or less cup-shaped
- Stem hardly flattened at apex; leaves to about 6 mm. wide; lip embracing lower half of column, tip of lip acute . . . . . 6. *A. tenue*
- Stem distinctly flattened at apex; leaves to 1.5 cm. wide; lip with round tip, embracing almost whole length of column . . . . . 7. *A. cyathiforme*

1. ***Agrostophyllum bicuspidatum*** J.J.S, Ic. Bog. 2: 55. 1903. Ridl., Flora 4: 108.—*Appendicula callosa* Bl., Bijdr. 303. 1825.—*Agrostophyllum callosum* J.J.S., Fl. Buit. 6: 286, f. 219, non Rchb. f. 1865.—*A confusum* J.J.S. Bull. Btzg. Ser. 3, 2: 38. 1920.

Stems 20-40 cm. long, slender, internodes about 5 mm. long; leaves at right angles to stem, 0.5-1.3 cm. long, 0.3 cm. wide near base, narrowed slightly to a rounded cleft tip, a slender point 3 mm. or more long at the end of the sheath on either side of the base of the blade; inflorescence terminal, from a close group of parallel oblique sheaths, usually one flower to each; flowers white or pale yellow; upper sepal 3-4 mm. long, to 2 mm. wide, erect, concave; lateral sepals forming a rather broad mentum 2 mm. long at an acute angle to the ovary, their ends spreading; petals narrow, about 6 mm. long, ends curved back, shortly pointed; saccate base of lip nearly 6 mm. long, its sides in contact with the column, ending in short triangular side-lobes which are connected across by a low yellow fleshy partition (sometimes with purple marks); midlobe at right angles to base of lip, 2.5 mm. long, 2 mm. wide, oblong with a short tip; column under 2 mm. long, with incurved purplish arms and beaked erect rostellum. Native in Java, Sumatra and Borneo; in Malaya a rather common epiphyte in both lowlands and mountains, varying in the colour of the flower and to a small

extent in its size and in the details of the shape of the fleshy partition of the lip. Lowland plants seem usually to have white flowers, but both yellow and white flowered plants occur on the mountains (e.g. at Fraser's Hill). Fig. 138.

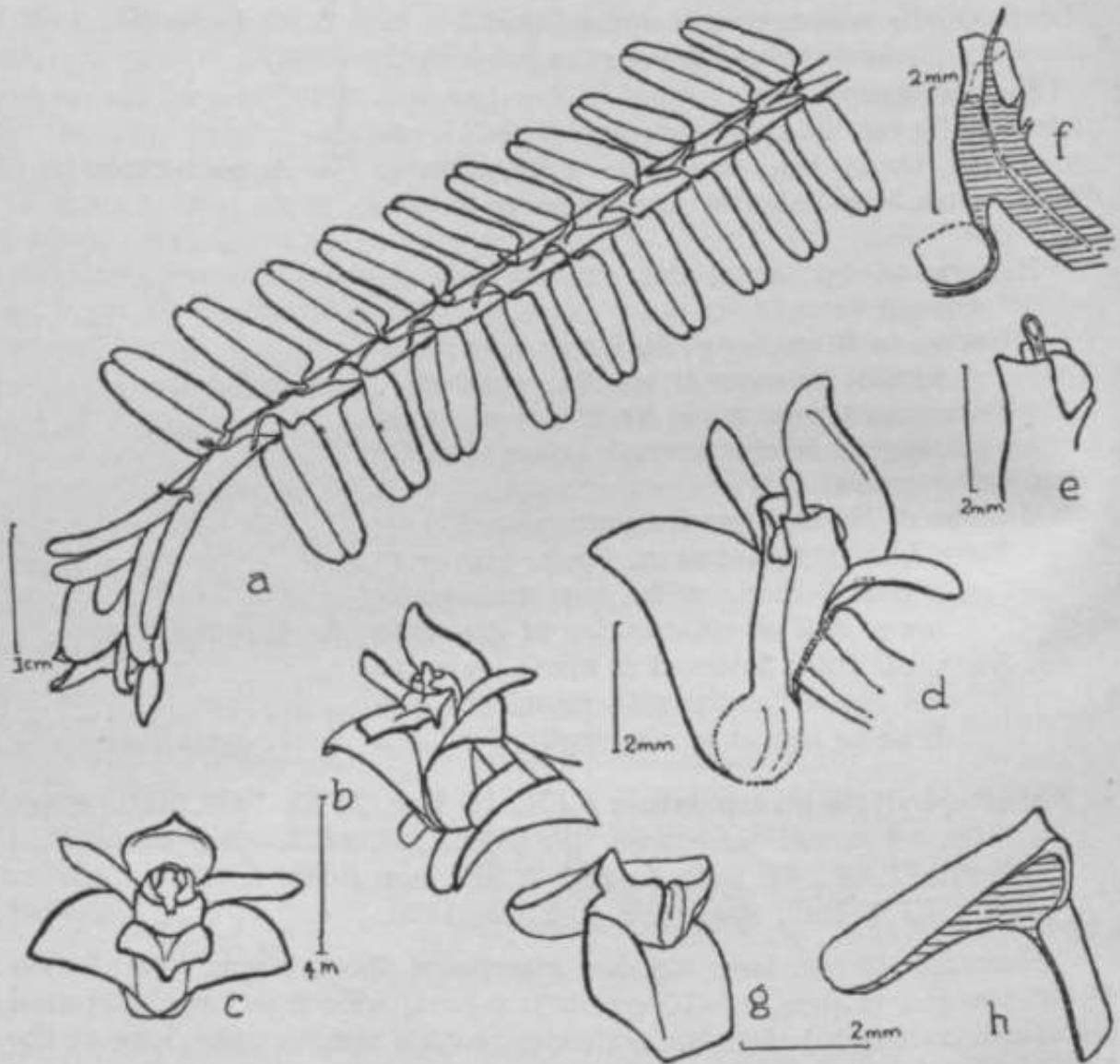


Fig. 138. *Agrostophyllum bicuspidatum*. a, stem with leaves and inflorescence, b, c, flower from side and from front, d, flower with lip and one lateral sepal removed, the dotted line showing attachment of saccate base of lip- e > o, h i q v X view of back of column. f, section of column and base of lip- 9' 1' P- "• section of lip.

2. *Agrostophyllum Hasseltii* (Bl.) J.J.S., Ic. Bog. 2: 55, 1903. FL Buit. 6: 288, f. 220. Ridl., Flora 4: 105.—*Appendicula Hasseltii* Bl., Bijdr. 304. 1825.

Stems to 120 cm. long, pendulous, 3 mm. thick, internodes 5 mm. long; leaves as in *A. bicuspidatum* but larger, to 3 by 1 cm., without the points at the base of the blade; inflorescence as *A. bicuspidatum*; flowers pale straw yellow, shaped much as in *A. bicuspidatum* but the men turn much shorter, the fleshy partition joining the side-lobes lower, yellow with



two purple marks, and the midlobe of the lip <sup>ra</sup> <sup>^ ^ r</sup> than long. Distributed in Java, Borneo and Sumatra; in Malaya <sup>^</sup>found in many places in the lowlands, on rocks and on trees by rivers, and once at Cameron Highlands.

3. **Agrostophyllum glumaceum** Hk. 1, F.B.I. 5: 821. 1890. Ic. PL t. 2095. Ridl., Flora 4: 107. Carr, Card. Bull. 5: 145. 1930.

Stems to 20 cm. long, much flattened; leaves 1 or 4 on each side of the stem, the basal ones short, with sheaths <sup>\* £ \*</sup> <sup>» « « tw ^</sup> <sup>Seal</sup> leaves to stem, the leaves in the same line as the sheaths, the two <sup>^</sup>apical ones 50 by 1-6 cm. with very short sheaths; inflorescence <sup>\* termma</sup> 1 head about 3 cm. in diameter, composed of many crowded branches each branch zigzag with several small bracts; flowers white; upper sepal 5 by 2 mm. acute; mentum short; lateral sepals keeled, tips not <sup>m u c h / ^ r</sup> <sup>S h ^ s e</sup> 4 mm. long, acute, narrow; lip with small saccate base from which acute triangular side-lobes pressed to sides of the column, the side-lobes joined across, enclosing the base of the column <sup>- ^ TM dlobe - 4</sup> <sup>by - 6 TM £</sup> pointing forwards, shallowly concave, shortly tipped; the whole lip 10 mm. long; column 4 mm. tall, with short square wings near the top, red. Distributed in Borneo and Sumatra; in Malaya found in many places in the lowlands.

4. **Agrostophyllum longifolium** (Bl.) Rchb. f., Bonpl. 5: 41. 1857. J. J. Fl. Buit. 6: 290, f. 222.—*Appendicula longifolia* Bl., Bijdr. J. Similar to *A. mijus* (no. 5) but leaves to 32 by 2-4 cm. (or larger) with broader sheaths; inflorescence head to 4 cm. diameter; flowers creamy white with the edges of the column and the edge of the partition of lip purple; the flowers larger with lip 5 mm. long, the blade acute, pointing forwards, and a purple swelling on the column below the stigma. Distributed in Java and Sumatra; in Malaya found at Cameron Highlands. The Malayan plants are larger than those described from Java, and it is possible that they represent a distinct species. On the other hand, they are very nearly allied to *A. majus*, and further collections may show intermediates.

5. **Agrostophyllum majus** Hk. f., F.B.I. 5: 824. 1890. Ic. PI. t. 2096. Ridl., Flora 4: 107.

Stems to 100 cm. long, flattened, widening towards the tip, 2-4 cm. long; leaves many, the lowest small, upper larger, blades at acute angle to the stem, to about 18 by 1-7 cm., narrowed slightly towards the shortly pointed tip, twisted at the base and jointed to a sheath 7-5 cm. long; inflorescence a head 2-5 to 3 cm. in diameter of many short crowded branches; flowers small, white, the edges of column and the partition of the lip purple-red; upper sepal about 2 by 1\* mm., erect, shortly pointed; mentum very short; lateral sepals upper, spreading, keeled on the back; petals as long as sepals but very narrow; lip in natural position 2.5 mm. long and wide, the base with sides raised as two small rounded side-lobes which are joined across by a partition; midlobe with a rounded downturned end; column 3 mm.

long, curved, with a thickened base but hardly any foot. A common lowland epiphyte, often in exposed places; found also in the mountains. Its flowering appears to occur as soon as the new growth is completed, about once a year. Fig. 139.



Fig. 139. *Agrostophyllum majus*, *a*, stem and flower head from below. *b*, side view of flower head, *c*, flower head from above. *d*, flower head from above with leaf-blades removed to show large bracts, *e*, flower from front. *f*, column. *g*, section through column and lip.

6. *Agrostophyllum tenue* J.J.S., Bull. Botg., Ser. 2, XXVI: 33. 1918. Ser. 3, 5: t. 36, f. 1. Carr in Gard. Bull. 7: 6. 1932.

Stems slender, hardly flattened, to 60 cm. long, internodes about 3 cm. long; leaves as in *A. majus* but narrow, the blade to 18 by 0.6 cm.; inflorescence head 2.5 cm. diameter, the branches each with 4 creamy-white flowers; upper sepal to 5 by 2.5 mm. with very short tip; laterals wider, forming a short mentum; petals about 4.5 by 1 mm., narrowed gradually to tip; lip with spherical hollow base within the mentum, bearing rounded side-lobes appressed to the sides of the column, a partition with a small appendage joining the side-lobes; midlobe concave at the base with acute forward-pointing blade, its lower surface bent sharply downwards in contact with the saccate base of the lip; column 3 mm. long, the sides forming narrow wings. Distributed in Java (probably also Sumatra); in Malaya only found at Fraser's Hill, but to be expected more widely on the hills. This species is very near *A. javanicum*, which has shorter broader leaves and 1 or 2 flowers on each branch of the inflorescence; this may also occur in Malaya, as it has been found in Sumatra.

7. *Agrostophyllum cyathiforme* J.J.S., Fl. Buit. 6: 291, f. 223. 1905. Carr in Gard. Bull. 7: 6. 1932.

Habit of *A. majus* but smaller; stems to 50 cm. long; leaves to 13.5 by 1.5 cm., flower head 3.5 cm. wide; flowers white, the base of lip and column yellow; upper sepal nearly 4 by 2 mm., thin, reflexed, acute; laterals forming a mentum 1 mm. long, their tips keeled, projecting forwards under the lip; lip with small saccate base, its sides produced upwards to the apex of the column where they open out into the cup-shaped blade; partition of lip low; a transverse fold in the lower surface between the base and the blade; column 3 mm. long. Distributed in Java and Sumatra; in Malaya only reported from Fraser's Hill, but probably elsewhere in the region. It may easily be mistaken for a small *A. majus*, but the flowers are very different.

### CERATOSTYLIS

Rhizome short or to 30 cm. or more long, creeping or pendulous, the free stems slender, short or long, 1-jointed, 1-leaved, with thin brown sheaths at the base; leaves narrow or almost terete, usually small; inflorescence terminal, short, dense, of many small flowers, usually few open together; sepals and petals about equal, the lateral sepals forming a mentum enclosing the base of the lip; lip narrow at base and usually curved, the blade usually thickened, hardly or not 3-lobed, with longitudinal folds; column short, divided at the apex into two erect arms which carry the stigmas on their inner sides; anther on the back of the column, its tip 4-chambered, PoUinia 8, all joined directly to a small

The structure of the plants is often difficult to understand, as the stems may be very short and quite covered with sheaths, the only organ projecting being the leaf, which appears as if it were joined directly to the rhizome. The inflorescence is actually always terminal, the leaf being joined to the stem just below it. The structure is most easily seen in the

common *C. subulata*, which should first be studied. Young plants of most species seem to have several 2-ranked leaves on a short stem; later stems are one-leaved. One species only is peculiar in having two leaves, like *barcostoma*, on mature plants.

In Malaya, only two species of *Ceratostylis* are at all widespread, namely *C. subulata* and *C. pendida*. The others are mostly mountain plants, found on high exposed ridges, locally common, but little collected. It is most probable that several more species remain to be found, and further information about several already known is desired.

The genus extends from India through the Malaysian region and into the Pacific at least to New Caledonia; about sixty species are known.

#### Key to the Malayan species of *Ceratostylis*

- Stems tufted, rush-like, green, the greater part not covered with sheaths
- Leaf much shorter than stem, almost terete
- Stems commonly 7-15 cm. long; mentum 1-5 mm. long      ..      ..      ..      1. *C. subulata*
- Stems commonly 20-25 cm. long; mentum 3 mm. long      ..      ..      ..      2. *C. ampullacea*
- Leaf as long as or longer than stem, distinctly flattened      ..      ..      ..      3. *C. gmcilis*
- Stems tufted or not, not rush-like, entirely or almost entirely covered with sheaths
- Stems more or less tufted
- Stems about 10 cm. long      ..      ..      4. *C. lancifolia*
- Stems very short
- Leaves 12 cm. or more long
- Petals and apical part of the lip fleshy      5. *C. linearifolia*
- Petals and apical part of the lip as thin as the sepals      ..      ..      6. *C. pulchella*
- Leaves not over 6 cm. long
- Leaves to about 5-5 by 10 cm., single      ..      7. *C. erixoides*
- Leaves to about 4 by 0.2 cm., two to each stem      ..      ..      ..      8. *C. sp.*
- Stems spaced on an elongated (often branched) rhizome, each very short, covered with sheaths
- Leaves to 12 by 2-5 cm.      ..      ..      9. *C. robusta*
- Leaves not over 6 cm. long
- Leaves to 6 by 0.7 cm.; sheaths not strongly veined      ..      ..      ..      10. *C. puncticulata*

Leaves not over 4 cm. long; sheaths  
strongly veined

Leaves to 4 by 0.5 cm.; lip with pointed  
ovate blade . . . . . 11. *C. pendula*

Leaves to 1.5 by 0.2 cm.; lip with end cut  
off almost square .. . . . 12. *C. clathrata*

1. ***Ceratostylis subulata*** Bl., Bijdr. 304. 1825. J.J.S., Fl. Buit. 6: 299, f. 229. Ridl., Flora 4: 109.—*C. malaccensis* Hk. f., F.B.I. 5: 825. 1890. Ic. Pl. t. 2098.

Stems closely tufted, commonly 7-15 cm. long, dark green, to 3 mm. thick; leaf almost terete, broadly grooved on one side, extending the line of the stem 2-4 cm. beyond the apparently lateral inflorescence; flowers appearing singly on very short stalks from a tuft of small chaffy bracts; flowers small, dull red-purple with yellow lip, not widely opening; upper sepal less than 3 mm. long, 1 mm. wide, tip curved backwards; lateral sepals forming a hairy mentum 1.5 mm. long, their inner edges joined in front of the mentum; petals about 2 by 1 mm., tips acute; lip narrow at the base with 2 raised lines, reddish, apical part fleshy, yellow, blunt, 1.5 mm. wide, the whole 3-5 mm. long; column arms rather short and broad. Distributed in Java and Sumatra. In Malaya a fairly common epiphyte in both lowlands and mountains, variable in the thickness of the stems, and perhaps also in the position of the mentum, which may be almost in contact with the ovary or at right angles to it. Young plants may have additional short green leaves at the base of a stem in place of some of the usual brown sheaths. **Fig. 140.**

2. ***Ceratostylis ampullacea*** Kranzl, Engl. Jahrb. 17: 487. 1893. J.J.S., Bull. Botg., Ser. 3, Suppl. II, t. 36, iv.

Habit of *C. subulata*, but with stems 20-25 cm. long and leaf very slightly grooved; mentum fully 3 mm. long, as long as upper sepal. Apparently common in mountain forest, distributed to Sumatra.

3. ***Ceratostylis gracilis*** BL, Bijdr. 306. 1825. J.J.S., Fl. Buit. 6: 300, f. 230. Carr, Gard. Bull. 7: 6. 1932.

Habit of *C. subulata* but stems slender, to about 6 cm. long, the leaf to 10 cm. long and 2.5 mm. wide, slightly flattened, narrowed to base and apex; flowers hardly opening, white, sweet-scented; upper sepal under 2 mm. long; mentum 1 mm. long, saccate, hairy; lip with narrow base suddenly widening to bluntly triangular fleshy blade, in all 2.5 mm. long. Distributed in Java and Sumatra; in Malaya only found at Fraser's Hill, but perhaps not uncommon on mountains.

4. ***Ceratostylis lancifolia*** Hk. f., F.B.I. 5: 826. 1890. Ic. Pl. t. 2102. Ridl., Flora 4: 109.

Stems tufted, slender, about 10 cm. long, bearing 2 or 3 overlapping rather loose brown sheaths and one leaf; leaf to 7.5 by 0.9 cm., acute, base gradually narrowed to a short stalk; flowers borne singly on pedicels

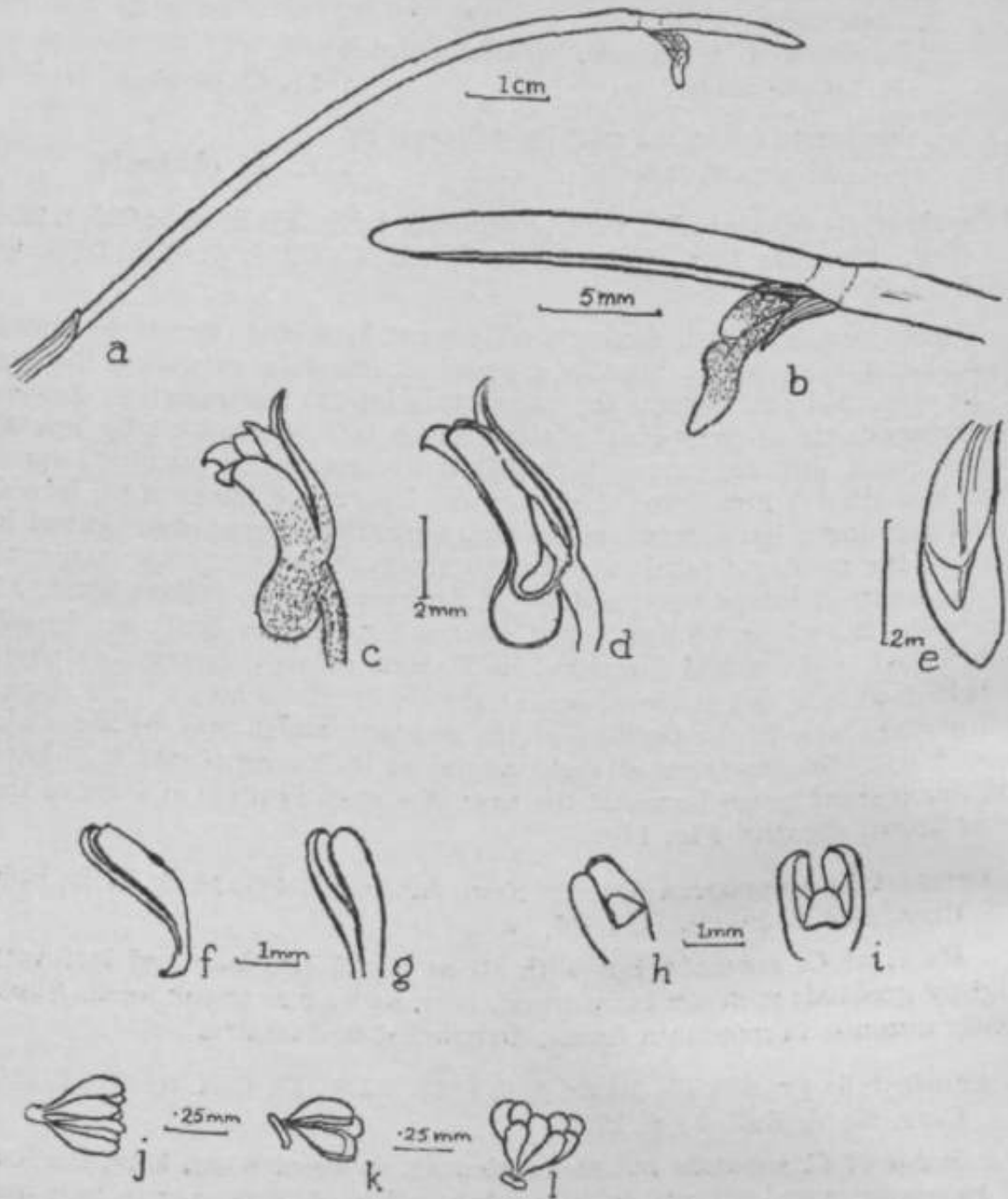


Fig. 140. *Ceratostylis subulate*, a, part of plant in flower. b, leaf and inflorescence. c, flower, d, flower with lateral sepals and petals removed, e, upper surface of lip. f, g, K different views of the column, h, i, back of column. j, k, l, pollinia.

about 8 mm. long, white with cream lip; upper sepal 6 mm. long<sup>1</sup>; laterals similar, their bases forming a short swollen round mentum; petals nearly as long, acute; lip 7 by 2 mm., straight, elliptic, apical third fleshy; column arms longer than wide. Collected only twice, on G. Tahan at 6,000 feet, and at an unspecified locality in Perak. In the original description the apical part of the lip is said to be much narrower than the base, but this is not true of the plant from G. Tahan.

5. *Ceratostylis linearifolia* Ridl., Flora M.P. 4: 110. 1924. ? = *C. radiata* J.J.S.

Stems short, tufted, hidden by sheaths; leaves to 16 by 0.9 cm., tough, tip blunt, base narrowed to a stalk; each flower borne on a scape 1 cm. long, the pedicel and ovary 8 mm., hairy; colour of flower unrecorded; upper sepal 11 by 0.2 cm.; laterals 3 mm. wide, their bases forming a short round mentum under 2 mm. in diameter; petals fleshy, almost as long as the upper sepal but narrower, pointed; base of lip narrow, bent at a right angle in the middle, the blade again at a right angle to it; base of blade broad, shallowly cup-shaped, about 4 mm. long and 3 mm. wide, with hairy edges; distal part of blade narrow, fleshy, the whole about as long as the sepals; column arms broad, barely 2 mm. long. Only known from a single collection from Langkawi. As the description is made from a dried specimen, the details may be somewhat inaccurate. This species is very nearly allied to *C. radiata* of Java and Sumatra.

6. *Ceratostylis pulchella* Holtt., Gard. Bull. Singap. 14: 4. 1953.

Similar in habit to *C. linearifolia*; leaves 12-20 cm. long, 5-7 mm. wide; scape 4 cm. long, hairy; bract 3-5 mm. long; petals and sepals translucent white, thin; dorsal sepal 12 mm. long, 2.5 mm. wide; lateral sepals 12 mm. long, 3 mm. wide, joined at the base and forming an almost spherical mentum 2 mm. in diameter; petals 11 mm. long, 2 mm. wide, gradually narrowed to apex; blade of lip 9 mm. long, 3 mm. wide at base, narrowed to apex, with 3 small keels at the base between the small side-lobes; claw of lip (enclosed in mentum) narrow, curved; stigmas 2 mm. long, taller than anther. Fraser's Hill; not uncommon as a low-level epiphyte near the path to Pine-Tree Hill.

7. *Ceratostylis eriaeoides* Hk. f., Ic. PL t. 2074. 1891. Ridl., Flora 4: 110. Carr, Gard. Bull. 5: 145. 1930.—*Eria pygma* Hk. f., F.B.I. 5: 804, 1890.

Stems tufted, hardly over 1 cm. long, covered with several overlapping sheaths; leaves to 5.5 by 0.5-1.2 cm., rather fleshy, widest in the distal half, shortly pointed; flowers borne singly on scape and pedicel 3 cm. long; sepals and petals white; upper sepal 0.9 to 1.4 cm. long, to about 5 mm. wide; laterals of similar size, forming a short mentum at the base; petals almost as large as sepals; lip with a narrow base close to the column-foot, widening to a blade about 4 mm. long and 2 mm. wide, fleshy, with 2 ridges, green with 2 dark brown patches at the base. Found on G. Tahan and at Cameron Highlands, on exposed ridges; a pretty species. The width of the leaves and size of flowers is variable.

8. Species from Cameron Highlands

Rhizome more or less erect, much branched, the leafy shoots 1 cm. or less apart, 2-leaved; leaves about 4 by 0.2 cm., tough; scape 2 cm., pedicel and ovary 2.5 mm. long; sepals 1.0 cm. long, 3 mm. wide; mentum under 1 mm. long; lip straight from end of column-foot, 6 mm. long,

narrow, median part fleshy throughout, base with thin erect sides, apical 2 mm. hardly 1 mm. wide, with a median low rounded fleshy keel; column arms 1 mm. high, narrowed to tips. This is similar in habit to *Sarcostoma javanica*. It appears to be locally common, and fresh flowers should be examined.

9. *Ceratostylis robusta* Hk. f., F.B.I. 5: 827. 1890. Ic. PL t. 2103. Ridl., Flora 4: 110.

Rhizome elongated, covered with rather short overlapping brown sheaths, bearing lateral stems to 2 cm. long, also covered with sheaths; leaf to 12.5 by 2.5 cm., narrowed to both base and acute apex, tough, with prominent midrib; scape almost hidden by sheaths; pedicel and ovary 1.2 cm. long; flowers 1.2 cm. long, hairy outside; upper sepal 5-6 mm. long; mentum of equal length, at an acute angle to the ovary; petals nearly as long as upper sepal but narrower; lip with narrow base as long as the ovate-acute fleshy blade, the whole 6-7 mm. long. Known only from a single collection by Wray in Perak at 4,900 feet altitude. The long mentum is peculiar if correctly described; no specimen exists in Singapore.

10. *Ceratostylis puncticulata* Ridl., J.S.B.R.A.S. 39: 79. 1903. Flora 4: 111.

Rhizome pendulous, the leaves about 1 cm. apart, their stems very short and covered with minutely punctate but not strongly veined sheaths; leaves to 6 by 0.7 cm., tip blunt, base shortly stalked; flowers about 3 mm. long, on very short stalks; lip about as long as the sepals and petals, the tip thickened, acute. Known only from a single collection made on G. Hijau (Taiping Hills) in 1893.

11. *Ceratostylis pendula* Hk. f., F.B.I. 5: 826. 1890. Ic. PL t. 2100. Ridl., Flora 4: 111.

Rhizome pendulous, to 30 cm. or more long, much branched, covered with overlapping brown sheaths which are strongly ribbed; leaves about 1 cm. apart, to 4 by 0.5 cm., thickly fleshy, acute, usually broadest towards the unstalked base; flowers appearing from a dense tuft of bracts at the base of each leaf, very shortly stalked; flowers white, about 3 mm. long, sepals and petals about equal; mentum short; lip with short narrow curved base, the blade at right angles to this, ovate, fleshy in the middle, longer than wide, the edges thinner and slightly raised; column-arms short and broad. Found at many places in the lowlands, but not known to occur outside Malaya. **Fig. 141.**

12. *Ceratosiylis clathrata* Hk. f., F.B.I. 5: 825. 1890. Ic. PL t. 2099. Ridl., Flora 4: 111.

Habit of *C. pendula* but smaller, the rhizome commonly to about 12 cm. long, covered with conspicuously net-veined sheaths; leaves about 1.5 cm. long, 3 mm. wide, almost terete, very fleshy; flowers on very short stalks, straw-coloured with dark purple veins, hairy outside, about 6 mm. long; upper sepal 4 by 2 mm.; mentum 2 mm. long, at right angles to ovary; petals half as wide as sepals with pale narrow tips; lip with narrow base and a massive pale callus forming the truncate apex of the blade,



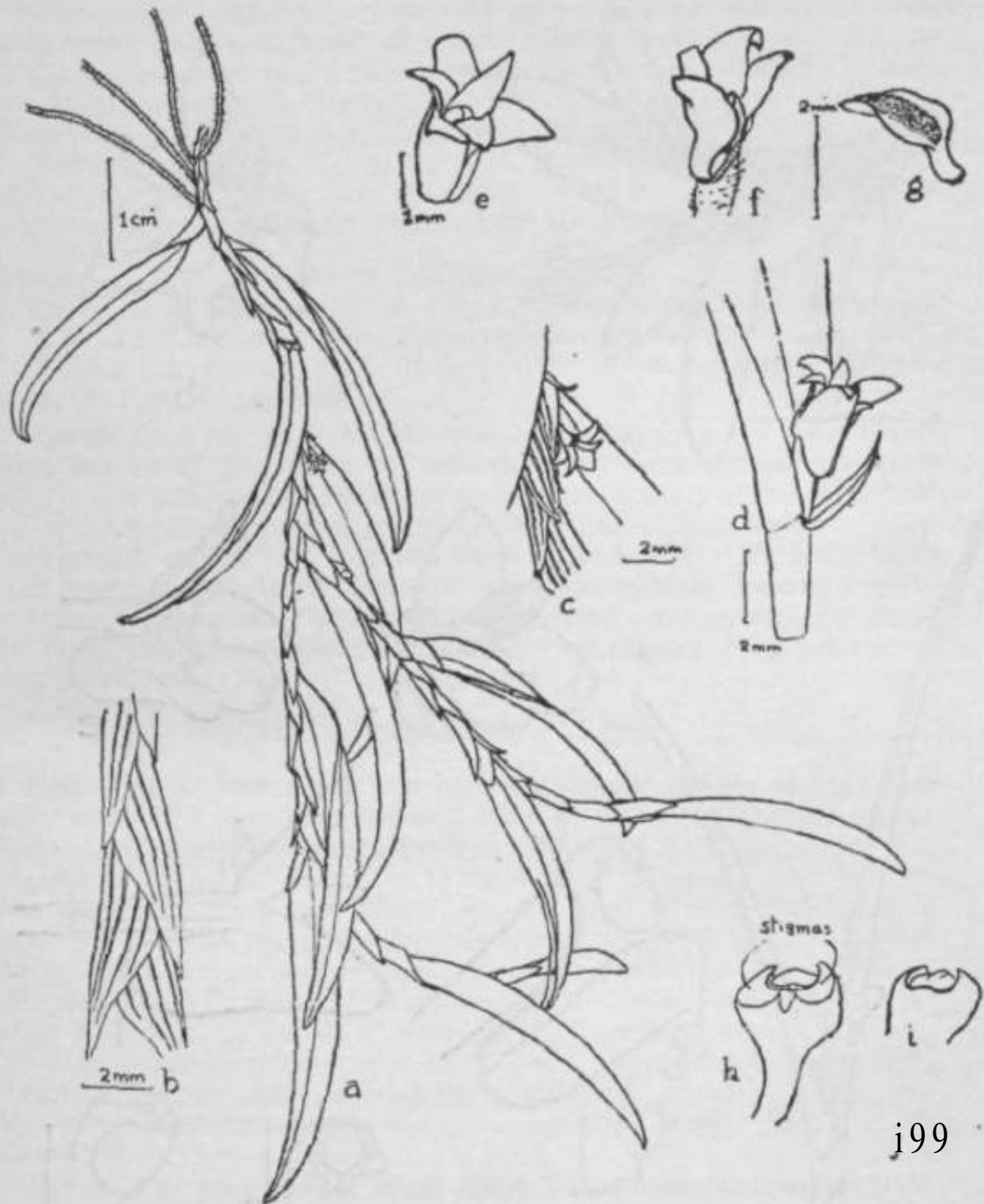


Fig. 141. *Ceratostylis pendula*. *a*, plant in natural position, *b*, sheaths on rhizome, *c*, inflorescence in natural position, *d*, flower with inflorescence sheaths and bract removed, *e*, flower. *f*, flower with lateral sepals removed. *g*, lip. *h*, front of column, *i*, back of column. *j*, pollinia, front and side views.

with 2 keels on the upper surface. Collected at Fraser's Hill, Cameron Highlands, G. Benom and at two unknown localities in Perak; not known outside Malaya, Fig. 142, *a*, *b*.

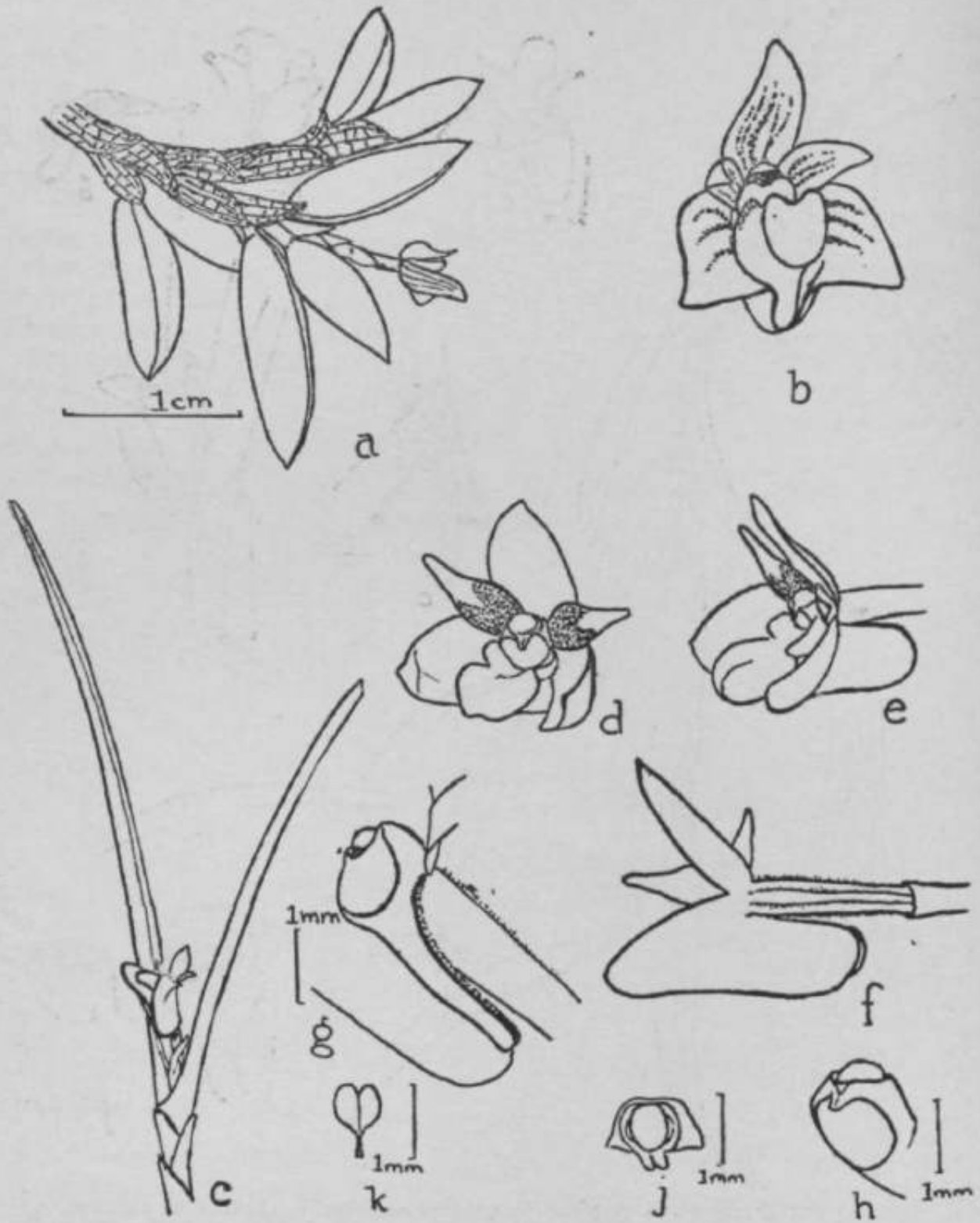


Fig. 142. *Ceratostylis clatkrata*. a, part of plant in flower, b, flower from front. *Sarcostoma javanica*. c, apex of stem with inflorescence, rf, flower from front, e, l, flower from side. g, column and column-foot, h, column. i, column from above, k, two pollinia.

## SARCOSTOMA

Stems short, close, 1- or 2-leaved; leaves narrow; inflorescence terminal, short, bearing 1 flower at a time; lateral sepals joined to column-foot to form a mentum; petals narrower than sepals; lip with narrow base, the blade 3-lobed, thickened at the tip; column short, broad[and undivided at the tip; anther 2-chambered; pollinia 4; stigma large, simple.

About 3 species are known, all from Malaysia. The flowers are near *Ceratostylis* in structure, but the column arms are not developed, the anther has 4 pollinia instead of 8, and the lip is clearly 3-lobed.

*Sarcostoma javanica* BL, Bijdr. 340. 1825. J.J.S., Fl. Buit. 6: 304, f. 233. Carr, Gard. Bull. 5: 16, pi. III, C. 1929.—*Ceratostylis cryptantha* Ridl., J.L.S. 32: 309. 1896. Flora 4: 110.—*Ceratostylis lineans* Rial., J.S.B.R.A.S. 61: 40. 1912. Flora 4: 110.—*Sarcostoma lineans* Carr, Gard. Bull. 5: 16. 1929.

Leaves 6-10 cm. long, 3 mm. wide; scape barely 1 cm. long, short-hairy; flowers 6-5 mm. diameter, the sepals and petals spreading; sepals white, petals with narrow white apical half, the borders of the basal half deep crimson; lip with small erect side-lobes and a blunt fleshy midlobe, cream colour; column-foot long and narrow, bent back at an acute angle to the ovary. Distributed in Java and Sumatra; in Malaya found in both lowlands and mountains, in various parts of the country, forming dense little tufts. The flowers, though small, are very elegant; they last only a day. **Fig. 142, c-k.**

## THE APPENDICULA TRIBE

Epiphytes or rock plants; stems long, slender, simple or branched, usually many in a close group; leaves small or rather small, more or less closely 2-ranked, nearly always jointed at the base of the blade, usually flat, more or less twisted at the base to bring them all into one plane; inflorescences terminal, usually also lateral, long or short; flowers small; sepals free or more or less joined, the laterals usually joined to the column-foot to form a sac- or spur-shaped mentum; petals similar to upper sepal or rather narrower; lip attached to the end of the column-foot, rarely with distinct side-lobes, in almost all cases with an appendage near the base, pointing downwards; column short, usually with a comparatively long foot; anther with long or short beak; pollinia 4, 6 or 8, joined to one or two stipes; column sometimes with erect arms; rostellum usually long, pointed, slightly cleft.

This is a group totalling in all about 140 species, distributed from India to the Pacific. In Malaya it is represented chiefly by the genus *Appendicula*, with 4 species of *Podochilus* and one of *Posephyllum*. All the species have a very similar general aspect, owing to the relatively long slender stems and numerous 2-ranked leaves; they resemble rather closely *Agrostophyllum bicuspidatum* and its allies, and are not very easy to distinguish vegetatively from these though the flowers are very different. Several species are very common epiphytes and rock plants, and among them are the very small-leaved species of *Podochilus*.

## Key to the genera of the Appendicula Tribe

- Pollinia 4; leaves not more than about 1-2 cm. long .. *Podochilus*  
 Pollinia 6 or 8; leaves larger  
   Pollinia 6; base of lip always with appendage .. *Appendicula*  
   Pollinia 8; base of lip without appendage, joined to  
     the edges of the column-foot to form a sac . . . *Poxphyllum*

## PODOCHILUS

Small, or rather small, epiphytes with slender stems and close small leaves; inflorescence not over 2 cm. long, with few or many flowers; appendages of lip simple or divided into 2 parts, one on each side of the base of the lip; pollinia 4, attached to 1 or 2 stipes.

The two common Malayan species of this genus have leaves so small as to be almost moss-like. The plants often form rather dense mats, growing on wet mossy tree-trunks or rocks in shady forest, bearing tiny white flowers, often with 2 small purple spots.

## Key to the Malayan species of Podochilus

- Leaves to 2 mm. wide, acute  
   Leaves about 6 by 1 mm., at a very acute angle  
     to the stem; lip with 2 narrow curved appendages at base . . . . . 1. *P. tenuis*  
   Leaves about 8 by 2 mm., more spreading; lip  
     with simple broad appendage at base . . . . . 2. *P. microphyllus*  
 Leaves wider, ends rounded  
   Leaves about 10 by 0.6 cm.; sepals and fruits  
     hairy . . . . . 3. *P. muricatus*  
   Leaves about 1.2 by 0.35 cm.; sepals and fruits  
     not hairy . . . . . 4. *P. lucescens*

1. **Podochilus tenuis** (Bl.) Lindl., Gen. et Sp. Orch. 235. 1833. J.J.S., Fl. Buit. 6: 509, f. 386. Ridl., Flora 4: 193.—*Apista tenuis* Bl., Bijdr. 296. 1825.—*Podochilus acicularis* Hk. f., F.B.I. 6: 82. 1890. Ic. PL \* 2147.

Stems to 20 cm. or more long, very slender; leaves to 6 by 1 mm., rather close to the stem, acute, twisted at the base; inflorescences terminal and lateral, about 5 mm. long; flowers few, 3 mm. long, white; upper sepal about 2 by 1.5 mm.; laterals joined in front of the swollen mentum, with or without purple spots at tips; petals blunt; lip white with 2 purple spots, a narrow curved appendage on each side near base, blade more or less bluntly triangular. Distributed in Java and Sumatra; in Malaya not uncommon in the lowlands and to 2,000 feet on the mountains.

2. **Podochilus microphyllus** Lindl., Gen. et Sp. Orch. 234. 1835. Wall. Cat. 7335. Ridl., Flora 4: 193.—*P. confusus* J.J.S., Bull. Botz., Ser. 3, » 358. 1927.

Stems to 20 cm. or more long and 1 mm. thick; leaves close, spreading, to about 8 by 2 mm., sharply pointed, twisted at base, sometimes purplish;

inflorescences terminal and lateral, few-flowered; flowers 2-4 mm. long, white; upper sepal broad, hooded, laterals joined to form a mentum, all sometimes with a median purple line; petals to 1.7 by 0.9 mm, with purple patch in centre; lip with narrow base bearing a short wider entire appendage, blade widened upwards, bluntly pointed, sometimes with a faint purplish blotch on each side. Distributed in Java, Sumatra and Borneo; in Malaya common in most places in shady forest in the lowlands and to 3,000 feet or more on the mountains. The lowland plants appear usually to have only purple on the petals, the flowers (at least sometimes) being smaller than those of the mountain plants. Fig. 143.

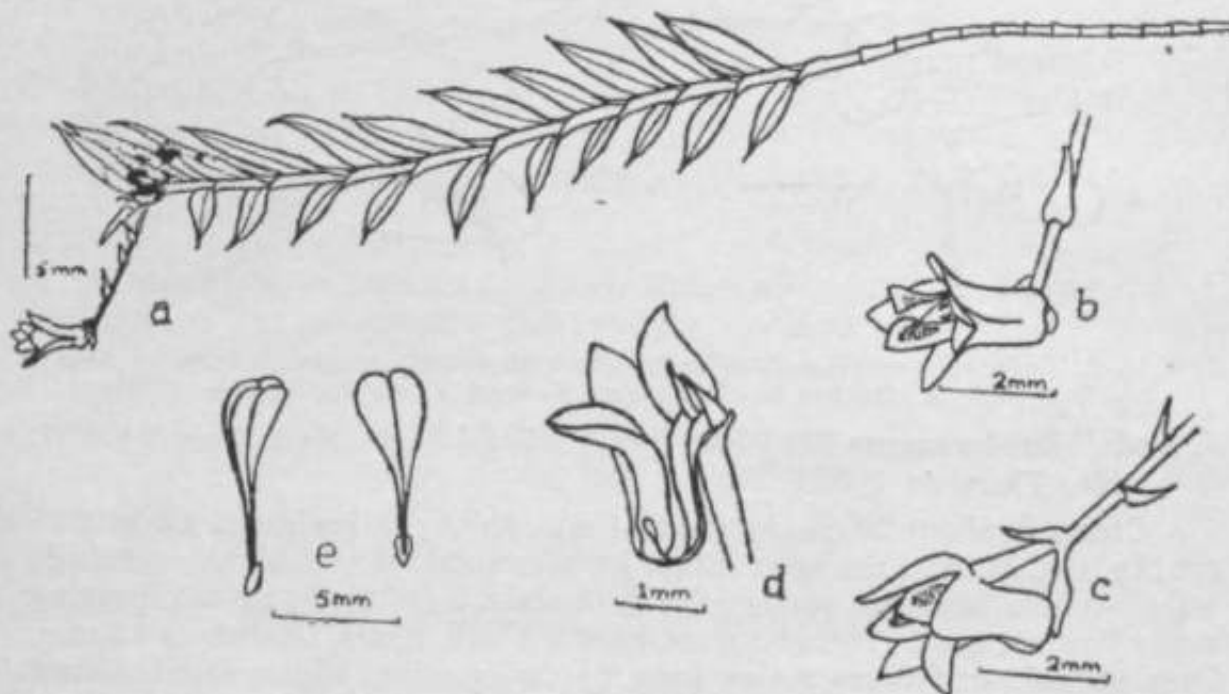


Fig. 143. *Podochilus microphyllus*, a, stem and inflorescence. b, c, flowers, d, flower with upper sepal and lateral sepal removed, showing lip with appendage, and column, e, pollinia from back and from front.

3. *Podochilus muricatus* (T. et B.) Schltr., Mem. Herb. Boiss. no. 21: 64. 1900. Ridl., Mat. Fl. M.P. 1: 196. J.J.S., Blumea 5: 720. 1945.—*Appendicvla mwricata* T. et B., Nat. Tijdschr. Ned. Ind. 24: 322. 1862. J.J.S., Fl. Buit. 6: 516. Ridl., Flora 4: 197.

Stems to about 15 cm, long, internodes 3-4 mm.; leaves about 10 by 0.6 cm., twisted at base, ovate, blunt, the tip slightly notched; inflorescence terminal, very short; flowers usually solitary, 7 mm. long, white with purple marks on petals and lip, the sepals stiffly hairy outside; lip with slightly bilobed hairy appendage; column-arms deep purple; fruit about 8 mm. long, conspicuously hairy. Distributed in Java (and probably Sumatra); in Malaya only found on mountains at 3,000-4,000 feet, on rocks and trees. The species is quite distinctive owing to its hairy fruits. Fig. 143 A.

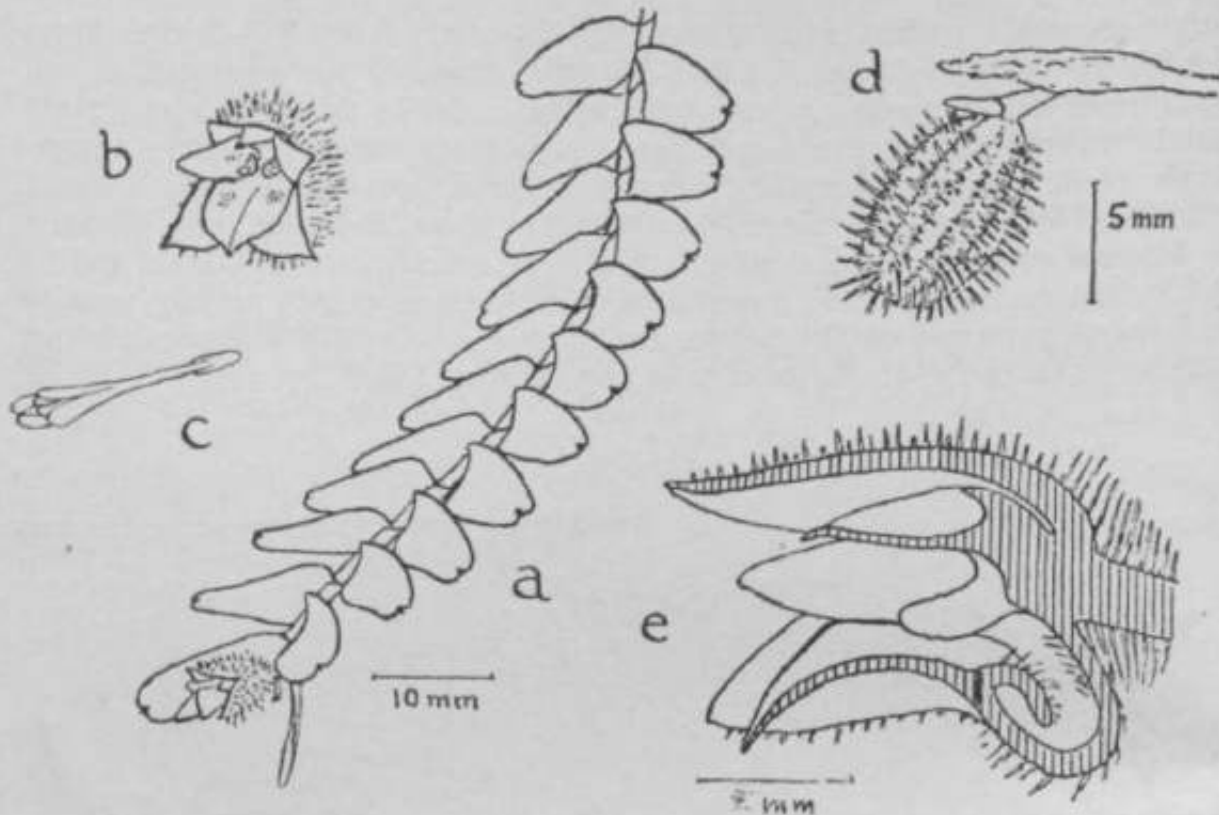


Fig. 143A. *Podochilus muricatus*. a, leafy stem with flower at apex, b, front of flower\* c, pollinia attached to cleft stipes, d, fruit, e, vertical section of flower.

4. *Podochilus lucescens* Bl., Bijdr. 295. 1825. J.J.S., Fl. Buit. 6: 510, f. 387. Ridl., Flora 4: 193.

Stems to about 20 cm. long and 1 mm. thick; leaves about 1-2 by 0.35 cm., twisted at base, the apex rather broadly rounded and slightly notched; inflorescences terminal, rarely lateral, to about 2 cm. long, zig-zag, bearing many flowers, one or two at a time, hardly 1 mm. apart, the bracts 1.5 mm. long, spreading; flowers 3 mm. long, hardly opening, white; sepals joined to form a tube at the base, the mentum very short; petals 2.5 by 1 mm.; lip with a fleshy tooth on each side at the base, and 2 short keels in the middle, the sides of the blade curved upwards and almost meeting, the tip blunt, a purple spot at the base. Distributed in Sumatra and Borneo and northwards to Tenasserim; in Malaya found in Langkawi, and also by the Sedili River in Johore. It must surely occur at other places between these two localities, and more information about its distribution is desired. The habit of the plant, and its almost tubular flowers on a minutely zig-zag inflorescence, are distinctive.

#### APPENDICULA

Small or large plants, with erect or pendulous, simple or branched stems; leaves small or fairly large, flat, usually oblique to the stems; inflorescences terminal and often also lateral, short or long; upper sepal always free, laterals forming a mentum; lip joined to the column-foot, with an appendage on the upper surface towards the base; appendage usually more or less round and concave, sometimes its edges continued towards the apex of the lip as small keels; midlobe of the lip sometimes with a median

keel or callus; rostellum usually almost erect, the anther behind it with long or short point; pollinia 6, on a single forked stipes or 2 separate ones.

Several species of *Appendicula* are common epiphytes, and a few of them are quite large. Their regular 2-ranked leaves, more or less twisted at the base so that the blades all lie in one plane, are characteristic, but quite similar also to species of the *Distichophyllum* group of *Dendrobium*, and to *Agrostophyllum bicuspidatum*. The flowers of *Appendicula* are all smaller than the *Dendrobiums*; and the very different shape of the lip, with its basal appendage inside, distinguishes them from *Agrostophyllum*. A good lens is necessary to distinguish the flowers of the different species.

### Key to the species of *Appendicula* in Malaya

Stems with side-branches

Lip of flower twisted to one side; inflorescence short

1. *A. ovalis*

Lip not twisted; inflorescence long

2. *A. pendula*

Stems unbranched

Floral bracts leaf-like, closely overlapping, purplish

3. *A. torta*

Floral bracts not leaf-like

Stem and leaf-sheaths strongly flattened

4. *A. anceps*

Stem and leaf-sheaths not strongly flattened

Inflorescence about as long as leaves, or longer

Flowers 1 or 2 at end of inflorescence 5. *A. undulata*

Flowers many, from base of inflorescence

Erect river-bank plant with leaves to 4 mm. wide

6. *A. rupestris*

Not on river-banks in flood-zone; leaves wider

Inflorescence to 3 cm. long; lip with median keel-like callus

7. *A. densifolia*

Inflorescence often much longer, lip with 2 short keels near edges, none in centre

2. *A. pendula*

Inflorescence shorter than leaves

Lip without callus or keel in centre of blade; upper sepal hardly 2-5 mm. long

8. *A. reflexa*

Lip with callus or keel in centre of blade; upper sepal larger

Leaves to 8 by 1-7 cm.; callus on lip curved towards column like a claw

9. *A. uncata*

Leaves always much smaller; callus of different shape

Leaves fleshy and shining, to 1-5 cm. long, very close; a median keel on blade of lip

10. *A. lucida*

Leaves hardly fleshy, to 3-5 cm. long;  
 a short broad cylindric callus in  
 centre of blade of lip .. 11. *A. cornuta*

1. **Appendicula ovalis** (Schltr.) J.J.S., Ic. Bog. 2: 57. 1903. Fl. Buit. 6: 534, f. 40S.—*Podochilus ovalis* Schltr., Mem. Herb. Boiss. 21: 54. 1900.—*Appendicula purpurascens* quoad RidL, Flora 4: 195, p.p-

Stem hanging, 60 cm. or more long, with several lateral branches; internodes under 1 cm. long on main stem; leaves to 1.8 by 0.9 cm., oblong with rounded end, those of branches much smaller than those of <sup>m</sup> ^ £ stem; inflorescences about 1 cm. long, lateral and terminal, each with few flowers; flowers white and purple, about 7 mm. long; upper sepal a little over 3 mm. long; mentum 3-5 mm. long, at right angles to ovary; lateral sepals joined in front of mentum; petals smaller than upper <sup>se</sup>P ^ j lip with triangular downturned purple blade twisted to the right, thickened at the tip, appendage broad and round; anther purple. Distributed in Java and Sumatra; in Malaya not uncommon as an epiphyte in mountain forests.

2. **Appendicula pendula** Bl., Bijdr. 298. 1825. J.J.S., Fl. Buit. 6: 524, 1 399. RidL, Flora 4: 198.—A *Maingayi* Hk. f., F.B.I. 6: 85. 1890. Ic. PL t. 2151.—A. *latibracteata* J.J.S., Bull. Btzg., Ser. 2, XIII: 37. 1914. Şer. 3, Suppl. II: t. 28, V.—A. *lancifolia* Hk. f., F.B.I. 6: 84. 1890. Ridl., Flora 4: 198.

Stems pendulous, to 2 m. long, in large plants often with side-branches; plants with simple stems to about 1 m. long; leaves on main stem to 12 by 2.5 cm., widest one-third from the base, narrowed evenly to acute unequally bilobed tip; leaves of branches smaller than on the main stem, the smallest about 3 by 0.7 cm.; inflorescences terminal or sub-terminal, hanging stiffly, often branched at the base, to 15 cm. long; bracts many, reflexed, the largest 6 mm. long and up to 5 mm. wide (often narrower); flowers 6.5 mm. long, pale green, turning yellowish, the lip palest; upper sepal about 4 by 2.5 mm., concave, broadly pointed; mentum 3 mm. long and wide, at an acute angle to ovary; lateral sepals more or less spreading, petals 3.5 mm. long and up to 2 mm. wide; lip fleshy, the appendage concave, round, fleshy, its edges running back on to the blade of the lip as two low keels near the sides; blade of lip bent in the middle but not downturned, about 3.5 mm. wide, a reddish mark on either side (always ?), the end broadly rounded with a very short tip within which is a small round callus; anther short. Distributed in Java, Sumatra and Borneo; in Malaya fairly common in both lowlands and mountains, variable in size of plants and also a little in size of flowers and width of bracts.

Var. **latibracteata**. Differs from the typical form of the species in having always very broad almost round bracts, the flowers a little larger (upper sepal 5 mm. long), the lip white, with the appendage distinctly notched at its end, and apparently also in longer anther. Found in Borneo; in Malaya only known to occur on trees by rivers in the lowlands of Pahang and Johore. How far this variety is variable we do not know; the cleft appendage of the lip seems to be the most distinctive character.



3. *Appendicula torta* BL, Bijdr. 303. 1825. J.J.S., Fl. Buit. 6: 514, f. 390.  
Var. *alba* J.J.S., FL Buit. 6: 516. *A. torta* quoad Ridl. Flora 4: 198  
(fide J.J.S.).

Stems to 25 cm. long, flattened internodes about 5 mm., leaves to 1.6 by 0.5 cm., nearly at right angles to the stem, oblong-elliptic, tips rounded, cleft, sheaths flattened; inflorescence terminal, about 1.5 cm. long, bracts leaf-like, closely overlapping, curved, about 1 cm. long, purplish; flowers yellowish, hardly appearing from between the bracts, about 5.5 mm. wide; upper sepal 3.5 by 2.5 mm., concave, very shortly tipped; mentum 3 mm. long, broad; lateral sepals spreading, keeled, acute; petals 3 by 1.7 mm., blunt; lip with grooved narrow basal part with appendage of similar shape; 2 purple spots where edges of appendage join lip; blade of lip 4 mm. wide, 2 mm. long, deeply cleft, twisted; rostellum long pointed. Distributed in Java, Sumatra and Borneo; in Malaya found at Batu Caves, Gua Musang and on Taiping Hills. The bracts distinguish this from any other Malayan orchid.

4. *Appendicula anceps* BL, Bijdr. 299. 1825. J.J.S., Fl. Buit. 6: 518, f. 393. Ridl., Flora 4: 195.

Stems to 45 cm. long, flattened, internodes 2 to 3 cm.; leaves oblique to the stem, to about 6 by 1.5 cm., almost evenly elliptic, the blunt tip slightly cleft, with a tooth in the sinus; sheaths keeled in continuation of the midrib of the blade, giving the leafy stem a strongly flattened appearance; inflorescences terminal and axillary, turned downwards, sometimes branched at the base, shorter than the leaves; flowers 4 mm. diameter, sepals and petals pale greenish; upper sepal 2.5 by 1.5 mm.; mentum under 2 mm. long, very broad; petals spreading, 2 by 1 mm.; lip white with 2 purple spots, no callus, blade turned down in front, with blunt tip; anther dark red-brown. Distributed from Sumatra to the Philippines; in Malaya common in the lowlands and to about 3,500 feet on the hills.

5. *Appendicula undulata* BL, Bijdr. 301. 1825. J.J.S.. \*1 Buit. 6: 527, f. 402.  
—*A purpurascens* quoad de Vr., III. Orch. t. XII. 1854, non BL Ridl., Flora 4: 195 (p.p.)—*Podochilus unciferus* Hk. f., F.B.I. 6: 81. 1890. Ic. PL t. 2145.

Stems to 80 cm. or more long, slightly flattened, pendulous, unbranched, internodes hardly 1 cm. long; leaves often purplish, oblique to the stem, to about 3 by 1.2 cm., broadly elliptic, the blunt tip turned back, with a small tooth; inflorescences many, lateral, about as long as the leaves, the scape very slender, bearing 1 or 2 flowers near its tip and below them several tubular sheaths; flowers 7.5 mm. long, barely 3 mm. wide; sepals and petals bright purple with pale mauve base and midrib; upper sepal 3.5 mm. long; mentum 4 mm. long, white; lateral sepals with edges joined in front of the mentum, only the tips being free; petals 2.5 by 2 mm.; lip white except for the bright purple blunt tip; appendage rather narrow, 1.5 mm. long; anther purple. Distributed in Java, Sumatra and Borneo; in Malaya found as an epiphyte on riverside trees, and at the foot of limestone hills, in Pahang. Fig. 144,

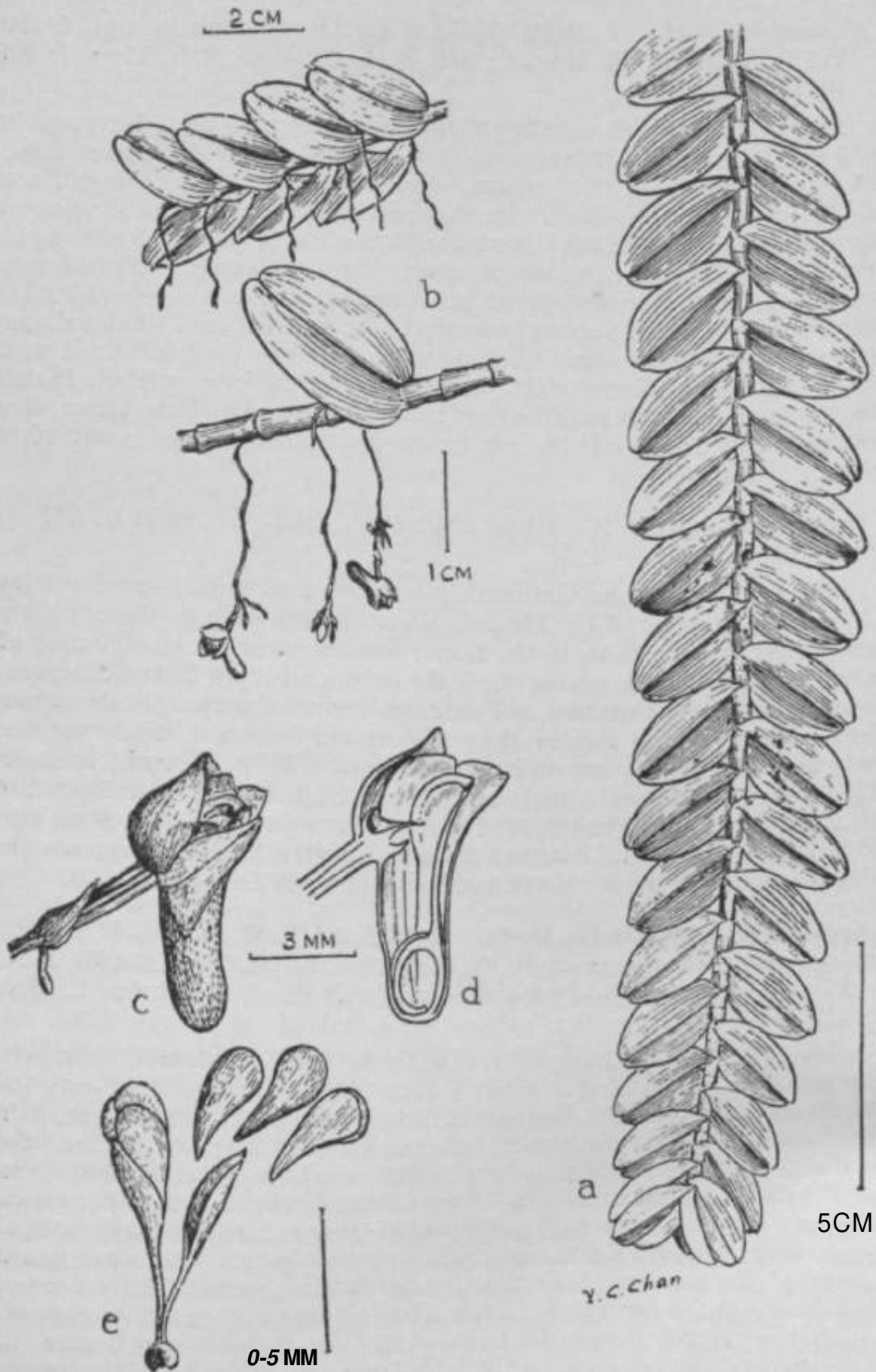


Fig. 144. *Appendicula undulata*. *a*, part of leafy stem, *b*, inflorescences, *c*, flower from side, *d*, section through flower, *e*, pollinia, showing stipes and disc.

6. *Appendicula rupestris* Ridl., J.L.S. 32: 391. 1896. Flora 4: 197.

Stems erect, to about 25 cm. long, slender, internodes to 1 cm. long; leaves grass-like, to 5.5 by 0.4 cm., narrowed to blunt tip; inflorescences erect, terminal or near the stem-apex, elongating, with many close flowers, to 5 cm. long; bracts deflexed, narrow, 4 mm. long; flowers white, 5 mm. long, little over 2 mm. wide; upper sepal hardly 2.5 mm. long, mentum nearly 3 mm. long; lateral sepals hardly spreading; petals shorter than upper sepal, blunt, erect; lip with short concave appendage shaped as in *A. cornuta*; blade not reflexed, pink (?), edges inrolled; rostellum short, broad. Found only on river-banks in flood zone, in Pahang and Perak; a grass-like plant.

7. *Appendicula densifolia* Ridl., Flora 4: 197. 1924.—*Podochilus densifolius* Ridl., J.S.B.R.A.S. 39: 86. 1903.

Stems to 35 cm. long, internodes to 8 mm. long; leaves almost at right angles to the stem, often slightly overlapping, shining, brownish beneath, to 3.2 by 1.4 cm., base very broad and overlapping the stem, slightly narrowed to rounded notched tip; inflorescences terminal or nearly so, to 3 cm. long, with many crowded flowers; bracts 3 mm. long, broad, concave; flowers 7.5 mm. long and 5 mm. wide, pale greenish, the petals and lip white; upper sepal broad, concave, 4 mm. long; mentum 3 mm. long; lateral sepals spreading; petals almost round, about 3 by 3 mm.; lip fleshy, with rather small round concave appendage, the midlobe only slightly reflexed, triangular with a mauve spot on each side and in the centre a high narrow fleshy mauve keel, rounded in profile from the side, descending as a low ridge nearly to the tip of the blade; column arms tall and narrow. Only known as an epiphyte on trees by rivers in Johore, Pahang and Kemaman (Trengganu).

8. *Appendicula reflexa* Bl., Bijdr. 301. 1825. J.J.S., Fl. Buit. 6: 523, f. 398. Ridl., Flora 4: 197.—*A. cordata* Hk. f., F.B.I. 6: 83. 1890. Ic. Pl. t. 2148.—*A. robusta* Ridl., Flora 4: 197. 1924.

Stems to 60 cm. or more long, internodes to 1 cm.; leaves sometimes bronzed, 3 to 4.5 by 1.0 to 1.8 cm., oblique to the stem, narrowed slightly to blunt bilobed apex; inflorescences lateral and terminal, to about 1.5 cm. long, with about 10-12 flowers; flowers barely 3 mm. diameter, greenish with white lip; upper sepal hardly 2.5 mm. long; mentum 2 mm.; petals about 2 by 1 mm.; base of lip as in *A. cornuta*, blade without callus, short, grooved in centre, tip blunt with a very small swelling close to it; column green, without tall arms, rostellum broadly triangular. Distributed from Sumatra to New Guinea; in Malaya found in Johore, Pahang and Perak, both in lowlands and mountains. A plant from 3,000 feet on Pulau Tioman which agrees in flowers with this species has leaves to 7 by 1.4 cm., internodes to 1.5 cm. In general, mountain plants have larger leaves than lowland ones. Fig. 145.

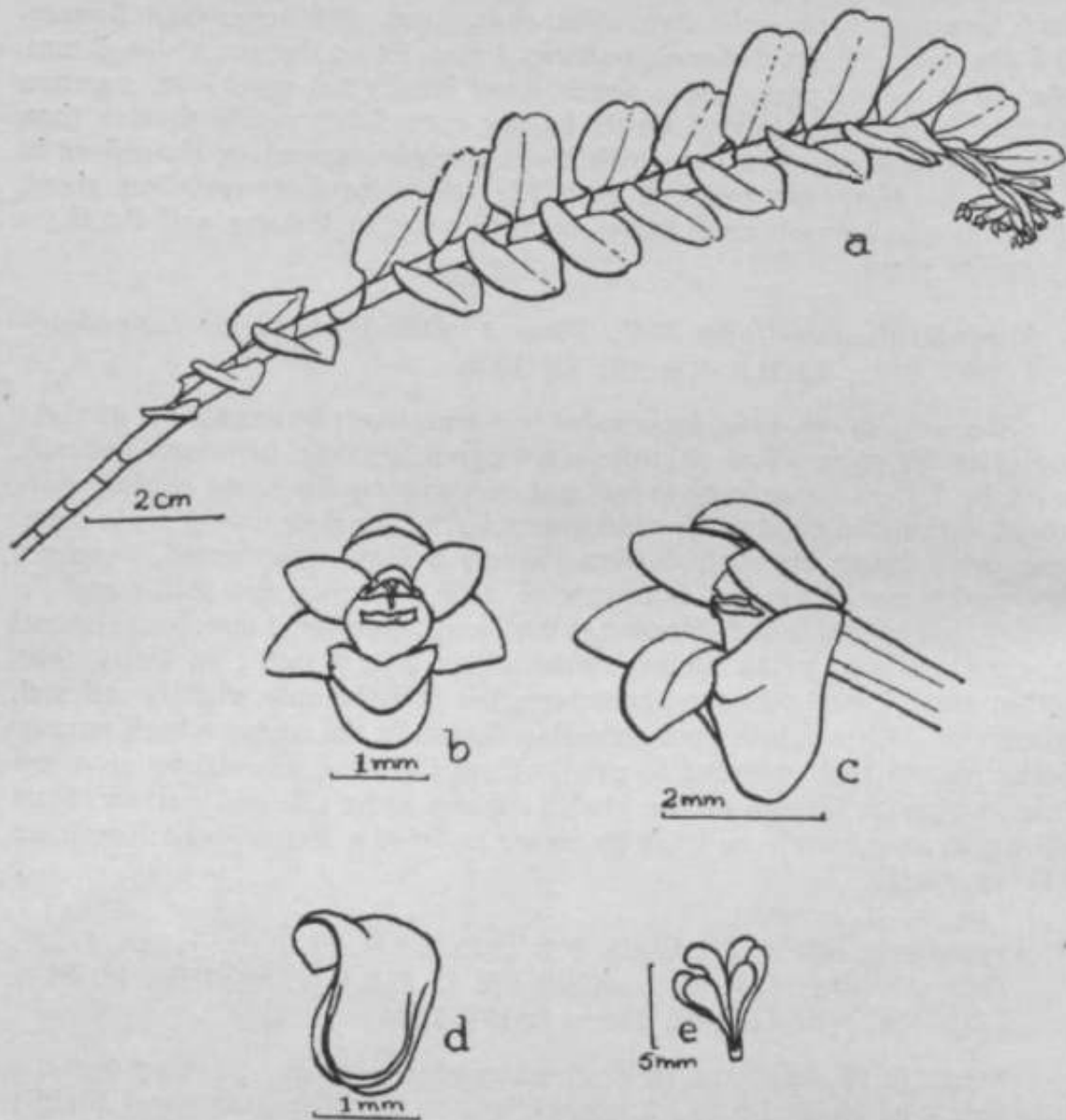


Fig. 145. *Appendicula reftexa*, *a*, stem and inflorescence, *b*, flower from front, *c*, flower from side, *d*, inside of lip, showing appendage, *e*, pollinia.

**9. *Appendicula uncata* Ridl., J.L.S. 32: 390. 1896. Flora 4: 196,**

Stems to 40 cm. long, internodes to 1.5 cm. long; leaves at about 45° to the stem, about 8 by 1.7 cm., narrowed gradually to an almost pointed slightly notched apex, a tooth in the sinus; inflorescences terminal and

lateral, about 1.5 cm. long, with up to 10 flowers; flowers white, 8 mm. wide and nearly 1 cm. long; upper sepal 6 by 4 mm., concave, tip blunt; mentum 3 mm. long, broad; lateral sepals with spreading tips; petals about 5 by 3 mm., pointed; lip blade 4.5 mm. wide, a broad green callus 1 mm. high in the middle, its blunt top curved towards the column like a hook; appendage round, concave; column arms short, rounded, rostellum long. In lowland swamp forest in the southern half of Malaya. Nearly related to *A. reflexa* but with longer leaves and much larger flowers.

10. *Appendicula lucida* Ridl., J.L.S. 32: 392. 1896. Flora 4: 196. J.J.S., Bull. Btzg., Ser. 3, Suppl. II: t. 29, I (by error as II).

Stems to 25 cm. long, internodes about 5 mm. long; leaves fleshy and shining, to 1.5 by 0.8 cm., widest near almost cordate base, narrowed to blunt unequal apex, little twisted, so that they do not lie in one plane; inflorescence of 3 or 4 flowers, terminal or axillary; flowers pale greenish, about 5 mm. long; upper sepal 3.5 by 2 mm., hooded over column; mentum nearly 2 mm. long and wide; lateral sepals slightly spreading; all sepals slightly purplish at tips; petals little over 2 by 1 mm., elliptic, with dull purple median band; lip joined to sides of column-foot to form a closed sac; appendage bluntly triangular; blade of lip downturned, blunt, bearing at the bend a median callus in the form of a short keel; sometimes a bright purple spot on each side of blade; no column-arms; base of column brown-purple. Known from Borneo, southern Malaya and Pahang, chiefly by rivers.

11. *Appendicula cornuta* Bl., Bijdr. 302. 1825. J.J.S., Fl. Buit. 6: 522, f. 396. Ridl., Flora 4: 196.—*A. bifaria* Lindl. in Hook. Kew Journ. 7: 35. 1855. King & Pantl. Ann. Calc. 8: 248, pi. 330.—*A. cyclopetala* Schltr., Orch. Deutsch. N. Guin. 336. 1912. J.J.S., Bull. Btzg., Ser. 3, Suppl. II, t. 28, I.

Stems to 50 cm. long, internodes to 1 cm. long; leaves to 3.5 by 1 cm., at 45° or more to the stem, not much twisted at the base, narrowed distinctly from base to blunt notched tip; inflorescences terminal and lateral, shorter than leaves, with several flowers close together; bracts to 5 mm. long, narrow, reflexed; flowers white, yellowing when old, 7.5 mm. long; upper sepal 4 mm. long and wide, concave; mentum 3 mm. long, broad; lateral sepals joined a little in front of mentum, ends spreading, broad; petals almost round, a little smaller than upper sepal; lip with large concave round appendage; blade of lip downturned, blunt, sometimes with purple edges, with a short broad cylindrical callus at the bend; column with long-pointed toothed arms on either side of the long rostellum. Distributed from Sumatra to the Philippines; distinctly variable in size. In Malaya it is common, chiefly in the lowlands. Fig. 146.

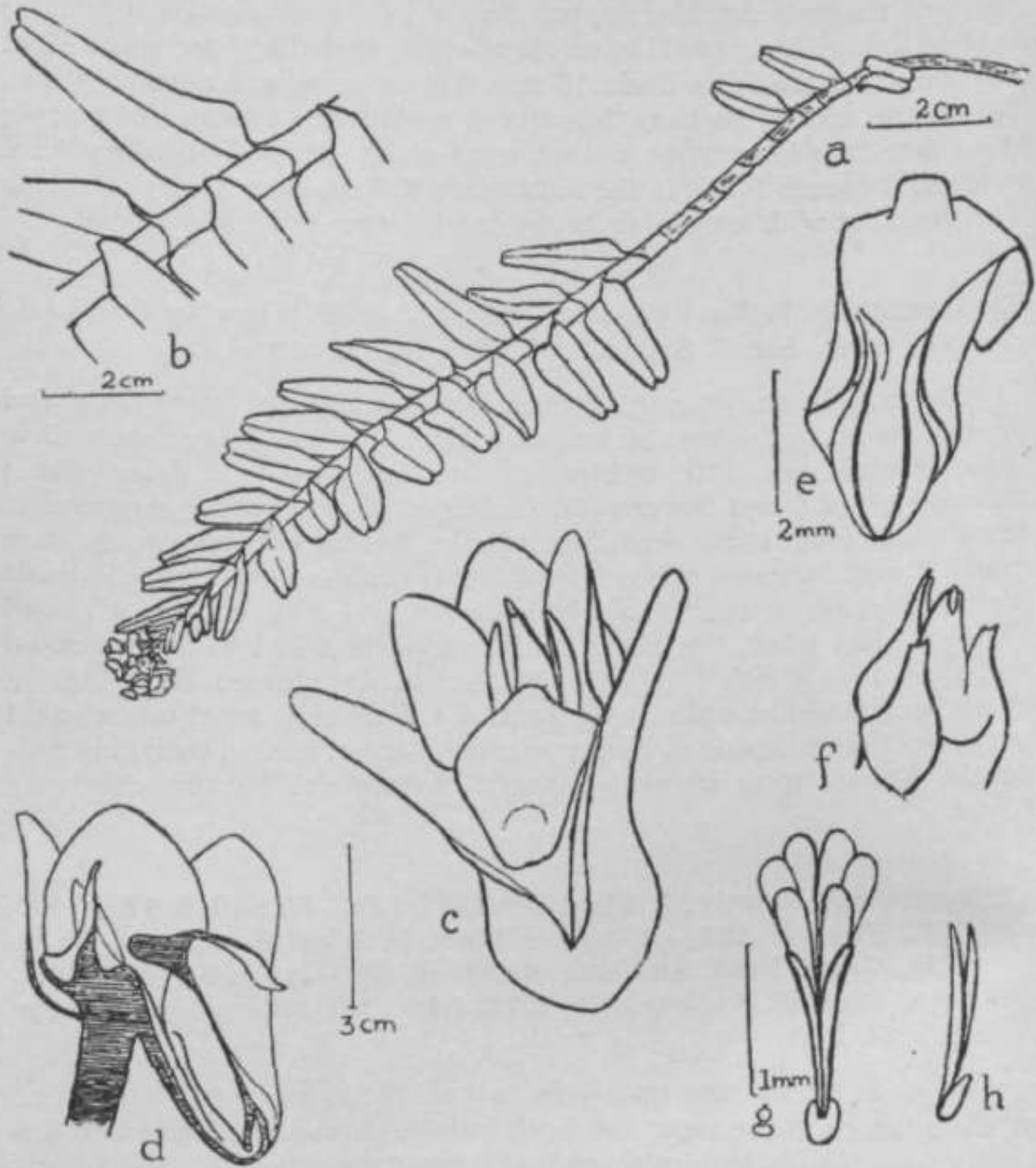


Fig. 146. *Appendicitla cornuta*. *a*, stem and inflorescence, *b*, part of stem, showing leaf bases, *c*, flower from front, *d*, section through column, column-foot and lip, with anther removed, *e*, lip from inside. *f*, column, *g*, pollinia. *h*, disc and stipes after removal of pollinia.

#### PO.EPHYLLUM

Habit of *Appendicula*, with many lateral inflorescences, but pollinia 8, lip without appendage, its base joined to the sides of the column-foot to form a sac. Only one species known, distributed in Sumatra and Java, in the lowlands.

**Po\*phyllum** pauciflorum (Hk. f.) RidL, Mat. Fl. M.P. 1: 109. 1907. Flora  
 4: 108.—*Agrostophyllum pauciflorum* Hk. f., F.B.I., 5: 84. 1890. Ic.  
 PL t 2097.—*Erin minutiflora* Ridl., J.L.S. 32: 297. IM&.—*Lectandra*  
*parviflora* JJ.S., Bull. Dep. Ag. XIII: 59, t. 2. 1907.

Stems to 50 cm. long, about 4 mm. thick, bearing closely 2-ranked leaves; leaves about 4 by 0.5 cm., narrowed slightly towards the notched tip, thinly fleshy, rather pale green; inflorescences many axillary, sianaer, 1 cm. long, bearing 3-4 flowers; sepals nearly 3 mm. long, pale green, long-pointed, keeled on the back; mentum short; petals nearly as long as sepals, greenish, the tips turned back; lip with saccate base, joined to the column-foot nearly all along its edges, the blade widening considerably, rather fleshy, short-pointed, white, in all 3.5 mm. long and 2 mm. wide; column with short foot; pollinia 8, all lightly joined to an elongated narrow stipes, forming a compact ovoid group. Collected in Johore, Pahang and Ferak; probably not uncommon in the south of the country. Fig. 147.

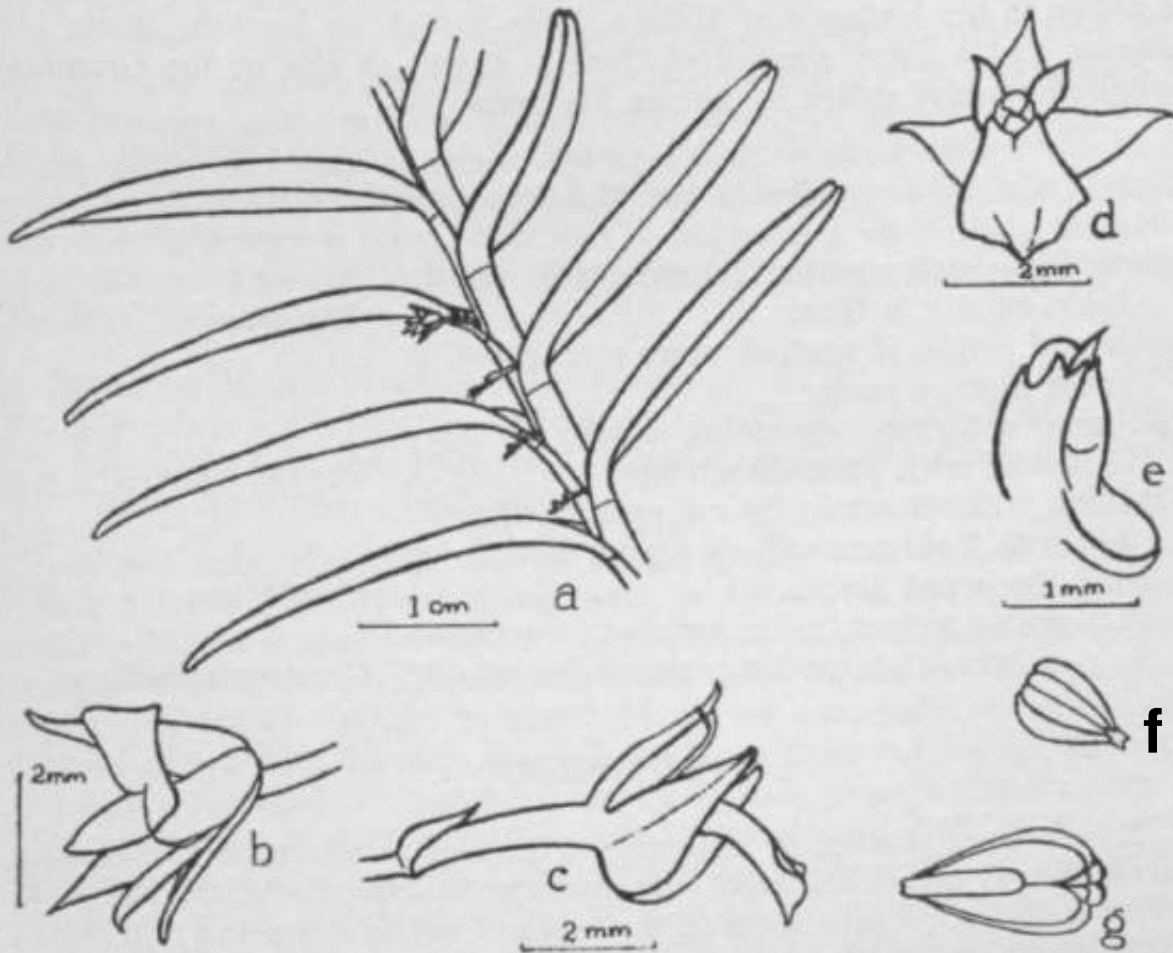


Fig. 147. *Poxphyllum pauciflorum*. a, stem, showing articulation of leaves, and inflorescences. b, flower in natural position, c, d, flower from side and from front. e, column and column-foot, f, pollinia from above, and g, from below.

## THE CYMBIDIUM TRIBE

Terrestrial or epiphytic plants; stems closely tufted, short or long, more or less thickened, with few or many leaves, in one case climbing indefinitely and rooting throughout; leaves narrow, often long, never pleated, often conspicuously jointed above the long sheathing bases; any florescence lateral, usually long, erect or pendulous, bearing few or many large or fairly large flowers; sepals and petals free similar; lip sometimes joined for a short distance to the base of the column, in nearly all cases distinctly 3-lobed, with longitudinal ridges more or less developed; column usually rather long, with a short foot; pollinia 2, joined by caudicles to a broad disc, sometimes seated directly upon it and sometimes each separate outgrowth.

The geographic range of the tribe as a whole is Madagascar, India, Japan, Malaysia to the Solomon Islands and to Australia. In Malaya the tribe is represented by 4 genera and about 15 species. Nearly all are aerial plants, and some very large, including *Grammatophyllum speciosum* which produces plants probably more massive than any other orchid in the world. The tribe also includes some of the finest decorative orchids but these are native further north, in the mountains of Burma, and can be grown in the lowlands of Malaya. They will thrive however at our hill stations, and a short account of them is given, as also of the *Grammatophyllum* species native in eastern Malaysia.

## Key to the Malayan genera

- |  |                        |
|--|------------------------|
| Sepals and petals spotted conspicuously on the back, faintly in front . . . . .        | <i>Dipodium</i>        |
| Sepals and petals, if spotted, more strongly so in front than on back                  |                        |
| Column with two spreading arms; lip very mobile with strap-like hinge . . . . .        | <i>Porphyroglossis</i> |
| Column without arms; lip not very mobile   |                        |
| Lip with 2 ridges; pollinia seated directly on the broad disc . . . . .                | <i>Cymbidium</i>       |
| Lip with 3 ridges; pollinia each on a separate outgrowth from the crescent-shaped disc | <i>Grammatophyllum</i> |

## DIPODIUM

Stems erect, tufted or climbing, with closely alternate rather long narrow curved leaves and erect inflorescences bearing 10-12 medium-size flowers with conspicuous spots on the backs of sepals and petals; lip hairy, column short and thick; pollinia on separate lobes of the broad disc.

A small genus, represented by 3 species in Malaya. One of them is terrestrial and sympodial in growth; the others have long climbing stems



which continue to grow at the apex, bearing roots throughout and branching irregularly. The latter have thus acquired the same growth-form as the orchids of the *Vanda* group. The stems of *Grammatophyllum speciosum* go on increasing in length for a considerable time if they are allowed room to hang, but they never bear roots or branches above the base of the plant like *D. pictum*. Australian species of *Dipodium* are leafless saprophytes.

### Key to the Malayan species of *Dipodium*

#### Climbing epiphytes

- |   |    |                          |
|---|----|--------------------------|
| Sepals and petals 13-14 mm. long; side-lobes of lip a little longer than column | .. | 1. <i>D. parviflorum</i> |
| Sepals and petals to 25 mm. long; side-lobes shorter than column                | .. | 2. <i>D. pictum</i>      |
| Terrestrial plants  | .. | 3. <i>D. paludosum</i>   |

#### 1. *Dipodium parviflorum* J.J.S., Bull. Dep. Ag. I.N., 45: 22. 1911.

Habit of *D. pictum*; inflorescence longer, with about 18 flowers; sepals and petals 13-14 mm. long, dull medium yellow with crimson blotches on both surfaces; sepals concave, boat-shaped, 6 mm. wide when flattened; petals slightly concave; lip 12 mm. long, 3-lobed from the base; side-lobes nearly white, narrow, lying close to the column and a little longer than it, with rounded ends; midlobe 9 mm. long, hardly 4 mm. wide, tip acute, edges somewhat reflexed, upper surface almost covered with white hairs, with two rows of shorter hairs between the side-lobes at the base. Originally described from a plant cultivated at Buitenzorg, Java; only known in Malaya from a collection at Sungkap Forest Reserve, near Sungei Patani, Kedah (Wolfe, 1949).

#### 2. *Dipodium pictum* (Lindl.) Rchb. f., Xen. Orch. 2: 15, 20, t. 107. 1862. Bot. Mag. t. 7951. J.J.S., Bull. Dep. Ag. XLIII: 62. 1910. Bull. Btzg., Ser. 3, 6: t. 10, IV. 1924. Ridl., Flora 4: *U7*.—*Wailesia picta* Lindl., Journ. Hort. Soc. 4: 262. 1849.

Stems long, climbing, rooting at any point; leaves to 25 by 2 cm., closely 2-ranked, with overlapping bases, blades curved outwards; inflorescence erect, the scape to 20 cm. or more long, the flowering portion as long, with 10 or more flowers; pedicel and ovary about 2-5 cm. long, bracts short; sepals and petals similar, to about 2.5 by 0.9 cm., pale yellowish, with crimson blotches on the back showing faintly in front; lateral sepals drooping only a little below the horizontal; lip as long as sepals and petals, its base narrow, in contact with the short broad column, with short narrow side-lobes close to the sides of the column, the blade widening and ending in a broad point, "the upper surface striped with purple, hairy in the apical half (hairs long and white) and on a median line which bifurcates towards the base; column short and broad, hollow and hairy at the base in front. Distributed in Java and Sumatra; in Malaya found in many localities, both lowlands and mountains, in primitive forest. **Fig. 148.**

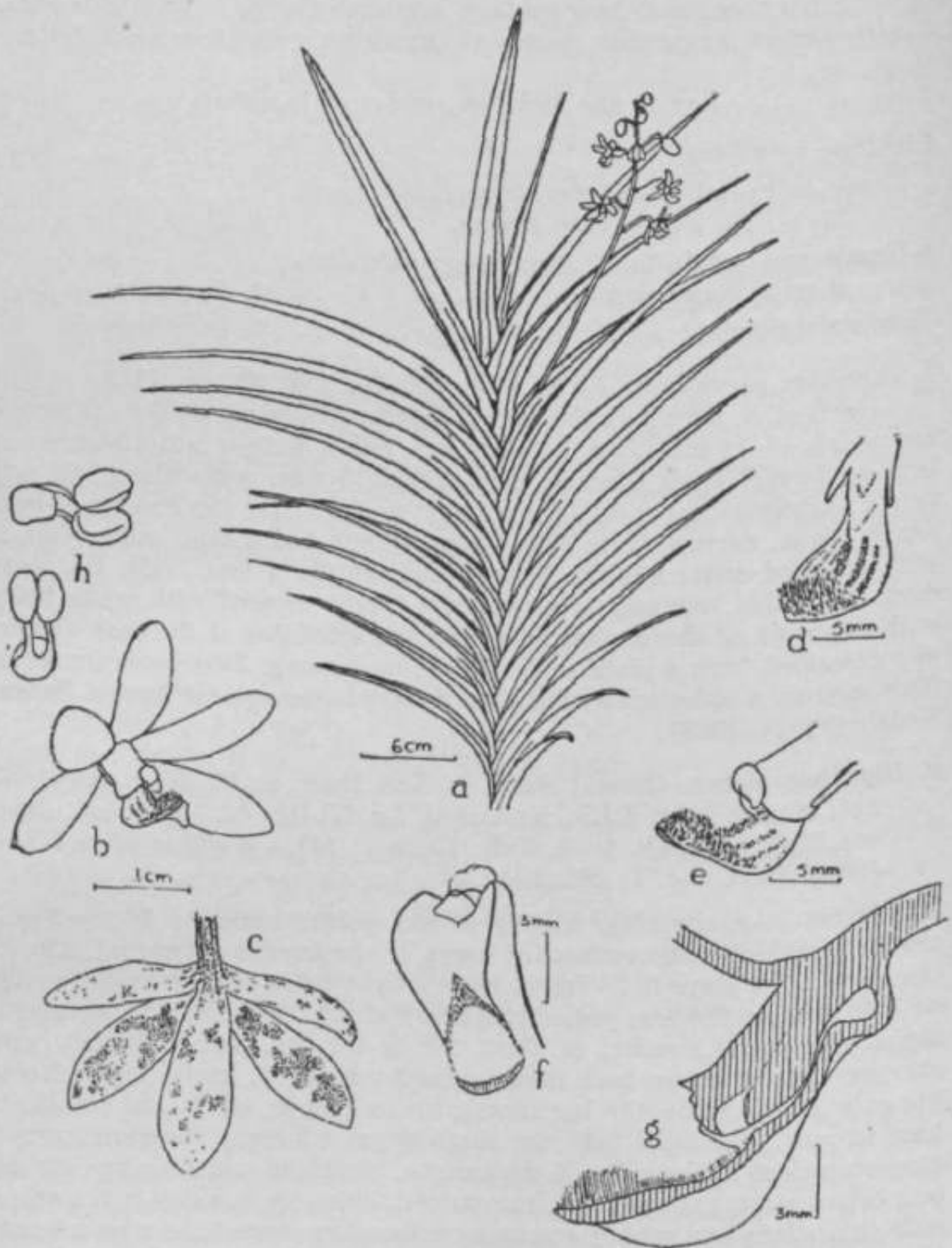


Fig. 148. *Dipodium pictum*. *a*, stem and inflorescence, *b*, flower from front, and *c*» from back, *d*, lip. *e*, column and lip. *f*, column and column-foot, *g*, section through column and lip. *h*, pollinia.

3. **Dipodium paludosum** (Griff.) Rchb. f., Xen. Orch. 2: 15. 1862. Bot. Mag. t. 7464. Ridl., Flora 4: 148. Holtt., M.O.R. 1936: 133.—*Grammatophyllum paludosum* Griff., Notul. 3: 344. 1851.

Stems tufted, erect, to 100 cm. tall, completely covered by the overlapping bases of the leaves; leaves light green, rather erect, somewhat curved, 15-30 by 1.5-2.5 cm. above the joint at the base of the blade; blade keeled on the back, sheaths strongly ribbed; inflorescence to 30 cm. long or more, including the scape of 17 cm.; flowers well spaced, coloured as in *D. pictum*, the sepals and petals shorter, about 20 by 0.7 cm.; Up about same size as sepals but with narrower tip, white with rows of purple spots, hairy, with small narrow side-lobes at base; column as in *D. pictum*. Distributed in Sumatra and Borneo. In Malaya found near Malacca; also abundant in open places in sandy ground near the coast of Pahang, and apparently never found far inland.

### PORPHYROGLOTTIS

- Porphyroglottis Maxwellia** Ridl., J.L.S. 31: 290. 1896. J.J.S., Blumea 5: 750. 1945.

This remarkable genus consists of one species only, first discovered in Sarawak about 1890, later in Dutch Borneo, and in recent years also in Johore. It has exactly the habit of a small plant of *Grammatophyllum speciosum*, but the flowers are very different.

The slender inflorescence elongates slowly, attaining a length of 150 cm. or more, sometimes with a lateral branch, bearing a succession of many flowers, only 2 or 3 open at once.

The sepals are about 2.4 by 0.8 cm., the petals a little smaller, all pale pinkish and all reflexed so that they lie against the pedicel and ovary, leaving the column and lip only outstanding; these lie, facing upwards, in a horizontal line.

The column is 1.8 cm. long, curved, hollowed up the front, with two large curved spreading arms about the middle; the stigma is round, much broader than the anther; there are two large round slightly cleft pollinia, attached by flattened caudicles to a broad round disc; the column has a short foot, and to this is attached a thin strap-shaped outgrowth, 6 mm. long and 2 mm. wide, which is joined to the lip and serves as a hinge.

The lip, attached by this hinge, is very mobile and of peculiar shape—its sides are turned downwards, so that the whole is convex as seen from above, just as if it had been turned inside-out; as seen from below, it is scoop-shaped, with a straight broad end 6 mm. wide. The outside is dark purple-brown, with a large yellow patch near the tip, hairy in various parts; it looks rather like the body of a large bee. **Fig. 149.**

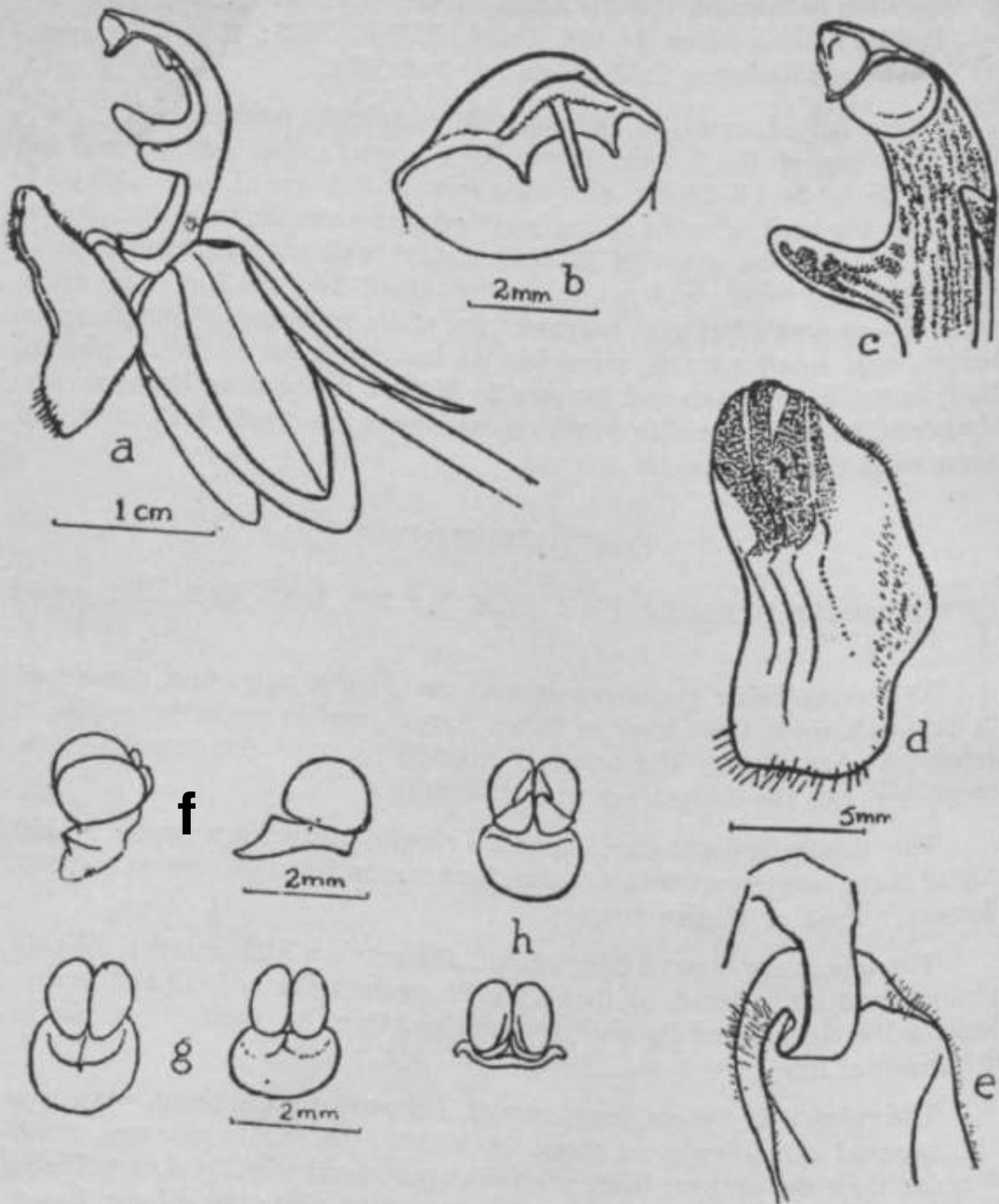


Fig. 149. *Porphyrantha Maxwellii* S.N.S.S. — *a*, flower from side, *b*, top of column after removal of anther; *c*, column, *d*, lip, *e*, hind view of lip, *f*, pollinia from the side, *g*, from front, *h*, from back, showing the irregular, ribbon-like caudicles.

Insect visits to this flower in the Botanic Gardens, Singapore, are certainly rare, and have not in fact been observed, though carpenter-bees, which one would consider the most likely visitors, are quite common. There is no doubt that the balance of the lip is such that it would cause an insect lighting upon it to fall upon the column, the arms of which would direct it to the anther.

The habit of the plant, the long column and the pollinia, indicate clearly a relationship to *Grammatophyllum* and *Cymbidium*; and the species has set fruit when pollinated with *G. multiflorum*. The great difference in the shape of the lip is however very remarkable, and no species are known having characters connecting it with either of the other genera.

The species is found in South-east Johore. It is probably not common, but we are not sure of this, as a flowerless plant is practically indistinguishable from *Grammatophyllum*.

### CYMBIDIUM

Terrestrial or epiphytic plants, with short or somewhat elongated pseudobulbs, each bearing a small number of leaves; in most cases the whole pseudobulb covered with the closely overlapping sheathing bases of the leaves; leaves rather long and narrow, erect or curved, rarely stalked, thick or thin, never plicate; inflorescence from near base of pseudobulb, erect or pendulous, usually long; flowers large or fairly large; sepals and petals about equal and free, usually spreading; lip 3-lobed, the side-lobes erect and close to the sides of the column, the central part of the lip cleft between them with two longitudinal keels; column rather long; pollinia 2, joined by a common caudicle and seated directly on the broad disc.

This genus consists of about 50 species, found in Madagascar, in Asia from Ceylon and India to Japan, and through Malaysia to Australia. Most of the species are decorative, and some are very handsome, especially those from the mountains of Burma, which have been extensively hybridized for cool green-house culture in temperate countries. In Malaya 9 species have been reported, and a tenth probably occurs; one of the nine is however somewhat doubtful.

Some species of *Cymbidium* in the broad sense have been separated by some authors as *Cyperorchis*. The typical species of *Cyperorchis* are distinguished from other *Cymbidiums* owing to the fact that their flowers do not open widely. There are also other differences, but the *C. lanceifolium* is considered to belong to *Cyperorchis*, but it is one of the rather intermediate species and for convenience we include it here in *Cymbidium*.

#### Key to the Malayan species of *Cymbidium*

- Leaves stalked, with elliptic acute blade . . . 1. *C. lanceifolium*
- Leaves not stalked; blades strap-shaped or grass-like
  - Inflorescence erect, or curved from an erect base
    - Sepals about 4-5 cm. long . . . 2. *C. roseum*
    - Sepals not over 2-5 cm. long
      - Flowers pale green
        - Flowers few; sepals and petals with 5 lines of purple spots . . . 3. *C. Munronianum*

- Flowers 15-20; sepals and petals without spots . . . . . 4. *C. chloranthum*
- Flowers not pale green; sepals and petals with purple median bands
- Leaves thin, grass-like . . . . . 5. *C. Dayanum*
- Leaves thick, stiff . . . . . 6. *C. rectum*
- Inflorescence pendulous
- Sepals and petals 3 cm. long; keels of lip continuous
- Leaves to 4 cm. wide; side-lobes of lip a little longer than column . . . . . 7. *C. Finlaysonianum*
- Leaves to 1.6 cm. wide; side-lobes of lip much shorter than column . . . . . 8. *C. atropurpureutn*
- Sepals and petals 2 cm. long; keels broken in the middle
- Lobes of lip spotted with purple . . . . . 9. *C. pubescens*
- Lobes of lip streaked with purple . . . . . 10. *C. sirmMns*
1. *Cymbidium lancifolium* Hook., Exot. Fl. t. 51. 1823-27. King & Pantl., Ann. Calc. 8: t. 247. 1898. J.J.S., Fl. Buit. 6: 476, f. 363. Ridl., Flora 4: 146.

Terrestrial; pseudobulbs slender, to 10 cm. or more tall, with 3 or 4 leaves near the top, basal part covered with thin sheaths; leaves <sup>stale</sup> the blade to about 20 by 4-5 cm., fairly tough but thin, elliptic, acute, <sup>stale</sup> about 6 cm. long; inflorescence erect, to 30 cm. or more long, the scap <sup>e</sup> half of this, flowers about 5 or 6; bracts 1 cm. or more long, narrow; <sup>se</sup> P\* about 2-5 by 0.6 cm., shortly pointed, pale green; petals shorter, pale green with broken purple median line and some purple spots; lip white, the <sup>e</sup> lobes low, rounded, shorter than the column, with purple edges and mar <sup>k</sup> ings, midlobe broad, its end downturned, with transverse purple mai <sup>ks</sup> near the base and 2 longitudinal ones near tip, 2 short fleshy keels on <sup>its</sup> basal part; column greenish with purple markings. Very widely distriou <sup>ted</sup> from India to Japan, and southwards to Sumatra and Java; in Mamy <sup>in</sup> hill forest, to 3,500 feet, found on the Main Range and Taiping Hills, ai <sup>nd</sup> at 800 feet on Bukit Sedanan, Malacca. Not common.

2. *Cymbidium roseum* J.J.S., Fl. Buit. 6: 475. 1905. Bull. Btztg., Ser. 3, 6: t. 11, I. Carr in Gard. Bull. 5: 149. 1930.—*Cyperorchis rosea* Schltr., Fed. Rep. 20: 96. 1924. J.J.S., Bull. Btztg., Ser. 3, 9: 56. 1927.

Terrestrial or sometimes epiphytic near-ground level; pseudobulbs close, short, each with 8 or more leaves; leaves to 30 by 2 cm. above the joint (base 4 cm. below the joint), leathery, apex blunt, unequal; inflorescence erect, about as long as the leaves, with about 3 flowers; sepals and petals at base forming a hollow cone, the apical halves widely spreading; sepals about 4-5 by 1-2 cm.; petals a little narrower; sepals and petals white when fresh, with faint pinkish tinge when older; lip a little shorter

than sepals, short-hairy within, with 2 orange-yellow keels; side-lobes erect, blunt, with irregular purple streaks and spots, midlobe concave, end rounded, yellow at base, rest white with a few purple spots; column yellowish, suffused mauve towards the tip. Distributed in Java and Sumatra; in Malaya found on G. Tahan and at Cameron Highlands, in rather exposed places at 5,000-6,000 feet. A handsome species.

3. **Cymbidium Munronianum** King & Pantl., Journ. Asiat. Soc. Beng. 64: 338. 1895. Ann. Calc. 8, t. 249. Ridl., Flora 4: 146.

Leaves thin and grass-like, to 60 by 0.8 cm, tip blunt; inflorescence about 35 cm. long; flowers few; sepals and petals about 1.2 cm. long, yellow-green with 5 broken purple longitudinal lines, the petals wider than the sepals; lip side-lobes pale pink with purple spots, midlobe yellow spotted crimson. Originally found in the Sikkim Himalayas; reported as occurring in Setul and Langkawi, but the record is uncertain.

4. **Cymbidium chloranthum** Lindl., Bot. Reg. 29: Misc. 68. 1843. Bot. Mag. t. 4907. J.J.S., Bull. Botg., Ser. 3, 3: 298. 1921.—*C. sanguinolentum* T. et B., Nat. Tijdschr. Ned. Ind. 24: 318. 1861. J.J.S., Fl. Buit. 6: 479, f. 365.

Leaves about 6 to each pseudobulb, to 45 by 2-7 cm., rather thin, tips rounded, flat near tip, folded along midrib near base; inflorescence erect, to 45 cm. long, with 15-20 flowers, the scape rather thick, half the total length; bracts very small; flowers pale green, turning light crimson after the pollinia are removed; sepals about 2 by 0.8 cm., blunt; petals narrower; lip with erect rounded side-lobes shorter than the column, spotted purple, short-hairy inside, midlobe broad, curved down but the tip not turned under, notched, greenish in centre, edges white, with a few purple spots; column pale greenish with purple spots. Distributed in Sumatra, Java and Borneo; in Malaya only once collected, near Tembeling in Pahang. The change of colour of the flowers is very interesting.

5. **Cymbidium Dayanum** Rchb. 1, Gard. Chron. 1869: 710. Ridl, Flora 4: 146.—*C. acutum* Ridl, J.L.S. 32: 334. 1896. Schltr, Orch. 358. 1915.—*C. Simonsianum* King & Pantl, Ann. Calc. 8: 188, t. 250. 1898.—*C. eburneum* var. *Dayanum* Hk. f, F.B.I. 6: 12. 1890.

Leaves grassy, to 50 by 1 cm, tips long narrow acute; inflorescence more or less erect, 30 cm. long including the scape of 20 cm, bearing a few flowers; sepals 2.5-3.3 by 0.6 cm, acute, white or mauve with a median purple band; petals a little smaller, similar; side-lobes of lip with rounded ends, as long as the column, white or pale yellow with purple veins; midlobe turned under, 8 mm. broad, acute, deep purple with a broad central basal yellow area; keels continuous, thickened at tips, yellow or white; column entirely very deep purple-crimson (almost black). Distributed from Assam southwards to Sumatra and eastwards to Celebes; in Malaya found on trees by the Tahan River at 500 feet, at Cameron Highlands (4,000 feet), on Kedah Peak and in Perlis on limestone. This species is easily grown in Singapore but flowers rarely. It probably occurs in many places in the northern half of Malaya.

6. *Cymbidium rectum* Ridl., Flora M.P. 4: 146. 1924.

Leaves erect, very stiff and fleshy, to 60 cm. long and 11 mm. wide, narrowed gradually towards the base, apex unequal, blunt; inflorescence erect, to about 35 cm. long, scape short, flowers about 10; sepals 21 by 9 mm., lemon yellow with a faint purplish median line; petals similar, 7 mm. wide; side-lobes of lip shorter than column, cream, with some faint purplish spots at junction with midlobe; midlobe cream with a broad median yellow band and a faint purplish spot near tip; keels continuous but uneven, diverging towards base. Described originally from a plant cultivated at Singapore, possibly from Perak; since known only from two specimens, from Negri Sembilan and Selangor (lowlands).

7. *Cymbidium Finlaysonianum* Lindl., Gen. et Sp. Orch. 164. 1833. J.J.S., Fl. Buit. 6: 481, f. 366. Ridl., Flora 4: 145.—*C. pendulum* Bl. (non Sw.), Bijdr. 379. 1825. Lindl., Bot. Reg. 26: t. 25. 1840.

Leaves about 5 to each pseudobulb, to about 75 by 4 cm. above the joint, with a sheathing base 14 cm. long below the joint, thick and fleshy, the apex rounded and cleft, the two halves unequal; inflorescence pendulous, to 90 cm. long, with many well-spaced flowers; sepals and petals dull greenish yellow, flushed with dull purple down the centre; sepals about 3 by 0.8 cm., blunt; petals a little smaller, acute, standing up near the upper sepal; lip about 2 cm. long in natural position with the midlobe curved down in front; side-lobes with projecting narrow acute forward ends, a little longer than the column, dull purplish outside, paler within, with deep purple veins; midlobe 1.2 cm. wide, white with a yellow patch at the base and a broadly crescent-shaped purple patch within the tip; middle of lip between side-lobes with 2 continuous straight crimson keels, their forward ends yellow; column yellow-green, flushed with purple at base, curved, 1.8 cm. long, foot very small. Distributed from Sumatra to the Philippines; in Malaya found throughout the country in the lowlands, as an epiphyte in rather exposed places, but especially near the sea, and most abundantly in the north of the country, where it sometimes grows into very large masses. The colour of the flowers varies a little, and the lip may have extra purple spots on the midlobe. Fig. 150.

8. *Cymbidium atropurpureum* (Lindl.) Rolfe, Orch. Rev. 11: 190. 1903.—*C. pendulum* var. *atropurpureum* Lindl., Gard. Chron. 1854: 287. Bot. Mag. t. 5710.

Habit similar to *C. Finlaysonianum*, but the leaves not more than about 1.6 cm. wide; flowers similar to *C. Finlaysonianum* but a little smaller, the sepals and petals suffused with dull purple throughout (the petals more deeply), the side-lobes of the lip much shorter than the column, the keels continuous but curved, the midlobe longer and a little wider, much curved under at the tip, with several irregular purple spots on each side in addition to the terminal patch; column entirely deep purple on the back. The typical form of the species, found in Borneo, has the sepals and petals a rich purple throughout; a variety with entirely olive-green sepals and petals is reported from Java; the Malayan plants appear



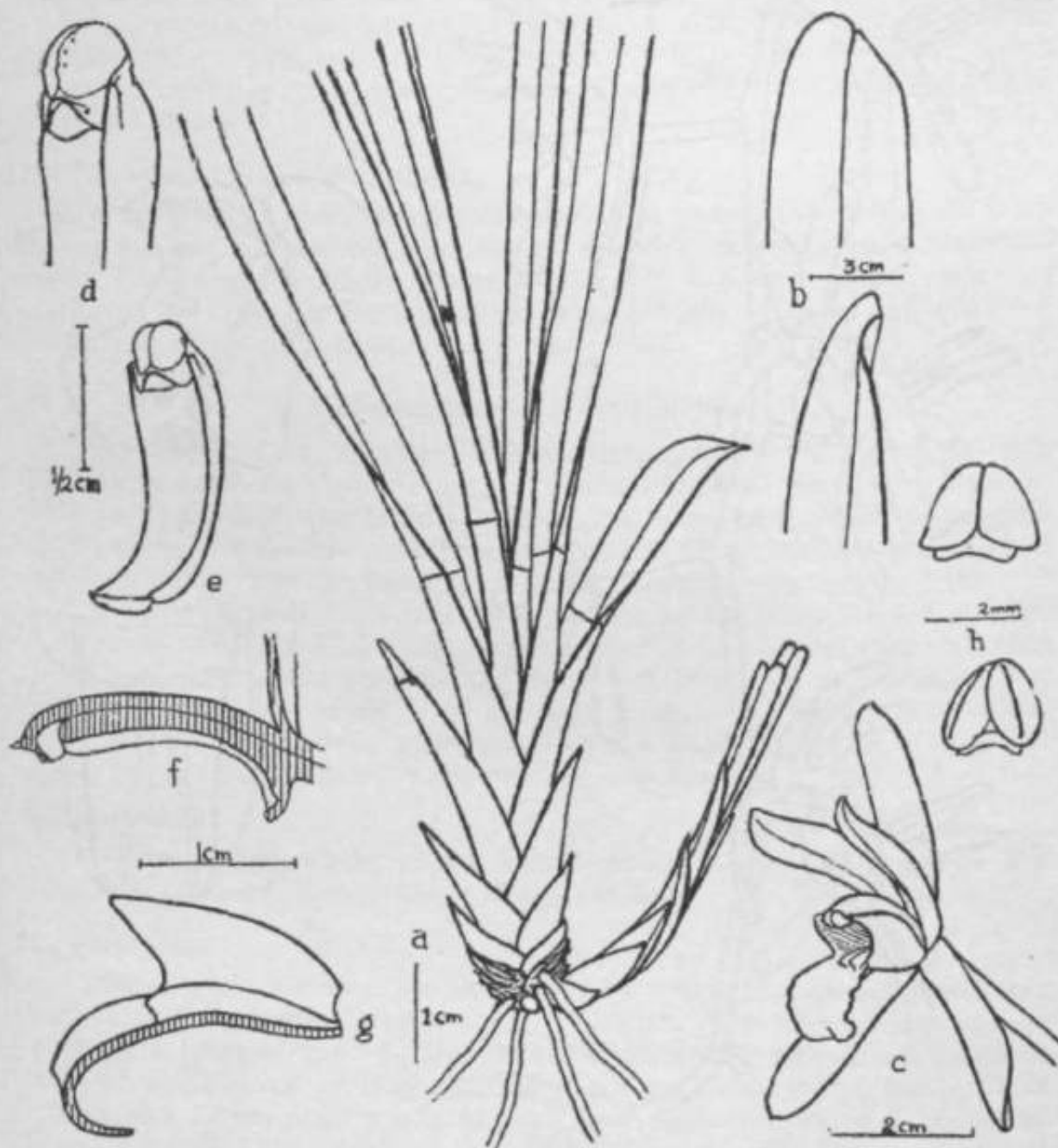


Fig. 150. *Cymbidium Finlaysonianum*. *a*, base of stem and leaves. *b*, leaf-tips, *c*, flower from side, *rf*, column, *le*, column and column-foot. *f*, section through column and column-foot, *g*, section through lip showing a keel, *ft.*, pollinia from front (above) and back.

to be intermediate. The species has been collected near Malacca and in Johore and Pahang; it may not be uncommon. The leaves are much as in *C. pubescentis* but longer; the flowers are very near *C. Finlaysonianum*. The flowers have a strong and peculiar scent, like slightly rancid coconut oil. The midlobe of the lip turns yellow after the pollinia are removed. Fig. 151.

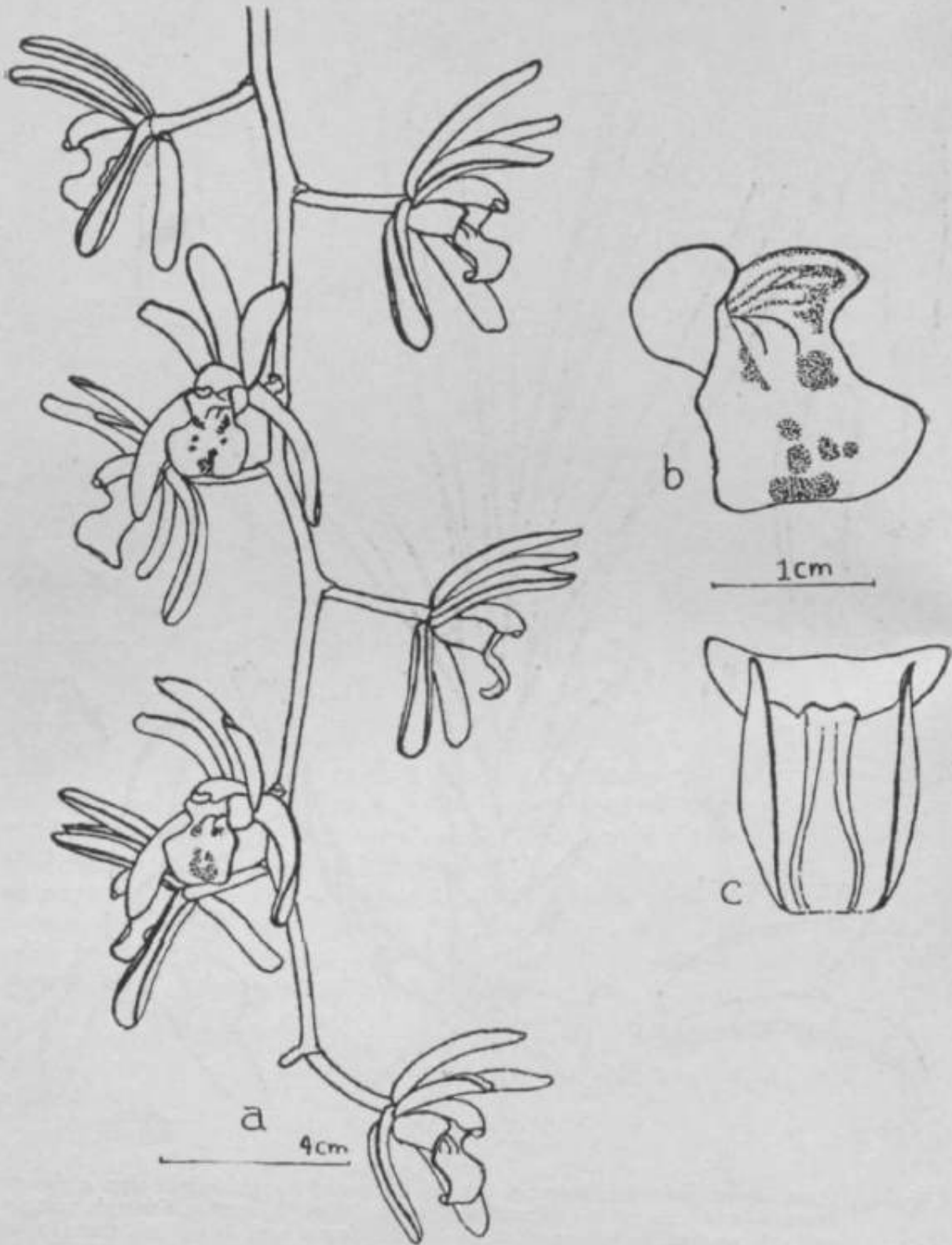


Fig. 151. *Cymbidium atropurpureum*. a, part of inflorescence. & r lip. o, inside of hp from above.

9. *Cymbidium pubescens* Lindl., Bot Reg. 26: Misc. 75. 1840; 27: t. 38. 1841. RidL, Flora 4: 145. J.J.S., Fl. Buit. 6: 483, f. 368.

Habit of *C. Finlaysonianum*, but leaves to only about 45 by 1.5 cm., with sheath below joint to 8 cm.; inflorescence usually not more than 25 cm. long; sepals and petals with a broad deep purple central band, the

edges pale greenish or buff, about 1.9 by 0.5 cm.; lip short-hairy at the base within, the side-lobes with pointed free ends shorter than the column, pale yellowish with many purple-brown spots; keels yellow, interrupted in the middle, the basal parts curved; midlobe with tip turned under, pale yellow with purple markings; column dark purple on back, front pale yellow with purple spots. Distributed in Java, Sumatra and Borneo, in Malaya found in many localities throughout the country, especially near the sea, in rather exposed places.

#### 10. *C. simulans* (*C. aloifolium*)

Similar to *C. pubescens*, but side-lobes as long as the column, all lobes of lip striped, not spotted, and usually a longer inflorescence. Distributed from Burma and southern China southwards to Sumatra and Java, not reported yet from the Peninsula, but is quite likely to occur, and when not flowering would be mistaken for *C. pubescens*.

#### Exotic species of *Cymbidium*

A number of fine species of *Cymbidium*, mainly from the region from Burma to southern China, but also from Madagascar, have been brought into cultivation in temperate countries, and have been extensively hybridized. They have large usually well-spaced flowers on more or less erect inflorescences. Most of these species and their hybrids may be grown at hill stations in Malaya but not in the lowlands. They are treated as half-epiphytes, and grown in a compost chiefly of fern-root and charcoal; they need light shade. The plants could quite well be grown in a well-drained rockery under light shade of small trees or shrubs, with exposure to the morning sun. Brief descriptive notes of the most important species are given below; the hybrids are too numerous to mention.

#### *C. eburneum*

Flowers large, white, with a yellow central band on the lip, 2 or 3 to each inflorescence. Himalayas, 1,000-5,000 feet.

#### *C. ensifolium*

Terrestrial; leaves grass-like, about 15 mm. wide; each inflorescence with 4 to 7 fragrant flowers; sepals 3-3.5 cm. long, pale green, with or without 5 lines of red; petals similar, shorter; lip pale greenish-yellow with or without red veins in side-lobes and spots on midlobe. Native from China and Japan southwards to Java and Sumatra, where it occurs at about 2,000 feet altitude. Though this has not very large flowers, it is very attractive. It can with care be grown and will flower in the lowlands. A Chinese grower states that it does best if the bottom of the pot is filled with small pieces of charcoal, the top half with good burnt earth. In Singapore two varieties are grown (I have also seen a third) : one with leaves about 20 cm. long and entirely green flowers, the other with taller leaves, and flowers slightly larger with red markings. The shape of the flowers is identical. These distinctions do not agree with those given by Schlechter as separating *C. sinense* from *C. ensifolium*. I consider the two should be united as a variable single species. Fig. 152.

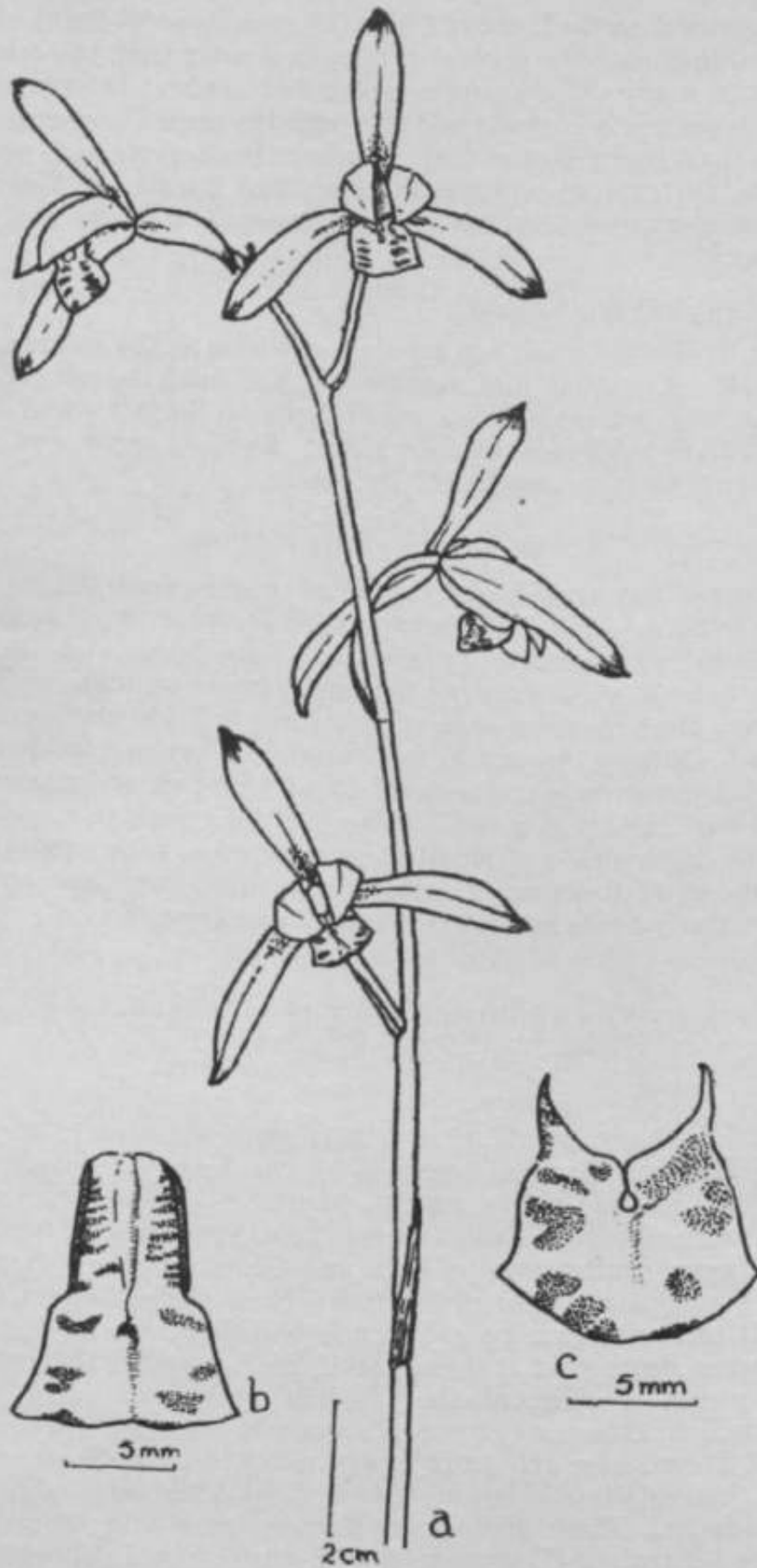


Fig. 152, *Cymbidium emifoliwm*. a, inflorescence, b, e, lip.

**C. giganteum**

Sepals and petals yellow-green with many purple streaks;;Hp ydtow with red blotches, 7-12 flowers on each inflorescence. Himalayas, d,&uu 5,000 feet.

**€. grandiflorum**

Sepals and petals green, lip pale yellow with many purple spots; flowers 6-12 to each inflorescence. Himalayas.

**C. insigne**

Sepals and petals rosy-white, keels of lip yellow, the rest pink marked with lines of purple spots; flowers 10-15 to each inflorescence. Annam, 4,000-5,000 feet. A very beautiful species which has yielded some oi me best hybrids.

**C. Lowianum**

Sepals and petals greenish-yellow with longitudinal brown streaks; side-lobes of lip yellow, midlobe purple with yellow margin; 20 flowers to each inflorescence. Burma.

**C rhodochilum**

Inflorescence to 100 cm. tall with long scape and many flowers in a compact group; sepals and petals green, the petals with darker spots; lip deep purple, the yellow centre purple-spotted. Native in Madagascar, as an epiphyte at about 2,000 feet elevation, always on Platycerium ferns. Tried in Singapore but did not survive; a very fine species, which does not seem to have been used in hybridizing.

**C. tigrinum**

Flowers 4-6 to an inflorescence; sepals and petals 4-5 cm. long, olive green; lip white with red veins on side-lobes and spotted midlobe; leaves short. Native in Tenasserim at 6,000 feet.

**C. Traceyanum**

Flowers 15-20 to an inflorescence; sepals and petals greenish yellow with bold brown stripes; midlobe of lip pale yellow with purple spots, side-lobes with purple veins. Native in Burma.

### Cultivation of Malayan Cymbidiums

The common Malayan species *C. Finlaysonianum* is often cultivated, and also *C. pubescens*. These have quite attractive flowers of moderate size, though their limply hanging inflorescences make them less usetui

than other orchids for decorative purposes. If the fine Bornean variety of *C. atropurpureum* could be found, it would be the best of this group.

These plants are large, and must have a place where their flowers can hang down. Either they must have large baskets, or be given permanent places on old trees. The latter is usually the better alternative, as it leaves the plant room to grow to a large size without disturbance. The trunk of an old oil-palm, or other palm with persistent leaf-bases, is suitable, or a fork in an old tree. There must be good light; almost full exposure to sun is tolerated by the plants. In a dark place they flower rarely.

*Cymbidium chloranthum* is quite worth growing, but needs cooler conditions than Singapore. *C. Dayanum* is well worth growing in the north. Both these should be hybridized.

In Singapore, hybrids have been raised between the local species *C. Finlaysonianum* and the Chinese *C. ensifolium*. The seedlings are growing strongly, and in leaf-form are intermediate between the two parents. The plants have not flowered at the time of writing.

#### GRAMMATOPHYLLUM

Epiphytes; pseudobulbs in a close group, short or long, with few or many leaves; roots stiff, white, growing upward or outward, with many branches; leaves 2-ranked, relatively long and narrow, not greatly thickened; inflorescence erect or drooping, of many large or fairly large flowers, shaped much as in *Cymbidium* but the lip with 3 low keels, pollinia 2, cleft, each joined by a caudicle to a separate outgrowth from the laterally extended (more or less crescent-shaped) disc.

This genus consists of about six species, confined to Malaysia; two are native in Malaya (*G. speciosum* and *G. stapeliiflorum*), the others further east. The latter are sometimes cultivated, and are briefly described below; they are also included in the key. There has been some confusion in the use of the name *G. scriptum*, which was originally given to two different species by Rumphius. See Miquel in Ann. Mus. Lugd. Bat. 4, t. 8, 9.

There are two types of growth-form in the genus. One has very long pseudobulbs which are really fleshy stems, bearing many leaves; the other has rather short proportionately thick pseudobulbs which are not covered by leaf-bases, with few leaves at the apex. The flowers in both are essentially similar. Both have the erect branched white roots. The plants of the second type approach *Cymbidium* in habit; the genera *Cymbidium* and *Grammatophyllum* are in fact very nearly allied. The most notable difference is in the pollinia, which are seated directly on the disc in *Cymbidium* and on separate upgrowths in *Grammatophyllum*.

#### Key to the species of *Grammatophyllum*

Stems very long with many leaves

Side-lobes of lip bluntly pointed, little incurved 1. *G. speciosum*

Side-lobes of lip elongate-triangular, with incurved tips

- Sepals and petals pale greenish yellow with orange-brown spots .. .. 2. *G. papuanum*
- Sepals and petals ivory white with deep maroon spots .. .. 3. *G. Wallisii*
- Stems short and thick, bearing few leaves  
Inflorescence limply pendulous .. .. 4. *G. stapeliiflorum*
- Inflorescence erect at base, curved  
Pseudobulbs smooth, yellowish; flowers with many almost round rather large brown spots; sepals 4 cm. long .. .. 5. *G. Rumphianum*
- Pseudobulbs ridged, green; flowers with larger markings of irregular shape, mostly not round; sepals 3 cm. long  
Sepals and petals entirely brownish except for pale green edges and midrib or part of midrib .. .. 6. *G. scriptum*  
(typical)
- Sepals and petals pale green with a few irregular large blotches of brown .. .. *G. scriptum* var.  
*tigrinum*

1. *Grammatophyllum speciosum* Bl., Bijdr. 278, f. 20. 1825. *Rumphia* 4: 47, t. 191. 1848. *Bot. Mag.* t. 5157. *J.J.S.*, *Fl. Buit.* 6: 485. *Ridl.*, *Flora* 4: 149.

Stems to 3 m. or more long, 5 cm. thick, with many ridges and yellowish when old, internodes about 4 cm. long; leaves thin, usually about 50-60 by 3 cm. (sometimes larger), narrowed and curved downwards towards acute tip; sheaths yellow; inflorescence to 2 m. or more high, with many flowers, the lower ones distant and abnormal, the upper ones close; flowers about 10 cm. wide, sepals and petals widely spreading, pale greenish yellow with large dull orange-brown spots; sepals to 5.5 by 2.5 cm.; petals a little wider; lip smaller, barely 3 cm. long from the base of the column, within hairy and striped with red-brown, with 3 keels ending in the middle of the midlobe; side-lobes erect, curving over the column, yellow with brown stripes; midlobe blunt, red-hairy, 1 cm. wide; column pale greenish, white beneath with purple spots, with an outgrowth on either side at the base, these outgrowths joined with the base of the lip to form a cup-shaped hollow. Distributed from Sumatra to the Philippines, with the closely related *G. papuanum* (see below) in New Guinea. In Malaya found in the lowlands throughout the country, often on trees near streams. The plants are often of enormous size. In Penang they usually flower about July; in Singapore either about July or January, and all plants do not flower every year. The abnormal lower flowers usually have two sepals, two petals, no lip and an abortive column. Ridley states that there are two varieties, one with rather large spots on sepals and petals and sepals (this is the common form), the other with more numerous small spots. Fig. 153,

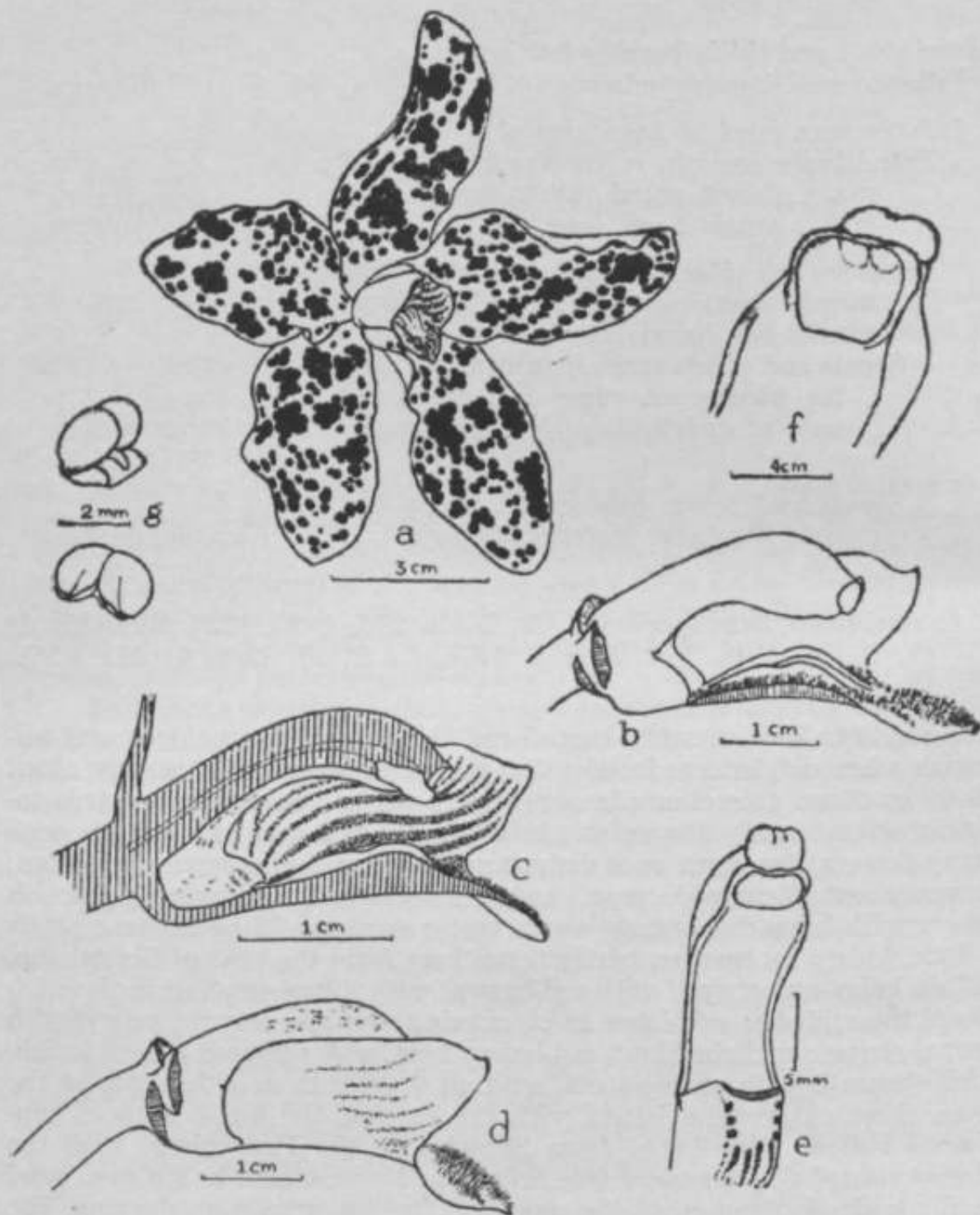


Fig. 153. *Grammatophyllum spedosum*. *a*, flower. *b*, flower with sepals, petals and one side-lobe of lip removed, *c*, section through column and lip. *d*, flower with lateral sepals and petals and upper sepal removed, *e*, column with lip removed. *f*, top of column, *g*, pollinia.

2. *G. papuanum* is a species occurring in New Guinea; its flowers have the colour of *G. spedosum* but the lip is shaped as in *G. Wallisii*.



3. *G. Wallisii* is a species found many years ago in the Philippines, of the same habit as *G. speciosum*, with which it has been considered identical. A plant flowered in Singapore in 1955, and was described (*Orch. Rev.* 63: 151, with photograph of flower). The flowers are a little smaller than in *G. speciosum*, their colour ivory-white with maroon spots. The side-lobes of the lip are drawn out into narrow tips which curve and meet; the front edges of the column curve down evenly to the base of the lip, lacking the basal outgrowths of *G. speciosum* (see fig. 153&).

4. **Grammatophyllum stapeliiflorum** (T. et B.) J.J.S., FL Buit. 6: 487, f. 369. 1905. Bull. Btzg., Ser. 2, IX: 96. 1913.—*Cymbidium stapeliiflorum* T. et B., Nat. Tijdschr. Ned. Ind. 24: 319. 1862. Ridl., Flora 4: 147.—*c. Huttonii* Hk. f., Bot. Mag. t. 5676. 1867.—*Grammangis stapeliiflora* Schltr., Engl. Jahrb. 45, Beibl. 104: 53. 1911.

Pseudobulbs 1-jointed, to about 14 cm. long and 6 cm. wide, flattened, narrowed upwards, shining green, with 2 or 3 leaves at the top; leaves narrowed to base and apex, to about 35 by 8 cm., sheaths very short; inflorescences from base of pseudobulb, pendulous, 30 cm. or more long, with about 12 flowers, the scape 12 cm. long; flowers about 4 cm. wide, with peculiar odour, the sepals and petals curved at the base to form a bell-shape, their tips spreading; upper sepal 4 by 2.2 cm., base broad, apex pointed, pale greyish with close small purple spots; lateral sepals smaller, similarly marked, petals about 3 by 1 cm., the base spotted like the sepals, the rest very dark black-purple; lip 2.2 cm. long with 3 simple fleshy keels; side-lobes erect, blunt, coloured as sepals; midlobe rounded, convex, warty, whitish with dark purple-grey spots; column much curved, dark purple-grey, with a hollow somewhat prominent base to which the lip is attached. Distributed from Sumatra to Celebes and Java; in Malaya only recorded as found on the Taiping Hills in 1899 and 1901. Further information about the occurrence of this interesting species in Malaya is desired. The species has been transferred to the genus *Grammangis*, but the essential structure of the flowers is the same as in other species of *Grammatophyllum*, and I do not consider the change justified. **Fig. 154.**

#### 5. *G. Rumphianum*

Habit of *G. stapeliiflorum*, but the pseudobulbs larger, yellowish, to 20 cm. long and 7 cm. wide, with very numerous erect branching roots, and leaves to about 50 by 5 cm.; inflorescence erect at the base, curving upwards, very long, with many flowers; flowers about 8 cm. diameter, greenish or greenish-yellow with numerous more or less round rather large brown spots. Native in the Moluccas and Borneo, and somewhat variable in the details and size of the flowers. Cultivated plants have also been given the name *G. Fenzlianum* and *G. Measureanum*, but these seem to be no more than varieties.

#### 6. *G. scriptum* (*G. multiUorum* Lindl.)

Closely similar to *G. Rumphianum* but the pseudobulbs (in cultivated specimens seen) green and distinctly ridged, and the whole plant a little smaller, flowers smaller (sepals 3 cm. long), pale greenish, in the typical form with the sepals and petals almost wholly suffused with brown, in the

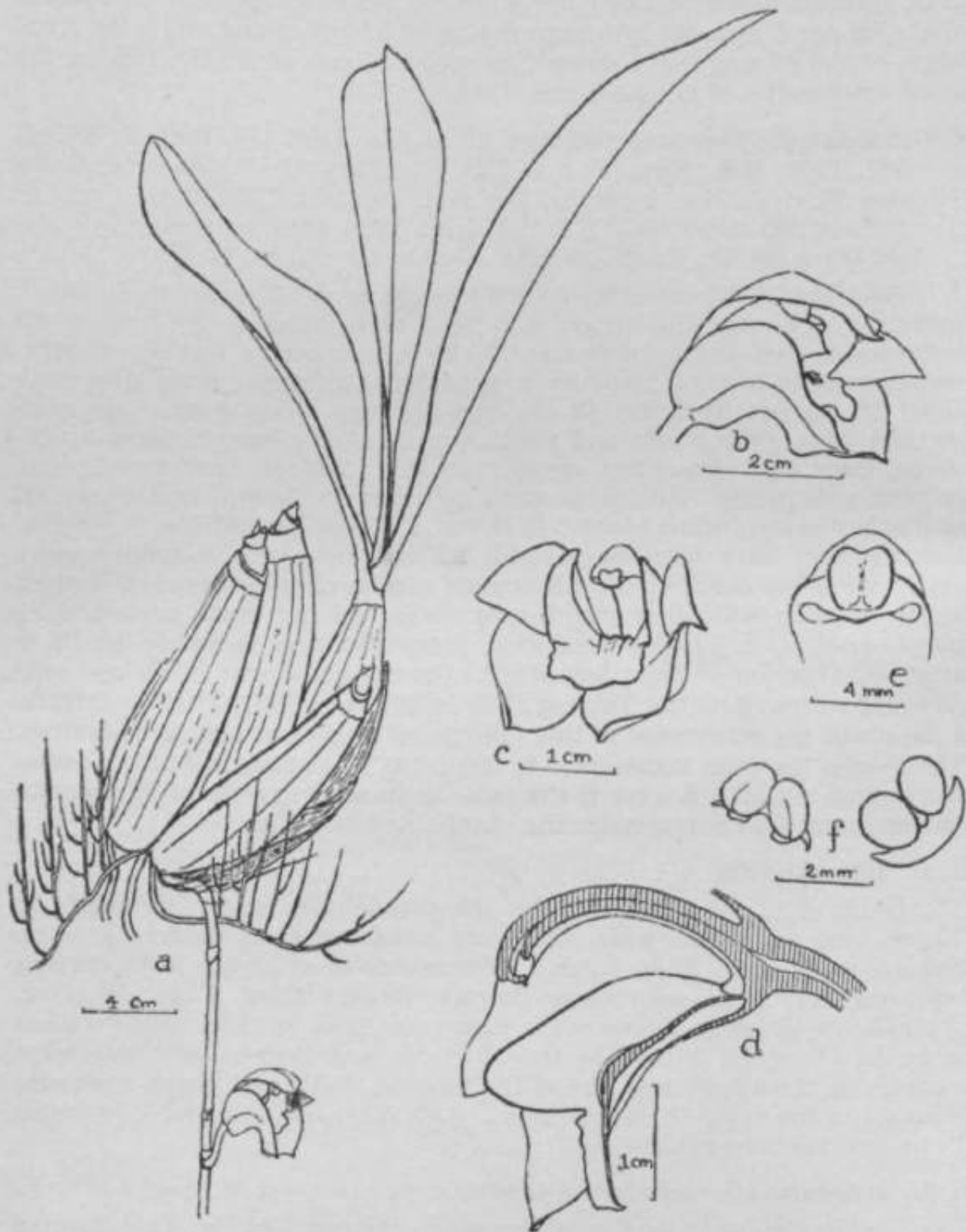


Fig. 154. *Grammatophyllum stapeiliiflorum*. a, plant and inflorescence, b, flower from side, c, flower with upper sepal removed, d, section through column and lip, e, top of column, f, pollinia.

variety *tigrinum* (fig. 155) with few large irregular brown spots with narrow gaps between them. Native in the Philippines. This seems to flower better in Singapore than *G. Rumphianum*; both the typical form and var. *tigrinum* grow and flower well. The colouring of the typical form is brighter (the brown a warmer tone), and there are more flowers, than in var. *tigrinum*, but the flowers are rather smaller, with sepals hardly 2.5 cm. long.

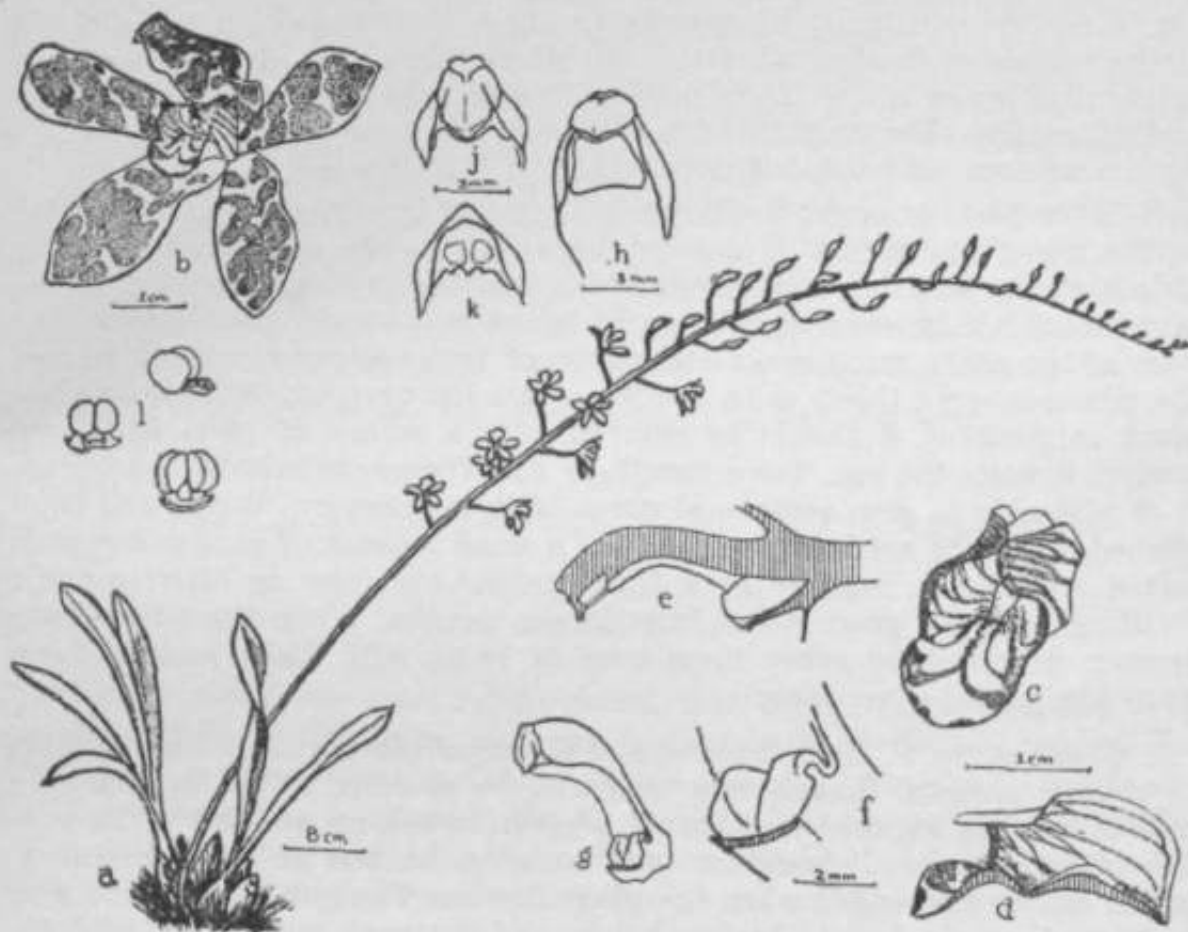


Fig. 155. *Grammatophyllum scriptum* var. *tigrinum*, a, plant with inflorescence. b, flower, c, lip, d, lip with one side-lobe removed, e, section through column. f, base of column, g, column, h, j, top of column, i, top of column with anther removed, l, pollinia.

#### Cultivation of Grammatophyllums

All Grammatophyllum plants need plenty of light—full sun, or something near it—and good drainage. The two types of plant found in the genus require however different treatment, and will be considered separately.

*G. speciosum* is by nature an epiphyte, and is seen at its best when grown on an old tree, where its stems have room to droop. A strong plant under such conditions will develop a graceful group of hanging stems ten feet or more long. But it is much more convenient to have the plants on the ground; the flowers also are then at eye-level. A medium-sized plant may be grown in a tub; the only advantage however is that the plant is movable. A really large plant is too large for any container, and must be

given a permanent place. As it will flower only once a year, and as the plant may not be considered particularly decorative when flowerless, a place not too prominent should be chosen. One well-known Singapore grower had a hedge of *Grammatophyllum* along one side of his orchid garden.

The base of the plant must be raised well above the ground. This is best done by making a low heap of stones or large pieces of brick or rubble. This will eventually be covered by the orchid roots, but looks better if the outside is finished off with good sized pieces of coral, or other rock if obtainable; or a low brick wall, with drainage holes, can be made to look attractive. The height of the pile or bricks need not be more than a foot above ground-level, but may be higher if so desired.

If the plant is large, it will probably stand firm in a slight depression in the pile of stones; but if it is top-heavy it must be supported, by tying it to a stout stake driven through firmly into the ground. The base of the plant must not be covered with rocks to make it stable. Round about the base of the plant small rocks and pieces of fern-root may be packed, and the whole covered thinly with a litter of garden compost. After fixing the plant in position, it should be covered with a screen of palm leaves, to protect it from the sun, for a month or so. When new growth has begun, it is advisable to give occasional doses of liquid manure. When well established, the plant needs little attention; a small amount of garden compost, mixed with cattle manure or a little ground-nut cake or other organic fertilizer, may be given about once in six months. When the flower-buds appear, it is well to spray them once or twice with Tuba root, to keep away thrips and other insects.

*G. scriptum*, *G. Rumphianum* and *G. stapeliiflorum* are all best grown in pots or baskets, though they may also be attached to the branch of a tree in a fairly exposed position. *G. stapeliiflorum*, on account of its pendulous inflorescence, should be in a hanging basket, or other container which can be suspended when the plant flowers. The potting mixture may be of medium-sized clean broken bricks and charcoal, with pieces of fern-root. A new plant should be fixed on top of this, with no part of its pseudobulbs covered, and kept in a sheltered place, sparingly watered, until new root-growth is established, when it may be given more and more exposure.

The plants do not take kindly to re-potting, and it is well to disturb them as little as possible. When a plant grows too large for its container, it may be placed intact into a larger one, or another basket framework built around it. All such plants produce a great quantity of white erect and branching roots; in fixing in a new container, these should not be smothered. Treated in this way, *G. scriptum* and *G. Rumphianum* will grow into very large plants, and the larger and stronger they are, the better they will flower. It is our experience that in Singapore *G. Rumphianum* is sometimes subject to rotting of the pseudobulbs; we think this is due to the irregular occurrence of rain when the plant should be resting. There is little doubt that *G. scriptum* is better suited to a non-seasonal climate like Singapore than *G. Rumphianum*, which is native in a more seasonal climate and probably needs the alternation of wet and dry seasons **for full** vigour of growth and flowering.

## THE EULOPHIA TRIBE

Terrestrial plants; pseudobulbs few-jointed, rising above the ground or not; leaves thin and grass-like or broader and plicate (one species of *Eulophia* is leaf-less) ; inflorescences lateral, usually rather tall, the scape erect, the flowering rachis erect or drooping; flowers few or many; sepals and petals about equal or the petals broader; lip attached to the column-foot, its base spurred or not, the blade 3-lobed or almost entire; column short or long, with a distinct foot; pollinia 2, often deeply cleft, attached to a short broad stipes.

This tribe is distributed throughout the tropics, especially in Africa. In Malaya are the two genera *Eulophia* and *Geodorum*, which are very nearly related and might perhaps be united. The genus *Eulophia* is better developed in Africa than in Asia. In America is found *Cyrtopodium*, with about 30 species, some of them in cultivation. *Cyrtopodium pulchellum* is like *Grammatophyllum speciosum* in habit, but smaller, with a large branched inflorescence. In Africa is found also the genus *Lissochilus*.

The Malayan genera are distinguished easily as follows:—

Inflorescence erect . . . . .	..	<i>Eulophia</i>
Inflorescence drooping . . . . .	..	<i>Geodorum</i>

## EULOPHIA

Apart from the erect inflorescence, this genus is distinguished from *Geodorum* by the lip being spurred (except in *E. Zollingeri*, where it is saccate as in *Geodorum*) and more or less clearly 3-lobed. The development of the column-foot is variable; in *E. squalida* it is strongly developed and also cleft, the spur of the lip fitting into the cleft, but this character is not found in the other species. *E. Zollingeri* is a saprophyte, with no foliage leaves.

The Malayan species of *Eulophia* are not particularly beautiful, but in Africa are some very fine species, with tall inflorescences of large and handsome flowers. They are mostly native in climates much less humid and more seasonal than ours, but those from the wetter parts of Africa might well be tried, and experiments in hybridization would be worth while.

**-Key to the Malayan species of *Eulophia***

Saprophyte; no green leaves; flowers dull red-brown . . . . .	..	1. <i>E. Zollingeri</i>
Not saprophytes; green leaves present (sometimes dying before flowering)		
Midlobe of lip hairy . . . . .	..	2. <i>E. graminea</i>
Midlobe of lip not hairy		
A distinct free column-foot present . . . . .	..	3. <i>E. bicarinata</i>

Column-foot not sharply distinct from spur  
of lip

Leaves about 1 cm. wide . . . . . 4. *E. Keithii*

Leaves much wider

Pseudobulb to 10 cm. long, with leaves  
at top; sepals 14 mm. long .. 5. *E. macrostachya*

Pseudobulb short, hidden by leaf-bases;  
sepals 2 cm. long . . . . . 6. *E. squalida*

1. ***Eulophia Zollingeri*** (Rchb. f.) J.J.S., Fl. Buit. 6: 228. 1905. Bull. Botz., Ser. 3, 8: 357. 1927.—*E. macrorhiza* Bl., Fl. Jav. N.S. 155, t. 63, f. 2. 1858. J.J.S., Fl. Buit. 6: 227. Bull. Botz., Ser. 3, 6: t. 2, II. Ridl., Flora 4: 142.—*Cyrtopera Zollingeri* Rchb. f., Bonpl. 5: 38. 1857.

Pseudobulbs below ground, large, with many thick roots; green leaves absent; inflorescence stout, about 60 cm. tall; bracts to 2-4 cm. long, narrow, flowers dull red-brown, not wide-opening; sepals 1-6 by 0-5 cm.; petals shorter and broader, near the upper sepal; lip at an acute angle to the column-foot and making with it a saccate base; side-lobes erect on either side of the column, with rounded incurved ends; midlobe slightly downturned, concave, broad, bluntly pointed. Distributed from India through Malaysia to New Guinea; only twice found in Malaya, in Ulu Batang Padang and at another (unrecorded) locality in Perak. Further local records would be welcome. This species is aberrant not only in the saprophytic habit but also in the spurless lip.

2. ***Eulophia graminea*** Lindl., Gen. et Sp. Orch. 182. 1833. King & Pantl., Ann. Calc. 8: 176, pi. 238. 1898. Ridl., Flora 4: 141.

Pseudobulbs of several internodes, to 15 cm. long, tapering upwards; leaves grass-like, to 30 by 0-6 cm.; inflorescence to 80 cm. tall, usually branched; flowers many, pale green with a network of red-brown veins; upper sepal about 1-4-1-7 by 0-3 cm., laterals similar, their ends turned back; petals shorter and wider than sepals; lip as long as sepals, with 3 keels in the basal part, the side-lobes blunt-ended, coloured like the sepals, the midlobe rounded, 7 mm. wide, white or pinkish with 5 purple-red-hairy ridges, the edges wavy; spur narrowly cylindrical, slightly curved, 3 mm. long; column with very short foot; pollinia freely exposed below the anther, which has an appendage above. Distributed from India to the Philippines; in Malaya found in all parts of the country, in open places. The structure of the anther is very peculiar. **Fig. 156.**

3. ***Eulophia bicarinata*** (Lindl.) Hk. f., F.B.I. 6: 6. 1890. J.J.S. in Fed. Rep. 32: 331 (synonymy).—*Cyrtopera bicarinata* Lindl., Gen. et. Sp. Orch. 190. 1833.

Pseudobulbs of irregular shape, prostrate and subterranean, white, bearing the circular bases of scale leaves, rooting at several places. Leaves narrow, to at least 60 cm. long and 1-5 cm. wide, plicate. Scape to 30 cm. tall; rachis bearing about 12 flowers; bracts narrow, 13 mm. long; pedicel and ovary 2 cm. long; sepals pale green with 5 brown veins on the back,

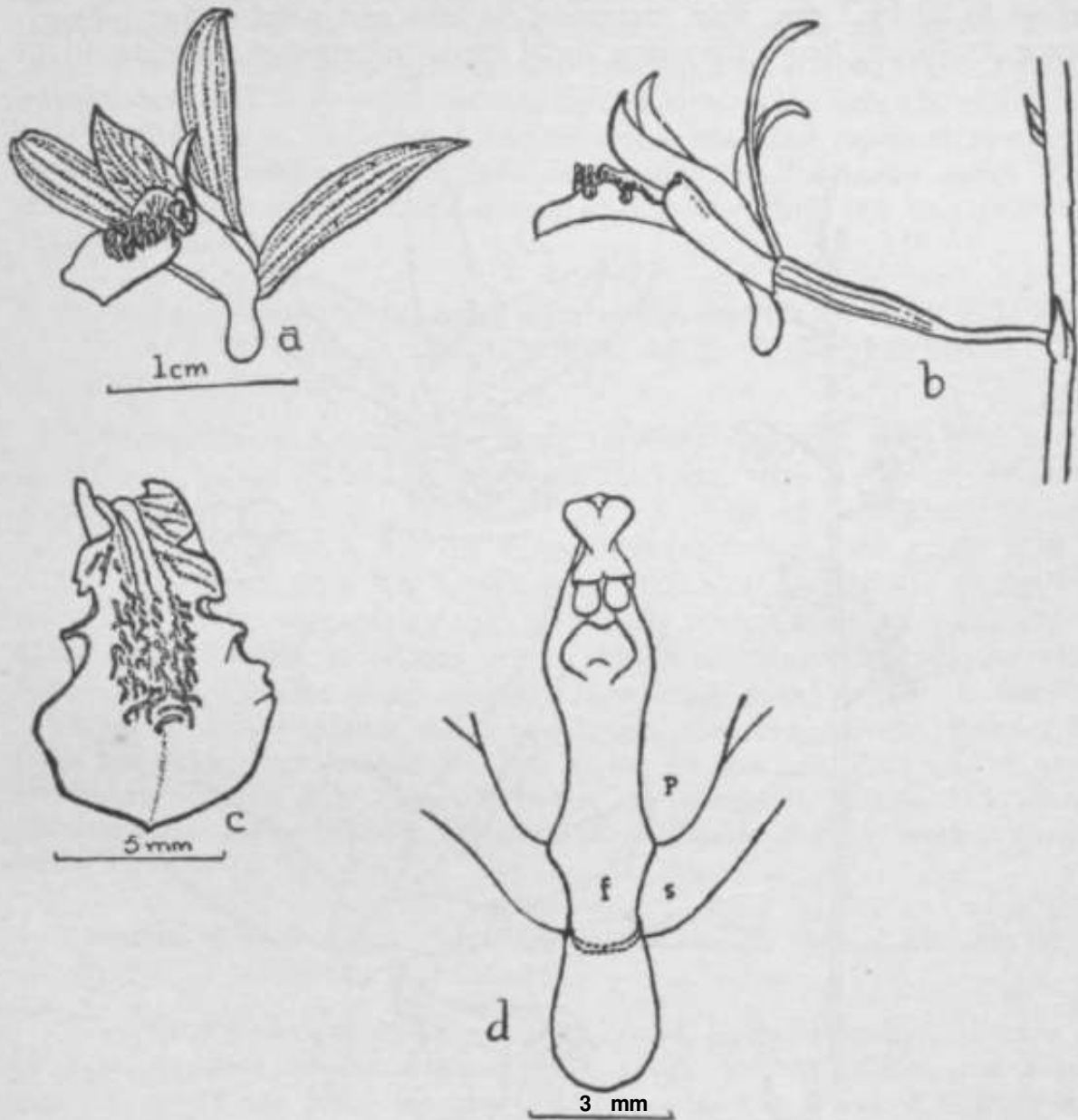


Fig. 156. *Eulophia graminea*. *a*, flower from front, and *b*, from side, *c*, lip. *d*, column, showing foot (*f*), base of lateral sepal (*s*) and petal (*p*).

upper sepal 14 by 4.5 mm., laterals spreading, a little larger; petals 12 mm. long, 6 mm. wide, widest near blunt apex, basal 2/3 greenish, rest pale mauve; side-lobes of lip erect on either side of column, green with dark purplish veins; midlobe down-turned, 7.5 mm. wide, wider than long, slightly bilobed, pale mauve with deeper veins, the basal and middle parts white with irregular warts; 2 prominent mauve keels from base of lip to base of midlobe, with a low third keel between them; base of lip forming a spur hardly 2 mm. long, attached to free column-foot 3 mm. long; column pale green, foot purplish. Distributed from India to Australia; only once collected in Malaya, in Negri Sembilan.

4. *Euiophia Keithii* Ridl., J.L.S. 32: 333. 1896. Flora 4: 142.

Pseudobulbs about 10 cm. long, green, shining, with about 5 leaves; leaves to 30 by 1 cm., thin, narrowed to base and pointed tip; inflorescence 30-40 cm. long (the scape to 24 cm.), unbranched, bearing 10-15

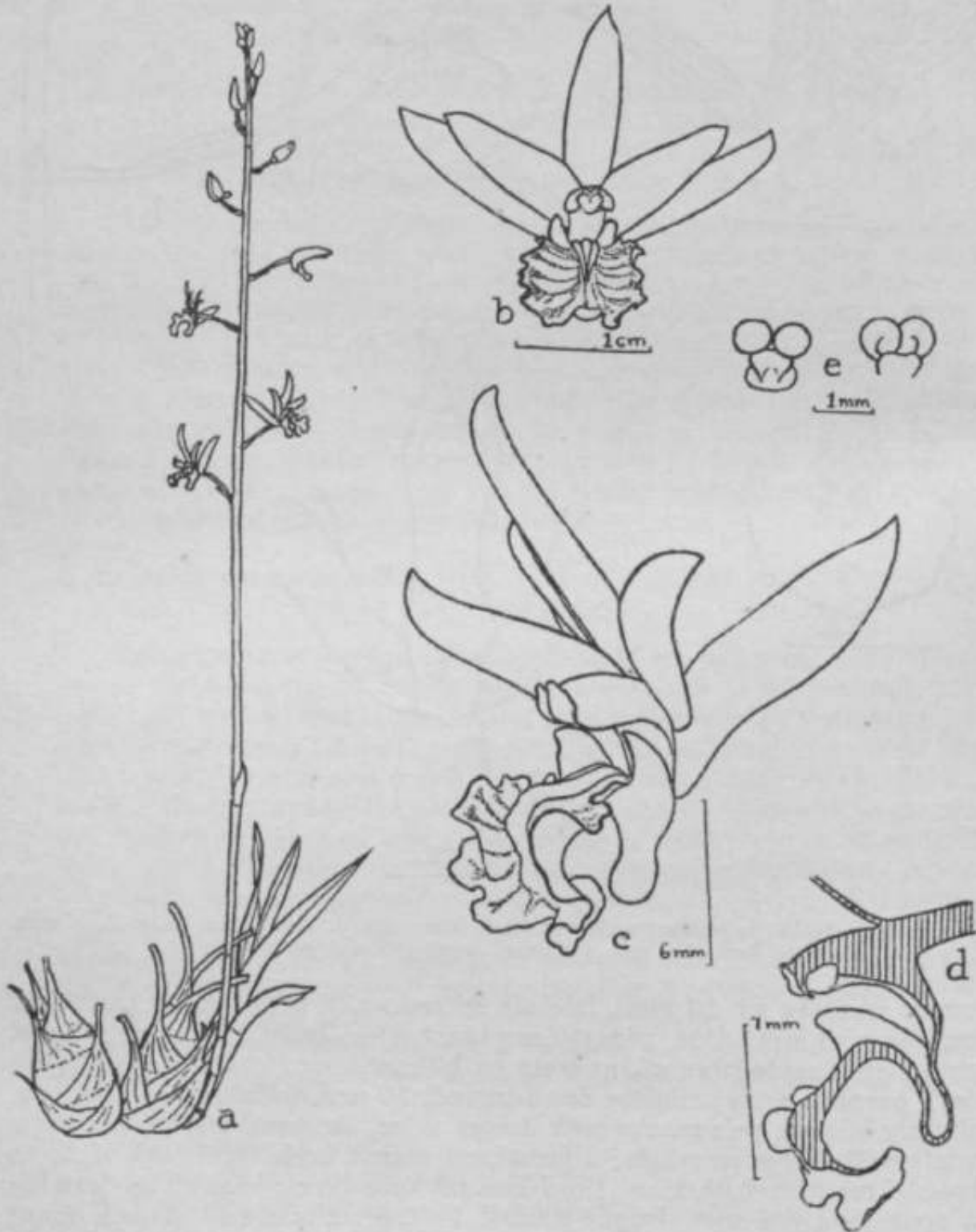


Fig. 157. *Euiophia Keithii*. a, plant; and inflorescence, b, flower from front, c, flower from side, d, section through column, column-foot and lip. e, pollinia.



well-spaced flowers; sepals green, about 1.4 by 0.4 cm., the laterals spreading horizontally; petals shorter, also green; lip pale green on side-lobes and edges of midlobe, rest nearly white with brown veins and 3 white warty keels on basal part; side-lobes erect, rather small, hardly overlapping the column; midlobe broad and reflexed with crisped edges; column rather short and thick with distinct foot as long as the column; spur continuing the line of the column-foot, about 4 mm. long, base narrow, end swollen. Found only in Langkawi and Kedah, on limestone rocks. The plants rest leafless in the dry season, and flower from the leafless pseudobulbs. **Fig. 157.**

5. ***Eulophia macrostachya*** Lindl., Gen. et Sp. Orch. 183. 1833. Bot. Reg. 23: t. 1972. 1837. Bot. Mag. t. 6246. J.J.S., Fl. Buit. 6: 224, f. 164. Ridl., Flora 5: 338.

Pseudobulbs to about 10 cm. long, tapering upwards, with two leaves at the top; leaves stalked, blade to 25 by 7 cm. with 3 strongly-marked veins, stalk to 12 cm.; inflorescence from near base of pseudobulb, 75 cm. tall (the scape 50 cm.), bearing many flowers; flowers pale green with a yellow lip; upper sepal 1.4 by 0.3 cm., laterals wider; petals 1.2 by 0.5 cm., side by side, overarching the column; lip with a short spherical green spur, blade 3-lobed, side-lobes erect, almost covering the column, with brown veins, midlobe much broader than long, broadly cleft, a divided callus at its base; column short and broad, foot very short. Distributed from the Mascarene Islands through India, Ceylon and Malaysia to Australia; in Malaya only collected twice, in Selangor. This is a lowland species, and must be found in other parts of Malaya; further records would be welcome.

6. ***Eulophia squalida*** Lindl., Bot. Reg. 27: Misc. 77. 1841. J.J.S., Fl. Buit. 6: 225, f. 165. Ridl., Flora 4: 141.

Pseudobulbs below ground, almost round, 3 cm. diameter, bearing 3 or 4 leaves and several sheaths below them; leaves stalked, the stalk grooved, to 15 cm. long, passing below to a sheath of equal length, the blade to 50 by 4.5 cm. or larger, with about 7 veins; inflorescence to 100 cm. long, the scape thick and fleshy, more than half total length; bracts narrow, 1 cm. or more long; sepals 2 by 0.5 cm., acute, the laterals joined at the base to the widened column-foot, dull brownish-olive, the laterals a brighter green at the base; petals overarching column, with upcurved tips, 1.7 by 0.8 cm., pure white, or base greenish and red; lip with broad flattened spur pointing downwards, between the divergent halves of the column-foot, blade bent at right angles to spur, its sides upcurved but hardly distinct as lobes, pale mauve with white or cream central area, mauve- and brown-veined. Distributed from Sumatra to New Guinea and the Philippines; in Malaya common throughout the country, in lightly shaded places (e.g. rubber estates) or in the open. The divided column-foot is very peculiar. **Fig. 158.**

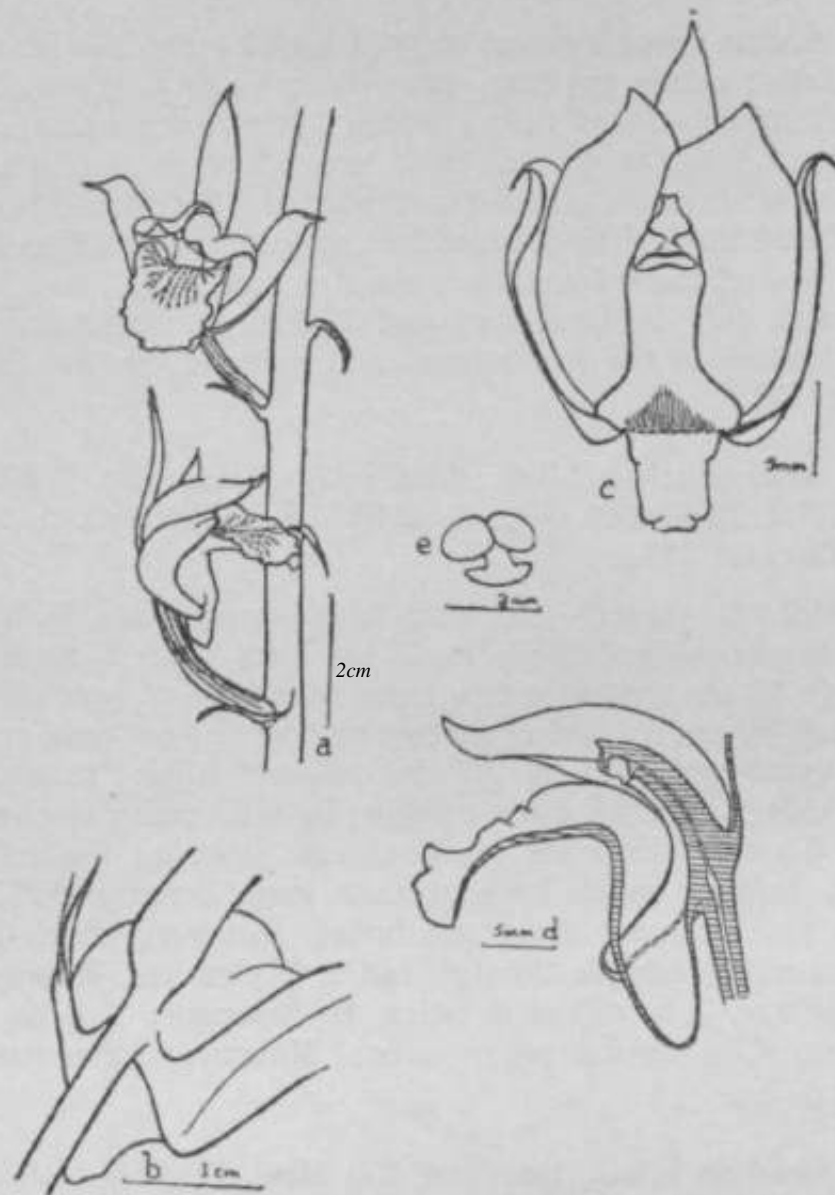


Fig. 158. *Euhphiala squalida*, a, part of inflorescence, b, base of lateral sepals, part of lip and column-foot, all joined, c, flower with lip removed, d, section through column, column-foot and lip. e, pollinia.

### GEODORUM

Pseudobulbs almost round, subterranean, with few leaves, the uppermost largest; leaves stalked, blades broad; scape erect, the rachis drooping, rather short with close flowers; sepals and petals similar, the petals wider; lip forming with the column-foot a short saccate base, not spurred, blade concave, not lobed; column short with a distinct foot.

This is a genus of about 10 species, distributed from India to Australia. In Malaya it is represented by 2 species only, which are not common except in the north. Their drooping inflorescences are distinctive. The two species may be distinguished from each other as follows:—

Sepals and petals about 1 cm. long, pink or white;

flowers not opening widely .. .. 1. *G. purpureum*

Sepals and petals about 2 cm. long, pale yellowish;

flowers more widely opening .. .. 2. *G. citrinum*

1. **Geodorum purpureum** R. Br., Ait. Hort. Kew Ed. 2, 5: 207. 1813. Ridl., Flora 4: 142. King & Pantl., Ann. Calc. 8: 181, pi. 245. J.J.S., Fl. Buit. 6: 222, f. 163.

Blade of leaf to 30 by 7 cm., with 5 or 7 principal veins, stalk and sheath to 20 cm. long; scape to 45 cm. tall, rather fleshy, rachis elongating to 5 cm., bearing a succession of many flowers, a few open together; bracts to 1.5 cm. long, narrow; flowers pink or white, not widely opening; sepals, petals and lip all about 1 cm. long, the petals wider than the sepals, the sepals acute; base of lip at right angles to the column-foot, broad and concave, narrowed to a slightly notched tip, with a broad yellow central area, the rest veined deeper pink; column about 5 mm. long, rather thick, with a foot 3 mm. long at right angles to it. Distributed from Burma through Malaya and Sumatra to Java and to Celebes; in Malaya found in open places from Malacca northwards, not common. The white variety retains the yellow area on the lip; it apparently occurs in the north only.

2. **Geodorum citrinum** Jacks., Andr. Bot. Rep. t. 626. 1810. Bot. Mag. t. 2195. Ridl., Flora 4: 143.

Habit of *G. purpureum*, with somewhat wider leaves; flowers rather wide-opening; sepals and petals white or pale yellow, the upper sepal 2 to 2.8 cm. long by 6 mm. wide, the petals shorter; lip shorter than sepals, 1.4 cm. wide, fleshy, concave, edges slightly downturned, tip slightly cleft, yellowish, more or less red-veined throughout, the base slightly saccate; column short and broad, the foot shorter than the column. Distributed in Burma and Siam; in Malaya not uncommon near Grik and Baling and further north, and once collected by the Sedili River, Johore, in forest. The Johore plant had smaller flowers than the northern ones, but of the same structure. Further records from the south would be interesting.

### THE BROMHEADIA TRIBE

The principal genus in this tribe is *Polystachya*, which has about 100 species, distributed throughout the tropics, but chiefly in Africa. In Malaya we have only one species of *Polystachya* (according to the present arrangement), and the principal genus is *Bromheadia*, which is not very closely related to *Polystachya*. The two genera agree in having terminal inflorescences of many flowers, and two cleft pollinia on a short thin stipes. They differ in that *Bromheadia* has long slender stems with (almost always) many leaves, and flowers with the lip at the bottom and no column-foot; whereas *Polystachya* has very short stems with a few leaves, the lip at the top of the flower and a pronounced column-foot and mentum.

Species of two exotic genera of this tribe are sometimes cultivated in Malaya; these are *Ansellia* and *Neobenthamia*, both African.

*ANSELLIA* plants have the habit of *Grammatophyllum speciosum*, but smaller, and with inflorescences at the ends of the leafy shoots. The flowers are rather similar to *Grammatophyllum* in shape, but more brightly coloured (yellow with brown spots), and quite attractive. About 6 species of *Ansellia* are recognized, but they are all rather alike. The only species known to have been tried in Singapore is *A. nilotica*, from East Africa.

This can be kept alive for a year or two, and will flower, but is not vigorous in our climate, which is probably too wet, and no plants have been kept alive for a long period. There are however Ansellias in West Africa, suited to wetter climates, and these should be tried in Malaya, both in the lowlands and at hill stations. They are certainly well worth cultivating.

NEOBENTHAMIA is a genus of one species, *N. gracilis*, native in east Africa, which grows quite well in Singapore and flowers regularly, but is evidently not so vigorous as it should be. It is a terrestrial plant of slender stems and grassy leaves (rather like *Arundina* but smaller), growing 60 cm. or so high, with terminal close clusters of rather small white flowers with a touch of yellow and some small purple spots on the lip. The flowers are rather bell-shaped, not opening widely, and take the usual position with the lip at the bottom. They are quite graceful, but rather too small to be generally popular. Though terrestrial, the plants need very good drainage, and full sun. It is reported that they normally grow to 150 cm. tall, and have a scrambling habit, perhaps growing in thickets with other plants.

### BROMHEADIA

Terrestrial or epiphytic plants; stems long and slender with many leaves, or rarely with few leaves; leaves with normal oblong blade or laterally flattened; inflorescences terminal and sometimes also lateral, of many flowers opening one or few at a time, in two opposite rows with regularly alternating bracts; sepals and petals similar and widely spreading; lip a little shorter than the sepals, straight, parallel with the column and close to it, the side-lobes usually erect and touching the column on either side, the area between them thickened and short-hairy, the midlobe ovate, more or less turned downwards, with a central warty or papillose area; column rather long and slender, without foot, the upper part winged, the rostellum broad and thin with the large pollinia freely exposed above it; pollinia 2, more or less cleft at the back, on a very thin short and broad stipes.

The genus extends from Sumatra to New Guinea, and about 11 species in all are known, of which 7 occur in Malaya; no species is found in Java, which is very strange, and in Sumatra only 3. Malaya may therefore be called the headquarters of the genus. The flowers are very much alike in all species, differing chiefly in size and small details of colouring; most are pale yellowish with purple and yellow markings. The vegetative form of the plants varies much more than the flowers, so that our key is based almost entirely on stem and leaf characters.

There are two very distinct groups in the genus. One has normal oblong leaves with blades spreading more or less horizontally; the other has leaves laterally compressed, so that they are all in one plane with the stem, exactly as in the *Aporum* section of *Dendrobium*, which they resemble so closely that when not flowering they can easily be confused with *Dendrobium*. In these species also the groups of bracts are short and chaffy, much as in the corresponding group of *Dendrobium*.

A character which all Bromheadias share is the short life of their flowers, which open in the morning and are fading by noon. Some species (including *B. alticola*) flower in response to the stimulus of a sudden fall of temperature, like *Dendrobium crumenatum*. The common *B. Finlaysonianum* however produces flower-buds continuously, their rate of development being controlled to some extent by climatic conditions, so that on some days flowering is more abundant than on others. More observations on the flowering of Bromheadias are desirable.

Key to the Malayan species of Bromheadia

Leaves normal, not laterally compressed

Terrestrial; a long stem between the highest leaf and the lowest flower .. .. 1. *B. Finlaysoniana*

Epiphytic or terrestrial; inflorescence starting directly from the base of the highest leaf, or inflorescence lateral

Inflorescence only terminal; bracts 8-10 mm. long; epiphyte .. .. 2. *B. alticola*

Inflorescences lateral and terminal; bracts under 4 mm. long; terrestrial .. 3. *B. rupestris*

Leaves laterally compressed

Leaves very close, many on each stem

Leaves to 12 cm. long .. .. 4. *B. pungens*

Leaves about 1-2 cm. long .. .. 5. *B. brevifolia*

Leaves widely spaced, few on each stem

Leaves to 8 by 0.4 cm., curved slightly away from stem .. .. 6. *aporoides*

Leaves to 9 by 0.25 cm., or longer, curved strongly away from stem .. .. 7. *B. scirpiodea*

1. *Bromheadia Finlaysoniana* (Lindl.) Rchb. f., Walp. Ann. 6: 882. 1864.—*Grammatophyllum Finlaysonianum* Lindl., Gen. et Sp. Orch. 173. 1830.—*Bromheadia palustris* Lindl., Bot. Reg. 27: misc. 89. 1844. *I.e.* 30: t. 18. Bot. Mag. t. 4001. Ridl., Flora 4: 150.

Var. *sylvestris* (Ridl.) *B. sylvestris* Ridl., J.L.S. 28: 237. 1891. Flora 4: 150.

Terrestrial; stems close, commonly 1 m. high, sometimes to 2 m., basal part with green sheaths, above these 6 pairs or more of leaves in 2 rows, then an apical part bearing green sheaths only, below the inflorescence; leaves to 12 by 3 cm., widest near the base, narrowed more or less to the slightly bilobed tip, fleshy, sheaths to 4-5 cm. long, overlapping or not; inflorescence erect, sometimes branched, commonly to 10 cm. long and sometimes much longer, bearing 1 (rarely 2) flowers at a time, at

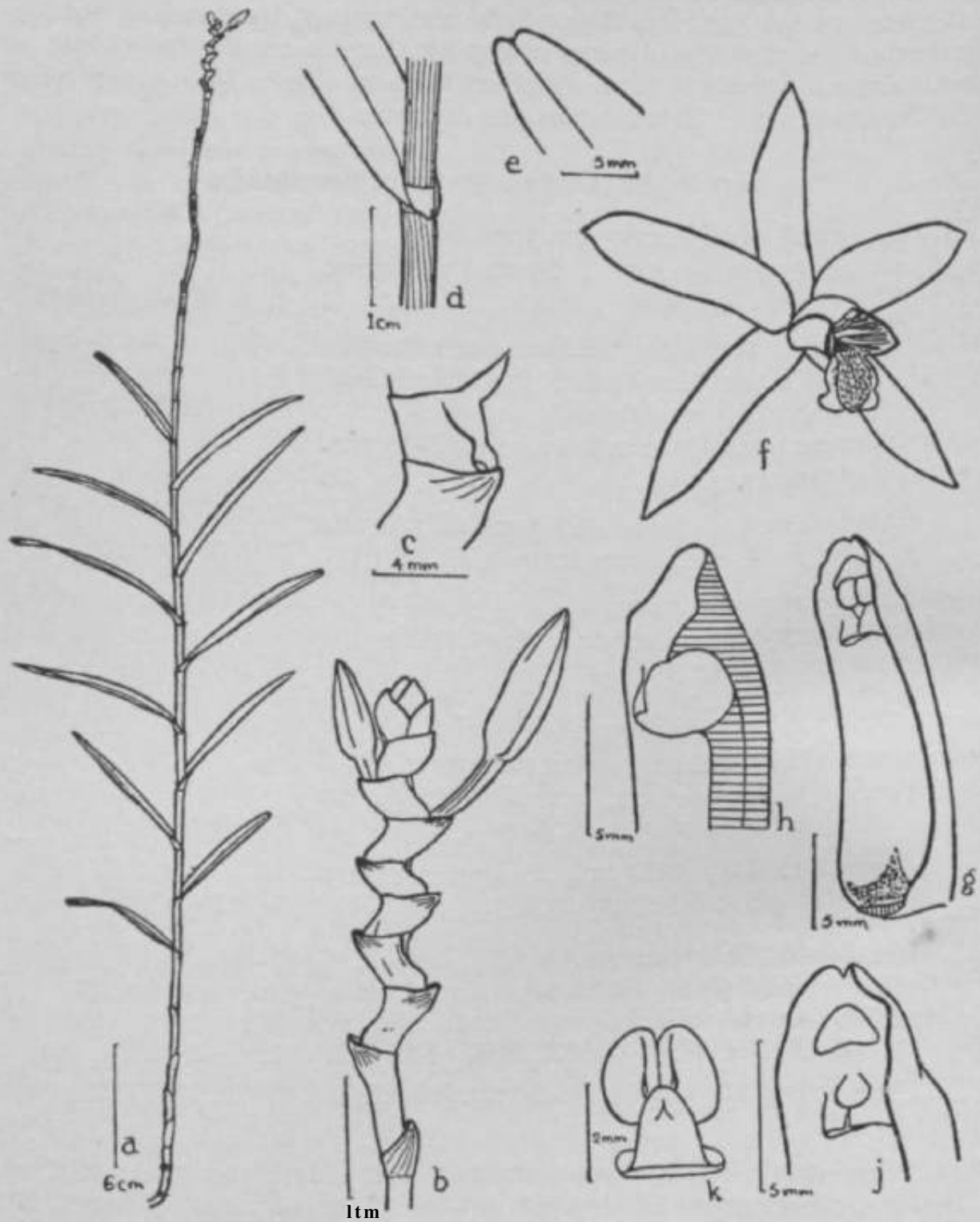


Fig. 159. *Bromheadia Finlaysonianana*. *a*, stem and inflorescence, *b*, inflorescence with flower buds, *c*, scar of fallen flower, *d*, leaf base, *e*, leaf tip from beneath. *f*, flower, *g*, column, *h*, section of top of column, *j*, top of column after removal of pollinia. *k*, pollinia.

intervals of about 10 days; bracts alternate in 2 regular ranks, close, stiff, boat-shaped, spreading about 3 mm. from the axis; pedicel and ovary 1-1.5 cm. long; flowers white or cream, sometimes tinted with mauve; sepals 2.8 to 3.8 cm. long, 6-9 mm. wide, acute; petals a little shorter and wider; lip to 3.3 cm. long, side-lobes erect, veined with purple, in contact with column, free ends extending a little beyond the column; midlobe to about 1 cm. long and 0.8 cm. wide, rounded with a very short tip, edges minutely toothed, central area irregularly warty, yellow, with some purple spots near the base. Distributed in Sumatra and Borneo; in Malaya common throughout, in the lowlands, in open scrub and light secondary forest. Flowers on large plants are much larger than on small plants. The flower-buds develop in regular succession, each taking about 3 weeks to full development from the time it first appears beyond its bract; dry weather appears to check buds which have reached a certain stage of development, so that flowering is not quite regular, and on some days there are more flowers than on others. The flowers are very attractive, but short-lived. Fig. 159.

Var. *sylvestris*. Differs from the normal form of the species in having thinner stems, thinner and sometimes very wide leaves, smaller flowers (sepals 2.8 cm. long) which are orange-yellow, the veins on side-lobes crimson, centre of midlobe orange, edges white. Found by Ridley in shady places in Singapore and Johore. He regarded this as a distinct species, but it differs in no structural detail from the typical form *B. Finlaysoniava*. It is uncertain whether the orange colour of the flowers is always associated with plants growing in shady places, or whether plants with such flowers may grow in the sun. Typical *B. Finlaysoniava* has been found growing in peat forest at Pontian, Johore, under similar conditions to *B. sylvestris*, which grew in the same forest.

2. *Bromheadia alticola* Ridl., J.L.S. 28: 390, pi. 42. 1891. Flora 4: 151.

Epiphyte; stems forming a large bushy mass, pendulous, to 60 cm. or more long, 5 mm. thick, flattened, internodes to 4 cm., leaves 12-20 by 1.5-2 cm., oblong, tip cleft with unequal rounded halves; inflorescence terminal, immediately beyond the last leaf, to 10 cm. or more long; bracts broad, curved, laterally flattened, 8-10 mm. long, internodes 5 mm.; flowers creamy white; upper sepal 2.8 by 0.8 cm., laterals a little shorter and wider, asymmetric at the base, keeled near tips; petals 2.5 by 0.85 cm.; lip 1.8 cm. long in natural position with the end turned down; side-lobes erect, 3 mm. high, a little longer than the column, forward edges purple; midlobe ovate, acute, 5 mm. wide, cream, with yellow median thickened and papillate band which extends to base of lip; column 1.4 cm. long, edges purple in basal part. Found in many localities from Singapore to Pahang and Perak, often on tall trees, in the lowlands and to 3,000 feet on the hills. This species responds to the stimulus of a sudden fall of temperature, and flowers one day later than *Dendrobium crumenatum*. Fig. 160.

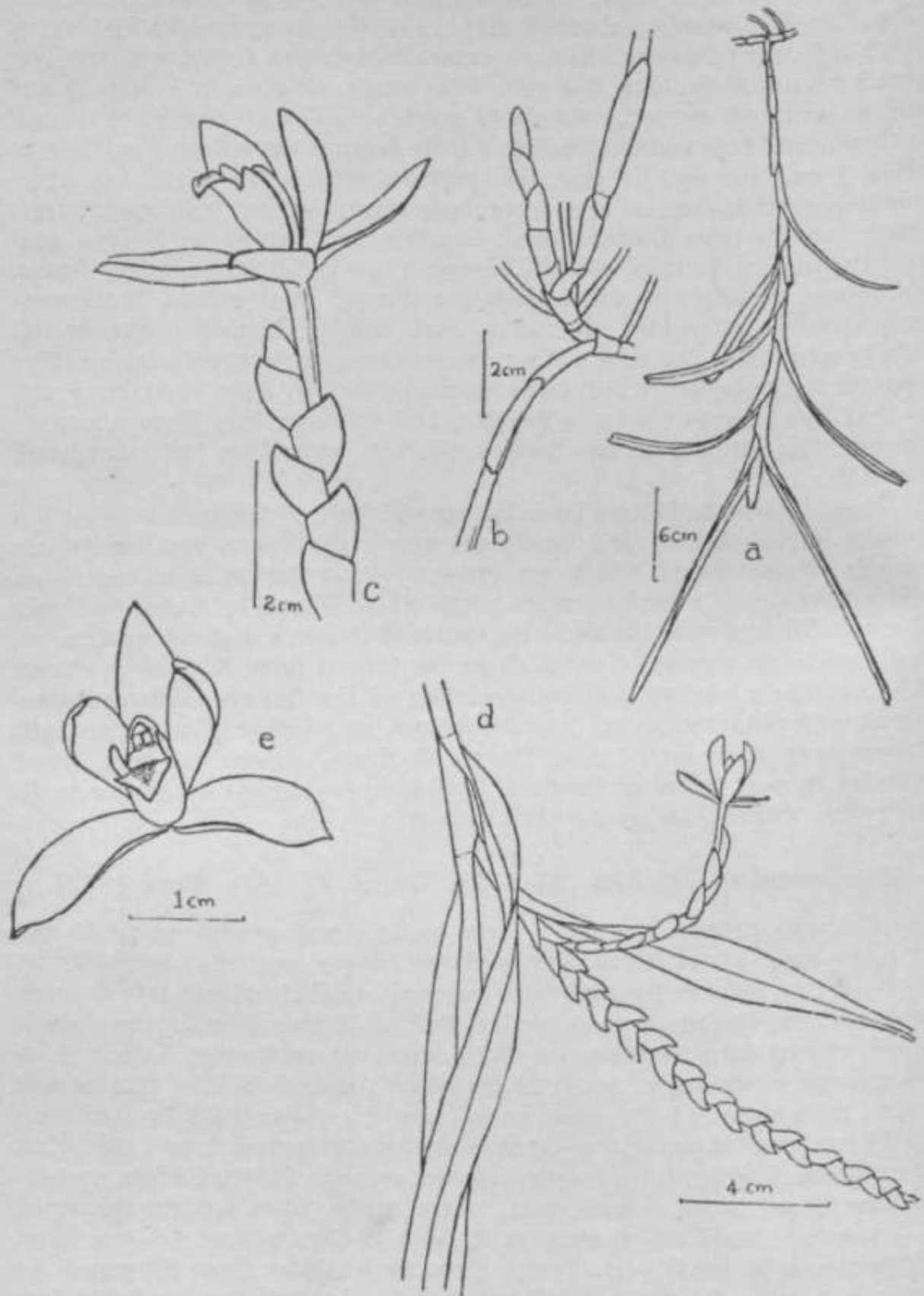


Fig. 160. *Bromkeadia alticola*. a, young shoot. 6, apex of rhizome, c, flower and bracts, d, inflorescences, e, flower from front.



3. *Bromheadia rupestris* Ridl., J.L.S. 32: 341. 1896. Flora 4: 150.

Terrestrial, stems to 150 cm. tall, somewhat flattened, leafy to the apex, the lower leaves falling from old stems, internodes 2 cm. long; leaves to 12 by 1.5 cm., almost oblong, slightly narrowed to the bilobed rounded tips; inflorescences axillary, often from the leafless lower part of the stem, and terminal, to about 2.5 cm. long; bracts closely overlapping, about 2 mm. apart on each side of the axis, the axis and bracts together 4 mm. across; sepals about 2.5 cm. long, cream, sometimes tinted pink on the backs; petals similar; lip nearly as long as sepals, the side-lobes purple-veined, midlobe purple-spotted, with crisped edges, median band pale yellow. Found only on G. Tahan, Mt. Ophir and Kedah Peak, on rocks at about 4,000 feet altitude.

4. *Bromheadia pungens* Ridl., J.L.S. 32: 340. 1896. Flora 4: 151.

Epiphyte; stems to 40 cm. long, flattened, internodes 2-3 cm.; leaves at a very acute angle to the stem, nearly straight, almost touching, laterally flattened, to 12 by 0.6 cm., tough, sharply pointed; inflorescences terminal, short, without scape, bracts concave, overlapping, 3 mm. long and 3 mm. apart on each side of the axis; flowers with yellowish sepals and white petals, all about 2 cm. long; lip with hardly raised cream side-lobes, the midlobe with white edges, the central part yellowish, fleshy, the surface broadly and irregularly moulded. Found only on Mt. Ophir and G. Tahan. A most striking species, shaped much like *Dendrobium carnosum* (§*Oxystophyllum*) but enormously larger.

5. *Bromheadia brevifolia* Ridl., J.L.S. 32: 340. 1896. Flora 4: 151.

Epiphyte; stems 12-28 cm. long, leafy throughout, internodes 3-4 mm. long; leaves closely 2-ranked, not quite touching, at 45° to the stem, laterally flattened, the outer edge 1-2 cm. long, 3 mm. wide, stiff, acute; inflorescence terminal, short, often branched, with closely overlapping thin bracts; sepals 1.4 cm. long, dark red outside; petals a little shorter, white or cream; lip with rather broad erect side-lobes, the area between them red-purple-hairy, midlobe slightly down-curved, yellowish with paler crinkled edges, tip shortly pointed. Found on Taiping Hills and at Cameron Highlands. This is even more like a *Dendrobium* in habit.

6. *Bromheadia aporoides* Rchb. f., Otia Bot. Hamb. 44. 1878. Ridl., Flora 4: 151.

Epiphyte; stems tufted, 6-12 cm. long, with 4 or 5 leaves on each side, the lowest smallest, and below them a few sheaths; leaves laterally compressed, to 8 by 0.4 cm., at a very acute angle to the stem, curved slightly backwards, tough, very sharply pointed; inflorescence terminal, very short, sometimes branched, with closely overlapping thin bracts; flowers pale yellowish, sepals 1.6 cm. long, petals a little shorter; lip with low side-lobes, a median yellow band, and a purple area on either side of the midlobe which is slightly downcurved, with crinkled edges. Distributed in Sumatra, Borneo, and northwards to Lower Burma and Siam; in Malaya found in the lowlands in the south, on trees by rivers, and on mountains further north.

7. *Bromheadia scirpioidea* Ridl., J. Bot. 1900: 71. Flora 4: 151.

Stems slender, curved, to 20 cm. long and 2 mm. thick, often densely tufted; leaves about 3 on each side of the stem, curved, laterally flattened, to 9 by 0.25 cm., stiff, sharply pointed; inflorescence terminal, short, branched, at base of uppermost leaf which is placed so that it continues the line of the stem; bracts thin, close; flowers pale yellowish; sepals 1.3 cm. long; lip with purple-spotted side-lobes, the midlobe yellow with 2 pink spots. Found in Borneo, and at many places from south to north of Malaya, in the lowlands. Plants with much longer leaves have also been found in Johore, but it is not certain whether they belong to this species.

### POLYSTACHYA

As noted above, this genus is found throughout the tropics, principally in Africa, where there are some pretty species with brightly coloured but not very large flowers. All are epiphytes, with short few-leaved stems and terminal inflorescences of many flowers which always have the lip uppermost; the column-foot is always well developed, and the lateral sepals form a conspicuous mentum. The pollinia are much as in *Bromheadia*. The only Malayan species is small-flowered, with somewhat the habit of *Thelasis*.

*Polystachya flavescens* (Bl.) J.J.S., Fl. Buit. 6: 284, f. 218. 1905.—*Onychium flavescens* Bl., Bijdr. 325. 1825.—*Polystachya siamensis* Ridl., J.L.S. 32: 343. 1896. Flora 4: 152.—*P. penangensis* Ridl., I.e.—*P. singaporensis* Ridl., I.e.

Stems tufted, short, flattened, each with 3 or 4 leaves, the upper largest; leaves to 20 by 3 cm. (usually smaller), widest in upper half, narrowed to base, tip blunt, sheaths keeled on the back; inflorescence terminal, erect, 10-30 cm. long, simple or with several short lateral branches; flowers small, close, bracts narrow, shorter than pedicel and ovary; flowers 6 to 8 mm. long and wide, pale greenish; upper sepal to 4 mm. long, broad, erect; lateral sepals broadly triangular, forming a wide mentum, ends spreading; petals very narrow, incurved; lip pale yellowish, side-lobes short, triangular, erect, midlobe broad, blunt, end downturned, inner surface mealy. Distributed from Sumatra to the Philippines; in Malaya found in all parts from Singapore to Langkawi, but apparently most common in the north (especially on Penang Hill). Plants have been found at Fraser's Hill. There is some variation in the details of the lip but it is doubtful whether more than one species can be recognized. Critical observations on this species are desirable. The basal part of the lip has a low rounded keel which is reddish, but the red colour is nearly obscured by a white mealy covering (composed of single loose round cells). **Fig. 161.**

### THE THELASIS TRIBE

Epiphytes; stems pseudobulbous bearing 1 or 2 terminal leaves, with some sheaths and sometimes also smaller leaves at the base, or short and unthickened with several leaves in 2 close opposite ranks, laterally compressed and overlapping at the base; leaves narrow and fairly long,

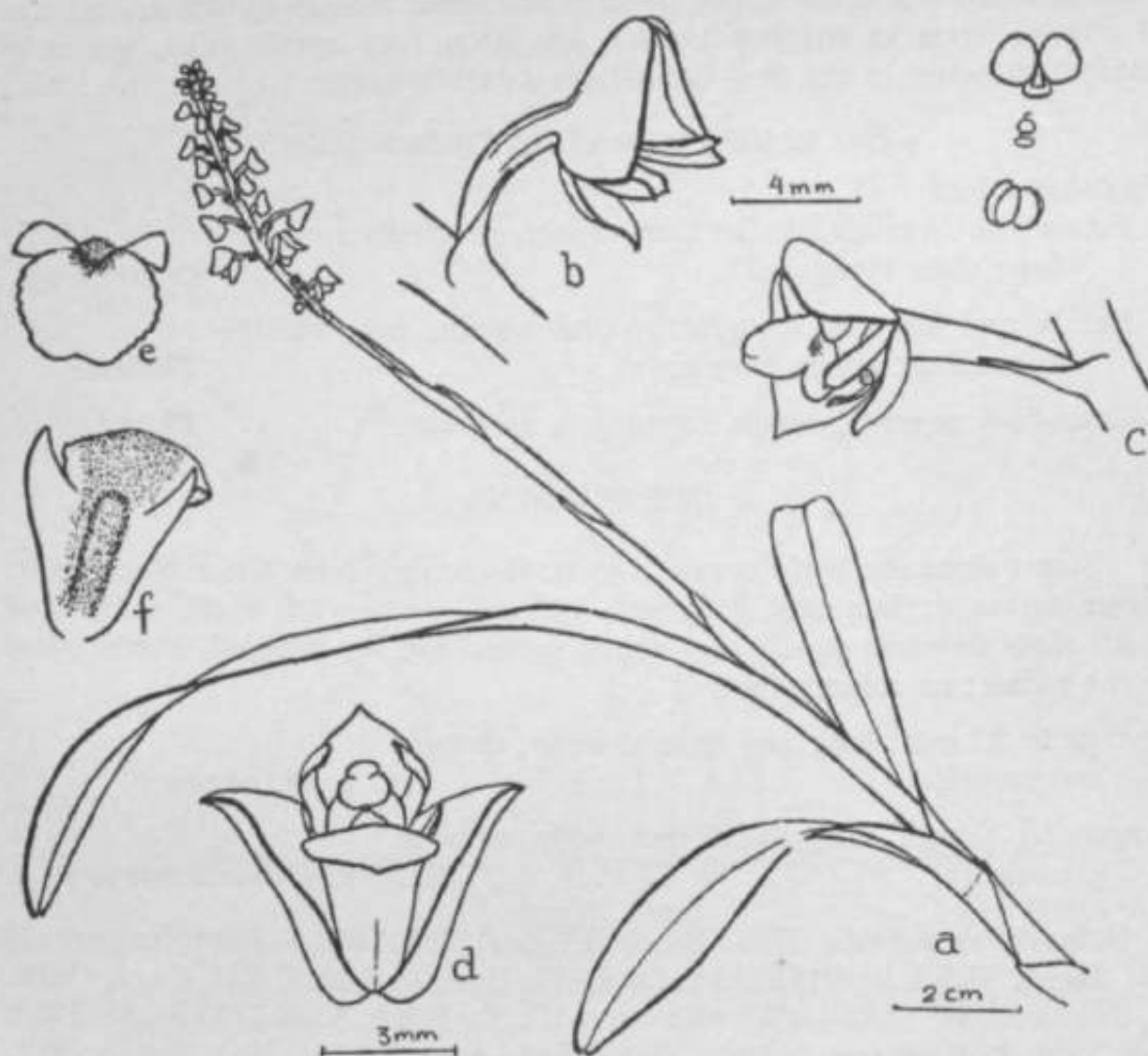


Fig. 161. *Polystachya fiavescens*. a, stem and inflorescence, b, c, flowers in natural position, d, flower reversed, from front, e, lip from above, f, lip removed and seen from the position of the column, g, pollinia from front (above) and back.

usually thin; inflorescence lateral, with long (in *Octarrhena* short) slender scape, rachis bearing many small flowers; sepals and petals about equal, the lateral sepals forming a mentum with the column-foot when this is present; lip undivided, not spurred, concave; column short, with or without a foot; anther 2-chambered, with 8 pollinia in 2 groups of 4, on a long slender stipes, with a long or short disc.

The two principal genera in this tribe are *Thelasis* and *Phreatia*, the latter being larger, with about 120 species, extending from India to the Pacific and to Australia, There is also the small but quite widely distributed genus *Octarrhena*, represented by two species in Malaya.

Several species of *Thelasis* and *Phreatia* are common epiphytes in Malaya. As indicated above, there are two plant-forms, one with pseudo-bulbous stems and one without; both forms occur in each genus, and plants of similar form in the two genera are often very much alike, the only distinction being in the flowers. All are small-flowered.

#### Key to the genera of the *Thelasis* tribe

No column-foot

Petals and lip much smaller than sepals, all widely spreading; stem elongated . . . . . *Octarrhena*

Petals and lip about equal to the sepals, not widely spreading; stems very short . . . . . *Thelasis*

Column-foot present, sepals forming a mentum .. *Phreatia*

#### OCTARRHENA

Stems elongate, leafy towards apex, branching from the rooting base; leaves terete or laterally flattened; inflorescences with short scape and small close flowers; sepals and petals spreading, lip unlobed, about equal to the petals; no column-foot.

Leaves to 22 mm. long and 2 mm. wide; flowers not crowded .. .. . 1. *O. parvula*

Leaves to 35 mm. long and 5 mm. wide; flowers crowded .. .. . 2. *O. condensata*

1. ***Octarrhena parvula*** Thw., Enum. Pl. Zeyl. 305. 1861.—*Phreatia parvula* Hk. f., F.B.I. 5: 811. 1890. J.J.S., Fl. Buit. 6: 500, f. 377. Carr, Gard. Bull. 7: 37. 1932.—*Phreatia nana* Hk. f., F.B.I. 5: 811. 1890. Ic. Pl. t. 2084. Ridl., Flora 4: 106.—*Octarrhena nana* Schltr., Fed. Rep. 9: 217. 1911.

Stems to about 6 cm. long (to 10 cm. ?) ; leaves laterally compressed or terete, 15-22 mm. long, about 2 mm. wide, spreading obliquely, curved, acute; inflorescence 2-3 cm. long, flowers about 12, pale greenish yellow, 2-5 mm. diameter. Distributed to Ceylon and Western Malaysia, in Malaya found at several mountain localities, as an epiphyte.

2. ***Octarrhena condensata*** (Ridl.) Holtt., Gard. Bull. 11: 285. 1947.—*Oberonia condensata* Ridl., J.L.S. 38: 322. 1908. Flora 4: 18.

Stems to 20 cm. long, flattened, lower part bare, upper part with about 8 leaves; leaves laterally flattened, 2.5-3.5 cm. long, 4-5 mm. wide, oblique, acute; inflorescence 4 cm. long, erect, with many crowded yellow flowers 2-5 mm. diameter; sepals triangular, acute, petals smaller and more narrowly pointed, lip as long as petals, narrower towards the base, anther white. Known only from Cameron Highlands and G. Tahan at about 5,000 feet. The old flowers are orange yellow. **Fig. 162.**

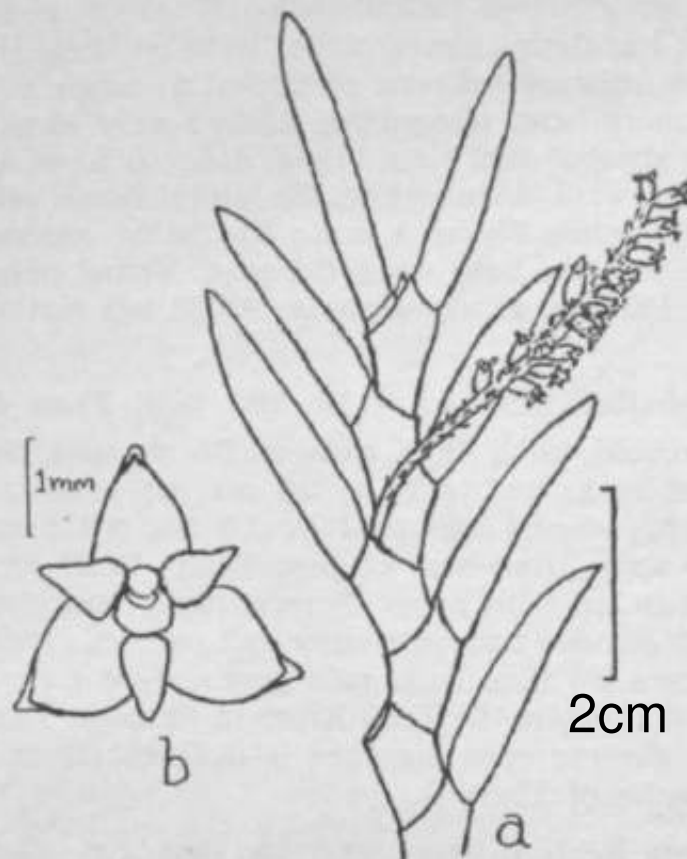


Fig. 162. *Octarrhena condensata*. a, stem and inflorescence, b, flower from front.

## THELASIS

The characters of this genus are those at the head of the group, with the modification that there is no column-foot. The sepals and petals do not spread, except their tips; the lip is usually widest and hollow at the base, narrowed to the tip.

## Key to the Malayan species of Thelasis

- Stems forming small pseudobulbs, ovoid or depressed, with 1 terminal leaf and rarely a second shorter one, the pseudobulb covered when young by small sheaths
- Leaf thick and fleshy, not over 1 cm. wide . . . . . 1. *T. succosa*
  - Leaf not thick and fleshy, usually wider
  - Pseudobulb not depressed, bearing a short leaf as well as a long one . . . . . 2. *T. macrobulbon*
  - Pseudobulb depressed, with 1 leaf only . . . . . 3. *T. triptera*
- Stems not pseudobulbous, laterally flattened, with about 5 leaves, all with laterally flattened overlapping sheathing bases
- Rachis of inflorescence to 15 cm, long . . . . . 4. *T. carinata*
  - Rachis of inflorescence about 15 cm. long . . . . . 5. *micrantha*

1. ***Thelasis succosa*** Carr, Gard. Bull. 7: 35. 1932.

Pseudobulbs lying flat on rhizome, about 1 cm. diameter and 7 mm. tall, apex pointed; leaf fleshy, almost terete, to 15 cm. long and 1 cm. wide; inflorescence from rhizome between pseudobulbs; scape to 15 cm. long; rachis to 3-5 or more long, elongating, flowers very close, opening few at a time; bracts about 2 mm. long, broad, deflexed when old and persistent, overlapping; flowers almost white, the lateral sepals yellowish; sepals about 3 mm. long, petals 2-5 by 1 mm.; lip fleshy, concave, as long as sepals, 2 mm. wide at the base when flattened. Found only on limestone at Kota Glanggi, Pahang, as an epiphyte. Allied but distinct species are found in Borneo.

2. ***Thelasis macrobulbon*** Ridl., J.L.S. 32: 393. 1896. Flora 4: 199.

Pseudobulbs ovoid, taller than wide, to 2-5 cm. tall, bearing 1 short and 1 long leaf at apex; leaf to 15 by 2-5 cm., tip broadly pointed, base gradually narrowed; second leaf to 4 by 1-5 cm. with broad sheathing base 2 cm. long; scape from base of pseudobulb, to 20 cm. long; rachis 10-12 cm. long, slender, with many flowers, many open together; bracts 2-5 mm. long, with slender tips, spreading, not reflexed; pedicel and ovary 2 mm. long; flowers 2-5 mm. long, pale green. Found on Taiping Hills, at Fraser's Hill and also by the Teku River in Pahang. The long inflorescence with many flowers open together is different from that of other pseudobulbous species of *Thelasis*.

3. ***Thelasis triptera*** Rchb. f., Bonpl. 3: 219. 1855.—*T. elongata* Bl., Mus. 2: 187. 1856. Fl. Jav. N.S. 23, t. 7, f. 2. 1858. Ridl., Flora 4: 199. J.J.S., Fl. Buit. 6: 494, f. 373.

Pseudobulbs close, the base to 2 cm. diameter, broader than tall, with one terminal leaf; leaf to 12 by 1-5 cm., often smaller, very variable in ratio of length to width, apex blunt, base gradually narrowed; scape 5-20 cm. long, rachis elongating, attaining 5 cm., bearing many close flowers, a few open at a time; bracts 2 mm. long, reflexed and persistent, acute; flowers pale greenish; sepals 2-5 mm. long; lip ovate, blunt, whiter than sepals. Distributed from Sumatra to the Philippines; in Malaya common as an epiphyte by rivers and in old mangrove in the south, and as an epiphyte on limestone further north, the size of the plants very variable. Very small plants may flower.

4. ***Thelasis carinata*** Bl., Bijdr. 385. 1825. Fl. Jav. N.S. 21, t. 7, f. 3. J.J.S., Fl. Buit. 6: 497, f. 375. Ridl., Flora 4: 200. *T. elata* Hk. f., F.B.I: 6: 87. 1890. Ic. Pl. t. 2156.

Stems tufted, very short, flattened, bearing about 5 leaves, the lower leaves much shorter than the upper, all with spreading flattened sheathing bases below the joint at the base of the blade; leaf-blades to 30 by 2-7 cm. (commonly to 20 by 2 cm.), oblong, tips bilobed and unequally rounded, the sheathing base 5 cm. long; scape slender, 15-25 cm. long; rachis bent at an obtuse angle to the scape, to 15 cm. long when fully grown, elongating slowly for some weeks; bracts spreading, narrow, 3-4 mm. long; flowers white, greenish at bases of sepals and petals; sepals 5 mm. long, the upper one with tip curved back; lip 4 mm. long, tip shortly pointed,

base suddenly widened, concave, with a nectary on each side. Distributed from Sumatra to the Philippines; in Malaya a common lowland epiphyte in all parts of the country. Fig. 163.

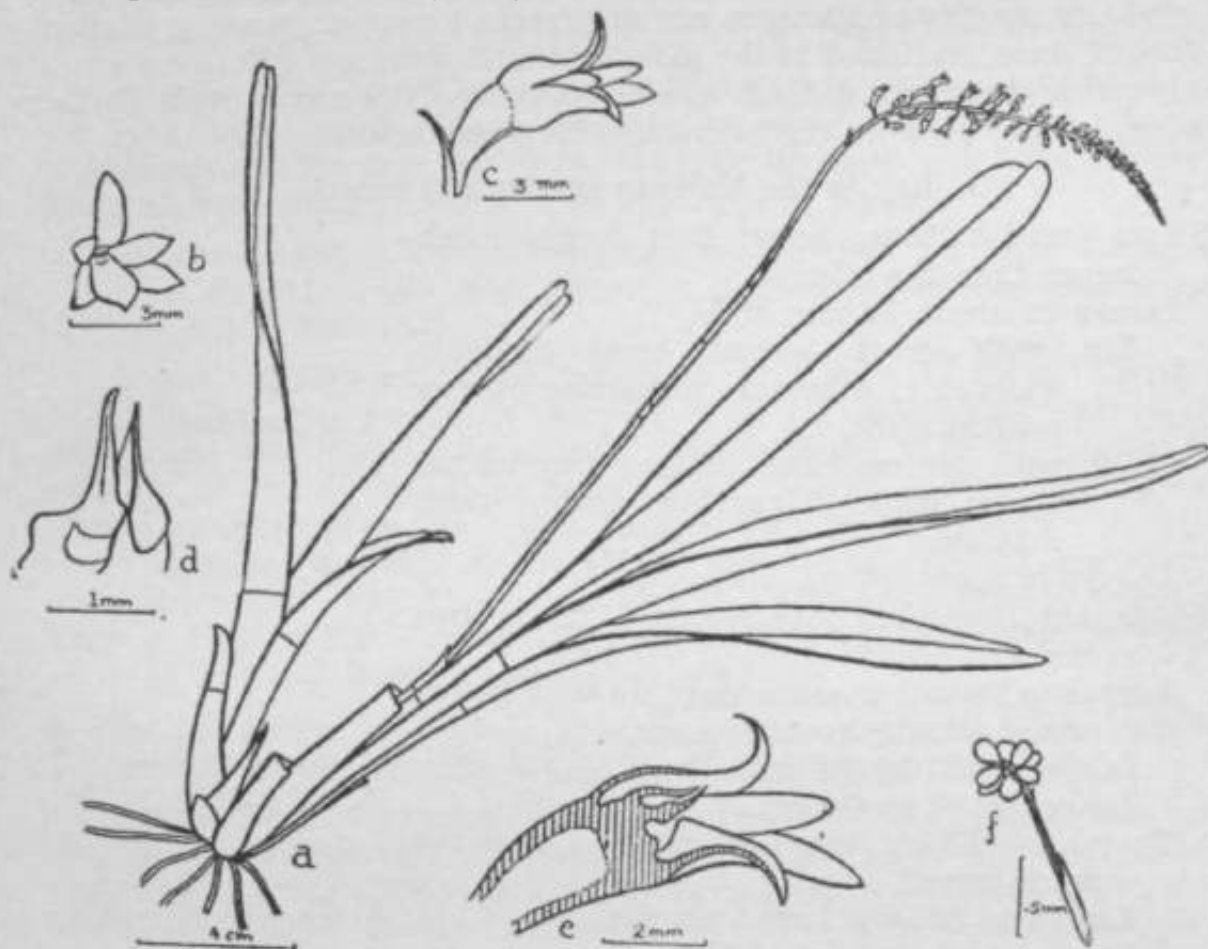


Fig. 163. *Thelasis caritutta*. *a*, plant with inflorescence, *b*, flower from front, and *c*, from side, *d*, column with pollinia removed, *e*, section through column and lip, *f*, pollinia with long stipes and narrow disc.

5. *Thelasis micrantha* (Brongn.) J.J.S., Fl. Buit. 6: 495, f. 374. 1905.—*Oxyanthera micrantha* Brongn., Dup. Voy. Coq. 198. 1934.—*Thelasis decurva* Hk. f., F.B.I. 6: 87. 1890. Ic. Pl. t. 2157. Ridl., Flora 4: 200.

Habit of *T. carinata* but smaller, the leaves to 20 cm, long, scape to 14 cm. long, rachis to only 15 cm., the flowers almost all open simultaneously; bracts 15 mm. long; sepals 3 mm. long; lip as in *T. carinata* but with blunt tip. Distributed from Sumatra to the Philippines; in Malaya especially in the south and in Pahang, on trees by rivers, and elsewhere chiefly found on limestone.

## PHREATIA

Like *Thelasis*, this genus contains both pseudobulbous species and others without pseudobulbs. The former usually have 2 or 3 leaves, and the pseudobulbs are never depressed as in *Thelasis triptera*. The non-pseudobulbous species may have as many as 12 leaves. All have rather lax inflorescences, with many flowers open together. The column-foot is always

well developed, and the little flowers have a distinct mentum. They rarely open widely. They differ also in many cases from *Thelasis* in having a narrow base to the lip, and always in having a short blunt anther.

Eight species of *Phreatia* are at present known to occur in Malaya. Most of these are found in the mountains and some are quite common. It is possible that more distinct species occur, and the group needs further study, both as regards vegetative and floral characters.

Key to the Malayan species of *Phreatia*

- Stems pseudobulbous; leaves 2 or 3, one much larger than the others
- Leaves to about 1-2 cm. wide
- Lip with short saccate base, suddenly widened to a broadly triangular bluntly pointed blade .. .. . 1. *P. sulcata*
- Lip with narrow basal part as long as the blade; blade triangular, acute, wider than long .. .. . 2. *P. listrophora*
- Leaves to about 0-5 cm. wide .. .. . 3. *P. linearis*
- Stems not pseudobulbous; leaves 6-12, in two ranks
- Leaves to 20 cm. or more long; lip with down-turned broadly rounded apex
- Leaves to 30 by 1-8 cm. .. .. . 4- F- <sup>^</sup>*unflora*
- Leaves to 20 by 0-6 cm. .. .. . 5- P- ~~W~~*Ua*
- Leaves to 12-5 cm. long; lip concave, apex not down-turned
- Leaves to 12-5 by 1 cm., not fleshy .. 6- ?- *laxiflora*
- Leaves much smaller, fleshy
- Leaves to 5 cm. long; lip with wide base .. 7. *P. secunda*
- Leaves shorter, often only 1 cm. long; lip widening from a narrow base .. 8. *P. crassifolia*

1. *Phreatia sulcata* (Bl.) J.J.S., Fl. Buit. 6: 505, f. 383. 1905. Carr, Gard. Bull. 7: 36. 1952.—*Dendrolirium sulcatum* BL, Bijdr. 347. 1825.

Longest leaf to 20 by 1-2 cm., apex blunt, unequally slightly bilobed, base narrowed gradually; inflorescence to 20 cm. long in all, the scape to 15 cm.; bracts 3-4 mm. long, longer than pedicel and ovary; flowers white; upper sepal almost round, 1-5-2 mm. long; lip with short saccate base suddenly widened to a broadly triangular bluntly pointed blade, about as long as wide, minutely hairy; whole lip 2 mm. long or rather longer. Distributed from Sumatra to the Philippines; in Malaya fairly general on the mountains from 2,000-4,000 feet altitude. It is possible that more than one species with lip of this character occurs in Malaya. Careful field observation of the plants is desirable.

2. *Phreatia listrophora* RidL, J.L.S. 32: 307. 1896. Flora 4: 106.

Longest leaf about 14 by 1-2 cm., shape as in *P. sulcata*; inflorescences about 18 cm. long including a scape of 11 cm., bracts 3-4 mm. long; flowers white; upper sepal little over 1 mm. long, broad; lip with narrow



base as long as the blade, the blade wider than long, triangular, acute. Known certainly only from the original collection from the Taiping Hills. It may be that some of the plants reckoned as *P. sulcata* belong here.

3. **Phreatia linearis** Ridl., J.F.M.S. Mus. 6: 14. 1915. Flora 4: 106.

Leaves to 10 by 0.5 cm., blunt, narrowed to base; inflorescence 15 cm. long; upper sepal 1.2 mm. long; lip broadly heart-shaped, its narrow base much shorter than the blade. Only known from one collection from Ulu Langat, Selangor. There is no specimen in Singapore.

4. **Phreatia densiflora** (Bl.) Lindl., Gen. et Sp. Orch. 64. 1830. J.J.S., Fl. Buit. 6: 502, f. 380. Ridl., Flora. 4: 105.—*Dendrolirium densiflorum* Bl., Bijdr. 350. 1825.

Stems not pseudobulbous, very short, with up to 12 leaves; leaves to 30 by 1.8 cm., very unequally rounded at the tip, sheathing bases 4.5 cm. long below the joint; inflorescence a little longer than the leaves, the scape to 20 cm., flowers close, many; bracts narrow, 2 mm. long; flowers white; upper sepal barely 1 mm. long, broadly ovate, laterals forming a broad mentum; lip widened from base with broad rounded downturned end. Distributed from Sumatra to the Philippines; in Malaya found on Taiping Hills and at Cameron Highlands. This has very much the same habit as *Thelasis carinata* but has more leaves.

5. **Phreatia pusilla** (Bl.) Lindl., Gen. et Sp. Orch. 64. 1830. J.J.S., Fl. Buit. 6: 503, f. 381.—*Dendrolirium pusillum* Bl., Bijdr. 350. 1825.

Leaves about 8 on each stem, to 20 by 0.4-0.6 cm., pale green, apex rounded, the halves very unequal; inflorescence 7 to 15 cm. long; flowers many, white; bracts 2-3 mm. long, narrow; upper sepal about 1 mm. long, broad; lip widened evenly from base, the end bent forwards and broadly rounded. Distributed in Java and Sumatra; in Malaya found at Fraser's Hill, Cameron Highlands and on G. Tahan. It is very like *P. densiflora* but much smaller.

6. **Phreatia laxiflora** (Bl.) Lindl., Gen. et Sp. Orch. 64. 1830. J.J.S., Fl. Buit. 6: 501, f. 379. Carr, Gard. Bull. 7: 36. 1932.—*Dendrolirium laxiflorum* Bl., Bijdr. 350. 1830.

Leaves about 6 to each stem, to 12.5 by 1 cm., narrowed to base and apex, tip unequal, blunt; inflorescence 14-20 cm. long, the scape about half of this; flowers white; upper sepal ovate, 1.5-2 mm. long; lip with saccate base and abruptly widened concave blade, minutely hairy. Distributed in Java and Sumatra; found once by the Cheka River, Pahang, and once at Renglet, Cameron Highlands.

7. **Phreatia secunda** (Bl.) Lindl., Gen. et Sp. Orch. 64. 1830. J.J.S., Fl. Buit. 6: 500, f. 378.—*Dendrolirium secundum* Bl., Bijdr. 350. 1825.  
—*Phreatia microtidis* Lindl., J.L.S. 3: 62. 1859. Ridl., Flora 4: 106.  
—*Phreatia minutiflora* Lindl., I.e. Ridl., Flora 4: 105.

Leaves to 9 on each stem, to 5 cm. long and 4 mm. wide, fleshy, with short broader sheathing bases; inflorescences a little longer than the leaves, the scapes to 2 cm. long; bracts 2-3 mm. long; flowers many, pale green, wide-opening, all directed to one side of the inflorescence; sepals about 1.5

mm. long, broad; lip with wide base, almost oblong, deeply channelled towards tip, very shortly tipped white. Distributed from Sumatra to the Philippines; in Malaya found in lowland swamp-forest, and also as an epiphyte on limestone hills in Pahang, Selangor and Perlis.

8. **Phreatia crassifolia** Ridl., J.F.M.S. Mus. 4: 69. 1909. Flora 4: 106.

Habit of *P. secunda* but leaves usually much shorter, often only 1 cm. long, very fleshy; inflorescence usually 2 to 3 cm. long with many small white flowers; lip widening from a narrow base, broadly ovate, concave. Found on mountains at Cameron Highlands, Fraser's Hill and G. Tahan on trees in exposed places.

### THE ACRIOPSIS TRIBE

Epiphytes with one- or few-leaved pseudobulbs; inflorescences simple or branched, erect or pendulous, flowers small or rather small; sepals and petals about equal, the lateral sepals joined or free; lip united at the base with the column, or with an outgrowth from the column, to form a tube; blade of lip 3-lobed or simple, with short keels; column slender, straight, or much curved with an outgrowth at the base, with two narrow arms near the apex, sometimes with a short foot; anther with 2 pollinia, on a stipes, with a small disc.

This tribe consists of two genera, both very peculiar in floral structure, and quite different from each other, though agreeing in the union of the base of the lip with the column to form a tube. Neither genus has many species; both are distributed widely in the Malaysian region, and one species of *Acriopsis* is very common in Malaya. The genera may be distinguished as follows:—

Lateral sepals joined together; lip joined to the base of the column ..	..	..	<i>Acriopsis</i>
Lateral sepals not joined; lip joined at the base with an outgrowth from the column ..	..	..	<i>Thecostele</i>

### ACRIOPSIS

Pseudobulbs ovoid, with few narrow leaves, and copious spreading branched white roots; inflorescence erect, simple or branched, usually with many small flowers; flowers wide-opening; lateral sepals joined throughout their length, forming a single organ behind the lip; lip joined with the basal half of the column, forming a narrow tube, the blade of the lip bent suddenly at right angles to this; column nearly straight, with two narrow arms near the top, the anther covered with a large hood; an outgrowth in front of the base of the column, within the tube formed by column and lip; rostellum beak-like; pollinia 2, elongate, with narrow stipes and a small disc.

The peculiar features of this genus are the united lateral sepals, the tube formed by lip and column, the column arms and the hood over the anther. The plants are also very distinct in their habit, with rather small narrow-leaved ovoid pseudobulbs covered with thin silvery sheaths, and the

outgrowth of branched white roots, resembling on a small scale those of *Cymbidium*, but whiter than any *Cymbidium*. There are five Malayan species, all very nearly related and similar in general appearance.

**Key to the Malayan species of *Acriopsis***

- Inflorescence to 12 cm. long; leaves to 3-5 cm. long 1. *A. densiflora*  
 Inflorescences and leaves much longer  
 Lip distinctly lobed  
   Midlobe uniformly about 1 mm. wide .. 2. *A. javanica*  
   Midlobe suddenly widened to a blade 2 mm.  
     long and wide .. .. 3. *A. Ridleyi*  
 Lip not lobed, of with very small basal auricles  
   Blade of lip broadly ovate; inflorescence laxly  
     branched with few ascending branches;  
     leaves to 15 by 0.6 cm. .. .. 4. *A. indica*  
   Blade of lip narrowly oblong, only slightly  
     widened at the base; inflorescence with  
     many stiffly spreading lateral branches;  
     leaves to 30 by 1 cm. .. .. 5. *A. Carrii*

**1. *Acriopsis densiflora*** Lindl., Bot. Reg. 33: sub t. 20. 1847.—*A. purpurea* Ridl., Tr. L.S. 3: 406. 1893. Flora 4: 191,

Pseudobulbs 2-5 cm. long; leaves about 3-5 by 0.9 cm., tip rounded; inflorescence about 12 cm. long, simple, the flowers close; sepals and petals dark purplish (sometimes with yellow-green edges ?); lip purple, edged with white, with small acute side-lobes at the base, the midlobe broadly rounded, with a small cleft white crest in the middle. Distributed in Borneo and Sumatra; in Malaya only collected at Pekan in Pahang. The short inflorescence and dark purplish sepals and petals distinguish the species.

**2. *Acriopsis javanica*** Reinw., Fl. Lit. 2: 4. 1825. J.J.S., Fl. Buit. 6: 537, f. 410. Ridl., Flora 4: 190.

Pseudobulbs close, ovoid, ridged, 2-5-5 cm. long, bearing 2 or 3 leaves near the top; leaves thin, to 20 by 1.2 cm., usually smaller, apex rounded, gradually narrowed to base; inflorescences from rhizome, the base covered with several short overlapping sheaths and often bearing *roots*, total length 40 cm. or more, with long scape, usually branching a few times, the branches curved forwards; flowers many but not crowded; bracts small; upper sepal 6 mm. long, 1.5 mm. wide, concave, blunt, pale yellowish with or without purple median stripe, the united lateral sepals 2-5 mm. wide; petals spreading, 6 by 2 mm., ends rounded, white or cream with purple median band; lip forming a tube 2-5 mm. long with the base of the column, the tube with a constriction; blade 3-lobed, 5-6 mm. long, crimson-purple with white edges, and at the base 2 close parallel short thin purple keels; side-lobes spreading, 1.5 mm. wide, 3-5-5 mm. from tip to tip; midlobe 1 mm. wide, slightly widened to rounded and notched tip; column 5 mm. long, nearly straight, dark purple-brown, the hood pale, the arms blunt, purple with yellow tips, 2 mm. long. Distributed from Tenasserim and Sumatra to New Guinea; in Malaya common in the lowlands throughout the country, on trees in rather open places. Fig. 164.

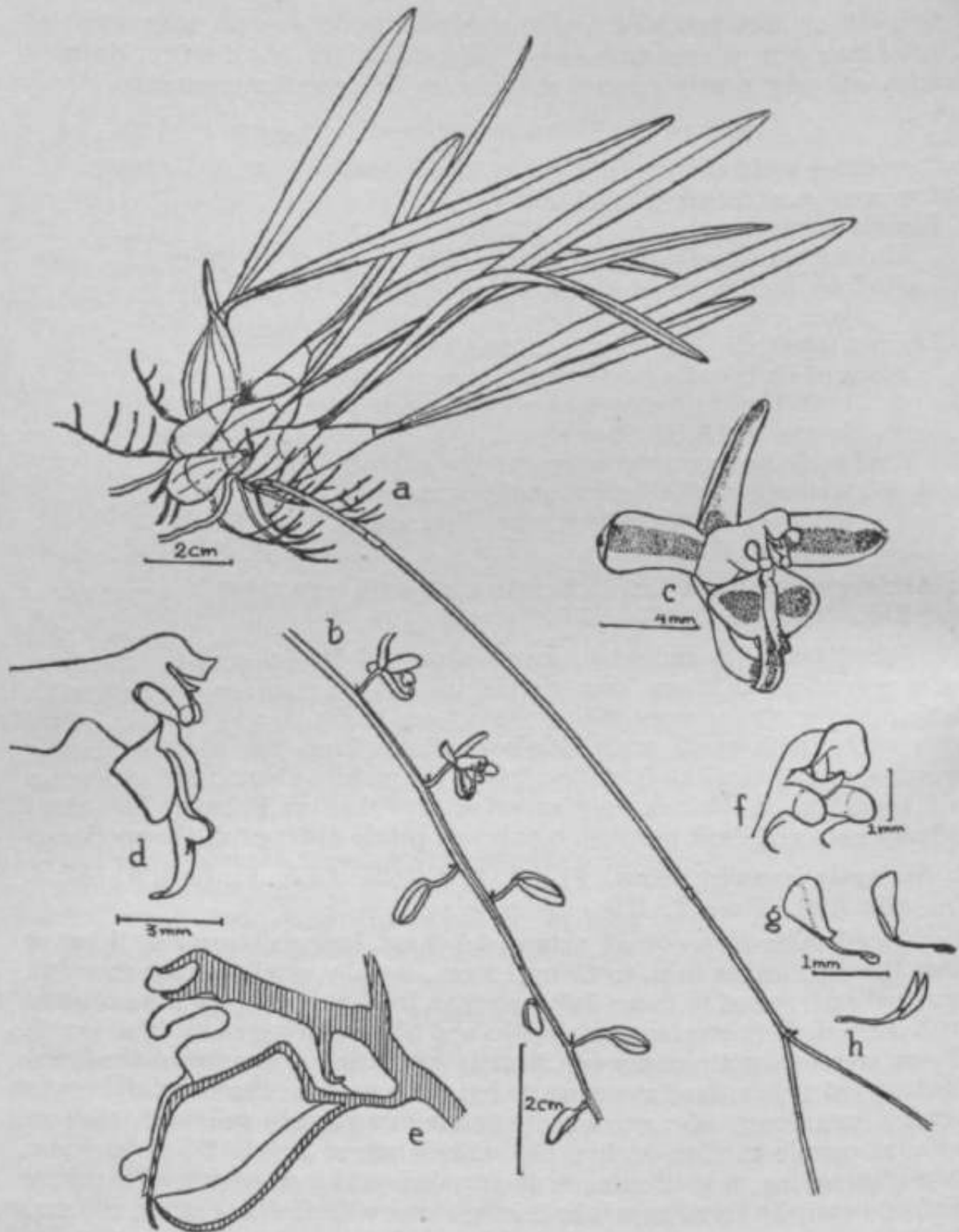


Fig. 164. *Acriopsis javanica*, a, plant with basal part of inflorescence, b, part of inflorescence, c, flower from front, d, lip and column from side, e, section <sup>th</sup>  $\wedge$   $\circ$   $\wedge$  <sup>n</sup> column and lip, f, top of column, showing hood over the anther and the column arms, g, anther, h, pollinia.

3. *Acriopsis Ridleyi* Hk. f., F.B.I. 6: 79, 1890. Ridl., Flora 4: 190.

Habit of *A. javanica*, but leaves to 15 by 0.6 cm., inflorescence to 30 cm., unbranched or with at most two lateral branches; flowers as in *A.*

*javanica*, but midlobe of the lip widened suddenly to a blade about 2 by 2 mm., concave, apex slightly notched. Found in the lowlands of Singapore, Johore and Pahang, and also at Cameron Highlands; apparently not common.

4. ***Acriopsis indica*** Wight, Ic. t. 1748. 1851. J.J.S., Fl. Buit. 6: 539, f. 411. RidL, Flora 4: 190.

Habit of *A. javanica*, but leaves to 6 mm. wide, inflorescence to 30 cm. long (scape 12 cm.), flowers a little smaller and less strongly spotted; upper sepal 5 mm. long; lip with simple broadly ovate blade, its edges a little wavy, a little shorter than the joined lower sepals; column arms very slender, terete. Distributed from Tenasserim to Java; in Malaya found on Penang Hill, in Kedah and at Fraser's Hill.

5. ***Acriopsis Carrii*** Holtt., Gard. Bull. 11: 275. 1947.

Habit of *A. javanica*, but leaves to 30 by 1 cm. and inflorescence to 40 cm. tall with up to 12 rather stiffly spreading, rather short lateral branches; flowers without purple spots; sepals and petals pale yellowish, lip white, column green with whitish hood and arms; blade of lip 3-5 mm. long, 1-5 mm. wide at the base, narrowing to a little over 1 mm., the tip curled under, notched, the keels 1-5 mm. long. This distinct species has been found only in Kelantan at Gua Musang, on *Platycterium* ferns on trees overhanging the river.

### THECOSTELE

Pseudobulbs 1-jointed, 1-leaved; inflorescence unbranched, pendulous, with many well-spaced flowers; sepals and petals spreading, free, almost equal, the lateral sepals attached to the column-foot; lip joined at its base with an outgrowth from the column and with the column-foot to form a tube at right angles to the base of the column, blade of lip 3-lobed with short ridges between the side-lobes; column very much curved, slender, with small spreading arms near the tip, a forward-pointing outgrowth near the base and a foot parallel to this and below it; pollinia 2, cleft, on a rather short stipes, with disc.

The structure of the flower in this genus is very complex. The lip is attached to the short column-foot, and its edges are joined to an outgrowth from the column parallel to the foot and above it (the outgrowth is longer than the foot) ; the free blade of the lip curves upwards at its base, closing the entrance to the tube, with the side-lobes rising on either side; the column is curved right over so that its tip is above the entrance to the tube, and in *T. secunda* its arms bend downwards between the side-lobes of the lip. At the bottom of the tube is a nectary, which presumably some insect is able to reach, and the end of the column is so placed that the insect will touch the anther, being partly guided by the side-lobes of the lip and the column-arms. No records of pollinating insects have (so far as we know) been published, and observations would be very interesting.

Thecostele is a genus of about 4 or 5 species, ranging from North-east India through Malaysia to the Philippines. There are certainly two species

in Malaya, and perhaps a third; the existence of a fourth is very doubtful. The species may be distinguished as follows:—

- Upper sepal about 8 mm. long; side-lobes of lip  
 narrow . . . . . 1. *T. alata*
- Upper sepal longer; side-lobes broad  
 Two keels between the side-lobes; side-lobes not  
 lobed nor with appendages . . . . . 2. *T. secunda*
- No keels between side-lobes; side-lobes with  
 narrow extra lobes or appendages . . . . . 3. *T. Maingayi*

1. **Thecostele alata** (Roxb.) Par. et Rchb. f., Tr. L.S. 30: 135, 144, t. 29. 1874. J.J.S., Fl. Buit. 6: 541, f. 412.—*Cymbidium alatum* Roxb., Hort. Beng. 63. 1814.—*Thecostele Zollingeri* Rchb. f., Bonpl. 5: 37. 1857. Xen. Orch. 2: 133, t. 147. Hk. f., F.B.I. 6: 19. 1890. Ridl., Flora 4: 192.—*Collabium Wrayi* Hk. f., F.B.I. 5: 784. 1890. Ic. Pl. t. 2065.—*Thecostele maculosa* Ridl., Tr. L. S. 3: 374. 1893. Flora 4: 191. Burk., Gard. Bull. 1: 350. 1916.

Pseudobulbs 4-6 cm. long, 2-2.5 cm. wide, flattened, with few ridges; leaves to 30 by 5 cm. (often less) with a grooved stalk 2-5 cm. long, apex suddenly narrowed to a broad point; inflorescence 15-50 cm. or more long with many flowers, scape and rachis slender; sepals and petals pale yellow at base, white in middle, light purple at tips, with a few irregular purple or crimson spots; upper sepal 8 by 3 mm; lateral sepals a little shorter, 4 mm. wide; petals 7.5 by 1 mm.; tube formed by base of lip 3 mm. long; two short keels between the side-lobes; side-lobes narrow, erect, 2 mm. long, curved, convex, white; midlobe convex, bent downwards, 4 mm. long and wide, finely hairy, apex broad and slightly bilobed, white with purple tip and large purple marks in centre; free part of column 5 mm. long, arms narrow, 2 mm. long. Distributed from North-east India through Malaysia to the Philippines; in Malaya found at many localities in the lowlands but not common. The details of the markings of the flower vary.

2. **Thecostele secunda** Ridl., J.L.S. 31: 399. 1896. Flora 4: 192. Burk., Gard. Bull. 1: 318, 349 with fig. 1916.

Pseudobulbs 4 cm. long, flattened; leaves to 20 by 3 cm., shape as in *T. alata*; inflorescence rigidly down-pointing, to 15 cm. long, with up to 17 flowers; flowers pale greenish-yellow with purple markings; upper sepal 20 by 0.8 cm., concave, base erect, upper half pointed forwards, acute; lateral sepals 1-2 cm. wide, basal part nearly flat, spreading, tips curved forwards a little; sepals with a little purple at tips and on mid-line near base; petals 1.8 by 0.55 cm., acute, with purple edges and midline in basal part; tube at base of lip 7 mm. long, the blade curved upwards to close the entrance and then curved again to project forwards; side-lobes 6 mm. wide, erect at the base, the tips curved inwards, the effective height only 2 mm., purplish brown; midlobe 7 mm. long and wide, convex, end slightly turned down, acute, finely hairy all over, a purple V in centre and other less well-defined marks; column deep purple-crimson, strongly curved, arms 3 mm. long and 2 mm. wide; column-foot 5 mm. long. Found on G. Pantani in Johore, on Taiping Hills and at Tapah; also in Borneo.

3. *Thecostele Maingayi* Hk. f., F.B.I. 6: 20. 1890. Ic. PL t. 2118. Ridl., Flora 4: 192.—*T. quinquefida* Hk. f., 1. c. Ic. PL t. 2119. Ridl., Flora 4: 192.

Vegetatively as *T. secunda*; inflorescence to 12 cm. long with up to 10 flowers; flowers to 2-5 cm. wide, same general shape as in *T. secunda*, side-lobes of lip larger, with an extra narrow lobe on either side and apparently no ridges between them. Found only once in Malacca, and imperfectly described; it may be that this species is not really different from *T. secunda*. A fourth species has also been reported from Malacca, differing little from *T. Maingayi* except in more peculiarly lobed side-lobes; this difference may be due to error of observation of an imperfect specimen.

### THE MAXILLARIA TRIBE

Each new shoot usually forming a pseudobulb of one internode, with sheaths at the base of the internode and one terminal leaf; inflorescence of few flowers, from base of pseudobulb; column-foot with lateral sepals attached forming a mentum; lip attached to end of column-foot, sometimes hinged, 3-lobed, with keels between the side-lobes; pollinia 2 or 4, attached to a broad disc.

This tribe is confined to tropical America. By far the largest genus is *Maxillaria*, of which more than 200 species have been described. It is widely distributed, from Brazil to Mexico, mostly on the mountains. Probably few species are now in cultivation; the best is *M. Sanderiana*, which would probably thrive at Malayan hill-stations. The only allied genus of which plants are known to have been grown successfully in Malaya is *Scuticaria*.

**Scuticaria Steelii** has very long pendulous slender terete leaves, without evident pseudobulbs, and short inflorescences of 1-3 flowers. The flowers are long-lasting and fragrant, about 6 cm. wide, with pale greenish chocolate-spotted sepals and petals, and a pale yellow lip with chocolate streaks and short yellow keels in the centre; the side-lobes of the lip are very large, the midlobe smaller, bent downwards, wider than long, with a broad cleft apex. The pollinia are on a crescent-shaped disc, much as in *Grammatophy* 11 um.

This species, native in Guiana, grows and flowers well in Singapore. It needs light shade, and owing to its pendulous habit is best grown attached to a piece of wood.

### THE ONCIDIUM TRIBE

This group of genera, ranging throughout the American tropics, from Mexico to southern Brazil, includes some very fine ornamental species, several of which are already well known to growers in Malaya, and more of which might be grown here, especially at our hill stations. Some of the finest species are mountain plants, which have been extensively hybridized for cool greenhouse culture in temperate countries, and these have been little tried in Malaya. A brief general review of the tribe, with special reference to those species which are in cultivation, is given below.

Nearly all species have pseudobulbs, which are usually flattened, always with 1-3 sheathless leaves jointed directly on to the top, and a number of overlapping sheaths, some of which may bear jointed leaf-blades, on either side at the bottom; the basal leaves are always smaller than the apical ones. A few species have no pseudobulbs (e.g. the *Oncidium Lanceanum* group) ; these have short flattened stems with a single terminal leaf and two opposite rows of sheaths at the base.

The inflorescence is always from the base of the pseudobulb. The flowers are very various in form and colouring. All have two more or less cleft pollinia on a flat stipes attached to a disc, exactly as in the *Vanda* tribe. The great difference of the *Oncidium* tribe from the *Vanda* tribe is in the sympodial growth of the former and the monopodial growth of the latter.

#### Key to the principal cultivated genera of the *Oncidium* tribe

- Lip with a short spur at the base (sometimes hidden by joined lateral sepals) . . . *Rodriguezia*
- Lip not spurred
  - Base of lip joined to column for half the height of the column . . . . . *Cochlioda*
  - Base of lip not joined to the column
    - Narrow base of lip parallel to the column, the blade bent at right angles to this . . . *Odontoglossum*
    - Lip spreading directly from the base of the column
      - Lip with fleshy keels or warts at base
        - Column winged . . . . . *Oncidium*
        - Column not winged . . . . . *Brassia*
      - Lip without fleshy keels or warts . . . *Miltonia*

#### RODRIGUEZIA

This is a genus of about 30 species, mostly native in Brazil. A few of them are in cultivation, but so far as is known only one has been tried and found successful in the plains of Malaya, namely *R. secunda*. This is native in Trinidad and Guiana, and though its flowers are small they have an unusual and very pleasant deep rose-pink colour.

The pseudobulbs of *R. secunda* are flattened, to about 5 cm. long, bearing at the top one leaf to 15 cm. long, and one or more basal leaves; the inflorescence is erect at the base, about 15 cm. long, the upper part curved over, the flowers 20 or more, close together, all bent to face on one side of the rachis; the flowers do not open widely. The sepals and petals are broad, about 12-15 mm. long, the lip longer, with a short spur at right angles to its base, the spur being hidden by the joined lateral sepals which are saccate at the base. The lip lies close to the column, almost to the full height of the column, and is then bent at right angles, with two short yellow to orange keels at the bend. A plant of this species may be grown on a piece of wood or in a small wooden basket, in light shade; it is best hanging. *R. secunda* flowers frequently in Singapore.



The species of *Rodriguezia* with lateral flowers are *R. Batemani*, *R. Candida*, *R. grenadensis* and *R. pubescens*, all having lips 4 to 4.5 cm. long, longer than sepals and petals, white or rose-flushed. They are classed as plants needing the warmest treatment in European hot-houses, but that does not necessarily mean that they would be successful in the lowlands of Malaya, as they may need seasonal rest. No hybrids are reported in the genus, nor any of this with other genera. *Rodriguezia* is not so nearly related to the other genera here listed as these are to each other, and is usually placed in a different sub-group.

### COCHLIODA

This is a small genus of about half a dozen species, native in Peru, Ecuador and Colombia. The flowers are bright red, smaller than those of *Odontoglossum*, in similar inflorescences. The distinguishing feature is the union of the lip with the column for half the length of the latter; the blade of the lip is at right angles to the column, 3-lobed, the side-lobes usually large. Species of *Cochlioda* are freely inter-fertile with *Odontoglossum*, and a large number of hybrids have been raised between the two genera, these hybrids taking the name *Odontioda*. The red colour of *Cochlioda* has given a brilliance which *Odontoglossum* lacked, and has added a series of new shades to the hybrid range.

*Cochlioda* has also been hybridized with other genera in the group, but to a much less extent than with *Odontoglossum*. With *Miltonia*, the bigeneric plants are called *Miltonioda*; with *Oncidium*, *Oncidioda*. The three genera combined give the hybrid genus *Charlesworthiara*, named in honour of a famous firm of orchid growers.

A much more extensive series of trigenic hybrids have been produced by a combination of *Cochlioda* with *Miltonia* and *Odontoglossum*; these are called *Vuylstekeara*. As with all others in the *Odontoglossum* series, they are cool-growing.

### ODONTOGLOSSUM

This is a genus of nearly 100 species, native in the higher mountains of tropical America, mainly at 5,000-9,000 feet and even higher. The range of temperature given to them in cultivation is 45-70° F. Many of them need however also an alternation of cool and warm seasons, and these would not be successful at our hill stations, though the range of temperature may be about right.

*Odontoglossum*s have the typical flattened pseudobulbs of this group, with one or two leaves at the top, an erect inflorescence which may be simple or branched, and flowers of varied form, the principal distinguishing character being the narrow base of the lip parallel with the column, the blade being bent suddenly at right angles to this. The most widely cultivated and most hybridized species are *O. crispum* and *O. nobile* (or *O. pescatorei*), from New Grenada. These have broad sepals and petals (3-4 cm. long) with crisped edges, arranged in an even 5-pointed star, making

a full round flower of very attractive shape and varied colouring. The largest-flowered species is *O. grande*, which will tolerate rather warmer conditions than most; it has flowers 10-12 cm. in diameter, but has not been much used in hybridizing.

As already noted, the range of colour in *Odontoglossum* hybrids has been greatly extended and enriched by crossing with *Cochlioda*, the bi-generic hybrids being known as *Odontioda*. A further series of hybrids have been produced by crossing *Odontoglossum* with *Miltonia*, and yet another from the three genera combined. These are all cool-growing orchids, and even at our hill stations may not be easy to handle.

### ONCIDIUM

This is a very large genus, including somewhere near 600 species, extending right through the American tropics. Few of the species have very large flowers, but many of them have very attractive colouring combined with unusual and graceful form, so that they are popular in cultivation. Unlike *Odontoglossum*, *Oncidium* includes many lowland tropical species, some of which thrive in Malaya. We shall therefore give a fuller account of this than of the other genera of the group.

*Oncidium* is very nearly related to *Odontoglossum*, *Miltonia* and *Brassia*, and authors have not agreed as to the generic status of certain species, but in general the distinctions given in the key hold good. *Oncidium* has prominent wings on either side of the short column, and a large warty growth, often of very complex form, at the base of the lip. The flowers are often yellow, which makes them welcome in a collection of orchids of preponderating purple or mauve colour.

Vegetatively, *Oncidiums* have two distinct forms. One (see fig. 165) is the usual pseudobulbous form common to nearly all members of this group of genera and already discussed. The other (see fig. 166) has no pseudobulb, but only a small short flattened stem, completely covered by sheaths. This short stem bears a single large leaf at its tip, the base of the leaf and the stem itself being covered by two ranks of overlapping sheaths which are green only when young. When old, the appearance of the plant is that of a stout rhizome with a series of single leaves growing upon it at rather close intervals, each leaf having a very short stem at its base, exposed by withering of the sheaths. The single leaf may be either broad and fairly flat, or it may be terete, but the structure is otherwise the same; and one has only to imagine the small stem enlarged many times, so that it outgrows the sheaths, to have the normal pseudobulbous condition. We find a similar diversity of vegetative form in many other groups of orchids, together with a uniformity of flower-structure, e.g. in the *Thelasis* tribe and the *Cymbidium* tribe.

In the following account are brief descriptions of all species known to have been cultivated successfully in Malaya and Java. Some other species might also be successful.

Key to the species of *Oncidium* cultivated in Malaya and Java

## Pseudobulbs present

Lateral sepals more or less united

Petals broad, not much smaller than the lip;  
flowers mainly brownFlowers red-brown, edged with yellow;  
petals little crisped, as wide as long 1. *O. Forbesii*Flowers brown with yellow marks near  
base of parts; petals much crisped,  
longer than wide .. .. 2. *O. crispum*Petals much smaller than lip; flowers mainly  
yellowUpper sepal and petals with red-brown  
blotch at base .. .. 3. *O. flexuosum*Upper sepal and petals barred with pale  
red-brown throughout .. .. 4. *O. varicosum*

Lateral sepals quite free from each other

Upper sepal and petals very long and narrow,  
lateral sepals much wider ... .. 5. *O. papilio*Upper sepal and petals not very narrow as  
compared with lateral sepalsPetals much broader than sepals .. 6. *O. ampliatum*Petals and sepals of about equal width  
Flowers over 5 cm. long .. .. 7. *O. splendidum*

Flowers much smaller

Pseudobulbs nearly round .. 8. *O. altissimum*Pseudobulbs much elongated .. 9. *O. sphacelatum*

No pseudobulbs

Leaves terete .. .. 10. *O. cebolleta*

Leaves flattened

Flowers yellow, flushed partly with brownish  
green, not spotted; column wings nar-  
row, deflexed .. .. 11. *O. bicallosum*Flowers distinctly spotted, not mainly yellow;  
wings of column broad, more or less  
roundedLip entirely purple, or partly white, not  
blotched .. .. 12. *O. lanceanum*

Lip not entirely purple, blotched

Background colour yellow-brown, blotch-  
ed yellowish .. .. 13. *O. luridum*Background colour white, blotched pur-  
ple .. .. 14. *O. carthaginense*

**1. O. Forbesii**

Pseudobulbs 5-7.5 cm. long, flattened, 1- or 2-leaved; leaves rather narrow, 15-25 cm. long; inflorescence 45-100 cm. long, branched; flowers 5-6 cm. diameter, bright chestnut brown with yellow border (often with brown spots in the yellow zone), the petals very large, almost round, lightly crisped; lip larger, nearly round, the tip deeply cleft, edges crisped. A very handsome species, which Dakkus says grows well in Java above 1,500 feet altitude in the hills.

**2. O. crispum**

Pseudobulbs 7-10 cm. long, flattened, ridged on the sides, with 2 or 3 leaves; leaves to 20 by 5 cm.; inflorescence 75-120 cm. long, branched; flowers much crisped and undulated, 5-7 cm. diameter, bright chestnut brown with some yellow markings; petals longer than wide and the lip also. This is another fine species, which also must be grown in the mountains, perhaps at somewhat higher elevations than *O. Forbesii*. Dakkus says that it does not flower in the plains of Java.

**3. O. flexuosum**

Pseudobulbs 5-10 cm. apart on a rather slender rhizome, ovate, flattened, 3-6 cm. long, with 1 or 2 leaves at the top; leaves thin, rather narrow, to 20 cm. long; inflorescence to 90 cm. long (usually shorter) branched, the branches slender, wiry and flexuous; flowers close, many, to about 2.5 cm. in height, bright yellow with red-brown blotches at the base of sepals, petals and lip; sepals and petals small; lip large, with small side-lobes and a broad blade with crisped edges. This species will grow and flower well in the lowlands of Malaya, given proper care, but Dakkus reports that it is at its best from 500 to 2,000 feet altitude. Its long rhizome makes pot-culture difficult; it must have room to spread. The yellow of the flowers is a very fine bright colour, and the whole habit of the plant very graceful. The flowers last well.

**4. O. varicosum**

Pseudobulbs 8-10 cm. long, flattened, oblong, 2-leaved; leaves 15-22 cm. long; inflorescence to more than 1 m. long, branched, with many flowers; flowers variable, the finest variety being var. *Rogersii* which has a lip 5 cm. in diameter; sepals and petals small, dull yellow barred with pale red-brown; lip bright yellow, side-lobes small, blade broadly rounded and cleft at the tip; in var. *Rogersii* the blade is 4-lobed. This is the finest yellow-flowered *Oncidium*. Unfortunately it is not at its best in our lowland climate, though it will flower in Singapore. It should be hybridized with other species which tolerate our lowland climate better.

**5. O. papilio**

Pseudobulbs nearly round, flattened, wrinkled, to 5 cm. long, 1-leaved, leaves fleshy, to 22 by 6 cm., dull green mottled with purplish, especially below; inflorescence about 60 cm. or more long, bearing a series of flowers one at a time; upper sepal and petals narrow, the sepal to 10 cm. long, lateral sepals curved downwards, broader; all sepals and petals red-brown with yellow markings; lip widening from a narrow base, the blade almost

round with a cleft apex, the centre canary yellow with a broad red-brown border all round. Native in Trinidad; a variable species as regards size of flowers and details of colouring. Plants will grow fairly well and flower in Singapore, but they are not as vigorous as they should be, perhaps because of the lack of seasonal change. *O. Kramerianum* is a closely allied species, with flowers of similar shape, from the Andes of Ecuador at 1,000-3,000 feet. The flowers of these two species are among the most remarkable and attractive in the genus.

#### 6. *O. ampliatum*

Pseudobulbs almost round, flattened, wrinkled and mottled with purple, 6-10 cm. long, 2-leaved; leaves very leathery, dark green, to 30 by 7.5 cm.; inflorescence to 100 cm. tall, with few branches; flowers to 3.5 cm. diameter, canary yellow with small red-brown spots at the bases of the parts; petals much larger than sepals; lip wider than long, deeply cleft. Native in Trinidad and neighbouring countries at 500-1,000 feet. This species has been grown and flowered successfully in Singapore, but is difficult to maintain. There are several varieties, of which var. *majus*, with a large clear yellow lip, is considered the finest.

#### 7. *O. splendidum*

Pseudobulbs nearly round, smooth, flattened, 5-7 cm. tall, 1-leaved; leaf fleshy, blunt, to 25 cm. long; inflorescence to 100 cm. tall, with few branches, and up to about 30 flowers; flowers 6 cm. diameter; sepals and petals yellow, rather densely mottled with red-brown; lip with broad clear yellow blade, cleft at apex, suddenly widened from a narrow base. Dakkus reports that this species grows well in Java at about 800 feet elevation. It grows and flowers well in Singapore.

#### 8. *O. altissimum*

Pseudobulbs about 7 by 5 cm., flat, 1- or 2-leaved; leaves narrow, thin, about 25 cm. long; inflorescence to 150 cm. or more long, with many short lateral branches, each with 3-5 flowers; flowers 4-5 cm. long; sepals and petals similar, narrow with wavy edges, pale yellow with light brown marks in the middle; lip bright yellow, the narrowed base red-brown, it? warty crest with two series of 5 teeth. Native in the West Indies and Guiana. Dakkus says that this species grows well in Java at altitudes up to 1,500 feet. So far as we know, it has not been tried in Malaya. It is very nearly related to the next species.

#### 9. *O. sphacelatum*

Pseudobulbs close together, to 15 cm. long, narrowed upwards, flat, smooth, pale yellow-green, with 2 leaves at the top; leaves thin, narrow, 30 cm. or more long; inflorescence as in *O. altissimum*; sepals and petals yellow at apex, barred with light red-brown in basal part; lateral sepals spreading and equal to the upper sepal in length; lip pale yellow, the basal part brown with yellow edges, the warty base with two prominent teeth and shorter lateral ones. Native in Mexico and Guatemala. This species grows very strongly in the lowlands of Malaya, and well-established plants flower frequently if given full morning sun; it is in fact one of the easiest

orchids to grow, but unfortunately it has not the brilliance of hue nor the elegance of some other species, Dakkus states that it will grow also in the hills. **Fig. 165.**

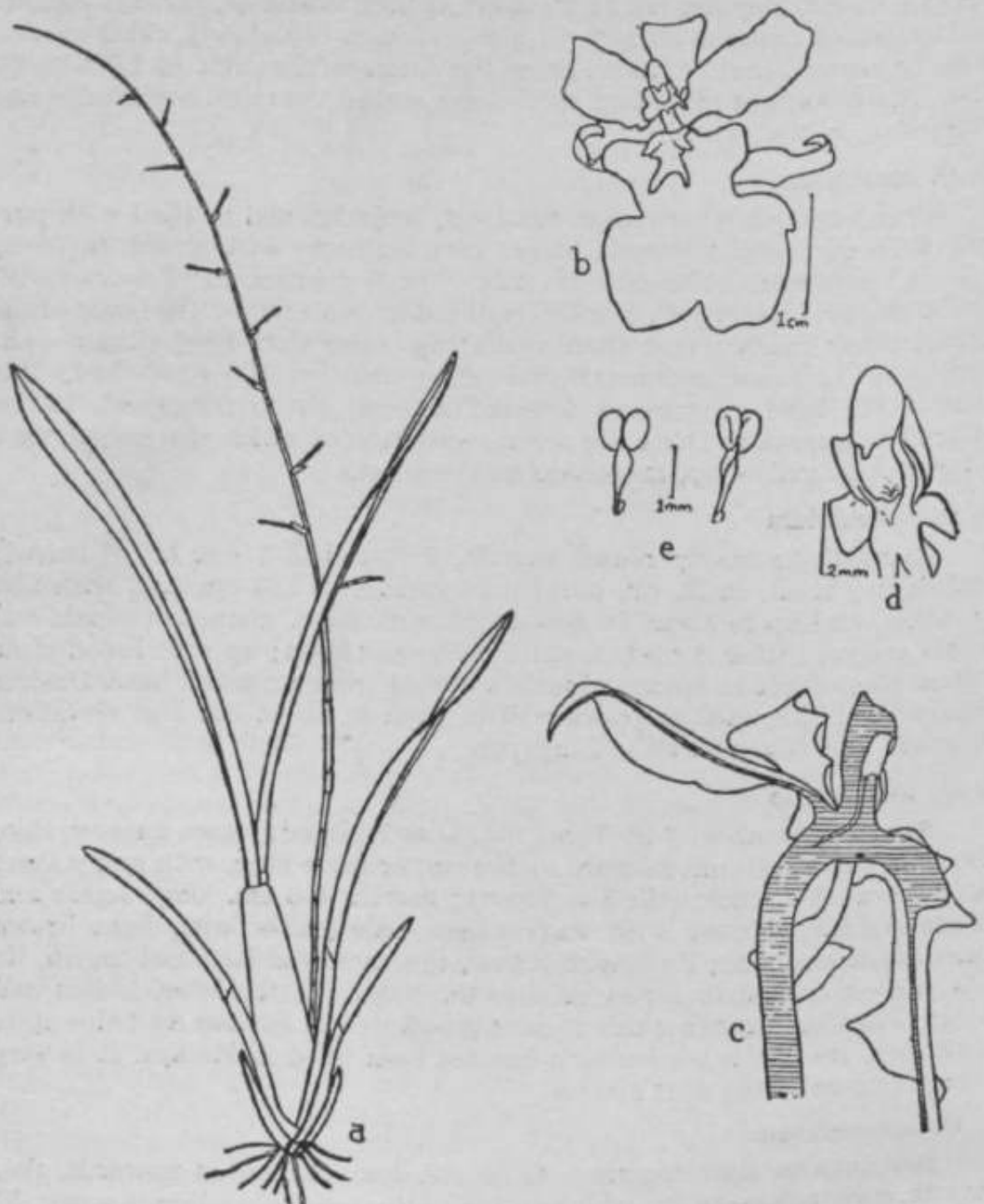


Fig. 165. *Ontidium sphacelatum*. a, plant, showing branched inflorescence. b, flower (left) from front, c, section through flower, d, column, e, pollinia from front and back.

#### 10. *O. ceboUeta*

No pseudobulbs; leaves almost terete, tapering to a sharp tip, grooved on the face, 15-40 cm. long; inflorescence usually twice as long as leaves, with a few branches; flowers variable, to 3 cm. diameter; sepals and petals

dull yellow spotted with red-brown; lip canary yellow, 3-lobed, the side-lobes widening above their bases, the midlobe wider than long. This species may be grown successfully in Singapore, but is not easy to maintain in vigorous condition. Dakkus reports that in Java it is found to grow more vigorously on the hills.

#### 11. *O. bicallosum*

No pseudobulbs; leafy very fleshy, to 30 cm. long; inflorescence erect, longer than the leaves, branched or not: flowers many, about 5 cm. high; sepals and petals similar, with wavy edges, yellow, more or less flushed with brownish-green; lip bright canary yellow, the warty base red-spotted, the side-lobes small, blade of midlobe wider than long. Native in Guatamala. Dakkus reports that in Java this species does well in the lowlands and to 1,600 feet altitude. We have no record of trials in Malaya.

#### 12. *O. Lanceanum*

No pseudobulbs; leaf thick, to 30 by 10 cm. or larger, tip acute, dull dark green with purple mottling throughout; inflorescence erect, often with a few branches, about 50 cm. tall, the flowers to about 20, each 5-6 cm. tall, very fragrant; sepals and petals similar; large, pale yellow-green densely mottled with chocolate-brown, edges somewhat crisped; lip deep purple, paler towards the tip or sometimes partly white, the base with small spreading bluntly triangular side-lobes, the midlobe widening from a rather long narrow base, the blade 2.5 cm. wide; column with large wings. Native in Guiana. This beautiful species will grow and flower well in Singapore if well tended. The roots are very intolerant of excessive moisture, and the potting material must have perfect aeration; it is very unwise to include pieces of coconut husk or other material which will easily rot, as such will hold too much moisture and may start a rot in the roots of the plant. Light shade is needed. There are several varieties, and not all flower well in Singapore. Dakkus reports that on the hills the plants will grow and flower, but that the inflorescence is short. This and other species of the group produce stout stilt-roots below the later-formed shoots, raising them above the potting mixture. When this occurs, the roots should be left freely exposed, not built up with more potting material.

#### 13. *O. luridum*

No pseudobulbs; leaf to 30 cm. or more long, fleshy, usually spotted; inflorescence 100-200 cm. tall, branched, the branches short, distant, 3-5-flowered; flowers 2.5-3.5 cm. high, variable in colouring, usually pale greenish to yellow-brown or red-brown with some markings or spots (sometimes on back only); sepals and petals very wavy, narrowed to the base; lip with small side-lobes, the midlobe widening from a narrow base, cleft, the warty outgrowth 5-lobed. Native in Mexico, Central America and the West Indies. This species may be grown in Singapore and will flower, but apparently is not so vigorous as *O. Lanceanum*. Some authors unite this species and *O. guttatum*, in which case the latter name is used.

14. *O. carthaginense*

No pseudobulbs; leaf to 30 by 8 cm., dull dark green, sometimes spotted; inflorescence to 150 cm. tall, branched as in *O. luridum*; flowers 2.5 cm. tall; sepals and petals reflexed, crisped, white with rose-purple blotches; lip shaped as in *O. luridum*, the colour as sepals and petals. This species is widely distributed in the same countries as *O. luridum*, and was one of the first *Oncidiums* to be grown in Europe (flowered 1804). It has small but graceful flowers, and does fairly well in Singapore.

## HYBRID ONCIDIUMS

Not many hybrid *Oncidiums* have been raised in Europe, as the best of them are less useful than *Odontoglossums* for general cultivation. In Malaya however *Oncidiums* are very useful ornamental plants, and provide colours not shown by other orchids. It is therefore well worth producing hybrids for local cultivation. Two so far have been successfully raised, and are vigorous in Singapore. It is hoped that others will follow.

*O. haematochilum* (fig. 166) is known in Trinidad and Guiana as a natural hybrid between *O. Lanceanum* and *O. luridum*. The same cross has been made artificially in Singapore. The plants are much like *O. Lanceanum* in appearance, with thick more or less spotted leaves, but have a taller inflorescence, with more yellow in the flowers, including the lip, these characters deriving from the other parent. The flowers vary somewhat in colour, but all are composed of delicate tints, less bold than in *O. Lanceanum*. The blade of the lip is mainly pale yellow, purple-brown and purple at the base. The plants are more vigorous than *O. Lanceanum*, and easier to handle, much less liable to trouble from too wet roots. They flower fairly freely.

**O. Golden Shower.** This is a hybrid between *O. flexuosum* and *O. sphacehitum*. It is very much intermediate in most respects between the two parents, but more vigorous and free-flowering than either, the flowers a very attractive bright canary yellow. The length and form of the inflorescence varies somewhat, and the size of the flowers also, but the lip is always quite a good size and a better shape than in *O. sphacelatum*. The pseudobulbs are close together, so that it is a more manageable pot-plant than *O. flexuosum*. This hybrid is one of the most free-flowering of all orchids in cultivation in Singapore.

## BRASSIA

This is a genus of some 40 species, ranging from Mexico to southern Brazil and Bolivia. It is closely related to *Miltonia*, differing in always having long narrow sepals and petals, and in having fleshy keels or warts at the base of the lip.

The plants are pseudobulbous, with the habit common to most members of this group. The lip is more or less flat, always shorter than the long narrow sepals, and has two parallel keels at the base, and sometimes also small warts on the surface. The column is short, not winged. The inflorescences are erect or spreading, stiff, with flowers all facing one way, usually in a close row



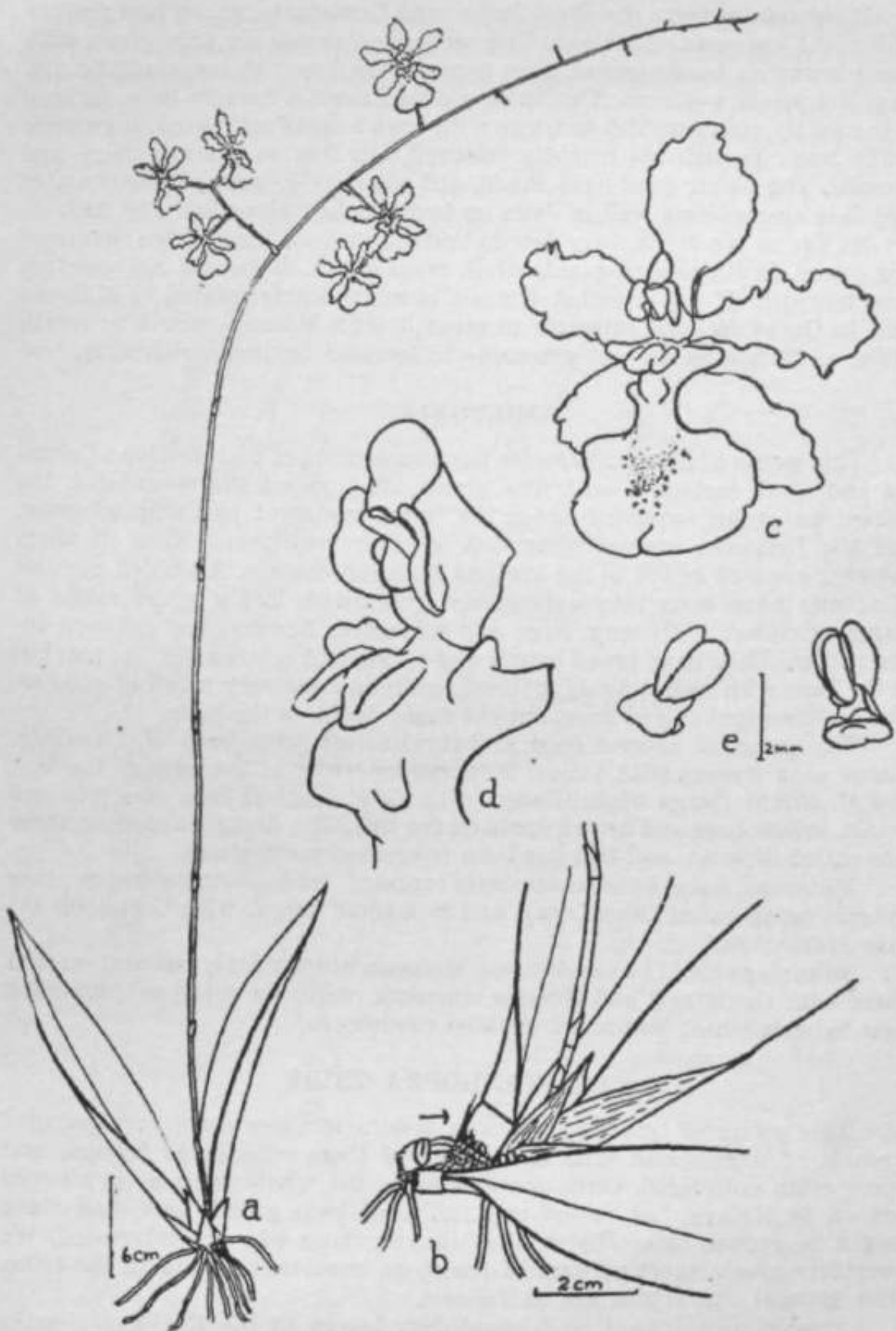


Fig. 166. *Oncidium hasmatockiliini*. *a*, plant with inflorescence. *b*, base of plant (arrow points to reduced pseudobulb). *c*, flower from front, *d*, column and base of lip. *e*, pollinia, showing very thick disc.

*B. maculata*, from the West Indies and Guatemala, grows and flowers well in the lowlands of Malaya. The sepals and petals are pale green with broad brownish bands across them towards the base; the sepals 6-7.5 cm. long, the petals 4-4.5 cm. The lip is widened from a narrow base, as long as the petals, pale greenish to white with brown spots and two orange keels at the base. Though not brightly coloured, the flowers are attractive and unusual. The plants need light shade, and are easy to grow. Dakkus states that this species does well in Java up to 2,000 feet elevation. Fig. 167.

So far as we know, very few hybrids have been made from plants of this genus. In Singapore, plants of *B. maculata* X *Oncidium sphacelatum* have flowered. It appears that *Brassia* is more nearly related to *Miltonia* than to *Oncidium*, and attempts to cross it with *Miltonia* would be worth while, as *Miltonias* are not amenable to lowland tropical cultivation.

### MILTONIA

This genus of about 20 species has two centres of distribution; Colombia and south-eastern Brazil. The plants all grow on the mountains, the Colombian group requiring about the same treatment as *Odontoglossum*, and the Brazilian species somewhat warmer conditions. None of them however are well suited to the lowland Malayan climate. A limited number of species have been very extensively hybridized, and a great range of forms produced, with very large and attractive flowers, few on each inflorescence. They have broad sepals and petals and a large flat lip, marked at the base with radiating dark lines, reminding one very much of pansies. The lip has slight raised lines, but not fleshy keels, at the base.

The principal species used in hybridization have been *M. vexillaria* (large pink flowers with yellow bordered by white at the base of the Hp) and *Af. Rcezlii* (large white flowers with violet spots at base of sepals and petals, yellow base and brown spots on the lip). The first hybrid from these was called *Bleuana*, and this has been re-crossed many times.

*Miltonias* have been extensively crossed with *Odontoglossum* (the hybrids being called *Odontonia*), and to a small extent with *Cochlioda* (to give *Miltonioda*).

*Miltonias* should be tried on our Malayan hill-stations, and also crossed there with *Oncidiums* and *Brassia maculata*, with the object of producing new hybrids which will stand lowland conditions.

### THE STANHOPEA TRIBE

This group of tropical American genera includes some very peculiar orchids of complicated structure, many of them with large flowers, and some often cultivated. Only one species in the whole tribe is at all well known in Malaya, but others can and have been grown here, and more might be grown, especially on the hills, by those who are interested. We therefore give a short account of the more important genera in the tribe. The general characters are as follows.

Pseiidobulbs with 1 to 3 sheathless leaves at the top, and sheaths (sometimes with small blades) at the bottom; leaves thin, broad, pleated; inflorescence arising from the rhizome, erect or pendulous, with many

(rarely few) rather large flowers; lip usually divided clearly into three parts, basal, middle and distal (the middle part sometimes absent); pollinia 2 or 4, joined direct to a disc or with a slender stipes.

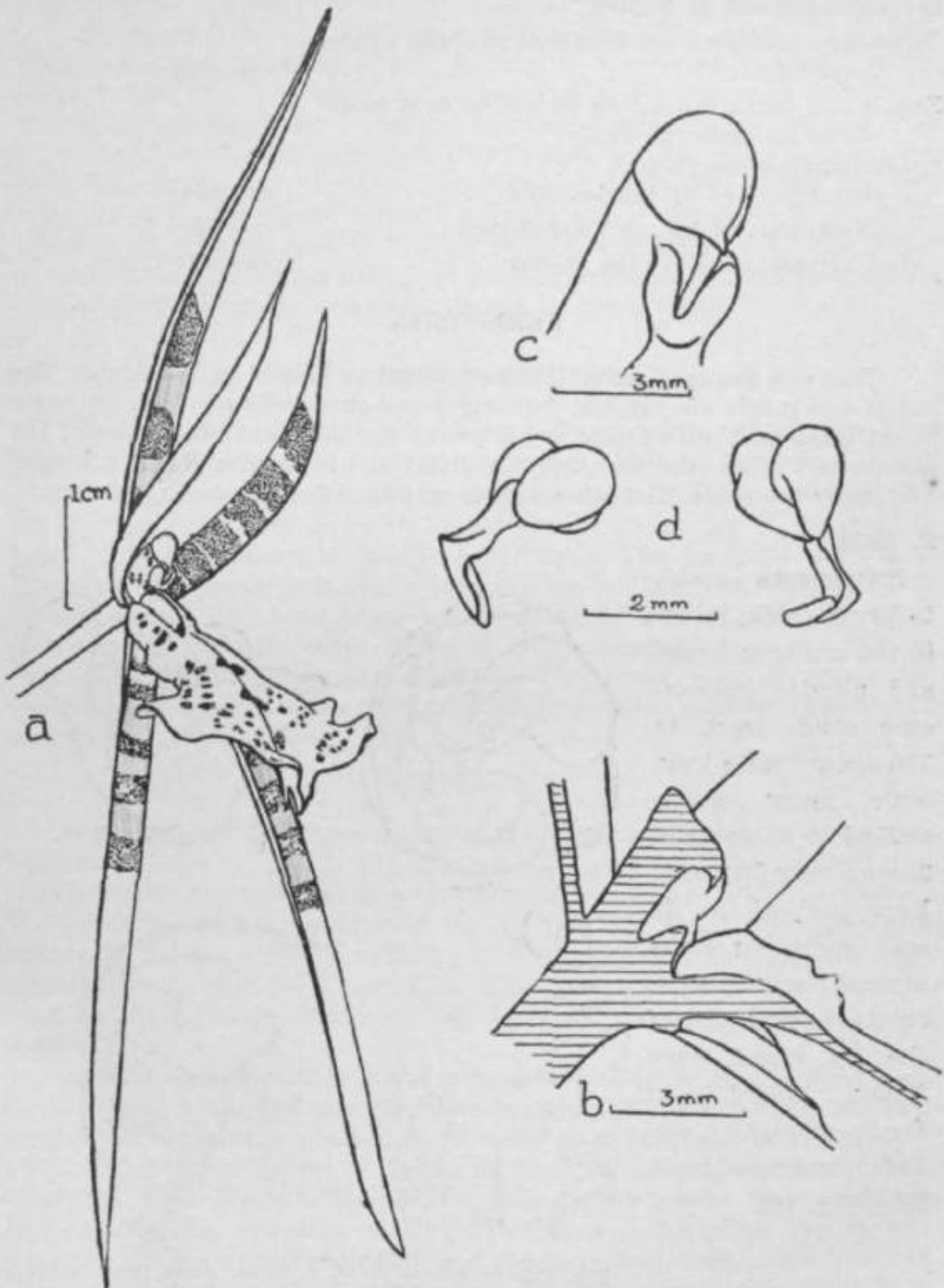


Fig. 167. *Brassia maoulata*. a, flower, b, section through column and base of lip. c, column, d, pollina.

raised here. The most important hybrids so far tried are derived from *E. radicans*. The first to be produced was *E. Obrienianum*, (*E. radicans* X *E. evectum*), in 1888 (Fig. 136). This is described as having flowers of a brilliant carmine colour, about the same size as those of *E. radicans*, but with the lip uppermost, the side-lobes of the lip spreading straight outwards, the midlobe broader and more toothed; the flowers are also in a rounder head than in *E. radicans*. The plant has few roots on its stems, which are shorter and more stiffly erect than in *E. radicans*. We have three distinct plants which correspond to this description, but their flowers are orange-yellow, yellow and rosy purple, the first-named being the best and most free-flowering in Singapore; it has been back-crossed with *E. radicans*, the hybrids having flowers variously oriented.

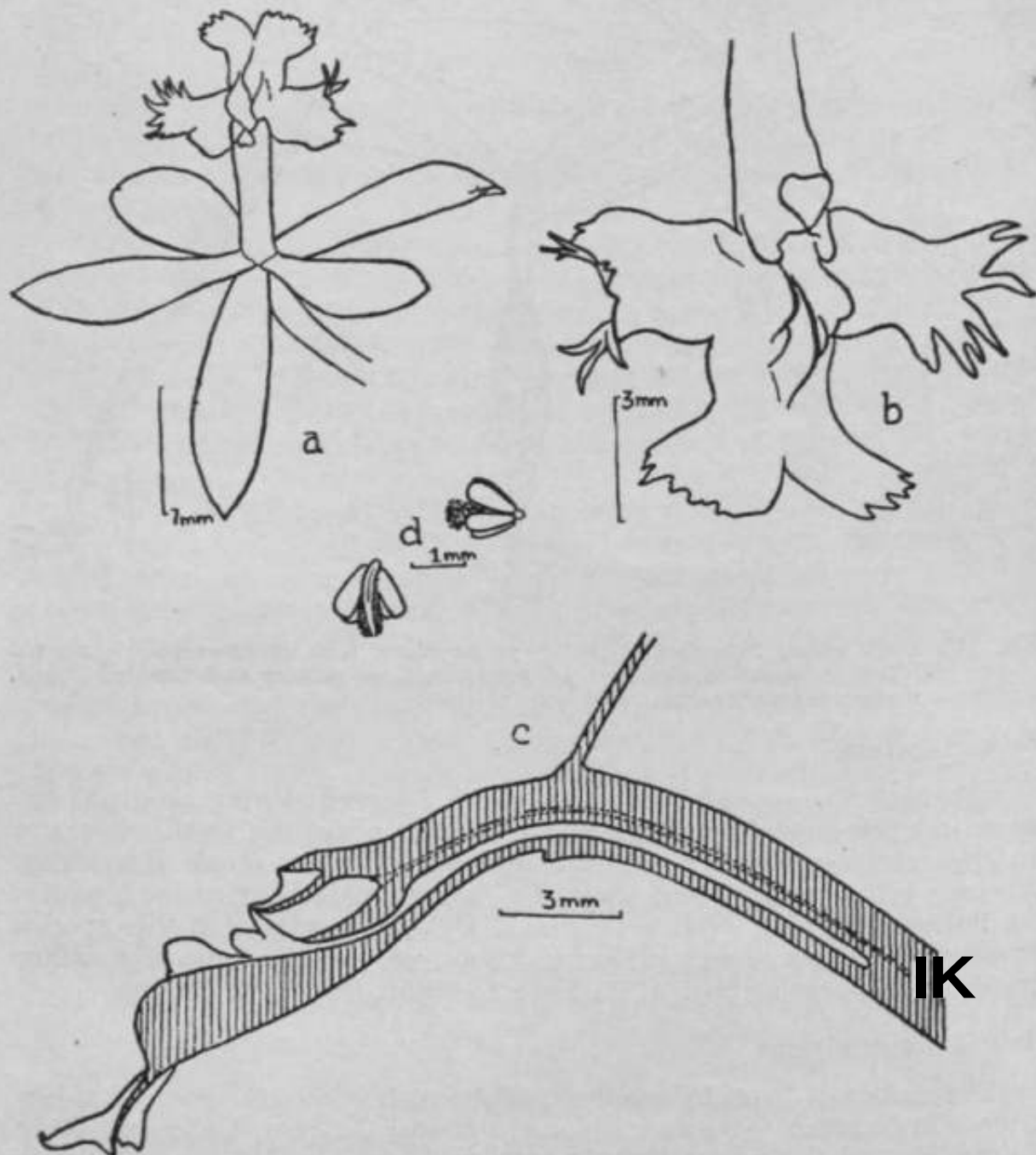


Fig. 136, *Epidendrum Obrienianum*. *a*, flower in natural position, *b*, lip and column. *c*, section through column and base of lip. *rf*, pollinia.

This beautiful species, native in Panama, is called the Dove Orchid, or Holy Ghost Orchid, because the column with its anther and beaked rostellum and the arms of the lip have very much the appearance of the head and wings of a white bird.

The Dove Orchid is easily grown in the lowlands of Malaya. It likes light shade and well-drained soil; in Java it is successfully grown in the open ground, but this would not be possible in the clay soils common in Malaya. In our experience, a potting mixture of rather large pieces of well-burnt earth, with some fern root (Bird's-nest fern) is quite satisfactory, or broken bricks and pieces of fern root will serve. The plants are very vigorous in growth if well tended, and need rather large pots. Perhaps the best way of growing them is in a lightly shaded rockery, in a large pocket of earth or broken bricks, with good drainage beneath. When a new pseudobulb is developing, manure-water should be given freely.

### CORYANTHES

This is a genus of about 12 species, native chiefly on the Andes. They have the same vegetative habit as Stanhopea. Most of them need a cool dry resting season, so would not be easy to manage in Malaya. The flowers are in some cases very large (in *C. macrantha* 13 cm. high). As in Stanhopea, they hang down below the pseudobulbs. The conspicuous parts of the flower are the large lateral sepals and the lip, the distal part of which is hood-shaped, the hood being upside down, so that it will hold water. There are two glands above the hood, which secrete a large quantity of watery nectar; this falls into the hood. The flower is so arranged that visiting insects fall into the nectar, and in extricating themselves come into contact with the pollinia.

### STANHOPEA

Stanhopea is the largest genus of the group, having about 50 species. The pseudobulbs are ovoid, ridged, 1-leaved, the leaves stalked, with elliptic plicate blade. The inflorescences are pendulous, of 2 to 10 large flowers. The sepals and petals are reflexed, the sepals wider. The lip has a complex structure; the basal part is hollow, the middle part rather fleshy with two horn-like arms, the distal part often 3-lobed or 3-toothed. The column is long, curved, and broadly winged near the apex; column and lip both hang downwards.

Several species of this genus will grow and sometimes flower in the lowlands of Malaya, but most are more vigorous in the hills. They all have hanging inflorescences which come directly from the bases of the pseudobulbs, and must be grown on pieces of wood, or in very shallow baskets which will allow the inflorescences to penetrate the bottom. The roots have stiff slender erect branches, as in *Cymbidium* and *Acriopsis*. The flowers are curious rather than beautiful, and not long-lived. Some have a strong and sweet but rather unpleasant odour. The following species have been grown in Singapore.

*S. eburnea*

Sepals and petals creamy white, 7 to 8 cm. long; lip without middle part, basal part purple-edged, purple within the hollow, with narrow curved side-lobes; distal part triangular, acute, fleshy, with polished ivory-like surface; 1 to 3 flowers in each inflorescence. The extent of purple colour on the lip is variable. This species flowers quite well in Singapore. Fig. 169.

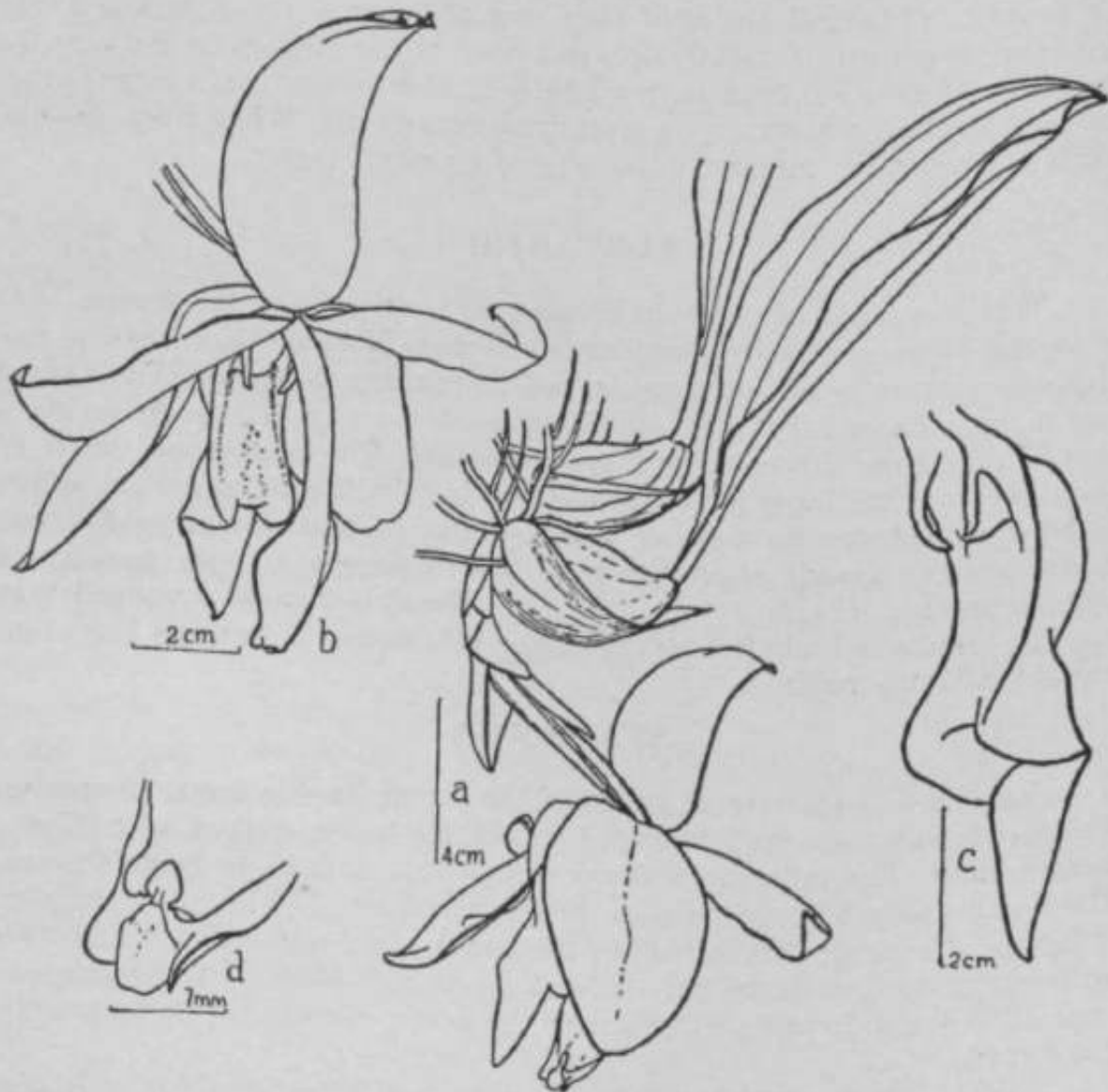


Fig. 169. *Stanhopea eburnea*. a, plant and inflorescence, b, flower, c, lip. d, top of column.

*S. tigrina*

Sepals and petals pale yellowish with large coalescing purple spots, 9 cm. long; lip very fleshy, the basal part hemispherical, yellow with purple spots, the middle part with long horns, the distal part broad, 3-toothed, white with light purple spots; 2 to 4 flowers in each inflorescence.

**S. Wardii**

6-10 flowers in each inflorescence; sepals and petals orange-yellow with small purple-red spots, 7 cm. long; basal part of lip ovate, orange-yellow with an almost black eye each side, middle part with two horns, distal part acute, orange-yellow with purple spots. Flowers rarely in Singapore.

**GONGORA**

This genus consists of about 25 species, ranging from Mexico to Peru and Brazil, mostly on the mountains. Many of them would certainly grow at Malayan hill-stations, but few in the plains. No local trials have been reported.

The habit of the plants is like that of *Stanhopea*, but the pseudobulbs have 2 leaves; the inflorescences are always pendulous. The upper sepal is joined to the base of the column for a short distance and then curves backwards; the lateral sepals are reflexed until they are in contact with the ovary; the petals are partly joined to the column and are much smaller than the lateral sepals. The lip is at the top of the flower, horizontal, parallel to the end of the column; the base of the column hangs vertically downwards, the end being bent horizontally, beneath the lip. The basal part of the lip is concave, and often bears slender horns, the distal part being laterally compressed or saccate.

As with the other genera of the group, the flowers are complex in structure, and may well be considered more curious than beautiful. They are however distinctive in having fine bright colours, which make them attractive, though they are not so large as the flowers of *Stanhopeas*.

**THE CATASETUM TRIBE**

Here again is a group of tropical American orchids which are cultivated for their interest rather than their beauty. *Catasetum*, the principal genus, has two remarkable characters; the flowers are of two (or sometimes three) distinct kinds in each species, and the pollinia are explosively discharged when a certain part of the flower is touched. The general characters of the tribe are as follows:—

Pseudobulbs ovoid to elongate, usually leafy throughout their length, the base covered with the thin sheathing bases of the leaves; leaves thin, with many raised veins; inflorescence lateral, erect, with several rather large flowers; lip fixed firmly to the base of the column, fleshy; column straight or twisted; anther with 4 pollinia, joined to a long elastic stipes with large sticky disc, explosively ejected.

The principal genera are distinguished as follows:—

Flowers all alike; column twisted .. ..	<i>Mormodes</i>
Male and female flowers different; column not twisted	
Column thick, straight, with antennae ..	<i>Catasetum</i>
Column slender, bent, without antennae ..	<i>Cychnoches</i>

MORMODES is a genus of about 30 species, chiefly on the Andes, mostly requiring cool conditions. Probably no species have been tried in Malaya.

CYCHNOCHES has some species with the male and female flowers almost alike, differing only in the column, and others in which the male flowers are peculiar in having the lip small, divided like the fingers of a hand, the female flowers being of the same general form as in the first group. The diversity of flower-form is much less developed than in *Catasetum*, and the genus is thus of less interest; and the plants are not of great beauty. There are no records of any species being grown in Malaya.

### CATASETUM

In this genus there are three distinct flower-forms. These are so different that when the plants were first seen by botanists, the three forms were placed in different genera, until one day an inflorescence was found bearing all three forms on one stalk. Such an occurrence is rare, each inflorescence usually only bearing flowers of one kind. Some species have flowers of two kinds only. The three kinds are as follows:—

*Male flowers.* These have a fleshy hooded lip at the top of the flower. The anther has two curved horn-like antennae; a stigma is present but is not functional. Flowers of this type were originally called *Catasetum*.

*Female flowers.* These have a smaller hooded lip at the top of the flower, no antennae, and the stamen is not functional. Flowers of this type were originally called *Monachanthus*.

*Hermaphrodite flowers.* These have the lip in the normal position at the base of the flower, narrow, hollow at the base, with a more or less flat and often fringed blade. The column is erect, and bears the anther in the usual position, with antennae. This type of flower was called *Myanthus*.

In general, the first two types of flower are not very decorative, but flowers of the third type are more attractive, and more varied in form and colouring. Only one species of *Catasetum* is known to have been tried in Malaya, namely *C. macrocarpum*, which thrives and flowers well in Singapore and is described below. This has only flowers of the first two types. Of species which produce *Myanthus* flowers, *C. barbatum*, *C. callosum* and *C. fimbriatum* might be tried in Malaya, *C. callosum* being the most likely to succeed in the lowlands.

#### *C. macrocarpum*

Stems thick and fleshy, tapering upwards, with about 6 leaves; leaves 20 cm. or more long, broad, acute, thin; inflorescence 20-30 cm. tall, with 6-10 flowers; in male flowers sepals and petals green with red-purple spots, 4 cm. long, the lip yellowish, hooded, very fleshy, 3-toothed; in female flowers sepals and petals much smaller, not spotted, lip smaller and not toothed. Fig. 170.



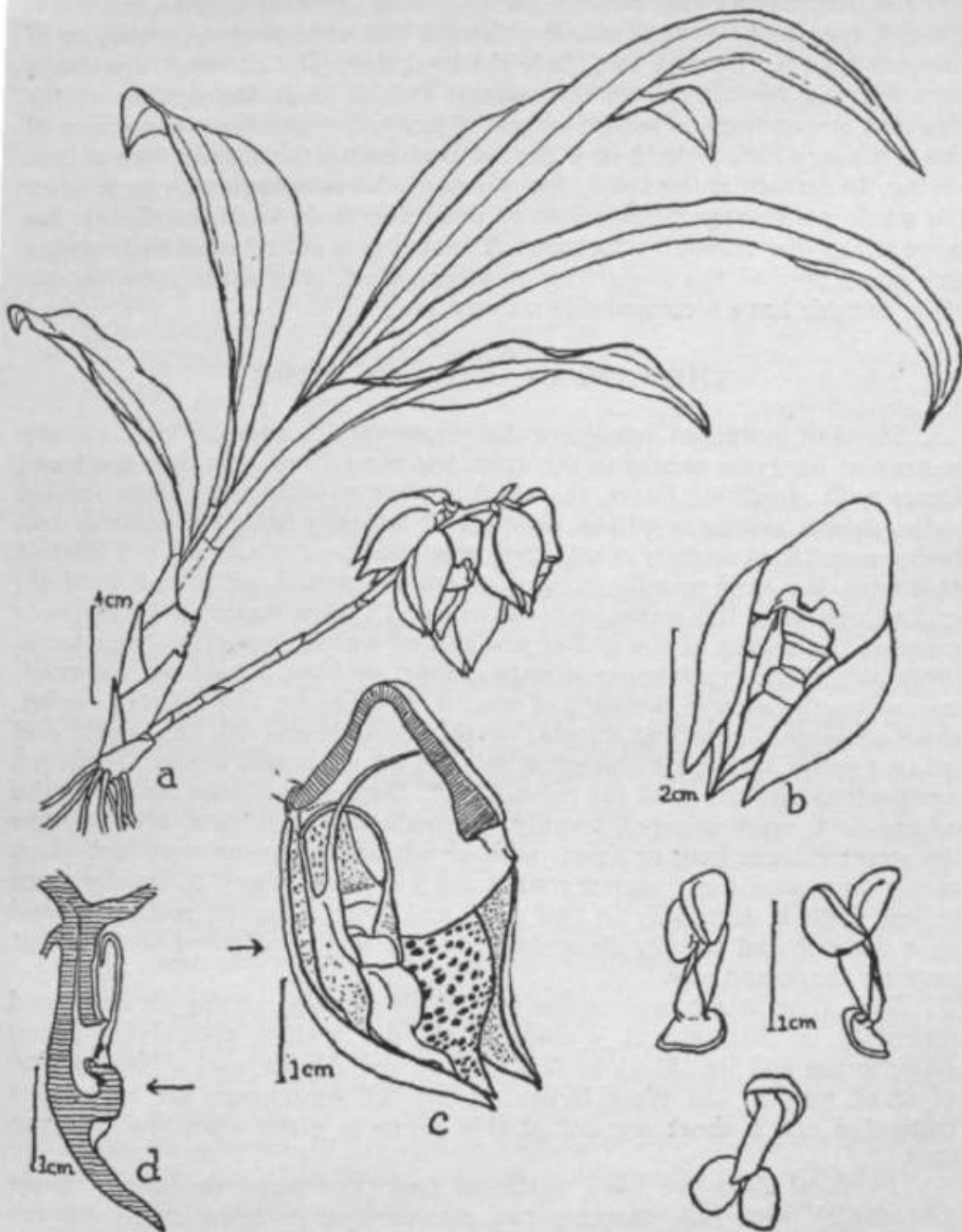


Fig. 170, *Catasetum macrocarpum* (male flowers), *a*, plant and inflorescence, *b*, flower from front, *c*, flower cut open, the arrow pointing to the stipes of the pollinia in its position ready to spring; in *d*, the arrow points to the swelling over which the stipes lay. Below, on right, discharged pollinia with the sides of the stipes folded inwards.

The plants are quite easy to grow, potted as for CattJeyas, in light shade. When in new growth, they should be watered freely and manured. They most frequently produce male flowers, which have a very strong

spicy odour, during the heat of the day only. Female flowers are rare. Though they look very robust, the flowers last only about a week; or if the pollinia are removed they fade the next day. The antennae are easily seen curving upwards from the column (which is at the bottom of the flower) ; one of them is sensitive, and if touched will release the stipes of the pollinia, which is held in a curved position in the flower, like a bent spring. In straightening itself, the stipes produces enough energy to eject the whole pollen-apparatus a foot or more forwards from the flower, the large sticky disc travelling foremost. The spring is not released by touching any other part of the flower, but a severe shock may cause ejection. No other orchids have a comparable mechanism.

#### THE VANDA—ARACHNIS TRIBE

*Stems* of unlimited apical growth (monopodial), short or long, usually rooting at intervals almost to the apex, but sometimes only near the base; *leaves* with sheathing bases, the sheaths often overlapping; blade jointed to the sheath, oblong or elliptic or terete or laterally flattened, more or less fleshy, sometimes slightly constricted near the apex, nearly always bilobed at the tip, the lobes usually unequal, narrow or broad, sometimes toothed; in *Tseniophyllum* the leaves reduced to small brown scales; *inflorescences* piercing the sheath of the leaf in the axil of which they arise (and sometimes also other overlapping sheaths), short or long, simple or branched, one- or many-flowered, sometimes several at one node; *flowers* very varied, small or large, fleshy and durable or thin and short-lived, the sepals and petals usually spreading and subequal, the lateral sepals rarely forming a conspicuous mentum with the column-foot; the *lip* sometimes hinged to the column-foot, often spurred, usually with calli or appendages, often within the spur; *column* long or short, with or without a conspicuous foot (foot rarely quite wanting) ; anther containing 2 or 4 pollinia, if 2, usually more or less cleft, if 4, usually in two pairs and often unequal; pollinia seated on a distinct and usually elongated thin flat stipes, attached to a disc of varying shape and size.

This tribe is confined to the Old World tropics, mainly in Asia, and especially in Burma and Western Malaysia, with' a special sub-group (*Angrsecum* and its allies) in Madagascar and Africa, and a few species, of small size, in the West Indies. Species of *Angrsecum* are sometimes cultivated and a short account of this genus is given after the Malayan ones.

In floral form we have variation from the large Scorpion orchids (*Arachnis*) with inflorescences two metres long carrying many flowers each 10 cm. high, to the minute flowers of *Schcenorchis* and *Microsaccus*, which are yet very complex in structure. Vegetatively the range is as great, from *Arachnis*, a single plant of which may form a thicket or climb to the top of a tall tree, to a small *Tseniophyllum* which will lie in the palm of one's hand.

The main characteristics of the tribe are the unlimited growth in length of the stem combined with the entire absence of pseudobulbs, and the stipes and disc of the pollinia. The latter character is shared with the

great *Oncidium* tribe in tropical America; but the *Oncidium* tribe is sympodial and mainly pseudobulbous in habit, and the corresponding tribes in the Old World (*Acriopsis* and a few others) are small in comparison.

The basic genera in the tribe appear to be *Vanda*, *Arachnis* and *Vandopsis*. *Vanda* has two pollinia, each of them somewhat cleft; *Arachnis* and *Vandopsis* have each four pollinia, in two pairs and almost equal. It seems likely that all the other genera, many of them small-flowered, originated from these three, or from something very like them. We can divide all the genera into two sub-groups according to their number of pollinia. In the 4-pollinia group the most important genera are *Arachnis*, *Vandopsis*, *Pomatocalpa*, *Trichoglottis*, *Sarcanthus*, *Renanthera* and *Thrixspermum*. In the 2-pollinia group the most important are *Vanda*, *Luisia*, *Phalsenopsis*, *Sarcochilus* and *Aerides*. Both sub-groups have a number of other smaller genera.

In addition, there are three interesting genera which have four quite distinct pollinia, not united in pairs; these are *Adenoncos*, *Microsaccus* and *Tseniophyllum*. It seems likely that *Adenoncos* is related to the *Arachnis* sub-group, but the other two genera perhaps not. *Tseniophyllum* is peculiar in being apparently leafless; actually the leaves are reduced to very small brown scales covering the tip of the stem, the work of normal leaves being carried out by the roots, which are numerous, green and usually flattened. Green roots are not uncommon among orchids; they are found for example in *Phalsenopsis*.

But though we may divide the tribe into two sub-groups according to the number of pollinia, it is still clear that genera in opposite sub-groups are closely related. For example, many species of *Vanda* will hybridize with species of *Arachnis* and *Renanthera*; *Phalsenopsis* will also hybridize with *Arachnis*. We do not yet know much about the small-flowered genera, which we may suppose to be later developments and so perhaps more specialized. It would be interesting to know whether *Sarcanthus* will mate with *Malleola*, or *Sarcochilus* with *Thrixspermum*.

The division into the two sub-groups is naturally a tentative one, and may need modification. As regards *Arachnis*, *Vandopsis*, *Trichoglottis*, *Pomatocalpa* and *Sarcanthus*, there can be no doubt that these are a closely related series. But with them we find *Thrixspermum*, which seems to have more in common with *Sarcochilus*, from the other sub-group. Perhaps *Thrixspermum* originated from the 2-pollinia sub-group, from something like a *Sarcochilus*. If that could happen, it might have happened more than once, perhaps also in the case of *Tseniophyllum*. Taking the 2-pollinia sub-group, we find that *Vanda*, *Aerides*, *Phalsenopsis* and *Sarcochilus* appear to be quite closely related.

Two large pollinia, more or less deeply cleft, are found in the *Cymbidium*, *Eulophia* and *Bromheadia* tribes, which are less highly organized than the *Vanda-Arachnis* tribe. These three tribes have all a distinct disc for the pollinia, and are also large plants with fairly large flowers; they seem to be the most likely groups in which to look for the origin of *Vanda* and *Arachnis*. Of the three, the *Cymbidium* tribe appears to be the most likely; and in *Dipodium pictum* of that tribe we see a plant that has acquired the monopodial habit.

We can well imagine that some massive plant of the Cymbidium-Grammatophyllum stock gave rise to the Vanda-Arachnis tribe; but this suggestion must be regarded as no more than a guess, unproved, but on present evidence at least possible. Such an origin would indicate the 2-pollinia condition as primitive in the Vanda-Arachnis group, but the 4-pollinia state must have originated very early.

### Sub-division of the Tribe

The Vanda-Arachnis tribe is so varied that it is rightly divided into a rather large number of genera. These have been established, on their present basis, in the main by Dr. J. J. Smith and Dr. R. Schlechter, who had the opportunity of examining more species of living Malaysian orchids than any other botanists. The arrangement adopted here is almost entirely that used by Dr. J. J. Smith, with a few corrections based on examination of Peninsular species which he had not seen. The genera appear to be very well arranged, on the whole,

Owing to this great diversity it is difficult for a beginner to find his way among the genera and species of the tribe, and hitherto there has been no single book which would help him. Dr. Smith's work on the orchids of Java includes many Peninsular species. Ridley's account in his Flora is both confused and out of date. Schlechter's generic descriptions are too vague, and he gives no key. The following keys and descriptions are offered in the hope that they will help both the beginner and the experienced botanist, and serve as a basis for further work.

The monopodial habit makes for a greater vegetative uniformity in this tribe than in some other groups of orchids. The possible differences are long or short stems, with the leaves close or well-spaced, leaves oblong or elliptic, flattened or terete. Sometimes nearly all of these vegetative differences are found within a single genus, e.g. *Sarcophyllum*, and there is no sharp distinction between long and short stems. Terete leaves are found in a few species of several genera, and only *Luisia* has all species with terete leaves. The peculiar character of a slight constriction near the apex of the leaf is also found in a few species of several genera. Thus it is difficult to base a key on vegetative characters.

We may note here that, in spite of the general monopodial habit of the tribe, some members of it have almost a sympodial appearance, rooting and branching near the base only. This is especially true of those which have a pendulous habit, but not all of them, and a sympodial aspect is sometimes also found in species with stems tending to be erect, as *Schcenorchis micrantha*. But such plants never have the regularly sympodial growth of orchids like *Eria*, and there is no limit except injury or failure of nutrition to the growth in length of their stems.

Of the two keys here given, the first is based as far as possible on characters easily observed in living plants, with minimum use of a high-power lens. It applies only to those species at present known to be native in Malaya, and may not be true for species hitherto undiscovered. The second key is based almost entirely on details of floral character, and will

perhaps be more useful for those who wish to make a more detailed study of the group. But though the first key may lead fairly easily to a genus, the use of a lens of magnification 10 and careful examination of the structure of the flower will be necessary to identify individual species of such small-flowered genera as *Sarcanthus*.

The main features which must be examined are the lip, the column with its foot, and the anther with its pollinia. Where the column-foot is well developed, the lip is attached to it, sometimes elastically (so that the lip will move easily) and sometimes firmly. In the latter case (e.g. in *Thrixspermum*) there is no sharp line of division between the column-foot and the lip. Schlechter proposed a main division of the whole tribe based on the presence or absence of a column-foot. But sometimes the column-foot is quite short, and to decide whether it is present or not is often difficult. In a genus like *Sarcohilus*, where most species have a long column-foot, a few have this organ quite short, no longer than in genera (e.g. *Vanda*) which are classed as footless. The distinction is in fact not satisfactory for a main division; but the question of whether the lip is hinged and sharply distinct from the column-foot is easy to see.

The lip is nearly always distinctly 3-lobed, and often spurred or sometimes only saccate at the base. The spur often contains one or more calli or other appendages or keels and sometimes also a septum which divides it longitudinally. The distinctions between *Sarcanthus* and allied genera depend on the nature of these parts of the spur, and within the genus *Sarcanthus* careful examination of the parts is necessary to distinguish the species.

The column sometimes has a peculiar structure in the rostellum, notably in the peculiar genera *Abdominea* and *Schcenorchis*, and to a somewhat less extent, in *Camarotis* and in odd species of a few other genera. The shape and size of the rostellum control the shape and size of the disc

also the length of  
 ng, broad or narrow, or sometimes  
 ---ped. The length of the stipes, whether short  
 or long, and whether widened or not at the tip, is characteristic of some  
 learn to recognize the species without examining  
 a place an unknown or new species in a genus  
 such examination is necessary.

The pollinia have been mentioned above. They are large and easy to see in the large flowers of *Vanda* and *Arachnis*, but not so easy in the smaller flowers, and to make sure whether 2 or 4 pollinia are present one must look very carefully, as the two pollinia of a pair are often very close fitting against one another to make a round whole.

**Key to the Malayan genera of the Vanda-Arachnis Tribe not based  
 on characters of the pollinia**

- Leafless plants .. .. . 1. *T&niophyllum*  
 Leafy plants  
 Short-stemmed plants with close, short, laterally  
 flattened leaves and small white flowers in pairs 2. *Microsaccus*

## Otherwise

- Flowers lasting one day, produced one or few at a time, at intervals, near the end of a slowly elongating inflorescence, rarely on a very short inflorescence
- Lip moveable, sharply distinct from the end of the column-foot to which it is attached
- Leaves either terete or laterally flattened . . . 19. *Cheirorchis*
- Leaves neither terete nor laterally flattened
- Sepals and petals with long narrow tips hardly spreading from each other . . . 20. *Chamteanthus*
- Sepals and petals not so . . . 21. *Sarcochilus*
- Lip not movable, not sharply distinct from the column-foot
- Side-lobes of lip long, thin, the ends broad, toothed or fringed . . . 26. *Pennilabium*
- Side-lobes of lip otherwise
- Entrance to spur of lip very small or narrow; no callus visible inside the spur
- Spur widening from the mouth, transversely flattened . . . - • 27. *Ascochilopsis*
- Spur laterally flattened, tapering from mouth to tip . . . • • 32. *SaccoUbm*
- Entrance to spur almost round, not narrowed; a callus on front wall inside the spur clearly visible . . . • • 4. *Thnxpermum*
- Flowers lasting more than one day, usually many open together on a more rapidly elongating inflorescence or sometimes on a very short one
- Leaves terete
- Lip shallowly saccate at the base, not spurred; the basal part of the lip separated from the rest by a transverse groove .. 16. *Lmsia*
- Lip distinctly spurred, base and apex not so
- MidTobfoflip 4 cm. wide .. - 8 0 . *Varuła Hookertana*
- Midlobe of lip very much smaller • • «• *Sarcamthvs*
- Leaves not terete
- Upper sepal 2 cm. or more long
- Lip hinged and moveable .. • • <sup>5</sup>- *Arachnis*
- Lip not hinged
- Lip with spur
- Flowers bright orange-red; midlobe not longer than spur . . . 9. *Renanthera*
- Flowers otherwise coloured; midlobe much longer than spur . . . 30. *V&nda*

- Lip not spurred
  - Stems very short . . . . . 18. *Phalxnopsis*
  - Stems not very short
    - Leaves very thick, to 30 cm. long . . . . . 12. *Vandopsis*
    - Leaves not very thick, to 12 cm. long . . . . . 11. *Trichoglottis*
- Upper sepal less than 2 cm. long
  - Flowers with lip at the top, on erect inflorescences
    - Lip deeply saccate or spurred
      - A thin tongue joined to the back wall of the spur, its tip visible at the mouth . . . . . 7. *Pomatocalpa*
      - Calli at base of midlobe partially closing mouth of spur; no tongue at back . . . . . 8. *Camarotis*
    - Lip not spurred, slightly saccate at base, with no tongue . . . . . 6. *Acampe*
  - Flowers with lip at the bottom if inflorescence is erect
    - Flowers 1-4 in an inflorescence
      - Lip shallowly saccate at base, with a papillose keel or callus in the base . . . . . 3. *Adenoncos*
      - Lip spurred or deeply saccate, the entrance to the spur or sac obscured by a tongue or hairs
        - Apex of lip turned up and bearing two small lobes at right angles to the tip . . . . . 17. *Uncifera*
        - Midlobe of lip simple or 3-lobed, never 2-lobed . . . . . 11. *Trichoglottis*
    - Flowers more than 4 in an inflorescence (sometimes not all open simultaneously)
      - Long inflorescences bearing many close white or pale mauve flowers with purple markings; upper sepal 1-2-1-5 cm. long
        - Spur pointing backwards, laterally flattened . . . . . 25. *Rhynchostylis*
        - Spur pointing forwards, in front of or beneath the midlobe, not flattened . . . . . 24. *Aerides*
- Not these characters
  - Flowers almost entirely red, orange-red or orange-yellow
    - Inflorescence erect, simple, spur long, slender . . . . . 31. *Ascocentrum*
    - Inflorescence not erect, branched, spur short . . . . . 9. *Renanthera*

- Flowers not so coloured
- Flowers with a cleft appendage  
near base of lip, or with a  
pair of antennae below the  
blade; no spur . . . . . 18. *Phalzenopsis*
- No such appendage or antennae;  
lip spurred or saccate  
Sepals keeled on the back, keels  
toothed . . . . . 13. *Pelatantheria*
- Sepals without toothed keels  
Base of lip cup-shaped; mid-  
lobe flat, nearly semi-  
circular, wider than the  
cup . . . . . 15. *Gastrochilus*
- Lip not so shaped  
Entrance to spur of lip  
closed by a callus  
attached to its back  
wall . . . . . 14. *Sarcanthus*
- No such callus present  
Inflorescence erect or  
horizontal, not  
drooping  
Sepals red-brown . . . . . 15. *Abdominea*
- Sepals and petals  
white or faintly  
tinged with violet 16. *Schcenorchis*
- Inflorescence drooping  
from a horizontal  
base or pendulous  
Midlobe of lip much  
longer and wider  
than side-lobes . . . . . 31. *Ascocentrum*
- Midlobe not so, often  
smaller than side-  
lobes  
Column bent back-  
wards; stipes of  
pollinia much  
widened near  
apex . . . . . 28. *Malleola*
- Column not bent  
backwards; sti-  
pes narrow  
throughout



- A thin tongue joined to back wall of the spur, its tip visible at the mouth .. 7. *Pomatocalpa*
- No such tongue present
  - A longitudinal septum in apical part of spur .. 8. *Camarotis*
  - No longitudinal septum in spur .. 29. *Robiquetia*

**Key to the genera of the Vanda-Arachnis Tribe, the main divisions based on characters of the pollinia (adapted from J. J. Smith)**

- Pollinia 4, nearly equal, free from one another
  - Leafless; inflorescence elongate with a succession of many flowers .. .. 1. *Tseniophyllum*
  - Leafy; inflorescence very short, few-flowered
    - Leaves laterally compressed; flowers in pairs, white .. .. 2. *Microsaccus*
    - Leaves thick, channelled above; flowers green .. 3. *Adenoncos*
- Pollinia 2 or 4; if 4, united in two pairs
  - Pollinia 4, equal or unequal, united in two bodies
    - Column-foot distinct .. .. 4. *Thrixspermum*
    - Column-foot wanting or indistinct
      - Lip moveable, with a narrow elastic hinge .. 5. *Arachnis*
      - Lip not freely moveable, without such hinge
        - Flowers not resupinate (pedicel and ovary not twisted)
          - Lip not spurred; or if spurred with neither a tongue at the back nor a median septum in the spur .. .. 6. *Acampe*
          - Lip spurred
            - Spur short, a thin tongue joined to its back wall, tip of tongue visible in mouth of spur .. .. 7. *Pomatocalpa*
            - No such tongue present
              - A median septum present, and a callus at the base of midlobe of lip inside spur .. .. 8. *Camarotis*
              - A callus at base of each side-lobe, on either side of entrance to spur .. 9. *Renanthera*

- Flowers resupinate (pedicel and ovary twisted)
- Rostellum very large, connected with column only by middle of its broad base; flowers small .. 10. *Abdominea*
- Rostellum otherwise
- Lip with an appendage at the back, just below the column
- Appendage thin, tongue-like .. 11. *Trichoglottis*
- Appendage not thin and tongue-like
- Flowers very massive; sepals 2-5 cm. long; lip slightly saccate at base .. 12. *Vandopsis*
- Flowers much smaller, lip spurred
- Column with conspicuous horns 13. *Pelatanthera*
- Column not horned .. 14. *Sarcanthus*
- Lip with no such appendages
- Flowers mainly red or orange-red; a callus at base on each side-lobe .. 9. *Renanthera*
- Flowers not mainly red; calli otherwise
- Rostellum much elongated parallel to column, in two long narrow points after removal of anther 16. *Schorsnorchts*
- Rostellum beaked, not vertically elongated nor with such points 17. *Uncifera*
- Pollinia 2, often furrowed or more or less deeply split
- No distinct spur, but the lip sometimes concave or somewhat saccate at the base
- Column-foot distinct
- Lip inserted immovably on the column-foot 18. *Phal<sup>^</sup>nopsts*
- Lip** inserted movably or elastically
- Leaves laterally flattened or terete 19. *Cheirorchis*
- Leaves neither laterally flattened nor terete
- Sepals and petals narrow, long-pointed, not spreading, tips near together .. 20. *Chamzeanthus*
- Sepals and petals otherwise, spreading widely .. 21. *Sarcochilus*
- Column-foot wanting or indistinct
- Flowers very large, flat; leaves not terete .. 22. *Euanthe*
- Flowers not very large not flat: leaves terete 23. *Luisia*

- Lip with a distinct spur or deeply saccate  
 Lip more or less movable, inserted at the end of  
 a distinct column-foot
- Flowers lasting many days, many open together; lip with keels and appendages  
 inside spur . . . . . 24. *Aerides*
- Flowers lasting one day, few open together;  
 no keels or appendages inside spur . . . . . 21. *Sarcochilus*
- Lip immovable
- Pollinia much shorter than the stipes
- Inflorescence long, bearing many close  
 flowers with upper sepal 1-2 cm. long;  
 spur laterally flattened . . . . . 25. *Rhynchostylis*
- Flowers smaller or fewer, spur not laterally  
 flattened
- Side-lobes of lip long and thin, with  
 broad, toothed or fringed ends .. 26. *Pennilabium*
- Side-lobes otherwise
- Inflorescence erect, scape rough . . . . . 27. *Ascochilopsis*
- Inflorescence usually pendulous; scape  
 not rough, sometimes very short
- Column bent back; stipes of pollinia  
 much widened near tip . . . . . 28. *Malleola*
- Column not bent back; stipes not  
 widened near tip . . . . .
- Spur slender, with internal callus 29. *Robiquetia*
- Spur cup-like, without internal  
 callus . . . . . 15. *Gastrochilus*
- Pollinia not much shorter than the stipes
- Stipes broad; flowers large .. .. 30. *Vanda*
- Stipes narrow; flowers small
- Midlobe of lip elongate, nearly flat; back  
 edges of side-lobes touching column 31. *Ascocentmvm*
- Midlobe short, fleshy; back edges of side-  
 lobes not touching column .. 32. *Saccolabium*

## 1. TVENIOPHYLLUM

Small leafless plants, usually epiphytic; stem short, covered at the apex with small brownish scale-leaves, bearing many long-spreading green roots; roots terete, triangular in section, or flattened, usually appressed to the bark of the supporting tree; scape of inflorescence very short, or in a few species 3 to 5 cm. long, slender, rachis of inflorescence slowly elongating, bearing flowers in succession one or two at a time, the bracts alternate and 2-ranked or facing all ways; flowers small, lasting one day or more; sepals and petals either quite free or united at the base in a tube; lip simple

or 3-lobed, spurred, the apex with or without a slender spine-like appendage; spur rounded, conic, cylindrical or club-shaped; column short; anther with short or long beak; pollinia 4, equal or unequal, not joined in two pairs, attached to a long or short stipes, the disc oblong or elliptic.

In this genus the leaves are reduced to tiny brownish scales, which are usually clearly seen, overlapping and covering the short stem-apex. The work of green leaves is carried out by the roots, which are always green.

Most species of *Tseniophyllum* grow on the small branches of trees, among the leaves, and are difficult to see. Only one of them is found in rather exposed places (*T. obtusum*), and one other has been found in many localities throughout Malaya (*T. filiforme*). The other are all known from single or few collections, mostly in Pahang. Intensive search in other parts of Malaya is desirable.

It will be seen from the key that the main division of the genus is into two groups, one with the sepals and petals free, and one with these parts joined at the base to form a tube. Plants of the former group usually flower by day, those of the latter by night; they usually last one day or one night, but some last longer. In some species there is a regular succession of flowers, one always open; in others, including *T. obtusum* and its allies, the buds develop only in response to some climatic stimulus, and flowering is gregarious, at intervals of some days or weeks.

About 170 species of this genus are known, ranging from Ceylon and northern India through Malaysia to Japan, Tahiti and Australia. The area with the largest number of known species is New Guinea, with 84. Java has 21, and Malaya is next with 17, largely due to the collecting of the late Mr. C. E. Carr, who added 13 to the 4 recorded in Ridley's *Flora*, and wrote a comprehensive illustrated account of them (in *Gardens' Bulletin*, S.S., Vol. 7, pp. 61-82). The following account is summarized from Carr's

### Key to the Malayan species of *Taeniophyllum*

Sepals and petals joined at the base into a tube

Bracts 2-ranked, alternate; scape short except  
in nos: 6 and 8

Roots triangular in section or terete, not over  
1 mm. thick

Flowers pink .. .. . 1. \**rvbnm*

Flowers greenish, yellowish or nearly  
white

Flowers 2 mm. long, sepals and petals  
hardly spreading, free parts 0.5-0.7  
mm. long .. .. . \**T. y* <sup>^</sup>*ngense*

Flowers larger, sepals and petals spread-  
ing, free parts 1-2 mm. long

Tube 1 mm. long, free parts of sepals  
2 mm. .. .. . 3. *T. viride*

- Tube equal in length to free part of  
sepals .. .. . 4. *T. tjibodasanum*
- Roots flattened, 1-5-3 mm. wide  
Free part of sepals 1 mm. long, tube 2 mm.  
long .. .. . 5. *T. campanulatum*
- Free part of sepals longer, always much  
longer than tube  
Incurved spine at apex of lip 1 mm. long 6. *T. intermedium*
- Incurved spine very small or absent  
Free part of sepals 5.5 mm. long; roots  
smooth .. .. . 7. *T. stella*
- Free part of sepals 2 mm. long; roots  
wrinkled .. .. . 8. *T. rugulosum*
- Bracts facing all ways, not 2-ranked; scape to  
3 cm. long .. .. . 9. *T. culiciferum*
- Sepals and petals free to the base  
Anther-beak short  
Bracts facing all ways  
Sepals and petals bright green turning  
yellow, upper sepal 3 mm. long .. 10. *T. montanum*
- Sepals and petals white; upper sepal 1  
mm. long .. .. . 11. *T. micranthum*
- Bracts alternate, in 2 ranks  
Spur conic, narrowed to apex  
Lip not lobed, apex fleshy, not incurved 12. *T. obtusum*
- Lip 3-lobed, midlobe concave with in-  
curved apex .. .. . 13. *T. ccdceolus*
- Spur cylindrical  
Blade of lip hairless, apex very fleshy.  
grooved .. .. . 14. *T. pallidiflo7mm*
- Blade of lip hairy, apex not fleshy nor  
grooved .. .. . 15. *T. annuliferum*
- Anther-beak long  
Scape to 5 cm. long; spur long, club-shaped 16. *T. filiforme*
- Scape about 2 mm. long; spur short, cylindrical 17. *T. rostratum*

**1. *Taeniophyllum rubrum*** Ridl., J.L.S. 32: 363. 1896. Flora 4: 177. Carr,  
Gard. Bull. 7: 68, pi. 7A. 1932.

Roots triangular in section, 1 mm. wide; inflorescence with scape  
about 5 mm., rachis elongating to 1 cm. or more, internodes to 1 mm.,  
bracts reddish, hairy; flowers pink, 5 mm. long, lasting several days; sepals

and petals slightly spreading, the free part equal in length to the tube; spur short. Found in Pahang and Negri Sembilan; not uncommon at Tembeling but the plants are small, and difficult to see.

2. *Taeniophyllum pahangense* Carr, Gard. Bull. 7: 65, pi. 6A. 1932.

Roots triangular in section, under 1 mm. wide; scape rough, to 1 cm. long; rachis to 1.5 cm., internodes 0.5 to 2 mm., bracts 0.5 mm. long; flowers scarcely opening, pale greenish, about 2 mm. long, lasting more than 1 day; sepals and petals joined beyond the middle in a tube, free parts 0.5 to 0.7 mm. long; lip with base of blade saccate, a short upturned spine at the tip; spur short. Known only from the Sat River in Pahang.

3. *Taeniophyllum viride* Carr, Gard. Bull. 7: 67, pi. 6B. 1932.

Roots triangular in section, about 1 mm. wide; scape to 1 cm. long; rachis to 7 mm., the internodes 0.5 mm.; flowers lasting one night, well expanded, greenish; tube of sepals and petals 1 mm. long, free part of sepals 2 by 0.5 mm., petals shorter; lip with narrowly triangular midlobe, an incurved spine at its tip; spur short. Found at Tembeling in Pahang, where it is common.

4. *Taeniophyllum tjibodasanum* J.J.S., Fed. Rep. 29: 251. 1931. Carr, Gard. Bull. 7: 68, pi. 7B. 1932.

Roots slender, terete; scape to 1.5 cm. long; rachis 1 cm. or more, internodes 1-2.5 mm., bracts papillose, 1 mm. long; flowers lasting more than 1 day, 4 mm. long, greenish white; sepals and petals joined to the middle, free parts spreading; lip narrow, with spine at tip; spur short. Found originally at Tjibodas in Java, and later also at Fraser's Hill and on G. Padang in Malaya.

5. *Taeniophyllum campanulatum* Carr, Gard. Bull. 7: 68, pi. 8A. 1932.

Roots flattened, to 1.5 mm. wide; scape 3-6 mm., rachis 8 mm. or more long; flowers lasting more than 1 day, whitish, 3-5-4 mm. long; sepals and petals joined in a tube which is much longer than the free blades; tooth at apex of lip very short, erect; spur short. Found only at Fraser's Hill.

6. *Taeniophyllum intermedium* Carr, Gard. Bull. 7: 71, pi. 9A. 1932.

Roots flat, 2 mm. wide; scape to 2 cm. long, rachis to 7 mm. or more, internodes 1-1.5 mm.; flowers lasting 1 night, pale salmon pink, 5 mm. long; sepals and petals joined in a short tube, free part of sepals 3 by 0.5 mm.; lip narrowly triangular, as long as petals, with an incurved spine almost 1 mm. long at the tip; spur short. Found only at Mentakab in Pahang, and at Kemaman.

7. *Taeniophyllum stella* Carr, Gard. Bull. 7: 69, pi. 8B. 1932.

Roots flat, 1.5 to 3 mm. wide; scape to 1 cm. long, rachis short, internodes about 1 mm.; flowers lasting 1 night, 0.9 to 1.2 cm. long, pale yellowish to bright yellow or salmon; sepals and petals joined at base into

a tube, free part of sepals 5.5 by 1 mm.; lip narrow, nearly same shape as petals, without spine at tip. Known only from Tembeling, Pahang. Fig. 171, a-c.

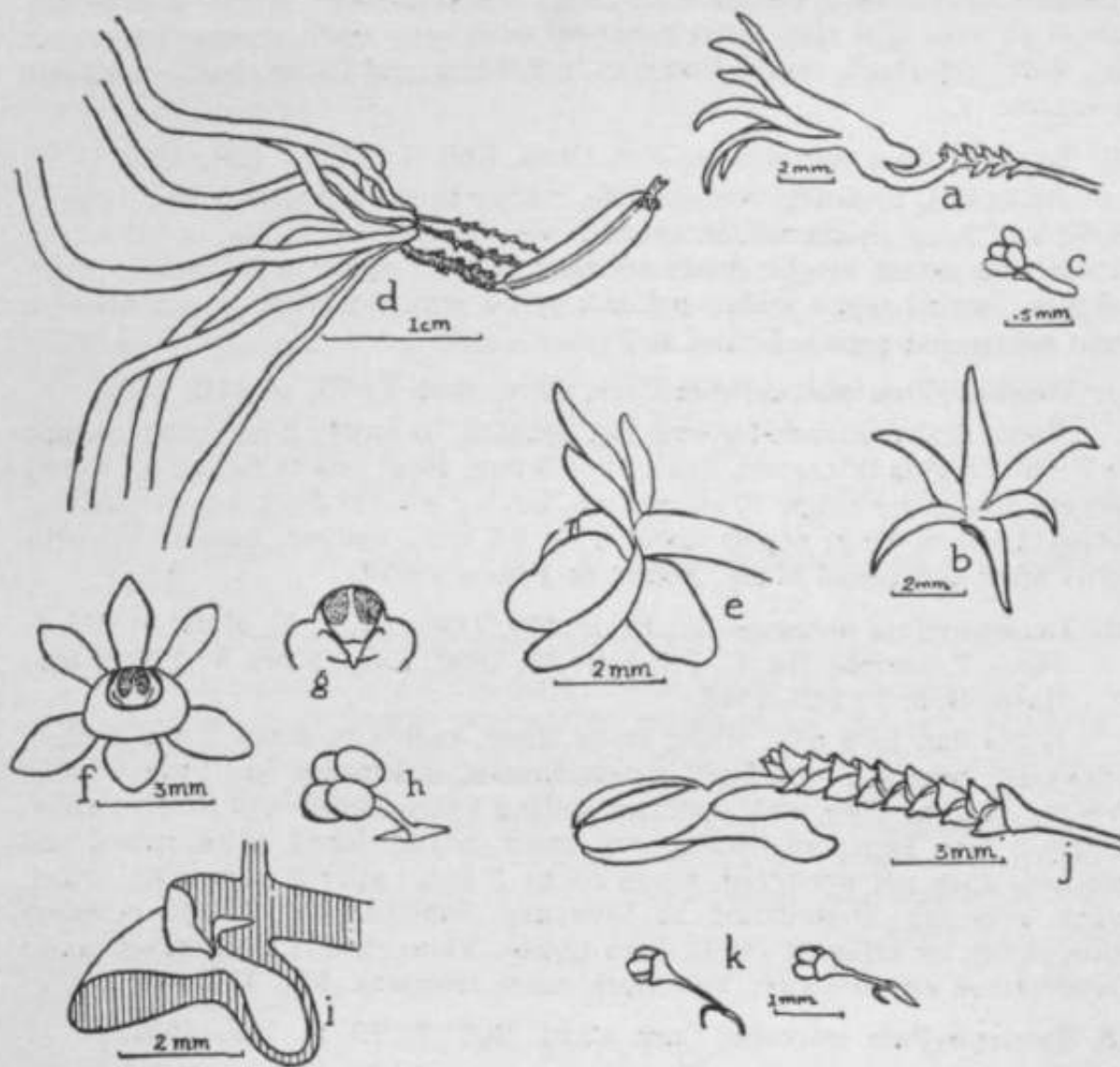


Fig. 171. *Tatniophyllum, stella*. a, flower from side, b, flower in face view with lip at top. c, pollinia. *T. obtusum*. d, plant with inflorescences and capsule. e, flower from side, and f, from front, g, column, h, pollinia. i, section through column and spur. *T. filiforme*, j, inflorescence with flower, k, pollinia, with disc bent.

8. *Taeniophyllum rugulosum* Carr, Gard. Bull. 7: 72, pi 9B. 1932.

Roots flat, minutely wrinkled, to nearly 3 mm. wide; scape 2-3 cm. long, rachis to 1.5 cm., internodes 0.5 mm.; flowers lasting 1 night, deep salmon, wide-opening, 3 mm. long; sepals and petals joined in a tube only 0.5 mm. long, free part of sepals 2 by 0.5 mm.; lip with thickened apex and very small incurved tooth; spur short. Found only by the Sat River, Pahang,

9. *Tamiophyllum culiciferum* Ridl., Fl. M.P. 4: 176. 1924. Carr, Gard. Bull. 7: 73, pi. 10. 1932.

Roots flat, to 3 mm. wide; scape very slender, to 3 cm. long; rachis 6 mm. or more long, bracts small, facing all ways; flowers lasting 1 night, greenish or yellow-green, 4 mm. long, wide-opening; sepals and petals joined at base in a very short tube; lip with very small recurved tooth at tip; spur very short, round. Common in Pahang, and found also in southern Kelantan.

10. *Taeniophyllum montanum* Carr, Gard. Bull. 7: 74, pi. 11A. 1932.

Roots flat, to nearly 3 mm. wide, rather thick; scape to 5 mm., rachis to 1.5 cm. long, thickened, internodes very short, bracts facing all ways; sepals and petals bright green turning yellow; upper sepal nearly 3 by 1.5 mm., lateral sepals wider, petals 2 by 0.8 mm.; lip white, much broader than sepals and petals. Found at Fraser's Hill.

11. *Taeniophyllum micranthum* Carr, Gard. Bull. 7: 75, pi. 11B. 1932.

Roots fleshy, rounded above, flat beneath, to nearly 2 mm. wide; scape to 7 mm.; rachis thickened, dense, to 3.5 mm. long, bracts facing all ways; flowers appearing singly in succession, lasting several days, not expanding, white, 1.5 mm. long; sepals about 1 by 0.5 mm., convex, keeled; lip with short spur and broad blade. Found at Fraser's Hill.

12. *Tamiophyllum obtusum* BL, Bijdr. 357. 1825. J.J.S., Fl. Buit. 6: 625, f. 469.—*serrula* Hk. f., F.B.I. 6: 77. 1890. Ridl., Flora 4: 176. Burk., Gard. Bull. 1: 352. 1916.

Roots flat, to 3 mm. wide; scape short, rachis to about 2 cm., rough, brownish; bracts 1 mm. long, rough, brown, internodes less than 1 mm.; flowers 5.5 mm. wide, wide opening, lasting 1 day; sepals and petals yellow, nearly 3 mm. long; lip white, very fleshy, hardly lobed, sides raised and concave, apex not upcurved, blade 2.5 by 2 mm.; spur 2 mm. long, broad, blunt, greenish. Distributed in Java and Sumatra; in Malaya common throughout, on trees in fairly open places. Flowering is gregarious, as in *Dendrobium crumenatum*, but much more frequent. Fig. 171, d-i.

13. *Taeniophyllum calceolus* Carr, Gard. Bull. 7: 76, pi. 12B. 1932.

Roots flat, to 3 mm. wide and 1.5 mm. thick; inflorescences many, scape 2 mm. long, rachis rough, to 2.5 cm., internodes 1.5 mm., bracts alternate, rough, red-brown when old; flowers lasting 1 day; sepals and petals bright yellow; sepals 3.5 by 1.5 mm., petals smaller; lip 3-lobed, white, 4 mm. long including the spur; side-lobes erect, bluntly triangular, midlobe rounded, deeply concave, apex curved upwards and inwards; spur yellow, broad, nearly as long as blade. Found only in Perlis; near *T. obtusum*, but larger, and differing in the shape of the midlobe of the lip.

14. *Taeniophyllum pallidiflorum* Carr, Gard. Bull. 7: 78, pi. 12A. 1932.

Roots flat, to 2 mm. wide, or almost cylindrical; scape 2-6 mm. long; rachis flexuous, to 2 cm., internodes 1 to 1.5 mm., bracts alternate, rough, dark green; flowers lasting 1 day, well expanded, very pale yellowish; sepals and petals keeled on backs, the sepals also warty; upper sepal 2.5 by 1.5 mm., the laterals a little wider and petals a little narrower; lip



hardly lobed, including spur 4 mm. long, blade little over 1.5 mm., concave, sides erect, rounded, very thin, apex fleshy, raised, grooved backwards; spur cylindrical, longitudinally grooved. Found on trees by the Tahan River, Pahang.

15. *Tamiophyllum annuliferum* Carr, Gard. Bull. 7: 79, pi. 13A. 1932.

Very near *T. pallidiflorum*, but sepals and petals yellow, lip 5 to 6.5 mm. long, without the thickened fleshy tip, the blade concave and densely hairy, pale yellow; spur 3.5 mm. long, cylindrical, not grooved. Found at Gua Musang, Kelantan.

16. *Taeniophyllum filiforme* J.J.S., Bull. Inst. Bot. Buit. VII: 4. 1900. Ic. Bog. 2: 127, t. 125B. 1903. Fl. Buit. 6: 623, f. 467. Carr, Gard. Bull. 7: 80, pi. 13B. 1932.—*T. macrorhizum* Ridl., Flora 4: 176. 1924.

Roots long, more or less cylindrical, often free, slender with distinct white spots beneath; scape slender, 1.5 to 5 cm. long, rachis to 1 cm. long, bracts very close, overlapping, 2-ranked; flowers lasting 1 day, not widely opening, pale yellowish; sepals and petals about 5 by 1.5 mm., nearly equal; lip 7 mm. long including spur, blade a little longer than spur, slightly 3-lobed, concave, blunt; spur very slender at mouth, then swollen to 1.5 mm. diameter, the tip pointed; anther with long beak. Distributed in Sumatra, Java and Celebes; in Malaya found at many localities from Singapore to Kedah. Fig. 171, j, k.

17. *Taeniophyllum rostratum* Carr, Gard. Bull. 7: 81, pi. 14. 1932.

Stem very thick, to 1.7 cm. long; roots terete but pressed to substratum, to 3 mm. thick; scape very short; rachis to 1.2 cm., internodes to 1 mm., bracts alternate, rough, broad, 1.5 mm. long; sepals and petals reflexed, pale yellow, hairy; upper sepal 3.5 by 1.5 mm., laterals and petals smaller; lip white with yellow spur, in all 3 mm. long; side-lobes broadly rounded, ascending, midlobe very small, ovate; spur cylindrical, short-hairy outside, long-hairy inside near mouth; anther with very long beak, twice as long as the rest of the anther, from which it is separated by a transverse groove. Only found at Tembeling in Pahang. The structure of the anther is very peculiar.

## 2. MICROSACCUS

Stems slender, curved, rooting at the base, densely leafy; leaves laterally flattened, small, fleshy; inflorescences very short, 2-flowered, flowers small, white, sepals and petals often not widely spreading, the lateral sepals joined at the base to the spur of the lip; lip spurred, the blade not lobed, the spur relatively large, usually transversely flattened, without appendages, the blade short, blunt, fleshy; column very short; pollinia 4, quite separate and equal, on a rather broad stipes with inrolled edges, with a narrow disc.

This small genus is confined to Malaysia. The plants are all small and very similar in general appearance. Vegetatively they somewhat resemble the species of *Dendrobium*, section *Aporum*, owing to their laterally flattened leaves, but their two-flowered inflorescences of tiny white flowers with conspicuous spur are unmistakable.

Key to the Malayan species of *Microsaccus*

- Stem with leaves hardly more than 1 cm. across 1. *M. brevifolius*
- Stem with leaves at least 1.8 cm. across
- Lip with a green blotch on blade; mountain plants
- Leaves to 1.5 cm. long; sepals spreading . . . 2. *M. sumatranus*
- Leaves to 0.8 cm. long; sepals not spreading 3. *M. truncatus*
- Lip white; lowland plants
- Blade of lip much narrower than spur; petals wider than sepals . . . . . 4. *M. ampullaceus*
- Blade of lip not much narrower than spur; sepals and petals of equal width . . . 5. *M. javensis*

1. ***Microsaccus brevifolius*** J.J.S., Ic. Bog. 3: 63, t. 225. 1906. Bull. Dep. Ag. XIII: 77. 1907. Bull. Btzg., Ser. 2, XXVI: 111. 1918. Carr, Gard. Bull. 7: 52. 1932.

Stems to about 10 cm. long, with the leaves about 1 cm. wide; leaves blunt, very close, to 3-5 mm. wide; flowers little over 3 mm. long, the lateral sepals not widely spreading; lip 2-5 mm. long, the blade longer than the spur. Distributed in Sumatra and Java, and northwards into Siam; in Malaya found in lowland forest by rivers and mangrove in Singapore, Johore and Selangor, and on limestone in Pahang and Selangor.

2. ***Microsaccus sumatranus*** J.J.S., Bull. Btzg., Ser. 2, XXV: 102. 1917. Carr, Gard. Bull. 7: 52. 1932.

Stem to 12 cm. long, and to about 3 cm. wide with the leaves; leaves spreading, 3-5 mm. wide, tip narrowed but not sharply pointed; flowers 6-5 mm. long, lateral sepals spreading; blade of lip 2 mm. long, with a large green spot inside; spur 2-5 mm. long. Distributed in Sumatra; in Malaya found at Fraser's Hill and on Taiping Hills.

3. ***Microsaccus truncatus*** Carr, Gard. Bull. 7: 52. 1932.

Stem to 13 cm. long, 10 to 1.6 cm. wide with the leaves; leaves to 2.5 mm. wide at the base, narrowed slightly to the blunt tip; flowers white with yellow-green spot on the lip; sepals hardly spreading; lip 4 mm. long, spur 2 mm. long and 1 mm. wide, cylindrical. Found only at Fraser's Hill.

4. ***Microsaccus ampullaceus*** J.J.S., Bull. Btzg., Ser. 3, 5: 99. 1922. Carr, Gard. Bull. 7: 52. 1932.

Stem to 15 cm. long, about 2 cm. wide with the leaves, or rather wider; leaves acute, to 4 mm. wide; flowers white, 4.5 mm. long, the sepals spreading; petals wider than sepals; lip with transversely compressed spur, in all 3-5 mm. long, the blade under 1.5 mm. wide, the spur over 2 mm. wide. Distributed in Sumatra; in Malaya with much the same distribution as *M. brevifolius* but not known to extend northwards into Siam. **Fig. 172, a.**

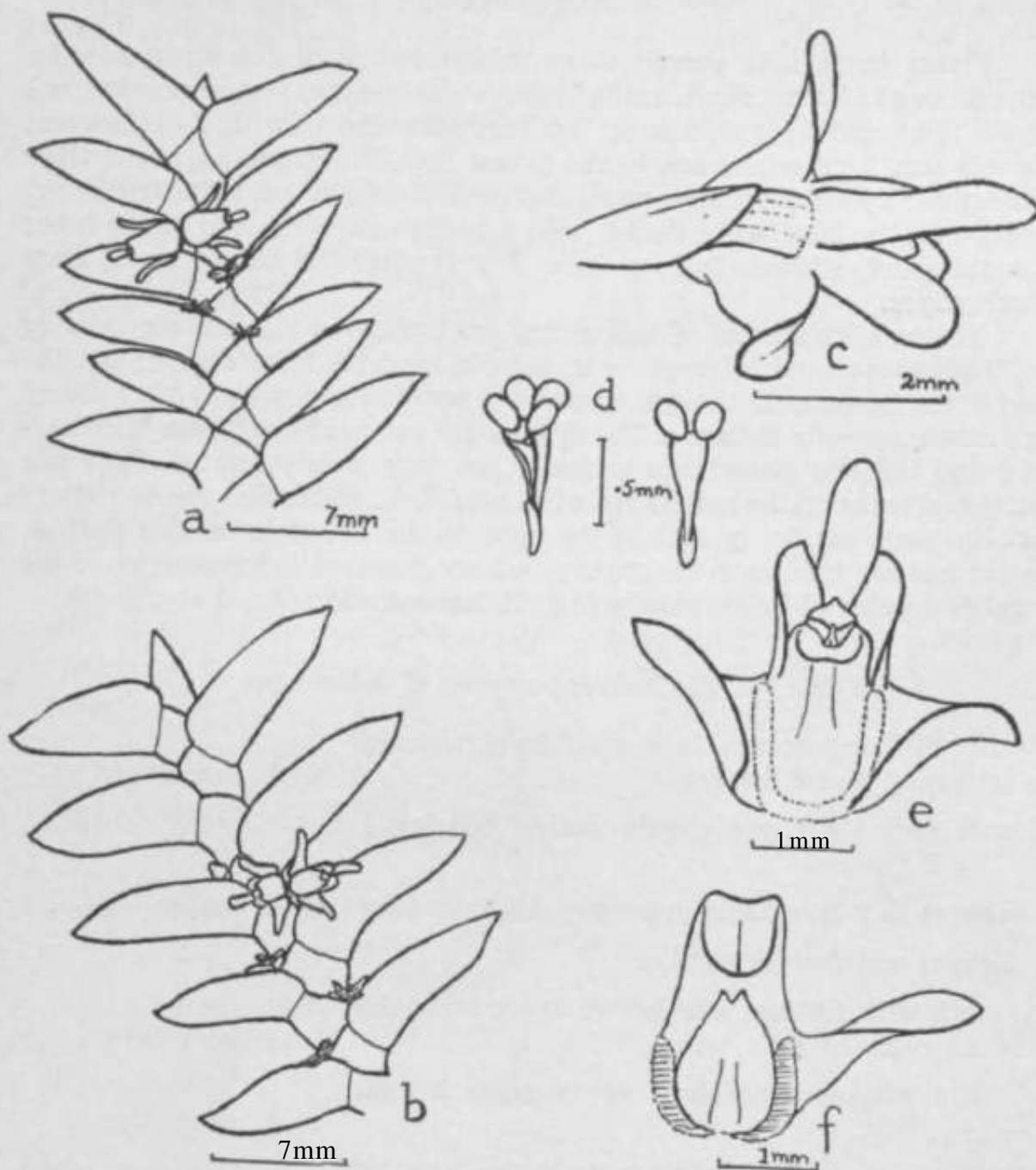


Fig. 172. *Microsaccus ampullaceus*. a, part of plant in flower. *M. javensis*. b, part of plant in flower. *O*, flower from above, *rf*, pollinia. *e*, flower with lip removed. *l*, lip and lateral sepal.

5. *Microsaccus javensis* Bl.<sub>f</sub> Bijdr. 368. 1825. J.J.S., Fl. Buit 6: 620, f. 465, RidL, Flora 4: 175.

Stem to 15 cm. long, about 2 cm. wide with the leaves; leaves about 3 mm. wide, acute; flowers white, 4-5 mm. long, the sepals spreading; sepals and petals of equal width; blade of lip much shorter than spur but not much narrower. Distributed in Java (not yet reported from Sumatra) ; in Malaya found in the south and in Pahang. **Fig-** 172, b-f.

## 3. ADENONCOS

Plants small, with usually short unbranched stem (in one species to 30 cm. long); leaves short, rather narrow, spreading, very fleshy but not terete (grooved above), acute; inflorescences short, with 1-4 flowers; flowers small, greenish; sepals and petals free, the petals narrower than the sepals; lip not moveable, undivided or distinctly lobed, not spurred but concave at the base, wide, fleshy, with a median papillose keel at the base; column short, without foot; pollinia 4, separated and almost equal, on a small stipes. ^

The smaller species of this genus are somewhat similar vegetatively to *Microsaccus*, and often grow in association with *Microsaccus*; but the leaves of *Adenoncos*, though sometimes narrow, are always very fleshy and never laterally flattened. The flowers are very different from *Microsaccus*, and the two genera are probably not very nearly related. Carr has published notes on the pollination of *A. major*; he states that insect visitors eat the papillose fleshy keel in the base of the lip. It is notable that *A. major* has the habit and the superposed one-flowered inflorescences of the smaller species of *Trichoglottis* (e.g. *T. lanceolaria*).

Key to the Malayan species of *Adenoncos*

Rachis of inflorescence to 8 mm. long, zig-zag,  
bearing 3 or 4 flowers . . . . . 1. *A. sumatrana*

Rachis very short, not clearly visible, bearing 1  
or 2 flowers

Leaves to 7 by 1 cm.; upper sepal 5 mm. long 2. *A. major* -

Leaves and flowers smaller

Lip with distinct side-lobes; upper sepal 3-5  
mm. long . . . . . 3. *A. parviflora*

Lip without side-lobes; upper sepal 2 mm.  
long . . . . . 4. *A. vesiculosa*

1. *Adenoncos sumatrana* J.J.S., Bull. Dep. Ag. XXII: 44. 1909.—*A. virens* quoad Ridl. Flora 4: 154, non Bl.

Stem to 15 cm. long, the leaves close, internodes 2-4 mm.; leaves very fleshy, tip acute, to 3 by 0.6 cm.; inflorescence to 8 mm. long, 3-4-flowered, rachis zig-zag; flowers pale green; upper sepal 4 mm. long, narrowly acute; lip 5 mm. long and wide, without distinct side-lobes, the midlobe broad, the end convex, with downturned acute tip, the keel at the base small; flowers fragrant. Distributed to Sumatra; in Malaya found at many localities, from Singapore to the north, and on the mountains to 4,000 feet. The shape of the lip, and of the inflorescence, are very characteristic. This species has been confused with *A. virens*, which is much smaller, and does not occur in Malaya. Fig. 173.

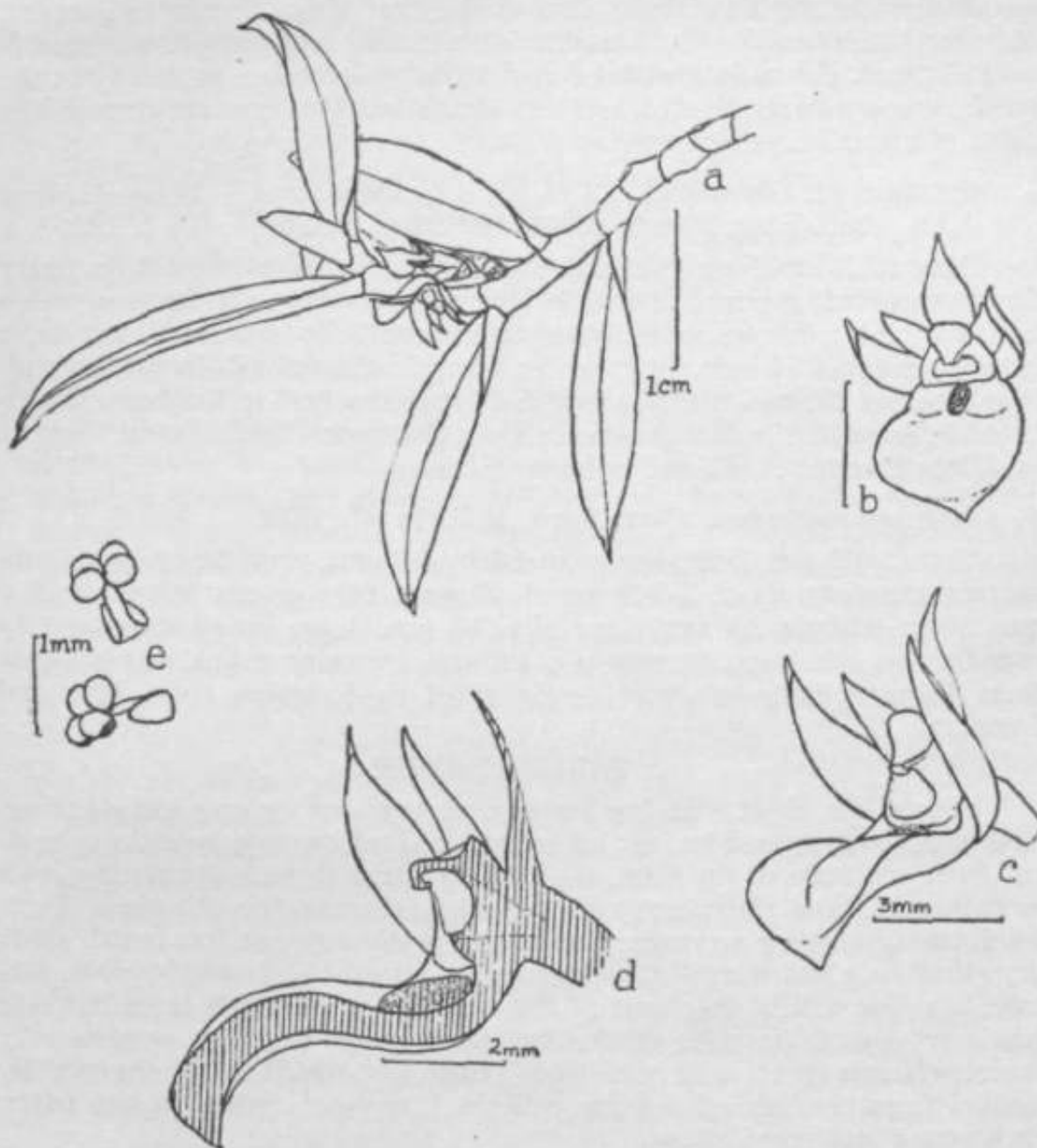


Fig. 173. *Adenoncos samatranensis*. a, plant and inflorescence, b, flower from front, and c, from side, d, section through column and lip. e, ovary.

2. *Adenoncos major* Ridl., J.L.S. 32: 350. 1896. Flora, 4: 154. Carr, J.M.B. R.A.S. 6: 62, pi. 13. 1928.

Stems to 30 cm. long, internodes 0.6 to 1.3 cm.; leaves to 7 by 1 cm., slightly constricted near the acute tip; inflorescences 1-flowered, one to four at a node, in a close row; sepals and petals green, the petals paler, all oblong with short acute tips; upper sepal 5 by 2.5 mm.; lateral sepals a little wider, keeled near the tip; petals 4 by 1 mm.; lip yellow-green, turning orange when old, fleshy, 6 mm. long; side-lobes short, erect, triangular, their front edges almost perpendicular; midlobe 2.5 mm. wide at base, 4 mm. wide near very shortly pointed apex, slightly concave, with a

rounded white papillose fleshy keel at the base. Only known to occur in Malaya; but *A. uniflora* in Sumatra is very near and perhaps not specifically distinct. Found in lowland forest at many localities, especially in the south, and up to at least 1,500 feet elevation. This has very much the habit of a small *Trichoglottis*.

3. *Adenoncos parviflora* Ridl., J.L.S. 32: 350. 1896. Flora 4: 154.—*A. vivax* J.J.S., Bull. Btzg. Ser. 3, 8: 64. 1926. Ser. 3, Suppl. III, t. 122, I.

Stem to 15 cm. long, internodes to 5 mm.; leaves to 4 by 0.4 cm., very fleshy, recurved, grooved above; inflorescence with 1 or 2 flowers, rachis hardly visible; flowers small, yellow-green with lip reddish-tinted when old; upper sepal 3-5 mm. long, acute; lip with distinct side-lobes, the mid-lobe concave, the end turned up, a distinct fleshy keel in the base. Distributed in Sumatra; in Malaya known from Selangor (Telok Forest Reserve and Batu Caves), Perak and in Lower Siam.

4. *Adenoncos vesiculosa* Carr, Gard. Bull. 7: 37. 1932.

Stem to 15 cm. long; leaves to 1.3 by 0.3 cm., very fleshy, acute; inflorescences very short, 1-2-flowered; flowers pale green; upper sepal 2 mm. long, laterals 2-5 mm. long; lip 3-3 mm. long, broad, concave, tip rounded, no side-lobes, in base a cruciform vesicular callus. Known only from Fraser's Hill; but it is nearly allied to *A. virens* from Java and Sumatra.

#### 4. THRIXSPERMUM

Stem either short with few leaves close together, or long and climbing, with many well-spaced leaves; inflorescence short or long, sometimes several from one node of the stem, the flowers either in two alternating rows or facing all ways, close, borne in succession, one or a few at a time, short-lived, usually facing upwards; sepals and petals more or less equal, short or rather long and narrow; lip immovably joined to the column-foot, saccate, a callus within the front of the sac, 3-lobed, the side-lobes more or less erect above the sides of the sac, the midlobe short or long, usually fleshy; column short, with a distinct broad foot which is not sharply delimited from the base of the lip; pollinia 4, unequal, united in two pairs, on a very short broad stipes.

The principal distinguishing characters of the genus are the column-foot and its firm junction with the lip, the saccate shape of the lip with the callus on the front wall of the sac, and the unequal pollinia on their very short stipes.

This genus includes a number of common Malayan species, many of them with graceful and attractive, though not very large, flowers. The flowers are unfortunately always very short-lived. Once an inflorescence has begun to bear flowers, it continues to produce them at intervals for several weeks or months, except in *T. calceolus*. In some species the flower-buds are certainly responsive to the stimulus of a sudden fall in temperature, like *Dendrobium crumenatum*, but the response seems not to be so regular, or perhaps to a slightly different stimulus. It is certain, however, that *T. calceolus*, *T. arvplexicaule*, *T. arachnites* and other species are gregarious in flowering in the same neighbourhood.

The genus *Thrixspermum* is naturally divided into two sections according to the form of the inflorescence. These sections have been raised to the rank of separate genera, but they are so closely related in flower-structure that it is more natural to unite them. They are distinguished as follows:—

*Section 1* (Orsidice). Flowers two-ranked.

*Section 2* (Dendrocolla). Flowers facing all ways.

**Section 1 (Orsidice)**

Most species in this section are easily distinguished by the large closely alternating laterally compressed bracts of their inflorescences; these are very similar to the bracts of *Bromheadia palustris*. Two principal flower-types are found, one with long narrow sepals and petals, the other with short, relatively broad sepals and petals; the flowers of the second type agree very closely with the flowers of some members of the second section of the genus. The long-sepalled flowers are in some cases very similar in different species, and it is possible that some of them are not very satisfactorily distinguished in the following account. Natural hybrids are quite possibly produced, and the amount of variation is not known. Much further information is wanted, which can best be obtained by gathering plants from different localities and growing them side by side. They are easy to grow, and mostly flower freely. An artificial hybrid has been produced by crossing *T. amplexicaule* by *T. scopa* and proves very vigorous.

**Key to the Malayan species of Section 1**

- Sepals and petals long and narrow (more than 3 times as long as wide)
  - Lip with long slender midlobe .. .. 1. *T. acuminatissimwn*\*
  - Midlobe fleshy, rather short
    - Stem long-climbing, internodes 1-5-5 cm. long
      - Internodes not over 2 cm. long .. 2. *T. Scortechinii*
      - Internodes to 5 cm. long
        - Midlobe of lip blunt; common lowland plant .. .. 3. *T. scopa*
        - Midlobe acute: mountain plant .. 4. *T. tahanense*
    - Stems short, internodes not over 1 cm. long
      - Sepals and petals white (or nearly so), 6-7 cm. long .. .. 5. *T. leucarachne*
      - Sepals and petals pale or deep yellow, shorter
        - Sepals under 2-5 cm. long .. .. 6. *T. crassifolium*
        - Sepals about 3-3-5 cm. long
          - Midlobe of lip narrow, violet .. 7. *T. iodochilus*
          - Midlobe fleshy, white .. .. 8. *T. arachnites*
- Sepals and petals relatively short and broad
  - Leaves short, ovate, flowers pale violet .. 9. *T. amplexicaule*
  - Leaves more or less oblong; flowers white, yellow or salmon
    - Whole inflorescence to about 3 cm. long, with few flowers
      - Sepals 2-5 cm. long, side-lobes of lip narrow 10. *T. calceolus*

- Sepals not over 1.6 cm. long, side-lobes broad  
 Flowers white with yellow lip . . . 11. *T. pauciflorum*  
 Flowers salmon, lip mainly orange-scarlet .. .. . 12. *T. platycaule*  
 Inflorescence much longer, with many flowers 13. *T. brevibracteatum*  
 Doubtful species (imperfectly described) . . . 14. *T. montanum*

1. ***Thrixspermum acuminatissimum*** (Bl.) Rehb. f., Xen. Orch. 2: 121. 1867. J.J.S., Fl. Buit. 6: 569, f. 427.—*Dendrocolla acuminatissima* Bl., Bijdr. 288. 1825.—*Sarcochilus notabilis* Hk. f., F.B.I. 6: 42. 1890. Ic. PI t. 2126.—*Thrixspermum notabile* Ridl., J.L.S. 32: 379. 1896. Flora 4: 186.

Stems to about 5 cm. long, internodes about 5 mm.; leaves to 10 by 2 cm., widest near tip which is bluntly pointed and slightly bilobed, narrowed gradually to the base; scapes slender, to 12 cm. long, 1 to 4 from each node; rachis to 8 cm. long, 5 mm. wide across the two rows of bracts, internodes about 2 mm.; sepals and petals yellow, flushed with red at the base, the sepals to 3 cm. long, petals shorter; lip pale yellow, red-spotted, the midlobe thread-like, white-tipped, 15 cm. long, the side-lobes small, blunt, with white tips; inside of sac spotted red. Distributed from Sumatra to the Philippines; in Malaya found in the lowlands from Singapore to Kelantan on the east side, but not collected north of Selangor on the west. One of the prettiest species.

2. ***Thrixspermum Scortechinii*** (Hk. f.) Ridl., J.S.B.R.A.S. 41: 33. 1904. Flora 4: 185.—*Sarcochilus Scortechinii* Hk. f., F.B.I. 6: 40. 1890.

Stems stout, to 30 cm. or more long, 5 mm. thick, internodes 1.5 to 2 cm. long; leaves fleshy, to 12 by 3 cm. or more, oblong, bilobed; scapes to 20 cm. long; rachis to 15 cm., 1-2 cm. wide across the bracts, internodes 4 mm.; sepals about 7 cm. long, narrow, pale yellow, petals a little shorter, lip 1 cm. long, shaped and coloured as in *T. arachnites*. Two specimens referred to this species were collected on Kedah Peak, and on a mountain in Perak. They are possibly not identical; and a distinction between this and *T. scopia* needs establishing.

3. ***Thrixspermum scopia*** (Hk. f.) Holtt, Card. Bull. 11: 289 1947.—*Sarcochilus scopia* Hk. f., F.B.I. 6: 40. 1890.—*Thrixspermum arachnites* quoad Ridl., Flora 4: 185, *p.p.*

Stems long, climbing, internodes 2.5 to 5 cm. long; leaves to 8 by 2.5 cm., oblong or widest near base, apex rounded and bilobed; scape very variable, 5 to 20 cm. long; rachis with bracts about 1-2 cm. wide, the internodes 4 mm., the bracts strongly curved; flowers pale yellow; sepals about 5-7.5 cm. long, petals a little smaller, tips thread-like; lip similar to that of *T. arachnites*, to 11 mm. long. Apparently not known outside Malaya; within Malaya found in many parts of the country, in fairly open places. The flowers are very much like those of *T. arachnites* but with longer sepals; the vegetative habit of the two species appears to be quite distinct. A critical comparison of the two is however desirable.



4. **Thrixspermum tahanense** Carr, Gard. Bull. 5: 149, pi. 4, f. 5. 1930.

Stems 30 cm. or more long, 3 mm. thick, elliptical in section, internodes 1.5 to 3 cm. long; leaves fleshy, to 10 by 3 cm., narrowed to rounded bilobed apex and to base, sheaths slightly keeled, spotted with purple; scape to 17 cm. long, the upper part flattened; rachis to 12 cm. or more, with the bracts 1.3 cm. wide, internodes 4.5 mm., bracts yellowish spotted with purple; sepals and petals cream, narrowed evenly to the tip; upper sepal 4.4-4.7 by 0.55 cm., laterals a little larger and petals a little smaller; lip 1.5 cm. long, depth of sac 7 mm.; side-lobes erect, rounded, white; midlobe 1 cm. long, fleshy, acute, white; sac with white callus, yellow-hairy below it, with a large brown-purple spot at the base. Found only once, on G. Tahan, at 5,000 feet. This species is nearly allied to *T. Scortechinii* but has much shorter sepals.

5. **Thrixspermum leucarachne** Ridl., J.L.S. 32: 379. 1896. Flora 4: 186.

Stems 12 cm. or more long; internodes under 1 cm.; leaves to 14 by 1.6 cm., unequally bilobed; scape to 18 cm. long; rachis stout, 1.2 cm. across the bracts; sepals and petals white or faintly greenish-yellow, 6 to 7 cm. long; lip white with crimson-purple spots on side-lobes and base of midlobe; side-lobes relatively long and narrow, curved forwards and slightly spreading; midlobe fleshy, acute, hairy towards the base and hairy within the spur (sometimes entirely purple ?). Known only from Langkawi Islands and Peninsular Siam.

6. **Thrixspermum crassifolium** Ridl., J.S.B.R.A.S. 41: 32. 1904. Flora 4: 186.

Stems to 16 cm. long, 3 mm. thick, a little flattened, internodes 7-10 mm.; leaves to 12 by 4 cm., shape as in *T. arachnites*, sheaths purple and sometimes young leaf-blade also; scape to 12 cm. long, rachis to 12 cm. or more, with the bracts 1 cm. across, internodes 3 mm.; sepals 1.8 to 2.4 cm. long, deep yellow; lip shaped as in *T. arachnites*, distinctly hairy outside, base orange, tip cherry red. Found in the lowlands of Johore, Selangor, Pahang and Perak; very nearly related to *T. arachnites* but with shorter flowers and lip hairy outside.

7. **Thrixspermum iodochilus** Ridl., J.S.B.R.A.S. 86: 307. 1922. Flora 4: 186.

Stem about 10 cm. long; leaves to 12 by 1.5 cm., fleshy; scape 5-8 cm. long, rachis to 3.5 cm. long, 7-8 mm. wide across the bracts; sepals and petals yellow, with slender tails, about 3 cm. long; midlobe of lip violet, narrow, tongue-shaped, 5 mm. long, saccate base of lip 3 mm. deep, surmounted by erect shortly forward-pointing side-lobes. Found only at Bukit Tinggi, Negri Sembilan. No specimen exists in Singapore.

8. **Thrixspermum arachnites** (Bl.) Rchb. f., Xen. Orch. 2: 121. 1867. J.J.S., Fl. Buit. 6: 570, f. 428. Ridl., Flora 4: 185.—*Dendrocolla arachnites* Bl., Bijdr. 287. 1825.—(?) *Thrixspermum papillosum* Carr, Gard. Bull. 5: 33, pi. 13B. 1929.

Stems 15 cm. or more long, internodes to about 1 cm.; young leaves with some purple spots, especially on sheaths; leaves fleshy, to 12 by 2 cm., usually widest in the upper half, narrowed to base, tip rounded and unequally bilobed; scape 4 to 8 (rarely to 10) cm. long; rachis elongating to

15 cm., with the bracts 0.7 to 10 cm. wide, internodes 3 mm., bracts flattened, curved; sepals pale yellow, about 3-5 cm. long and 3 mm. or more wide at the base; petals a little shorter; lip white, orange-red-spotted near base, total length 9 mm.; side-lobes curved forwards, blunt; midlobe fleshy, laterally flattened; sac spotted purple inside, with a few hairs at the base only. Distributed through Sumatra, Borneo and Java; in Malaya found throughout the country except in the extreme south, as a lowland epiphyte in lightly shaded places. Fig. 174.

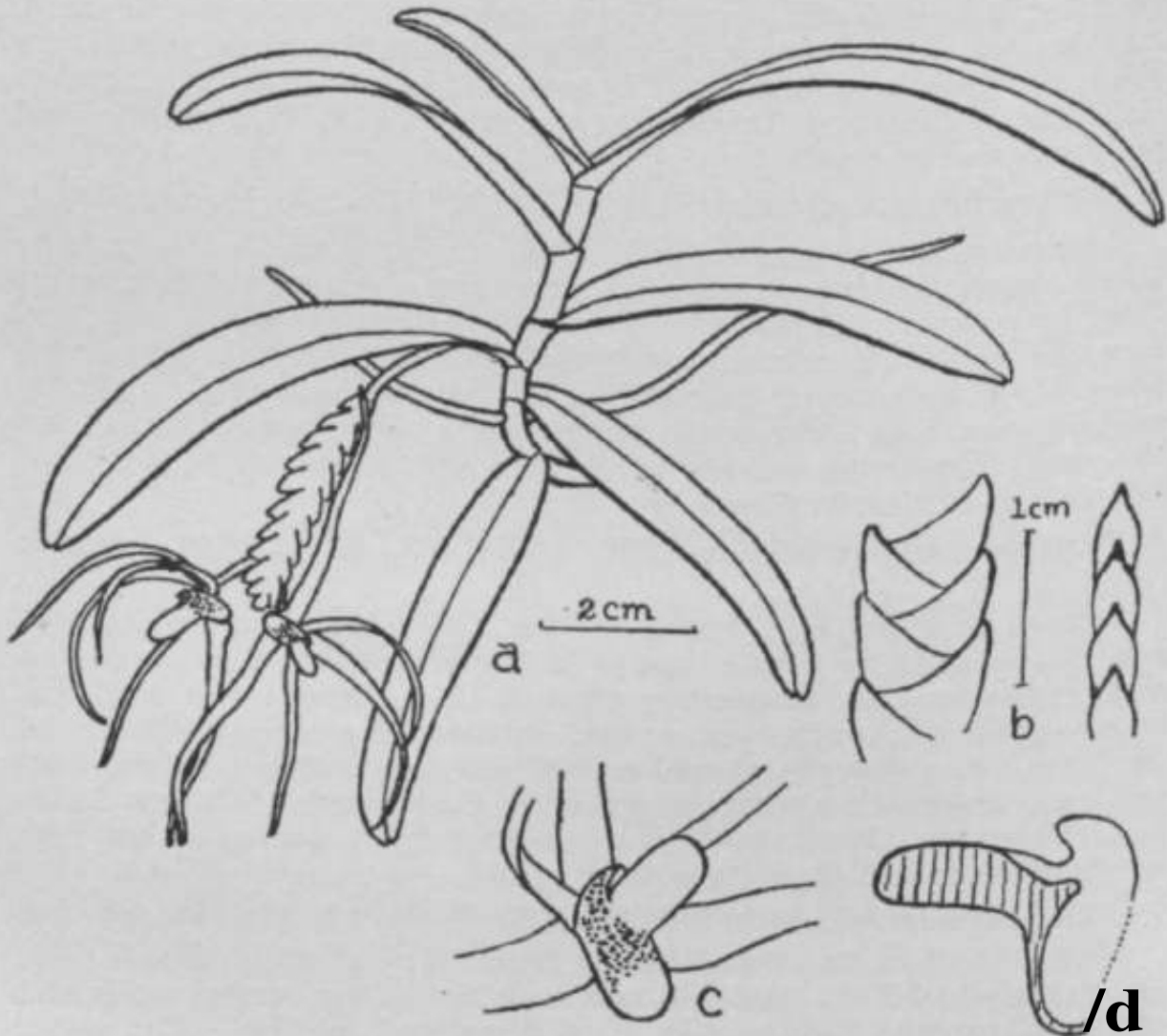


Fig. 174. *Thrixspermum arachnites*, a, plant in flower, b, bracts of the inflorescence from side and edge-on, c, lip, d, lip in section.

- 9. *Thrixspermum amplexicaule* (Bl.) Rchb. t.** Xen. Orch. 2: 121. 1867. J.J.S., Fl. Buit. 6: 573, f. 430.—*DendrocolUt amplexicanlis* Bl., Bijdr. 288. 1825.—*Sarcophilus lilaeinus* Griff., Notul. 3: 334. 1851. Ic. PL Asiat. 3: t. 320, f. 2.—*Thrixspermum lilacinum* Rchb. f., Xen. Orch. 2: 121. 1867. Ridl., Flora 4: 184.

Stems long, climbing, 3-4 mm. thick, pale yellow-green, often purple-spotted, with long white roots, internodes 3-5 cm. long; leaves to 5 by 2-5 cm., base broad, heart-shaped and clasping the stem, gradually tapered to

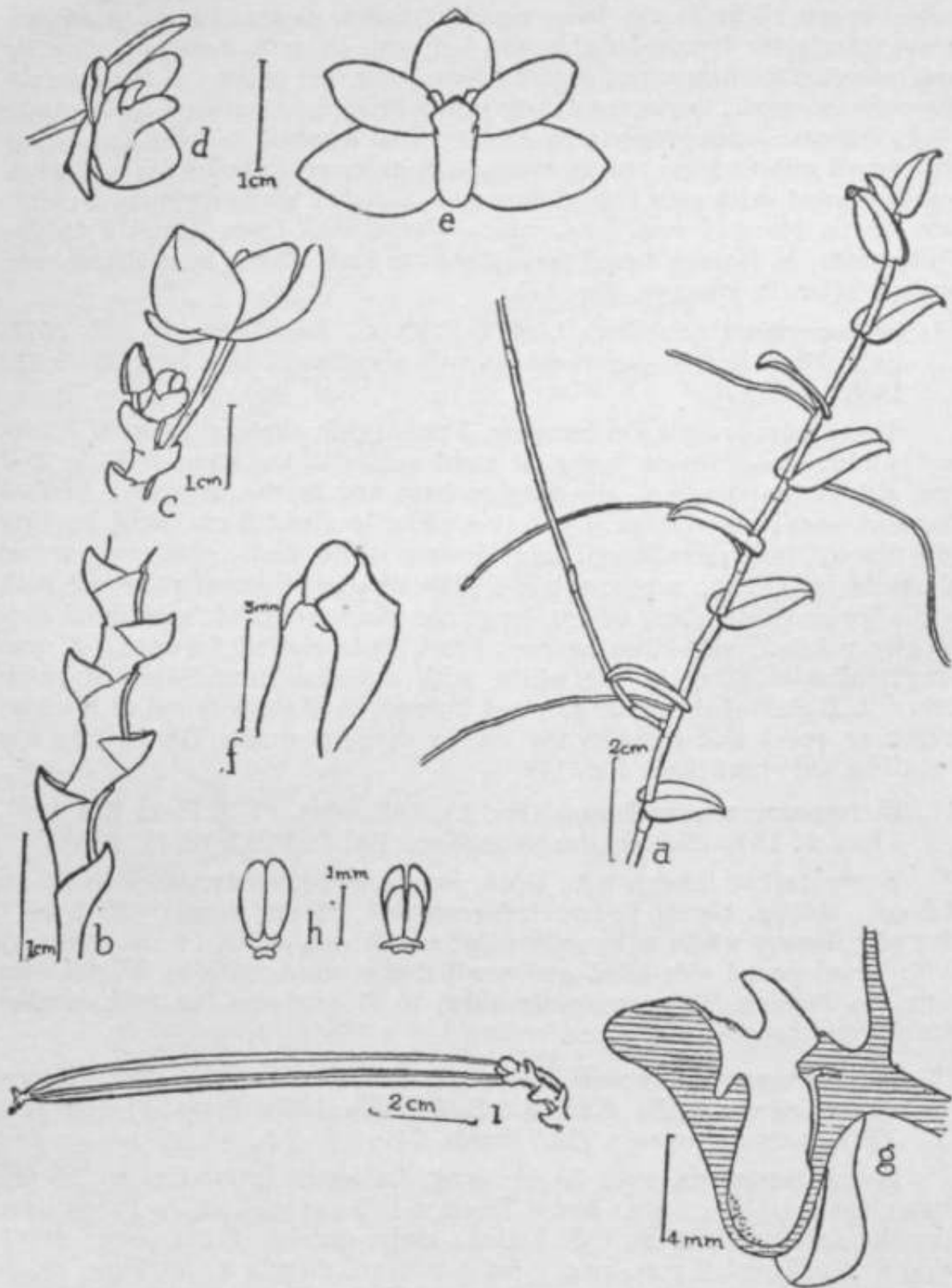


Fig. 175. *Tkrivapermum amplexicaule*. *a*, stem showing<sup>1</sup> leaves, aerial roots and base of inflorescence stalk, *b*, bracts of inflorescence, *c*, flower and flower buds in natural position, *d*, *e*, flower from side and from front. *f*, column and column, foot, *g*, section through column and lip. *h*, pollinia, *i*, fruit.

a blunt notched tip, yellow-green, the sheaths much shorter than the internodes; scape 15 to 25 cm. long, slender; rachis elongating to 10 cm. or more, internodes 5 mm. long, bracts 5-7 mm. long; flowers pale lilac or nearly white, wide-opening; sepals 1.6 cm. long, the upper 0.7, the laterals 0.9 cm. wide, ovate, the laterals decurrent a little on the column-foot; petals 1.3 by 0.6 cm., tips rounded; lip shorter than sepals, the sac 6 mm. deep with small yellow callus and an orange-red hairy patch below it; side-lobes small, pointed, with ends curved forwards, blotched white and mauve; mid-lobe fleshy, blunt, 4 mm. long, white. Distributed from Sumatra to the Philippines; in Malaya found throughout, in open places, scrambling over bushes, often in swamps. **Fig. 175.**

10. **Thrixspermum calceolus** (Lindl.) Rchb. f., Xen. Orch. 2: 122. 1867. Ridl., Flora 4: 184.—*Sarcochilus calceolus* Lindl., Bot. Reg. 32: t. 19. 1846.

Stems long, creeping or hanging, 5 mm. thick, slightly flattened, internodes 2 cm. long; leaves fleshy, at right angles to the stem, 6-10 by 2-3 cm., oblong, narrowed to the twisted base and to the unequally bilobed rounded apex; inflorescences 1-3 at a node, to about 3 cm. long, bearing few flowers, the bracts 7 mm. long; flowers white, fleshy, fragrant; sepals about 2.5 by 1.0 cm., acute; petals a little smaller; lip orange-yellow with white tip and side-lobes, 1.5 cm. long; sac short, rounded; midlobe fleshy, bluntly pointed; side-lobes narrow, erect, ends curved forwards, 4 mm. long; callus in front of sac white, with a yellow orange-spotted patch below it. Distributed in Sumatra and Borneo; in Malaya found in the lowlands, on rocks and trees in the sun or in light shade. The flowers are beautiful but short-lived. **Fig. 176.**

11. **Thrixspermum pauciflorum** (Hk. f.) Ridl., Mat. Fl. M.P. 1: 182. 1907. Flora 4: 184.—*Sarcochilus pauciflorus* Hk. f., F.B.I. 6: 41. 1890.

Stems rather long, 5 mm. thick, leaves well-spaced; leaves to 7.5 by 3.5 cm., oblong, blunt, fleshy; inflorescences 2.5 cm. long, with 2 or 3 flowers; flowers white with yellow lip; sepals and petals 1.6 cm. long; lip with broad round side-lobes and small fleshy blunt midlobe. Found once only, on Taiping Hills; evidently allied to *T. calceolus* but with smaller flowers and broader side-lobes.

12. **Thrixspermum platycaule** Holtt., Gard. Bull. 11: 292. 1947.—*Sarcochilus anceps* Ridl., J.S.B.R.A.S. 54: 53. 1909. Flora 4: 180 (not *Thrixspermum anceps* (Bl.) Rchb. f.).

Stems pendulous, over 30 cm. long, flattened, internodes to 2.5 cm. long; leaves to 5 by 2 cm., fleshy, blunt, a little twisted at the broad base, sheaths flattened and sharply keeled; scape slender, 2 cm. long; rachis slightly thickened, 7 mm. long, 3- or 4-flowered, bracts 2 mm. long; sepals and petals salmon, the upper sepal 1.0 by 0.5 cm., blunt, the laterals joined for a short distance to the column-foot; lip small, about 4 mm. long, the sac 3-4 mm. deep; side-lobes 3 mm. long, curved, acute, scarlet with white tips; midlobe very short, rounded, with scarlet tip passing to yellowish red towards base of sac. A very interesting and distinct species, collected only once, in Johore.

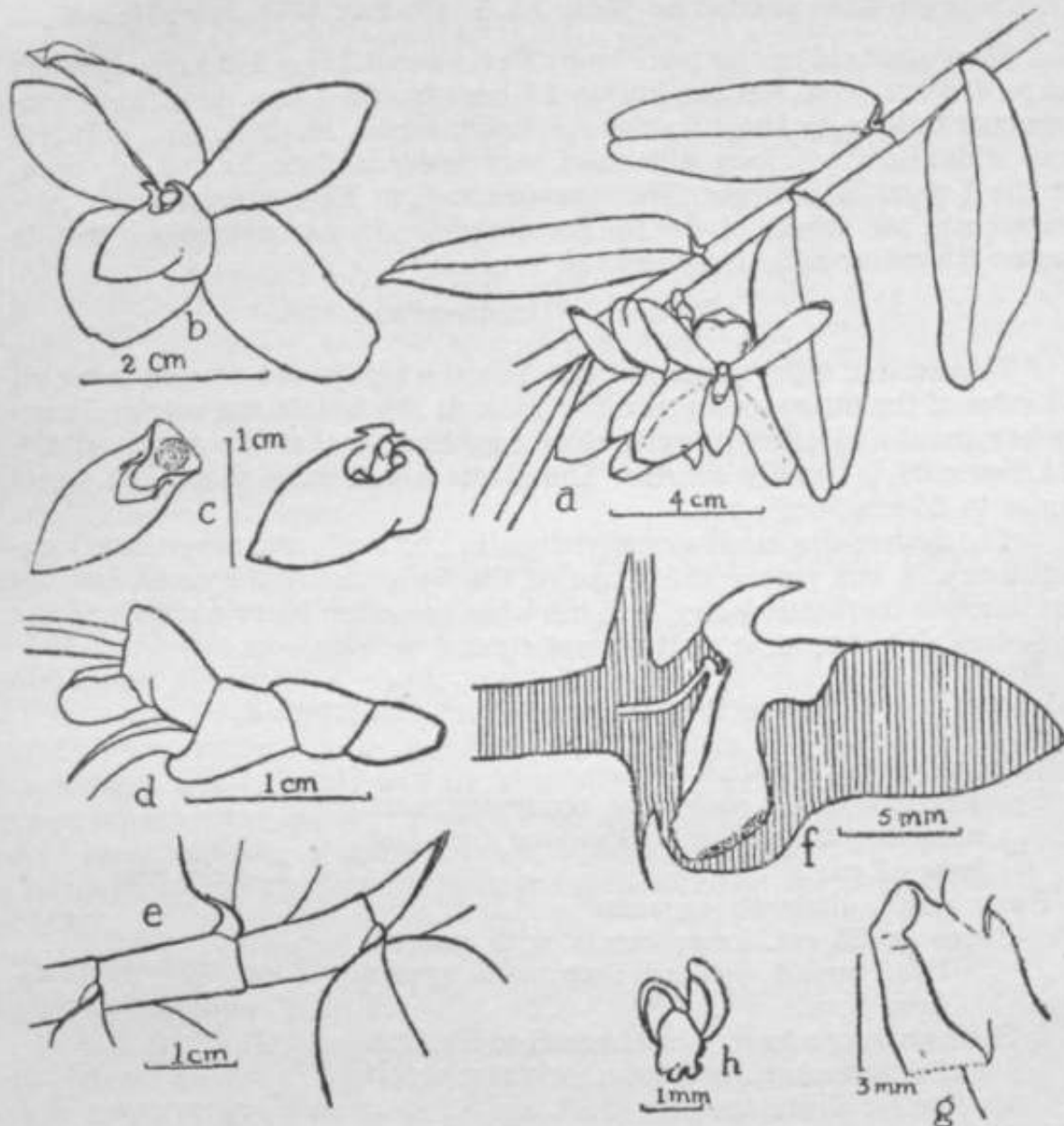


Fig. 17fi. *Thrixspermum calceolus*. *a*, part of stem, and inflorescence, *b*, flower, *c*, lip, *d*, inflorescence bracts, *e*, leaf bases at tip of stem, to show twisting. *f*, section through column and lip. *g*, column and column-foot, the anther having been removed, *h*, pollinia from back.

**13. *Thrixspermum brevibracteatum* J.J.S., Bull. Botz., Ser. 3, 10: 71. 1928; Suppl. III: t. 112, III.**

Stems to 50 cm. or more long, internodes 15-2-5 cm.; leaves to 8 by 1-5 cm., oblong, unequally bilobed; scapes 2-5 to 10 cm. long; rachis to 3' cm. or more, with the bracts 6-7 mm. wide, internodes 4 mm., upper edges of bracts 3-5 mm. long; flowers yellow (pale or bright); upper sepal about 1-1 by 0-6 cm., laterals wider towards the base; petals a little smaller; lip shaped much as in *T. amplexicaule* but the side-lobes broader, yellow with red markings, the midlobe white. Originally described from Sumatra; in Malaya found at Cameron Highlands at 4,000-5,000 feet, and on G. Kerbau at 7,000 feet.

**14. *Thrixspermum montanum* Ridl., J.L.S. 41: 298. 1913. Flora 4: 185.**

Stem stout, 15 cm. or more long; leaves about 15 by 2-2.5 cm., oblong; scape 4-6 cm. long, slender, rachis 1.5 cm.; bracts 3 mm. long, not overlapping; flowers to about 7; flowers small, sepals 10 by 4 mm., petals 2 mm. wide; lip 6 mm. long with short very fleshy midlobe. Found only once, at Ulu Langat in Selangor. The type-specimen at Kew is imperfectly preserved and the details of the lip are not clear. It may not belong to this genus. No colour-notes are recorded.

**Section 2 (*Dendrocolla*)**

This section differs from Section 1 in the bracts and flowers being on all sides of the inflorescence, not two-ranked. The bracts are nearly always rather small and narrow, quite close together, so that the rachis of the inflorescence is usually shorter. The stems are usually short, but sometimes to 25 cm. long.

The flowers are usually smaller than in Section 1, and never have long-tailed sepals and petals. The shape of the lip is much the same, but the sac is more frequently hairy, and the lobes are often hairy also. The hairs are often club-shaped, with thickened tips.

**Key to the Malayan species of Section 2**

Sepals and petals spotted

Spots bright purple, coalescing, occupying more area than the yellow background except at base of parts . . . . . 1. *T. pulchrum*

Spots small, distinctly separate

Stems to 25 cm. long; bracts with narrow tips, turned upwards; spots on sepals deep purple . . . . . 2. *T. pardale*

Stems to 4 cm. long; bracts broad to the tips, fleshy, ends turned down; spots on sepals pale red-brown . . . . . 3. *T. recurvum*

Sepals and petals unspotted, white or pale yellowish

Lip not hairy

Side-lobes of lip narrow, curved forwards

Stems slender, to 10 cm. long, sepals 6 mm. long, an orange spot on lip . . . . . 4. *T. psiloglottis*

Stems stout, to 20 cm. long; sepals 8-9 mm. long, no spot on lip . . . . . 5. *T. carinatifolium*

Side-lobes of lip broad, erect, not curved forwards

Stem short with few flat leaves 11 mm. wide . . . . . 6. *T. dulplocallosum*

Stem elongate with many fleshy leaves 5-6 mm. wide . . . . . 7. *T. brevicapsularis*

Lip hairy, at least in part

Saccate base of lip with a long slender spur . . . . . 8. *T. tenuicalcar*

- Saccate base of lip without slender spur  
 Midlobe of lip narrowly triangular, long-pointed . . . . . 9. *T. rubrocallosum*  
 Midlobe of lip short and blunt  
 Leaves terete . . . . . 10. *T. Corneri*  
 Leaves not terete  
 Sepals 5-6 mm. long .. .. 11. *T. carnosum*  
 Sepals over 6 mm. long  
 Rachis to 3 cm. or more long, bracts 4-5 mm. long  
 Leaves to 6 cm. long; bracts narrowly pointed . . . . . 12. *T. trichoglottis*  
 Leaves to 15 cm. long; bracts broadly pointed .. 13. *T. Ridleyanum*  
 Rachis not over 1 cm. long; bracts shorter 14. *T. album*

1. **Thrixspermum pulchrum** Carr, Gard. Bull. 7: 48, pi. 5A. 1932.

Stem 2 cm. long, leaves about 6; leaves to 3-7 by 1-2 cm., tip unequally bilobed, narrowed gradually to base; scape shorter or longer than leaves; rachis about 10-flowered, short, bracts triangular, acute, fleshy; flowers 1-3 cm. wide, fragrant; sepals and petals yellow, densely blotched with bright purple except at base; upper sepal 6-7 by 3-4 mm., widening from narrow base, blunt; petals to 6 by 3 mm.; lip deeply saccate, with white clubbed hairs on the side-lobes and inside front of sac, yellow with a few purple spots outside; side-lobes erect, bluntly triangular; midlobe very short, blunt, hairy. Only known from the original collection from Krambit, Pahang.

2. **Thrixspermum pardale** (Ridl.) Schltr., Orchis 5: 3. 1911.—*Dendrocolla pardalis* Ridl., J.L.S. 32: 382. 1896. Flora 4: 187.

Stems slender, to 25 cm. long, internodes 0.5 to 1.5 cm.; leaves to 8 by 1 cm. (exceptionally to 1.3 cm. wide), narrowed to base and unequally bilobed apex; scape slender, to 25 cm. long; rachis elongating to 5 cm., the bracts very close, narrowed to a slender tip, ascending (except the lowest); flowers about 1.4 cm. wide, cream or nearly white with deep purple spots; upper sepal 7.5 by 4.5 mm., widest in upper half; lateral sepals a little wider; petals smaller; lip deeply saccate; side-lobes erect, rounded, merging forwards into the short rounded midlobe; the whole inside and edges of the lip conspicuously hairy. Distributed in Borneo and Sumatra; in Malaya found in Perak and Pahang only, locally common on village trees, and also in the forest.

3. **Thrixspermum recurvum** (Hk. f.) Carr, Gard. Bull. 5: 151. 1930.—*Sarcochilus recurvus* Hk. f., F.B.I. 6: 39. 1890. Ic. Pl. t. 2122.—*Thrixspermum brevicaule* Carr, Gard. Bull. 5: 35, pi. 15. 1929.—*Dendrocolla pardalis* quoad Ridl., Flora 4: 187, p.p.

Differs from *T. pardale* in the following characters: stems short, 2-4 cm. long, leaves few, close; scapes to 15 cm. long; bracts broader, more fleshy, spreading horizontally, the broad tips downturned; flowers with

pale red-brown spots, the lip less hairy. Only known from Pahang and Perak, from few localities, on small trees near rivers.

4. **Thrixspermum psiloglottis** (Ridl.) Schltr., Orchis 5: 3. 1911.—*Sarcophilus psiloglottis* Ridl., Tr. L.S. 3: 372. 1893.—*Dendrocolla psiloglottis* Ridl., Mat Fl. M.P. 1: 187. 1907. Flora 4: 189.

Stems to 10 cm. long, 2 mm. thick, flattened, internodes 5-7 mm.; leaves to 7 by 1 cm., tip rounded and bilobed, base narrowed almost to a stalk and flattened laterally; scape to 10 cm. long, slender; rachis to 1.5 cm., the bracts 4 mm. long, narrow, rather distant; flowers pale yellow; sepals about 6 mm. long; sac of lip rather deep; side-lobes narrow, curved, white, longer than midlobe; midlobe short, slightly recurved, an orange spot at its base within. Only known from the original collection from Kuala Pahang. This is evidently nearly related to the next species, and might be only a variety of it.

5. **Thrixspermum carinatifolium** (Ridl.) Schltr., Orchis 5: 3. 1911.—*Sarcophilus carinatifolius* Ridl., J.S.B.R.A.S. 23: 136. 1891.—*Dendrocolla carinatifolia* Ridl., J.L.S. 32: 382. 1896. Flora 4: 189.—*Thrixspermum batuense* J.J.S., Bull. Dep. Ag. 22: 47. 1909.

Stems to 18 cm. long, 3 mm. thick, flattened, internodes 5-7 mm.; leaves to 6 by 1.5 cm., apex broadly rounded and unequally bilobed, base narrowed almost to a short stalk; scape to 12 cm. long; rachis to 4 cm., bracts 5 mm. long, acute, not very close; flowers white or faintly yellowish; sepals 8-9 mm. long, rather narrow, laterals with the lower edge suddenly curved upwards above the much widened base; sac of lip curved, conical; side-lobes narrow, curved, 3 mm. long; midlobe shorter, broad and blunt; callus rounded. Distributed in Sumatra and Java (and to Christmas Island); in Malaya known only from South-East Johore and Pulau Aor. Apparently this species usually grows near the sea.

6. **Thrixspermum duplocallosum** Holtt., Gard. Bull. 11: 290, fig. 5. 1947.

Stem about 4 cm. long, bearing few leaves, internodes 4 mm. long; leaves 6 cm. long, 11 mm. wide, not fleshy, tip bilobed, lower surface flushed with purple; scape purple, 4.5 cm. long, rachis 8 mm. long, bracts 2 mm. long, broadly triangular, purplish; pedicel and ovary 5 mm. long; sepals and petals white, very faintly tinged with mauve; upper sepal 6.5 mm. long, little over 3 mm. wide, laterals 4 mm. wide; petals little over 2 mm. wide; lip as long as sepals and petals, hairless, orange with dull crimson calli, side-lobes erect, 2.5 mm. high, rounded, their forward edges not prominent, midlobe little over 2 mm. wide, semi-circular with a toothed edge, downturned; calli 2, one at the base of the midlobe, in shape like an additional midlobe with free bilobed forward end, the other on base of lip, longitudinally extended, with short free ends; column white, 2.5 mm. long, foot as long, pale mauve; fruit purple, 5.5 cm. long. Only known from Cameron Highlands, on a tree near Robinson's Falls. **Fig. 177, a-c.**



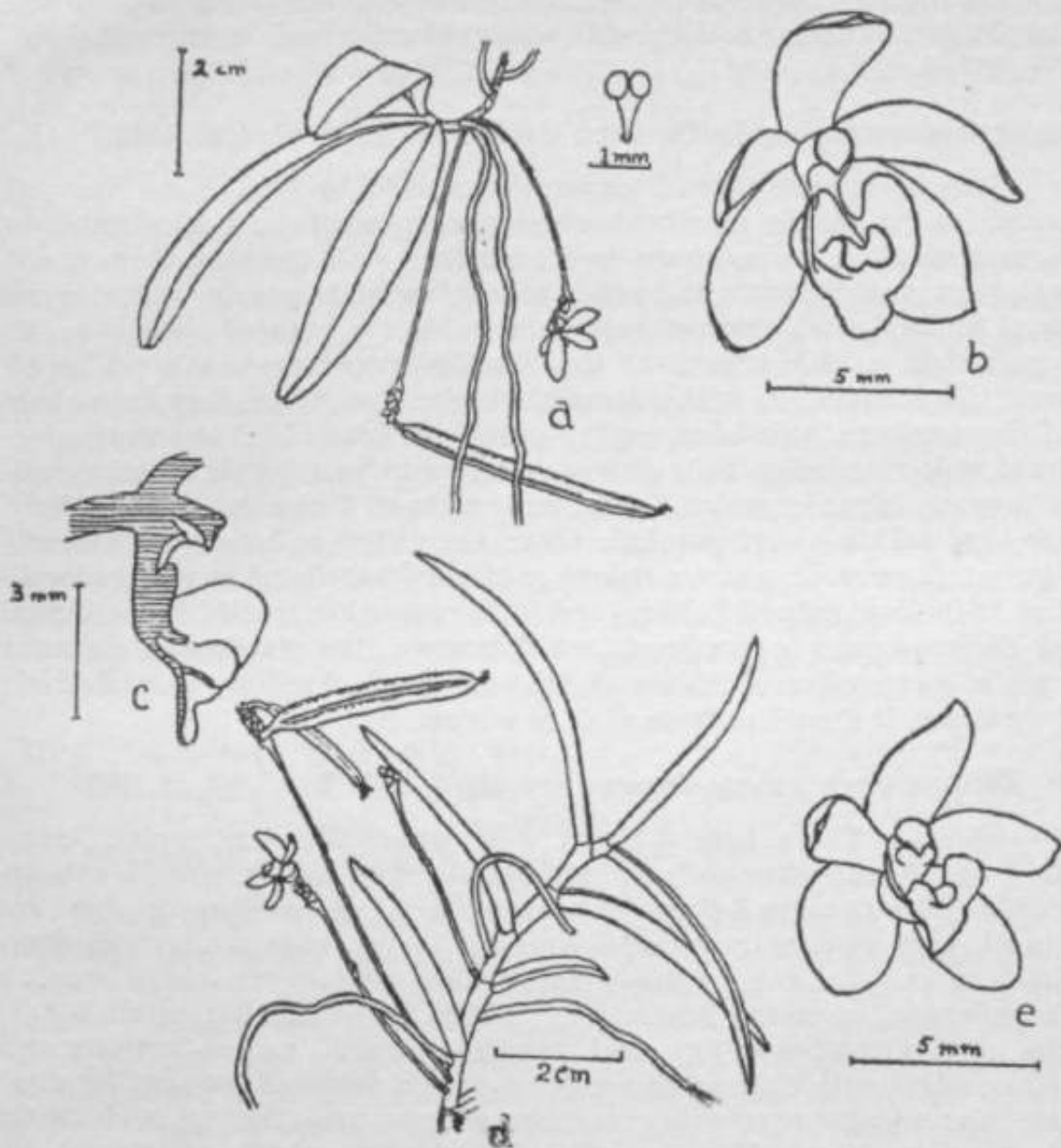


Fig. 177- *Thrixspermum duplocaltoaum*. a, plant in flower and fruit, b, flower from front, c, section through column and lip. *T. brevicapsularis*. d, plant in flower and fruit, e, flower from front.

7. *Thrixspermum brevicapsularis* Holtt, Gard. Bull. 11: 290, fig. 5. 1947.

Stem 18 cm. long, many-leaved, internodes 10 mm. long; leaves 4-5 cm. long, 5-6 mm. wide, very fleshy, narrowed gradually to acute bilobed apex, purple-spotted on both surfaces; scape 4-6 cm. long, rachis elongating to 10 mm., bracts 1 mm. long, very thin with only the tip projecting beyond the cylindrical rachis, pale green; flowers shaped as in *T. duplocallosum* but sepals and petals faintly cream, lip yellow with a deep orange flush in central part and radiating lines near base, front callus dull orange, back callus dull purplish at forward end, midlobe triangular with acute apex,

edges not toothed; fruit 3-3.5 cm. long, green with slight purple mottling. Only known at Cameron Highlands, on an old coffee bush in exposed place. *Fig. 177, d, e.*

8. ***Thrixspermum tenuicalcar*** Carr, Gard. Bull. 7: 46, pi. 4, C. 1932.

Stem short, with about 5 leaves; leaves to 8.5 by 1 cm., apex recurved acute, base gradually narrowed, edges purple; scape to 8 cm.; rachis to 5 cm. with 50 or more flowers in succession, 1 or 2 together; flowers not widely expanded; sepals and petals pale yellowish to nearly white; upper sepal 8.5 by 5 mm., concave, curved forwards, tip rounded; lateral sepals asymmetric, a little wider, the tips slightly spreading; petals 8.5 by 4.5 mm., tips rounded; lip with a straight slender spur 8 mm. long at the base of the usual sac; side-lobes erect, 9 mm. from base of column to tip, forward ends rounded, slightly hairy, with longitudinal purple streaks; midlobe ovate, edges irregular, 5 mm. wide at base, 3 mm. long, pale yellow, the base within hairy, purplish, above the yellow callus; pollinia nearly equal, in 2 pairs, on a stipes as long as themselves. Found at various localities in the lowlands of Pahang, and in Borneo. This species is not typical of *Thrixspermum* in two important characters: the presence of a sphenaei spur as continuation of the sac, and the almost equal pollinia on a relatively long stipes. It should perhaps rank as a separate genus.

9. ***Thrixspermum rubrocallosum*** Carr, Gard. Bull. 5: 37, pi. 16. 1929.

Stems to 10 cm. long, 2-3 mm. thick, internodes about 5 mm.; leaves to 8 by 1.3 cm., often suffused and spotted with purple, apex blunt, unequally bilobed, scape 2-6 cm. long; rachis to 1.5 cm. long, bracts short and broad, with short narrow tip; flowers 1.5-1.8 cm. wide, white, wide-opening; upper sepal 6-8 by 2.5-3 mm., widest near apex; lateral sepals, a little larger, spreading horizontally, widest below middle; petals 1.5 by 1.5 mm.; side-lobes of lip erect, broadly rounded, curved towards each other, edges with clubbed hairs; callus with a deep red spot on the upper surface; midlobe narrowly triangular, 4.5 mm. long, 2.5 mm. wide at the base, either sharply bent backwards towards the column or straight, the edges with clubbed hairs. Found at many localities in the lowlands of Pahang, Negri Sembilan and Johore, and in Borneo. A variety with flowers strongly violet-tinted throughout is sometimes found.

10. ***Thrixspermum Corneri*** Holtt, Gard. Bull. 11: 292. 1947.

Stem very short; leaves about 3, terete, to 4 cm. long and nearly 3 mm. thick; scape 1 cm. long; rachis thickened, short, bracts broad, short, shortly pointed; pedicel and ovary 5 mm. long; flowers very pale yellow, the lip with faint brown markings; upper sepal 4.5 by 3 mm., broadly pointed; lateral sepals broadly decurrent on the column-foot, 4 mm. wide; petals 2.5 mm. wide, widest near the blunt tip; lip 4 mm. long from base of column to tip of midlobe, from tip of side-lobes to base of sac 7 mm.; side-lobes erect, broadly rounded; midlobe cut off short, without any blade, thickened

and very short-hairy; callus cleft, with a zone of rather long hairs below it to the base of the sac; column very short; foot 2-5 mm. long. Found only once, at Mawai in Johore, by the Sedili River; a very distinct species.

11. **Thrixspermum carnosum** (Ridl.) Schltr., Orchis 5: 3. 1911.—*Dendrocolla carnosa* Ridl., Journ. Bot. 1898: 216. Flora 4: 188.

Stem to 5 cm. long, internodes about 3 mm.; leaves to 8 by 0.8 cm., tip narrow, bilobed, base gradually narrowed; scape slender, 3-8 cm. long; rachis to 4 cm., bracts about 2 mm. long, broadly triangular; flowers pale yellow-green or nearly white, translucent; sepals 5-6 mm. long, petals smaller; side-lobes of lip rounded; midlobe short, triangular, the callus at its base large and woolly-hairy; outside spur pale yellow, inside a line of furry brown hairs. Found on Penang Hill and near Ipoh only. The mass of woolly hairs is evidently conspicuous, but has not been accurately described from living plants, and its exact position is not sure. Near Kota Tinggi in Johore has been found a similar plant, differing in having the callus not woolly-hairy. The whole flower is pale yellow, with 4 or 5 orange spots outside the lip at the angles between side- and midlobes and an orange spot at the apex of the spur; the flowers are strongly fragrant. This may be a distinct species.

12. **Thrixspermum trichoglottis** (Hk. f.) O. Ktze., Rev. Gen. Pl. 2: 682. 1891. J.J.S., Bull. Botz., Ser. 3, 3: 320. 1921; 6: t. 15, I. 1924.—*Sarcochilus trichoglottis* Hk. f., F.B.I. 6: 39. 1890. Ic. PL t. 2123.—*Dendrocolla trichoglottis* Ridl., J.L.S. 32: 381. 1896. Flora 4: 187.

Stems to 25 cm. long, 3 mm. thick, internodes 0.7 to 1 cm.; leaves leathery, to 6 by 1.2 cm., widest near rounded unequally bilobed apex; inflorescences many, often 2 to a node; scapes to 6 cm. long; rachis to 3 cm., bracts close, stiff, 4 mm. long; flowers pale yellowish, spotted only on the lip; upper sepal about 9 by 3.5 mm., widest above the middle; laterals a little wider, widest below the middle; petals 2.5 mm. wide; lip with sac 4 mm. deep; side-lobes erect, rounded, midlobe very short, triangular, edges of lobes and the interior of the sac clubbed-hairy, longest hairs on side-lobes; yellow-brown or orange spots on the side-lobes and sometimes also on outside of midlobe; callus in lip broad, low, orange. Distributed in Sumatra, Java and Borneo; in Malaya found in the lowlands at many localities from Singapore to Perak and Pahang. This species grows on small branches of trees, among the leaves, in fairly open places. **Fig. 178.**

33. **Thrixspermum Ridleyanum** Schltr., Orchis 5: 4. 1911.—*Dendrocolla maculata* Ridl., J.L.S. 32: 381. 1896. Flora 4: 188. (not *T. maculatum* Schltr.).

Stem to 12 cm. long, internodes 7-10 mm.; leaves to 15 by 1 cm., apex abruptly rounded-bilobed; scape 3-10 cm. long; rachis to 6 cm., bracts broad, acute but not narrowly pointed, 5 mm. long; flowers pale greenish-yellow with red spots on lip only; upper sepal about 9 by 4 mm.; petals

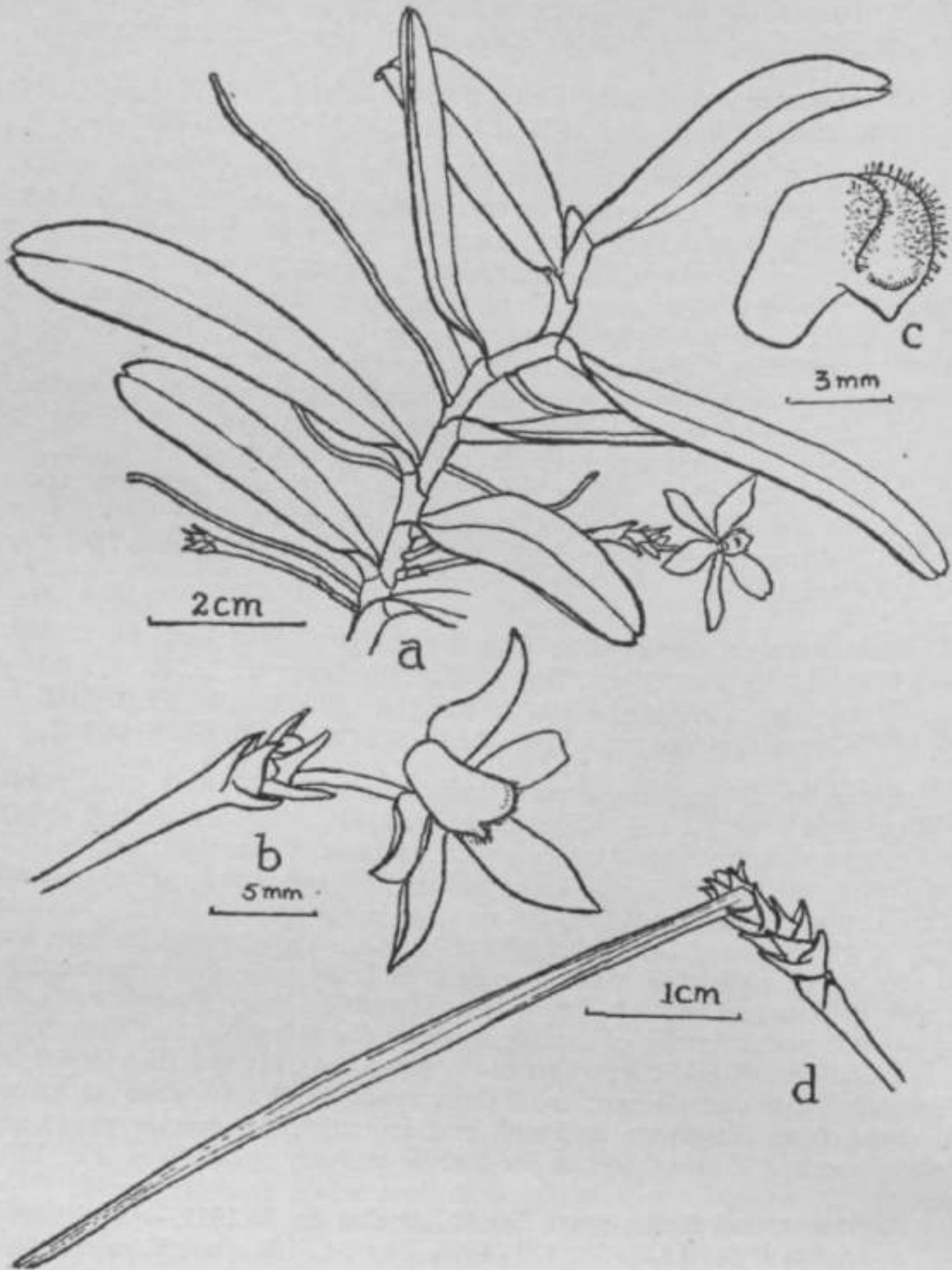


Fig. 178. *Thrixpsarmitis trichoglottis*. *a*, apex of stem, and inflorescences, *b*, apex of inflorescence, showing bracts and flower, *c*, lip, *d*, apex of fruiting inflorescence with capsule.

smaller; lip with deep narrow sac; side-lobes rounded, red-spotted, with clubbed hairs *on* the edges; midlobe narrow, short, with shorter hairs; spur faintly spotted. Only found in Singapore Island.

14. **Thrixspermum album** (Ridl.) Schltr., Orchis 5: 2. 1911.—*Dendrocolla alba* Ridl., J.S.B.R.A.S. 44: 191. 1905. Flora 4: 188. Carr, J.M.B. R.A.S. 6: 60, pi. 16. 1928.

Stem to 10 cm. long, internodes 2-7 mm.; leaves to 10 by 0.9 cm., narrowed a little to bilobed tip, lobes acute; scape to 15 cm. long; rachis under 1 cm. long, bracts 3-4 mm. long, acutely pointed; flowers 1-4 together, 1.2 to 1.5 cm. diameter, white or pale yellowish; upper sepal 6-10 by 2.5-3 mm., base narrow, apex acute, curved backwards; petals 5.5-8 by 2.2-5 mm., widened from a narrow base; lip 6.5 mm. from apex of midlobe to tip of sac; side-lobes triangular, much taller than column, rather long clubbed-hairy on the edges; midlobe short and broad, densely short-hairy inside; callus a truncate lamina, obliquely pointing forwards, with a small orange spot, sac spotted brown inside. Distributed to Sumatra; in Malaya found in the lowlands of Perak and Pahang, in fairly open places (formerly collected on coffee-bushes). This species is very closely allied to *T. trichoglottis*, and perhaps the two should be united.

## 5. ARACHNIS

Stems long, climbing, much branched (or in some non-Malayan species shorter, hanging); leaves oblong or somewhat narrowed to the tip, bilobed; inflorescence short or long, erect or pendulous, simple or branched, with few or many rather large flowers; sepals and petals almost equal, spreading, usually narrow, widening to the tips, with recurved edges; petals and lateral sepals usually curved downwards towards their tips; lip attached to a short massive column-foot by a very short thin elastic hinge, fleshy, 3-lobed, with a very short spur usually pointing backwards; side-lobes broad, usually almost rectangular, erect on either side of the column, their ends more or less diverging; midlobe fleshy, with a low or high median keel, interrupted near the base, and (in Malayan species) a fleshy chin-shaped callus below the tip; column short and thick, with a short foot; pollinia 4, almost equal, in 2 pairs, on a short broad stipes with a large disc.

This genus was formerly included in *Renanthera*. As at present limited, *Arachnis* consists of about 15 species, extending from Burma and Indo-China southwards throughout Malaysia. In Malaya we have three species, one of them being a natural hybrid between the other two. They are popularly called Scorpion Orchids, owing to the peculiar shape of their flowers, the curved lateral sepals representing the claws of the scorpion, the upper sepal its tail. Outside Malaya, there are four other groups of species, with flowers of rather different shape, but agreeing in the hinged lip with its keels, and in the structure of the column and anther. Some of these species are very handsome, and are cultivated; they are mentioned below after the Malayan species.

The Malayan species are all long climbing plants, which form thickets over small trees and bushes, especially in old mangrove and near the sea. They are also common garden plants throughout Malaya, and grown for the cut-flower trade, especially the white Scorpion Orchid (*A. Hookeriana*) which flowers frequently in Singapore.

### Key to the Malayan species of *Arachnis*

- Sepals and petals cream, with only very small purple spots . . . . . 1. *A. Hookeriana*
- Sepals and petals with large spots and bars  
 Midlobe broad with a low keel; sepals and petals yellow-green with dark purple-brown markings . . . . . 2. *A. flos-seris*
- Midlobe narrow with high keel; sepals and petals nearly white with light purple or pinkish markings . . . . . 3. *A. Maingayi*

- 1. *Arachnis Hookeriana*** (Rchb. f.) Rchb. f., Bot. Centralbl. 28: IV, 343. 1886.—*Rena?ithera Hookeriana* Rchb. f., Xen. Orch. 2: 42, t. 113. 1862.—*Arachnanthe alba* Ridl., Tr. L.S. 3: 369. 1893.—*Arachnis alba* Schltr., Fed. Rep. 10: **197. 1911.** Ridl., Flora 4: 159.

Internodes of stem 2-3 cm.; leaves stiff, obliquely ascending, to 9 by 1.8 cm., widest near base, edges decurved, especially near base where they are slightly toothed, running round the stem in a stiff recurved frill at the top of the sheath on the side remote from the blade; inflorescences erect, unbranched, about 60 cm. long, the scape 30 cm., dark purplish, flowers 6 to 8; flowers 6.5 cm. high and 5.5 cm. wide; sepals and petals creamy white, yellowish towards the widened tips, with very small purple spots mainly in middle third; upper sepal about 4 cm. long; lateral sepals and petals spreading about equally above and below the horizontal, ends only slightly curved downwards, ends of petals 9 mm. wide; lip with slightly diverging side-lobes, their ends only slightly recurved, shorter than the column; midlobe with rather high narrow keel sloping downwards almost straight to the tip. with a very small callus below the tip, the upper surface entirely purple or with 6 purple stripes. Distributed in Borneo, the Rhio Archipelago and other islands south of Singapore, and the coastal districts of Malaya, especially the east coast as far north as Trengganu, where it grows in scrub on sandy soil 100-500 yards from the sea. Commonly called the white Scorpion Orchid, and also known as *Arachnis alba*. This species is much cultivated and flowers frequently in Singapore. **Fig. 179.**

*Var. luteola.* No purple colour in any part of flower or rest of plant (scape yellow-green) ; petals and sepals more yellow towards the tips than in the usual form; lip pale yellow. This variety was found among plants brought into Singapore for cultivation, and has been propagated.

*Var. viridipes.* Scape bright green, petals almost spotless; midlobe with 6 purple stripes. A very clean-looking and attractive variety.

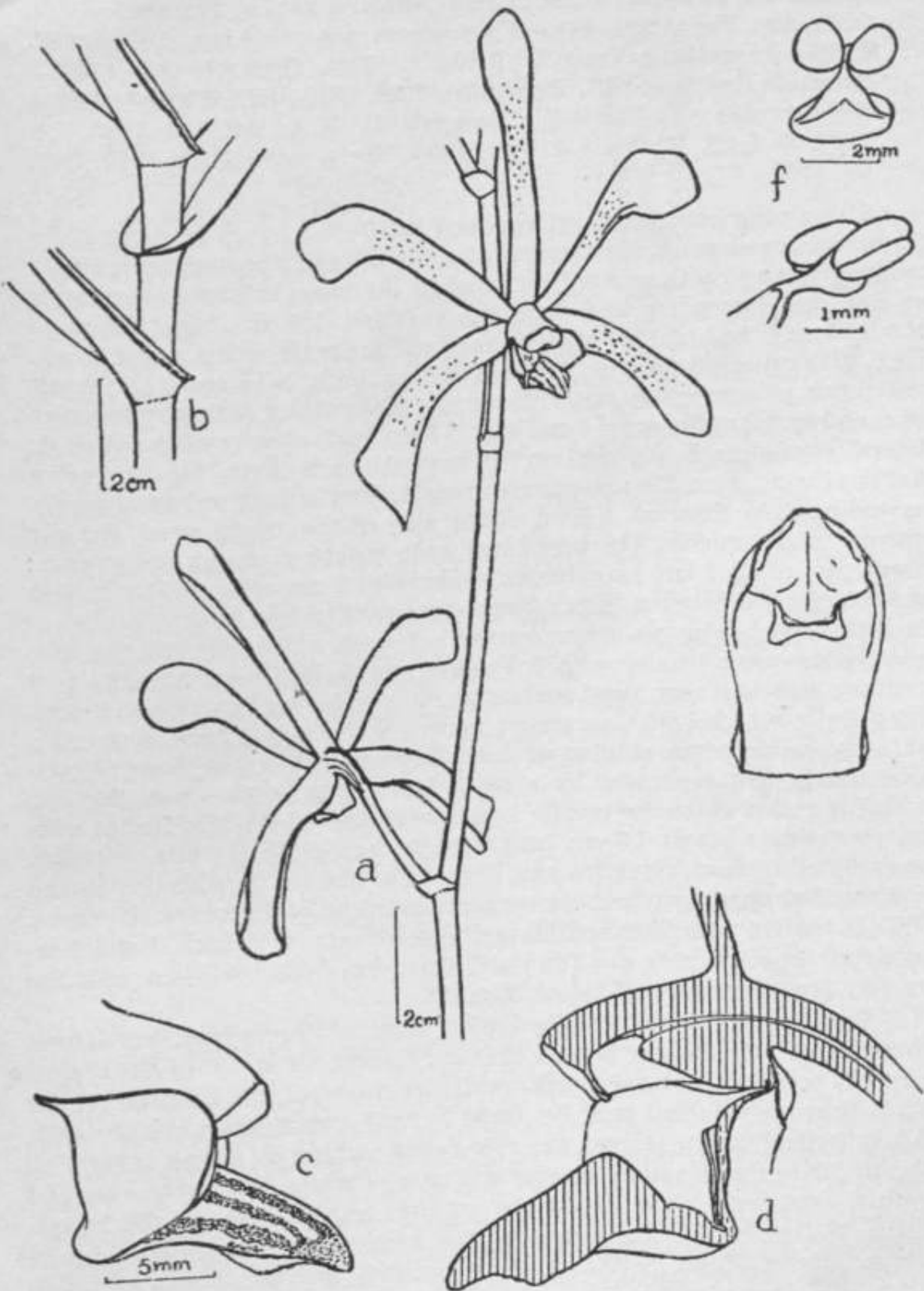


Fig. 179. *Arachnis hookeri*, a two flowers; b, stem with leaf bases, showing frill; c, side view of flower; d, section through column and hypochrysalis; e, front view of pollinium; f, side view of pollinium.

2. *Arachnis flos-aeris* (L.) Rchb. f., Bot. Centralbl. 28: IV, 343. 1886. J.J.S., Orch. Jav. Fig. Atl. f. 437.—*Epidendrum flos-seris* Linn., Sp. Pl. 952. YlbZ.—*Renanthera flos-xris* Rchb. f., Xen. Orch. I: 88. 1858.—*Arachnis moschifera* Bl., Bijdr. 365, f. 26. 1825. Ridl., Flora 4: 159.—*Arachnanthe moschifera* Bl., Rumphia 4: 55, t. 196, 199. 1848.—*A. flos-teris* J.J.S., Fl. Buit. 6: 584. 1905. Var. *gracilis* Holtt, MOR. 2: 65. 1935.

Stems very long, stout, internodes 4 to 10 cm.; leaves to about 17 by 5 cm., narrowed gradually towards the 2-lobed apex, curved and slightly twisted, edges smooth and not recurved at the base; inflorescences simple or branched, ascending and drooping, to about 150 cm. long, the scape about 25 cm., the branches at right angles to the main rachis, about 15 cm. long, with usually 3 flowers; flowers 9-11 cm. high, 7-8-5 cm. wide; sepals and petals pale yellow-green, with broad and irregular dark purple-brown bars and spots; upper sepal 6 cm. long, 1.5 cm. wide at apex when flattened; lateral sepals much shorter, curved towards each other, the tips when flattened wider than the upper sepal; petals about as long as lateral sepals, ascending from base at 45° on either side of the upper sepal, sharply curved in the middle, the broadened ends pointing almost downwards; basal part of lip 1 cm. long, bearing side-lobes 1 cm. wide and as long as the column, and between them several close parallel smooth orange ridges; ends of side-lobes purple-brown, curved outwards a little, towards the base pale yellow-green banded with dull purple; midlobe 1.4 cm. long, its base running back to a very short horizontal spur, widening forwards to 8 mm., tip broadly rounded with an abrupt narrow white point 3 mm. long and a chin-like callus below, making an acute angle with the apex; base of midlobe nearly flat, separated by a small transverse groove from the rest which is raised down the middle into a low keel and slightly flushed with purple; column nearly 1.5 cm. long, 1.0 cm. thick at base, white or cream. Distributed in Java, Sumatra and Borneo; in Malaya found in Perak and Pahang, but apparently not common, on limestone and perhaps elsewhere. This is the true scorpion orchid, and has a musky fragrance. Precise records of its occurrence are few; and there has been confusion with the variety *gracilis* mentioned below. **Fig. 180.**

*Var. gracilis.* Habit of the typical form of the species, but lateral branches of inflorescence always shorter; flowers about 4/5 of the typical size, the petals and lateral sepals usually more curved, the side-lobes of the lip with more recurved tips, the basal banded area shorter, midlobe with 6 longitudinal purple stripes, the chin-callus making an obtuse angle with the tip, the column rather smaller and always white, the scent sweet and rather unpleasant, quite unlike the peculiar musky odour of the typical form. Native in the mangroves of the west coast of southern Malaya (especially of Negri Sembilan and Selangor) but not known certainly elsewhere. In cultivation this variety flowers usually once a year in Singapore, about June, the typical form of the species flowering usually twice, in May and November.



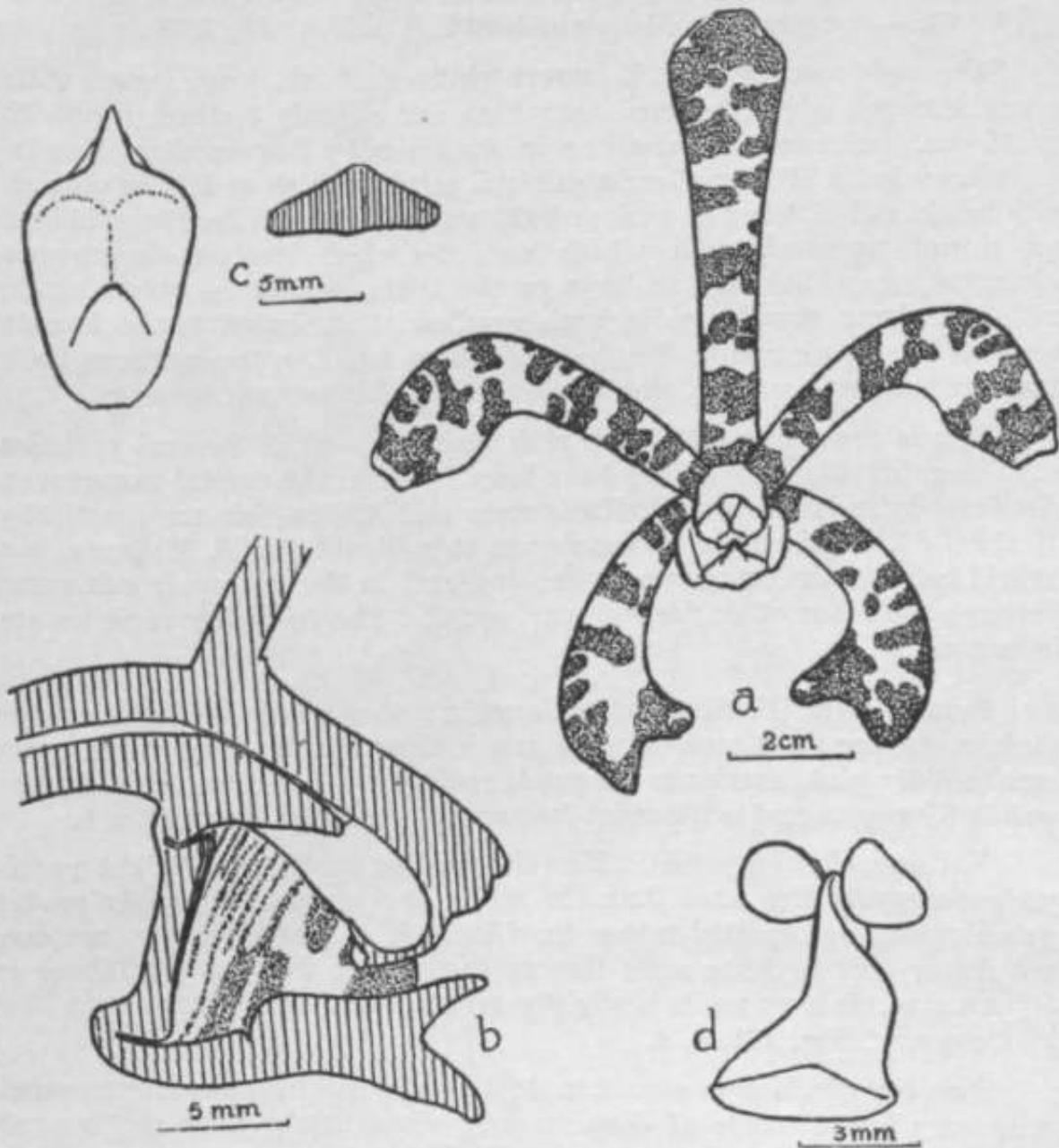


Fig. 180. *Aracknis fics-aeris*. a, flower from front, b, section through column and lip, c, midlobe of lip, upper surface and section, rf, pollinia and disc-

*Var. insignis*. Identical with var. *gradlis*, but leaves when young flushed with purple, flowers a little smaller (about 8 cm. high), the sepals and petals wholly dark maroon, almost black towards the tips, with a dull shining waxy appearance, the column pure white. Native in Sumatra, and cultivated in Singapore, where it flowers simultaneously with var. *gradlis*. It has exactly the same odour.

3. *Arachnis Maingayi* (Hk. f.) Schltr., Fed. Rep. 10: 197. 1911. Ridl., Flora 4: 159.—*Arachnanthe Maingayi* Hk. f., F.B.I. 6: 28. 1890.

Stem red-brown when old, internodes 2.5 to 5 cm. long; leaves stiff, nearly straight, edges recurved near base and slightly toothed, about 12 by 2.5 cm.; inflorescences about as in *A. flos-seris*; flowers shaped as in *A. flos-seris* but a little smaller; sepals and petals whitish or faintly pinkish with bands and blotches of pink or light purple; lip with narrow midlobe, not abruptly pointed, with a high keel, the whole inclined downwards somewhat, the chin-callus as large as the apex, making an obtuse angle with it; column usually white, anther yellow. Distributed to the islands south of Singapore and to Borneo; in Malaya found in the southern half, **near** the sea, often with *A. Hookeriana* and *A. flos-seris* **var.** *gracilis*.

This is commonly called the pink Scorpion orchid. Several varieties exist in cultivation, and others have been found in the coastal mangroves. Artificial hybrids between *A. Hookeriana* and *A. flos-seris* are practically identical with wild plants, and there can be no doubt that *A. Maingayi* is a hybrid between the other two. It has (at least in the commonly cultivated variety) the odour of *A. flos-seris* **var.** *gracilis*. The following varieties are in cultivation.

*Typical form.* Flowers rather large, markings a rather light salmon pink, occupying more area than the pale background, the base of the upper sepal solidly pink, markings on petals mainly banded. This form flowers well in Singapore and is the most frequently cultivated. Fig. 181, a, b.

*Var. maculata* (spotted). Flowers smaller, mottling a bright purple pink, occupying less area than the white background, especially on the petals, which are spotted rather than banded. A pretty variety, but does not flower well in Singapore; flowers throughout the year at Tebrau in Johore, and perhaps needs a slightly cooler night temperature than that of Singapore. Fig. 181, c, d.

*Var. tricolor.* Leaves nearer to *A. flos-seris* than in typical form; sepals with very broad bands of deep maroon separated by very narrow pale bands; petals with wider pale bands; side-lobes of lip deep maroon, midlobe bright purple, column white, anther yellow. Said to have come from Sumatra, but origin uncertain. Behaves like *var. maculata* as regards flowering. This is a fine variety.

*Artificial hybrid A. Hookeriana X flos-seris.* This is very nearly the same as the typical form as *A. Maingayi*, but differently scented, and does not flower in Singapore.

**Maggie Oei** (*A. flos-seris X Hookeriana* **var.** *luteola*)

This has flowers as large as typical *A. flos-seris*, varying in colour, in shape near the typical *A. Maingayi*, differing in having a more restricted spotting of various shades from deep purple to pink or light yellow-brown. This flowers continuously in Singapore.

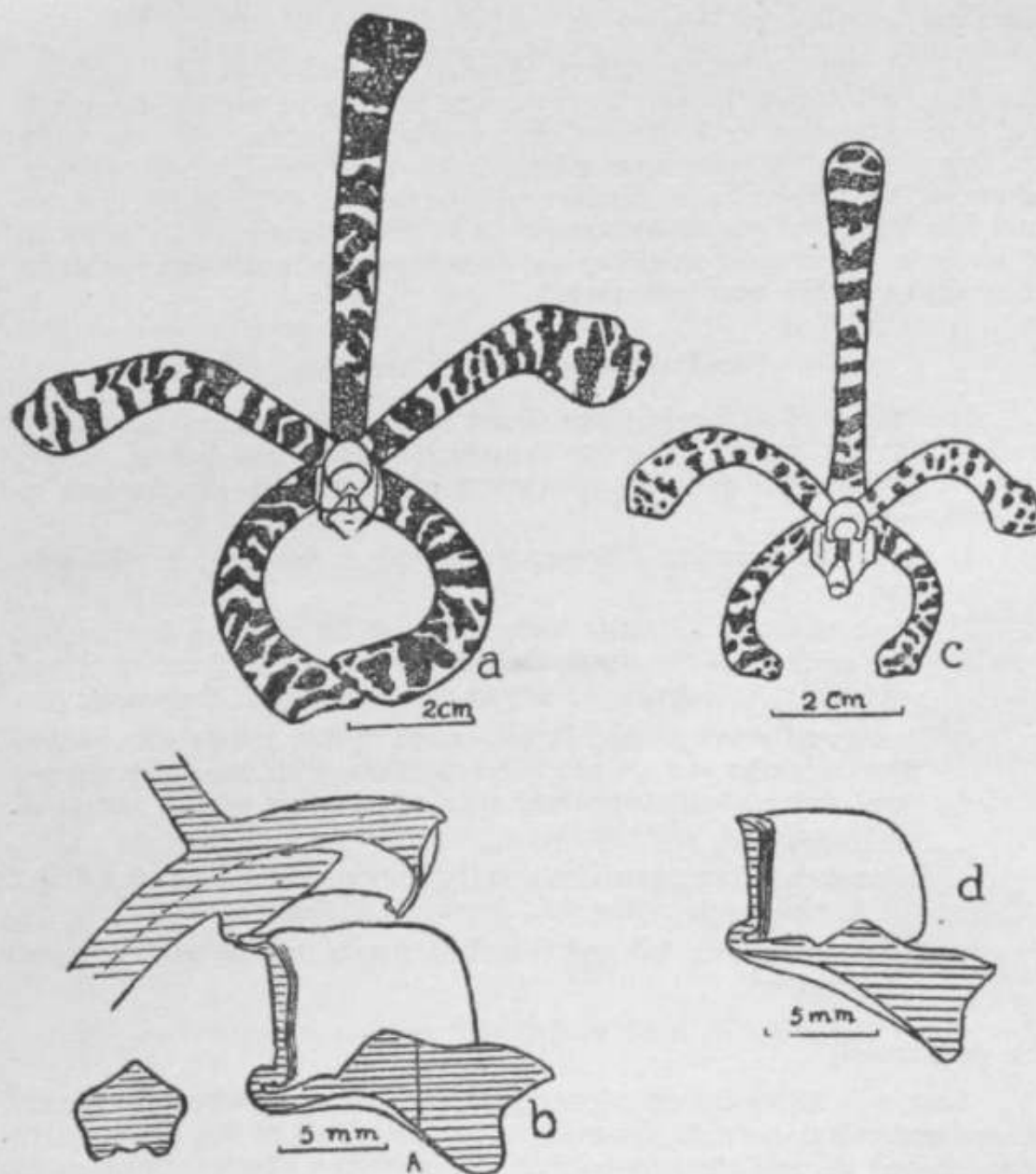


Fig. 181. *Arachnis Maingayi*. *a*, *c*, flowers of the typical form and var. *maculata*.  
*b*, section through column and lip, with transverse section of lip at point A,  
*d*, longitudinal section of lip of var. *maculata*.

Ishbel (*A. Maingayi* X *Hookeriana*)

A number of seedlings of this have been raised, all with different flowers, mainly intermediate between the two parents. The best variety has a lip near *Maingayi*, and would be classed botanically as *Maingayi*. It has an unbranched inflorescence, almost white flowers with small bright purple spots, and flowers continuously in Singapore. Another seedling has a branched inflorescence with flowers coloured as *A. Hookeriana* but as large as *A. Maingayi*.

### The Gem

A wild plant collected with *A. Hookeriana*. Inflorescence with two branches, each with 6 flowers, the main stem bearing 10 flowers; flowers 7 cm. high, shaped as in *A. Hookeriana*; sepals and petals yellow towards the tips, the basal 2/3 with large purple spots on a cream ground; column cream, anther yellow; lip with wider midlobe than in *A. Maingayi* and the keel less high. An interesting variety, with the influence of *A. flos-xris* showing in the broader midlobe; not free-flowering in Singapore. Many more such varieties may be expected.

### Non-Malayan species of *Arachnis*

The species of *Arachnis* which do not occur in Malaya are mostly of a rather different aspect from our Scorpion Orchids, and belong to five distinct groups, the principal characters of which are summarized as follows:—

1. Shape and colouring of flower resembling *A. flos-seris*: *A. annamensis*.
2. Sepals and petals usually wider; spur of lip pointing downwards, the midlobe of the lip turned abruptly down in front of it and widened: *A. Sulingi*, *A. labrosa*, *A. Clarkei*, *A. Cathcartii*.
3. Sepals and petals usually broad, cream or dull yellow with yellow-brown marks and crisped edges; midlobe with very high narrow keel and a slender upcurved tip; inflorescence usually short: *A. breviscapa*, *A. celebica*, etc.
4. Inflorescence long, pendulous, hairy; flowers red, except the first 2 or 3 which are yellow: *A. Lowii*, *A. Rohaniana*.
5. Inflorescence very tall and branched, woody, lasting several years: *A. Muelleri*.

#### *A. annamensis*

Leaves to 28 by 2.5 cm.; inflorescence 30 cm. long with 6 flowers of shape and colour near *A. flos-seris* but the side-lobes of the lip acute, incurved, and the midlobe long-pointed. An attractive species, which might be worth growing in Malaya.

**Group of *A. Sulingi*.** *A. Sulingi* (fig. 182) is native in Java and Sumatra and might turn up in Malaya. It has a short inflorescence of few flowers which are 4 cm. tall, dull pale yellow irregularly suffused with light warm brown, especially towards the bases of petals and sepals; the downturned midlobe of the lip is warty, cream spotted with purple. It is not a very decorative species. Its Himalayan relatives *A. Cathcartii* and *A. Clarkei* are however very fine. *A. Cathcartii* has pendulous stems 100 cm. or more long and leaves to 18 by 4.5 cm.; the inflorescences are up to 40 cm. long with 4-6 flowers about 8 cm. high with very broad sepals and petals narrowly barred throughout with yellow and chocolate brown, the lip with broad ridged midlobe. This species is native in the valleys of the

eastern Himalayas at 3,000-6,000 feet, in shade by the streams, and might be successful at Malayan hill-stations; at any rate it should be used for breeding. *A. Clarkei* is nearly related, but has rather smaller flowers, narrower sepals and petals with broader bands of colour, and occurs at rather higher elevations\* *A. labrosa*, native in Burma and Assam, is something like *A. Sulingi* but has larger and brighter-coloured flowers. It is not so fine as the other species. The hybrid *A. Sulingi* X *Hookeriana*, var. *luteola* (Catherine) flowers freely in Singapore.

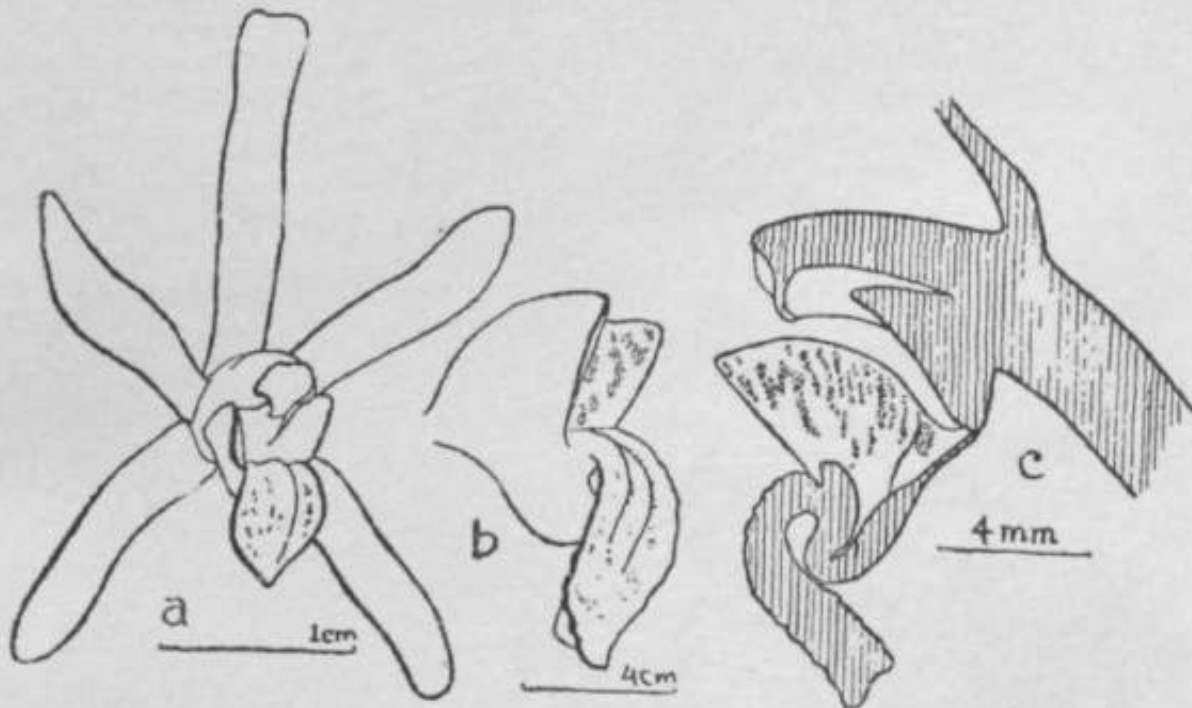


Fig. 182. *Arachnis Sulingi*. a, flower from front, b, lip. c, section through column and lip.

Group of *A. breviscapa*. This group consists of *A. breviscapa* (fig. 183) from Borneo, *A. celebica* from Celebes, *A. longicaulis* from New Guinea, which all have few-flowered short inflorescences. The sepals and petals are broad, with wavy edges, cream with large irregular warm or light brown markings, the lip rather small with slender upcurved tip. *A. breviscapa* flowers usually once a year in Singapore; the sepals are about 3-5 by 15 cm., so that the flower is fairly large and the colouring pleasant, but the shortness of the sprays (5 to 6 cm., with 2 to 6 flowers) restricts their usefulness. *A. breviscapa* will stand full sun, but is best with a little shade. It may be encouraged to flower by moving it to a rather more exposed position after the end of the wet season.

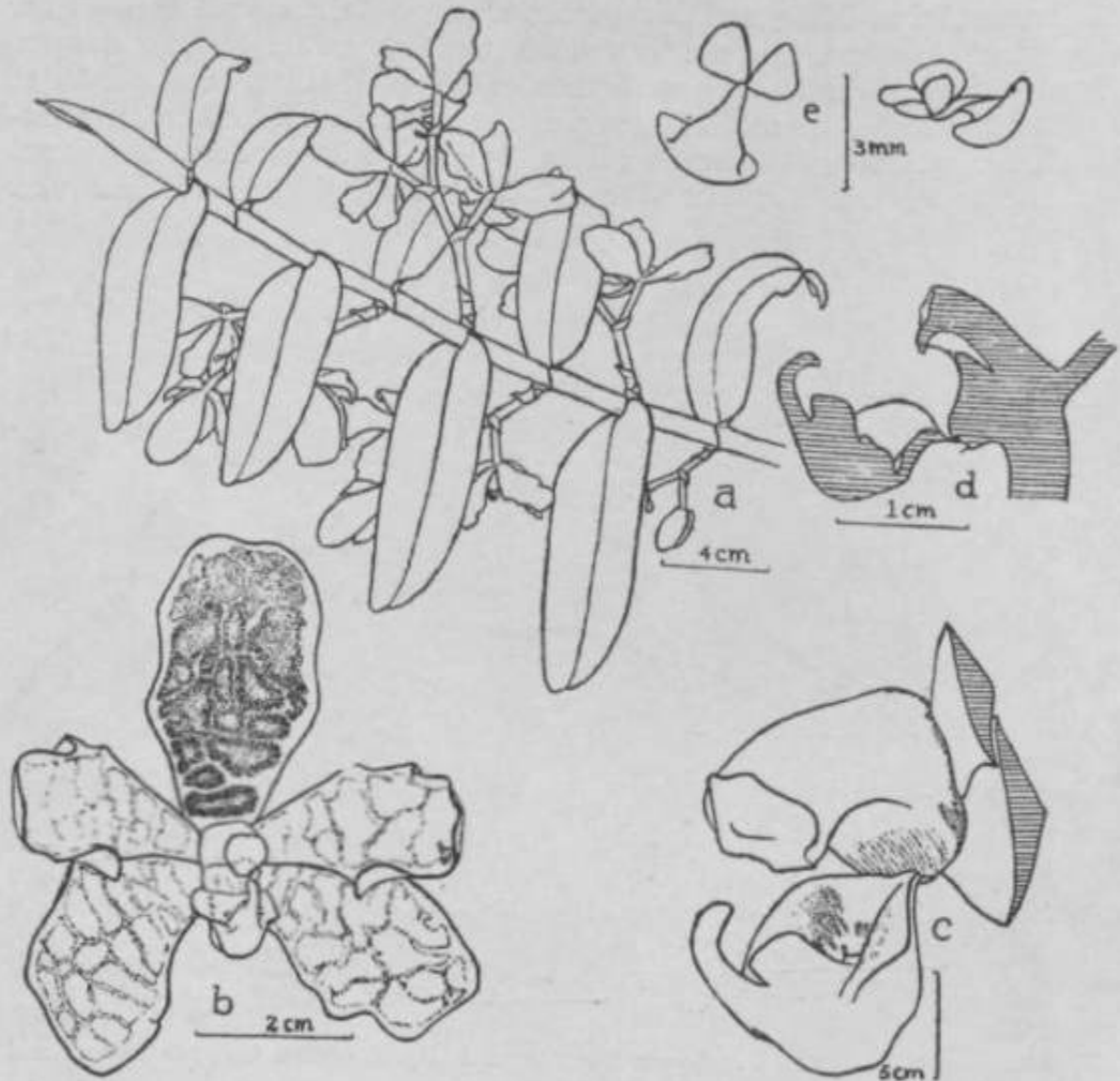
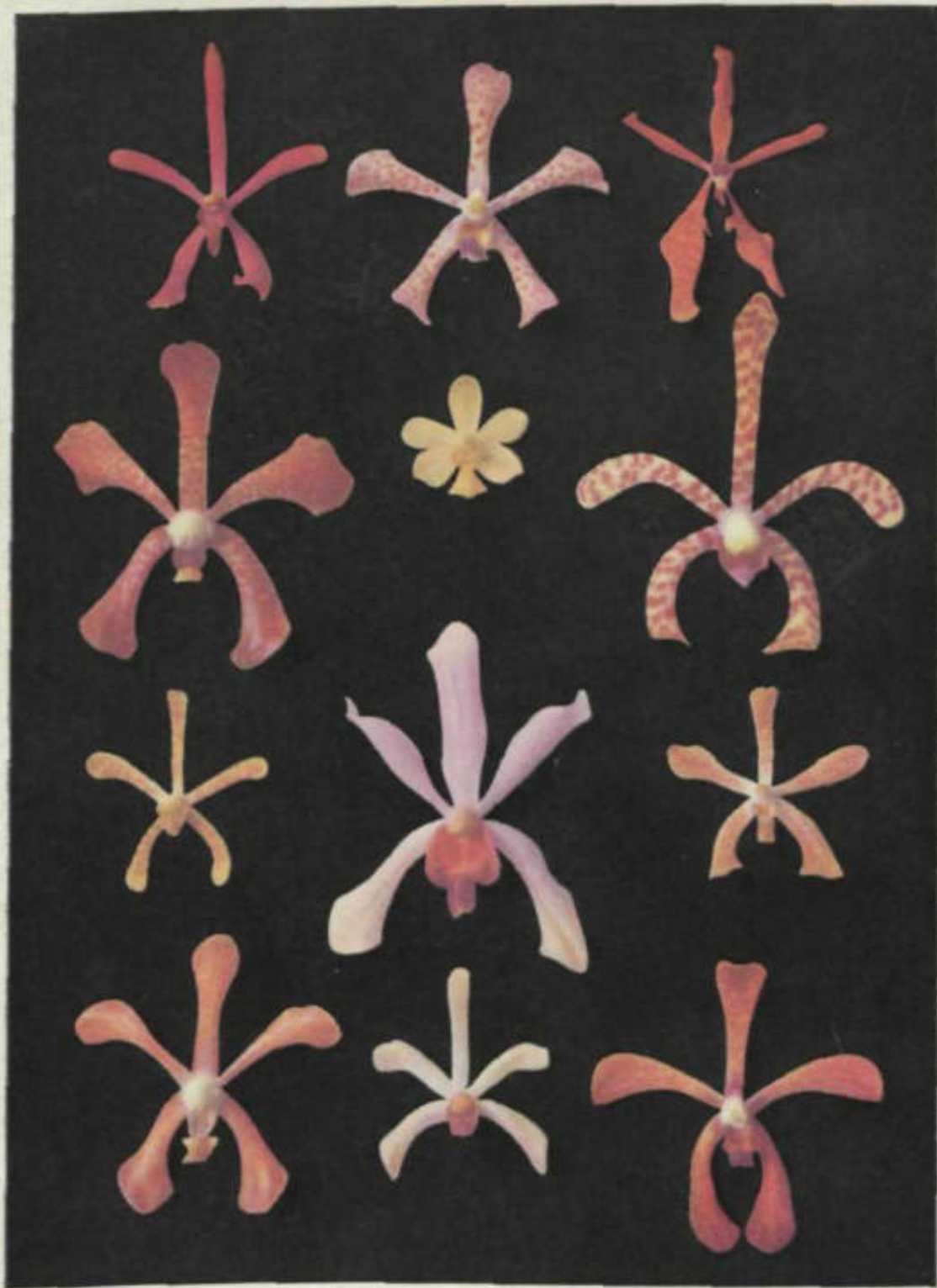


Fig. 183. *Arachnis breviscapa*. *a*, stem and inflorescences, showing the downward facing flowers, *b*, flower from front, *c*, lip and column from side, *d*, section through column and lip, showing attachment of lateral sepal, *e*, pollinia and disc.

#### A. Lowii

This remarkable species is native in Borneo, on trees overhanging rivers. It has large stems bearing broad leaves to 50 cm. long, and limply hanging inflorescences 200-300 cm. long, the flowers about 7 cm. apart. The first 1-3 flowers are yellow with small purple spots, the rest dark red with small pale markings, the lip with a very high thin keel and a slender straight point. The structure of the lip is essentially similar to that of *A. breviscapa*, but the habit of the plant very different. This species has been called *Vanda Loxvii* and *Vandopsis Louni*, but is certainly not a member of either of these genera. It grows well in Singapore, in light shade, and



Arachnis, Aranda, Aranthera, KtMianthera

X Aranthera  
X Mohamed Haniff

X Aranda  
X City of Singapore

X Arachnis  
X Catherine

X Aranda  
X Afei Ling

X Aranda  
X Hilda Galistan

X Vanda apathulata  
X Arachnis Hookeriaia

Aranda X Mars

Arachnis  
Hookeriana

Renanthera  
cocci nea

X Arachnis  
X Maggie Oei

Arandu  
X Deborah

X Aranda  
X Eileen Addison





strong plants usually flower once a year. They may be grown in tubs, fitted with charcoal for the roots, and supported with bricks and wooden posts. The roots should neither be manured nor watered in the drier part of the year; but the plants should be manured and watered in the wetter part of the year. Another method of dealing with very large plants is to grow them in rows of wooden posts. The roots should be manured and watered in the drier part of the year; but the plants should be manured and watered in the wetter part of the year. They will probably fail to flower. A plant with a dozen inflorescences ranks with a *Grammatophyllum* in the most remarkable objects in the orchid world. *Rohania* is similar in habit but with flowers, and a different form of the keels on the lip (see fig. 184).

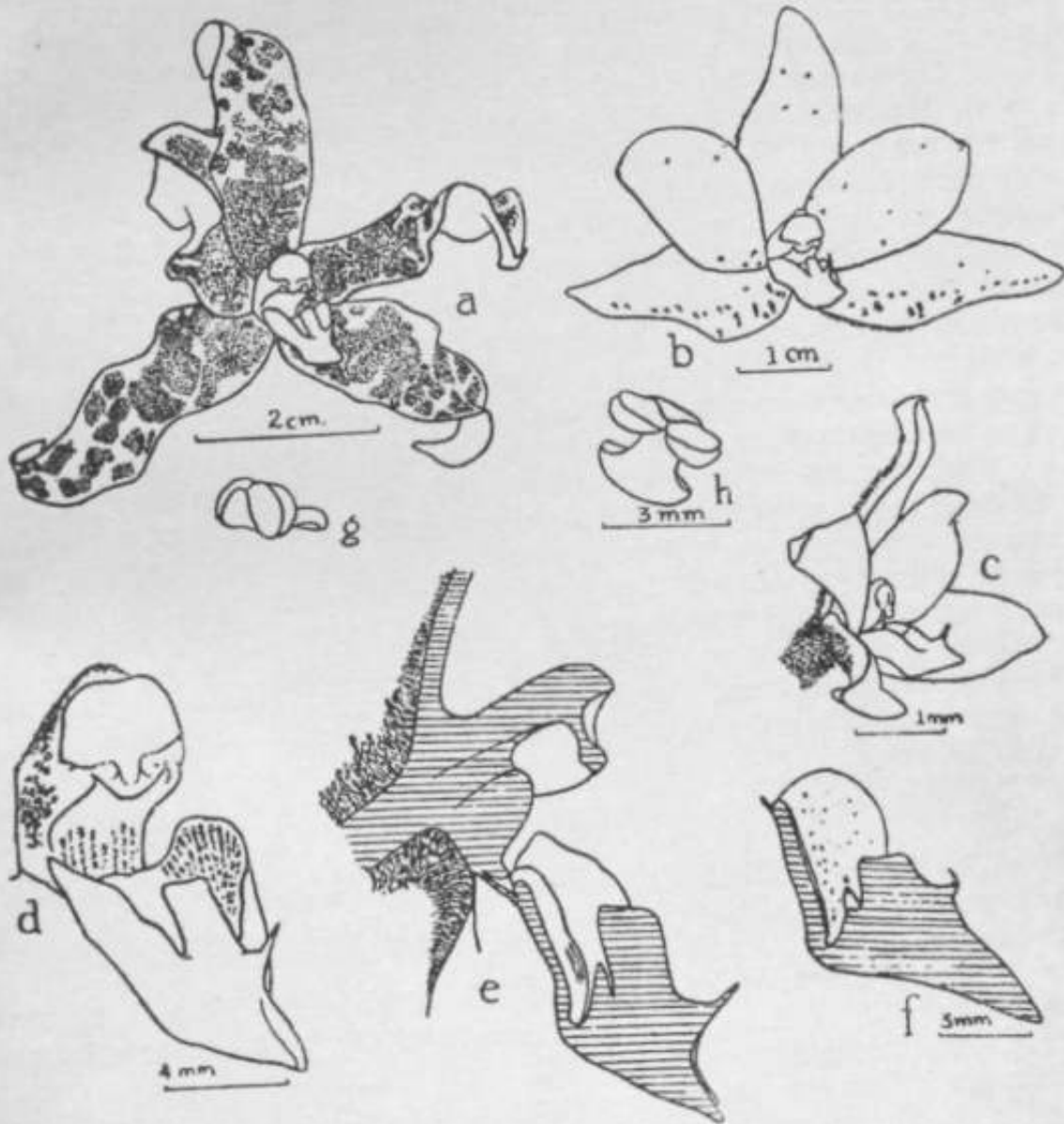


Fig. 184. *Arachnis Lowii*. a, flower from front. b, c, the yellow basal flower of the inflorescence. d, column and lip. e, section through column and lip. g, h, pollinia from side and from above. A. *Rohania*. f, lip in section.

**A. Muelleri**

This New Guinea species has stem and leaves rather like *Vandopsis gigantea*, and an inflorescence 5 metres tall, with a stout woody base and many branches which continue to bear flowers at intervals for several years. It never has many flowers open at one time, and is not decorative. The sepals and petals are pale yellow with light brown spots, and are shaped something like those of *A. Lowii*.

**Cultivation of Scorpion Orchids**

The Malayan Scorpion Orchids all need full sun if they are to flower freely. They also need some sort of support, and a layer of well-drained litter at the base to give shelter and food to the feeding roots.

*A. Hookeriana* (the white Scorpion Orchid) is much less vigorous in growth than the others, and short posts, 2 feet high above ground level, are satisfactory. Cuttings about 18 inches long may be tied to the posts, with their bases at ground level, and garden compost or cut grass piled around the base. A shelter of palm leaves should be placed overhead to protect the orchid cuttings from the sun until they have produced new roots, after which the cover may be removed, the plants being watered regularly in dry weather. The compost or cut grass must be regularly maintained in sufficient quantity to protect the feeding roots which will grow down into it and branch freely. When growth is well established, a generous mixture of cattle manure may be added to the compost.

The other species (*A. flos-zeris* and *A. Maingayi*) grow much larger and need taller supports. These may be tall separate posts, or a wooden arch, or a row of posts with a continuous horizontal bar at the top. The plants will not flower until they have free hanging branches. They need a litter round the roots exactly as *A. Hookertana*, and are grown easily from cuttings in the same way. Essentially the same treatment is given to *Renanthera coccinea* and *Vanda teres* with its hybrids; but these continue to grow erect above the top of their supports, and flower on the free ends of the stems.

**6. ACAMPE**

Like *Trichoglottis*, but no tongue or other structure at back of lip, and the flowers with the lip at the top, or pointing to the apex of the inflorescence.

This genus consists of a few species, mostly in the region of Burma to southern China. These have not been dealt with by the botanists who have re-arranged the orchids of the *Sarcanthus* group in recent years, and it is not certain how the genus should be limited. We are concerned here with only one species, which was among those originally called *Acampe* by Lindley in 1853, so that we are safe in assuming that it is properly so called.

*Acampe longifolia* Lindl., Fol. Orch., Acampe 1. 1853.—*Vanda longifolia* Lindl., Gen. et Sp. Orch. 215. 1833.—*Saccolabium longifolium* Hk. f., F.B.I. 6: 62. 1890. King & Pantl. Ann. Calc. 8: 220, pi. 292.—*Acampe penangiana* Ridl., J.L.S. 32: 358. 1896. Flora 4: 155.

Stems stout, often branched, internodes about 3 cm.; leaves thick, stiffly ascending, to about 20 by 35 cm., tip broad, unequal but hardly bilobed; inflorescence erect, with one or two short side-branches, in all about 15 cm. long, the scape stout, to about 10 cm., flowers close, the lip pointing upwards; flowers fleshy, not wide-opening, 1.5 cm. wide and high; sepals and petals pale lemon yellow with narrow crimson transverse stripes and spots; upper sepal 1.3 by 0.7 cm., end broadly rounded; lateral sepals about same size, slightly keeled; petals 1.2 by 0.35 cm.; lip white with few purple spots, 10 cm. long, very fleshy, saccate at the base, the sac 2 mm. deep; side-lobes erect, 2 mm. high, 3.3 mm. from back to front, hairy inside; midlobe bent down slightly, blunt, about 5 mm. long and 3 mm. wide, concave and hairy at the base; column short, with small horns shorter than the anther; pollinia 4, unequal, in 2 pairs, on a short narrow stipes, disc small. Distributed from the Sikkim Himalayas south to Penang and Langkawi, where it grows in rather exposed places. **Fig. 185.**

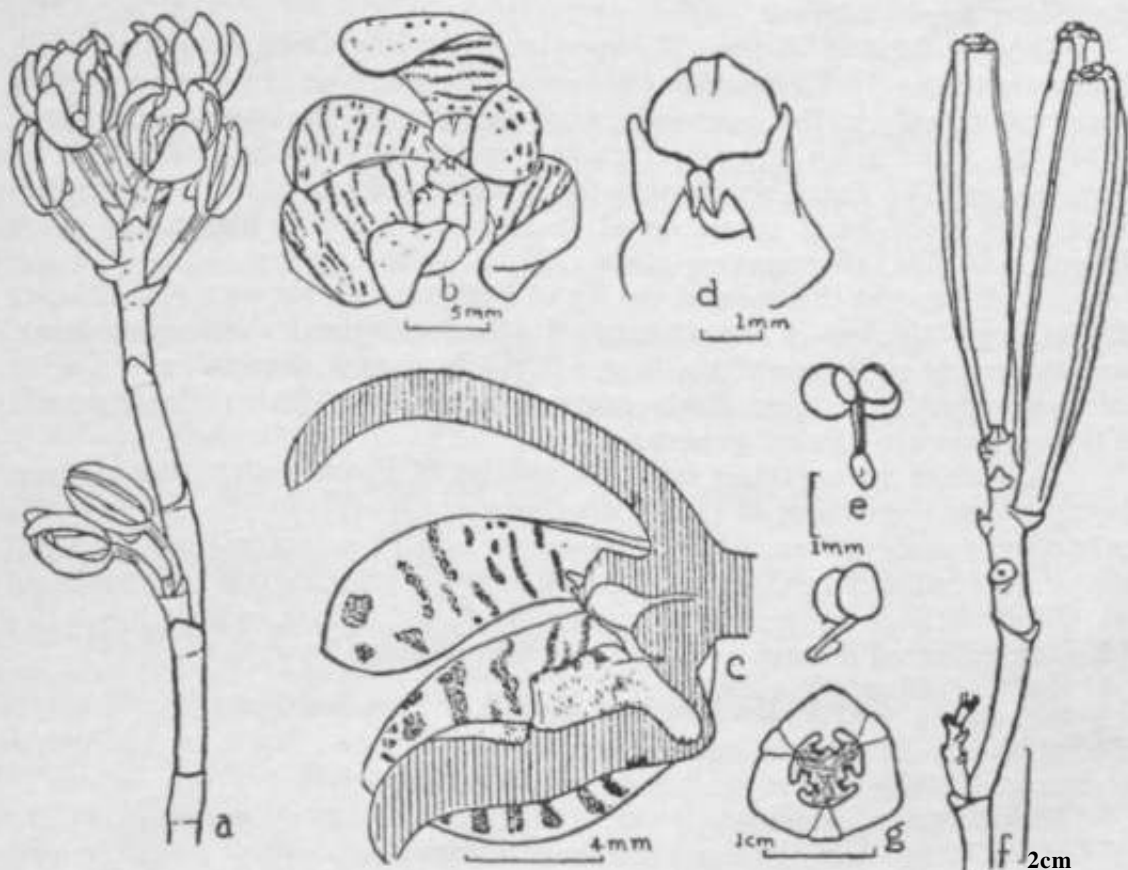


Fig. 185. *Acampe longifolia*. a, inflorescence, b, flower from front, c, flower in section, d, top of column, e, pollinia, f, fruiting inflorescence, g, cross section of fruit.

This species is very near *Trichoglottis*, having the rudiment  $O1$  tongue at the back of the sac of the lip; but this is so short that it cannot properly be called a tongue; and what appear to be allied species are said to lack such a structure altogether. The flowers are attractive in colour, but hardly large enough to be worth cultivating for decorative purposes.

### 7. POMATOCALPA

Stems short or long, sometimes climbing; leaves oblong or narrow; inflorescence short or long, erect or decurved, often branched, usually densely many-flowered; flowers small, with lip at the top or pointing towards the apex of the inflorescence; sepals and petals almost equal, free and spreading; lip 3-lobed, with a rounded saccate spur; side-lobes small, joined a little at the back to the base of the column, broadly triangular, the front edges incurved; midlobe straight or downcurved, fleshy, usually round or ovate-triangular; spur rounded, widening somewhat from the opening, the front wall with a fleshy thickening, the back wall with an erect tongue arising from the middle or lower, the tongue reaching to the mouth of the spur, its upper edge usually toothed, its sides sometimes also joined to the wall of the spur; column short, with or without a short foot; anther shortly beaked; pollinia 4, in 2 round bodies, on a narrow stipes of thin texture, its edges quickly curved backwards, with a small disc; rostellum small, 2-lobed.

This is a genus of some 30 species, extending from Burma through Malaysia to the Pacific islands (Samoa). The shape of the flowers is very constant, notably in the saccate form of the lip with the tongue on its back wall, the latter quite distinct from the callus at the back of the spur of *Sarcanthus*. The short simple usually downturned midlobe is also distinct from the arrow-head shape usual in *Sarcanthus*. The plants are often larger, and the inflorescences denser, than in *Sarcanthus*.

The tongue at the back of the lip of *Pomatocalpa* shows a resemblance to *Trichoglottis*; but in *Pomatocalpa* the tongue is much deeper in the sac, and the whole structure of the flower is much simpler than in most species of *Trichoglottis*. It seems likely however that *Pomatocalpa*, *Acampe* and *Trichoglottis* are related genera.

In Malaya we certainly have six species of *Pomatocalpa*, one of them being common on trees in rather open places throughout the country; the other two species given below (*P. parvum* and *P. naxvatum*) are doubtful and need further investigation. The only species which could be considered at all attractive for garden purposes is *P. latifolium*, which has quite brightly coloured flowers and also stands in an exposed position.

#### Key to the Malayan species of *Pomatocalpa*

**Stems** short; internodes under 1 cm. long

Leaves to 5 by 0.6 cm.; inflorescence 1 cm. long

with few flowers . . . . . 1. *P. parvum*

Leaves larger and inflorescence much longer

Flowers pinkish; inflorescence minutely

hairy . . . . . 2. *P. Kunstleri*

- Flowers yellowish; inflorescence not hairy  
 Sepals and petals with red edges . . . 3. *P.atifolium*  
 Sepals and petals without red edges  
 Sepals and petals all with pink marks at  
 base, lateral sepals with irregular  
 pink marks almost throughout .. 4. *P. spicatum*  
 Sepals and petals without pink marks,  
 or only at base of lateral sepals .. 5. *P. setulense*  
 Stem long-climbing; internodes 2-3 cm. long  
 Sepals and petals with red edges . . . 3. *P. latifolium*  
 Sepals and petals without red edges  
 Flowers white with violet spots at base of  
 sepals, upper sepal 1 cm. long . . . 6. *P. arachnanthe*  
 Flowers greenish yellow, with reddish or  
 purplish spots; upper sepal shorter  
 Leaves to 14 by 3-5 cm.; tongue in back of  
 spur as long as spur, its sides joined  
 to spur throughout . . . 7. *P. elongatum*  
 Leaves to 18 by 2-4 cm.; tongue in back of  
 spur attached half-way down, its sides  
 not joined to spur throughout . . . 8. *P. naevatum*

1. **Pomatocalpa parvum** (Ridl.) J.J.S., Nat. Tijdschr. Ned. Ind. 72: 106. 1912.—*Cleisostomi parvum* Ridl., J.L.S. 32: 366. 1896.—*Saccolabium parvum* Ridl., Mat. Fl. M.P. 1: 167. 1907. Flora 4: 167.

Stems very short; leaves about 5 by 0.6 cm., thin; inflorescence about 1 cm. long, with few flowers; upper sepal 4 mm. long. Only known from the original collection from the limestone of Kota Glanggi\*, Pahang. The specimen is not in very good condition and we are not certain whether it belongs to this genus; and the plant may be under-sized.

2. **Pomatocalpa Kunstleri** (Hk. f.) J.J.S., Nat. Tijdschr. Ned. Ind. 72: 104. 1912.—*Cleisostoma Kunstleri* Hk. f., Ic. Pl. t. 2335. 1895. J.J.S., Fl. Buit. 6: 610, f. 457.—*Saccolabium pubescens* Ridl., J.L.S. 31: 295. 1896. Flora 4: 174.

Stem rather short, usually not over 10 cm. long, stout; leaves to 25 by 3-5 cm., dull grey-green, ends broadly rounded and unequally bilobed, edges more or less wavy; inflorescence branched, erect, to about 30 cm. tall, the lower branches sometimes branched again, slender, curved, finely short-hairy; flowers very close and small; bracts 1 mm. long, spreading; flowers pale pinkish, with darker stripes on sepals and petals; upper sepal 3-5 by 1-5 mm., laterals shorter, all hairy on back; petals 3-5 by 1 mm.; lip nearly as long as sepals; spur pale pinkish, sometimes with small darker spots; tongue narrow, 2-toothed; side-lobes white; midlobe white with 2 pink spots. Distributed in Java, Sumatra and Borneo; in Malaya found at many localities in the lowlands of Pahang, Kelantan, Perak and Kedah, in shady places. The flowers are small, but the inflorescence is more graceful than in most species.

3. **Pomatocalpa latifolium** (Lindl.) J.J.S., Nat. Tijdschr. Ned. Ind. 72: 105. 1912.—*Cleisostoma latifolium* Lindl., Bot. Reg. 26: Misc. 60. 1840. Hk. f., F.B.I. 6: 7. 1890 (*p.p.*). J.J.S., Fl. Buit. 6: 612, f. 458.—*Saccolabium hortense* Ridl., J.S.B.R.A.S. 39: 83. 1903. Flora 4: 167.—*Saccolabium latifolium* var. *parviflorum* Ridl., J.S.B.R.A.S. 61: 41. 1912. Flora 4: 166.

Stems short or long, 5 to 30 cm. or more, thick; internodes 1-2 cm. long; leaves 12-20 by 2-5-4 cm., slightly shining, often yellowish green, oblong, leathery, apex broadly rounded and bilobed; inflorescence erect, 15-40 cm. long, branched; scape to 25 cm., branches several, stiffly spreading, to 5 cm. long; flowers close, bracts 1 mm. long; sepals and petals yellow or greenish yellow, with crimson or red-brown edges; upper sepal 5 by 2 mm., concave; lateral sepals shorter; petals 5 mm. long, less than 2 mm. wide; lip yellow, with red spots on outside of spur and inside of side-lobes, the tongue white. Distributed from Sumatra to the Philippines; in Malaya found in the lowlands throughout the country, as an epiphyte on village trees and in similar rather exposed places. Sometimes quite small plants may flower.

4. **Pomatocalpa spicatum** Breda, Orch. Kuhl et v. Hass. t. 15. 1827. J.J.S., Fl. Buit. 6: 598. Bull. Btzg., Ser. 2, IX: 106. 1913; Ser. 3, 6: t. 19, II.—*Cleisostoma uteriferum* Hk. f., F.B.I. 6: 74. 1890. Ann. Calc. 5: 56, t. 84.—*Saccolabium uteriferum* Ridl., Mat. Fl. M.P. 1: 167. 1907. Flora 4: 168.—*Saccolabium Hobsonii* Ridl., J.S.B.R.A.S. 57: 97. 1911. Flora 4: 167

Stem very short and thick; leaves leathery, to 18 by 4 cm. or more, edges wavy, tips broadly and unequally rounded; sheaths overlapping closely, spreading, to 3 cm. long; inflorescence simple or with few branches, shorter than the leaves, to 15 cm. long, the scape 3 cm., stout; rachis bearing flowers very close together, many open at one time; bracts 3 mm. long, acute; sepals and petals pale yellow, all marked with pink at the base, the lateral sepals also with irregular pink markings nearly throughout; upper sepal 4-5 to 5-5 by 2-5 to 3 mm., blunt; lateral sepals bent towards lip, shorter; petals to 4-5 by 2 mm., blunt, base narrow; lip 4 mm. long; spur somewhat transversely flattened, white; tongue yellowish with purple flush, edge white, toothed; side-lobes pale yellow, sometimes spotted, with ridges running down inside spur from their forward edges; midlobe short, fleshy, slightly downturned, white, sometimes with pink spots. Distributed in Java, Sumatra and Borneo; in Malaya found at many localities in Perak, Pahang and Negri Sembilan, an epiphyte in shady places. Fig. 186, a-d.

5. **Pomatocalpa setulense** (Ridl.) Holtt, Gard. Bull. 11: 287. 1947.—*Saccolabium setulense* Ridl., J.S.B.R.A.S. 59: 198. 1911. Flora 4: 167.

Stems to 5 cm. long, leaves few, close, at the end of the stem, to 19 by 2-5 cm., erect, thick, edges not waved, apex unequally rounded; inflorescence to 15 cm. tall, with a few branches; scape short, purple-spotted; flowers pale yellow, sometimes with a reddish spot at base of lateral sepals; upper sepal about 4 by 2 mm.; lateral sepals and petals a little shorter;

thin, arising about half-way down the back wall of  
 S r a X £ n £ to sides of spur throughout, top edge toothed. Found  
 on i Stone in Peru and Peninsular Siam.

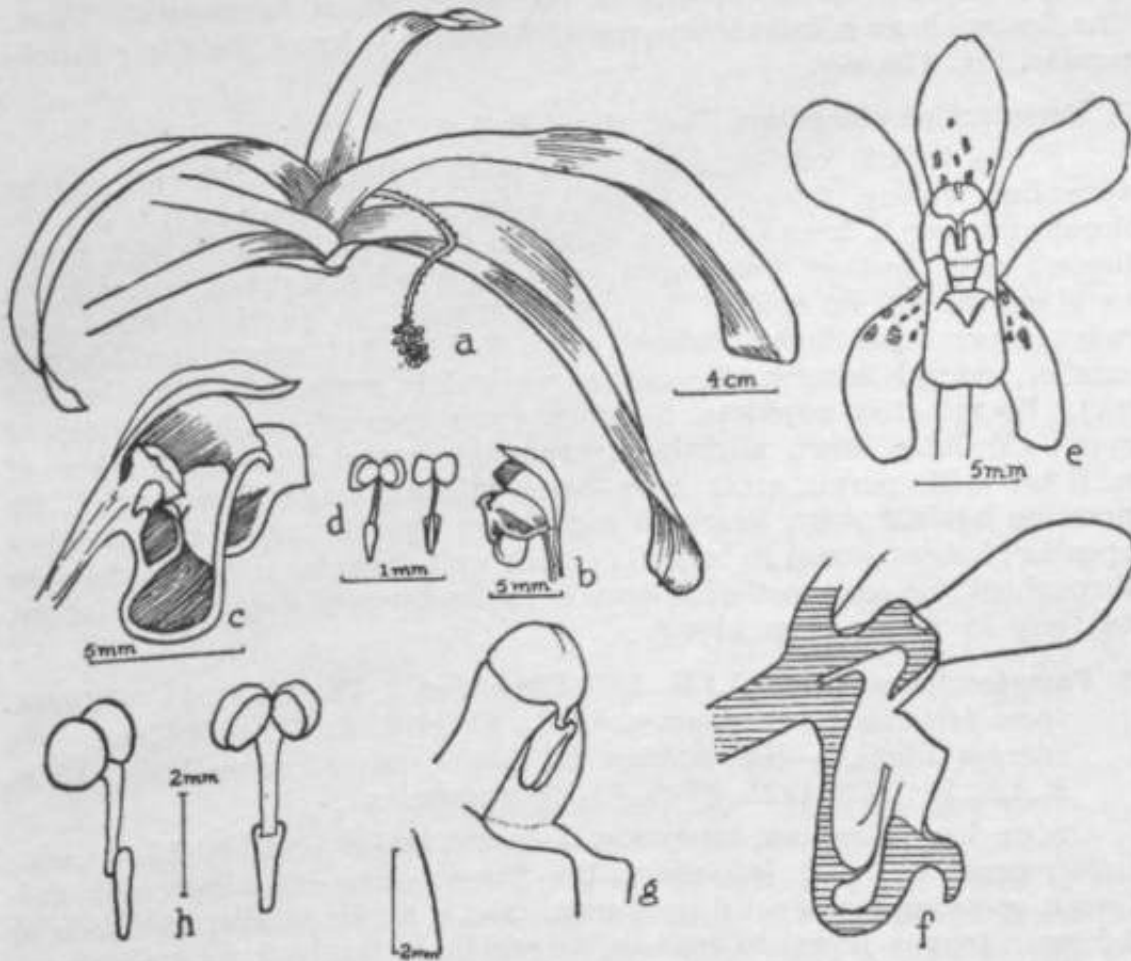


Fig. 186. *Pomatocalpa spicata*tm. a, leaves and inflorescence. b, flower from side, c, section d, pollinia. *P. arachnanthe*. e, flower from front. f, section g, column and lip. h, column and base of lip. i, pollinia from side and

*Pomatocalpa arachnanthe* (Ridl.) J.J.S., Nat. Tijdschr. Ned. Ind. 72: 103. 1912. -*Saccokibium arachnanthe* Ridl., J.S.B.R.A.S. 39: 83. 1903. Flora 4: 174. Burk., Gard. Bull. 2: 48. 1918.

climbing, internodes 2-3 cm.; leaves to 12 by 3 cm., oblong, a- upwards not twisted at base, tip rounded and bilobed; scape 20-40 curving upwards bearing an inflorescence of several branches (in weak plants each branch elongating slowly for many weeks, always with rounded flowers near its tip; flowers facing upwards, white, fading greenish-yellow, with violet spots at bases of sepals only; upper sepal blunt; lateral sepals curved inwards towards each other; petals 10 by 0.4 cm., blunt, curved a little away from upper lip; spur of lip transversely flattened and widened, depth 6 mm. from base of lip almost from top of spur 3 mm. long; tongue arising at base of lip for about half its length, top edge finely toothed; side-lobes joined

2 mm. high in front; midlobe downturned, acute; disc of pollinia narrow, more than half as long as stipes. Found only a few times, in the lowlands of Kedah, Perak and Pahang, in rather open places. This has the largest flowers among Malayan species of the genus but is an ungainly plant. The flowers have a little the shape of *Arachnis*, whence the name *arachnanthe*. Fig. 186, e-h.

7. *Pomatocalpa elongatum* Carr, Gard. Bull. 7: 50. 1932.

Stems to 120 cm. or more long, stout, internodes 2-5 cm.; leaves spreading, oblong, fleshy, to 14 by 3-5 cm., sheaths keeled on back; inflorescence erect, branched, the scape 20 cm. long, rachises with many flowers close together, 4 or 5 open together; sepals and petals yellow-green or greenish, outside spotted dull purple throughout, inside in basal half only; upper sepal fleshy, obtuse, erect, 6-8 by 3-4 mm.; lateral sepals smaller, curved downwards; petals not widely spreading, 5-6-5 by 3-4 mm.; lip minutely papillose, 5-6 mm. from apex of side-lobes to tip of spur; side-lobes erect, slightly divergent, incurved in front to base of midlobe, with purple spots near base; midlobe ovate, downturned, tip pressing against spur, nearly 3 mm. long; spur laterally dilated below opening; tongue joined to bottom of back wall, its sides joined to the spur throughout, top edge toothed. Found in the lowlands of Pahang and Johore, on trees in rather open places.

8. *Pomatocalpa naevatum* J.J.S., Bull. Botz., Ser. 2, IX: 106. 1913.—*Cleisostoma latifolium* var. *fuscum* J.J.S., Fl. Buit. 6: 613. 1905. (? = *C. fuscum* Lindl.).—*Saccolabium latifolium* var. *strictum* Ridl., J.S.B.R.A.S. 59: 199. 1911. Flora 4: 166 (probably).

Stem long, climbing, internodes 2-3 cm.; leaves 10-18 by 1-5-2-4 cm.; inflorescence as in *P. latifolium*, the flowers greenish-yellow with red-brown spots; upper sepal 6 by 3 mm., lateral sepals smaller; petals 5 by 2-5 mm.; tongue joined to spur in the middle of the back wall, shortly 2-lobed, white; side-lobes and midlobe bright yellow. This species was first found in Java; to it we ascribe with some uncertainty some narrow-leaved plants from Setul, found on limestone, and also one from Batu Caves, Selangor. Critical examination of fresh plants is necessary to decide whether the Malayan and Java plants are identical.

## 8. CAMAROTIS

Stems long, climbing, with many itfng roots; leaves narrow, oblong, often slightly constricted near the tip; inflorescence erect or drooping, not branched, with many but not densely crowded flowers; flowers of medium size, fleshy, the lip at the top when the inflorescence is erect; sepals and petals similar, spreading; lip spurred, 3-lobed, the back wall at the opening of the spur sometimes fleshy but without a prominent callus; side-lobes vertical, short, broad, hardly joined to the base of the column; midlobe small and fleshy, pressed to the front edges of the side-lobes, bearing at its base inside the spur a rather large usually 2-lobed callus astride the edge of a longitudinal septum in the bottom of the spur; column short, often a little twisted, so that the anther does not point straight forwards;



column-foot very short; anther beaked; end of rostellum always long and narrow, forming with the anther a conspicuous beak; pollinia 4, united in 2 round bodies, on a long narrow stipes, the disc very small.

This is a small but very interesting and well-marked genus, consisting of about a dozen species distributed from Burma through Malaysia to New Guinea and Queensland. The habit is much like that of the long-stemmed *Sarcanthus* or *Trichoglottis*. The flowers are distinguished by always having the lip pointing to the apex of the inflorescence, by the spur with its 2-lobed callus attached below the midlobe, and by the long beak of rostellum and anther. The flowers are cream or yellow with few purple markings. The species all appear to grow in rather open places, but they have been little collected, except *C. apiculata* in the north. More observations on the other species are desirable.

#### Key to the Malayan species of *Camarotis*

- Upper sepal about 12 mm. long . . . . . 1. *C. proboscidea*  
 Upper sepal not over 7.5 mm. long  
     Side-lobes triangular on a long base their forward edges hardly higher than the midlobe 2. *C. adnata*  
     Side-lobes more or less quadrangular, much higher than the midlobe . . . . . 3. *C. apiculata*

1. *Camarotis proboscidea* (J.J.S.) J.J.S., Nat. Tijdschr. Ned. Ind. 72: 99. 1912.—*Sarcanthus proboscideus* J.J.S., Bull. Dep. Ag. V: 24. 1907.

Stem long-climbing internodes 2-3 cm.; leaves fleshy, 12-17 by 1.6 to 2.2 cm., slightly constricted near the tip; inflorescence erect, scape 7-10 cm. long, rachis 8 cm. or more, elongating; bracts broadly triangular, & mm. long; sepals and petals pale yellowish, lip white; upper sepal 12 by 4 mm.; lateral sepals a little shorter, descending on either side of the lip, joined together and to the base of the lip for 3 mm.; petals nearly 9 by 4 mm.; lip 12 mm. long from base of column to tip of spur; side-lobes almost quadrangular, on a base 6 mm. long, 2.5 mm. high, their upper edges nearly meeting just beneath the beak of the rostellum; midlobe triangular, acute, fleshy, 2.5 mm. long, between the front edges of the side-lobes, a small conical callus near the tip on the inside; spur with tip slightly curved forwards, hardly flattened, 3.5 mm. wide, tip round, longitudinally septate for a short distance only; a hollow 2-lobed ascending callus from base of midlobe almost closing entrance to spur; rostellum S-curved, bent to the right, from back of anther to tip of rostellum 7 mm. Originally found in Bangka, then in Sumatra, and now from two localities near Klang in Selangor. One of the Selangor plants was growing on a village fruit-tree..

2. *Camarotis adnata* (Ridl.) Holtt, Gard. Bull. 11: 277. 1941.—*Sarcohilus adnatus* Ridl., J.L.S. 32: 373. 1896.—*Saccolabium adnatum* Ridl., Flora 4: 174.

Stem 40 cm. or more long, climbing, 3 mm. thick (with leaf-sheaths 5 mm.), internodes 2 cm. long; leaves spreading, tough, to 20 by 1.7 cm., tips broad, the two unequal halves rounded, a slight constriction 1 cm. from the tip; inflorescences erect, to 20 cm. long, the scape 5-10 cm., flowers 5 mm. apart, bracts 2 mm. long; flowers with yellow sepals and

petals, the sepals tipped and more or less spotted with maroon; upper sepal to 7.5 by 3.5 mm., erect, blunt; laterals descending at over  $45^\circ$  to horizontal. 8 by 4 mm.; petals nearly 7 by 3 mm., blunt, horizontal; lip at right angles to ovary; side-lobes triangular with back edge 6 mm. long sloping steeply downwards, forward edge 2.5 mm., tip acute, slightly incurved; midlobe tipped maroon, 2.5 mm. long, nearly 3 mm. wide at base, thickened on the inside at the tip; spur transversely flattened, 4.5 mm. wide, end rounded; tip of spur to base of column 1 cm.; a broad bilobed callus at base of midlobe, resting on a longitudinal septum dividing the bottom of the spur, with ridge continuing the septum up back of spur; column not twisted, rostellum curved slightly upwards, the beak under 2 mm. long. Only known from Singapore, Johore and Pahang; nearly related to *C. costulata* from Sumatra. Fig. 187, a, b.

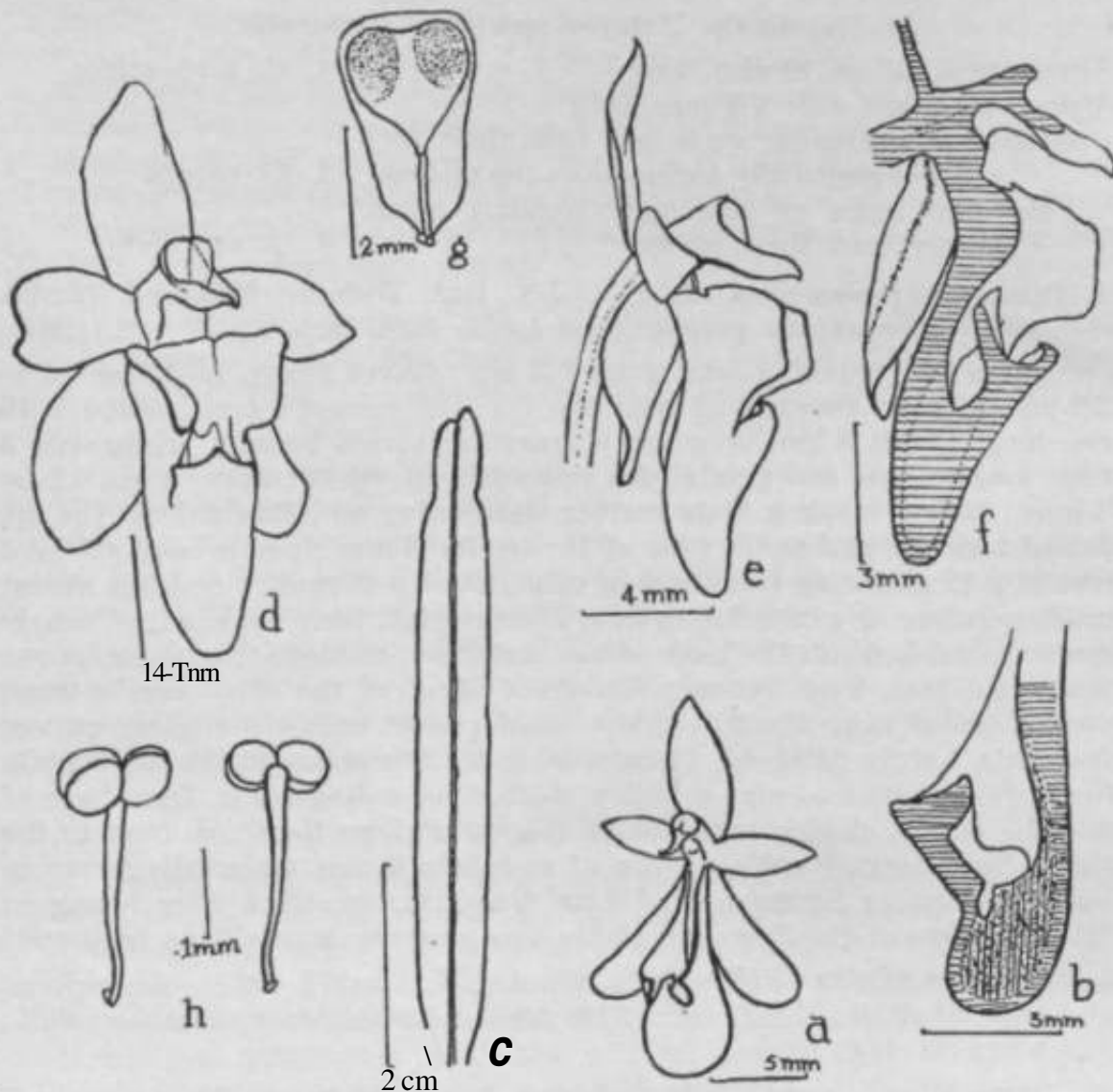


Fig. 187. *Camarotis adnata*. (t, flower from side, but upside down, h, section through spur, the septum shown by vertical hatching. *C. apiculata*. c, leaf from above, showing constriction near tip. d, flower from front, showing column twisted to right, e, side view of flower. f, section through flower, showing septum (dotted line) and the rostellum, which, being twisted, is only partly cut. p, top of column from above, h, pollinia from above (left) and from below.

3. *Camarotis apiculata* Rchb. f., Bonpl. 5: 39. 1857. Carr, Gard. Bull. 7: 54. 1932.—*Sarcanthus apiculatus* J.J.S., Fl. Buit. 6: 598, f. 445.—*Saccolabium saxicolum* Ridl., Tr. L.S. 3: 374. 1893. Flora 4: 172.

Stem rather slender, internodes about 2 cm. long; leaves fleshy, to 9 by 1 cm., tip rounded and bilobed, slightly constricted at 1 cm. from tip; inflorescence drooping, scape 2-8 cm., rachis to 6 cm. or more, flowers close, scented; sepals and petals cream turning yellow (sepals with purple midline on the back), lip white with yellow calli and edges of side-lobes; sepals about 5.5 by 3 mm.; petals 4.5 by 2 mm.; lip 7.5 mm. long, spur 3 mm. wide; side-lobes almost quadrangular, with stretched-out base, much larger than midlobe; midlobe triangular with incurved tip, with at its base a bilobed fleshy ridge extending obliquely upwards to the back of the spur; column short, slightly twisted, beak of rostellum curved, 2.5 mm. long. Distributed in Java, Sumatra and Borneo; in Malaya common in the north and found also a few times in Pahang and Johore. **Fig.** 187, c-h,

## 9. RENANTHERA

Stem long and climbing, with well-spaced oblong (usually rather short) leaves; inflorescence more or less horizontal, usually branched, with many flowers; flowers small or large, red or red and yellow; sepals and petals narrow, spreading, the lateral sepals often near together and broader than the upper sepal; lip small, not hinged, with rather shallow conical spur as long as or longer than the small down-curved midlobe, with a high oblong callus on either side at junction of mid- and side-lobes (rarely with additional calli); column short or (in one species) long, quite without foot; pollinia 4, almost equal, on a fairly broad stipes.

This genus is closely related to *Arachnis* and has been made to include *Arachnis*; but the two genera are sufficiently distinct in the attachment and structure of the lip, as well as in shape and colouring of the flowers. About ten species of *Renanthera* are known, ranging from southern China and Indo-China through Malaysia to the Philippines. In Malaya we have the three species *R. rnatutina*, *R. elongata*, and *R. histrionica*; the southern Chinese *R. coccinea* is often cultivated, and less frequently other species also. The following key includes all important species.

### Key to the principal species of *Renanthera*

- |  |                            |
|--|----------------------------|
| Column slender, curved; leaves sharply pointed                         | 1. <i>R. histrionica</i>   |
| Column short, straight; leaves bilobed                                 |                            |
| Lateral sepals not more than about 8 mm. long                          |                            |
| All sepals equal, about 8 mm. long                                     | 2. <i>R. elongata</i>      |
| Upper sepal about 2 mm. long, laterals longer                          | 3. <i>R. sarcanthoides</i> |
| Lateral sepals at least 1.7 cm. long                                   |                            |
| Upper sepal 1.3-1.5 cm. long   |                            |
| Flowers yellow, spotted red throughout                                 | 4. <i>R. monachica</i>     |
| Flowers yellow with side-lobes of lip and upper half of petals red . . | .. 5. <i>R. pulchella</i>  |

- Upper sepal 2 cm. or more long  
 Midlobe of lip with 5 calli at base as well  
 as the two large ones beside the side-  
 lobes . . . . . 6. *R. Imschootiana*  
 Midlobe of lip with only two large calli  
 All sepals about equal, inflorescence  
 little branched . . . . . 7. *R. matutina*  
 Lateral sepals much longer than upper  
 sepal; inflorescence much branched  
 Lateral sepals with deeper crimson  
 blotches . . . . . 8. *R. Storiei*  
 Lateral sepals almost uniformly  
 coloured, not blotched . . . . . 9. *R. coccinea*

**1. *Renanthera histrionica*** Rchb. f., Gard. Chron. 1878: 74.—*Renantherella*  
*histrionica* Ridl., J.L.S. 32: 355. 1896. Flora 4: 161.

Stem climbing and hanging, to 60 cm. or more long, internodes about 1 cm. long; leaves curved, very fleshy, channelled above, gradually narrowed to an acute tip, to about 10 by 0.7 cm.; inflorescences horizontal, elongating gradually with 1 or 2 flowers open at a time, usually unbranched, to 10 cm. long, the scape 1.5-3 cm., the rachis flexuous, flowers about 1 cm. apart, the lip pointing upwards; sepals and petals lemon yellow, with small crimson spots near edges and tips; upper sepal 1.4 by 0.4 cm., widening from a narrow base; lateral sepals a little shorter and wider, their inner edges touching, their ends curved back; petals curved away from the upper sepal, 1.1 by 0.25 cm.; lip with narrow diverging side-lobes nearly as long as the column, yellow with red spots, midlobe very short; column 7 mm. long, curved, yellow with red spots. Found on old mangrove in the south, and further north at moderate elevations on the hills, on trees and rocks. The flowers are pretty, and produced frequently, but not numerous or large enough to be showy. The long column, inverted flowers and pointed leaves are not found in other species of *Renanthera*, and these differences were considered by Mr. Ridley sufficient to establish a new genus (*Renantherella*) for this species, but the essential floral structure, including shape of lip and top of column, are exactly typical of *Renanthera*. Fig. 188.

**2. *Renanthera elongata*** Lindl., Gen. et Sp. Orch. 218. 1833. J.J.S., Fl. Buit. 6: 589, f. 440. Ridl., Flora 4: 160.

Stems long, climbing, internodes 1.5 to 3.5 cm.; leaves 7 by 1.2 to 13 by 2.5 cm., bilobed, lobes rounded, sheaths purplish; inflorescence to 40 cm. long with several alternate branches, the scape to 20 cm., branches straight, to 20 cm. long, many-flowered; flowers red with faint darker spots, with lip pointing to tip of inflorescence or branch; sepals widening from a narrow base, with broadly crisped edges, all about 8 mm. long, the upper one 2 mm. wide, the laterals 3 mm. wide, the extra width being on the side towards the lip; petals 6 by 1.5 mm.; lip with spur 3 mm. long, lobes short, midlobe with end curved under, its base white, calli also white. Distributed in Java, Sumatra and Borneo; in Malaya found at many places in the lowlands, often near the sea, in fairly open places. This is an attractive species, though the flowers are small; it needs full sun, and treatment as for *R. coccinea*, flowering fairly often when well grown.

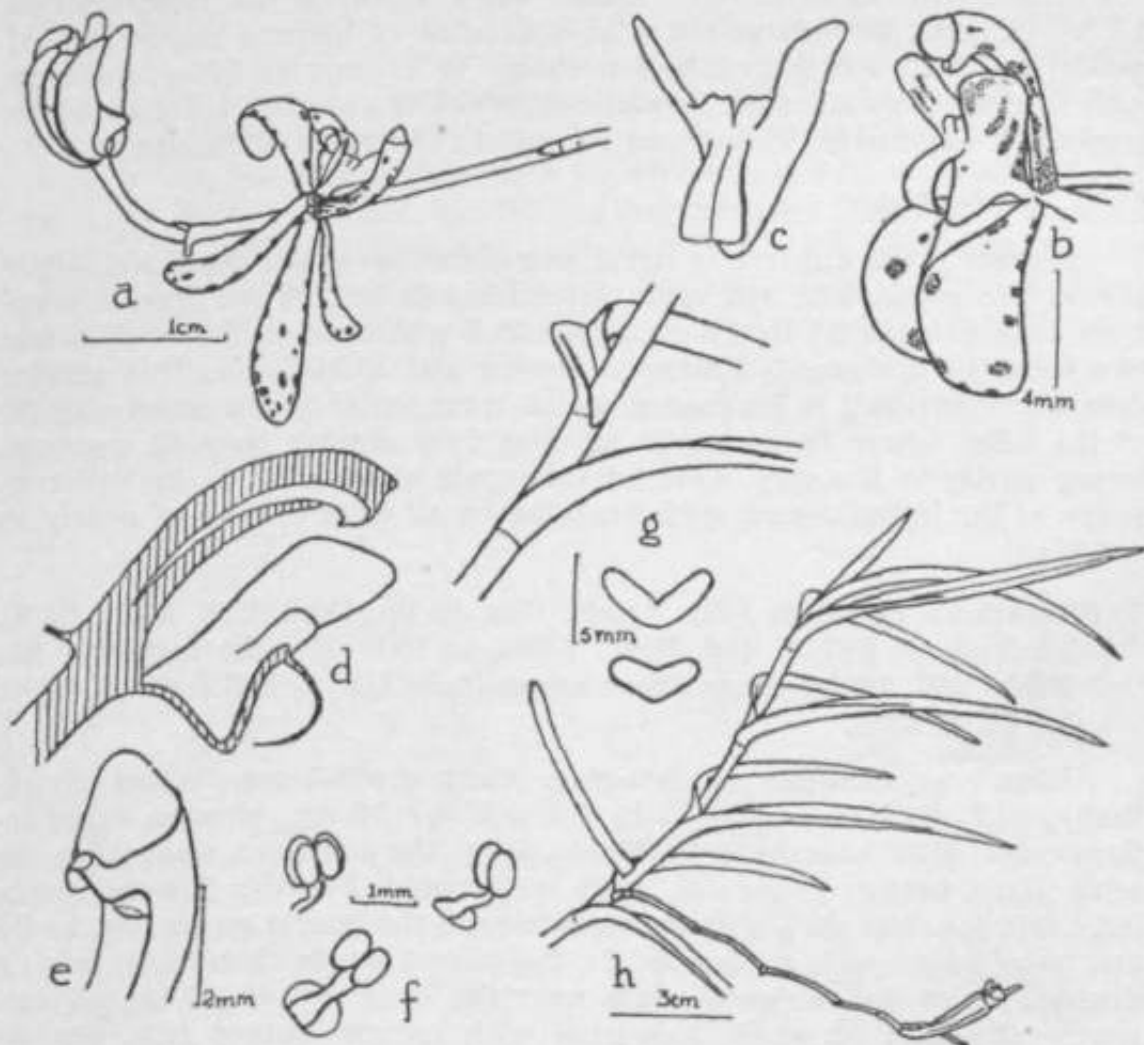


Fig. 188. *Renanthera histrionica*. *a*, inflorescence with two flowers, *b*, flower from side, *c*, lip. *d*, section through column and lip. *e*, column. *f*, the pollinia when first removed (lower drawing) and after 2 minutes (upper drawings), *g*, leaf bases and sections through leaf (upper from near base of leaf, lower from near apex), *h*, stem and fruiting inflorescences.

### 3. *R. sarcanthoides*

A small-flowered species found in Sumatra and Celebes which might turn up in Malaya. It resembles *R. elmgata* but has smaller flowers, the upper sepal only 2 mm. long. It has only 2 pollinia, on a narrow stipes, with narrow disc, and is probably not a true *Renanthera*.

### 4. *R. monachica*

A short species, with fleshy dark green leaves to 13 by 1.5 cm., unequally and obtusely bilobed; flowers yellow with red spots; upper sepal 1.5 by 0.3 cm., lateral sepals 2 by 0.6 cm. Native in the Philippines; an attractive species which flowers fairly well in Singapore. It is best treated as a pot plant, and does not grow rapidly.

### 5. *R. pulchella*

Plants with habit of *R. elongata*; upper sepal 1.3 cm. long, laterals 1.7 by 0.8 cm.; flowers yellow with side-lobes of lip and upper half of petals red. Native in Burma and probably in Peninsular Siam; the very wide lateral sepals make the flowers bright and the species would be worth growing if obtainable. There is no record of cultivation in Malaya.

### 6. *R. Imschootiana*

A short plant, apparently never long-climbing; upper sepal and petals yellow, the petals with red spots, lateral sepals flushed red; upper sepal 2 cm. long, laterals 3.7 by 1.6 cm.; lip with 5 additional calli as well as the two usual in the genus. Native in Assam and Indo-China. This species does not flower well in Singapore, and is more suited to the cooler climate of the hills, where it can make an even finer display than *R. coccinea*, owing partly to the very wide lateral sepals and partly to the different shape of the inflorescence, with branches on all sides instead of nearly in one plane.

7. *Renanthera matutina* (Bl.) Lindl., Gen. et Sp. Orch. 218. 1833. J.J.S., Fl. Buit. 6: 587, f. 439. Ridl., Flora 4: 160.—*Aerides matutina* Bl., Bijdr. 366. 1825.—*Renanthera angustifolia* Hk. f., F.B.I. 6: 49. 1890. Ic. PL t 2128.

Stem long, climbing and hanging, internodes 2-3 cm.; leaves thickly fleshy, stiff, dark grey-green, 7 by 1.2 to 20 by 1.6 cm., sheaths dark; inflorescence little branched, 40-80 cm. long, the branches elongating for some time, nearly horizontal, with well-spaced flowers; flowers rather light crimson with deeper spots, especially on the lateral sepals; sepals 2-8 cm. long, 5 mm. wide in the middle, the lateral sepals close together with diverging tips and reflexed edges near the base; petals 2-3 by 0.3 cm., nearly straight; lip small, side-lobes with narrow curved tips, orange-yellow and white with red spots; midlobe very short, turned under, blunt, red-brown; spur much longer than midlobe, cylindrical, blunt; column nearly 5 mm. long, yellow with deep crimson spots. Distributed in Java and Sumatra; in Malaya found at Fraser's Hill, Cameron Highlands and elsewhere on the Main Range at about 4,000 feet altitude, in fairly exposed places. This species can be cultivated and will flower in Singapore, but is not so vigorous as on the hills, and cannot be called showy as a garden plant, though its slender flowers are pleasing in shape and colouring. It appears that the edges of the lateral sepals are joined together for a short distance **near the base**. **Fig. 189**, a-f.

### 8. *R. Storiei*

Stem stout; leaves to 20 cm. or more long, bilobed, broad; inflorescence and flowers much as in *R. coccinea*, but the flowers a deeper red, the wide lateral sepals with crisped and waved edges, and with blotches of a deeper crimson. Native in the Philippines; often grown in Malaya, and undoubtedly a finer species than *R. coccinea*, but much less free-flowering in Singapore.

9. *R. coccinea*

Stems tall, climbing; leaves usually about 6 by 3 cm., rather light green, bilobed, venation pinnate, inflorescence horizontal, with several long branches all arising from the base. Sepals and petals somewhat thickened, the lip widened and a little folded on the sides. Upper sepal 2.8 cm. long, laterals 3.5 by 1.0 cm.; callus white. The midlobe yellow with red stripes, midlobe white at base, rest deep red. Native in Siam, Indo-China and southern China. This species is much cultivated in Malaya, and when well-grown flowers freely in Singapore. It needs a fully sunny place, and treatment as for *Arachnis* and the *Vanda* (see *Arachnis*, p. 624). A well-branched plant 2 metres high may have a number of inflorescences together, and makes a very fine foliage of a colour unusual among orchids. Such a plant will have some flowers during a good part of the year. Fig. 189, g-i.

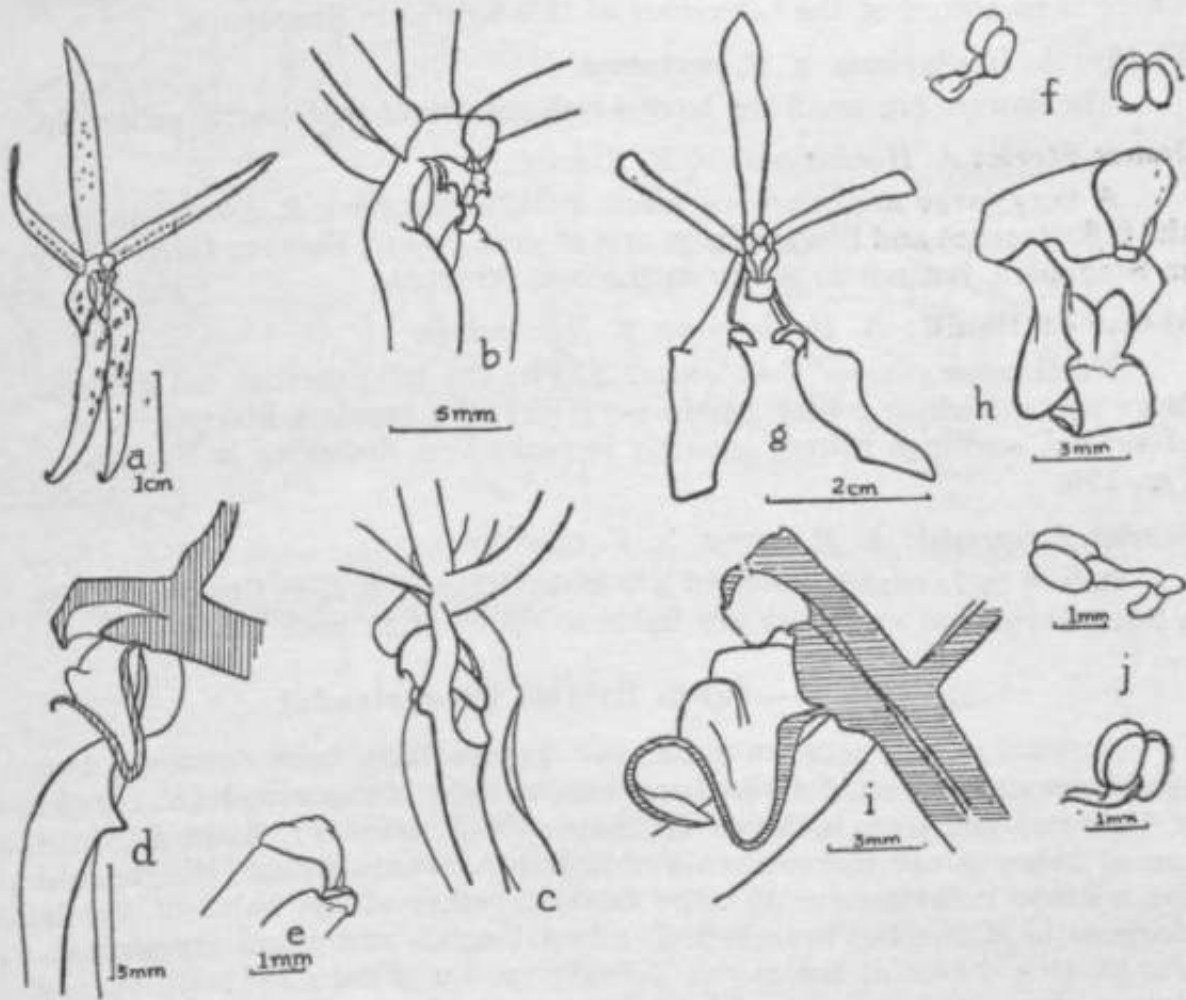


Fig. 189. *Renanthera matutina*. a, flower from front. b, lip and column and bases of petals and sepals from front, and c, from back, d, section of column and hypochrysalis. e, pollinia. *R. coccinea*. g, flower from front, h, column and lip. i, section through column and hypochrysalis; j, pollinia from front and side (above) and from back.

A variety native in Lower Siam, having leaves about 8.5 by 2.5 cm., with purple suffusion on the sheaths, and rather longer inflorescences with more widely spaced flowers, flowers rarely in Singapore, and is not worth cultivating. The flowers are hardly distinguishable from those of the typical form.

#### Renanthera—Arachnis Hybrids (Aranthera)

Species of *Renanthera* and *Arachnis* are freely inter-fertile, and several hybrids between the two genera have been produced. They all have a red colour, less intense than in *Renanthera*, the inflorescences usually less freely branched, more or less ascending from the base instead of horizontal, with the flowers more widely spaced. In shape the flowers are rather intermediate between the parent genera, but the lips of all have a small reflexed midlobe much more like that of *Renanthera* than *Arachnis*.

#### **Caprice:** *A. Maingayi* X *R. Storiei*

Raised in Java. A fine hybrid, but seedlings will probably differ from each other, and some may be finer or more free-flowering than others. There is no record of the behaviour of this hybrid in Singapore.

#### **Firefly:** *A. Hookeriana* X *R. matutina*

The flowers are small but have a rich red colour with partly yellow lip.

#### **James Storie:** *A. Hookeriana* X *R. Storiei*

A very large and vigorous plant, with leaves near *R. Storiei* in size, the inflorescence and flowers large and of good colour. Flowers fairly freely in Singapore, but not so freely as the best *Arachnis*.

#### **TMohamed Haniff:** *A. Hookeriana* X *R. coccinea*

Much more slender than James Storie, the inflorescence not quite so large nor so rich in colour (more purplish), the sepals a little narrower; of several seedlings raised, one only is really free flowering in Singapore. Fig. 190.

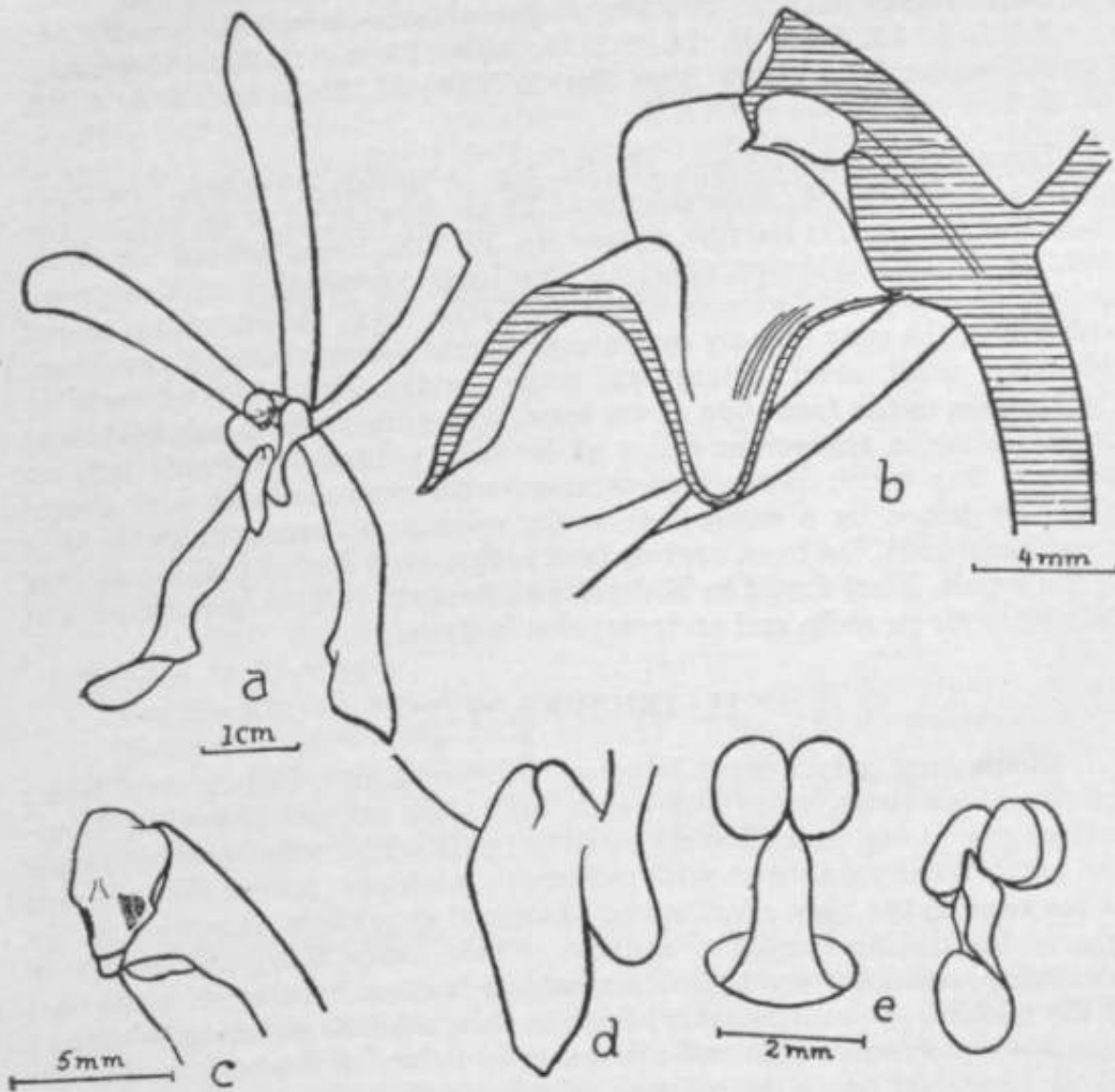
#### **Scarlet Pimpernel:** *A. Maingayi* X *R. coccinea*

Raised in Java; no record of a trial in Singapore. Like Caprice, this is a fine hybrid, but seedlings are liable to differ from each other.

#### Renanthera—Vanda Hybrids (Renantanda)

A few hybrids between these two genera have been flowered; two have been named and described in Java, namely Morgenrood (*R. Storiei* X *V. teres*) and Oranje Boven (*R. Storiei* X *V. tHcolor*). A third hybrid named Mars is not *Renanthera*-*Vanda* but *Arachnis*-*Vanda*. Morgenrood has a dense inflorescence of large flowers, rather of the habit of *Vanda* Marguerite Maron but branched. The broad sepals and petals are pinkish-orange (the colour of the sky at dawn); the lip is dark red with orange stripes, the midlobe small and bent downwards. Oranje Boven has smaller flowers, the sepals and petals orange yellow with bold red spots; it is more like an *Arachnis* in shape, but with the rich colours of *Renanthera*. It has flowered well in Singapore.





v 190 *Arttnthera Mohamed Haniff*. a, flower from front, b, section through column  
 t lg. J-3 • an ^ j-p. c ^ c 0 ] u m n . d, t up. e, pollinia in first position (left) and in later position with sides of stipes fallen in.

10. ABDOMINEA

Small plants with very short stems and few elliptic leaves; inflorescence unbranched, elongate, with many well-spaced small flowers; petals broader than sepals; lip joined at the base to the column, spurred, 3-lobed; side lobes small, triangular; midlobe larger, acute, erect, with a transverse <sup>S</sup>allus at its base; anther beaked; rostellum very large, longer and broader than the column to which it is joined by a narrow base; pollinia 4, very unequal, united in two bodies, on a narrow stipes widened near the apex:

diSC ThTcurious genus consists of a single species. The most conspicuous feature of its small flowers is the very large rostellum, joined to the column by a narrow base.

*Abdominea minimiflora* (Hk. f.) J.J.S., Bull. Btzg. Ser. 2, XXV: 98. 1917. Carr, Gard. Bull. 5: 20. 1929.—*Saccolabium minimiflorum* Hk. f. F.B.L 6: 59. 1890. Ic. Pl. t. 2133. Ridl., Flora 4: 166.—*Abdominea micrantha* J.J.S., Bull. Btzg. Ser. 2, XIV: 53. 1914. Ser. 3, 6: t. 25, f. 1.

Leaves to 5.5 by 1.7 cm., elliptic, tip unequally 2-toothed, base narrowed to a short stalk; inflorescence to 12 cm. long, erect or spreading, the scape 2-3 cm., bracts narrow, spreading, 1.5 mm. long; flowers not wide-opening; sepals red-brown, about 1.7 by 0.7 mm.; petals dull reddish green, as long as sepal and twice as wide; lip 3 mm. long, almost white, tinged with green, the spur broadly conical and laterally compressed, 1 mm. long; side-lobes small, erect, triangular, acute; midlobe pointing upwards at right angles to the front line of the spur, triangular, with a pointed tubercle at its tip, a transverse callus at its base produced upwards into an incurved flap which closes the entrance to the spur; column very short; rostellum joined by a small base to the column, widening suddenly to a broad basal part, the tip a narrow beak; stipes and disc of pollinia as long as the sepals. First found in Malaya, on limestone in Selangor, Perak and Pahang, both on rocks and on trees; also in Java.

## 11. TRICHOGLOTTIS

Stems long, climbing or hanging; leaves narrow, oblong or elliptic; inflorescences short, often 1-flowered, and often several in a close longitudinal row at one node; flowers small to fairly large, wide-opening; sepals and petals usually yellowish with red-brown markings; lateral sepals joined at the base to the very short column-foot and sometimes decurrent on the spur of the lip; lip saccate or spurred at base, blade fleshy and usually in part hairy, side-lobes erect, their forward ends often running on to the base of the midlobe as (usually hairy) keels or calli, midlobe simple or 3-lobed; a tongue-shaped organ, thin and often shortly hairy, on the back wall of the sac or spur, just below the column; column short, with a horn on each side (horns often papillose or hairy); rostellum often vertically elongated below tip of anther; pollinia 4, rather unequal, united in 2 bodies, on a stipes of medium length.

The characteristic features are the tongue at the back of the lip, the horns of the column, and the usually complicated midlobe. The species called *T. misera* has a typical tongue, but lacks the horns of the column, these being reduced to swellings on either side of the rostellum. The midlobe of the lip is also quite simple and hairless. *T. misera* approaches some Burma species which have been called *Acampe*, which genus needs further study.

*Trichoglottis* extends throughout Malaysia and appears to be particularly well represented in the Philippines, where there are about 16 species. The flowers are attractively coloured, and a few are large enough to be used as garden plants. The largest species approach *Vandopsis* in structure, and the smallest approach *Sarcanthus* both in general aspect and structure. *Acampe* is also very near *Trichoglottis* but lacks the tongue;

Pomatocalpa has a tongue at a deeper level in the spur and a much simpler hairless lip but sometimes a similar column. The inter-relationships of these genera need further study.

Several species of *Trichoglottis* are very variable; among the Malayan species this is true of *T. cirrhifera*, *T. Winkleri* and *T. lanceolaria*. The variation is often in size of the flowers as a whole, in details of colouring, and also to some extent in the shape of the midlobe of the lip. In spite of this variation, however, the species appear to be distinct from each other.

### Key to the Malayan species of *Trichoglottis*

- Inflorescences 1-flowered  
 Midlobe of lip 3-lobed  
 Midlobe conspicuously hairy . . . . . 1. *T. scaphigera*  
 Midlobe not hairy  
 The 3 parts of midlobe about equal in length and width, the lateral parts thin, central part fleshy . . . . . 2. *T. Winkleri*  
 Lateral parts of midlobe much smaller than the central part .. .. . 3. *T. cirrhifera*  
 Midlobe of lip simple  
 Midlobe hairy, 9 mm. long .. .. . 4. *T. retusa*  
 Midlobe hairless, 5 mm. long .. .. . 5. *T. misera*  
 Inflorescence with 2 to 4 flowers  
 Inflorescence 4 mm. long; flowers 5-7 mm. high 6. *T. lanceolaria*  
 Inflorescence to 12 cm. long; flowers over 4 cm. high .. .. . 7. *T. fasdata*

1. *Trichoglottis scaphigera* Ridl., J.L.S. 32: 357. 1896. Flora 4: 162.

Stem long-climbing and trailing, internodes about 2 cm.; leaves narrowly elliptic, 7 by 1.2 cm. to 13 by 1.8 cm.; flowers yellow with transverse brown bars; sepals about 8.5 by 3 mm., the laterals with a broad base; petals 8.5 by 2 mm.; lip shortly saccate at the base, not spurred, total length 6 mm.; side-lobes on a base of 2.5 mm., with forward-curving narrow point near the forward end which is 1 mm. high; base of lip between side-lobes hairy, and tongue hairy; main part of midlobe round and fleshy, 2.5 mm. long, covered densely with coarse hairs, with at base on either side a narrow hairless lobule 1.5 mm. long pointing somewhat backwards and at apex a large hairless lobule 2 by 1 mm., turned backwards under the lip; column with long hairs on the horns and shorter hairs elsewhere. Only known from Penang Hill. The very hairy midlobe with its three backward-pointing hairless lobules is quite distinctive.

2. *Trichoglottis Winkleri* J.J.S., Engl. Bot. Jahrb. 48: 105. 1912. Var. **minor** J.J.S., Bull. Botz., Ser. 2, XXVI: 102. 1918; Ser. 3 6-'t 17 III.

Stem hanging, 60 cm. or more long, 3 mm. thick, internodes 2-2.5 cm.; leaves to 12 by 2.5 cm., narrowed to acute apex and to base; inflorescences 1-flowered, 1-3 at a node; sepals and petals yellowish with bars and spots

of light red-brown; upper sepal 1 by 0.5 cm., widest in upper half, pointed; lateral sepals 8.5 by 4.5 mm., widest in middle; petals 8.5 by 2.5 mm.; blade of lip 6.5 mm. long; spur 6.5 mm. long, pointing downwards at right angles to blade, slightly curved forwards, blunt, transversely flattened, 2.5 mm. wide; side-lobes bluntly triangular, erect, close to base of column, 1.5 mm. high and wide, forward ends running on to two rounded small calli at base of midlobe; midlobe 3-lobed, the 3 parts equal in length, the lateral ones thin, blunt, with ends downcurved, 3.5 mm. long and more than 2 mm. wide, the middle one fleshy, oblong, straight, 2 mm. wide, with rounded end; horns of column flattened. Distributed in Borneo and Sumatra; in Malaya only known from Port Swettenham and Cameron Highlands.

*Var. minor.* Identical with the typical form but smaller; leaves about 5 by 1.3 cm.; flowers small with upper sepal 6 by 3 mm. and other parts in proportion. Reported from Java; in Malaya found at Kota Glanggi in Pahang. Whether this is really distinct, or whether intermediate forms occur, is not known.

3. **Trichoglottis cirrhifera** T. et B., Nat. Tijdschr. Ned. Ind. 1853: 493. J.J.S., Fl. Buit. 6: 615, f. 461.—*T. tetraceras* Ridl., J.L.S. 32: 357. 1896. Flora 4: 162.—*Saccolabium cornigerum* Ridl., J.L.S. 32: 361. 1896. Flora 4: 171.—*Cleisostoma tenidcaule* King & Pantl., J. As. Soc. Beng. 66: 596. 1897.—*Saccolabium Pantlingii* Ridl., Mat. Fl. M.P. 1: 162. 1907. Flora 4: **175**.

Stem long-climbing, internodes about 2 cm.; leaves spreading, to about 10 by 2 cm., narrowly elliptic, tip acute, base narrow; inflorescences 1-flowered, several at each node; sepals and petals spreading, blunt, pale yellow with the central parts more or less completely suffused with brown; sepals to 8.5 by 3.5 mm.; petals 2 mm. wide; lip spurred, white, from tip of spur to tip of blade 1.4 cm., the blade about 7 mm.; spur straight, slender, pointing backwards, the blade in the same line; side-lobes short, triangular, erect, close to base of column, their front edges produced forwards into two low rounded finely hairy keels meeting in front between the basal lobules of the midlobe; midlobe fleshy, 4.5 mm. long, 1.5 mm. wide at base, 2.5 mm. wide near blunt apex, bearing near base two spreading upcurved narrow oblong lobules 2 mm. long. Distributed to Java (not known at present from Sumatra); in Malaya only found in Penang and Kedah. This is a variable species as regards size of flowers. The Penang Hill plants have sepals only 5.5 mm. long, and other parts in proportion, but are identical in shape. The blade of the lip is also sometimes longer and downturned. In Java the petals are reported as 3 mm. wide.

4. **Trichoglottis retusa** Bl., Bijdr. 360. 1825. J.J.S., Fl. Buit. 6: 614, f. 460. Ridl., Flora 4: 162.

Stem long-climbing, internodes 2.5-3.5 cm.; leaves 7 by 1.5 to 12 by 2 cm., oblong, ends unequally bilobed, the halves rounded, base slightly narrowed; inflorescences 1-flowered, 1-3 at a node; sepals and petals pale greenish yellow spotted with red-brown, the spots large; upper sepal 1.3 by

0.5 cm., laterals 1.5 by 0.5 cm., tips acute; petals as long as upper sepal, 2.5 mm. wide; lip with a short spur 2.5 mm. long, the tongue narrow, short-hairy; side-lobes close to base, narrow, curved outwards and upwards, with purple spots and a small hairy yellow callus at the base; midlobe 9 mm. long, 5 mm. wide, covered with long white hairs, narrowed to the base, brown-spotted near apex, beneath which is a fleshy tooth; column 6 mm. long, horns hairy. Distributed in Java, Sumatra and Borneo; in Malaya found chiefly on limestone, in Pahang and at Batu Caves in Selangor, both on the rock and *on* trees.

5. **Trichoglottis misera** (Ridl.) Holtt, Gard. Bull. 11: 292. 1947.—*Saccolabium miserum* Ridl., J.L.S. 32: 359. 1896. Flora 4: 171.

Stems 50 cm. or more long, internodes 1-1.7 cm.; leaves to 13 by 1 cm., narrowed gradually to blunt tip and to narrow base, purple-spotted when young; inflorescences 1-flowered, several at a node; sepals and petals pale yellow, about 4 mm. long; lip with spur 2 mm. long at right angles to column, the tip pointing forwards below the blade; blade of lip turned downwards, about 5 by 2.5 mm., elliptic, white, tip blunt; side-lobes at the very base, narrow, incurved, 1 mm. long, with purple marks and two short purple streaks on the blade between them; column without the typical horns of the genus but with a fleshy thickening on either side of the rostellum. Found only in the north of Malaya, in the Dindings, at Baling in Kedah, in Penang and Langkawi Islands. This species has the typical tongue of *Trichoglottis*, but not the horned column.

6. **Trichoglottis lanceolaria** BL, Bijdr. 359. 1825. J.J.S., Fl. Buit. 6: 618, f. 463, 464.

Stems pendulous, about 70 cm. long, slender, rooting at base only, internodes about 1.5 cm.; leaves spreading, to 10 by 0.7 cm., narrowly elliptic, acute, twisted at the base; inflorescences about 4 mm. long, in a close row of 3 to 6 at each node, each bearing 2-4 flowers, the rachis zigzag; flowers 5-7 mm. high, the sepals and petals pale yellow with a broad median red-brown or crimson band, or sometimes spotted or quite plain; upper sepal about equal in length to the spur, which is in line with it, less than 2 mm. wide; lateral sepals joined to sides of spur and decurrent in a broad base, rest of blade as upper sepal; petals narrower than sepals; spur straight, 1 mm. wide, hairy within, especially down the front, the tongue narrow, blunt or notched; side-lobes triangular, erect, acute, base 1 mm. long; midlobe at right angles to spur, triangular or more or *less* 3-lobed, the whole 2 mm. wide, each lobe 1 mm. long, the middle one acute, the others rounded; at the base of midlobe a transverse deep yellow band and two low hairy calli which diverge to meet the front edges of the side-lobes. Distributed in Java and Sumatra; in Malaya only found at present on G. Panti in Johore and on Pulau Tioman. As noted above, this is a variable species; at least two forms have been found on G. Panti, side by side.

**Fig. 191.**

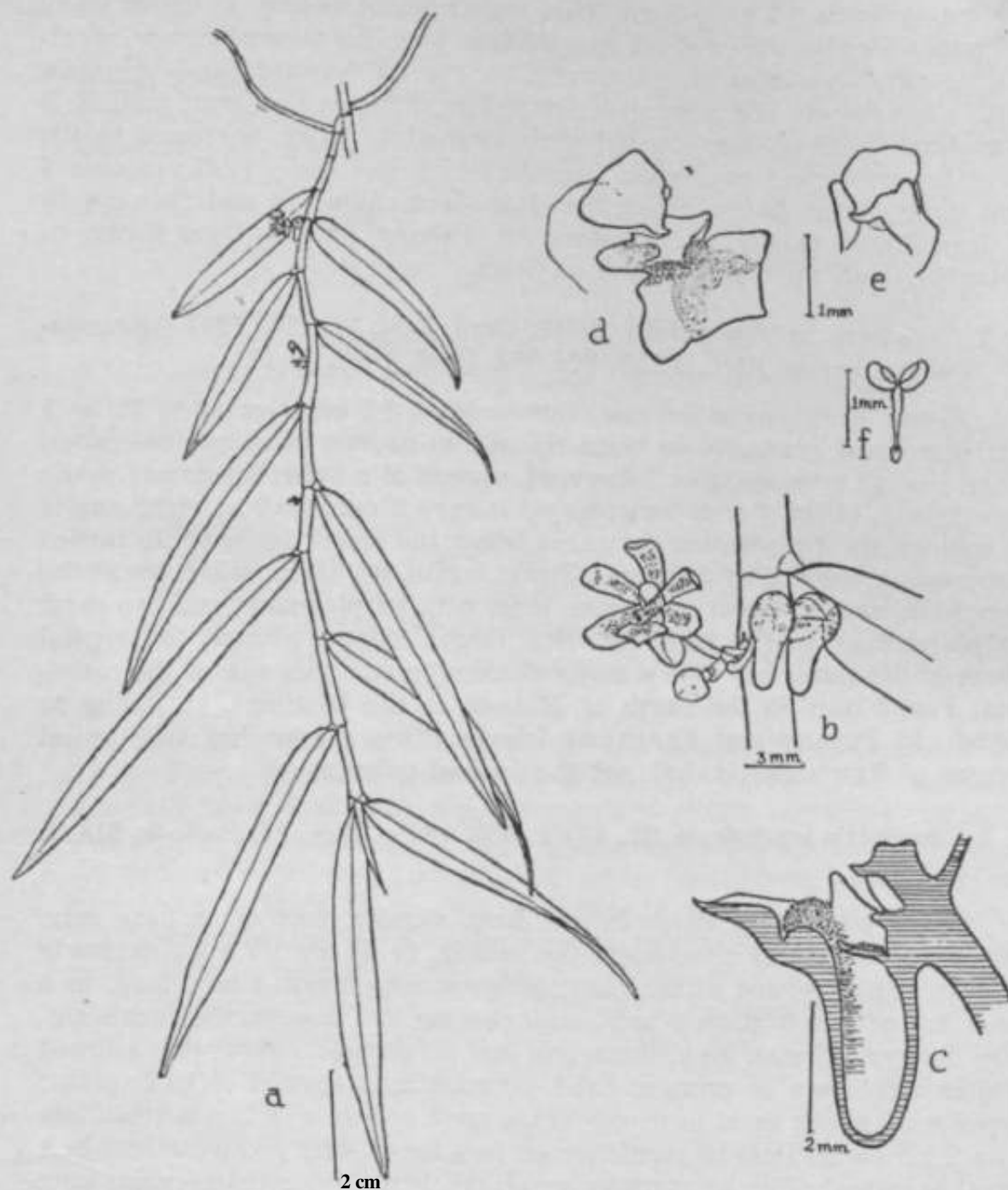


Fig. 191. *Trickoglottis lanceolaria*. a, stem and inflorescences. b, inflorescence and leaf base, c, section through column, lip and spur, d, lip and column, e, column, f, pollinia.

7. *Trichogiottis fasciata* Rchb. f., Gard. Chron. 1872: 699. Warner & Will Orch. Alb. 5: pi. 208.—*Stauropsis fasciata* Benth., Gen. Plant. 3: 572. 1833. Ames & Quis., P. J. Sci. 47: 214, pi. 2, f. 4, 5; 12; 28; 29.—*Staurochilus fasciatus* Eidl., JX.S. 32: 350. 1896. Flora 4: 157.

Stems climbing, 60 cm. or more long, internodes about 2 cm.; leaves to 12 by 2.5 cm., end bilobed, halves rounded, unequal; inflorescence more or less horizontal or obliquely ascending, to about 12 cm. long, with 2-4

flowers rachis angled, bracts short; sepals and petals white on backs, on front pale lemon yellow with broad transverse brown bands; sepals to 2.8 by 1.1 cm keeled on back towards tip, acute; petals a little shorter and narrower—lip not spurred, white with few brown spots, 2-2.2 cm. long; side-lobes erect close to each other and parallel, 5 mm. high, oblong, extending nearly half length of lip, front edges erect; midlobe with lateral lobules spreading at right angles on either side from the middle of the lip the lobules 8 by 5 mm., triangular, flattened horizontally; apex of midlobe laterally flattened, 6 mm. high, ending in an acute tip, hairy on the upper edge and towards the base, the area between the side-lobes also hairy; tomium small; column brown with horns 3 mm. tall tipped yellow; anther and disc yellow. Distributed from the Philippines to Sumatra (not in Java) and in Siam; in Malaya only found in the extreme north, in Langkawi and Kedah. This is an attractive species, often cultivated. Fig. 192.

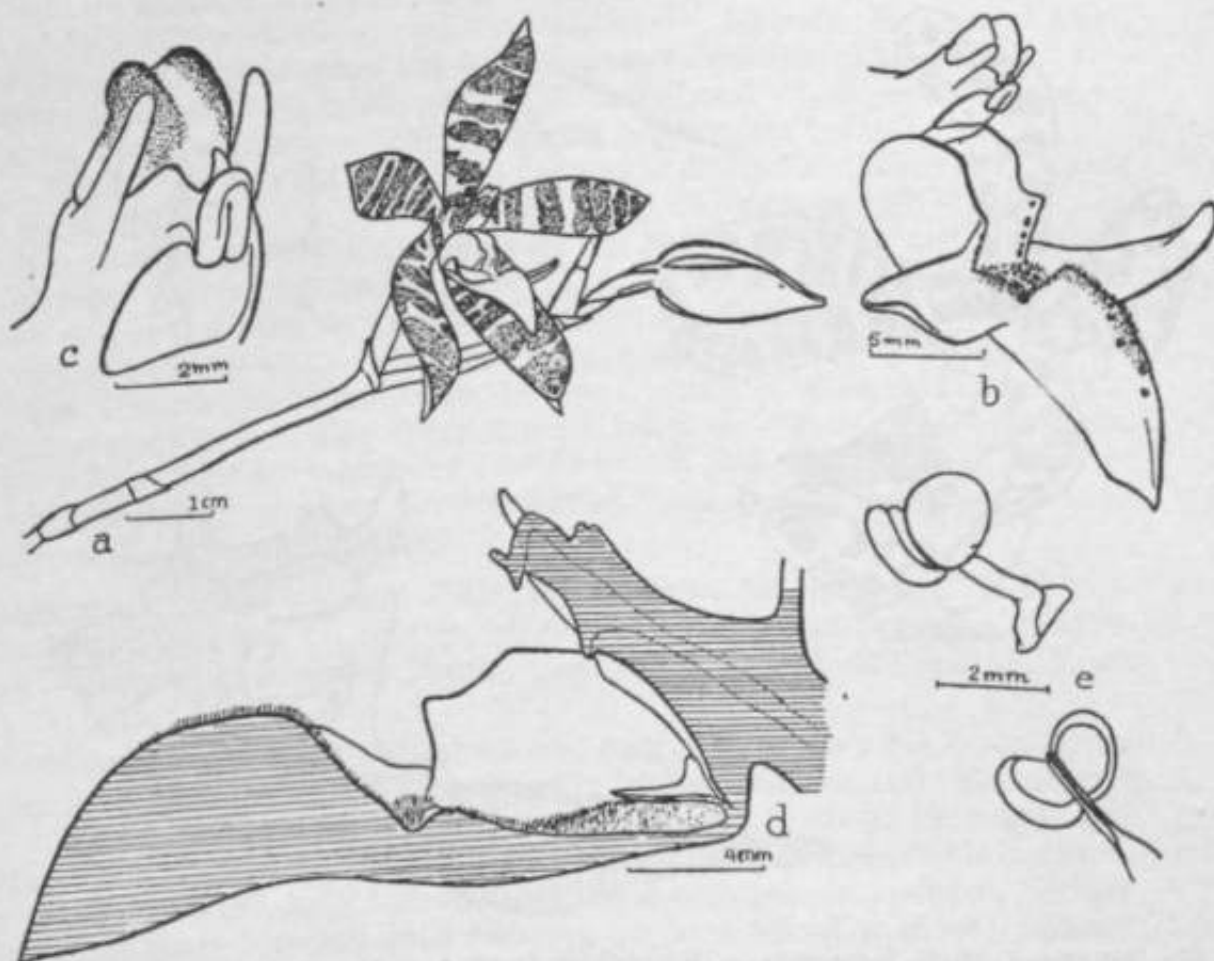


Fig- 192. *Trichoglottis fasciata*. a, inflorescence with opened flower and flower bud. b, lip and column. c, column, d, section through column and Hp. e, pollinia,

### Cultivated *Trichoglottis*

The only species of *Trichoglottis* commonly cultivated in Malaya is *T. fasciata* described above. It may be treated exactly as the Scorpion (*Trichoglottis Arachnis*) but is not so strong in growth and is best with supports. It grows 2 feet tall. Its roots need good shade and moisture; that is, it needs more litter about the base than *Arachnis*. It flowers once a year,

about May, very regularly in Singapore. The flowers are not very brilliant in colour, and the stalks are short, which detracts from its value as a decorative plant.

Two Philippine species are sometimes cultivated, and both are more attractive in colouring than *T. fasciata*; they are *T. luzonensis* and *T. philippinensis*.

*T. luzonensis* has short stems and rather long leaves; the inflorescences are branched, on long scapes, each bearing many flowers, which last a long time. The flowers are not large (upper sepal 2 by 0.7 cm., lip 1.9 cm. long) but are attractive in colouring, cream with rather small red-brown spots and a little yellow on the lip, the midlobe of which is undivided and narrow. This species does not flower very often in Singapore, but is well worth growing. Fig. 193.

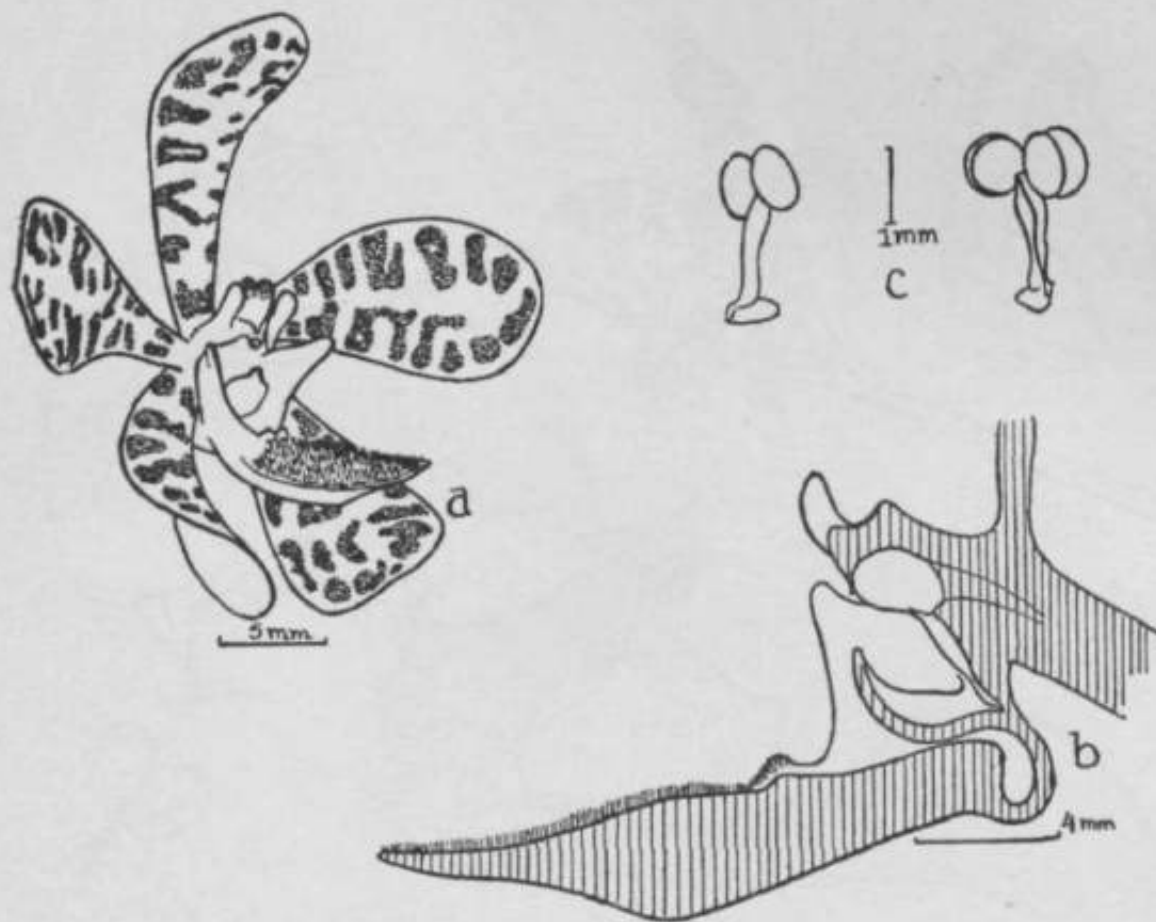


Fig. 193. *Trichoglottis luzonensis*. *a*, flower from front, *b*, section through column and lip, *c*, pollinia.

*T. philippinensis* is very different in appearance, having longer climbing stems with short broad leaves and solitary flowers. The flowers are larger than in *T. luzonensis*, with very deep crimson-purple sepals and petals edged with a thin line of cream, and a white lip with 3-lobed midlobe not unlike that of *T. fasciata*. The species is variable, some varieties being richer in colour than others; the best variety is called var. *braehiata*. This species will stand the full sun and grows well in Singapore, but is not



very floriferous. It can sometimes be made to flower by moving to a more exposed place, especially at the change from wet to dry season.

No hybrids have yet been flowered in this genus, but some are on the way, and should prove useful. Hybrids also with *Arachnis*, to give added size to the flowers, will be worth producing. Few genera have the consistent yellow and red-brown of *Trichoglottis*, and though the flowers are not large, they may be worth crossing for their colours.

## 12. VANDOPSISIS

Erect, stout plants with short internodes and broad strap-shaped leaves, usually very fleshy; inflorescence stout, simple, erect or curved, with many flowers; flowers large, fleshy, the sepals and petals almost equal and widely spreading; lip attached to base of column by the sidelobes, which are small, and have joining them a fleshy flap which arches over the basal keel of the midlobe; midlobe long, fleshy, laterally flattened, keeled, the keel interrupted near the base, hairless; column short, with a projection in front at its base; pollinia 4, flat, almost equal, in two pairs, on a short broad thin stipes with recurving edges; disc broad.

This genus consists of about 8 species, in Burma and Siam southwards to northern Malaya, in southern China, the Philippines and New Guinea. It is related to *Arachnis*, as shown by the keels on the lip, and also (perhaps more nearly) to *Trichoglottis*, as shown by the flap joining the sidelobes across the base, in the same position as the tongue of *Trichoglottis* but of a different shape. It is not certain that this flap is present in all species. One species is native in Malaya, and one is often cultivated; both are described below. The other species found in Burma is *V. undulata*, with a long climbing stem very like *Arachnis*, and a long-stalked inflorescence of rather few white flowers flushed with pink. It is perhaps nearer to *Arachnis* than our species.

***Vandopsis gigantea*** (Lindl.) Pfitz., Nat. Pflanz. Ed. 1, ii, 6: 210. 1889.—  
*Vanda gigantea* Lindl., Gen. et Sp. Orch. 215. 1833. Bot. Mag. t. 5189  
—*Stauroopsis gigantea* Benth., Gen. Plant. 3: 572. 1883. Ridl., Flora  
4: 155.

Stems very stout, to about 30 cm. long; leaves very fleshy, to 35 by 6 cm., narrowed slightly to the unequally bilobed rounded tip; inflorescence to about 35 cm. long, the scape to 10 cm., flowers to about 15; sepals and petals 2.5 to 3 cm. long, broad, fleshy, dull yellow with red-brown blotches; lip straight, 1.8 cm. long, side-lobes suffused with purple, rounded, slightly diverging, their forward ends running on to sides of midlobe; midlobe yellow, shape as described for genus. Distributed in Burma and Siam, and south to the Langkawi Islands and the islands off Trengganu; usually found on rocks near the sea, sometimes in very large plants. A plant has also been reported from Batu Pahat in Johore. This species is sometimes cultivated, requiring good exposure, but does not flower well in Singapore.

***V. lissochiloides*** (also known as *V. Batemanii*)

Stems taller and leaves straighter than in *V. gigantea*; inflorescence to 200 cm. or more tall, bearing many flowers, the sepals and petals bright

purple or yellowish on the back, bright yellow with purple spots on the front. This is a handsome species, native in the Philippines, which grows and flowers well in Singapore, but often only a few flowers are open simultaneously. The structure of the flowers is almost exactly the same as in *V. gigantea*. Fig. 194.

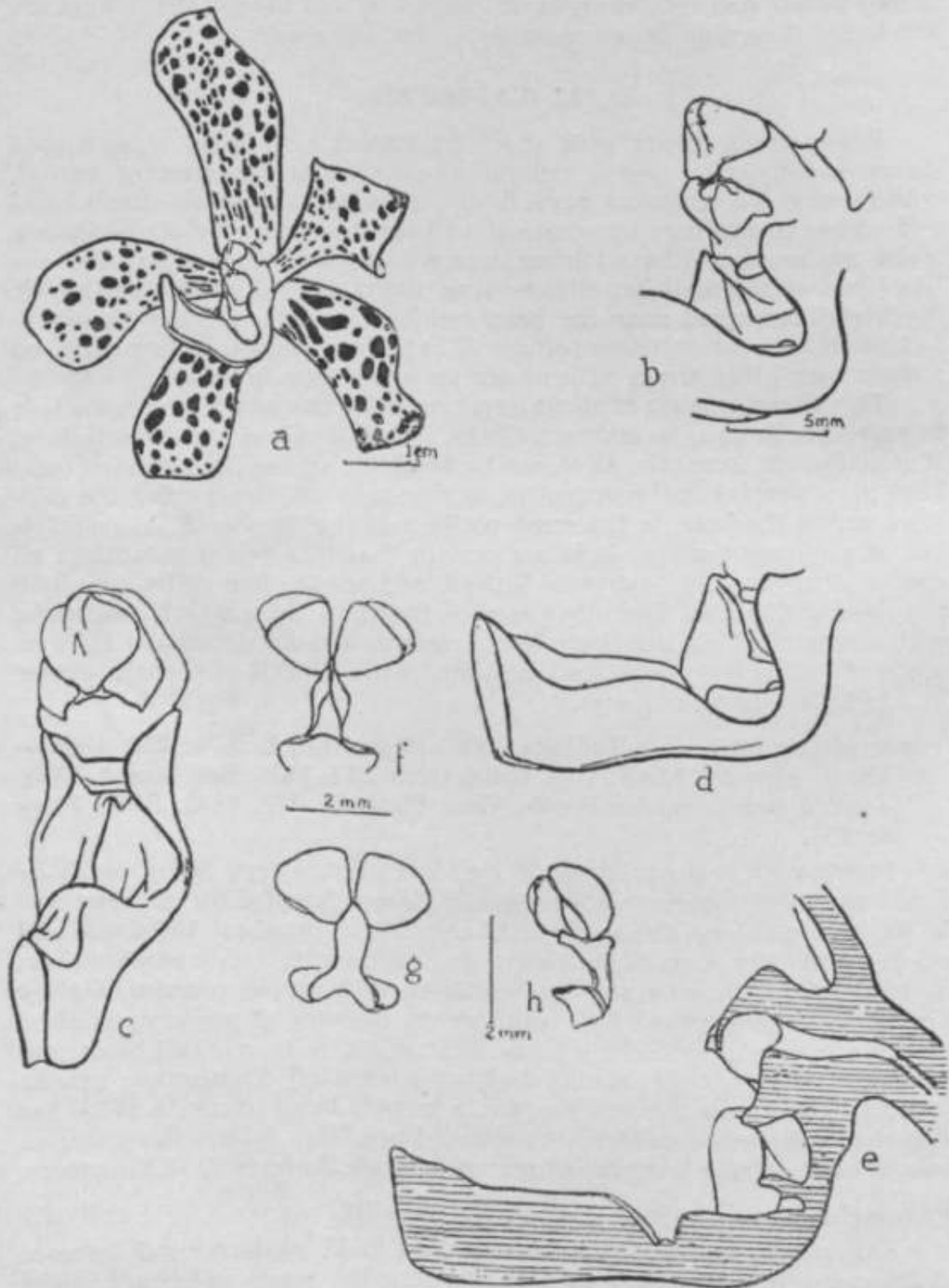


Fig. 194- *Vandopsis lissochiloides*. *a*, flower from front, *b*, column and base of lip. *c*, column and lip from front, *d*, lip from side, *e*, section through column and lip. *f*, pollinia from back, *g*, from front, *h*, from side.

### 13. PELATANTHERIA

Stems rather long-climbing, of medium thickness; leaves oblong, bilobed, in one species distinctly narrowed near the apex; inflorescences short or fairly short, unbranched, the flowers well spaced on an angled rachis with small bracts; flowers of medium size, fleshy, their structure as in *Sarcanthus*, differing as follows: sepals and petals with several longitudinal purple lines; midlobe of lip with long point; column with well-developed pointed horns; stipes of pollinia broader than long, disc more or less crescent-shaped.

This is a genus of three species, one of them Malayan, the others occurring further north. They have the vegetative appearance of *Camarotis* rather than *Sarcanthus*, but the flowers have the lip in the normal position. The structure of the spur with its back callus is exactly as in *Sarcanthus*, and the shape of the lip generally, except that the midlobe is always long-pointed; in one species (*P. ctenoglossa*) the point is fringed with hairs. The horned column resembles *Trichoglottis*, but the horns are pointed and smooth. One might perhaps regard the genus as a link between *Trichoglottis* and *Sarcanthus*. There are 4 pollinia, united in 2 bodies, exactly as in *Sarcanthus*, not two as stated by Ridley.

***Pelatantheria cristata*** (Ridl.) Ridl., J.L.S. 32: 373. 1896. Flora 4: 177.—  
*Cleisostoma cristatum* Ridl., Tr. L.S. 3: 370. 1893.

Stems 30 cm. or more long, internodes 1.5-2 cm.; leaves fleshy, to 7 by 1.2 cm., slightly narrowed 1 cm. from the tip, lobes of tip with points curved towards each other; inflorescence to 9 cm. long, the scape 1 cm., flowers to about 10, sweet-scented; sepals and petals yellowish, closely veined with red-brown; sepals strongly keeled on the back, the keels toothed towards the tips; upper sepal 5 mm., laterals 6 mm. long, all strongly concave, the laterals rising above the horizontal; petals spreading, blunt, almost as long as the lateral sepals; lip white with pink markings; base of column to tip of midlobe 8.5 mm., base of column to tip of spur 6 mm.; side-lobes triangular, acute, with incurved tips, base 3.5 mm., height 2.5 mm.; midlobe 5 mm. long (excluding tip) and 6 mm. wide] arrow-shape, with a low median ridge and higher lateral ridges joining the ends of the side-lobes, tip suddenly narrowed and turned down, 2.5 mm. long; spur conical, with longitudinal septum in the apical part, back callus long and very massive, short-hairy beneath, lying right across the mouth of the spur and touching the lateral keels on the midlobe. Found at a few localities in the lowlands of Pahang, Negri Sembilan and Perak, on trees, in fairly open places. The crested keels of the sepals are striking. **Fig. 195.**

### 14. SARCANTHUS

Stems short or long, erect or hanging; leaves flat or terete; inflorescences short or long, simple or often more or less branched, erect or pendulous, usually many-flowered, the flowers rather small; sepals and petals about equal, usually spreading; lip 3-lobed, spurred, joined a little to the foot of the column by the back edges of the side-lobes, with a conspicuous callus of varied form at the entrance to the spur on its back wall, and often a callus also on the front wall at the base of the midlobe;

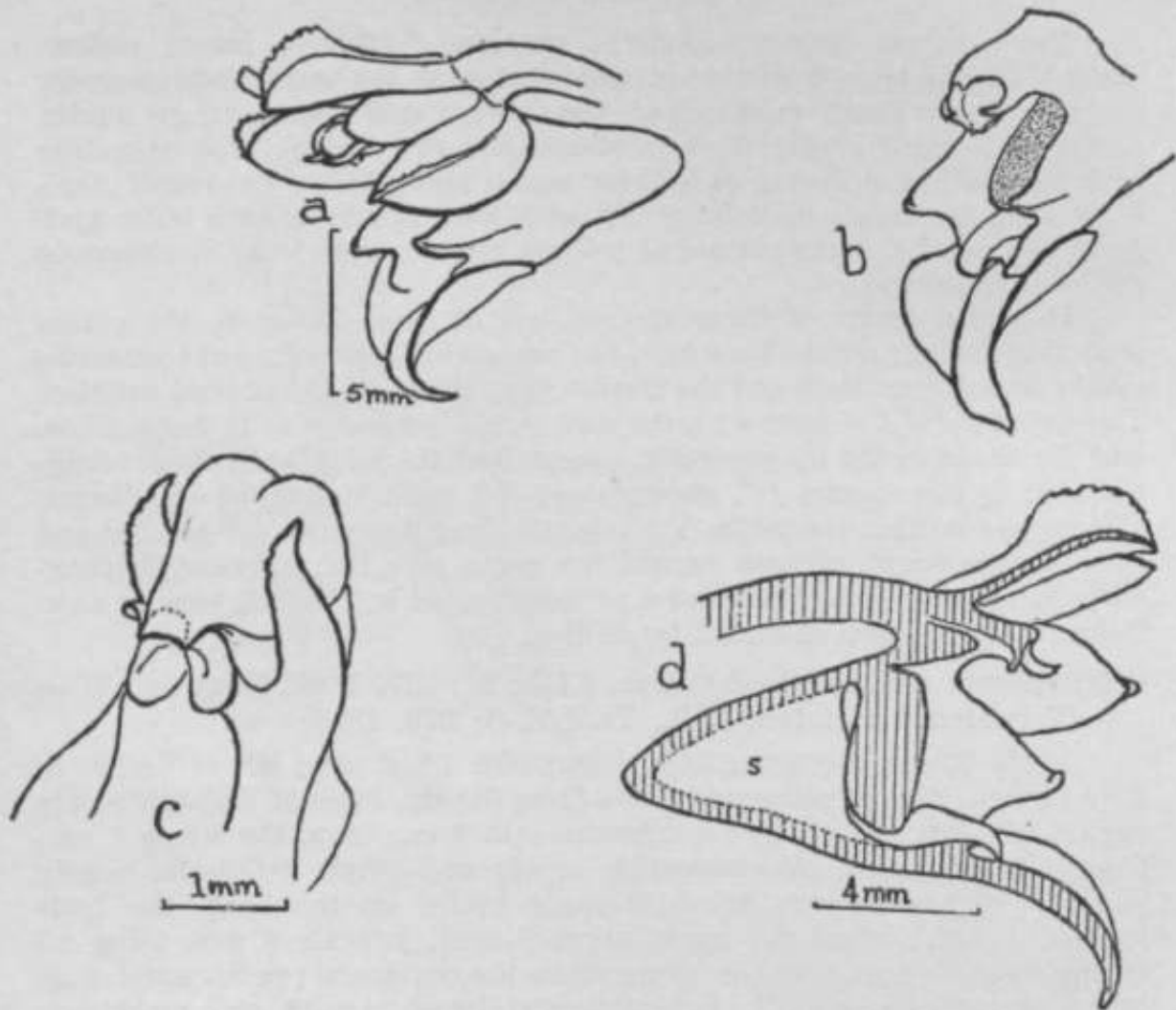


Fig. 195. *Pelatantkeria cristata*. *a*, flower from side, *b*, column and lip, the back callus in mouth of spur dotted, *c*, column from front, showing the horns. *d*, section through column and lip (*s*, the septum in the spur).

side-lobes more or less erect, triangular; midlobe straight or sometimes curved upwards, nearly always triangular and usually shaped like an arrow-head, with small spreading barbs at the base; spur conic or cylindric, rarely saccate, often but not always longitudinally septate, the septum sometimes reduced to a narrow keel; column short, with a short foot; pollinia 4, united in two round bodies, the stipes usually narrow and widened to the apex, the disc small or large, sometimes horse-shoe-shaped.

This is the largest genus of the small-flavoured orchids of this group. The flowers are always rather fleshy and last several days. Their most distinctive feature is the large callus at the back of the spur, just within the entrance. This often has a groove on its lower surface, the groove resting on the top edge of the septum which divides the bottom of the spur. The back callus also sometimes interlocks with the front callus. In one way or another the entrance to the spur is very restricted. To what extent this aids in guiding visiting insects so that they effect pollination is

unknown in most cases, and any observations of visiting insects would be of interest. The spur often has plenty of nectar.

The complexity of structure of these little flowers makes rather detailed descriptions necessary; but even so it is difficult to convey an accurate idea of their form. Good drawings of all are needed.

A few of the species are common and have been frequently collected; others are known from very few collections, as indicated below, and concerning these further information is needed. Nearly all are lowland plants, and many are known to occur in Sumatra or Borneo. It is probable that further search in those islands as well as in Malaya will add to the number of these.

### Key to the species of *Sarcanthus* in Malaya

#### Leaves terete

- Leaves about 6 mm. thick; inflorescence more than-twice as long as leaves .. .. 1- *S. Kunstleri*
- Leaves not over 3 mm. thick; inflorescence less than twice as long as leaves
  - Midlobe of lip 6 mm. wide at base; spur septate .. .. 2. *S. Machadonis*
  - Midlobe of lip much narrower; spur not septate
    - Leaves about 4 cm. long, strongly recurved 3. *S. capricornis*
    - Leaves much longer, not strongly recurved
      - Spur longer than wide, almost cylindrical 4. *S. halophilus*
      - Spur almost spherical, widening beyond orifice, about 2 mm. diameter .. 5. *S. sacculatus*

#### Leaves not terete

- Sepals conspicuously keeled on the back; bracts as long as flowers .. .. 6. *S. lanatus*
- Sepals not conspicuously keeled on the back; bracts much shorter
  - Stems to 30 cm. or more long, with well-spaced leaves, internodes 1-5-3 cm.
    - Leaves narrow, to 30 by 14 cm. .. 7. *S. subulatus*
    - Leaves shorter and proportionately much broader .. .. 8. *S. Scortechinii*
  - Stems much shorter, the leaves rather close
    - Lobes of lip slightly toothed; forward ends of side-lobes produced into narrow incurved triangular lobules meeting across base of midlobe .. .. 9. *S. termissus*
    - Lobes of lip not toothed; side-lobes otherwise
      - Side-lobes of lip inflexed, closing entrance of spur except for a narrow slit; back callus T-shaped, above the side-lobes .. .. \* 10. *S. inflexilobus*

- Side-lobes not thus inflexed, entrance to spur mainly closed by back callus  
**Spur** without longitudinal septum  
 Side-lobes erect, acute, 1.5 mm. high, taller than column . . . 11. *S. suffusus*  
 Side-lobes blunt, hardly raised, shorter than column . . . 12. *S. fissicors*  
**Spur** with longitudinal septum  
 Inflorescence about 1.5 cm. long . . . 13. *S. rugulosus*  
 Inflorescence 15 cm. or more long  
 Spur rather strongly bent; inflorescence simple or with few branches  
 Side-lobes narrow, acute; disc of pollinia small . . . 14. *s. pensilis*  
 Side-lobes broad, blunt; disc of pollinia large, saddle-shaped . . . 15. *s. rostellatus*  
 Spur nearly straight; inflorescence with many branches . . . 16. *S. ionosmus*

- 1. *Sarcanthus Kunstleri*** King & Pantl., Journ. As. Soc. Beng. 66: 594. 1897.  
 —*Saccolabium Kunstleri* Ridl., Mat. Fl. M.P. 1: 163, 1907. Flora 4\*: 169.

Stem to 20 cm. or more long, 5 mm. thick including the leaf-sheaths, internodes about 1 cm.; leaves terete, about 7 cm. long, 6 mm. thick, almost at right angles to stem, often slightly decurved, sheaths purple-spotted when young; inflorescence more than twice as long as leaves, simple or branched, scape about 6 cm. long; flowers many, 3-5 mm. apart; sepals and petals pale pink with a purple stripe along the middle, 3-4 mm. long; side-lobes of lip erect, obtuse, purple; midlobe acute, concave, narrowly triangular, purple; spur shorter than midlobe, laterally widened, rounded, with a partial septum arising from the front wall, nearly touching a large callus from the back wall. Only known with certainty from the original collection made by Kunstler somewhere in Perak. The short very thick leaves, thick stems and long inflorescence appear to distinguish this species from *S. Machadonis*.

- 2. *Sarcanthus Machadonis*** (Ridl.) J.J.S., Nat. Tijdschr. Ned. Ind. 72: 89. 1912.—*Saccolabium Machadonis* Ridl., J.S.B.R.A.S. 39: 82. 1903. Flora 4: 168.

Stem to 20 cm. or more long, 3 mm. thick including the leaf-sheaths, internodes to 1.5 cm. long; leaves to 10 cm. long, 3 mm. thick, sharply pointed, grooved; inflorescence unbranched, sometimes elongating to 15 cm., the scape 1.5-2 cm., flowers 5-10 mm. apart; sepals and petals pale yellow-green, with or without median bands of purplish spots, lip pale violet-purple, deeper on ends of side-lobes; sepals about 4-5-5 by 2-5 mm.; petals spatulate, 2-5 mm. wide; lip 7 mm. long to tip of midlobe; side-lobes erect, blunt, front edges incurved; midlobe broadly arrow-shape, 5 mm. long and 5-6 mm. wide, the blunt thin tip slightly downturned, edges

slightly concave; spur barely 3 mm. long, at right angles to the plane of the midlobe, with an almost complete vertical septum; callus at back of spur white, base broad, suddenly narrowed to narrow apical part which JS curved downwards into the spur; pollinia with saddle-shaped disc. Distributed in Borneo and Sumatra; in Malaya found at a few localities in Perak, Selangor and Johore, in the lowlands.

3. *Sarcanthus capricornis* (Ridl.) Holtt., Gard. Bull. 11: 287. 1947.—*Ascochilus capricornis* Ridl., Flora M.P. 4: 181. 1924.

Stems to about 15 cm. long, internodes about 5 mm. long; leaves 2-5-4 cm. long, terete, strongly recurved, acute, about 3 mm. thick; inflorescences about 6 cm. long including scape of barely 1 cm.; bracts 1 mm. long, about 3 mm. apart; pedicel and ovary 8 mm. long; upper sepal nearly 4 mm. long; petals about 3 by 1.5 mm.; lip with saccate non-septate spur 1.5 mm. long and wide, erect broadly rounded side-lobes 2 mm. long and wide, narrowly triangular midlobe 3 mm. long and 2 mm. wide, with short hairs at the entrance to the spur, and a thick bluntly triangular back-callus; column-foot about 2 mm. long "upper petal (i.e. sepal) magenta, lower shorter inflorescence and larger flwvers.

petals brownish-green mottled with red" (collector's note). Only known from G. Senyum, Pahang; closely allied to *S. recurvus* of Siam, but with

4. *Sarcanthus halophilus* (Ridl.) J.J.S., Nat. Tijdschr. Ned. Ind. 72: 87. 1912.—*Sarcobolabium halophilum* Ridl., J.L.S. 32: 367. 1896. Flora 4: 168.—*Ascochilus teres* Ridl., J.S.B.R.A.S. 39: 85. 1903. Flora 4: 181.

Stems to about 30 cm. long, curved, internodes 1-1.5 cm.; leaves terete, curved, to 15 cm. long and 3 mm. thick, tip acute; inflorescence to 20 cm! long, often branched once near base, flowers 3 mm. apart; sepals and petals olive-green with purple streaks; upper sepal 3-5 by 1.5 mm., laterals wider, petals 1 mm. wide; side-lobes of lip slightly incurved, pale pinkish with deep purple edges; midlobe almost continuing the line of the spur (as seen from the side), 2 mm. wide, rather narrowly arrow-shape with straight blunt tip, pale pink with a purple spot on each side; spur parallel to ovary; shorter than midlobe, not septate, olive-green suffused or spotted purple; callus at back of spur small, triangular, white; disc of pollinia round with two diverging narrow lobes behind. Distributed in Borneo and Sumatra; in Malaya found in the southern half only, chiefly on trees near the sea.

5. *Sarcanthus sacculatus* Ridl., J.L.S. 32: 368. 1896.—*Saccolabium sacculatum* Ridl., Mat. Fl. M.P. 1: 164. 1907. Flora 4: 172.—*Sarcanthus flaccidus* J.J.S., Bull. Botz., Ser. 2, XXVI: 107. 1918; Ser. 3, 6: t. 18, II.

Stem to 30 cm. long and 3 mm. thick (including sheaths), internodes 1.5 to 3 cm.; leaves terete, blunt, to 18 cm. long and 2-5 mm. thick; inflorescence sometimes branched near the base, usually simple, to 15 cm. long, the flowers well spaced; sepals and petals pale olive-green, lip white with purple lobes, spur pale mauve; upper sepal barely 3-5 by 1.5 mm., laterals a little longer; petals under 3-5 by 1 mm.; column-foot with lateral sepals attached nearly as long as spur; lip from tip of midlobe to tip of spur hardly 5 mm.; spur saccate, swollen beyond orifice, 2 mm. long and nearly

as wide, not septate; callus at back white, papillose; side-lobes broadly triangular, blunt, 1.5 mm. high; midlobe triangular with raised tip, fleshy, 2 mm. long and wide. Distributed in Lower Siam, southwards to Langkawi and Perlis, and in Sumatra. It is distinguished by its long slender leaves and small spur.

6. **Sarcanthus lanatus** (Lindl.) Holtt., Gard. Bull. 11: 288. 1947.—*Cleisostoma lanatum* Lindl., J. Hort. Soc. 4: 161. 1849.—*Saccolabium lanatum* Hk. f., F.B.I. 6: 60, 1890. Ann. Calc. 5: 48, t. 72. 1895.—*Sarcanthus bracteatus* Ridl., J.L.S. 32: 370. 1896.

Stem erect, stout, 15 cm. or more tall, internodes about 7 mm., the leaves close, overlapping at the base, curved outwards and downwards as in a *Vanda*; leaves to 14 by 2.4 cm., fleshy, tips unequally bilobed and rounded; inflorescence erect, the scape slender, 8-14 cm., short-hairy, rachis to 7 cm. or more, bearing many flowers, sometimes branched; bracts 6 by 3 mm., short-hairy; sepals strongly keeled on back, about 2.5 mm. long, dark red-brown with pale green edges; upper sepal erect, hooded, blunt, laterals spreading, petals pale greenish with 3 red-brown veins, shorter than sepals, edges hairy; lip about 5 mm. long; side-lobes pale greenish, thin, erect, triangular, acute, as long as midlobe, longer than wide; midlobe erect, cordate, fleshy with 2 narrow lobes 1 mm. long at right angles to the tip, white with mauve edges, 2.5 mm. long, edges inflexed, with a median keel rising backwards to form a callus stretching across entrance to spur, callus hairy at base on each side; spur laterally compressed, about as long as wide, a low keel running down the back, right round the base and up the front to the base of the midlobe, back callus small, spreading laterally along bases of side-lobes and there fitting on either side of the callus from base of midlobe; pollinia on a long narrow stipes, widened and rather deeply cleft at the tip, disc small. This peculiar species was originally found in Tenasserim and Siam; then in Kedah, and recently near Kuantan and on G. Pulai in Johore.

7. **Sarcanthus subulatus** (Bl.) Rchb. f., Bonpl. 5: 41. 1857. J.J.S., Fl. Buit. 6: 604, f. 449. Nat. Tijdschr. Ned. Ind. 72: 94. 1912.—*Cleisostoma subulatum* BL, Bijdr. 363. 1825.—*Sarcanthus secundus* Griff., Notul. 3: 362. 1851. Ic. Pl. As. 3: t. 336. King & Pantl., Ann. Calc. 8: 241, pi. 321.—*Saccolabium secundum* Ridl., Mat. Fl. M.P. 1: 163. 1907. Flora 4: 169.

Stem to 30 cm. or more long, internodes 2-3 cm.; leaves fleshy, to 30 by 14 cm., sides parallel, constricted about 2.5 cm. from the tip, tip sharply pointed; inflorescence pointing downwards, unbranched, to 15 cm. long, gradually lengthening for several weeks, scape short, flowers very close; sepals and petals dark purple-brown with pale greenish edges and median band; upper sepal 5 by 3 mm. or somewhat larger; petals 4 by 2 mm.; lip liJac on spur and midlobe, fading to white at base, yellow at base of side-lobes; base of column to tip of spur 6.5 mm.; spur almost parallel to ovary, tapering to tip, back callus almost oblong in profile, grooved in front and resting on a keel running down from the base of the midlobe to join the septum; side-lobes folded in the middle, their tips narrow, acute, curved towards each other; midlobe arrow-shaped, acute, 2.5-3 mm. long and about as wide; disc of pollinia small. Distributed from Sikkim, Siam and



Cochinchina southwards through Malaysia to Celebes; in Malaya throughout the lowlands, especially near the coast, fairly common. There is some variation in details of colouring of flowers, and in the extent of the septum.  
Fig. 196.

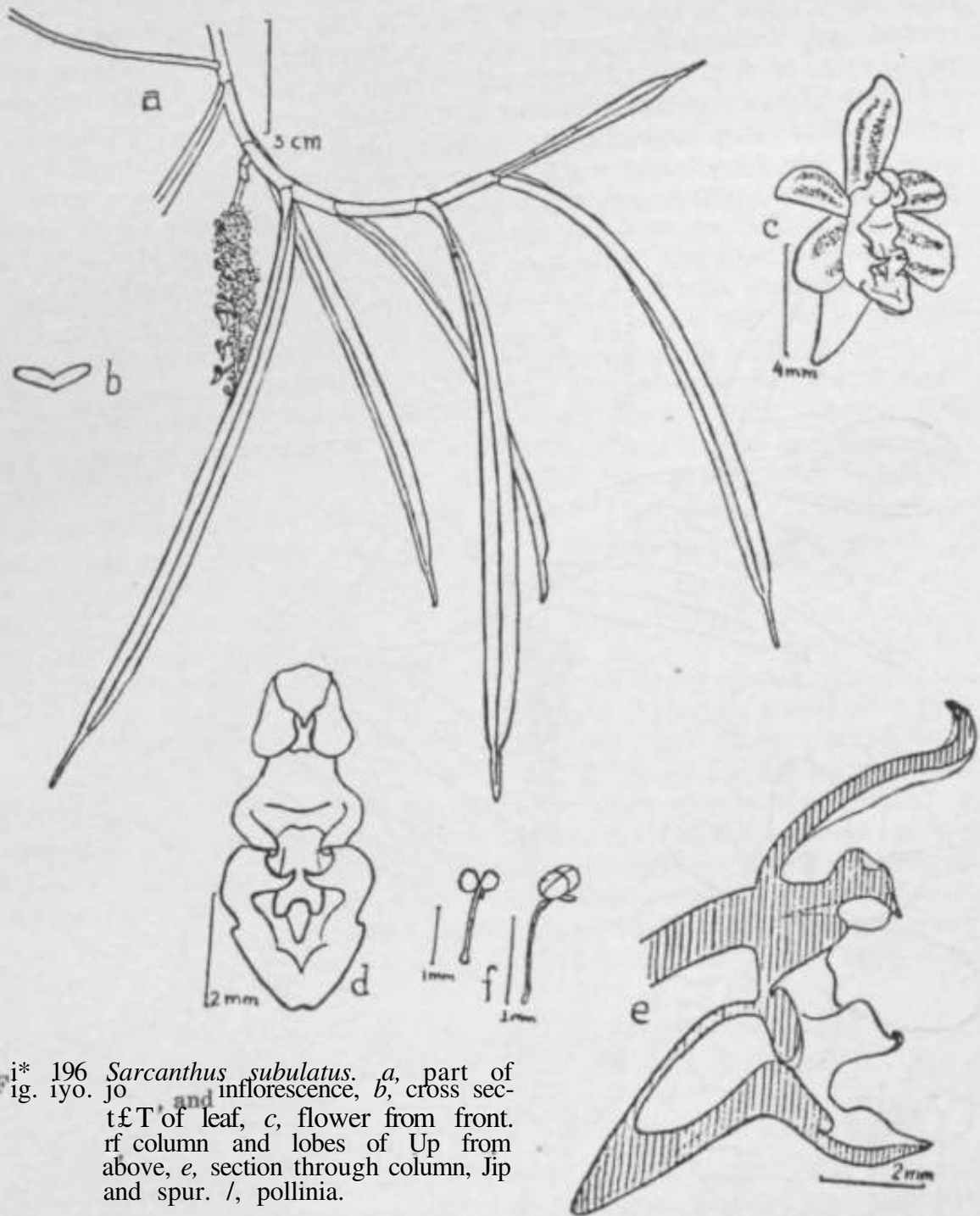


Fig. 196. *Sarcanthus subulatus*. a, part of inflorescence, b, cross section of leaf, c, flower from front of column and lobes of lip from above, e, section through column, lip and spur. f, pollinia.

R *Sarcanthus Scortechinii* Hk. f. F.B.I. 6: 68.1890. Ic. PL t. 2138.—*Saeco-*  
*Jabium Scortechinii* Ridl., Mat. FL M.P. 1: 167. 1907. Flora 4: 169.

Stem often long, 5 mm. thick including the sheaths, internodes 2-3  
cm.; leaves to 12 by 22 cm., widest near suddenly narrowed and stalked  
base, gradually narrowed to about 1 cm. (sometimes less) from apex

where is a slight constriction, apex shortly acute, keeled; inflorescence stiffly pendulous, 7-16 cm. long, rarely forked at the base, scape short, rachis slowly elongating, flowers close; upper sepal and petals almost entirely dark purple-brown, lateral sepals with pale yellow-green median line and edges; upper sepal 4.5 by 2.5 mm., blunt; petals 1.5 mm. wide; Up from tip of spur to tip of midlobe 7-8 mm.; spur 4.5 mm. long, slightly curved away from ovary, narrowed to tip, septate; callus at back of spur rectangular as seen from front, surface rounded, pale greenish; side-lobes pale yellowish, short, bent first inwards and then outwards, with a dull-yellow callus along base of each; midlobe pale mauve, arrow-shape, 5 mm. wide, 3-5 mm. long, blunt, with 2 pale mauve calli near its base, between the bases of the side-lobes; whole flower including lip flushed with yellow when old. Distributed throughout Malaya, from Penang to Singapore; locally abundant on trees by rivers in Pahang. This common species has not yet been identified with any *Sarcanthus* so far reported from Sumatra or Borneo. It is near *S. snbulatus*, differing in the much shorter leaves and broader midlobe of more complex structure. Fig. 197.

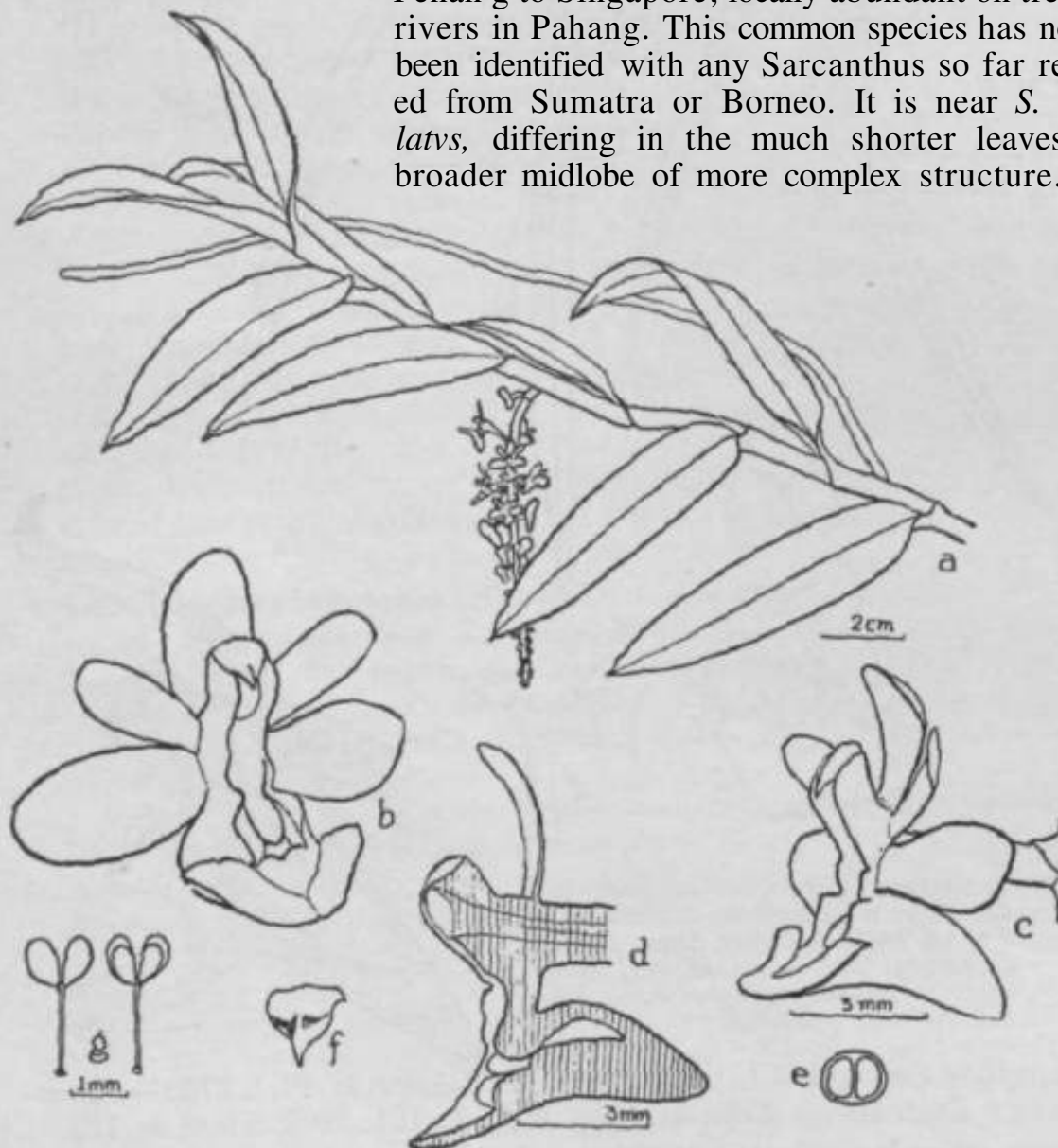


Fig. 197, *Sarcanthus Seorteekinii*. *a*, stem and inflorescence, *b*, flower from front, and *c*, from side, *d*, section through column, lip and spur, *e*, cross section of spur, *f*, anther-cap, *g*, pollinia from front (left) and from back.

9. *Sarcanthus termissus* Rchb. f., Hamb. Gartenz. 16: 15. 1860. J.J.S., Bull. Btztg., Ser. 3, 8: 367. 1927.—*S. Josephii* J.J.S., Bull. Btztg., Ser. 2, IX: 103. 1913; Ser. 3, 6: t. 19, II. 1924.

Stem to 6 cm. long, stout, with about 10 leaves; leaves not very thick, to 23 by 1.8 cm., apex rather deeply and unequally bilobed, lobes narrowed, blunt, toothed; inflorescence pendulous, to 25 cm. long, simple or with a few branches; scape dark purplish, to 12 cm. long; sepals and petals very pale green with dull purple-red median band (darker on backs); upper sepal 5 by 2.5 mm., blunt; lateral sepals a little larger; petals 4 by 2 mm.; lip from tip of midlobe to tip of spur 8.5 mm.; spur slightly curved, blunt, from its tip to base of column 5 mm.; side-lobes with purple patch at base, not fleshy, almost semi-circular, 2 mm. tall and wide, edges slightly toothed, with the front edge of each continued into an acute white triangular lobe 1.5 mm. long, the lobes curved towards each other and meeting across the base of the midlobe; midlobe white, flushed with purple, ascending, ovate, concave at the base, tip slightly reflexed, keeled on the lower side towards the base, 4 mm. long, 2 mm. wide at base, edges slightly toothed, tip blunt; back callus broadly tongue-shaped; apical half of spur septate, a small callus at front side of entrance; column 2 mm. high, rostellum beaked and curved, 1 mm. long; disc of pollinia small, stipes folded longitudinally. Distributed in Java and Sumatra; in Malaya only known from Langkawi Islands and Lenggong in Perak. **Fig. 198.**

10. *Sarcanthus inflexilobus* Holtt., Gard. Bull. 11: 288. 1947.

Stem about 5 cm. long, with about 10 leaves; leaves to 16 by 1 cm., fleshy, apex gradually narrowed, bilobed, blunt, strongly keeled beneath; inflorescence simple or with 1 or 2 branches, to 15 cm. or more long, the scape 5 cm.; upper sepal 3 by 1.5 mm., blunt; petals 2.5 by less than 1 mm.; lip from tip of spur to tip of midlobe 6 mm.; spur narrowly conical, 3 mm. long, with longitudinal septum near apex only; side-lobes inflexed horizontally towards each other, meeting and forming an almost complete closure of the mouth of the spur (a narrow gap only between them), a T-shaped callus (as seen from front) at the base of the column, the top prominent, above the mouth of the spur, the stalk of the T descending into the slit between the side-lobes; midlobe concave, arrow-shape, 2.5 mm. wide and long, the barbs narrow, acute, raised, the blunt tip slightly turned down, no callus on surface. Known only from one collection, from Gua Musang, south Kelantan.

11. *Sarcanthus suffusus* (Ridl.) J.J.S., Nat. Tijdschr. Ned. Ind. 72: 94. 1912.—*SaccoUibium suffusum* Ridl., J.S.B.R.A.S. 44: 189. 1905. Flora 4: 166.—*Saccolabium validum* Ridl., Mat. Fl. M.P. 1: 166. 1907. Flora 4: 167.—*Sarcanthus Kuyperii* J.J.S., Bull. Dep. Ag. XV: 22. 1908.

Stems to 20 cm. long, stout, with about 10 leaves, internodes to about 1 cm.; leaves to 17 by 2.7 cm., fleshy, oblong, apex rounded and bilobed; inflorescence to 45 cm. long, drooping, with several branches, the scape 10-12 cm.; sepals and petals spreading, yellow-green suffused with dull red-purple in the middle; upper sepal 4 by 1.5 mm., laterals a little wider, petals 3 by 1 mm.; *Up white, 6.5 mm. from tip of spur to tip of midlobe;* spur cylindrical, straight, not septate, parallel with ovary, 3.5 mm. long,

<sup>^</sup> s w <sup>^</sup> w \* r <sup>^</sup> u v u , nun., Journ. Bot. 28: 73. *IWO.-Saccolabiwn*  
 ' ' *bicarinatum* RidL, Mat. Fl. M.P. 1: 169. 1907. Flora 4: 170. -<sup>^</sup> fJT  
 t&u\* *duplicilobus* J.J.S., Bull. Dep. Ag. XIII: 64. 1907. Bull. Btzg-  
 Ser. 3, 6: t. 18, III.

Stem to about 15 cm. long; leaves to 18 by 2 cm., fleshy, apex un-  
 equally bilobed, the halves broadly rounded, narrowed slightly to base,  
 inflorescence about 15 cm. long, with a few branches which spread a<sup>x</sup>  
 curve downwards, the scape 8 cm.; flowers many, about 5 mm. <sup>a p a r</sup>  
 sepals deep red-brown with median green line and edges; upper sepal<sup>l</sup>  
 mm. long, nearly 3 mm. wide; lateral sepals wider; petals narrower; sp<sup>ur</sup>  
 5 mm. long, bent strongly in the middle, the tapering tip pointing forward.<sup>ds</sup>  
 yellowish with red marks, septate almost throughout, the septum <sup>r u n m</sup>  
 up in front to a short-hairy thickened end; back callus yellow, broaa<sup>al</sup>  
 triangular in profile, its front surface grooved, and short-hairy where<sup>it</sup>  
 meets the septum; side-lobes triangular, base 2 mm., 2 mm. high, <sup>IP</sup>  
 blunt, white with yellow edges and a red spot; midlobe 2 mm. long, <sup>very</sup>  
 fleshy, arrow-shape, blunt, with a median fleshy keel, shining <sup>w\*?; t e</sup>  
 column 1-2 mm. high, almost hood-shape; disc of pollinia large, sadai<sup>e</sup>  
 shaped. Distributed in *Borneo, Java and Sumatra*; in Malaya found near<sup>r</sup>  
 Ipoh and in Selangor.

16. **Sarcanthus ionosmus** (RidL) Holtt, Gard. Bull. 11: 288. 1947.—<sup>Clai-</sup>  
*sostoma ionosmum* RidU J.L.S. 32: 336. 1896. (non Lindl.).—*Sacco-*  
*labium ionosmum* RidL, Mat. FL M.P. 1: 170. 1907. Flora 4: 174.

Stem about 6 cm. long, stout, with about 10 leaves; leaves to 15 by 1-<sup>8</sup>  
 cm., tips unequally rounded; inflorescence to 25 cm. long with ma<sup>n^</sup>  
 branches, the scape 9 cm. long; flowers smelling of violets, olive-yelio<sup>w</sup>  
 transversely barred with violet; sepals barely 3-5 mm. long; lip 6 mm,  
 from tip of midlobe to tip of spur; side-lobes violet, spur white; spu<sup>r</sup>  
 parallel to ovary, slightly curved backwards, blunt, not tapering, septa<sup>te</sup>  
 in apical half; side-lobes very bluntly triangular, base 1-5 mm., 1 mm. <sup>h l ^</sup>  
 midlobe fleshy, barely 2 mm. wide, wider than long, arrow-shaped, wit<sup>h</sup>  
 acute barbs, tip blunt, bearing 2 calli convergent forwards with erect ends,  
 callus at back of spur rounded in profile, attached by a narrow base. Only  
 known from the Taiping Hills.

## 15. GASTROCHILUS

Stems usually rather short with few leaves close together; often <sup>2</sup>  
 inflorescences at a node, short, each with up to 10 flowers, several open  
 together; flowers rather fleshy, lasting several days, wide-opening, lip<sup>at</sup>  
 the base; lip not hinged, with a broad round sac, the side-lobes consistg  
 of an upward continuation of the walls of the sac, often almost meeting  
 across the base of the midlobe; midlobe pointing forwards, broad and  
 rounded, nearly flat, sometimes hairy and fringed; pollinia 2, slightly  
 notched, on a long narrow stipes.

By oversight, J. J. Smith included this genus in his key among genera  
 with 4 separate pollinia, though in his work on the orchids of Java he  
 described the pollinia correctly.

This is a very distinct genus, of few species. It is perhaps most nearly related to *Sarcochilus*. There are only two Malayan species, one in the mountains, one in *the* lowlands. They are distinguished as follows:—

- Midlobe of lip hairy and fringed .. 1. *G. calceolaris*  
 Midlobe neither hairy nor fringed .. 2. *G. patinatus*

1. *Gastrochilus calceolaris* Don, Prodr. Fl. Nep. 32. 1825.—*Saccolabium calceolare* Lindl., Gen. et Sp. Orch. 223. 1833. King & Pantl., Ann. Calc. 8: 225, pi. 300. J.J.S., Fl. Buit. 6: 632, f. 4X2.—*Gastrochilus sororius* Schltr., Fed. Rep. 12: 315. 1913.—*Saccolabium bigibbum* quoad Ridl., Flora 4: 165 (non Rchb. f.).

Leaves 3 to 6, 7 by 1 to 16 by 1.5 cm., the tips very unequally 2-toothed, moderately fleshy, tinged with purple beneath; inflorescences to about 2 cm. long, with few flowers, the scape purple-spotted, fleshy; sepals and petals pale greenish or yellowish with brown or purplish spots, about 6 mm. long, the sepals 2.5 mm. wide, the petals narrower; sac of lip transversely elliptical at the opening, about 4 mm. wide and as deep below the junction of the midlobe, externally yellow, brown-spotted; side-lobes 1 mm. high, white, nearly meeting at base of midlobe; midlobe 3 mm. long, nearly 6 mm. wide at the base, almost semi-circular, with fringed white edges and fleshy orange central part, hairy all over; column purplish. Distributed from Assam and Burma to Sumatra and Java; in Malaya found at many places in the mountains. **Fig. 199.**

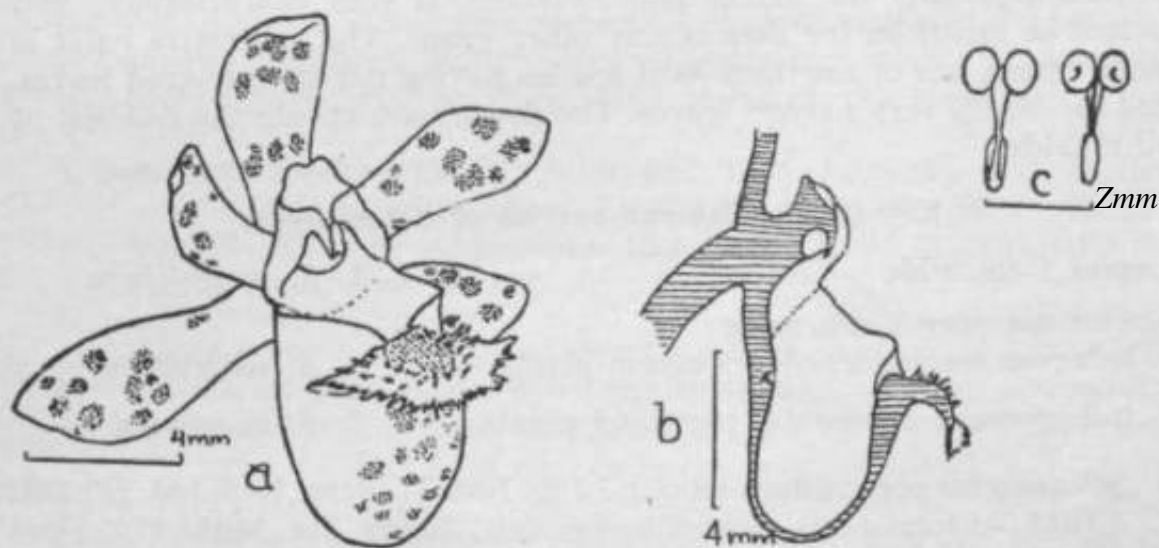


Fig. 199. *Gastrochilus calceolaria*, *a*, flower from front, *b*, section through column and lip, *c*, pollinia.

2. ***Gastrochilus patinatus*** (Ridl.) Schltr., Fed. Rep. 12: 314. 1913.—*Saccolabium patinatum* Ridl., J.S.B.R.A.S. 39: 84. 1903, Flora 4: 165.

Leaves to 20 by 5 cm., often narrower, widest 1/3 from apex, apex very broadly bilobed, the end of the midrib prominent between the lobes;

inflorescences very short, with few flowers; sepals and petals yellow, spotted with red; sepals 11 by 0.55 cm., widest above middle, blunt; petals 10 by 0.4 cm., ends rounded; lip white spotted with purple; sac 7 mm. deep from base of column, opening almost round, 6 mm. across; side-lobes short, their upper edges sloping downwards and meeting across base of midlobe; midlobe 4 mm. long, 8 mm. wide at the base, rounded, smooth. Distributed in Sumatra and Borneo; in Malaya found at Grik and in the lowlands of Pahang, on limestone and by rivers.

## 16. SCHCENORCHIS

Stems erect or pendulous, not very long, often only branching and rooting at the base, the leaves narrow (often very narrow), inflorescences simple or branched, erect or horizontal, bearing many very small flowers; sepals and petals similar, hardly spreading; lip 3-lobed, spurred, often with a callus or fleshy swelling at the entrance to the spur on the side remote from the column; side-lobes erect, low, rounded; midlobe straight, fleshy, often angled, contracted at the base; spur cylindric or ellipsoid, pointing downwards or forwards, sometimes septate; column short; anther with a long beak abruptly upcurved from its base; pollinia 4, united in 2 round bodies, on a narrow stipes, with a long narrow disc; rostellum appearing as two long slender erect arms after removal of the anther, the stigma a small cavity at the base of the column.

This genus consists of about 10 species, distributed from the Himalayas to New Guinea, including three in Malaya. The structure of the flowers, especially the anther and rostellum, is very characteristic, and cannot be mistaken for that of any other genus. The vegetative habit is more varied, one of the three local species having flat strap-shaped leaves, and the others very narrow leaves. The flowers are among the smallest of all orchids.

### Key to the Malayan species of Schoenorchis

- Leaves 1 cm. wide . . . . . 1. *S. secundiflora*  
 Leaves not over 5 mm. wide  
   Inflorescence branched; mountain plants . . . 2. *S. minutiflora*  
   Inflorescence unbranched; lowland plants . . . 3. *S. micrantha*

1. *Schoenorchis secundiflora* (Ridl.) J.J.S., Nat. Tijdschr. Ned. Ind. 72: 101. 1912.—*Saccolabium secundiflorum* Ridl., Journ. Bot. 1898: 210. Flora 4:173.

Stems erect, rooting throughout, commonly about 5 cm. long, 3-5 mm. diameter with sheaths, internodes about 2 mm.; leaves at right angles to the stem, fleshy, to 6 by 1 cm., sides parallel, tip very unequal bilobed; inflorescences spreading horizontally, elongating to 12 cm., the scape to 1.5 cm.; flowers fragrant, close, pedicels all bent upwards at right angles to rachis, ovary bent forwards so that sepals and petals point towards the

apex of the inflorescence, the spur downwards parallel with the pedicel; upper sepal 3.5 by 1.5 mm., tip turned back, blunt, white or sometimes tinted violet; lateral sepals 4 by 1.8 mm., not spreading, tips violet; petals as long as upper sepal but narrower; blade of lip 5 mm. long, pointing forwards with sepals and petals; side-lobes longer than midlobe, rounded, descending in front to the narrow base of the midlobe; midlobe 2 mm. long, fleshy, pale violet lines on the sides, the tip curved slightly upwards, acute, and below this a fleshy chin, in the middle of the upper surface a small callus, spur white or tinged with yellow, nearly 5 mm. long, septate at the base, the entrance closed by a callus on the front side just within the tube. Found at many places in the lowlands of southern Malaya (to Pahang), on trees by rivers and in old mangrove.

2. *Schoenorchis minutiflora* (Ridl.) J.J.S., Nat. Tijdschr. Ned. Ind. 72: 101. 1912.—*Saccolabium minutiflorum* Ridl., J.F.M.S. Mus. 4: 71. 1909. Flora 4: 171.

Stems to 15 cm. long, rooting and branching near base only, internodes 3-5 mm.; leaves to about 6 by 0.5 cm., fleshy, apex 2-toothed; inflorescence erect, branched, to nearly 20 cm. long; branches 2-4, elongating to about 10 cm. long, slender, scape to 6 cm.; flowers very small, white; upper sepal under 2 mm. long and about 1 mm. wide, end rounded; lateral sepals asymmetric, a little larger; petals about 1 by 0.7 mm., apex broadly rounded; spur of lip ellipsoid, parallel with and close to ovary, blade of lip at an obtuse angle to ovary; side-lobes erect, low, extending about half the total length of the blade; midlobe thickly fleshy, nearly as wide as long, end rounded, a callus at the base somewhat closing entrance to spur. Found at Cameron Highlands and Fraser's Hill only, apparently not uncommon, and probably occurring at many other places on the Main Range.

3. *Schoenorchis micrantha* Bl., Bijdr. 362. 1825. J.J.S., Fl. Buit. 6: f. 453. *Saccolabium chionanthitum* Lindl., J.L.S. 3: 34. 1859. J.J.S., Fl. Buit. 6: 635.—*S. perpusillum* Hk. f., F.B.I. 6: 56. 1890. Ic. Pl. t. 2129A. Ridl., Flora 4: 171.

Stems much branched and densely tufted, rooting at base only, to about 15 cm. long, internodes 3-5 mm.; leaves thickly fleshy, grooved above, curved away from the stem, bent and slightly constricted at about 7 mm. from the apex, to 3.5 by 0.2 cm.; inflorescences horizontal, 2-5 cm. long, scape very short, flowers close, all pointing forwards, white, turning yellow when old; sepals hardly spreading, 1.5 mm. long and half as wide, blunt; petals close to sepals, a little smaller; blade of lip as long as sepals and curved outwards, the side-lobes low, erect, longer than the midlobe which is fleshy, laterally flattened, almost oblong as seen from the side, tip acute; spur ellipsoid, curved forwards, as long as the blade of the lip, a callus at the entrance on the front side. Distributed in Java; in Malaya found at many localities from Singapore to Taiping and in Pahang. **Fig.** 200.

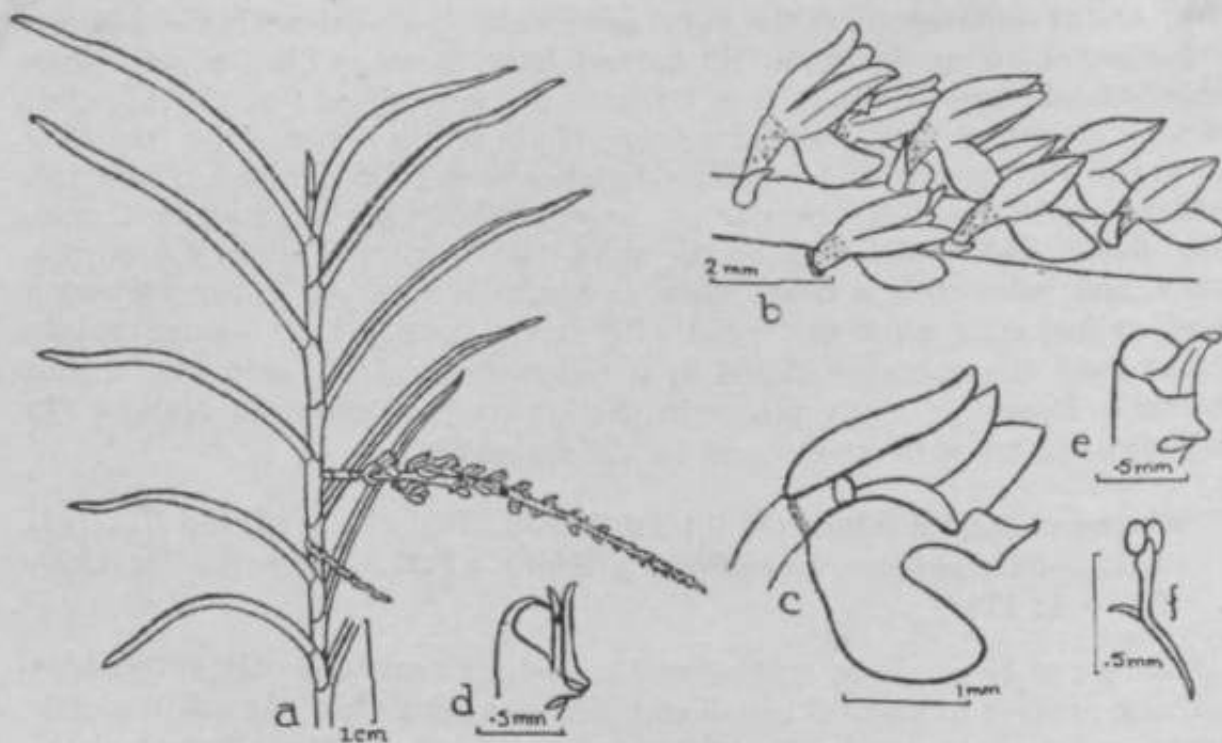


Fig. 200. *Sch&Twrchis micrantha*. *a*, stem and inflorescences, *b*, part of inflorescence. *c*, flower from side, with lateral sepal and petal removed, *d*, column with anther removed, showing rostellum. *e*, column with anther in place. *f*, pollinia.

## 17. UNCIPERA

Stems fairly long, usually pendulous, with well-spaced leaves; inflorescences pendulous with numerous flowers, or (in the Malayan species) very short, of 1 to 3 flowers; sepals concave, not widely spreading; lip 3-lobed, spurred; side-lobes joined to the column above its base, more or less triangular; midlobe pointing forwards or upwards, fleshy or concave, sometimes with lateral lobules, narrowed to the tip; apur with apex curved forwards and usually turned upwards, often narrowed to the tip, within without calli or appendages but sometimes hairy on the front wall; column short, curved backwards a little, with a small protuberance just below the anther on either side; rostellum rather thickly beaked; aperture of stigma small; anther beaked with a short turned-up tip; pollinia 4, unequal, united in two small round bodies, much smaller than the top of the stipes which is much broadened and ridged and usually recurved in the middle; disc massive, ovate or elongate.

This genus consists of a few species in Burma and neighbouring countries, with one which occurs in Malaya. The Malayan species differs from the Burma species in having inflorescences of only 1 to 3 flowers, in the spur not curved upwards in front, in having hairs within the spur, and in not having the tip of the stipes recurved. In other ways it agrees well with the Burma species, and certainly belongs to no other genus. The widened stipes and massive disc, the small protuberances on either side of the top of the column, and the curved spur with no appendages, are characteristic.



*Uncifera tenuicaulis* (Hk. f.) Holtt., Gard. Bull. 11: 292. 1947,—*Saccolabium tenuicatde* Hk. f., F.B.I. 6: 64. 1890. Ann. Calc. 5: 49, t. 74. Ridl., Flora 4: 171.

Stems pendulous, to 30 cm. or more long, slender, internodes about 15 cm. long; leaves to 12 by 0.6 cm., narrowed gradually to an acute tip; inflorescences many, very short, each with 1-3 flowers, more than one at a node; flowers 7 mm. long, yellow, tip of lip and column white; upper sepal 3.5 mm. long; petals 3 by 15 mm., acute; side-lobes of lip with erect back edge 1 mm. long, forward edges sloping downwards and incurved; midlobe narrowly elliptical, concave, pointing upwards in front of the

column, as long as the spur, with two small diverging curved horns at the tip; spur directed obliquely backwards from the mouth, widening in the middle to a broad forward-curved tip. with long hairs on the front wall closing the narrow part; stipes of pollinia nearly 2 mm. long. Found chiefly on limestone, in Pahang, Selangor, Perak and Langkawi, and also in Penang. This species has almost exactly the habit of *Trichoglottis lanceolaria*, but the structure of the flower is very different. Fig. 201.

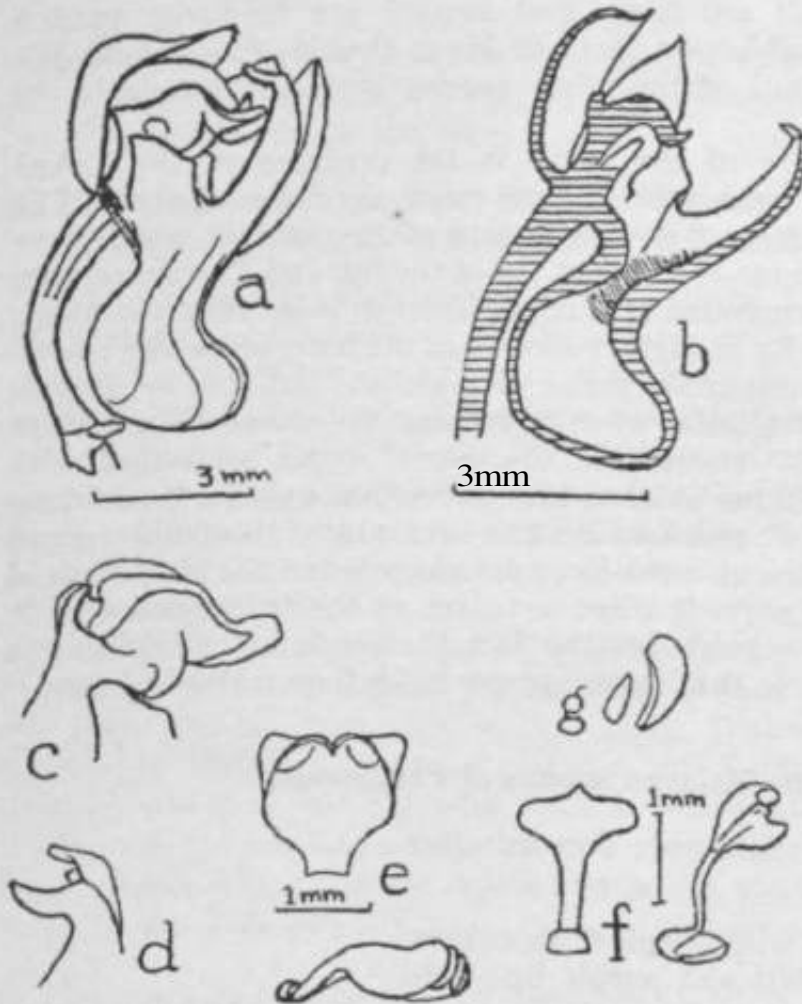


Fig. 201. *Uncifera tenuicaulis*, a, flower from side, b, section through column, lip and spur, c, column, d, back of column, anther removed, e, anther cap, f, anther, g, one pair of pollinia, separated.

## 18. PHAL^KNOPSIS

Stems short, with few leaves close together; leaves rather fleshy, broad, usually widest in apical half and narrowed gradually to base, usually drooping; inflorescence short or long, drooping or erect, the rachis sometimes flattened with 2 rows of alternating bracts, but more usually not flattened, with bracts on all sides; flowers small to rather large, lasting



Lip with 1 forked appendage; midlobe not wider than long, broadly cleft at the apex .. • .. 4. *P. decumbens*

Upper sepal at least 1.8 cm. long  
Flowers pale yellow-green, sepals and petals blotched and suffused with brown near base only; lip not hairy 5. *P. fuscata*

Flowers cream with brown bars and spots not confined to bases of parts; end of lip hairy .. .. 6. *P. sumatrana*

Lip without such a forked appendage, but with a very narrow acute lobe on either side at the base, below the blade .. .. 7. *P. pulcherrima*

1. **Phalaenopsis violacea** T. et B., Nat. Tijdschr. Ned. Ind. 24: 320. 1862. Rolfe, Gard. Chron. N.S. 26: 277. 1886. Ridl., Flora 4: 156.

Leaves shining dark green, to about 25 by 8 cm.; scape short, rachis of inflorescence flattened, zig-zag, with alternate bracts 6 mm. long, flowers appearing one or two at a time in succession; sepals and petals very pale greenish, flushed with bright purple towards the base, the lateral sepals with their inner halves at the base deep purple; upper sepal to 2.5 by 1 cm.; lateral sepals somewhat drooping on either side of the lip; lip 1.8 cm. long; side-lobes of lip erect, 7 mm. high, narrow, parallel, with forward edges incurved to meet each other, yellow; midlobe bright purple, fleshy, narrow, broadly keeled above, widest (7.5 mm.) near shortly pointed apex, with a small white point (pointing downwards) below the apex; a cleft appendage with two slender points lying on base of midlobe, and between the side-lobes an irregular warty callus. Distributed in Sumatra and Borneo; in Malaya only found in Perak and Selangor, in shady places on trees by rivers at low altitudes. This is a very attractive species, though the flowers are not large, and also very variable in colouring. There is one local variety which has the sepals and petals almost entirely flushed with rosy purple. **Fig. 202, a-d.**

2. **Phalaenopsis cornu-cervi** (Breda) Bl. et Rchb. f., Hamb. Gartenz. 16: 116. 1860. J.J.S., Fl. Buit. 6: 548, f. 415. Ridl., Flora 4: 156.—*Polychilns cornu-cervi* Breda, Gen. et Sp. Orch. t. 1. 1827. Batem. in Bot. Mag. t. 5570.

Leaves 12 by 2 to 28 by 3.5 cm.; scape 7-25 cm. long, rachis branched, the branches 8 mm. broad, much flattened, the bracts conspicuous, alternate; several flowers open at once, the sepals and petals pale yellow-green barred and blotched with red-brown; upper sepal 1.6 to 2 cm. long, petals smaller, lateral sepals spreading; lip small, of complex structure; side-lobes erect, pale yellow or white, 4 mm. high; total length of midlobe 5.5 mm., basal part white or yellow with orange marks at sides, 5.5 mm. wide

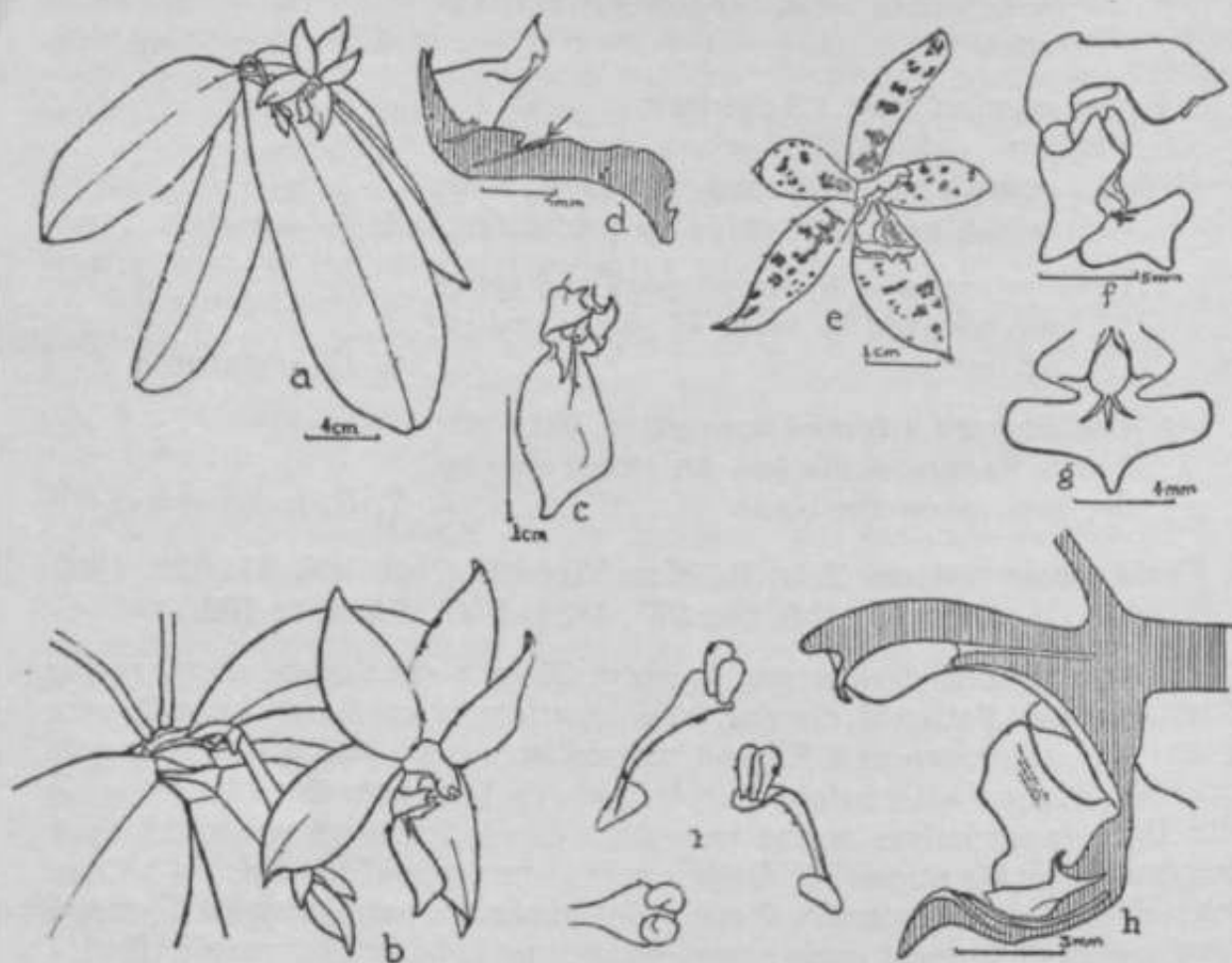


Fig. 202. *Phalsenopsis violacea*. a, plant in flower. b, inflorescences and leaf bases. c, lip. d, section of lip, the arrow pointing to the forked appendage. *P-comu-cervi*. e, flower. f, column and lip from side. g, lip from above, h, section of column and lip. i, pollinia.

at base, narrowing to middle part, middle part white, 3 mm. wide and 2 mm. long, suddenly widened to apical part 6 to 7.5 mm. wide and shortly pointed, also white; at base between side-lobes 3 appendages in series, the first yellow, short, upcurved, the second white, long-pointed and forked, the third violet, laterally flattened, the second and third extending on to the midlobe. Distributed in Java, Sumatra and Borneo; in Malaya found in Kedah, Perak, Pahang, Selangor and Negri Sembilan, more exposed situations than *P. violacea*. Natural hybrids between the two species have been found. Fig. 202, e-i.

### 3. *Phalaenopsis appendiculata* Carr, Gard. Bull. 5: 16, pi. 8. 1929.

Leaves to 7 by 3.5 cm., thin; scape 1 cm., rachis to 1.5 cm. long; flowers small, white with purple markings; upper sepal concave, 4 by 3.5 mm.; lateral sepals joined to column-foot, 5 by 4.5 mm.; petals almost round, 3.5 mm. diameter; lip 6.5 mm. long; side-lobes erect, 3 by 1 mm-

the front edges incurved, ending in a tooth; midlobe 8 mm. wide, widening from a narrow base and then more gradually narrowed to apex; two appendages at base of midlobe, back one 2-lobed, each half 2-toothed, white, front appendage purple, produced at tip into two long sinuous white threads. Found only in the lowlands of Pahang, on small trees in the forest.

4. **Phatenopsis decumbens** (Griff.) Holtt., Gard. Bull. 11: 286. 1947.—*Aerides decumbens* Griff., Notul. 3: 365, 1851. Ic. Pl. Asiat. t. 320, 1851.—*Kingiella decumbens* Rolfe, Orch. Rev. 25: 197. 1917. Ridl., Flora 4: 158.—*Phalsenopsis Wightii* Rchb. f., Bot. Zeit. 1862: 214. *Doritis Wightii* Benth., Gen. Plant. 3: 574. 1883. King & Pantl. Ann. Calc. 8: 198, pi. 265.—*Phaltenopsis Hebe* Rchb. f., Hamb. Gartenz. 18: 35. 1862. J.J.S., Fl. Buit. 6: 550, f. 417.—*P. deliciosa* Rchb. fil., Bonpl. 2: 93. 1854. Backer, Bekn. Fl. Jav., Orch. 395.

Leaves to 13 by 3.5 cm., rather thin; scape slender, 6-12 cm. long, rachis hardly thickened, flowers facing all ways, small, with white sepals and petals; upper sepal 6.5-8.5 mm. long; lateral sepals purple-spotted at base; lip rather longer than sepals and petals, slightly saccate at base; side-lobes purple, slightly spreading, widening from a narrow base, each with a tooth-like appendage near the back edge, tips rounded, 2-5 mm. wide; midlobe purple, 6 mm. long and wide, widening from a narrow base, the apex broad and deeply cleft, at the base with a flattened appendage divided into two spreading teeth. Distributed from South India, Ceylon and Burma through Malaysia to the Philippines; in Malaya apparently not common but found at a number of places in many parts of the country. In Java, this species is called *P. hebe*, or *P. deliciosa*, but the difference, if any, is very slight. In the broad sense, it is the widest-distributed species of Phalsenopsis.

5. **Phalaenopsis fuscata** Rchb. f., Gard. Chron. N.S. 2: 6. 1874. Ridl., Flora 4: 157. J.J.S., Bull. Btzg., Ser. 3, 9: 488.—*P. Kunstleri* Hk. f., F.B.L. 6: 30. 1890. Ann. Calc. 5: 38, pi. 58. Bot. Mag. t. 7885.—*P. viridis* J.J.S., Bull. Dep. Ag. V: 21. 1907.

Leaves to 30 cm. long and 10 cm. wide, rather thin, base much narrowed; scape to 30 cm. long, inflorescence usually with several lateral branches to 4 cm. long, flowers close, 1-3 on a branch open at once, facing all ways; flowers pale yellow-green, the sepals and petals more or less blotched and suffused with chocolate brown near the base only; upper sepal about 1.8 by 0.8 cm.; lateral sepals spreading; lip shorter than sepals; side-lobes rather short and broad, twisted so that they touch, white with red-brown lines and spots; midlobe flat with a median ridge and a forked appendage at the base, widening from the base to near apex, broadly and bluntly pointed, not hairy, cream with red-brown stripes; column-foot short and very fleshy. Distributed in Borneo and Sumatra; in Malaya found in Johore, Pahang and Perak, in shady forest, often by streams. Natural hybrids with *P. sumatrana* have been found. **Fig.** 203.

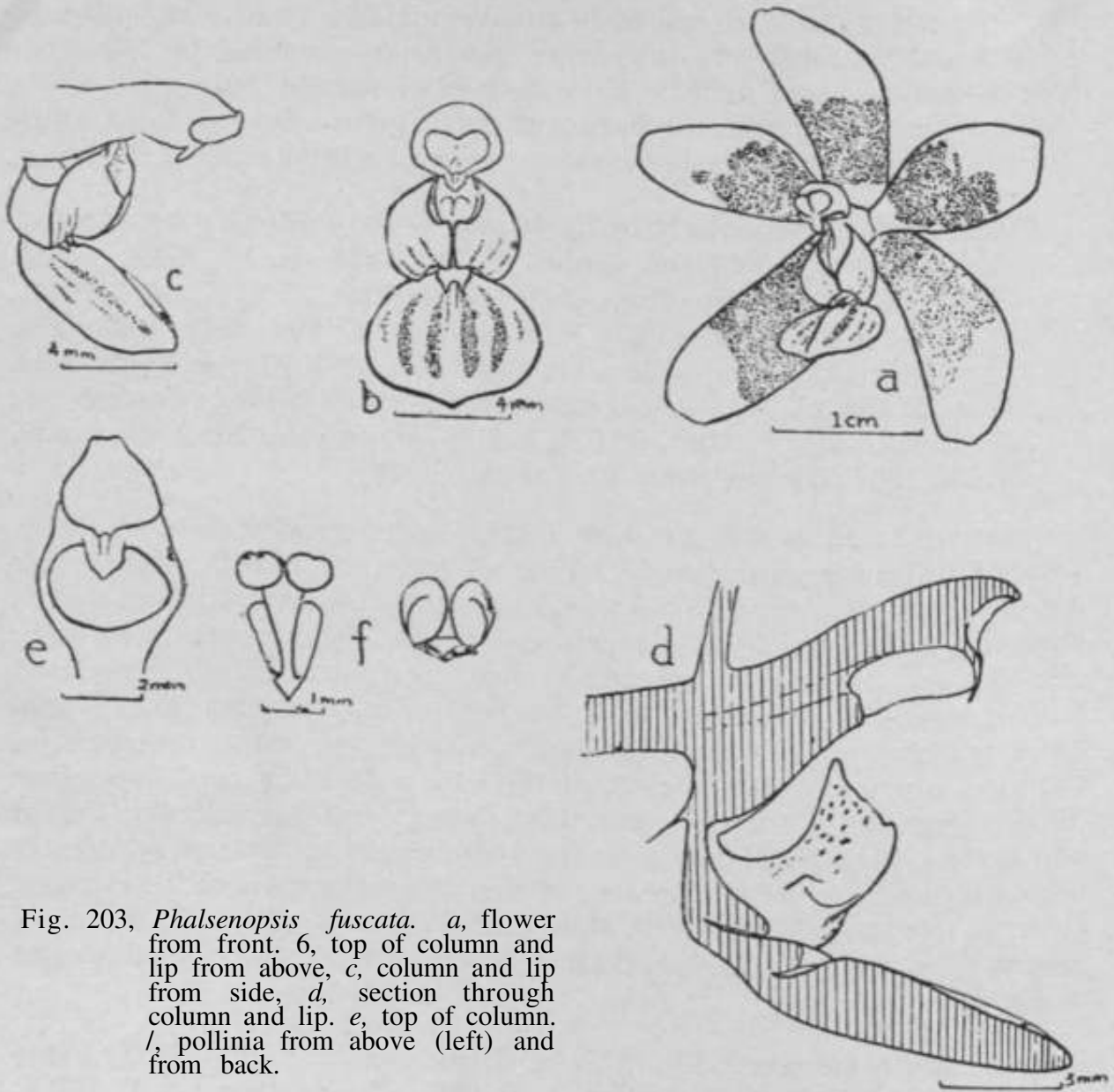


Fig. 203, *Phalsenopsis fuscata*. a, flower from front. b, top of column and lip from above, c, column and lip from side, d, section through column and lip. e, top of column. f, pollinia from above (left) and from back.

6. *Phalsenopsis* ~~in rana~~ <sup>ist?</sup> ~~Ridl.~~ <sup>Korth et Rchb. f. Hamb.</sup> ~~Flora 4: 156~~ <sup>Gartenz. 16: 115.</sup>  
 1860. Bot. Mag. t. 5527. ~~Flora 4: 156~~ <sup>p.</sup> ~~musculosa~~ <sup>musculosa</sup> Ridl., Tr.  
 L.S. 3: 373. 1893. Flora 4: 156-

Leaves rather thin, to 30 by 8 cm.; scape to 30 cm. long, often shorter; rachis elongating to 15 cm. or more, the flowers fairly well spaced, facing all ways; sepals and petals similar, cream with warm brown or purplish brown bars and spots; sepals to 3 by 0.8 cm., petals a little smaller; side-lobes of lip cream with yellow or brown edges, erect, narrow and parallel, fleshy, with 2-pointed ends and a third point on the inside 7 mm long; midlobe white, with purple stripes, fleshy, rather narrow, 1.6 cm. long, apical half hairy, at base with a forked appendage; column long, white, the apex irregularly toothed. Distributed in Borneo and Sumatra; in Malaya found in Johore and Perak on trees by streams. The colour of the flowers, and the extent of the marks, is very variable, and also the size of the flowers. A plant from Pahang with sepals only 1.6 cm. long, named *P. muscicola*, appears to be this species. Fig. 204.

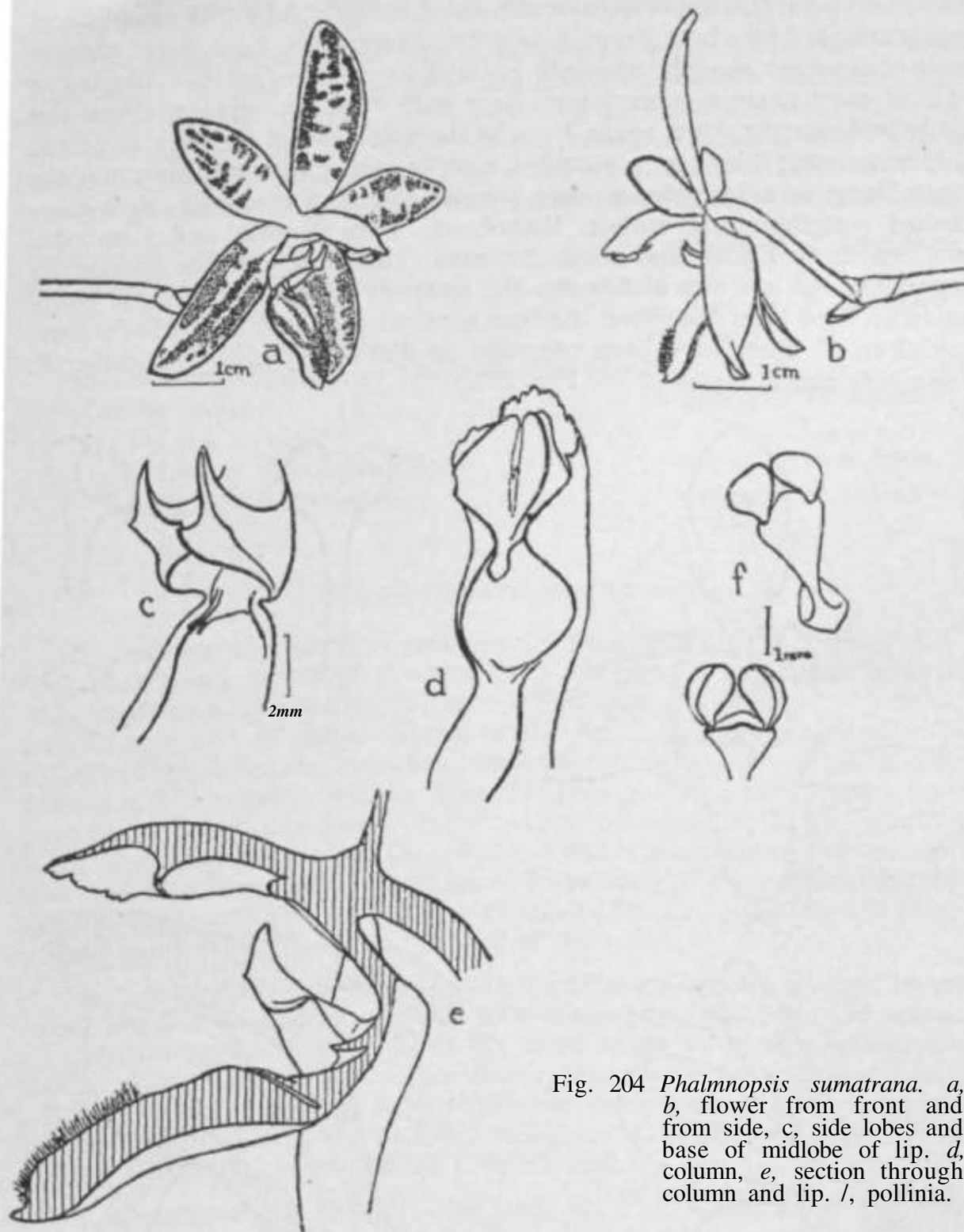


Fig. 204 *Phalajenopsis sumatrana*. *a*, *b*, flower from front and from side, *c*, side lobes and base of midlobe of lip. *d*, column, *e*, section through column and lip. *f*, pollinia.

7. *Phalajenopsis pulcherrima* (Lindl.) J.J.S., Fed. Rep. 32: 366. 1933. *Blumea* 5; 753. 1945.—*Doritis pulcherrima* Lindl., Gen. et Sp. Orch. 178. 1833. Ridl. *Flora* 4: 158.—*Phajdenopsis esmeralda* Rchb. f., *Gard. Chron.* N.S. 2\* 582. 1874. *Bot. Mag.* t. 7196.—*Phalajeyiopsis antennifera* Rchb. f. *Gard. Chron.* N.S. 11: 398. 1879. *Xen. Orch.* 3: 147, t. 285. 1896.

Leaves 6 to 15 by 1.5 to 3 cm.; inflorescence erect, the scape to about 30 cm., the rachis elongating to 10 cm. or more; sepals and petals more or less

deep mauve-purple; upper sepal and petals to about 1.2 by 0.55 cm.; lateral sepals attached by a base 9 mm. long to the column-foot, 1 cm. long; narrow base of lip bent sharply upwards parallel to column-foot and bearing a pair of very narrow lobes 3 mm. long with a callus between them, the blade bent sharply down again, bearing the side-lobes at the highest point; side-lobes erect, 5 by 3 mm., rounded, usually redder than midlobe; midlobe 8 mm. long, its sides reflexed, deep purple; column 5 mm. long, with long-beaked rostellum and anther. Distributed from Burma and Cambodia southwards to Kedah and north Sumatra. This is a variable species, as regards colour and size of flowers, and in small details of structure. Many varieties have been described, the best having bright and attractive colouring. Two of them have been regarded as distinct species, and called *P. esmeralda* and *P. antennifera*. Fig. 205.

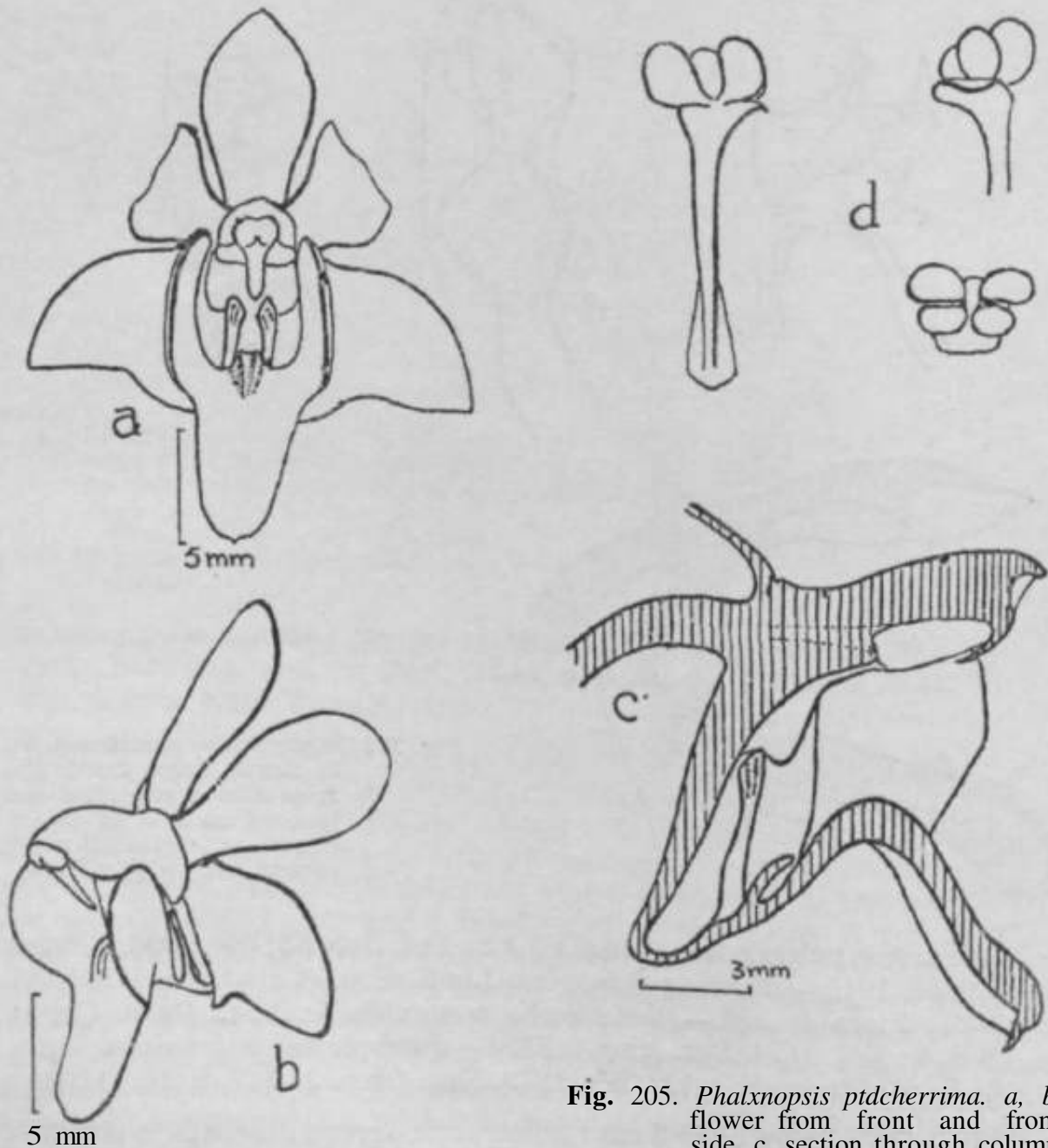


Fig. 205. *Phalxnopsis ptdcherrima*. a, b, flower from front and from side, c, section through column and hp. d, pollinia.



### Extra-Malayan species of Phalaenopsis

The genus Phalaenopsis was based originally on the species *P. amabilis*, which belongs to a group found mainly in eastern Malaysia. This group includes the finest decorative species of the genus, several of which, and their hybrids, are well-known in cultivation. Another group which is not represented in Malaya is that of *P. Denevei*, confined to Borneo. The various groups in the genus may be distinguished by the following key.

Petals wider than sepals	..	..	group of <i>P. amabilis</i>
Petals not wider than sepals			
Inflorescence erect	..	..	group of <i>P. pulcherrima</i>
Inflorescence drooping or obliquely ascending			
Leaves terete	..	..	group of <i>P. Denevei</i>
Leaves not terete			
Midlobe of lip simple, fleshy	..	..	group of <i>P. violacea</i>
Midlobe of lip complex	..	..	group of <i>P. cornucervi</i>

### Group of Phalaenopsis amabilis

This group consists of *P. amabilis*, *P. Schilleriana*, and *P. Stuartiana* with their many varieties. **P. amabilis** itself (fig. 206) is found in Java, Borneo, Celebes, the Moluccas and the Philippines, and is very variable both in size and in minor details of the lip (especially distribution of yellow). The Philippine form has been called *P. aphrodite*; it has smaller flowers and a broader midlobe than the Java variety. All varieties have pure white flowers, the petals very broad and rounded, the lip with a rather large bilobed callus between the side-lobes and a narrowly triangular midlobe with two long slender antennae close to the tip, the callus and other parts of the base of **the lip** yellow **with** small crimson spots. There is sometimes a faint flush of pink on the back of the sepals.

**P. Schilleriana** is a very beautiful Philippine species, It has leaves which are dull dark green mottled with silver-grey, and branched sprays of beautiful pale rose flowers, of the same shape as in *P. amabilis* but smaller. Unfortunately it will not flourish nor flower in the coastal lowlands of Malaya, needing a somewhat cooler temperature. Dakkus reports that in Java it is best at 1,000-2,000 feet altitude. It certainly does well on Penang Hill, and flowers also at Fraser's Hill.

**P. Stuartiana** (fig. 206, f), also from the Philippines, has leaves like those of *P. Schilleriana*, but white flowers with the lower halves of the lateral sepals and the lip brown-spotted. With care, it will flower quite well in Singapore and though not large is very beautiful.

Numerous natural hybrids between these species, and varieties of them, have been brought into cultivation and named. It is impossible to give descriptions of all these from which they could be recognized. Among the best known is *P. Sanderiana*, considered to be a natural hybrid between *P. Schilleriana* and *P. amabilis* var. *aphrodite*.

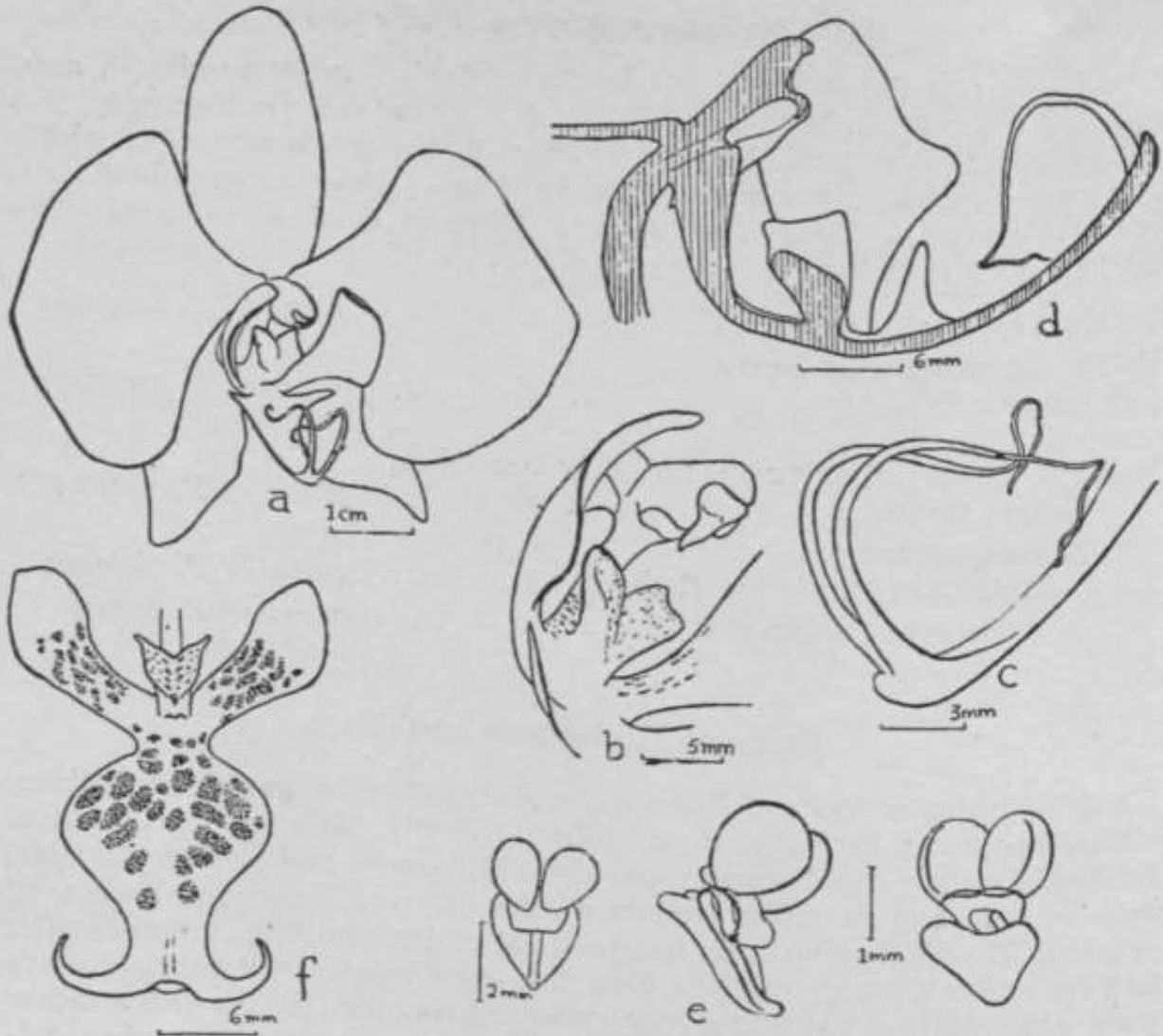


Fig. 206. *Phalamopsis amabilis*. a, flower from ... j. i. • v # <<, c, appendages at tip of lip, 10 mm from front, column and base of hypochlipsis, from V. (left) after bending of stipes (centre), from back (right). P-

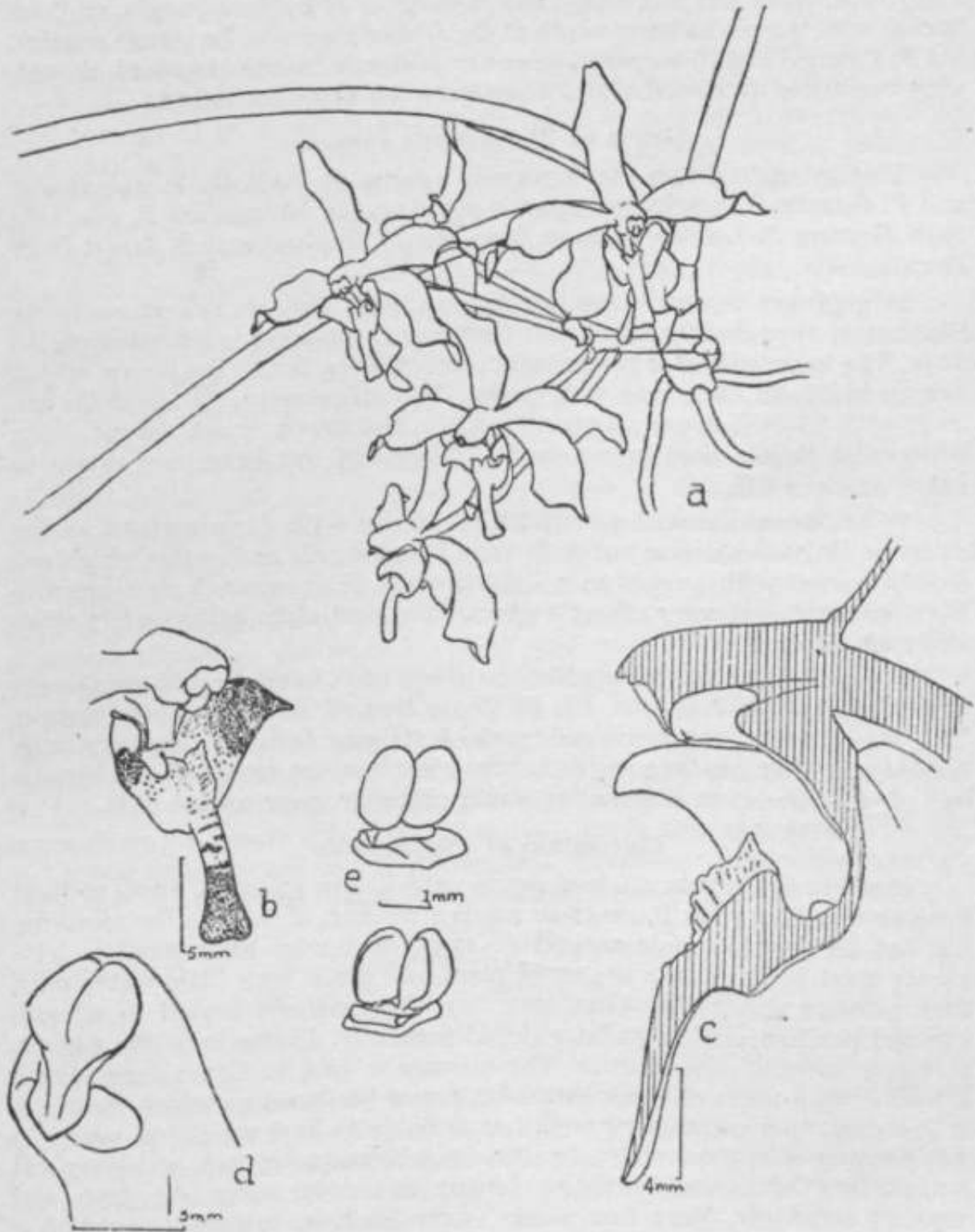
Group of *Phatenopsta pulcherrima*

There are only two species, *Phatenopsta pulcherrima*, described from the Philippines. *P. pulcherrima* has the same inflorescence and many raised ribs on the lip. The sepals are pale rose, and the lip bright purple. We have no record of its occurrence in Malaya. It is also called *P. rosea*.

Group of *Phalaenopsis Denevei*

This group, as at present known, consists of three species, all from western Borneo; they have only been discovered in recent years. They differ from all other *Phalaenopsis* in having long terete leaves. The sepals and petals are about equal, much as in the group of *P. violacea*, the side-lobes narrow, erect, with a bilobed callus between them, the midlobe narrow, not keeled, and widened at the apex. In *P. Denevei* (fig. 207), the

scaoe is short and the rachis also, the flowers (to about 12) being in a rather close group. The sepals and petals are a rather light warm brown with reenish yellow edges and tip, the lobes of the lip dark maroon, their bases white with crimson-purple spots, the callus yellow, the column with its foot white. The sepals are about 2.5 cm. long.



« \* 207. *Phalaenopsis Denevei*. a, leaf bases and inflorescence. b, column and lip. c, section through column and lip. d, column. e, pollinia.

**P. serpentilingua** has a long scape, bearing an inflorescence like that of *P. Denevei* but with white flowers which are rather smaller (sepals 1.5 to 2 cm. long). The lip is transversely barred with yellow and purple, its end deeply bilobed with acute diverging lobes, like a snake's tongue, and the callus is strongly toothed. **P. Laycockii** has a short inflorescence like *P. Denevei*, with flowers of similar shape, but much larger (sepals 3-7 cm. long), the sepals and petals pale rose, side-lobes of lip dark purple, midlobe barred with purple at base, white at tip. This appears to be a rare species, but *P. Denevei* and *P. serpentilingua* are evidently locally abundant, though very restricted in distribution. They grow on trees by rivers.

#### Group of *Phalsenopsis violacea*

This group includes the Peninsula species *P. violacea*, *P. sumatrana* and *P. fuscata*. The principal species not found in Malaya are *P. gigantea* from Borneo, *P. Luddemanniana* from the Philippines and *P. Lowii* from Burma.

**P. gigantea** is a rare species, and certainly difficult to acclimatize in Singapore, though it grows well (but rarely flowers) at Buitenzorg in Java. The name *gigantea* refers, not to the flowers, but to the leaves, which are up to 50 cm. long and very fleshy. The inflorescence is about 30 cm. long, with 20-30 flowers all open together, the sepals broad, 2.5 cm. long, white with rather close brown spots. Hybrids of this have been raised in Java.

**P. Luddemanniana** is an attractive species with flowers about as big as those of *P. sumatrana* but with very broad sepals and petals which are closely barred with purple on a light ground. It grows well in Singapore but does not flower very often; we have no report of its behaviour in other parts of Malaya.

**P. Lowii** has broad petals like the group of *P. amabilis*, but the flowers are only 5 cm. in diameter, the lip being that of the *P. violacea* section. The flowers are an attractive pale pink. A striking feature is the very long-beaked rostellum, as long as the column. We have no record of the behaviour of this species in Malaya; it would probably grow on the hills.

#### Cultivation of *Phalaenopsis*

*Phalaenopsis* plants are best grown attached to pieces of wood, coconut husk or tree-fern root. *P. amabilis* needs some sun, at least in the morning, but not all day; *P. violacea* and *P. sumatrana* need more shelter. New-plants must be hung in a sheltered place and given very little water until they produce new roots, when they may be gradually moved to a more exposed position, and must be watered regularly. Plants in active growth certainly benefit by manuring. The manure is best in liquid form. Some growers put a paste of fresh cattle-dung over the wood on which the plant is growing; this works very well, but is liable to harbour insect pests. In wet weather also, a quantity of cattle-dung becomes too wet, and the plant may suffer. This is avoided if the plant is kept under cover from rain, and watered sparingly. Very fine plants have also been grown attached to a basket containing pieces of fern-root which have been soaked in manure-water. The fern-root is renewed from time to time.

A small black weevil is a serious pest of Phalaenopsis plants. It bores into the young part of the stem and may kill a plant before its presence is noticed. Regular spraying with Tuba root is the best method of control for this as for most orchid pests.

#### Hybrids of Phalaenopsis

A considerable number of hybrids within the genus Phalaenopsis have been made especially in France. The finest of these are between species of the *P. amabilis* or between these and other members of the genus. As far as tried, appear to be difficult to grow well in Singapore, but would probably be quite successful at moderate elevations in the mountains. It is probable that few if any hybrids will prove finer or better for general cultivation than *P. amabilis* itself.

A hybrid between *P. amabilis* and *P. violacea* (called Anak Bulan) was raised and has flowered in Singapore, where the plants grow well but do not flower very freely. The inflorescence bears only one or two flowers at a time, like its *P. violacea* parent. We may hope that some second generation hybrids may have the full inflorescence of *P. amabilis*.

Seedlings of *P. pulcherrima* X *amabilis*, raised in Singapore have rather small but pretty, pink flowers, a few open together.

Hybrids of Phalaenopsis with Vanda have also been raised and flowered. That between *P. Denevei* and *V. teres* is very fine but appears to be very shy of flowering in Singapore, though it flowers well in Java. Possibly other Phalaenopsis-Vanda hybrids may be more successful here.

Hybrids of Phalaenopsis with Arachnis have also been raised, but only two have yet been reported as flowering. The first was *P. Schilleriana* X *Arachnis Meringayi*, one plant of which was reported to be free-flowering (in Java). The plant had the habit of Arachnis, but shorter, with leaves to 20 by 5 cm.; the inflorescence was 70 cm. long, branched, the flowers 6.5 cm high, bright rose, slightly spotted towards base of sepals and petals, the lip with large side-lobes, cream with purple spots, and narrow midlobe. *P. Denevei* X *Arachnis Maggie Oei* (Arachnopsis Eric Holttum) has flowered in Singapore. The plants have the habit of a semi-terete Vanda, will stand full sun, and are free-flowering. The flowers, on a short spray, are a fine light orange colour, with crimson lip.

#### 19. CHEIRORCHIS

Stems very short, usually pendulous, few-leaved; leaves either terete or laterally compressed; inflorescences short or long, few- or many-flowered bracts on all sides of rachis, short; flowers lasting one day, borne singly at intervals of time; sepals and petals similar, the lateral sepals attached to the column-foot; lip movably attached to the apex of the column-foot, slightly saccate, the sac very shallow, not spurred, the median line as seen from the side more or less S-curved; side-lobes erect with a callus between them; midlobe rather fleshy, powdery or hairy; column short, foot longer; pollinia 2, more or less deeply cleft, the stipes longer than the pollinia, the disc small.

This small genus is at present only known to occur in Malaya. The habit of the plants is very characteristic, especially those with laterally flattened leaves, all in one plane, hanging down rather like the fingers of a hand (whence the name *C heir orchis*—hand-orchis). In flower structure the genus is probably nearest to *Sarcochilus*, from which it differs in the shallowly saccate lip with well-developed midlobe. It is also allied to *Chamseanthus*. The plants are found in lowland forest, nearly always on the tips of the branches of small trees.

Key to the species of *Cheirorchis*

Leaves laterally flattened

Scape very short, covered with sheaths

Side-lobes shorter than midlobe; sepals 5

mm. long . . . . . 1. *C. breviscapa*

Side-lobes longer than midlobe; sepals 1 cm.

long . . . . . 2. *C. major*

Scape with sheaths at the base only . . . . . 3. *C. pulverulenta*

Leaves terete

Midlobe of lip very shortly hairy; sepals and

petals almost white . . . . . 4. *C. filiformis*

Midlobe glabrous except on callus; sepals and

petals deep red . . . . . 5. *C. fulgens*

1. *Cheirorchis breviscapa* Carr, Gard. Bull. 7: 41, pi. 3. 1932.

Leaves about 5, laterally flattened, to 18 by 0.55 cm. slightly curved, tips acute, sheaths at base overlapping; scape very short, the whole inflorescence about 1 cm. long, bracts broad, thin, closely overlapping; sepals cream, translucent, sometimes suffused with pale rose-mauve; upper sepal 5 by 2.5 mm.; lateral sepals running down column-foot, the base 5 mm. wide; petals 4.5 by 3 mm., rounded, cream; lip 5 mm. long; side-lobes short, rounded, papillose, cream; midlobe ovate, tip rounded, cream, papillose and densely yellow-powdery; callus orange-yellow, powdery, produced forwards into a keel reaching the midlobe; column-foot 4 mm. long. Found only at Budu and Batu Balai in Pahang.

2. *Cheirorchis major* Carr, Gard. Bull. 7: 43. 1932.

Habit of *C. breviscapa* but leaves to 15 by 0.7 cm. and flowers much larger; sepals and petals cream; upper sepal 10 by 0.5 cm.; lateral sepals over 6 mm. wide at the base; petals 8 by 0.55 cm.; lip 8 mm. long, callus powdery; side-lobes cream with some lilac spots, erect, nearly rectangular, edges papillose; midlobe short, broad, obtuse, powdery; column-foot 6.5 mm. long. Found at Krambit in Pahang and at Mawai in Johore.

3. *Cheirorchis pulverulenta* Carr, Gard. Bull. 7: 45. 1932.

Leaves laterally flattened, to 6 by 0.5 cm., fleshy, longitudinally wrinkled, acute, the basal ones longest; scape 1 cm., not covered with sheaths, prickly; rachis 3 mm. long, few-flowered, bracts broadly triangular; sepals and petals pale yellow, translucent; upper sepal 4 by 2

mm., blunt; lateral sepals wider; petals a little smaller; lip very strongly S-curved; callus large, orange-powdery; side-lobes erect, obtuse, papillose, cream; midlobe abruptly downturned, blunt, fleshy, cream, bright-yellow-powdery; column-foot 1.5 mm. long. Known only from the original collection, from Tembeling, Pahang.

4. *Cheirorchis filiformis* (Hk. f.) Carr, Gard. Bull. 7: 46, pi. 4, A. 1932.—  
*Sarcochilus filiformis* Hk. f., F.B.I. 6: 39. 1890. Ic. PL t. 2124.—  
*Dendrocolla filiformis* RidL, J.L.S. 32: 382. 1896. Flora 4: 187.

Stem to about 5 cm. long; leaves few, terete, to 30 cm. long and 2 mm. thick, often purplish; scape slender, purplish, to 10 cm. long; rachis to 2.5 cm., bracts short and broad; flowers white or faintly flushed with mauve; upper sepal about 1.3 by 0.5 cm., blunt; laterals similar, the base not greatly widened; petals almost as large; lip with erect orange side-lobes, the midlobe broad, blunt, papillose, yellow throughout. Found in the lowlands of Singapore, Selangor, Perak and Pahang. There appears to be a variety with small flowers, the sepals only 6 mm. long, common in peat forest, Pontian, Johore.

5. *C. fulgens* (RidL) Carr, Gard. Bull. 7: 46. 1932.

Habit similar to *C. filiformis*; scape 3-6 cm. long, rachis to 4 cm., bracts very close, spreading; sepals and petals dark red; upper sepal about 1.0 by 0.3 cm.; lip yellow with purple stripes on the side-lobes and purple spots near base; side-lobes spreading, hardly distinct from midlobe at the forward ends; the whole glabrous except for the small hairy callus. Only known as a cultivated plant in Singapore.

## 20. CHAM^EANTHUS

Stems short, with few leaves; leaves narrow, more or less fleshy; inflorescences short, the flowers close, lasting one day, not opening widely; sepals and petals about equal, with long narrow tips, the lateral sepals joined to the short column-foot; lip movably hinged to the column-foot. 3-lobed, sometimes saccate at the base, side-lobes erect, midlobe fleshy; column short, with a short foot bent forwards; pollinia 2, round, cleft, on a short narrow stipes.

This genus (as at present known) consists of a few species, distributed throughout Malaysia. It is very near *Sarcochilus*, but differs in the shape of the flowers, which never expand and have long-pointed narrow sepals and petals, and in the absence of a spur. The column-foot is always short, but this sometimes occurs in *Sarcochilus*. The plants are always small, and the inflorescences very short; they are thus inconspicuous, and have not been much collected. The shape of the flowers and the movable lip on the free end of the column-foot show a strong resemblance to species of *Bulbophyllum*; but the plants are of course quite different in habit from *Bulbophyllum*, and the pollinia have the typical stipes of the *Vanda* group.

### Key to the Malayan species of *Chamseanthus*

Lip saccate at base

Sepals and petals spotted; midlobe of lip with  
toothed edges . . . . . 1. *C. laciniatus*

Sepals and petals unspotted; midlobe with  
smooth edges . . . . . 2. *C. sarcanthoides*

Lip not saccate at base . . . . . 3. *C. flavus*

**1. *Chamaeanthus laciniatus*** Carr, Gard. Bull. 5: 31, pi. 17, A. 1929.

Leaves 5-8, to 3 by 0.8 cm., slightly fleshy; inflorescences about 6 mm. long, bracts 2-5 mm. long; flowers to 4 simultaneously; sepals and petals pale yellow with orange spots; sepals 3-4 by 1 mm., petals 2.5-3 by less than 1 mm.; lip 2 mm. long, saccate at base, pale yellow with orange at base of side-lobes; side-lobes erect, curved forwards, 0.5 mm. long, acute; midlobe 1-2 mm. long, at base 0.5 mm. wide, narrowed to acute tip, edges with irregular long slender teeth; sac 3 mm. deep; foot of column short, at less than a right angle to column. Found in the lowlands of Pahang and in Singapore Island, on trees by rivers and in swamp forest.

**2. *Chanueanthus sarcanthoides*** (Ridl.) Carr, Gard. Bull. 7: 40, pi. 4, B. 1932.—*Bulbophyllum sarcanthoides* Ridl., J.S.B.R.A.S. 50: 131. 1908, Flora 4: 71.

Leaves about 6, to 4 by 0.6 cm.; inflorescences about 7 mm. long; flowers about same size and shape as in *C. laciniatus*, but sepals and petals not spotted, side-lobes of lip smaller, blunt, the ends not curved forwards, and the midlobe with smooth edges. Only known from the original collection at Tebrau, Johore.

**3. *Chamzeanthus flavus*** Carr, Gard. Bull. 5: 32, pi. 17, B. 1929.

Leaves about 5, rather fleshy, to 5-7 by 0.5 cm., grooved above, the two longitudinal halves of the blade convex; inflorescences about 3-5 mm. long, bracts 1.5 mm.; flowers translucent yellowish; upper sepal 3-5 by nearly 1 mm.; lateral sepals a little longer; petals 3 by 1 mm.; lip hardly lobed, not saccate, 1-3 mm. long, fleshy, widest near the base, the toothed sides a little raised, end oblong, blunt. Found only in the lowlands of Pahang. This is nearly related to a species occurring in Java and Borneo, and the two might be considered as identical. They need critical comparison.

## 21. SARCOCHILUS

Epiphytes with short stems, usually horizontal or ascending, and 2-ranked fleshy leaves, often spreading and drooping, unequally lobed at the tip; inflorescences many-flowered, the flowers short-lived, usually wide-opening, facing all ways or sometimes 2-ranked, opening one or a few together; sepals and petals almost equal, the lateral sepals more or less

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The type species of *Sarcochilus* is *S. falcatus* R. Br. of Australia. This has four pollinia, and a lip different in structure from the Malayan species here included in *Sarcochilus*. These species must therefore be transferred to another genus. To determine the correct procedure will involve considerable study, and it is regretted that the necessary changes cannot be made in this book.



joined to the column-foot (though not throughout its length) ; lip hinged to the end of the column-foot, spurred or saccate, 3-lobed, the side-lobes usually narrow, curved, erect, the midlobe thickened as a callus or more or less 3-lobed, the spur more or less continuing the line of the column-foot ; column short or fairly short, nearly always with well-developed foot; pollinia 2, cleft, on a rather short stipes.

This genus is like *Thrixspermum* in its short-lived flowers, but the plants never have long stems, the lip is always hinged to the column-foot (the junction between the two parts distinct), the lip often has a tubular spur instead of a sac, and the stipes of the pollinia is not very short.

The genus is divided in the following key into two sections, in one of which the scape is smooth, in the other finely prickly or rough. The former section contains all the larger species, in which leaves and inflorescences are usually drooping and the lip spurred; the second section consist chiefly of smaller plants, often with upright inflorescences, the lip usually saccate, with midlobe often more or less 3-lobed.

The typical species of the first section have the spur pointing forwards, with the midlobe as a fleshy thickening on its upper surface. There is however a small sub-section (group of *S. virescens*) which has the lip hollowed without being truly spurred or saccate, the midlobe hardly developed ; in this the flowers are 2-ranked, but there is also a spurred species which has 2-ranked flowers (*S. biserratus*), so that the rachis characters are less important in this genus than in *Thrixspermum*.

The second section also is not at all uniform, containing two species with the lip hardly even saccate, and two which it is almost as much spurred as in the first section.

As in other genera, several species are little known and much further information is needed. Two species, *S. hirsutus* and *S. tjidadapensis* are known to have flowers lasting several days. Most others last one day, but of some there is no record.

At two points in the key, the characters of spotted or unspotted sepals are used. This is a convenient and obvious distinction; but it should be noted that colour variation occurs in many orchids, and unspotted varieties of spotted flowers might occur, though we have no records of them in the present case.

#### Key to the Malayan species of *Sarcochilus*

- Scape of inflorescence quite smooth, not rough nor prickly  
 Spur bent at almost a right angle just above the middle, its total length 1 cm. . . 1. *fif. stenoglottis*
- Spur not bent, much shorter  
 Rachis of inflorescence not flattened, flowers facing all ways  
 Sepals and petals spotted  
 Inflorescence bearing about 5 flowers, all open at once; upper sepal 10 mm. long . . . 2. *S. Berkeley!*

- Inflorescence bearing about 25  
flowers, opening a few at a time;  
upper sepal 18 mm. long .. 3. *S. alatus*
- Sepals and petals not spotted  
Sepals and petals white or faintly  
yellowish
- Side-lobes of lip purple with narrow  
green veins .. .. 4. *S. caligaris*
- Side-lobes of lip white, usually with  
bars of purple
- Leaves 20 by 1.5 to 40 by 4 cm.,  
nearly straight .. .. 5. *S. tanyphyllus*
- Leaves to 20 by 3-5 cm., curved .. 6. *S. pallidus*
- Sepals and petals flushed with violet .. 7. *S. violaceus*
- Rachis of inflorescence flattened, flowers 2-  
ranked .. ..
- Rachis elongating to 15 cm. or more; lip  
distinctly spurred .. .. 8. *S. biserratus*
- Rachis much shorter; lip saccate, not  
spurred
- Leaves about 3-6 by 2.0 cm. .. 9. *S. tahanensis*
- Leaves not more than about 1 cm. wide  
Flowers lasting 1 day only; upper  
sepal 6 mm. long .. .. 10. *S. virescens*
- Flowers lasting several days; upper  
sepal not over 4 mm. long .. 11. *S. tjidadapensis*
- Scape minutely prickly or roughened  
Sepals and petals not spotted
- Lip distinctly spurred, spur tubular  
Spur very slender, midlobe 3-lobed .. 12. *S. siamensis*
- Spur about 2 mm. diameter; midlobe not  
distinctly lobed .. .. 13. *S. johorensis*
- Lip at most saccate, not with a tubular spur  
Lip hardly saccate, with hairy side-lobes 14. *S. ciliatus*  
Side-lobes not hairy
- Lip 15 mm. long, midlobe blunt .. 15. *S. fasciculatus*
- Lip 3 mm. long, midlobe tapering, acute 16. *S. ecalcaratus*
- Sepals and petals spotted  
Sepals conspicuously hairy .. .. 17. *S. hirsutus*

Sepals not conspicuously hairy  
 Sepals about 3 mm. long .. 18, *S. minutiflora*

Sepals at least 6 mm. long  
 Midlobe strongly 3-lobed, the lateral lobules similar to the side-lobes but shorter and broader .. 19, *S. appendiculatus*

Midlobe broadly triangular with raised basal angles, not clearly 3-lobed .. 20, *S. tami*

1. *Sarcochilus stenoglottis* Hk. f. *F.R.T.* 6\* 34. 1890. *Ann. Calc.* 5: 41, t. 62. 1895. *RidL, Flora* 4: 179.

f K hv 55 cm (often proportionately narrower), often flushed with purple. Leaves to 25 by 5.5 cm, if the blade is broad; scape pendulous, to 7 cm. or more, the sepals and petals very close; the sepals and petals with purple near the base, most very close; petals almost equal to the very short column-foot, about 1 cm. long, bent at

almost a right angle in the middle, almost the whole consisting of a narrow spur which is constricted by a fleshy thickening about the middle, the tip bluntly pointed; side-lobes hardly developed, spreading slightly on either side of the mouth of the spur, with purple streaks; midlobe very short, with a small triangular pointed callus on either side of it. Distributed in Sumatra and Borneo; in Malaya found in the lowlands of Perak and Pahang, abundant near the limestone hills of Kota Glanggi and Gua Mus-

ang. Fig. 208.

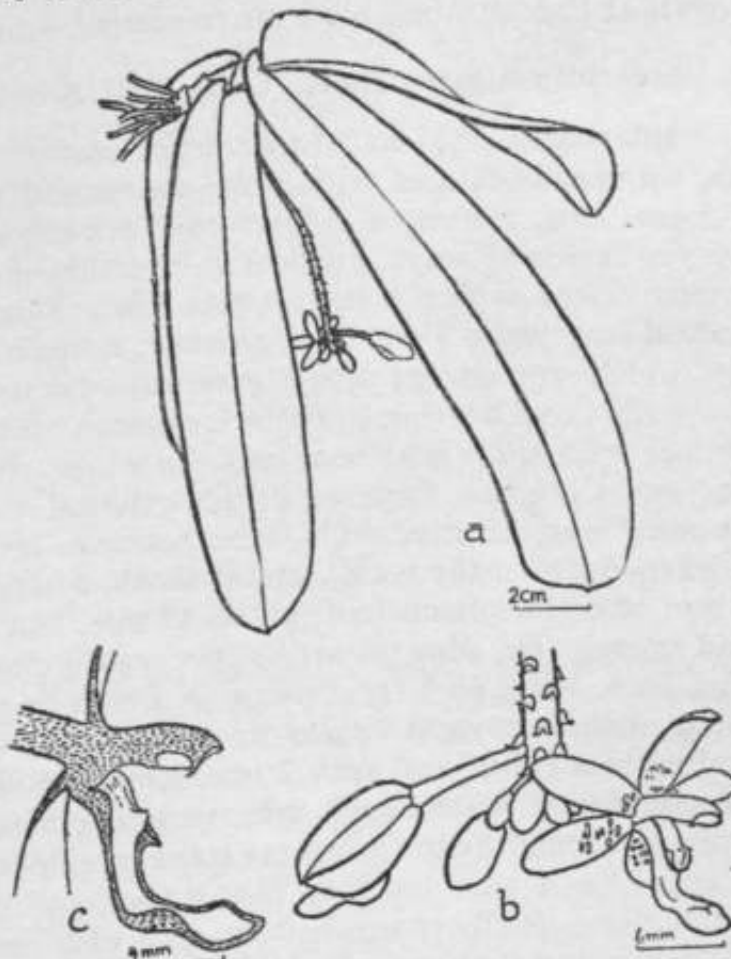


Fig. 208. *Sarcochilus stenoglottis*. a, plant in flower, b, inflorescence, with a faded flower on left, c, section through column and lip.

2. **Sarcochilus Berkeleyi** (Rchb. f.) Rchb. f., in Hk. f., Ann. Calc. 5: 44, pi. 66. 1896.—*Thrixspermum Berkeleyi* Rchb. f., Gard. Chron. N.S. 17: 557. 1882.

Stem to 6 cm. or more long, 3 mm. thick, with about 7 leaves at the tip, internodes 5 mm.; leaves to 15 by 2 cm., widest near tip, narrowed gradually to base; scape to 3 cm. long, rachis to 4.5 cm. or more, not thickened, bearing about 5 flowers, all open at once; bracts broad, short; pedicel and ovary 2-2.5 cm.; sepals and petals pale yellow thickly spotted with orange-brown (spots 0.5-1.5 mm. wide); upper sepal 10 by 0.7 cm., very concave; lateral sepals 11 by 0.9 cm., running half-way along column-foot; petals shorter than upper sepal but as wide; column-foot 9 mm. long, brown; lip 1.2 cm. long, almost at right angles to the column-foot, its basal line curved; side-lobes erect, 5 by 1 mm.; midlobe entirely fleshy with 4 short acute erect points (2 lateral, 2 on mid-line) 1-2 mm. high, lilac-spotted; spur beyond midlobe 4.5 mm. long, 2.5 mm. diameter, at a very obtuse angle to basal part of lip, brown-spotted; column pale greenish yellow, 5 mm. tall, rostellum 4 mm. long. This remarkable species has been found on G. Pantii in Johore; the Johore plants match almost exactly an illustration of a plant cultivated at Calcutta, named *S. Berkeleyi* and stated (with some doubt) to have come from the Nicobar Islands. The plant grown at Calcutta had however unspotted sepals and petals.

3. **Sarcochilus alatus** Holtt., Gard. Bull. Singap. 14: 5. 1953.

Internodes of stem 10 mm. long; leaves fleshy, commonly 18 by 2.5 cm, tip usually bilobed with acute convergent points 3-5 mm. long; scape 4-5 cm. long, rachis of inflorescence pendulous, 30 cm. long, bearing 25 flowers facing all ways, grooved at insertion of each flower, the sides of the groove raised as thin wings; bracts 4 mm. long, attached by a broad base; pedicel and ovary 3 cm. long, slender; flowers fragrant, sepals and petals not widely spreading; sepals greenish externally, white tinged with yellow within and bearing c. 10 dark crimson spots 1-2 mm. diameter; petals similar with spots near base only, lip white with purple marks on midlobe and small crimson spots on cream external surface of spur; upper sepal 18 mm. long, 12 mm. wide, base concave, apex broadly rounded with a thickened tip on the back; lateral sepals a little wider, attached by a base 7 mm. wide to column-foot; petals 17 mm. long, 7.5 mm. wide, tip rounded and asymmetric, edge towards upper sepal inflexed; column-foot narrow, 11 mm. long, distal part free from sepals with lip hinged to its tip; lip 17 mm. long, almost at right angles to column-foot, its midline slightly curved, ending in a cylindrical spur 7 mm. long, and nearly 3 mm. diameter; base of midlobe of lip rising 7 mm. vertically from spur, laterally flattened, bearing a small tooth facing the column; side-lobes 5 by 1.5 mm, each with a small tooth near the base facing the tooth on the midlobe; claw of lip 6 mm. long, deeply channelled, marked with deep crimson; column 10 mm. high, pale greenish, rostellum with a slender beak nearly 5 mm. long which is deeply bilobed after removal of pollinia; anther yellow; stipes of pollinia narrow, slightly widened at tip. Found only once at Fraser's Hill; the plant

re and flower  
 orescence had there The flowers opened a few at  
 lasted a few days. Fig. 208a

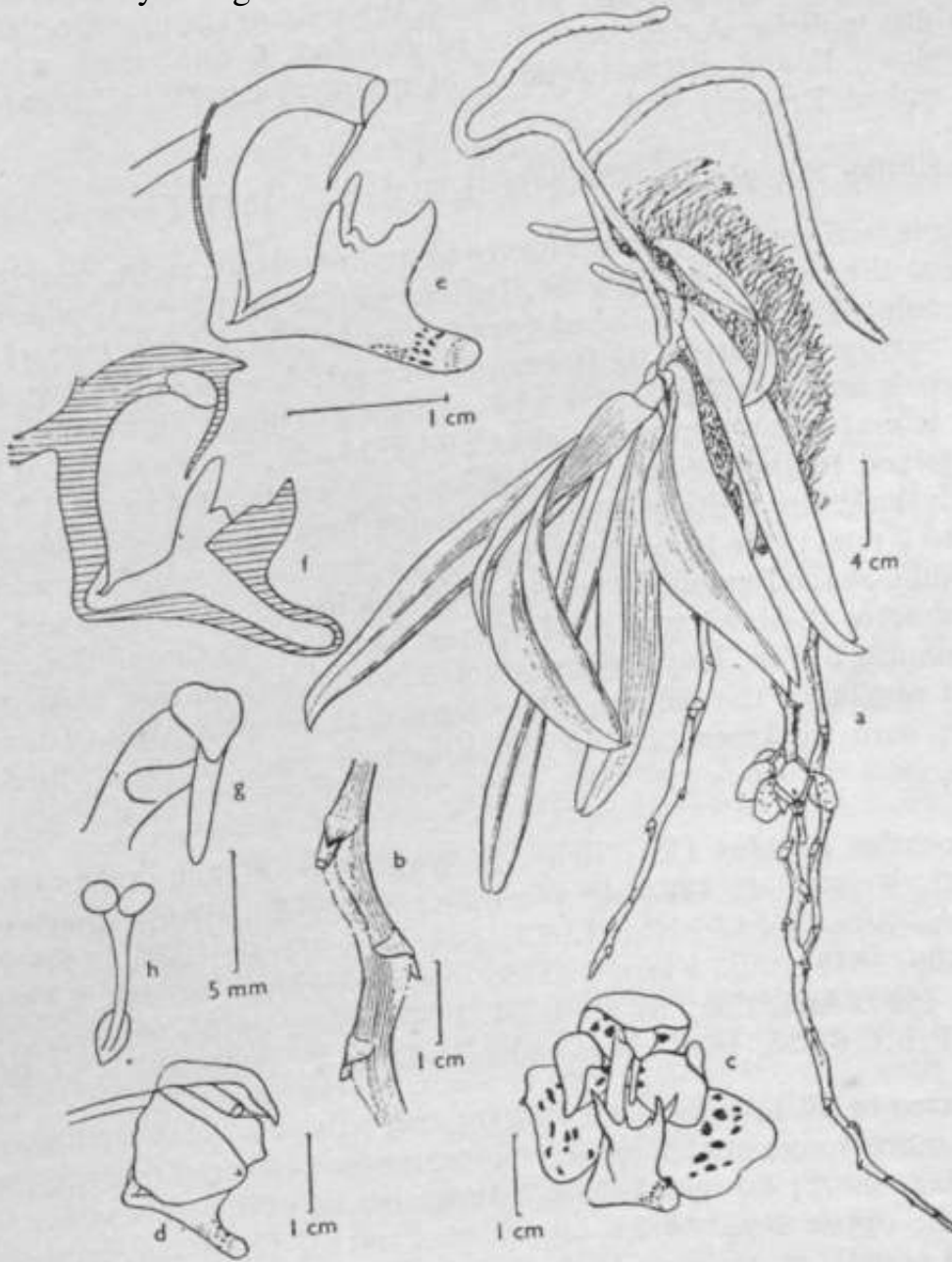


Fig. 208a. a, plant in flower, o. t. ? \* " size: e, lip and column from the side; f, section of column showing the beak of the pollinia; g, detail of column; h, detail of the inflorescence rachis; c, flower from the side; d, section of column showing the beak of the pollinia; k, pollinia.

4. *Sarcochilus calgaris* BULL. Tr. L.S. 3: 572, 1893, Flora 4: 178.

Stem short, bearing 1-10 leaves, gradually to base; scape rather suddenly to 1. W. or more, not thickened, with 2 to 3 cm. long, drooping, sepals and petals white or pale yellowish; upper sepals broad 2-3 mm, lateral sepals running a little way along the column-foot; petals a little smaller,

ends rounded; lip 6-7 mm. long to tip of spur, shaped as in *S. pallidus* (no. 6) but the side-lobes more erect, to 6 by 2.5 mm., bright purple with faint greenish veins on the upper surface (sometimes only tips and edges purple), the bases swollen and yellow on the outside; spur pale yellowish with white midlobe seated upon it; column-foot 6 mm. long, purple or purple-edged. Found in the lowlands at many places from Singapore to Perak, and at Fraser's Hill.

5. *Sarcochilus tanyphyllus* Ridl., Tr. L.S. 3: 372. 1893. Flora 4: 179.

Stems to 5 cm. long, stout; leaves many, nearly straight, closely overlapping at the base, to 40 by 4 cm. (often only 20 by 1.5 cm.), widest near bluntly pointed unequally bilobed apex; scape to 3.5 cm. long, curved downwards; rachis elongating to 10 cm., thickened; bracts spreading, 5 mm. long; sepals and petals pale yellowish or nearly white with purple spots at base of lateral sepals; upper sepal to 20 by 0.6 cm., concave, acute; lateral sepals joined to the column-foot for half its length; petals to 1.5 by 0.5 cm., elliptical; lip white with broad purple bands inside side-lobes, total length to 7 mm.; side-lobes erect, 6.5 by 2.5 mm., ends rounded; midlobe a high saddle-shaped callus on top of spur (as high as the thickness of the spur), shorter than the spur; end of spur rounded, maximum diameter 2.5 mm.; column 5 mm. long, column-foot 6 mm. long, marked with purple, at right angles to the column. Only known to occur on Kota Glanggi in Pahang, both on trees and on the limestone rock; closely allied to *S. pallidus*.

6. *Sarcochilus pallidus* (Bl.) Rchb. f., Walp. Ann. 6: 500. 1863. J.J.S., FK Buit. 6: 559, f. 422.—*Dendrocolla pallida* Bl., Bijdr. 290. 1825.—*Sarcochilus unguiculatus* Lindl., Bot. Reg. 26: Misc. 67. 1840; 32: sub t. 109. 1846. Ridl., Flora 4: 178.—*Sarcochilus aureus* Hk. f., F.B.I. 6: 35. 1890. Ann. Calc. 5: 42, t. 64. 1895.—*Sarcochilus cladostachys* Hk. f., F.B.I. 6: 35. 1890. Ann. Calc. 5: 43, t. 65. Ridl., Flora 4: 179.

Leaves to 20 by 3.5 cm. or larger; scape more or less pendulous, to 6 cm. or more long; rachis to 4 cm. or more, thickened; bracts broadly triangular, short; flowers 1-3 at a time; sepals and petals white or pale yellowish; upper sepal to 2.5 by 0.7 cm., narrowed to tip; lateral sepals running a little way down the column-foot; petals a little smaller than sepals; lip about 6 mm. long, composed of a fleshy spur continuing more or less in the line of the column-foot, with side-lobes curved upwards and backwards towards the column; side-lobes 5.5 by 3 mm., tips rounded, barred with purple; cavity of spur evenly tubular, the tip a little swollen; midlobe a fleshy callus on top of the spur, not as long as the spur, the end raised and rounded; midlobe and spur more or less purple-spotted; column-foot 6 mm. long. Distributed from Sumatra to the Philippines; a variable species, collected in Perak and Pahang, in the lowlands, but apparently not common in Malaya. The flowers are the largest in the genus in Malaya, and quite attractive. Fig. 209.

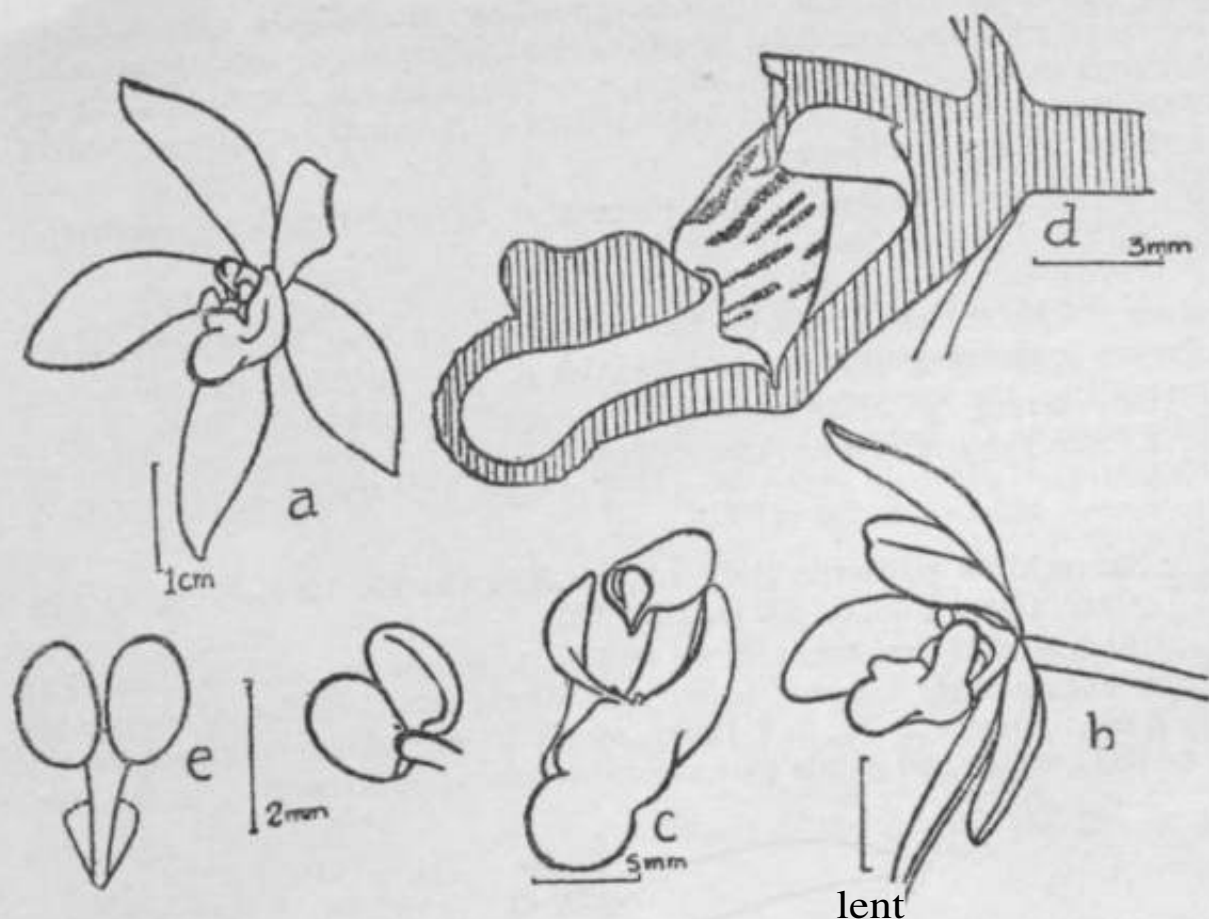


Fig. 209. *Syrcochilus pallidus*. a, b, flower from front and from side, e, column and pollinia through column and hp. e, pollinia.

7. *Sarcochilus violaceus* Ridl., J.F.M.S. Mus. 6: 183. 1915. Flora 4: 180.

Stem about 5 cm. long, with few leaves; leaves fleshy, to 16 by 1.8 cm. broad with rounded lobes, sheathing base flattened; scape to 3 cm. long, slender; bracts broad, spreading, 3 mm. long; sepals and petals pale violet outside, upper surface violet, about 10 mm. long, the lateral sepals with broad concave bases; petals narrower than sepals, acute; lip shorter than petals, white, side-lobes oblique, ovate, incurved; midlobe short, fleshy, ovate, a brown bar near the mouth, hairy within; column 4 mm. long. Found only once, on G. Tahan at 5,000 ft.; there is no specimen in Singapore, and the description is incomplete and possibly not entirely accurate.

8. *Sarcochilus biserratus* Ridl., Journ. Bot. 1900: 73. Flora 4: 180.

Stem creeping, slender, 10 cm. or more long; leaves to 9 by 0.7 cm., thin, glaucous, scape to about 4 cm.; rachis elongating to 15 cm. or more, flowers in 2 ranks, the bracts rather unevenly alternate, very short; bracts pale yellowish; upper sepal 8 by 3 mm., acute; lateral sepals short; floums joined for a short distance to the column-foot; petals smaller than sepals; lip at a very obtuse angle to the column-foot, 6 mm. long, straight, narrowly tubular, 1.5 mm. diameter at opening and tapering a little to

tip; side-lobes erect and slightly sr>readino- column 3 mm, long; midlobe small Aflexed fi m ^ n f, edge towards barely 1 mm. long, with a violet mkrk Tolumn s?enriPy 9 ^ triar ular. mm. long. Found at **Ipoh** and Sungei Sip i n P rak and bV?h ^ , f o ? 8 and Sat Rivers in Pahang. and by the Tembelmg

9. *Sarcochilus tahanensis* Ridl., Flora MP 4- i<o low

Ridl., J.F.M.S. Mus. 6: 182. 1915 (not of Rolfe)

Stem to 10 cm. long; leaves 6, very flesh v P-^JA^A \* about 36 by 20 cm.; inflorescence thick 2 ^ c m \Z, slig ^ % flattened, flowers greenish-white; sepals 6 mm -1 l ic with r ^ f side lobes, no midlobe, the spur broad' fleshy 4?th a br'own blotch in the throat. Found only once on G. Tahan at 5,500 feS, and incom specimen, at Kew, is impe^t This spe ^ p t t W ^ i S 8 o n y vraweiu, but this is not certain. appeals to be related to *S.*

10. *Sarcochilus virescens* Ridl, J.S.B.R A S SO- >>; IQHQ T>

Carr, Card. Bull. 5: 23, pi. 10B. 1929.

Stems to 2-5 cm, long; leaves to 7 by 1 cm flmk u k p 1 ^ r 181611 at base, apex acutely bilobed; scape very short ;ac W, fl S " 8 p 1 ^ r 181611 at to 2 cm.; flowers to 12, in 2 ranks grnri l in' .flattened, elongating

one day; sepals and pei, s t&ASZS iting nm.,

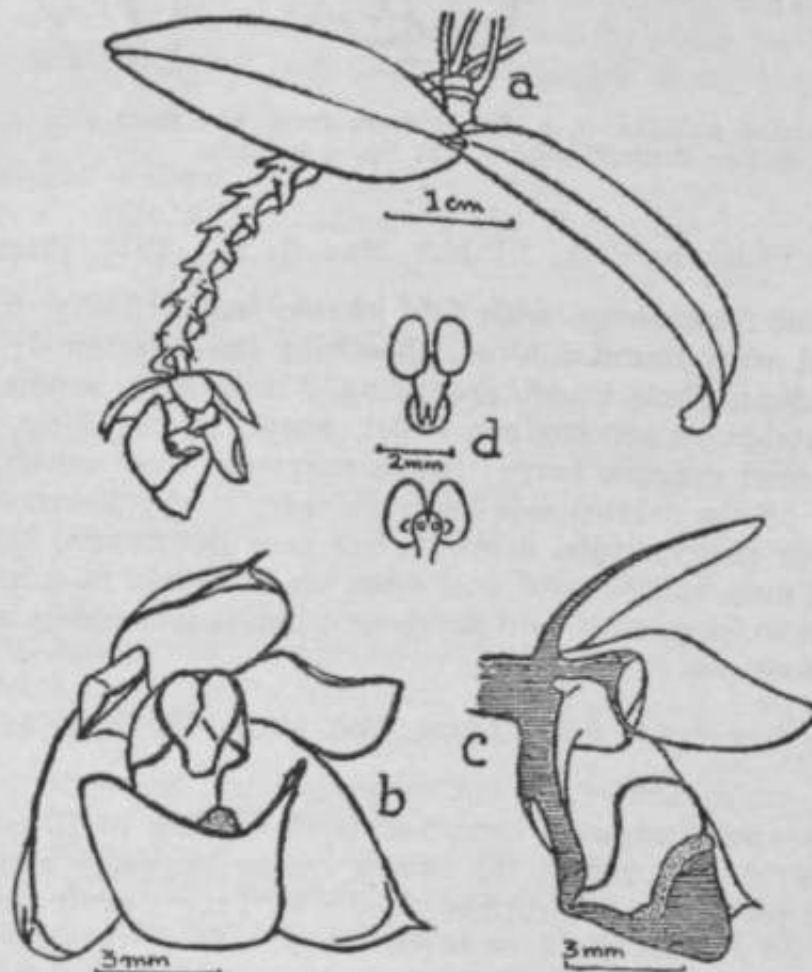


Fig. 210. *Sarcochilus virescens*. a, plant in flower, b, flower from front section through column and lip. rf, pollinia.



concave, with short narrow tip; lateral sepals joined to the column-foot for half its length; petals 6 by 2 mm., apex blunt; lip white, at a very obtuse angle to the column-foot, saccate but not spurred, the side-lobes ascending and diverging, rounded, 2.5 mm. long; midlobe represented by the very fleshy short bluntly conical end of the lip; callus running up the forward end of the sac, behind the midlobe, orange; column 2 mm. long, foot at right angles to column, 3.5 mm. long. Found in the lowlands of Perak and Pahang, at many localities, especially in Pahang. A pretty little species with flowers strongly vanilla-scented. **Fig. 210.**

- 11. *Sarcochilus tjidadapensis*** (J.J.S.) Carr, Gard. Bull. 5: 24. 1929; 7: 40. 1932.—*Chroniochilus tjidadapensis* J.J.S., Bull. Btzg., Ser. 2, XXVI: 82. 1918; Ser. 3, 6: t. 12, III.—*Sarcochilus tembelingensis* Carr, Gard. Bull. 5: 25, pi. IIA. 1929.

Leaves to 2.5 by 0.8 cm., fleshy; inflorescence 1 cm. long, with about 6 flowers, rachis as in *S. virescens*; flowers yellow-green, lasting several days, shaped as in *S. virescens* but smaller; upper sepal nearly 4 by 2 mm., concave, blunt; petals 3 mm. long, under 2 mm. wide; lip with a distinct oblong basal part before the side-lobes diverge; side-lobes under 2 mm. long, minutely hairy; column 2 mm., foot 2 mm. long. Originally found in Java; in Malaya at Fraser's Hill and at Tembeling in Pahang only. The Tembeling plant differed in some small details of the flowers and has been considered a distinct species.

- 12. *Sarcochilus siamensis*** (Ridl.) Carr, Gard. Bull. 5: 31. 1929 (excl. descr. et t. 11B).—*Ascochilus siamensis* Ridl., J.L.S. 32: 375. 1896. Flora 4: 181.—*Sarcochilus mentakabensis* Carr, Gard. Bull. 5\*, 29, pi. 12B, 1929.

Leaves about 5, close together, to 8 by 1.7 cm. or more, fleshy; inflorescences to 3 at one node, more or less erect, the scape minutely prickly, about 3.5 cm. long, the rachis somewhat thickened, short, the bracts broad, 1.5 mm. long; flowers pale yellow; upper sepal 5 by 2 mm.; lateral sepals asymmetric, wider; petals 4 by 1.2 mm.; lip white, the spur continuing almost in the line of the column-foot, the midlobe at right angles to this; side-lobes erect, oblong, ends rounded, 3 by 1.5 mm.; midlobe 3-lobed, the lateral lobules fleshy, acute, 1 mm. long, the tip fleshy, acute, laterally flattened, 1.5 mm. long; spur very slender, straight, 2 mm. long; tip of spur to tip of column-foot 3.5 mm.; column under 2 mm. long, foot a little shorter. Found at several localities from Peninsular Siam southwards to Negri Sembilan and Pahang, in the lowlands.

- 13. *Sarcochilus johorensis*** Holtt., Gard. Bull. 11: 289. 1947.

Leaves about 5, to 8 by 1.5 cm., blunt; scape 3 cm. long, finely prickly; rachis 1 cm. or more, thickened, flowers close, bracts broad, blunt, 2 mm. long, pedicel and ovary 8 mm. long; sepals and petals pale dull yellow; upper sepal 1.1 by 0.5 cm., widest in upper half, tip acute; lateral sepals

very shortly attached to column-foot; all sepals short-hairy on the back, petals 10 by 0.35 cm.; lip 7 mm. long almost in line with the column-foot, the spur bent upwards a little; side-lobes dull brownish-crimson, erect, broadly rounded, 4 mm. long, 2.5 mm. maximum width near the tip; mid-lobe a raised laterally compressed thickening on top of spur, 2.5 mm. long, 2 mm. high, highest in front, the end rising vertically from the upper surface of the spur; spur continuing nearly 3 mm. beyond the midlobe, evenly 2 mm. in diameter; column 6.5 mm. long, column-foot 5 mm. long; <sup>rostr. 1.25 mm. long.</sup> Found only by the Sedili River in southern Johore.

14. *Sarcochilus ciliatus* (Ridl.) J.J.S., Bull. Botz., Ser. 3, 8: 63. 1926. Carr, Gard. Bull. 5: 14A. 1929. *Dendrocolla ciliata* Ridl., J.S.B. 1911. *Dendrocolla ciliata* *var. blepharolobum*

Leaves about 5, to 7 cm. long and 1-2 cm. wide; scape slender erect, finely punctate, to 3.5 cm. long; rachis thickened, to 1.5 cm. bracts short, <sup>ar.</sup>  $\hat{v}i^{\wedge}oi'Z''^{6}adi?$   $\hat{N}^{BA}-1^{\wedge}$  SePalS and PCtalS yellow, P white =  $\hat{\wedge}$  out 7 by 2.5 to 3 mm., petals narrower; lip almost at right angles to the column-foot, with a small cavity near the base, not spurred, 5-6 mm. long; side-lobes erect, parallel to each other, with free ends curved forwards to same length as midlobe bearing rather long slender erect hairs, midlobe narrow, very fleshy, hairless, rather less than half total length of lip; column 3 mm. long; column-foot 1 mm. long. Found at Sungai Siput in Perak, by the Sat River in Pahang, and at Kemaman.

15. *Sarcochilus fasciculatus* Carr, Gard. Bull. 5: 28, pi. 14A. 1929.

Stems to 6.5 cm. long, with about 6 leaves near apex; leaves to 11 by 1.4 cm. widest near apex; scapes in groups at each node, up to 10 in a group, to 5 cm. long, minutely roughened; rachis thickened to 8 mm long; flowers many; bracts spreading, 1 mm. long; flowers small, yellow, upper sepal not quite 3 by 1 mm., acute; laterals a little wider, blunt; Ss half as wide as lower sepals, acute; lip 1.5 mm. long; side-lobes erect, curved, 1.5 by 0.5 mm.; midlobe fleshy, blunt, 1 mm. long with a very small, pointed lobule on either side, at bases of side-lobes; spur a shallow sac 1 mm. long, continuing the line of the column-foot; column nearly 1.5 mm. long, foot the same length. Found only at Krian, Perak.

16. *Sarcochilus ecalcaratus* Holtt, Rev. Fl. Mai. 1: 685. 1953. *Sarcochilus swmensis* sensu Carr, Gard. Bull. 5: 31, pi. HB. 1929, non *Ascochilus siamensis* Ridl.—*S. Carrii* Holtt., Gard. Bull. 11: 288, 1947 (non T. O. Williams 1937).

Stems very short; leaves about 5, fleshy, to 4 by 1.2 cm.; scapes slender, minutely roughened, erect, shorter than leaves; rachis short; bracts very short; flowers pale yellowish with white lip; sepals about 3.5 mm. long, the laterals 2 mm. wide, the upper narrower; petals 3 mm. long, less

than 1 mm. wide; lip continuing the line of the column-foot, without spur; side-lobes ascending obliquely, with broadly rounded ends wider than base, 2.5 mm. along the back edge, more than 1 mm. wide; midlobe solidly fleshy, tapering gradually to tip; base of lip to tip of midlobe 3 mm.; column and column-foot about equal, a little over 1 mm. long, the foot at right angles to the column. Found only at Mentakab in Pahang. This species resembles *S. siamensis* in general appearance and colouring, but has no spur.

17. *Sarcochilus hirsutus* Hk. 1, F.B.I. 6: 38. 1890. Ann. Calc. 5: 44, t. 67. 1895.—*Ascochilus hirsutus* Ridl., Mat. Fl. M.P. 1: 179. 1907. Flora 4: 182. Burk., Gard. Bull. 3: 15. 1923.—*Sarcochilus Burchardianus* Schltr., Bull. Herb. Boiss. Ser. 2, 6: 467. 1906. J.J.S., Bull. Btzg., Ser. 3, Suppl. III: t. 116, I.

Leaves to 20 by 3.5 cm., widest near apex, pendulous; scape almost horizontal, to 2.5 cm. long, densely and minutely prickly; rachis thickened, short, flowers to 8 or more, several open together, lasting several days; bracts broad, stiff-short-hairy, the pedicels also; sepals and petals yellow, barred and spotted with crimson, the sepals conspicuously hairy on the backs; sepals 9 by 4 mm.; petals narrower; lip with narrow erect side-lobes longer than the column, their tips toothed, white with a purple spot at the tip; midlobe seated on top of spur, with low raised much-toothed lateral lobules and thickly fleshy blunt tip; spur broad at the base, narrowed to a short, slender, hairy straight tip pointing forwards under the fleshy midlobe, white with purple spots in front. Distributed in Borneo and Sumatra; in Malaya found in Perak only.

18. *Sarcochilus minutiflorus* (Ridl.) Holtt., Gard. Bull. 11: 289. 1947.—*Ascochilus TYiunutiflorus* Ridl., J.S.B.R.A.S. 39: 85. 1903. Flora 4: 182.

Leaves about 5, to 11 by 1.7 cm., twisted at base to lie in one plane; scape slender, minutely roughened, 2.5 cm. long; rachis short; sepals yellow with red spots, about 3 mm. long; petals smaller, with a red spot at the base; lip yellow; side-lobes broad, erect, flushed with pink; midlobe broad, almost square, nearly as long as side-lobes; spur rounded and slightly elongate, under 2 mm. long; column longer than foot. Found only at Kuala Tembeling in Pahang.

19. *Sarcochilus appendiculatus* (Bl.) J.J.S., Fl. Buit. 6: 564, f. 425. 1905. Carr, Gard. Bull. 5: 27. 1929.—*Dendrocolla appendiculata* Bl., Bijdr. 289. 1825.—*Sarcochilus hirtulus*\* Hk. f., F.B.I. 6: 89. 1890. Ic. Pl. t. 2121.—*Ascochilus hirtulus* Ridl., J.L.S. 32: 375. 1896. Flora 4: 181.

Leaves to 8 by 1.2 cm., apex pointed and very unequally bilobed; scape 1.5-5 cm. long, minutely prickly; rachis thickened, to 1 cm. long; flowers close, bracts 1.5 cm. long, fleshy, acute; sepals and petals reflexed against the ovary, pale or deep yellow, densely spotted with red-brown; upper sepal 8-9 by 3 mm., tip upcurved; lateral sepals wider, joined to about half the length of the column-foot; petals a little smaller than sepals; lip about 5

mm. long, the spur (3 mm. long) almost continuing the line of the column-foot, the midlobe almost at right angles to this; side-lobes erect above the spur, narrow, 3 mm. long, purplish, deeper at the tip; midlobe fleshy, white, 3-lobed, the lateral lobules parallel to the side-lobes but shorter and broader, the tip short, acute; column slender, slightly curved, 5-5 mm. long; foot 2-5 mm. long. Distributed in Java; in Malaya found at many places, especially on the limestone, as an epiphyte, but also on trees by rivers. The spur is sometimes not straight but bent forwards under the midlobe.

20. *Sarcochilus Carrii* L.O. Will., Bot. Mus. Leaflet. Harv. Univ. 5: 57. 1937.  
—*S. maculatus* Carr, Gard. Bull. 5: 26, pi. 12A. 1929, non Benth.

Like *S. appendiculatus* but: leaves to 10 by 1-5 cm.; bracts over 2 mm. long; upper sepal 6 by 2 mm., laterals nearly 3 mm. wide, joined to the whole length of the column-foot; petals 5-5 by 1-5 mm.; side-lobes of lip 3 by 1-7 mm., back edges purple-mottled; midlobe widening suddenly from a narrow base, almost triangular, white with purple spots, the sides curved upwards, the tip curved downwards over the spur, short, acute; spur yellow, almost in line with the column-foot, swollen somewhat from the constricted entrance, 3-5 mm. long, 2-5 mm. wide; column 5 mm. long, curved, foot 1-5 mm. long. Found at several localities in the lowlands of Pahang.

## 22. EUANTHE

Habit of *Vanda*. Flowers large, with flat sepals and petals; lip rather small, fleshy, the basal part deeply concave (almost hemispherical), its edges hardly developed into side-lobes, distal part (midlobe) fleshy, with a very narrow base above which the side-lobes meet in two small folds; a small hump in the cavity of the lip just below base of midlobe, and longitudinal ridges on the midlobe; pollinia as *Vanda*.

There is only one known species of this genus, *E. Sanderiana*, native in south-eastern Mindanao. It is much prized in cultivation, and is briefly described below. The genus *Euanthe* is very closely allied to *Vanda*, but the lip has a different shape. As *E. Sanderiana* produces fertile hybrids when crossed with *Vanda*, growers generally include it in the genus *Vanda*; this action has much to recommend it from a practical standpoint.

### ***Euanthe Sanderiana***

Inflorescence of 6-10 flowers, closely placed at the apex of a scape about 20 cm. long. Flowers to 10 cm. high; upper sepal and petals a delicate mauve, or almost white, the petals with some red-brown spots near the base; the lateral sepals larger, cream or pale yellowish with a network of deep red-brown veins; lip hardly 3 cm. long, basal hollow part pale greenish or dull yellow, lightly streaked with red; midlobe 15 mm. long, 20 mm. wide, dull red-brown. Fig. 211.

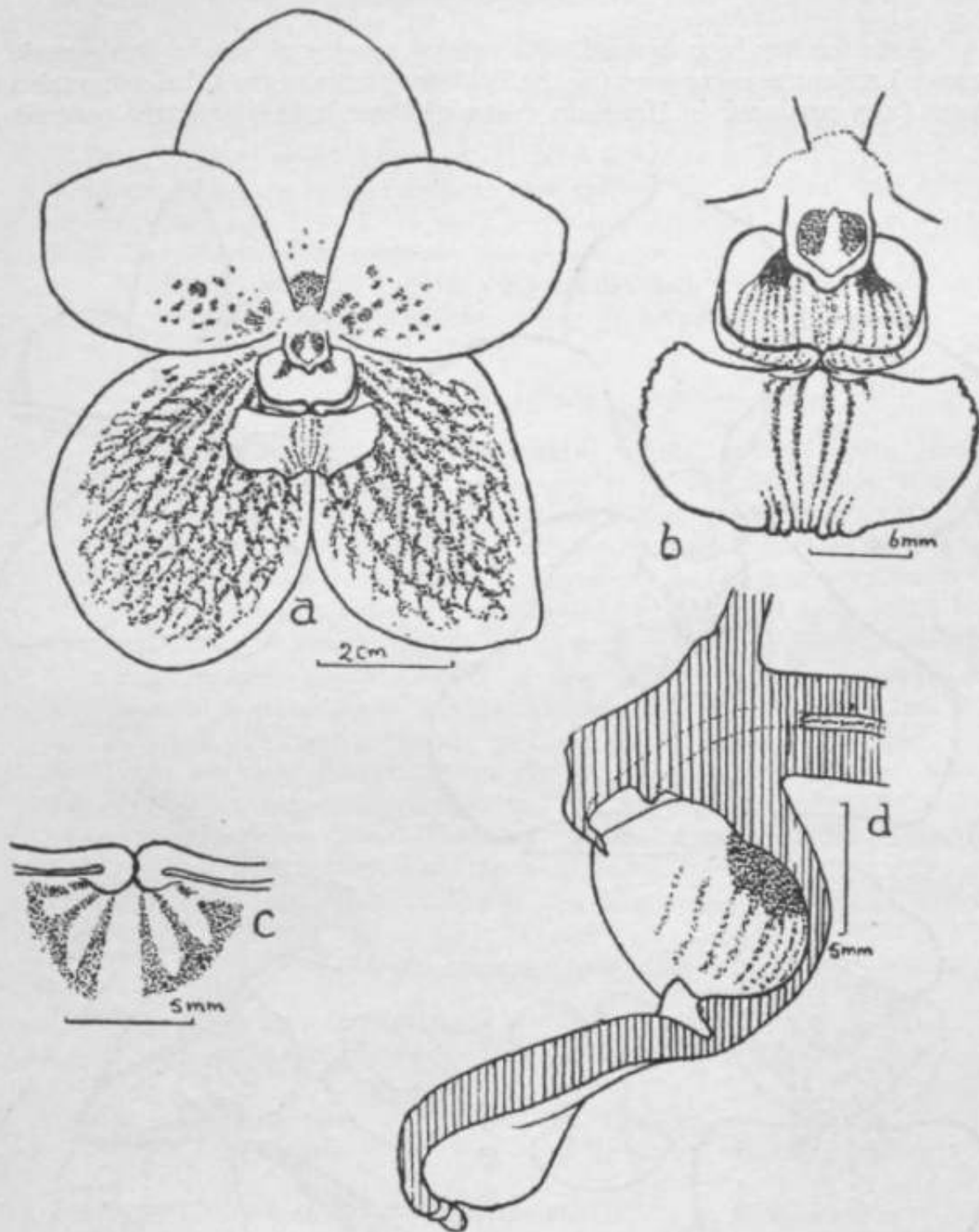


Fig. 211. *Euanthe Sanderiana*. a, flower from front, b, lip. c, base of midlobe of lip. d, section through column and lip.

In Mindanao, this species grows on trees close to the sea, and has a regular though not extreme seasonal change of climate. The very uniform climate of Singapore apparently does not suit it very well, and it is difficult to maintain a plant in good condition here. It is cultivated in the same way as the non-terete Vandas, and is probably best in a basket hung in an airy position, with light overhead shade but exposed to morning sun.

## Hybrids of Euanthe

Euanthe has been crossed with several species of Vanda, the generic name Vandanthé being used for the hybrids. Plants of the third generation have been produced in Honolulu. None of these hybrids are yet common

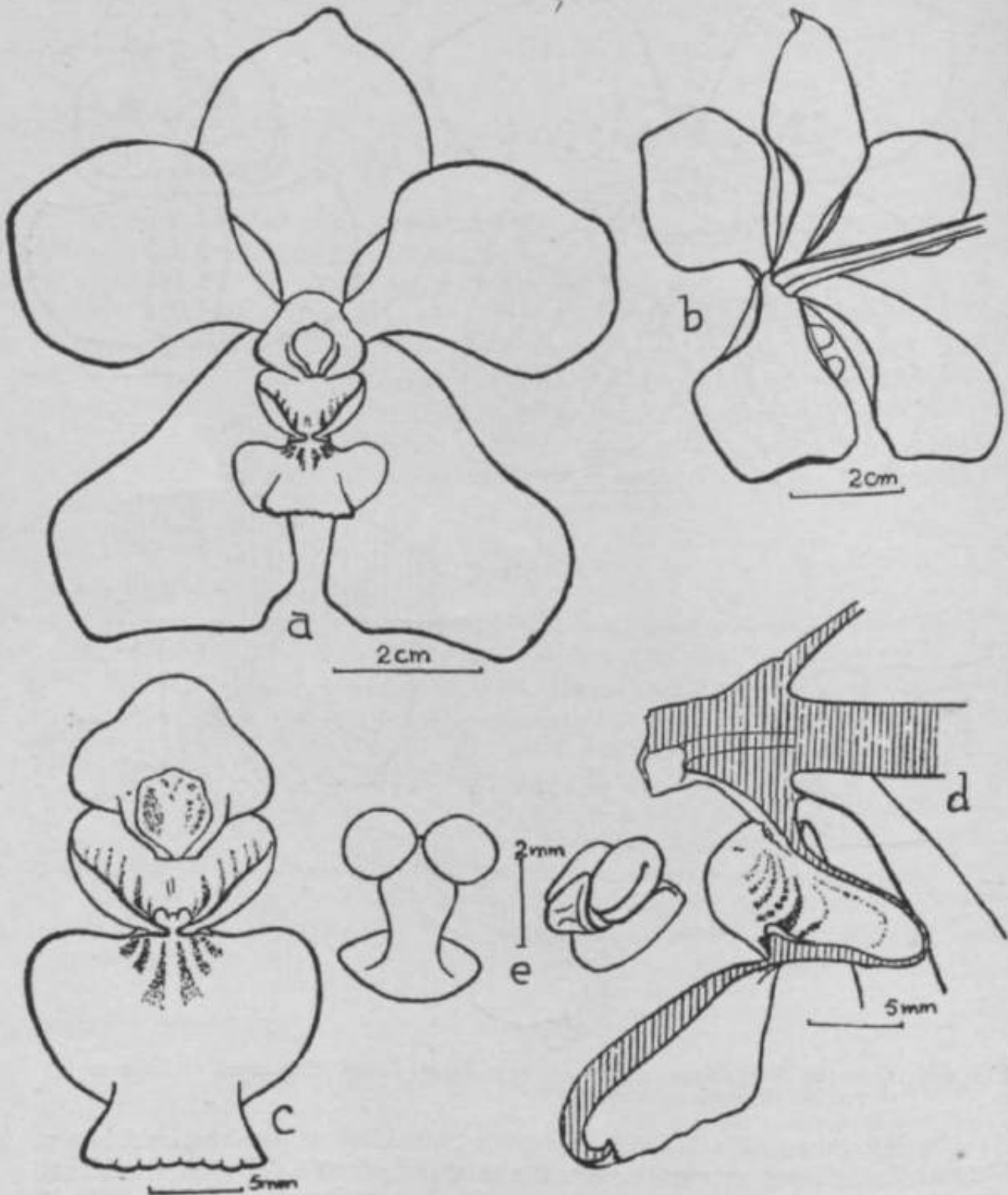


Fig. 212. *Vandanthé Ellen Noa*. *a*, flower from front, and *b*, from back, *c*, lip and column from front, *d*, section through column and lip. *e*, pollinia, from front just after removal from flower (left), after contraction of stipes (right).

in Malaya, though that obtained by crossing with *Vanda* Miss Joaquim should become so. These hybrids are certainly among the finest of the *Vanda* alliance, partly on account of the large size and flat petals of *E. sanderiana*. *E. Sanderiana* X *V. cxrulea* is *Vandanthe Rothschildiana*; X *V. suavis* is *Vandanthe Burgeffii*; X *lamellata* is *Vandanthe Kupperi*; X *teres* is *Maurice Restrepo*; X *V. Miss Joaquim* is *Vandanthe Mevr. L. Velthuis*. A hybrid with *Vanda Dearei* (Ellen Noa, fig. 212) has flowered in Singapore; its flowers are large but poorly coloured. In France a hybrid with *Renanthera imschootiana* has been produced.

It appears that all hybrids of *Euanthe* and *Vanda* are freely inter-fertile, so that further opportunities for breeding are very great.

### 23. LUISIA

Stems fairly long, with well-spaced leaves; leaves terete, slender; inflorescence short, dense, the scape very short and the rachis thickened; sepals and petals free, equal or the petals longer and narrower; lip fleshy, fixed immovably to the base of the column, distinctly divided by a groove into basal and apical parts; basal part more or less hollow, sometimes with distinct side-lobes; apical part usually larger, wrinkled or grooved longitudinally; column short; pollinia 2, entire or cleft, on a short broad stipes.

This peculiar genus consists of few species, being apparently most abundant in the region of Burma. The plants are very like some of the terete-leaved *Sarcanthus* in appearance, or the larger ones like *Vanda teres*, but are very distinct in the flowers, which are usually greenish or yellowish, with a purple-brown fleshy lip, the peculiar structure of which is described briefly above. They are species of open places rather than shady forest. The flowers continue to increase in size for some days after they open; this especially applies to the long petals of species 1 and 2.

#### Key to the Malayan species of *Luisia*

Petals twice as long as sepals

Lip with distinct side-lobes and cordate midlobe 1. *L. Jonesii*

Lip without distinct side-lobes, the midlobe

not cordate . . . . . 2. *L. antennifera*

Petals and sepals of almost equal length . . . 3. *L. Zollingeri*

**1. *Luisia Jonesii*** J.J.S., *Blumea* 5: 311. 1943. = (?) *L. tristis* quoad Ridl., *Flora* 4: 153.

Stem stout, straight, internodes 2-3 cm. long; leaves about 12-18 cm. long, nearly straight; inflorescences 1-5-2 cm. long, erect and close to the stem; sepals and petals narrow; sepals 1-3 to 1-5 cm. long, the lateral ones strongly keeled, green; petals cream, to 3-2 cm. long, base 2-5 mm. wide, near apex 4 mm. wide; lip to about 1-8 cm. long and 1-3 cm. wide when

flattened, deep chocolate-purple, the basal part separated by a semi-circular groove from the apical part; basal part 6-8 mm. long, with rounded side-lobes 2-5 mm. long and wide; apical part cordate-ovate; longitudinally wrinkled, the sides reflexed. Found only at a few localities in Penang and Perak; closely allied to *L. taurina* of Java. Fig. 213.

2. *Luisia antennifera* Bl., Mus. Bot. Lugd. Bat 1: 64. 1849. Rchb. f., Xen. Orch. 1: 205 t. 78<sub>t</sub> ii, f. 4-7. J.J.S., Bull. Btzg., Ser. 2, XXVI: 100. 1918. Ser. 3, 6: t. 16, IV. 1924, RidL, Flora 4: 153.

Habit of *L. Jonesii*; sepals and petals pale green, lip dark purple; sepals about 7.5 by 4 mm.; petals about 1.7 by 0.1 cm.; Up 7.5 mm. long, the basal part almost square, 3.5 mm. long and wide, without distinct side-lobes, the apical part ovate, wrinkled, 4 by 4.5 mm. Distributed in Java, Borneo and Sumatra; in Malaya found at many localities in the lowlands of Perak, Pahang and Negri Sembilan.

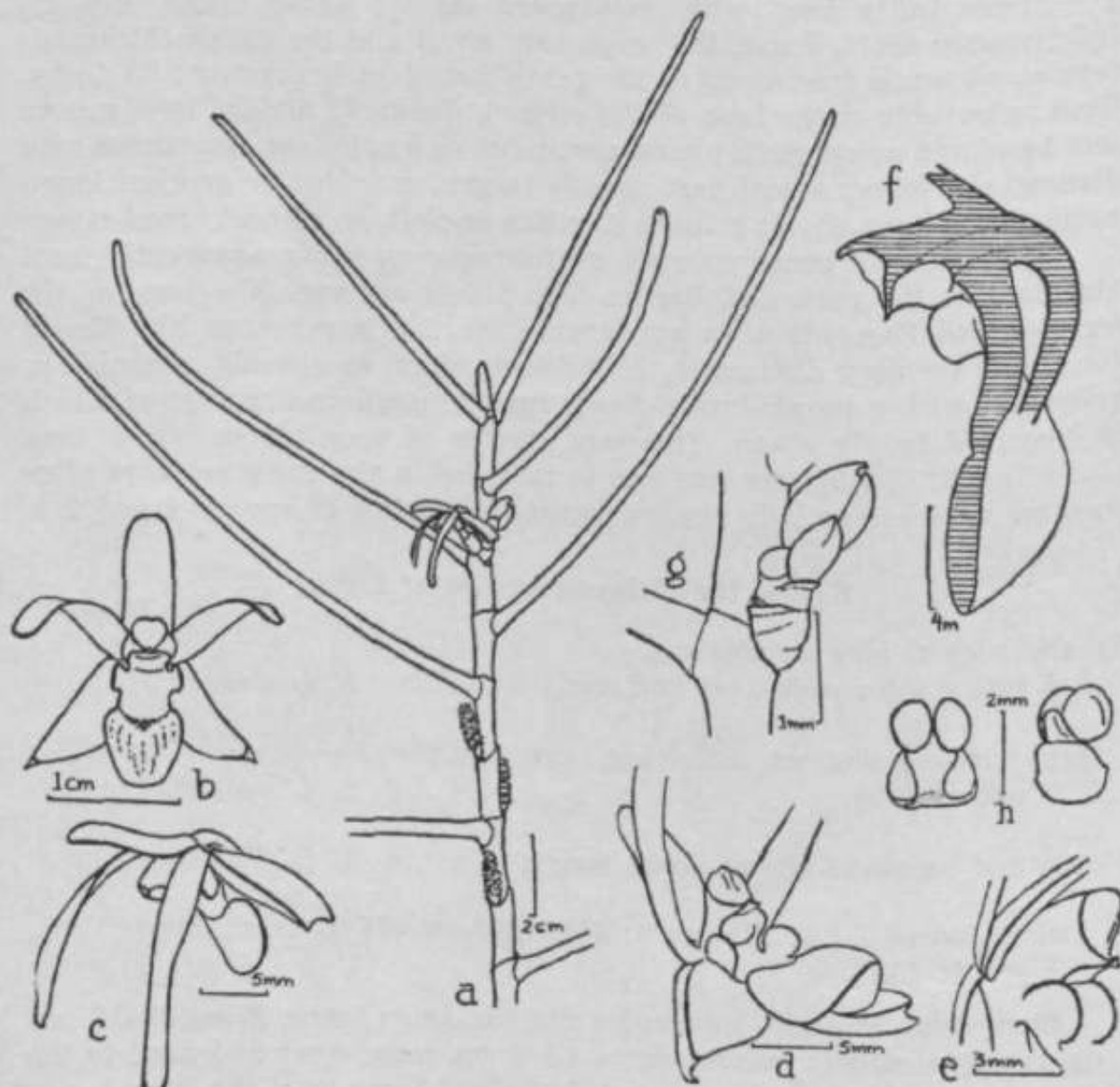


Fig. 213, *Luisia Jonesii*. a, plant in flower. b, flower from front, and c, in natural position, d, column and lip. e, column, f, section through column and lip. g, inflorescence after removal of first flower, h, pollinia.



3. *Luisia Zollingeri* Rchb. f., Walp. Ann. 6: 622. 1862. J.J.S., Bull. Btzg., Ser. 3, 8: 367. 1927.—*L. latipetala* J.J.S.M Bull. Dep. Ag. XLIII: 67. 1910. Bull. Btzg., Ser. 3, 6: t. 17, II.—*L. braekystachys* quoad Ridl., Flora 4: 153. (?of Lindl.),

Stems curved, not very long, rather slender, internodes 1 to 2 cm. long; leaves to 20 cm. long, slender; inflorescences about 1 cm. long; flowers not widely opening, the upper sepal and petals lying close together almost in one plane, the lateral sepals and lip in another plane almost at right angles to the upper one; sepals and petals greenish more or less mottled or flushed with purple, lip purple; sepals about 5 by 3 mm.; petals about 6 by 3-5 mm.; lip 5 by 35 mm., the basal part hollow with raised sides, the apical part of about the same length as the basal part, the line of separation not very distinct. Distributed in Java and Sumatra, and probably also in Burma and Siam. In Malaya found only in the north, in Perlis and Langkawi, In Java the flowers are rather larger than the dimensions given above. Fig. 214.

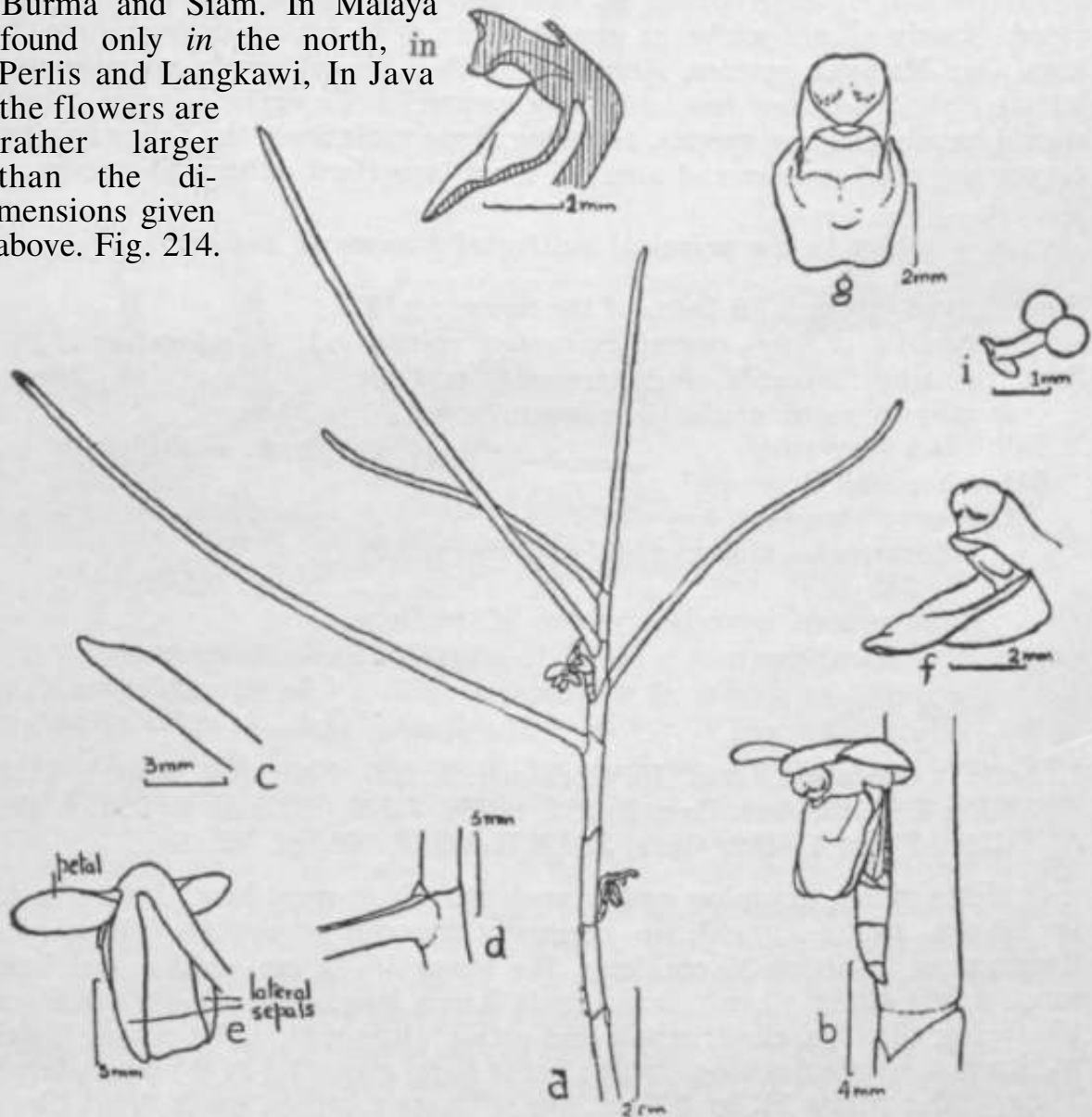


Fig. 214. *Luisia ZoUingeri*. *a*, part of plant in flower, *b*, inflorescence, *c*, profile of tip of leaf. *d*, base of leaf, *e*, flower from behind. *f*, column and lip from side. *g*, column from above, and foreshortened lip. *Uppermost drawing*, section through column and lip. *i*, pollinia.

## 24, AERIDES

Stems fairly long, branching, stout, with many thick roots; leaves flat or terete; inflorescences simple or sometimes branched, long, bearing many (rarely few) moderately large, usually scented, flowers, close together; sepals and petals similar, spreading, the lateral sepals more or less decurrent on the column-foot; lip rather stiffly hinged to the end of the column-foot, spurred, 3-lobed; spur usually bent forwards, with swellings or calli within; column short, with large foot; pollinia 2, cleft, on a rather long narrow stipes.

This genus consists of a rather small number of species, distributed through India (including the south and Ceylon), Indochina and Malaysia, and one species in Japan. The flowers of all species are of medium size, but attractive and often fragrant, so that nearly all species have been cultivated. Nearly all are white, or almost white, with mauve or purple markings. Our Malayan species, *Aerides odoratum*, is extremely variable and widely distributed, and has had many names for its various forms, which should hardly rank as species. Ignoring these variations, the following key covers the local species and also the most important cultivated species.

Key to the principal cultivated species of *Aerides*

- Spur curved upwards in front of the flower; mid-lobe of lip narrow, covering front of column 1. *A. odoratum*  
 Spur pointing forwards or downwards; midlobe usually at right angles to column, broad  
 Side-lobes very small .. .. . 2. *A. multiflorum*  
 Side-lobes well developed  
 Leaves not terete  
 Inflorescence unbranched, midlobe nearly  
 ^ at , •• •• .. 3. *A. falcatum*  
 Inflorescence branched, sides of midlobe  
 turned down .. .. 4. *A. crispum*  
 Leaves terete .. .. f 5. *A. vandarum*  
 " \ 6. *A. cylindricum*

1. *Aerides odoratum* Lour., Fl. Cochinch. 2: 525. 1790. Bot. Mag. t. 4139. King & Pantl. Ann. Calc. 8: 212, t. 282. J.J.S., Fl. Buit. 6: 581, f. 436. Ridl., Flora 4: 182. Carr, J.M.B.R.A.S. 6: 65, pi. 15. 1928.

Stems stout, drooping and branching, often quite long; leaves to 25 by 2-5 cm., fleshy, curved, tip unequally rounded or slightly bilobed; inflorescences to about 35 cm. long, the scape 10-15 cm, rachis and buds more or less sticky when young, bracts 5 mm. long, acute; flowers to about 30, facing all ways, close; sepals and petals white with violet-purple blotch at tips and sometimes other spots; upper sepal about 1-2 by 0-8 cm., laterals 1 cm. wide; petals 1-2 by 0-7 cm, lip with spur turned up in front like a horn and the lobes enclosing the column almost completely; spur greenish or yellowish at the tip, more or less purple-spotted throughout, within with small keels guarding the nectar-containing tip and also sometimes 2 curved

appendages which almost close the mouth; side-lobes more or less quadrangular, erect, touching the sides of the column and more or less arched over it, *their edges entire or toothed*, white or faintly cream, more or less purple-spotted; midlobe erect, narrow, filling the gap between the side-lobes in front of the column, its tip in contact with and more or less arching

over the top of the column, its edges entire or toothed, its tip blunt or notched, white, with a broad purple median band, about 10 by 04 cm. Distributed from Burma and southern China through Malaya to the Philippines; in Malaya found at many localities but not in the extreme south, in the lowlands and often near the sea, in moderately exposed positions, very variable. Fig. 215,

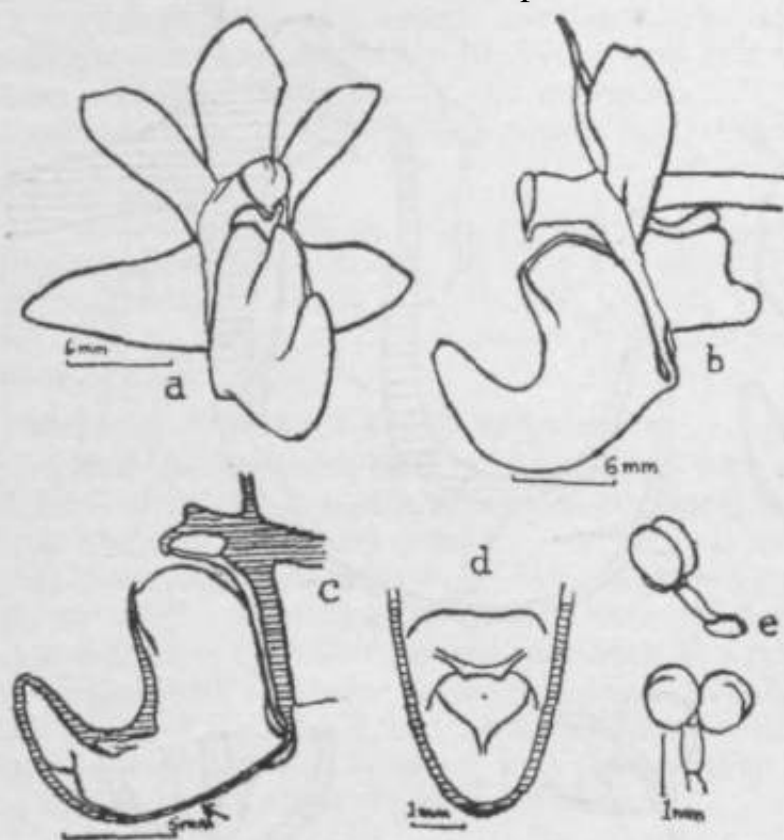


Fig. 215. *Aerides odoratum*\* *a, b*, flower from front and from side, *c*, section through column and lip. *d*, looking into spur from the direction shown by arrow in *e*. *e*, pollinia.

There is independent variation of many characters in the wild plants of this species in Malaya. The variation is in details of colouring of all parts {including size and distribution of spots}, in smooth or toothed edges of the lobes of the lip, in pointed or notched end of midlobe, in the extent to which the lobes cover the column, and in the presence or absence of the two appendages at the mouth of the spur; there is also some variation in the intensity of the perfume of the flowers- Poor varieties have nearly white flowers with faint mauve spotting and dull green spur; fine varieties have strongly marked bright purple spots at the ends of sepals and petals, and bright purple median band to the midlobe, the lobes large and with toothed and crisped edges, the spur yellowish with purple spots. The name *A. suavissimum* was given to one of the better varieties; the name *odoratum* is the oldest, and was given to a plant from Indochina, probably one with almost entire lobes of the lip and lacking the appendages in the spur; the name *virens* was given to a plant from Java, where the species is said to be as variable as in Malaya; the name *cornutum* was given to a plant from Burma.

The finest varieties of the species occur in the Philippines. The two best known have been called *A. Lawrenceae* and *A. quinquevulnerum*. Of these, *A. Lawrenceae* (fig. 216) is found in Mindanao (southern Philippines), and produces very large plants with long inflorescences of unusually

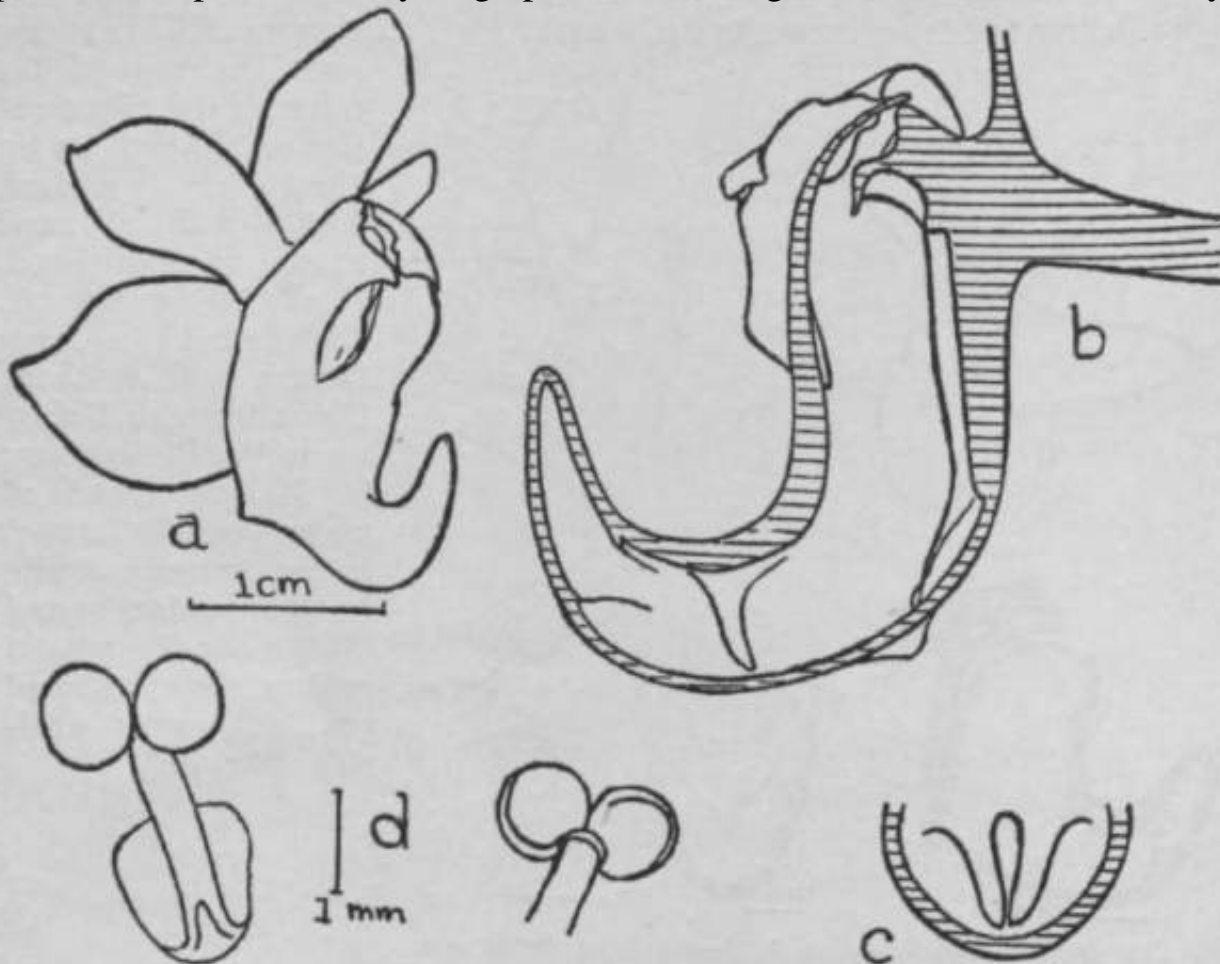


Fig. 216. *Aerides Lawrenceae*. a, flower, b, section through column and lip. c, entrance to spur, d, poll in i a.

large flowers (upper sepal 16 by 10 cm.), with very broad side-lobes and crisped almost entirely purple midlobe 17 by 0.9 cm.; *A. quinquevulnerum* is native in Luzon, and has the apical spots on sepals and petals very distinct and bright, but flowers not so large as in *A. Lawrenceae*. In essentials of floral structure, these do not differ from *A. odoratum*, and are better called var. *Lawrenceae* and var. *quinquevulnerum*. Carr published notes on the pollination of this species by large bees, which push the hinged lip away from the column and so have access to the nectar in the spur. An illustrated account of Philippine *Aerides* appears in the Philippine Orchid Review, Vol. II no. 3 (Oct 1949).

2. *Aerides multiflorum* Roxb., Fl. Ind. 3: 475. 1832. Cor. Pl. 3: 63, t. 271. Bot. Mag. t 4049. Ridl., Flora: 183.

Habit of *A. odoratum*, but leaves somewhat narrower; spur of lip short, straight, pointing forwards under the midlobe; side-lobes very small; midlobe about 1.7 cm. long, broadly ovate, nearly flat and pointing straight forwards, at right angles to the plane of the sepals and petals; column-foot very short; sepals and petals white flushed with purple towards the tips and sometimes purple-spotted, lip purple, a deeper shade

down the middle. Native from the eastern Himalayas southwards to Langkawi and Baling in Kedah. A very attractive species, the flowers of much more graceful shape than in *A. odoratum*; but it does not flower well in Singapore, needing a more pronounced change of season.

### 3. *A. falcatum*

Very like *A. multiflorum*, but the side-lobes of the lip well developed and the spur longer. Native in Burma and Siam; one of its varieties has been called *A. crassifolium*. *A. mitratum* is also closely related if not identical. These species do not flower in southern Malaya.

### 4. *A. crispum*

Inflorescence large, with several branches; flowers rather like *A. falcatum* but the side-lobes smaller and the sides of the midlobe turned down. Native in southern India and Ceylon. This must be a fine species; we have no record of its behaviour in cultivation in Malaya. It should be used for hybridization.

### 5 and 6. *A. vandarum* and *A. cylindricum*

Both these species have hanging stems with slender terete leaves, with 2 or 3 white flowers in a short inflorescence, the spur of the lip rather long and slender, nearly straight, carrying on the line of the column-foot, side-lobes long and narrow, midlobe widened from a long narrow base, deeply cleft. *A. vandarum* is the finer species, native in Burma; *A. cylindricum* has smaller flowers, differing in various details, and is native in Ceylon and southern India. *A. vandarum* might be worth growing in the north of Malaya. It has been hybridized with *Vanda teres* giving the hybrid *Aeridovanda Mundayi*; this flowers very rarely in Singapore, and is not so fine as many *Vanda* hybrids.

## Cultivation of Aerides

In their natural state, *Aerides* plants tend to hang downwards, the young growing parts of the stems curving forwards and upwards towards the light, and producing roots which grow back to the supporting tree; the plants branch freely if they have a favourable place. Owing to this drooping and branching habit, the plants need careful training to maintain them in a good shape in a pot or basket. They are probably best in a rather wide hanging basket (which may be of broad-mesh wire-netting or of wood). A successful local grower reports that he finds the best rooting medium is coarse fern-root, packed tightly. In such a basket, the growing stems can be kept almost upright, and the roots bent as necessary to grow into the basket. Watering with manure in liquid form stimulates growth, and is really necessary for good results. A fair amount of exposure to sun and air is necessary to ensure flowering; at least full morning sun is desirable, or both morning and afternoon sun, with shade in the heat of the day. If gradually hardened, plants can even be made to stand full sun all day, and may be grown attached to a short stump of wood driven into the ground, with grass and litter around; plants so treated in Singapore have grown strongly and flowered freely. Plants may also be grown in other ways to suit varying circumstances, but plenty of light and air are always essential.

## Hybrids

*Aerides* will hybridize freely with *Vanda* and *Arachnis*, and probably also with other genera. A hybrid of *A. odoratum* with *V. Hookeriana* (*Aeridovanda* Grete, fig. 217) has flowered in Singapore, and is pretty but apparently not very floriferous. *Aeridovanda* Jeneal (*V. tricolor* var. *suavis* X *A. odoratum*) has proved very vigorous and free-flowering.

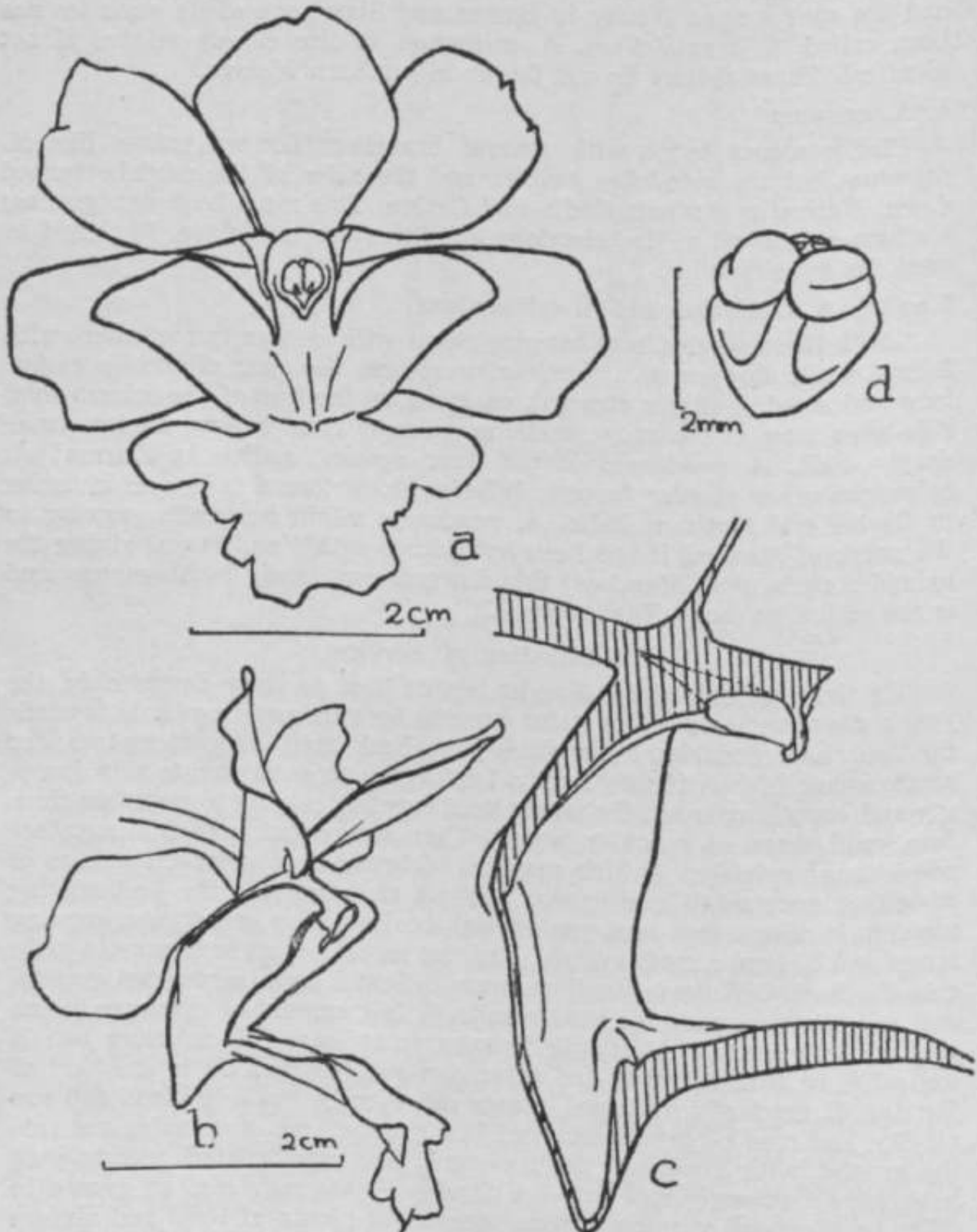


Fig. 217. *Aeridovanda* Grete. *a*, flower in face view, *b*, flower from side, *c*, section through column and lip. *d*, pollinia after bending forwards.

25. RHYNCHOSTYLIS

Stems short and thick; leaves thickly fleshy, rather long and narrow, channelled, unequally bilobed and toothed at the tips, with several longitudinal pale lines; inflorescences erect or drooping, about as long as the leaves, bearing many flowers close together; sepals and petals spreading, with or without purple or blue spots, petals smaller than sepals; lip not hinged, joined to the short column-foot, with backward-pointing laterally flattened spur and forward-pointing unlobed or slightly 3-lobed blade; column short, column-foot short, its point of separation from the lip not sharply distinct; pollinia 2, cleft, on a long slender stipes slightly widened at the tip only, the disc small; rostellum and anther long-pointed.

This is a small genus of much the same habit as *Aerides*, with rather similar inflorescences of closely placed medium-sized flowers, but with shorter stems and thicker leaves. The lip is not sharply delimited from the column-foot as in *Aerides*, the spur points backwards and the blade of the lip is only slightly lobed. When not in flower, the pale lines on the leaves serve to distinguish plants of this genus. In some books, all the species are included in the genus *Saccolabium*. *R. retusa* is native in the north of Malaya; *R. gigantea* doubtfully native in the south and certainly on islands not far away. Two other species are sometimes cultivated; the following key covers all four. Schlechter separated species 3 and 4 as a genus *Anota*, because he said that they had no column-foot, but fig. 218 shows that a short foot is in fact present.

Apex of lip sometimes notched but not 3-lobed;

column-foot distinct

Inflorescence drooping; sepals and petals white

with few purple spots . . . . . 1. *R. retusa*

Inflorescence erect; sepals and petals with in-

digo mark at tips . . . . . 2. *R. ccelestis*

Apex of lip distinctly 3-lobed; column-foot very short

Lip with 5 close keels, purple throughout . . . 3. *R. violacea*

Lip with 2 small keels near base, purple at tip only or entirely white . . . . . 4. if?, *gigantea*

1. **Rhynchostylis retusa** Bl., Bijdr. 286. 1825. J.J.S., Fl. Buit. 6: 629, f. 471  
King & Pantl., Ann. Calc. 8: 213, pi. 284. Ridl., Flora 4: 163.

Stems thick, short, with up to 12 leaves; leaves to about 40 by 4 cm.; inflorescences drooping, to 40 cm. long, the scape to 10 cm.; sepals and petals white or with a few purple spots; upper sepal to 12 by 0.7 cm., laterals to 1 cm. wide but hardly decurrent on the column-foot; petals to 1.2 by 0.6 cm., blunt, widening from a narrow base; spur of lip about 8 mm. long, pale mauve; blade of lip to 1.2 cm. long, purple with white base and tip, curved upwards and forwards, 5 mm. wide at the base widening to 8 mm. near apex, the apex concave, the end rounded and more or less notched; column-foot distinct. Native in Ceylon and India, and through Malaysia to the Philippines; in Malaya native in the north only, near Grik and in Kedah and Langkawi. In Peninsular Siam this species grows in large masses, in exposed places, and flowers seasonally, when it makes a

fine display. It does not flower well in Singapore, and is difficult to maintain in vigorous condition. There is some variation in both size and details of colouring of the species in different parts of its wide range. The Philippine form appears to be unspotted.

2. *R. coelestis*

Leaves to 15 cm. long; inflorescence erect, flowers about 2 cm. wide; sepals and petals white with an indigo blue apical blotch; lip with base of blade white, the apical half bright indigo blue, shaped as in *R. retusa*; spur longer than in *R. retusa* and narrower, with the end bent downwards. Native in Siam. This attractive species has been cultivated and flowered in Singapore, but does not flourish here. It would be worth growing in the north, and should be hybridized, preferably with the white variety of *R. gigantea*.

3. *R. violacea*

Leaves to about 30 by 4 cm.; inflorescences to 25 cm. long; sepals and petals white, conspicuously but not densely spotted with purple; sepals to 1.5 by 0.9 cm., petals to 1.3 by 0.6 cm.; blade of lip purple, 1.2 cm. long, 8 mm. wide, with 5 close fleshy ridges near base, the apex less distinctly 3-lobed than in *R. gigantea*, the sides raised slightly and the apex with a raised lobule prominent beyond them and a white swelling beneath; spur 6-7 mm. long. Native in the Philippine Islands (Luzon). This species will flower in Singapore, but not freely. It is perhaps easier to grow here than *R. gigantea*. Fig. 218.

4. *Rhynchostylis gigantea* (Lindl.) Ridl., J.L.S. 32: 356. 1896. Flora 4: 163.—*Saccolabium giganteum* Lindl., Gen. et Sp. Orch. 221. 1833. Bot. Mag. t. 5635.—*Vanda densiflora* Lindl. 1850.—*Anota densiflora* Schltr., Die Orchideen 588. 1915.

Var. *Harrisoniana* (Hk.) Holtt., Gard. Bull. 11: 287. 1947.—*Saccolabium Harrisonianum* Hk., Bot. Mag. t. 5433. 1864.

Size of plant as in *R. violacea*; sepals and petals white, the petals with purple spots near base, apical part of lip purple; sepals about 1.5 by 0.8 cm., blunt; petals 1.4 by 0.5 cm., widest near apex; spur 7 mm. long; blade of lip 1.2 cm. long, 7 mm. wide near tip, pointing straight forwards, nearly oblong, widening somewhat from the base, 3-lobed at the tip, the side-lobes rounded, ascending, the midlobe much smaller, rounded, with a white fleshy lump beneath and behind it; two small raised keels near the base of the blade. Native in Burma and Indo-China, and southwards to the islands of the China Sea (including the Anamba group) and probably also to Borneo; a plant once found by Mr. Ridley in Singapore. It is very closely related to *R. violacea*.

Var. *Harrisoniarui* is a pure white variety that is very pretty, occurring on various islands. This species (including var. *Harrisoniarui*) will usually flower once in Singapore but is difficult to maintain in vigorous condition. It should do well in the north.



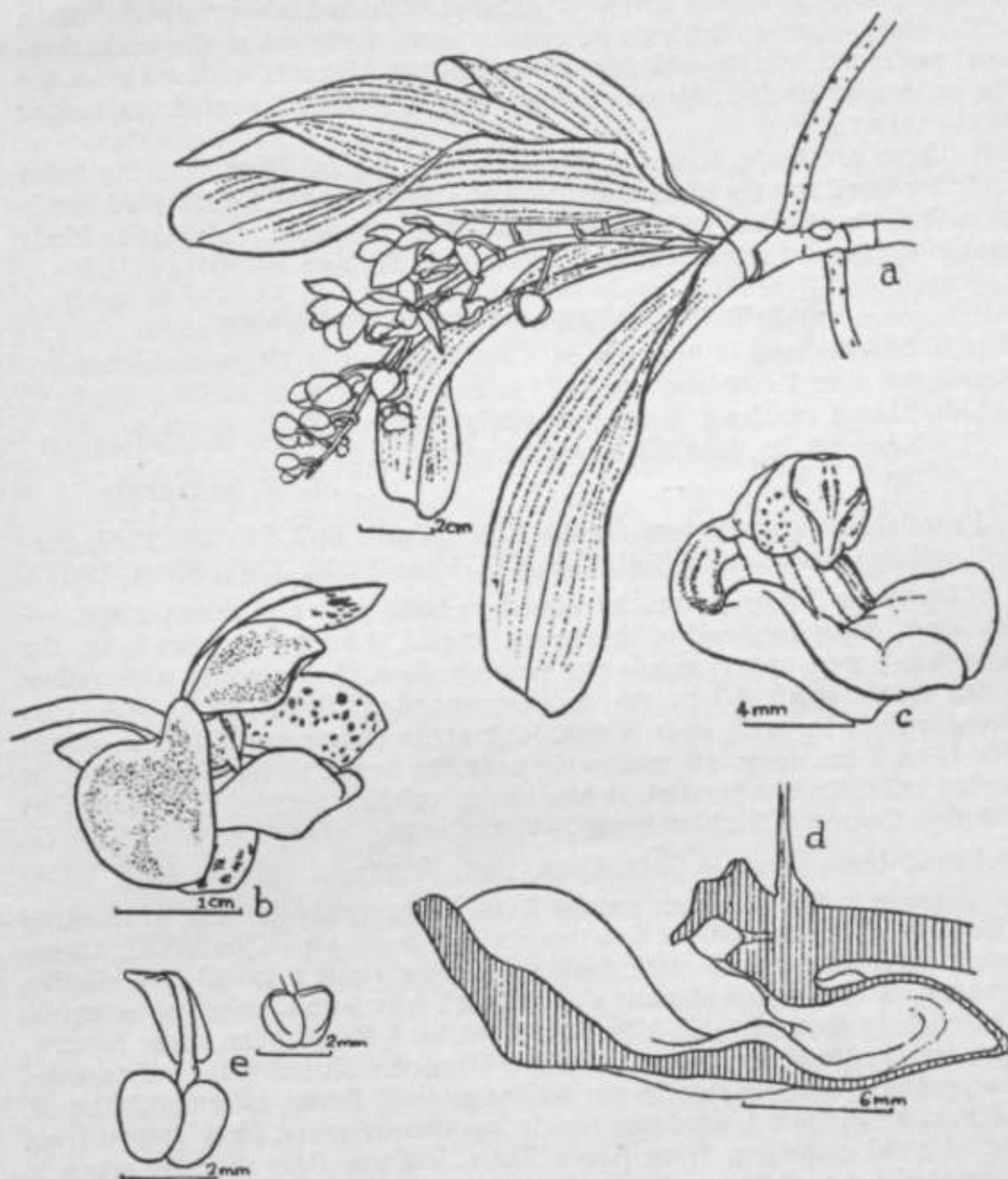


Fig. 218. *Rhynchosstylis violacea*. a, apex of plant and inflorescence, b, flower from side. c, column and lip. d, section through column and lip. e, pollinia.

26. PENNILABIUM

Small plants with the habit of *Sarcophilus*; stems very short with a few leaves close together; leaves elliptical, more or less fleshy, unequally bilobed at the tip, often twisted more or less at the base; inflorescences short, unbranched, 2-ranked, alternate; flowers short-lived, of medium size, opening in succession; sepals and petals about equal in size, the petals sometimes finely toothed; lip not hinged, 3-lobed, spurred; side-lobes rather large, thin, with toothed or fringed edges; midlobe usually smaller,

fleshy; spur thin, rather long and slender, without keels or septum\* often with raised edges at the mouth; column short, flattened at the base, less; pollinia 2, nearly round, on a long stipes which is widened near tip, with a small disc; stigma large, covering almost the whole unanterior side of the column.

There are three Malayan species of this genus. They have the habit and shortlived flowers of *Sarcochilus*, but a long-spurred lip attached to a footless column, and large thin toothed side-lobes. It is quite likely that more species remain to be discovered in Malaya.

#### Key to the Malayan species of *Pennilabium*

- Sepals 2.5 cm. long .. .. . 1. *P. acuminatum*  
 Sepals not over 1 cm. long .. .. .  
 Side-lobes 1 cm. long, their ends finely fringed 2. *P. struthio*  
 Side-lobes 0.6 cm. long, their ends toothed, not fringed .. .. . 3. *P. angraecum*

1. ***Pennilabium acuminatum*** (Ridl.) Holtt, Gard. Bull. 11: 285. 1947. *Sarcochilus acuminatum* Ridl., J.F.M.S. Mus. 4: 72. 1909. Flora 4: n.

Leaves to 11 by 3 cm., narrowed to both base and apex; scape 1 cm. long, drooping; rachis thickened, angled, 1.5 cm. or more long; flowers 2-3 mm. apart; sepals and petals yellow, the lip white with faint spur; sepals about 2.5 by 0.5 cm., long-pointed; petals 2.2 by 0.35 cm., long-pointed; lip with spur 8 mm. long at an obtuse angle to the ovary; side-lobes 1 cm. long, 4-5 mm. wide near the broad toothed tips; midlobe fleshy, laterally compressed, 3 mm. long; column purple. Found only at Renglet, Cameron Highlands on two occasions.

2. ***Pennilabium struthio*** Carr, Gard. Bull. 5: 151, pi. 4, f. 4. 1930.

Leaves to 6.5 by 1.3 cm.; scape 1 cm. long; rachis flat and widened, to 2.5 cm. long, bearing one or two flowers at a time; sepals spreading, lucent yellowish spotted with dark red; upper sepal 1 by 0.5 cm., concave; lateral sepals of same size; petals 8.5 by 5 mm., coloured as sepals; tips slightly toothed; side-lobes of lip white, 1 by 0.35 cm., base narrow, ends widened and diverging, the edges fringed with hairs 1-1.5 mm. long; the two lying side by side in one plane; midlobe fleshy, laterally flattened, 3-5 mm. long; spur 1 cm. long, nearly parallel to ovary. Only known from the original collection from Kuala Teku, Pahang. The name is given to suggest the resemblance of the side-lobes to ostrich feathers.

3. ***Pennilabium angraecum*** (Ridl.) J.J.S., Fl. Buit. 6: f. 473. 1914. Bull. Botz., Ser. 2, XIV: 44, 1914.—*Saccolabium angraecum* Ridl., J. & C. 1898: 214. J.J.S., Fl. Buit 6: 637. Ridl., Flora 4: 173.

Leaves to 8 by 1.5 cm., narrowed to base and apex; inflorescence pendulous, to about 3 cm. long in all, the scape to 1 cm.; sepals and petals widely spreading, the sepals pale yellowish, the petals glistening translucent white; sepals about 8 by 4 mm., petals about 6 by 3.5 mm.; spur of lip narrow, 9 mm. long, pointing downwards, straight, yellowish; side-lobes about 6 by 3.5 mm., toothed at the broadly rounded ends, their bases at the edges of the spur-mouth thickened, purplish-brown; midlobe small, fleshy,

column very short, yellowish. Distributed in Java and probably in Sumatra; in Malaya not uncommon in the lowlands, often on trees by rivers, found in Perak, Selangor, Kemaman, Pahang and Johore. The name is given on account of resemblance of the flowers to the African-Madagascan genus *Angrsecum*.

## 27. ASCOCHILOPSIS

This genus consists of one species only. It has the appearance of a small *Sarcochilus*, with roughened erect scape and thickened rachis bearing many very small flowers in succession close together, a few open at the same time; but the flowers lack a column-foot, and the lip consists almost entirely of a spur joined immovably to the base of the column. The stipes of the pollinia is rather long, and the disc narrow.

*Aseochilopsis myosurus* (Ridl.) Carr., Gard. Bull. 5: 21, pi. X, A. 1929.—

*Saccolabium myosurus* Ridl., J.S.B.R.A.S. 39: 84. 1903. Flora 4: 173.

Stems to 7 cm. long, much branching, with up to 10 leaves at apex; leaves 5-20 by 0.6-1.5 cm., apex narrow, unequally bilobed, base gradually narrowed; scapes often 2 or more together, 2 to 5 cm. long; rachis to 4-5

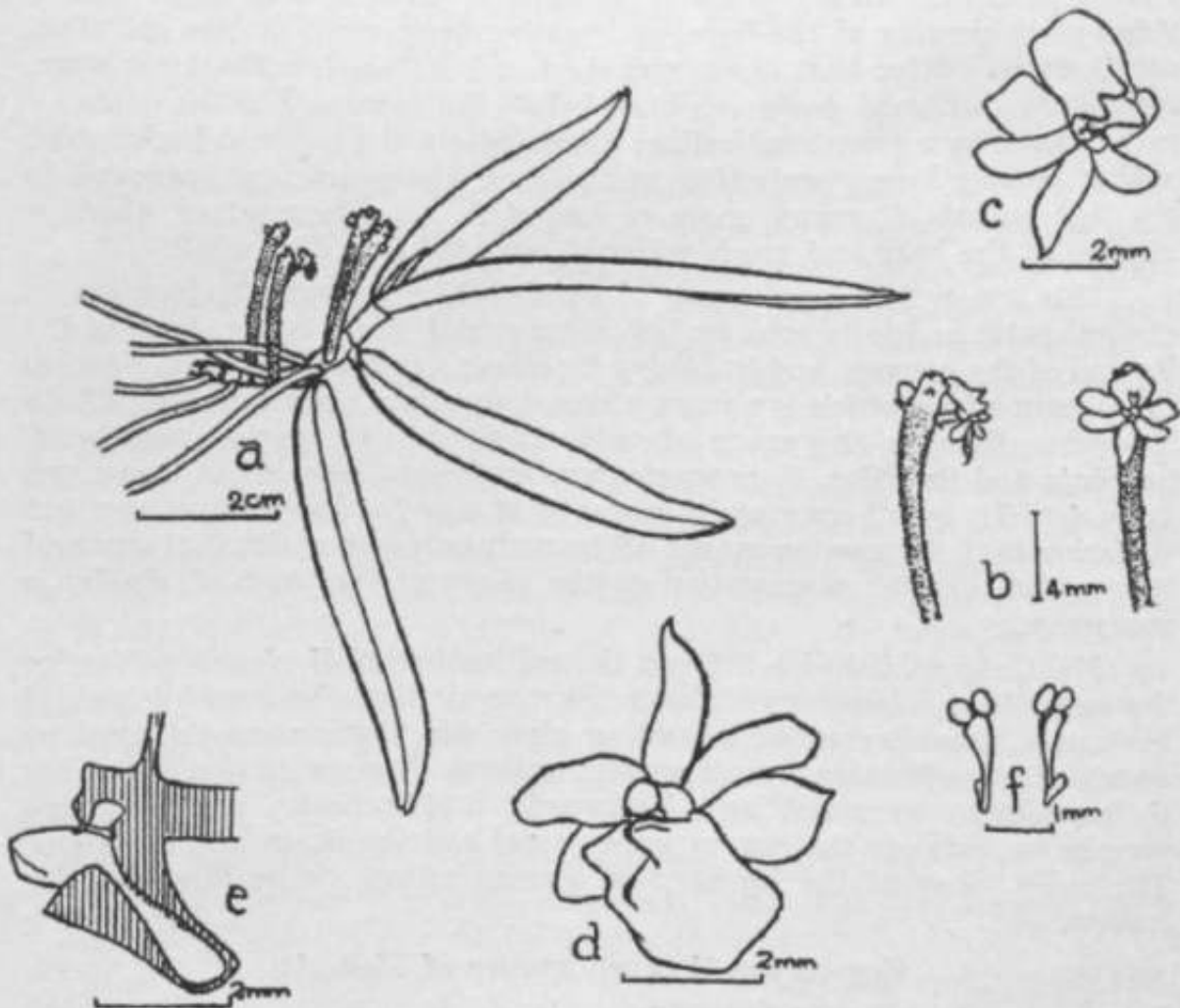


Fig. 219. *Aseochilopsis myosurus*. a, plant with inflorescences, fc, inflorescences, c, flower in natural position, d, flower from front with lip underneath, e, section through column and lip, f, pollinia.

cm. long, flowers very close; bracts minute, spreading; flowers with the lip uppermost, arising from hollows in the rachis, lasting 1 day, 1-4 open together; sepals and petals spreading, pale yellow, blunt; upper sepal barely 3 mm. long, a little over 1 mm. wide; lateral sepals 2.5 by 1.5 mm.; petals 2.5 by 1.0 mm.; lip joined to base of column, the spur fleshy, white, transversely flattened, at an acute angle to the ovary, 2 mm. long, 2-7 mm. wide, under 1.5 mm. thick; at mouth of spur 3 very small orange-yellow fleshy lobes; column under 1 mm. long, yellow. This peculiar little species has been found at several localities in the lowlands of Pahang and Selangor, and at Bekok in Johore; also in Sumatra. **Fig. 219.**

## 28. MALLEOLA

Stems usually long and pendulous, rarely short; leaves oblique, oblong or narrowly elliptic; inflorescences fairly long, usually drooping, flowers many, small, facing in all directions; upper sepal erect, rather strongly concave, the other sepals and petals flatter, spreading widely; lip immovably joined to the base of the column, 3-lobed, spurred; side-lobes short, triangular, the back edge partly joined to the column; midlobe small, conical or linear, rarely concave, straight or downcurved, often with a ridge or thickening at the base; spur rather long, more or less cylindrical, rarely conical, often bent in various ways and flattened, without a septum, sometimes thickened down the back below the column, but the entrance never closed by a prominent callus; column short, the top bent backwards; anther usually large, projecting at the back of the column, narrowed to the tip; pollinia 2, round, more or less cleft, on a long stipes which is slender at the base and much widened near the tip; disc small.

This is a rather small genus of plants which resemble *Sarcanthus* in general habit and inflorescence, but differ considerably in the shape of the lip and of the column, and in having 2 pollinia (instead of 4 as in *Sarcanthus*) on a stipes which is always widened very much near the tip. Within the genus there is one group of very closely related species, namely *M. undulata* and its allies. Four species are at present included in this group (nos. 4 to 7), but there may be more; or it may be that there is so much variation that the species cannot all be maintained. For discrimination of the species, careful examination of the shape of the lobes of the lip is necessary.

Mr. Carr published a note on the pollination of *M. dentifera* (under the name *Saccolabium undulatum*). He records that the rounded back of the upper sepal serves as a landing place for visiting insects (moths) which effect pollination from above the column. This would not be possible if the column were not bent backwards, and indicates an interesting correlation between the convex upper sepal and the shape of the column. The small lobes of the lip of most species afford no landing-place for insects.

### Key to the Malayan species of *Malleola*

Stems very short; leaves few, close

A high median keel at base of midlobe; rostellum short . . . . .

• • • • • 1. *Af. altocarinata*

- No keel at base of midlobe; rostellum as long as column .. .. . 2. *M. macranthera*
- Stems elongated, to 15-30 cm. long, internodes 1 cm. or more long
- Lateral sepals deep yellow, upper sepal and petals paler, all unspotted; midlobe very short and fleshy .. .. . 3. *M. penangiana*
- Sepals and petals yellowish, with reddish or purplish marks; midlobe with narrow apex
- End of spur bent backwards, widened and flattened; midlobe of lip very narrow throughout .. .. . 4. *M. Witteana*
- Spur nearly straight; midlobe with triangular base and narrow apex
- Stem and leaf-sheaths distinctly flattened; leaves green; side-lobes of lip low, rounded .. .. . 5. *M. undulata*
- Stem and leaf-sheaths hardly flattened; leaves usually purplish; side-lobes of lip erect, acute
- Side-lobes 3-pointed, midlobe not thickened at base .. .. . 6. *M. dentifera*
- Side-lobes narrow, 1-pointed, midlobe much thickened at base .. .. . 7. *M. insectifera*

**1. *Malleola altocarinata* Holtt, Gard. Bull. 11: 283. 1947.**

Stem short, pendulous; leaves few, about 8 by 2-5 cm., widest near the blunt unequally bilobed apex; inflorescence about 10 cm. long, pendulous, with many flowers; flowers 8 mm. long; upper sepal hooded over column, about 4 by 2-5 mm.; lateral sepals spreading, same size; petals 3-5 by less than 2 mm., acute; lip curved back towards ovary; side-lobes fleshy, low, rounded, slightly spreading; midlobe with free tip 2 mm. long, narrowly triangular, fleshy, pointing forwards with end bent down; at the base of midlobe a median keel, rising above the mouth of the spur, its base joined across to the side-lobes, so that there is a hollow behind the free blade of the midlobe; spur broadly cylindrical, 2 mm. diameter for 3 mm. below the mouth, then a constriction and an almost spherical widened tip 1 mm. in diameter; a small fleshy projection from the middle of the back wall of the spur; column 1-5 mm. tall. This curious species is known from only one collection, made in 1932 at Ginting Simpah; no colour notes of the flower were made. The high keel behind the midlobe of the lip is found also in *M. aberrans* from Celebes and *M. baliensis* from Bali and Java.

**2. *Malleola macranthera* (Ridl.) Holtt., Gard. Bull. 11: 284. 1947.—*Saccolabium macrantherum* Ridl., Kew Bull. 1926: 478.—*Abdominea macranthera* Carr Gard. Bull. 7: 54, pi. 5B. 1932.**

Stem very short; leaves to 7 by 2-8 cm., rather thin, apex obtuse and slightly unequally bilobed; inflorescence 8 cm. long in all, the scape 2 cm., flowers many, small, white (or mainly white); upper sepal 4 mm. long.

under 2 mm. wide; lateral sepals about 4 by 2 mm.; petals about 2 by 1 mm.; lip from base of column to tip of spur 4.5 mm.; spur cylindrical, constricted near the widened saccate tip, with a low keel half-way down the back having a small callus at its end; side-lobes erect, 1 mm. wide at base, 5 mm. tall, blunt; midlobe almost flat, pointing straight forwards at right angles to spur, 2 mm. long, rather fleshy at the base, tip blunt; column 1.5 mm. long; rostellum large, curved, as long as the column, almost touching the base of the midlobe; stipes of pollinia 2 mm. long. Only known from one collection, from Ulu Gombak in Selangor. The long rostellum is peculiar, but otherwise the flowers are typical of the genus, the spur being very nearly the same shape as in *M. altocarinata*. This species has been placed in the genus *Abdominea*, owing to the large rostellum; but the rostellum is quite different in shape from *Abdominea*, being broadest at the base, the pollinia are 2 instead of 4, and the shape of the lip is quite different.

3. **Malleola penangiana** (Hk. f.) J.J.S. et Schltr., Orch. Deut. Neu-Guin. 981. 1914.—*Saccolabium penangianum* Hk. f., F B I . 6 • 57, 1890, Ic. Pl. t. 2129B. Ann. Calc. 5: 47, pi. 71. Ridl., Flora 4: 172.—*Saccolabium Hendersoni* Carr, Gard. Bull. 5: 29, pi. 9. 1929.

Stems pendulous, to 20 cm. or more long, internodes about 1 cm.; leaves fleshy, narrowed gradually to acute bilobed tip and suddenly to slightly twisted base, often densely purple-spotted, 7-12 by 0.6-1.0 cm.; inflorescences stiffly pendulous, scape 5 mm., rachis 1-3 cm. long; bracts spreading, acute, 3 mm. long; flowers many, fragrant; young flower-buds pale yellow; in old buds and flowers lateral sepals deep yellow upper sepal, petals and spur pale yellow; old flowers fading almost white; upper sepal 2.5 by 1 mm., erect, concave; lateral sepals curving forwards, nearly 2 mm. wide; petals spreading, 2 mm. long, under 1 mm. wide; lip 5.5 mm. long; side-lobes with purple-brown edges, erect, fleshy, short, the ends curving inwards almost to meet in front of the midlobe; midlobe very short and fleshy, pointed, extending behind into a fleshy base which nearly closes entrance to spur; spur pendulous, laterally compressed, tip narrowed and curved forwards; column very short. Found in the lowlands of Pahang and Perak, on trees by rivers and in forest; originally reported by error to have been found in Penang and named accordingly. **Fig. 220.**

4. **Malleola Witteana** (Rchb. f.) J.J.S. et Schltr., Orch. Deut. Neu-Guin. 981. 1914. J.J.S., Orch. Jav. f. 474.—*Saccolabium Witteanum* Rchb. f., Gard. Chron. N.S. 20: 618. 1883. J.J.S., Fl. Buit. 6: 639.

Stems to 30 cm. long, pendulous; internodes to nearly 2 cm.; leaves to 8.5 by 3.5 cm., very fleshy, often purplish, very unequal at apex; inflorescence to 20 cm. or more long, pendulous, the scape 6 cm.; flowers about 5 mm. apart, bracts narrow, spreading, 2 mm. long; flowers 7.5 mm. long, sepals and petals pale yellow-green suffused or mottled with red-brown; upper sepal hooded, its back bent in almost a semi-circle; lateral sepals spreading, 3.5 by 2 mm.; petals a little smaller; spur of lip bent at almost a right angle in the middle, the apical half pointing back towards the ovary; side-lobes white with brown edges, bluntly triangular, with long back edges! the tips curved inwards so that the front edges almost meet just behind the

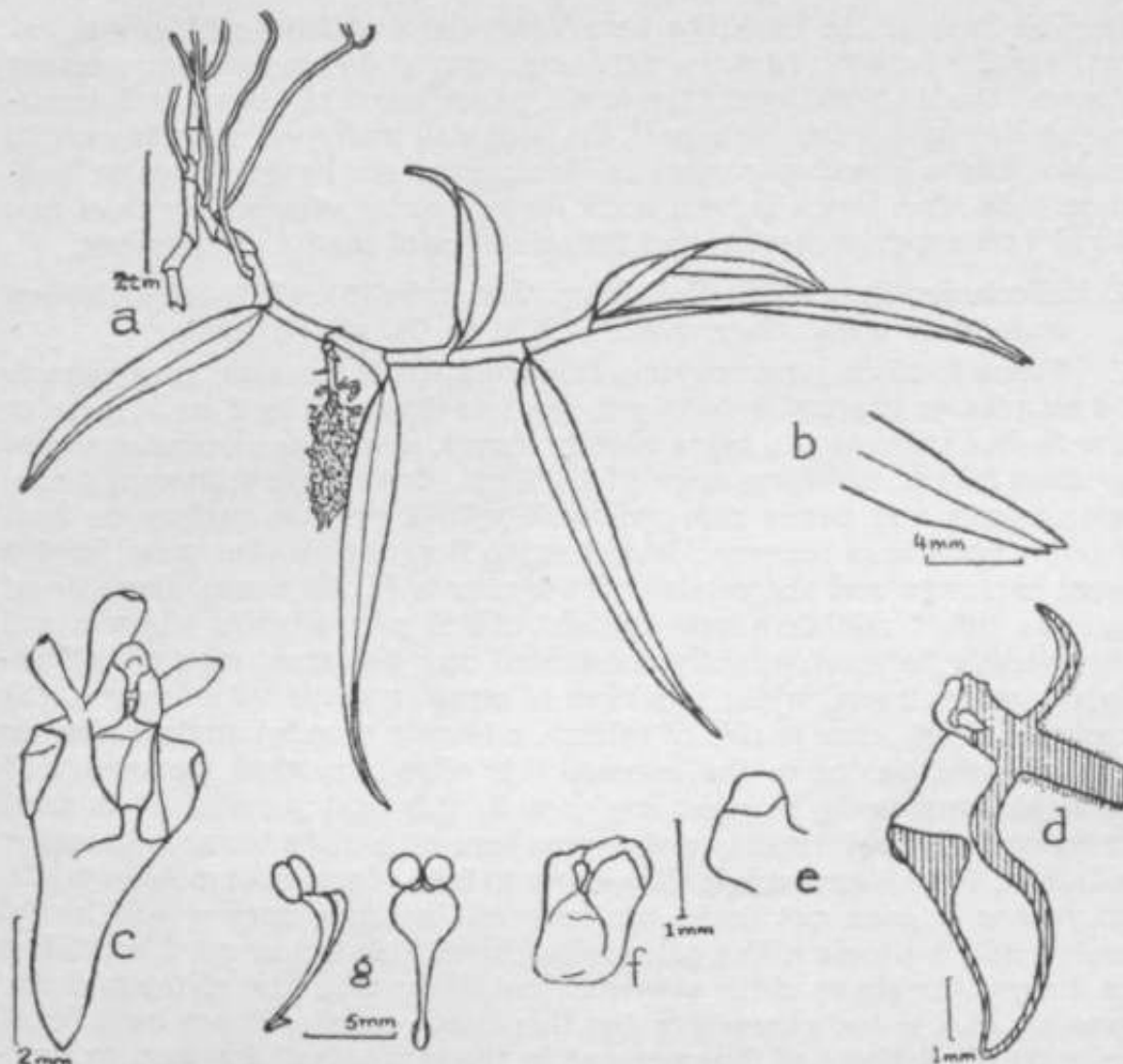


Fig. 220. *Malleola penangiana*. *a*, plant with inflorescence, *b*, tip of leaf, *c*, flower. *d*, section through column and lip. *e*, column from side, *f*, front of column. *g*, plicinia, when first removed from anther (right), after 2 minutea (left).

midlobe; midlobe very narrow, pinkish with a white tip, erect or bent downwards, about 1.5 mm. long; spur pale yellow, almost cylindrical near mouth, beyond the angle much transversely flattened and widened to 3 mm. Distributed in Java and Sumatra; in Malaya only found once, at Cameron Highlands. There may be some variation in details of colouring.

5. ***Malleola undulata*** (Ridl.) J.J.S. et Schltr., *Orch. Deut. Neu-Guin.* 981. 1914.—*Saccolabium undulatum* Ridl., *J. Bot.* 1900: 72. *Flora* 4: 173.—*SaccoUtbium sylvestre* Ridl., *J.S.B.R.A.S.* 57: 98. 1910. *Flora* 4: 168.

Stem to 15 cm. or more long, flattened, internodes 1-1.5 cm.; leaves green, to 14 by 2 cm., apex very unequal and slightly cleft, the two halves blunt, edges more or less waved (i.e. not flat), base suddenly narrowed and a little twisted, sheath flattened and keeled; inflorescence pendulous, to 16 cm. long, with many flowers; sepals and petals yellow with irregular longitudinal deep orange stripes; upper sepal about 3 by 2 mm., strongly concave, blunt; lateral sepals wider; petals under 2 mm. wide; lip yellow, about 5 mm. long; side-lobes very low and rounded; midlobe white with a

purplish flush at the base, the base triangular, not thickened, the apical part narrow, turned under, 1.5 mm. long; spur at 45° to the ovary, nearly straight, the tip bent slightly forwards, cylindrical in the basal part, transversely flattened in the distal part, the back wall thickened near the mouth; anther yellow. Found only twice, in Perak, as an epiphyte on trees on limestone hills. This seems to be a much larger species vegetatively than nos. 6 and 7; the spur is shorter, and the side-lobes of the lip are peculiar.

6. **Malleola dentifera** J.J.S., Bull. Botz., Ser. 3, 9: 191. 1927.—*Saccolabium undulatum* Carr, J.M.B.R.A.S. 6: 64, pi. 14. 1928.

Stems to 25 cm. or more long, hardly flattened, flexuous, internodes to 1.4 cm.; leaves to about 8 by 1.2 cm. (in Sumatra to 10 by 2 cm.), more or less flushed with purple, edges slightly waved, apex unequal; inflorescence to about 8.5 cm. including scape of 1-1.5 cm., flowers close; flowers 8 mm. wide, sepals and petals pale yellowish with 2 crimson stripes on each (stripes sometimes uneven); lateral sepals 3 mm. wide, the upper hooded sepal narrower, and the petals under 2 mm. wide; lip 6 mm. from tip of spur to tip of midlobe; spur straight, distal part slightly widened and transversely flattened, slightly constricted near the apex, apex cut off abruptly, under 2 mm. wide; side-lobes of complex shape with 5 edges, (1) upwards, short, close to side of column, a bluntly rounded angle leading to (2) at right angles to the column, this edge somewhat incurved, (3) straight downwards, at right angles to 2, this part purple, (4) a short horizontal edge pointing inwards across base of midlobe towards the other side-lobe, (5) a short edge leading down to base of midlobe; midlobe white, triangular at base, not fleshy but grooved, the apex narrow and turned under; anther purple with a pale median band. This is near no. 7 but differs in the peculiar shape of the side-lobes and in the thin base of the midlobe, possibly also in leaf-characters, but this is not certain. It has been found near the West Coast of Sumatra and in the lowlands of Pahang, on limestone and on trees by rivers.

7. **Malleola insectifera** (J.J.S.) J.J.S. et Schltr., Orch. Deut. Neu-Guin. 981. 1913.—*Saccolabium insectiferum* J.J.S., Fl. Buit. 6: 641, f. 477. 1905.

Stems to 20 cm. long (possibly more), elliptic in section, internodes 1-1.5 cm.; leaves to 7 by 1.4 cm., almost oblong, narrowed to blunt unequal apex and to twisted base, purple beneath and purple-blotched above when young, edges slightly waved; inflorescence oblique (below the horizontal) at the base, curved downwards, the scape to 2 cm., the rachis to about 7 cm. long, purplish; bracts 2-5 mm., pedicel and ovary 7 mm. long; flowers wide-opening, 8 mm. across; sepals and petals a little over 3 mm. long, pale yellow with 2 crimson stripes on each; upper sepal hooded, a little over 2 mm. wide, lateral sepals nearly 3 mm. wide, petals under 2 mm. wide; lip 8 mm. from tip of spur to highest point on midlobe, yellowish throughout except for white midlobe and purple patch on front edges and base of side-lobes; side-lobes narrowly triangular, erect, slightly incurved, barely 1 mm. high; midlobe with fleshy triangular base, much thickened, and narrow apex 2 mm. long and 0.5 mm. wide, curved under in a loop; spur straight, close to and parallel with ovary, basal part cylindrical, narrow, apical part transversely flattened and over 2 mm. wide, slightly constricted near the



tip; column purple, with a pale median band. Known from Java, and from an unrecorded locality in Malaya, probably in Pahang. This is nearly allied to no. 6, but differs in longer spur, different shape of side-lobes and thickened base of midlobe. Fig. 221.

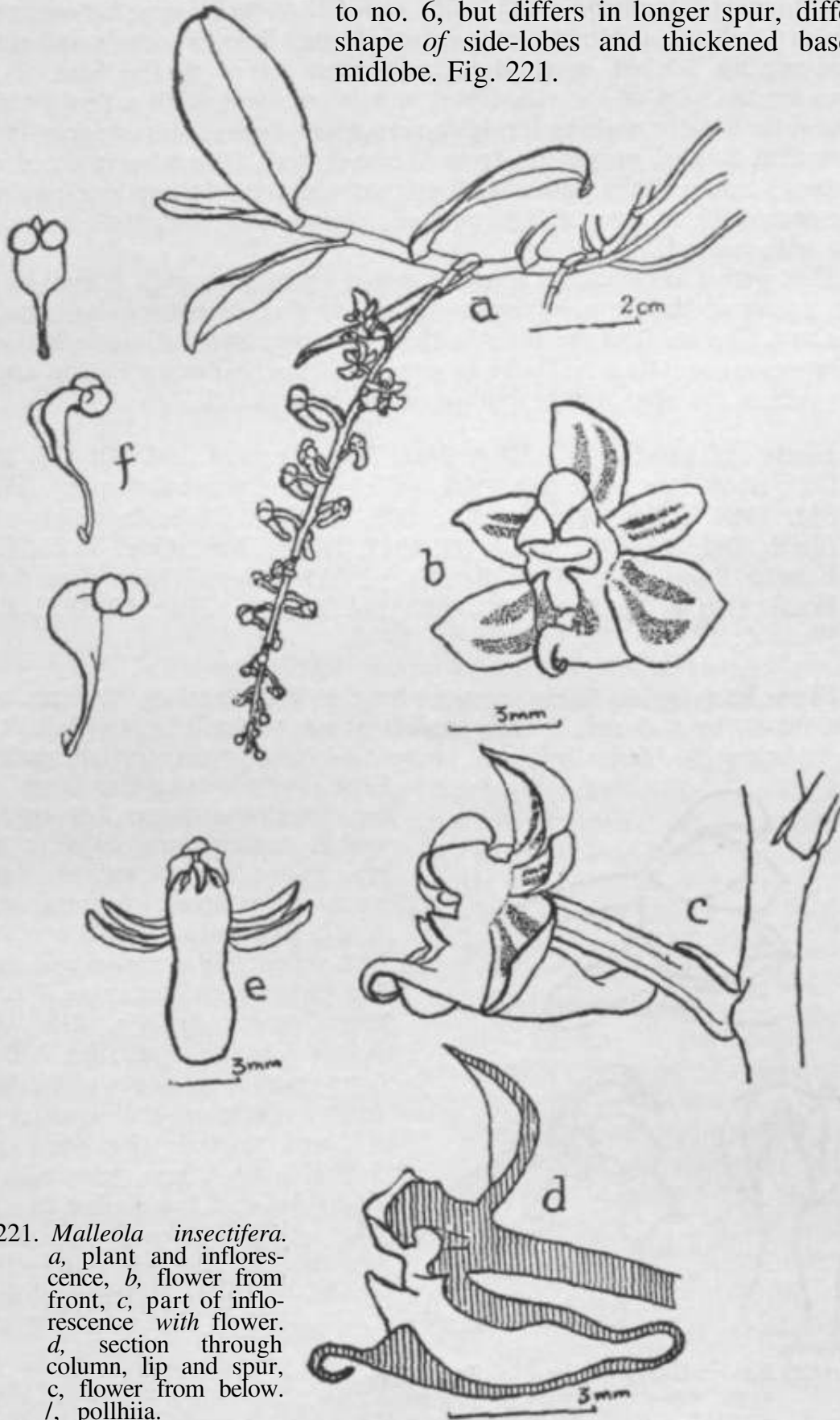


Fig. 221. *Malleola insectifera*.  
 a, plant and inflorescence, b, flower from front, c, part of inflorescence with flower. d, section through column, lip and spur, e, flower from below. f, pollinia.

## 29. ROBIQUETIA

Stem stout, elongated, pendulous; leaves broadly oblong; inflorescence pendulous, unbranched, with many crowded small flowers; sepals and petals spreading; lip 3-lobed, spurred, more or less joined to the base of the column by the back of the side-lobes; side-lobes short, with a fleshy thickening on the inside; midlobe straight, very small, fleshy, convex; spur large<sub>T</sub> with a thin 2-lobed projection from the back wall (the lobes pointed and diverging) and a fleshy callus on the front wall at a deeper level; column very short, without foot; anther pointed; pollinia 2, round, cleft, on a long stipes with a small disc.

This genus consists of about a dozen species, mostly found in the eastern part of Malaysia, but with one widely distributed species occurring in Malaya. The habit of the plant is that of a stout *Sarcanthus* or *Matteola*, the flowers resembling *Malleola* in general shape, differing in the appendages within the spur and the shape of the column.

***Robiquetia spathulata*** (Bl.) J.J.S., Nat. Tijdschr. Ned. Ind. 72: 115. 1912. Bull. Btzg., Ser. 3, 8: 367. 1927.—*Cleisostoma spathu* Uitwm BL, Bijdr. 364. 1825. J.J.S., Fl. Buit. 6: 609, f. 456.—*Cleisostoma spicatum* Lindl., Bot. Reg. 33: sub. t. 32. 1847. Hk. f., Ann. Calc. 5: 55, t. 83—King & Pantl., Ann. Calc. 8: 232, pi. 311.—*Saccolabium de-nsiflorum* Lindl., Gen. et Sp. Orch. 220. 1833. Bot. Reg. 24: Misc. 56. 1838. RidU Flora 4: 170.

Stems hanging, to 50 cm. or more long, stout, internodes 2-3 cm. long; leaves 12-20 by 4-5 cm., usually widest above the middle, twisted at the base to bring the blades into one plane, tips broad and very unequally 2-lobed; inflorescence drooping, to 25 cm. long, the scape 3-4 cm., the rachis densely covered with flowers, many open together; bracts narrow, reflexed, 5 mm. long; sepals and petals red-brown with dull yellow edges and middle band, the upper sepal concave, 5 by 35 mm., lateral sepals a little wider, petals 4 by 2-5 mm.; Up dull yellow; spur at an acute angle to the ovary, somewhat transversely widened towards the blunt apex, 7 mm. long, 3 mm. wide near the tip; side-lobes triangular, the back edge close to and as tall as the column, the front edge thickened; midlobe pointing obliquely

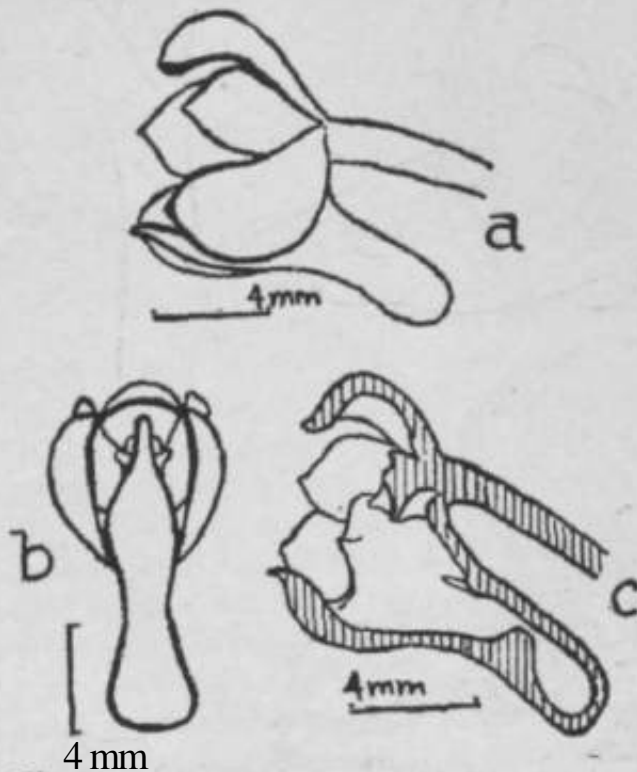


Fig. 222, *Robiquetia spathulata*. a, h, flower from side and from below, c, section through column, lip and spur.

upwards, triangular, 3 by 3-5 mm., thickened and narrowed to the tip. Distributed from Burma through Malaysia to the Philippines; in Malaya found in many places in the lowlands, on trees by rivers and in similar places. It has larger leaves than most other plants of the Sarcanthus group. Fig. 222.

### 30. VANDA

Stems long or fairly long, usually stout, with short internodes (in *V. Hookeriana* slender with long internodes) ; leaves terete or flat, the base at an acute angle to the stem, and in flat leaves the tip usually curved more or less outwards and downwards, bilobed and variously toothed; inflorescence more or less erect, simple, of few well-spaced large or fairly large flowers which are rather fleshy and last several days; sepals and petals nearly equal, narrowed to the base, the edges more or less reflexed and crisped; lip attached immovably to the short column-foot, shortly spurred, 3-lobed; spur often laterally flattened, without internal appendages or calli; midlobe usually with longitudinal ridges and two small calli at the base, at the entrance to the spur; column short, thick, usually thickened on either side of the base; foot short and not distinct except when cut longitudinally; anther 2-chambered, with 2 rather large cleft pollinia on a short broad stipes with a large disc.

The floral structure of Vanda is simple as compared with most orchids in this Tribe. The spur is relatively small and has no calli or septum; the lobes of the lip are of simple shape, without high keels, but the midlobe usually has low keels and two small humps at the base. *V. Hookeriana* is peculiar in having a V-shaped callus at the back of the lip, between the column and the spur. If the flowers of Vandas were reduced, without change of shape, to a very small size, they would most nearly resemble *Ascocentrum*; and the species here called *Ascocentrum micranthum* is perhaps no more than a very much reduced Vanda. But even if *A. micranthum* is technically a Vanda, we prefer to exclude it from the genus Vanda, the members of which otherwise have fairly large flowers easily recognizable as related together.

This is a genus of some 30-40 species extending from India and Ceylon through Malaysia to the Philippines. Nearly all the species have fairly large flowers, of varied and attractive colouring, so that several are well-known garden plants, including our Malayan *V. Hookeriana*, and its hybrid offspring Vanda Miss Joaquim. Most Vandas have fairly long and wide flat leaves (the midrib grooved), but *V. Hookeriana* and a few others form a special and exceptional group with terete leaves and long climbing stems. Because of this habit, and because their flowers are also a little different in shape, Schlechter proposed a new genus *Papilionanthe* for them; but a careful examination of longitudinal sections of the flowers, and of their pollinia, shows that there is no essential difference of floral structure from the other Vandas, and it is best to retain them in the genus Vanda.

Leaves distinctly flat

Flowers 7-10 cm. diameter, blue, with small lip .. *V. caerulea*

Flowers smaller, not blue

•Flowers clear yellow, sepals and petals rounded,  
edges not crisped .. .. . *V. spathukbta*

Flowers not clear yellow, edges of sepals and  
petals crisped .

Midlobe of lip purple or violet

Sepals and petals tessellated

Not more than 3 flowers; tessellation near  
outer edges only .. .. . *V. foetida*

More than 3 flowers; tessellation through-  
out

End of midlobe deeply cleft, the two  
halves narrow, diverging .. *V. Bensoni*

End of midlobe otherwise

Midlobe a clear lilac-mauve throughout *V. limbata*

Midlobe rather deep dull violet, paler  
towards base .. .. . *V\* tessellata*

Sepals and petals not tessellated

Sepals and petals white with few purple  
spots .. .. . *V. luzonica*

Sepals and petals with many separate pur-  
ple-brown spots .. .. . *V. tricolor*

Sepals and petals with dark brown blotches  
coalescing towards the margins .. *V. insignis*

Sepals and petals pale lilac .. .. . *V. caerulescens*

Midlobe brown, yellow, white, or red

Sepals and petals spotted

Lip hairy, the apex bent upwards and 2-  
lobed .. .. . *V. hastifera*

Lip not hairy, apex not bent upwards .. *V. lamellata*

Sepals and petals not spotted

End of lip deeply cleft; sepals and petals  
white, or light olive-brown with indis-  
tinct spots .. .. . *V. Denisoniana*

End of lip not deeply cleft

Sepals and petals pale yellow slightly  
flushed with brown towards tips . . *V. Dearei*

Sepals and petals grading from olive-  
brown at tips to red-brown at base *V. sumatrana*

Sepals and petals yellow streaked with  
red at base, red at apex; or some-  
times entirely red or entirely yellow *V. Merrillii*

## The terete-leaved species

*V. teres*

Habit of *V. Hookeriana*, but stouter, with straight or curved leaves not constricted near the tip; flowers varying in size according to variety (the largest to 10 cm. diameter), the petals almost circular and twisted at the base, the lip with broad side-lobes enfolding the column and a rather small rounded and deeply cleft midlobe. Native in Burma, northwards to the foothills of the Himalayas, in the lowlands and valleys. Both large and small-flowered forms grow together. Many varieties are in cultivation; not all of them have well-established names. Fig. 224.

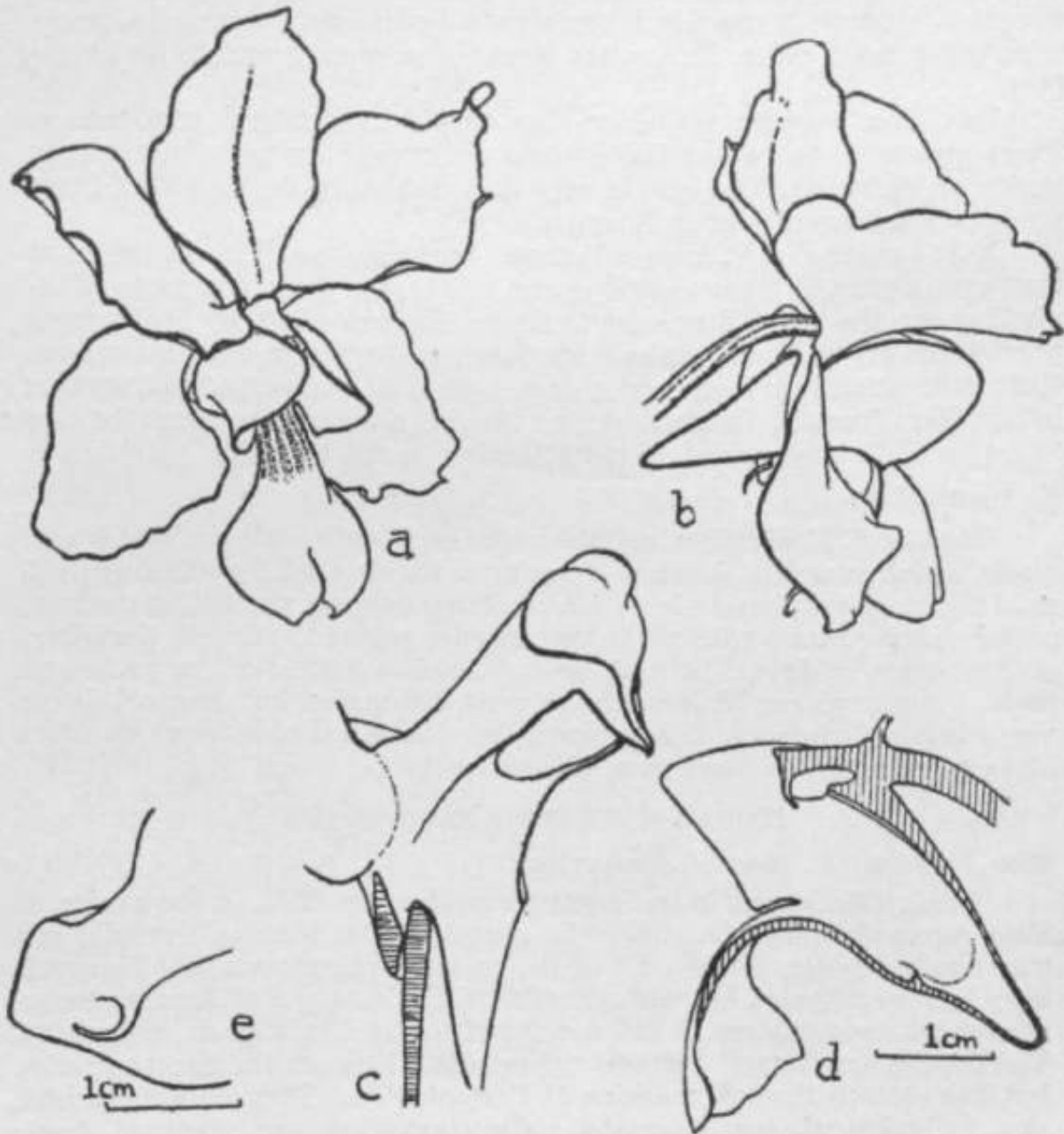


Fig. 224. *Vanda teres*, a, flower from front and b, from side, c, column, d, section through column, lip and spur, e, the hooked tip of the lateral sepal.

*Var. gigantea.* This name is applied in Singapore to a very large-flowered variety with straight purple-spotted leaves; the flowers are a fairly deep mauve, with purple lip, marked with orange inside the side-lobes. This is a very fine variety, but as grown in Singapore the scapes are short and there are few flowers to each inflorescence.

*Var. aureora.* This name is applied to a rather pale mauve variety of good size, shaped much as *var. gigantea*, the side-lobes yellow within; the leaves are green, not spotted.

*Var. Andersoni.* Leaves green, curved upwards towards the stem; scapes short, bearing few flowers; sepals and petals not so large as in *var. gigantea*, but the lip larger, with large spur and large side-lobes richly marked inside with strong bands of brown spots on an orange ground. This variety is apparently called *v. longalabia* in Java; but the name *Andersoni* is certainly much older. This is the least free-flowering variety in Singapore.

*Var. alba.* Flowers white, or only very faintly tinged with mauve. There appear to be two or three white varieties, varying in size and in purity of whiteness. The best is very fine, and when well grown flowers freely at least once a year in Singapore.

Most varieties of *V. teres* will flower moderately well in Singapore at least once a year, if they are well-grown plants; the taller and more straggly they are, the better they seem to flower. Undoubtedly they need a more pronounced dry season to make them flower really freely. For this reason, their cultivation has been largely superseded by the perpetual-flowering hybrid Miss Joaquim (see below), but there is a distinction about the best varieties of *V. teres* which is quite lacking in the hybrid.

### **V. tricuspidata**

Habit of *V. Hookeriana*, and the upper sepal and petals similar; lateral sepals broad, rounded, deflexed, forming a background for the lip; lip 3 cm. long, deep purple side-lobes 1-8 cm. long, narrow, pointed, spreading; midlobe large, ovate, with three long slender points. Native in the island of Alor (east of Java), both at sea-level and to 3,000 feet, on rocks and trees in sunny places. This species is most distinctive, but does not flower very well in Singapore. It appears to be a little variable, some varieties being more finely coloured than others.

### **Hybrids of the terete-leaved species**

#### **Miss Joaquim (*V. teres* X *Hookeriana*)**

This hybrid appeared in Singapore in the year 1893, in the garden of Miss Agnes Joaquim (in which the parent species were cultivated), and was named by Mr. Ridley. From the original plant countless thousands have been propagated by cuttings, so that it is now one of the commonest garden plants in Malaya. A full account of this orchid is given on pp. 9, 16. The flowers are in most respects intermediate between the parent species, but lack entirely the bold marking of *V. Hookeriana*. They are not graceful, nor well-coloured, but have the virtue that they are produced freely throughout the year in Singapore; this is true of very few garden flowers, and still fewer which are suitable for the cut-flower trade.

Josephine and Rose Marie are hybrids of the same parentage as Miss Joaquim, but from different varieties of *V. teres* (the parent variety of the original Miss Joaquim was not recorded); they should be classed as varieties. Josephine was raised in Singapore from *V. teres* v. *aurorea* and *V. Hookeriana* v. *alba*. It has flowers of a rounder shape than Miss Joaquim, with a broader more spreading midlobe to the lip, the side-lobes curved towards the column, not spreading widely. Rose Marie was raised in Java from *V. Hookeriana* and a white variety of *V. teres*; it has very large flowers, rather pale in colour but of very good shape.

### Cooperi

The original hybrid so named was a chance seedling found in the garden of Mr. C. B. Cooper at Johore Bahru; it was undoubtedly *V. Miss Joaquim* crossed with *V. Hookeriana*. The flowers had almost the shape of *Hookeriana* but the lip was almost entirely a rich bright purple. The plant was propagated and is now grown in Singapore; it flowers quite freely, but not so freely as Miss Joaquim. Subsequently the artificial hybrid of the same parentage was raised, and a number of seedlings, all slightly different, were selected for propagation. The best has flowers very similar to *V. Hookeriana* in shape and colouring, but larger and more robust; the variety was called Cho Yam Neo. These plants are as strong in growth as Miss Joaquim but not quite so free-flowering.

### Amy (*V. tricuspidata* X *Hookeriarui*). Fig. 225

This has flowers shaped nearly as in *V. tricuspidata* but somewhat larger, with rich purple-red lip. It is as distinctive as *V. tricuspidata* in form, and much stronger and more free-flowering under Singapore conditions. A cross of *V. tricuspidata* with *V. Cooperi* produced very similar flowers, rather variable in shape and colour, and redder in tone.

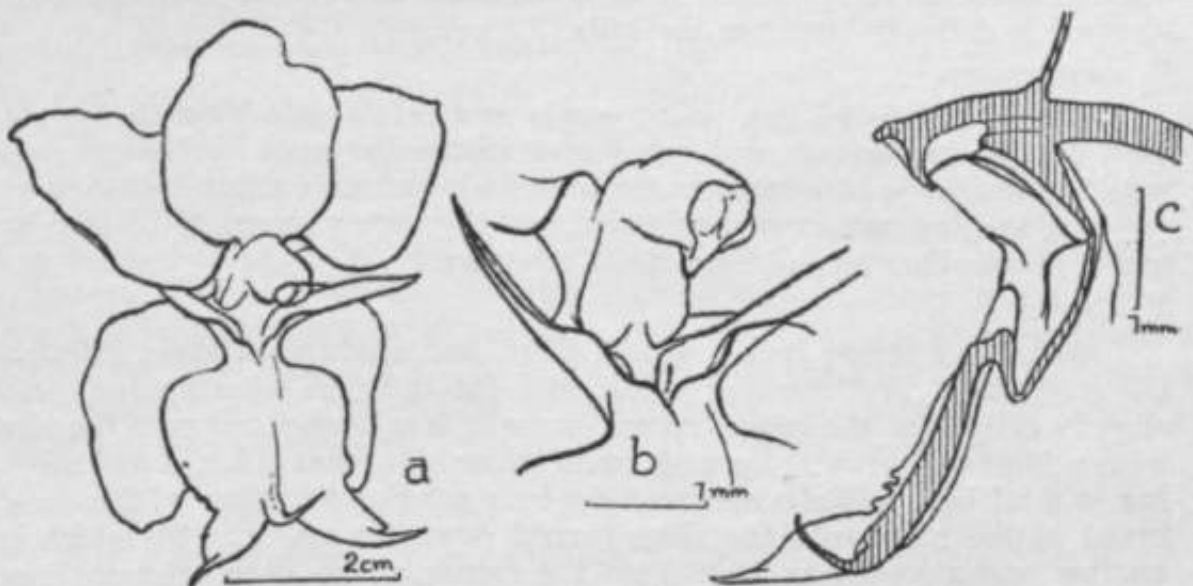


Fig. 225. *Vanda Amy*. a, flower from front, b, column and side lobes of lip, c, section through column and lip.

Nam Kee (*Cooperi* X *Marguerite Maron*)

Many varieties have been raised. The best have flowers of the Miss Joaquim type, but larger, of better shape and much more richly coloured lip.

**Prolific**

A fourth generation hybrid involving *V. teres*, *V. Hookeriana* and *V. tricolor* as ultimate parents. The best plants have a very wide richly coloured lip.

**The non-terete species (in alphabetical order)**

**V. Amesiana**

Leaves grooved, almost terete, 20-30 cm. long; inflorescence erect, to 50 cm. long, with 15-20 flowers, 4 cm. diameter; sepals and petals white, sometimes rose-tinted; lip broad. Native in Cambodia and Siam, in the hills; will not flower in Singapore, but flowers in Java at altitudes of over 1,500 feet, and would be worth growing at hill-stations.

**V. Bensoni**

Flowers 5 cm. wide; sepals and petals olive-green or brownish, with brown tessellation; lip purple, white at base, narrowed in the middle and widened to the tip which is deeply cleft, the two halves rather narrow and diverging. Native in Burma; has flowered in cultivation in Kedah and in Singapore, but apparently is not free-flowering in the south of Malaya.

*V. caerulea*

Leaves rather thick, to 20 by 2-5 cm. (usually shorter); inflorescence 20-50 cm. long, bearing 10-15 flowers; flowers 7-10 cm. diameter, pale to fairly deep blue, in some varieties beautifully tessellated; lip small, with narrow curved side-lobes. Native in the Khasya Hills in northern Burma at 3,000-4,000 feet altitude. This is probably the finest of all Vandas, but unfortunately does not flourish in the lowlands of Malaya. It will grow very strongly and flower finely in the hills.

*V. caerulescens*

Flowers 2-5 to 3-5 cm. wide; sepals and petals pale lilac, lip deeper lilac. Native in Burma; will not flower in the lowlands in Malaya, but would probably be successful in the hills. It is not such a fine colour as *V. cserulea*, and has rather small flowers, but they are unusual and would be useful in hybridization, at least for hill flowers.

**V. Dearei**

Stem very stout; leaves broad, close, and slightly twisted; inflorescence short, of few flowers; sepals and petals broad, overlapping, only slightly crisped at the edges, cream, more or less flushed towards the tips with a faint dull brown; lip with small white side-lobes inflexed and meeting at their tips, midlobe cream at the base grading to yellow at the apex, broad at the base, with the sides turned down towards the tip which is narrow and rounded as seen from the front; a few deep crimson lines near the junction of mid- and side-lobes. Native in Borneo, in the lowlands; grows and flowers well in Singapore, under light shade. This is a fine species, with very fragrant flowers, but not showy because of the short





**V. hastifera**

Leaves rather short; inflorescences short; flowers pale yellow with brown spots, the lip with white side-lobes and hairy midlobe with cleft brownish fleshy upturned apex. Native in Borneo; flowers well in Singapore, and stands full sun. The flowers are fragrant. A closely related species, *V. siccundens*, has smaller flowers (Sarawak Mus, Journ. 5: 389).

**V. insignis**

Inflorescence 15-25 cm. long, with about 7 flowers; flowers 6 cm. wide, the sepals and petals greenish yellow with dark warm brown blotches which coalesce towards the edges; lip with somewhat incurved white side-lobes and a broad almost flat clear mauve midlobe, widest near the somewhat upcurved broadly rounded tip. Native in the Moluccas; a very handsome species, which flowers well both in mountains and lowlands in Java, but not so well in the uniform climate of Singapore. Fig. 227.

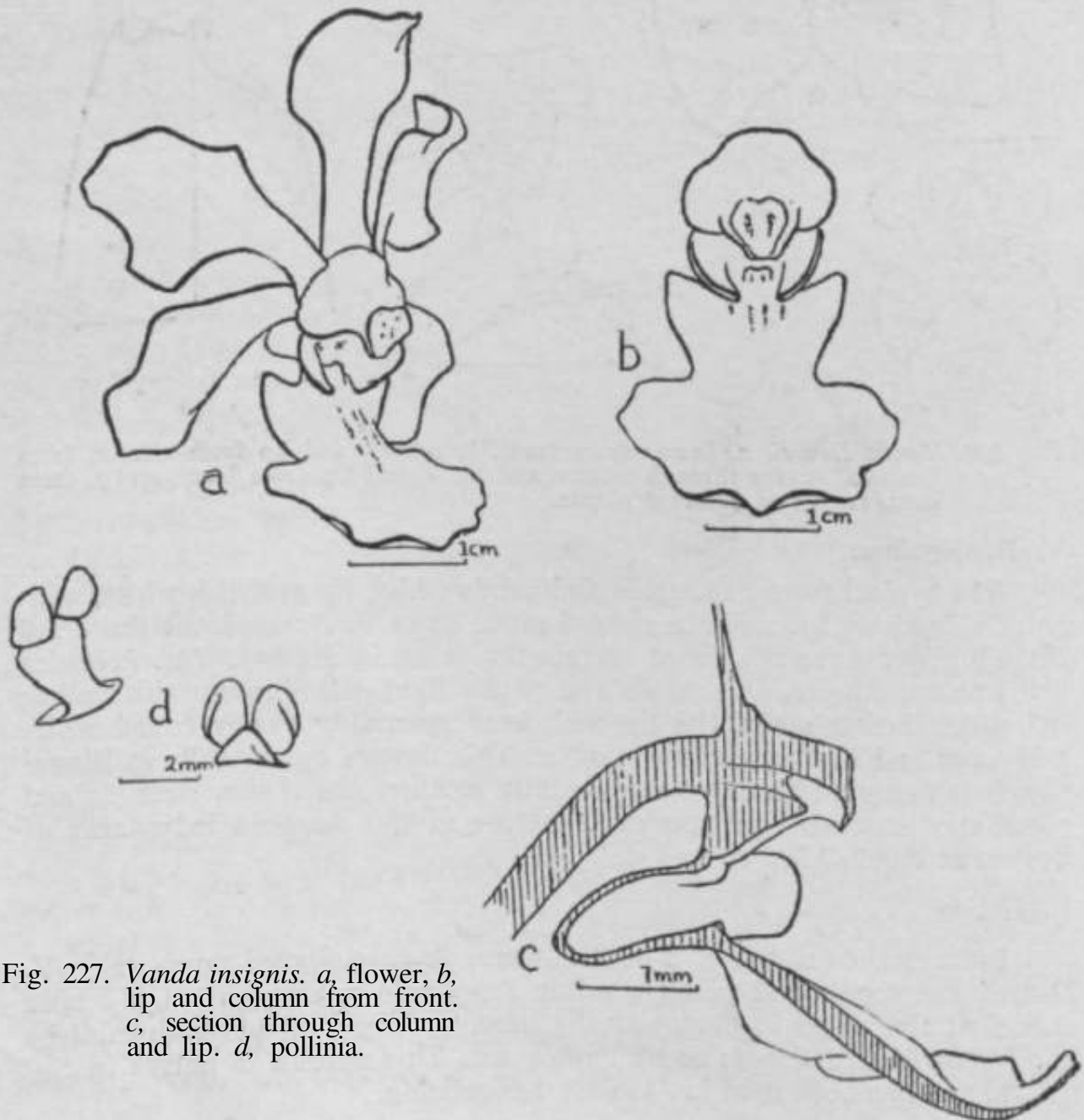


Fig. 227. *Vanda insignis*. a, flower, b, lip and column from front. c, section through column and lip. d, pollinia.

**V. Kimballiana**

In habit like *V. Amesiana*, but a finer species with rather larger flowers; side-lobes of lip small, yellow with purple spots, midlobe deep rose-purple, round, toothed, cleft. Native in the Shan States at 4,000-5,000 feet altitude; rarely if ever flowers in Singapore, but would be well worth growing in the hills of Malaya.

**V. lamellata**

Leaves 2 cm. wide; inflorescence 30 cm. tall, erect, bearing many rather small flowers, 3 cm. wide or less; sepals and petals light yellow with brown spots; lip yellow with brown stripes. Native in the Philippines; grows and flowers well in Singapore but the flowers are small. The tall erect inflorescence is a good character. Var. *Boxallii* (sometimes called *Vanda Boxallii*) has rather larger flowers of richer colouring, the lip light purple at the base, deep red at the tip. **Fig. 228.**

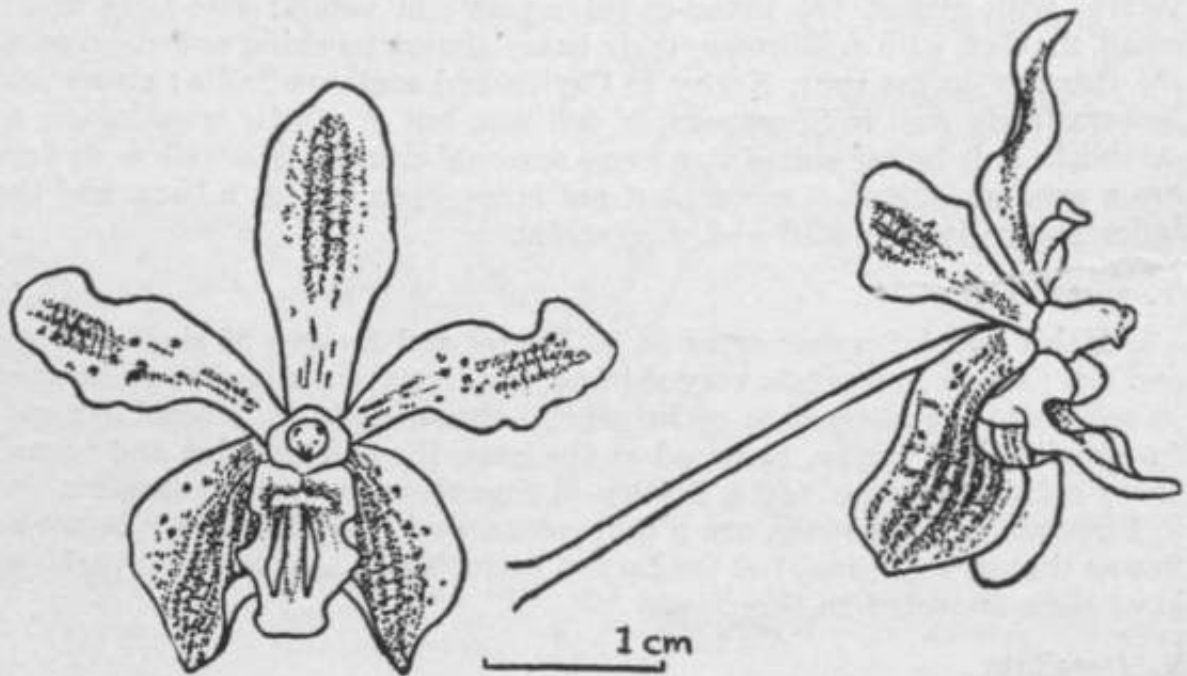


Fig. 228. *Vanda lamellata*, flower from front and from side.

**V. limbata**

Leaves about 2 cm. wide, rather stiff; inflorescence about as in *V. insignis* but flowers smaller; flowers 3 cm. high, a little wider than high, sepals and petals very evenly spreading, dull pale yellow with broad tessellation of dull red-brown which suffuses lightly into the spaces; lip a clear mauve, 7 mm. wide, nearly flat, the end cut off almost square. Native in Java and further eastwards; grows well in Singapore, given plenty of light, and flowers fairly well.

**V. luzonica**

Leaves broad, strongly curved and slightly twisted; inflorescence about as in *V. tricolor*; flowers with broad sepals and petals, pure white with a few bright purple spots; lip almost as in *V. tricolor*, bright purple. Native

in northern Philippines; grows well in Singapore and flowers fairly well when plants are large. The pure white flowers are very beautiful; the spotting is never general, and one variety has very few spots, the greater part of the flower being white.

#### **V. Merrillii**

Flowers 3 cm. wide; sepals and petals yellow, streaked with red near the base, the tips entirely deep red; lip yellow at base, tip red; colour varieties have entirely yellow and almost entirely deep red flowers. Native in the Philippines; grows and flowers fairly well in Singapore but the flowers do not last long.

#### **V. spathulata**

Habit more like *Arachnis* than *Vanda*, with climbing stems and short leaves, sometimes purple-flushed; scape 20-30 cm. long, bearing a succession of many flowers, only 1-3 open together; flowers 3 cm. wide, clear yellow, with almost flat round-ended sepals and petals; side-lobes of lip small, marked with red-brown, their bases almost touching and narrowing the entrance to the spur. Native in Ceylon and southern India; grows and flowers fairly well in Singapore, in full sun, but is a little troublesome to establish. It is better suited to a more seasonal climate. The yellow flowers are a good and unusual colour, but not large, open few at a time, and the inflorescence is very stiff and ungraceful.

#### **V. sumatrana**

Habit and inflorescence as in *V. Dearei* and flowers of similar shape and size; sepals and petals very shining, grading from olive-brown at apex to red-brown at base; base of lip white, almost as in *V. Dearei*, tip suffused with light brown, as broad as the base, the end rounded and turned down a little; column white. Native in Sumatra; grows and flowers well in Singapore. The flowers are a dull colour, and their fragrance is not so fine as that of *V. Dearei*, but the lip is a better shape. At least two varieties have been imported to Singapore.

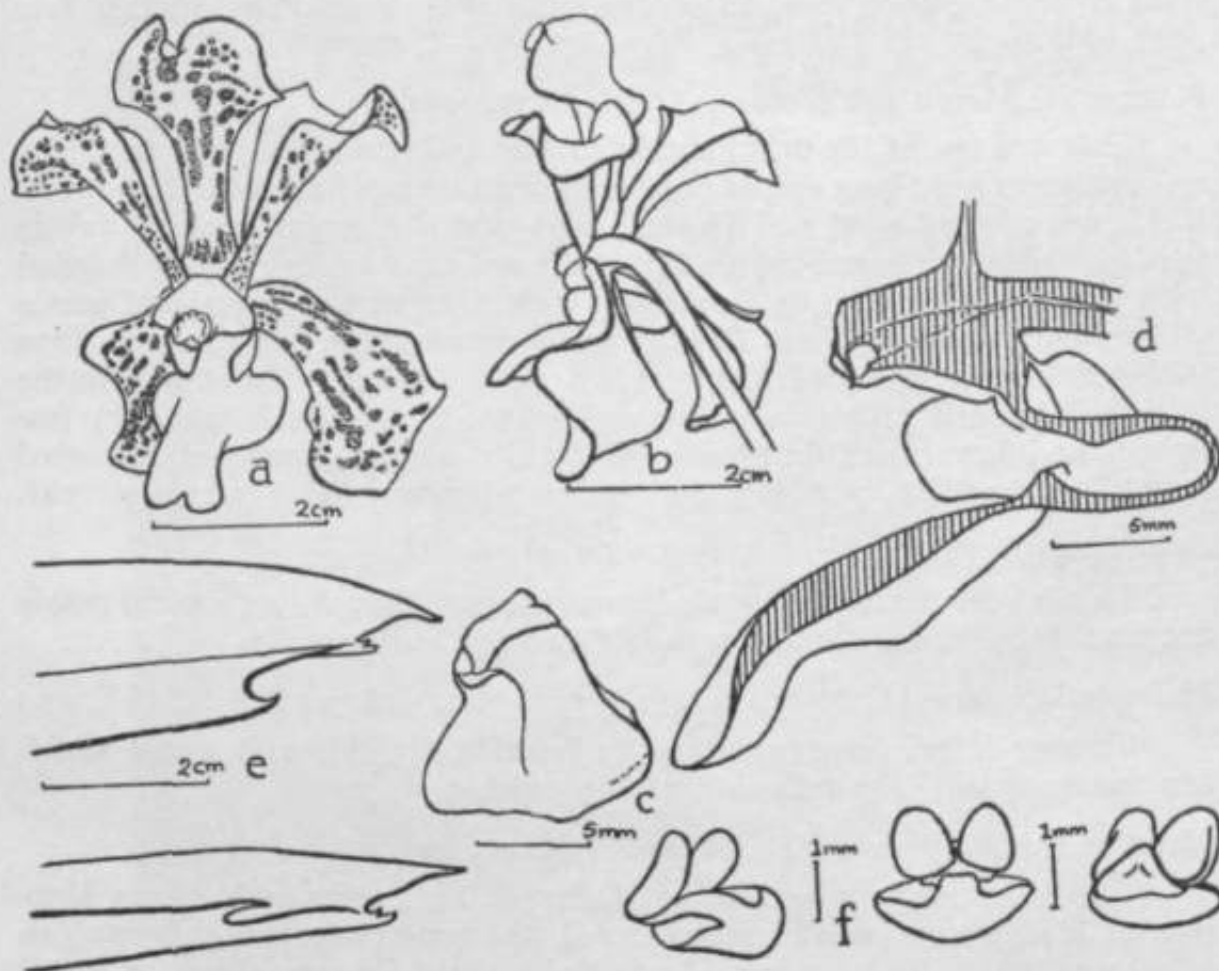
#### **V. tessellata**

Inflorescences to 30 cm. long with 5-10 flowers; flowers 5 cm. wide, the sepals and petals greenish yellow with dull brown tessellation; lip with white purple-spotted side-lobes and a deep rather dull violet midlobe, paler at the base; native in Ceylon and India; does not flourish in Singapore, and is reported to grow and flower best at about 1,500 feet elevation in Java. This is quite a fine species.

#### **V. tricolor**

Leaves fairly well spaced, strongly curved, to 40 by 4 cm.; inflorescence curved, to 25 cm. long with 6-10 flowers; flowers about 5 cm. high; base of sepals and petals rather narrow, with edges rolled back, distal part widened with crisped edges, colour nearly white or pale cream or pale mauve, with numerous chocolate brown spots, light or dark; lip purple with radiating white stripes at the base of the midlobe; side-lobes parallel, p<sub>p</sub>t incurved, midlobe wide at the base, narrowed forwards, the side§

turned down towards the tip which is notched. Native in Java; much cultivated, and very variable. Var. *suavis* is considered the finest variety; it is native in East Java and Bali, and has large flowers with deep-coloured markings. Fig. 229.



Fig<sup>1</sup>. 229. *Vanda tricolor*, a, flower from front, and b, from side, c, column, d, section through column and lip. e, leaf tip from above (upper drawing) and from side. f, pollinia after movement to pollinating-position.

Var. *purpurea*, native in Alor Island, has the background suffused with purple towards edges of sepals and petals, the spotting a rich deep maroon. A variety with white flowers, yellow-spotted, is in cultivation. *V. tricolor* and its varieties grow and flower well in Singapore. They need a good light, but not full sun.

#### Hybrid Vandas

We have already dealt with the hybrids within the terete group of *Vanda*; here we are concerned with hybrids of terete with non-terete species and with hybrids within the non-terete group. Owing to the large flowers of *V. teres*, and to the vigour and ease of cultivation of the terete group generally, many hybrids of *V. teres* and its allies with non-terete species have been made. These have leaves intermediate between the two types; they are narrow and deeply channelled, and are often called *semi-terete*. The plants also are intermediate in habit; they have longer internodes than non-terete Vandas, and so grow tall more rapidly, but have not

quite the climbing habit of *V. teres*. Plants of good flowering size are always tall and, like *V. teres*, they need full sun if they are to flower well. Hybrids within the non-terete group are fewer, as the flowers are of rather uniform size, except for *V. cserulea*. A number of hybrids have been made with *Ewinthe Sanderiana*; these are dealt with under that species (see page 694).

**Marguerite Maron** (*V. teres* X *tricolor* var. *suavis*)

This was one of the first hybrids (1909) and was made in France. The inflorescences have long scapes and bear simultaneously six or more flowers, which are of very good size (8 cm. wide) and shape, pale mauve, lightly spotted, with a dull red-purple lip, the basal part and side-lobes banded with pale dull pink. The lip is narrow, with sides turned down, and points stiffly forwards. Var. *Delia Dakkus* is the same cross, but made in Java with a different variety of *V. teres*; it has slightly larger flowers, with the lip boldly banded with pale yellow and purple to the tip. It is a very fine hybrid, and flowers well in Singapore. A third variety, unnamed, imported from Java, has the lip wholly dull yellow with only faint purple streaks.

**Emma van Deventer** (*V. tricolor* X *teres*)

This is very near Marguerite Maron in shape, but the sepals and petals are densely spotted with deep purple (the spots quite small).

**Madame Dubarry** (*V. teres* var. *Andersoni* X *sumatrana*)

Flowers large, fragrant, with finely crisped petals and sepals which are mauve with slight reticulation. Lip orange.

**Madame E.M.E. Dinger** (*V. tricolor* X Miss Joaquim)

This is very variable, the best forms being nearly as large as Marguerite Maron and more richly coloured, the poorest forms quite insignificant and not worth growing. The midlobe of the lip may either be broad and spreading, or have its sides turned down as in *V. tricolor*; it is nearly always wider than in M. Maron. Most varieties are lightly spotted and tessellated with mauve, and some suffused with cream. A free-flowering variety with richly purple lip has been called var. *Profusion*.

**Audrey** (Miss Joaquim X *tricolor* var. *purpurea*)

A deeper mauve than any of the Madame Dinger varieties, and with less distinct spotting.

**Majestic** (*F. cserulea* X *teres*)

This varies according to the variety of *V. teres* employed. The best forms have very large flowers of a beautiful lilac mauve. Some, but perhaps not all, will flower reasonably well in Singapore.

**Prinses Beatrix** (*V. Miss Joaquim* X *cserulea*)

Several seedlings of this have been raised in Singapore. Two have proved fairly free-flowering, and others will hardly flower at all. The flowers are large, of good shape, pale mauve with a rather small violet-purple lip; the inflorescence is long, with many flowers open together.



Vanda

---

X 'Triple Cross'

X Prolific

X Peng Soon

X Audrey

X Diana

X Rothschildiana

X Madam\*; E. M. E. **Dingex**  
Mr. Galistan's variety

X Ruby Prince

X Mataram

X Madame E. M. E.  
Dinner var.  
**Profusion**

X La Tosca

**Josephine van Brero** (*F. teres* X *insignis*)

A very beautiful hybrid, with a prevailing yellow-orange tinge, the lip broad. There is one especially fine variety. The plants are slow in growth.

**La Coquette** (*F. insignis* X *Hookeriana*)

The flowers of this are 6-7 cm. high, richly coloured and of good shape. The sepals and petals are closely spotted with deep red-purple. The hybrid is apparently not very free-flowering in Singapore.

**Alice Laycock** (*F. sumatrana* X Miss Joaquim)

A variable hybrid, the flowers usually rather pale mauve, sometimes tessellated, with usually a broad spreading lip of pinkish shade, in the best variety salmon. Some varieties do not flower at all freely. They have the fragrance of *F. sumatrana*.

**Mataram** (*F. fctida* X *teres* var. *alba*)

This is a fine hybrid, having large clear pale mauve flowers of good size, with a well-marked lip, the whole similar in shape to Marguerite Maron; the only bad feature is the short scape. This flowers well in Singapore.

**Henriette** (*F. spathulata* X *teres*)

This is not a very satisfactory hybrid, the flowers being little larger than those of *V. spathulata*, and lacking the fine yellow of that species. Only one or two flowers are open at one time. This hybrid does not flower freely in Singapore.

**Gilbert Triboulet** (*F. cserulea* X *tricolor*)

This is a most beautiful hybrid, and free-flowering in Singapore. The inflorescences are much as in *F. tricolor*, but the flowers larger, of a fine lilac mauve with violet spots.

**Kapoho** (*F. tricolor* X *lamellata* var. *Boxallii*)

The flowers of this are about the same size as in *F. tricolor* or a little smaller, cream with maroon markings, fragrant, very freely produced in erect inflorescences of good size. The exceptional freedom of flowering of this hybrid, and its erect full-flowered inflorescences, make it very useful, though the flowers are not large.

**Amelia Noa** (*F. Dearei* X *teres* var. *alba*)

Flowers faintly purple, fading white. Raised independently in Hawaii and Singapore.

**D. S. Senenayake** (*Cooperi* X *cserulea*)

Flowers large, with dark cobalt-violet lip. Produced in Ceylon and later in Singapore.

**Jean Kinloch Smith** (*Josephine* X *cserulea*)

Flowers large, pale violet with deeper tessellation and a violet lip. Unlike Prinses Beatrix, this has the true *cserulea* colour.



**Norbert Alphonso** (Alice Laycock X Cooperi)

Petals and sepals pale mauve with faint tessellation and spotting, broad, rich crimson-purple. Unfortunately the lip is often distorted.

**Ruby** (*Hookeriana* X *tricolor*)

Flowers rather small, but richly coloured, the lip with broad crimson midlobe.

**Ruby Prince** (Ruby X Cooperi var. Cho Yam Neo)

Flowers larger than those of Vanda Ruby, and equally rich colouring.

**Flammerolle** (*luzonica* X *cxrulea*)

Resembling Gilbert Triboulet, but the colour a purer violet-mauve with less spotting.

**Diana** (*teres* var. *alba* X White Wings)

There is some variation among seedlings, but all have large flowers with some yellow inside the base of the lip; there is variation in freedom of flowering.

**Vanda-Phalaenopsis Hybrids (Vandaenopsis)**

A number of these have been produced, both in Java and few have come into general cultivation, and no hybrid of *Vanda amabilis* has yet been reported. The best seem to be the *Denevei*, which has been crossed with both *V. teres* and *V. Miss Java's Glorie* is *V. teres* X *P. Denevei*; it has fine flowers with a salmon-pink tinge, the lobes of the lip deep blood-red. It but apparently does not flower freely in Singapore. *Prinses ym V. Miss Joaquim* X *P. Denevei*. Presumably this is variable, like generation hybrids, but the extent of the variation has not been reported. The variety which has flowered in Java has pale mauve sepals and petals with orange lip.

**Vanda-Arachnis Hybrids (Aranda)**

These hybrids are usually very vigorous in growth, like terete Vandas, and are treated in the same way, requiring full of them flower freely, but some do not. All first crosses of this flowers which approach the typical Arachnis shape, though with broader petals and sepals. Unfortunately most Arandas are sterile this fact limits the possibilities of further breeding. has however produced some seedlings, which may lead to a large of hybrids.

**Alastair** (*A. Hookeriana* var. *luteola* X *V. limbata*)

Inflorescence bearing 12 flowers; upper sepal 2-8 cm. long sepals burnt sienna with a narrow yellow margin; midlobe pink. A free-flowering hybrid.

**Deborah** (*A. Hookeriana* X *V. lameUata*)

This has erect inflorescences nearly as long as in *A. Hookeriana*, with flowers almost as large, of narrower shape, pale yellow with fine streaks of red-purple spots, the lip yellow with crimson stripes. The plants are vigorous, and when well grown flower frequently in Singapore; the flowers are excellent for cutting,

**Eileen Addison** (*Vanda Kapoho* X *Arachnis Maggie Oei*)

Inflorescence unbranched; flowers 7-5 cm. tall; sepals and petals yellowish, with close purple spotting near the tips; midlobe of lip purple with 7 white keels. This flowers freely and has proved fertile.

**Jacoba Louisa** (*A. Maingayi* X *V. Miss Joaquim*)

This has branched inflorescences bearing about 20 fine large flowers. It is no doubt variable, and some varieties may not flower freely. No plants have so far been reported in Singapore.

**Mars** (*A. Hookeriana* X *V. Marguerite Maron*)

Flowers of good size and shape, but not borne very freely in Singapore. **Fig.** 230.

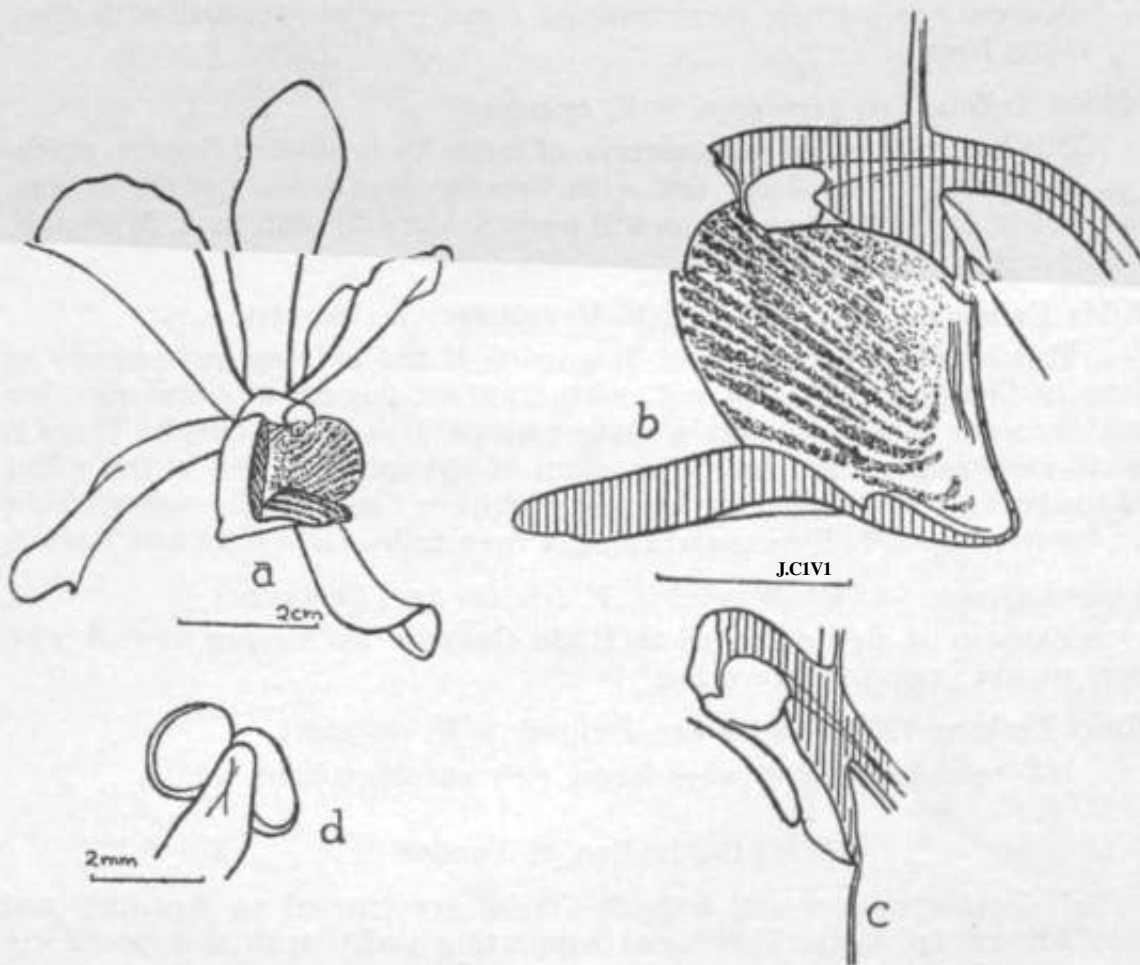


Fig. 230. *Aranda Mars*, *a*, flower from front, *b*, section through column and lip, *c*, section through column, showing junction of base of lip with foot of column, *d*, pollinia from behind.

**Mignon** (*A. Hookeriana* X *V. Hookeriana*)

This has been produced in Singapore but the plants entirely failed to flower; plants raised in Java have flowered there, with 12-15 flowers on an inflorescence 50 cm. long.

**Mei Ling** (*A. Hookeriana* X *V. sumatrana*) is very free-flowering; the flowers are near those of Aranda Nancy but the inflorescence is longer.

**Nancy** (*A. Hookeriana* X *V. Dearei*)

This is very vigorous in growth, with large leaves; plants of 60 cm. and more high flower fairly freely. The inflorescences are rather short, but the flowers are a good shape and size, cream, more or less tinged with light brown at the tips. The best variety has sepals and petals entirely a clear cream colour, with about 6 flowers to each inflorescence.

**Queen of Purples** (*A. Hookeriana* X *V. cxrulea*)

\* This plant had 14 large flowers, shaped rather like Arachnis but with broader sepals and petals, lilac-purple lightly tessellated.

**City of Singapore** (*A. flos-xris* var. *insignis* X *V. Dearei*) has a branched inflorescence bearing large flowers. Creamy yellow spotted with chocolate brown.

**Edwina ToUens** (*A. Maingayi* X *V. tricolor*)

like *S. A. L.* branched inflorescence of large finely spotted flowers, much flow is a

**Hilda Galistan** (*A. Hookeriana* X *V. tricolor* var. *suavis*)

This hybrid flower long as in the Arachnis? Well & Si W > re - « has inflorescences nearly as it broader sepals & petals finely spotted with brown-purple. There is of the back of the petals finely spotted with brown-purple. There is or mauve IS 251 F. 231. Fine varieties have been called Gold Gem and Suntan.

Layco no X *V. tricolor* var. *purpurea*)

rosy-mauve not a white? 0 HiMa Gamstan but deeply flushed with

**Ruby Pestana** (*A. flos-teris* var. *insignis* X *V. cxrulea*)

Inflorescence long, flowers large, rich purple, column white.

**Cultivation of Vandas**

1. *Renanthera* (p. 624). These are treated as Arachnis and they need supporting posts, with a layer of cut bark & moss to protect and nourish the plants. The sun is essential. The plants grow erect, not with drooping ends like the larger Arachnis, and will not flower

until they have free stems rising above the supporting posts; the posts should therefore not be too high; three feet above ground level is enough. Cattle manure may be given, especially to *7. Hookeriana*; watering the compost with dilute liquid manure is also practicable. The plants will grow very well however with nothing but cut grass, which should be renewed fairly often, as it decays rapidly.

2. *Semi-terete hybrids*. These may if desired be grown in beds, supported on posts, as the terete species, but they need good drainage, and a good layer of broken bricks or rubble under the bed is necessary, and it is

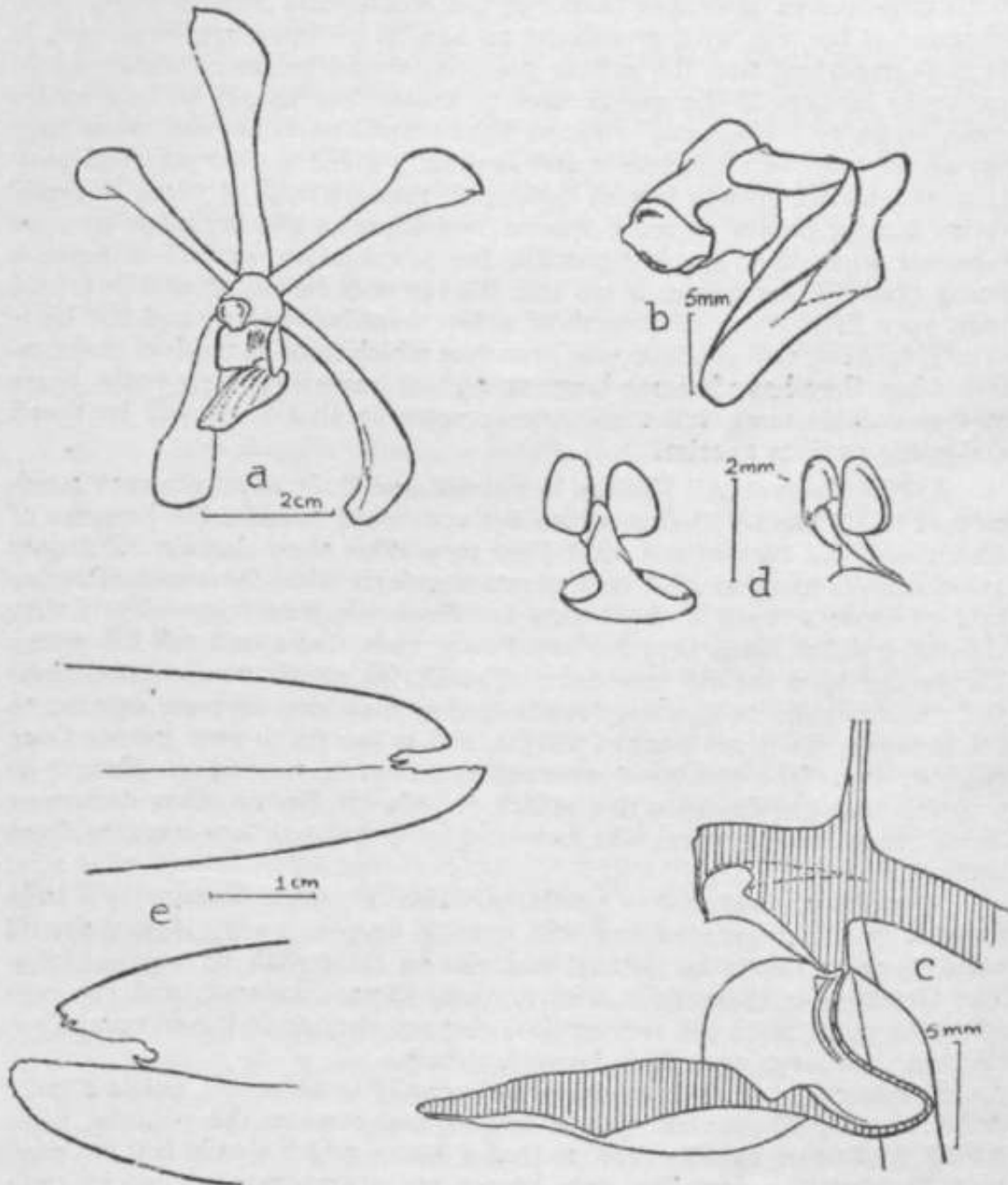


Fig. 231. *Aranda Hilda Galistan*. *a*, flower from front, *b*, column and under surface of lip. *c*, section through column and lip. *d*, pollinia. *e*, leaf tip from above (upper drawing) and from beneath.

usual to grow the plants in pots. The potting medium may be small broken bricks and charcoal, or tightly packed coarse fern-root. Liquid manure at frequent intervals after the roots are well established ensures good growth. When the plants are too tall, the top may be cut off and re-potted; usually a length of about 18 inches is suitable, but it must include one or two good roots. The base of the plant will soon produce side-shoots, which may be cut off and potted separately when large enough.

3. *Non-terete species and hybrids*. These are much slower in growth than the fore-going. They may be potted in open-sided pots or in baskets, with large pieces of broken bricks at the bottom and smaller pieces with charcoal at the top, with or without an admixture of coarse fern-roots. It is most important that the potting material should be clean; bricks should be newly broken. If the plants have no roots, they should be kept under cover in an airy place and watered lightly until roots appear, when they should be watered more freely and gradually given a more exposed position. When root growth is well developed, manure may be given in liquid form. Strong plants of most species will branch; the branches may be removed when they are big enough, for propagation, or left to make a bushy plant. When a stem is too tall, the top may be cut off and re-potted with very little check in growth if a few roots are taken, and the base, even if leafless, will produce new branches which may be used in propagation when they have become large enough to have their own roots. Some species require more sun than others; notes on this point will be found under the various species.

4. *Pest Control*. All Vandas, Arachnis, and their allies are very much subject to attacks by Thrips, which are very small insects, the presence of which may not be realized until they have done their damage. The only safe course is to spray all Vanda plants regularly with Tuba root (Derris) extract; once a week if the plants are flowering, less frequently if they are not, a watch being kept for new flower buds. Tuba root will kill young Thrips and keep the old ones away. The Thrips attack young flower buds and damage them before they expand; they may also do some damage to young leaves. They are winged insects, and so can fly to your garden from outside; therefore continued preventive action is necessary. Also, it is probable that the Thrips which attack orchids can live on other flowers or leaves. Few local flowers, whether wild or cultivated, are immune from their attentions.

A medium sized yellow beetle can also do much damage to Vanda flowers, but regular spraying will usually keep it away. If any should come, they will soon be noticed and can be dealt with by hand-picking. The larvae cover themselves with a white slimy substance, and are conspicuous, apart from the very obvious damage they do to the flowers. Even the eggs are large enough to be seen clearly.

Large wood-boring bees are almost equally troublesome, but in a quite different way. They visit Vanda flowers and remove the pollinia, after which the flowers rapidly fade, so that a flower which should last ten days may be over in a day. The only known preventive measure, apart from placing flowering plants under a wire gauze cover, is spraying with Tuba root, which the bees do not like, but the effect is transient.

31. ASCOCENTRUM

Small plants with the habit of *Vanda*; inflorescence erect or spreading, many-flowered; flowers small, facing all ways, wide-opening, sepals and petals similar; lip immovably fixed to the base of the column and slightly joined to it at the base of the side-lobes; side-lobes erect, small, rounded or triangular; midlobe larger, tongue-shaped, pointing forwards or downwards; spur shorter than the ovary and pedicel, without keels or septa, with a small thickening at its mouth at the base of the midlobe; column short; no column-foot; pollinia 2, cleft, on a short stipes which is narrow or widened from a narrow base.

The typical species of this genus is *A. miniatum*, which makes a most attractive garden plant, with its spikes of bright orange flowers. The other species included here is not very closely related, being perhaps nearer to *Vanda*; but there seems no other genus into which it could be placed. Further study of this and allied species from Burma are needed to decide the limits of the genus *Ascocentrum*. The two Malayan species are thus distinguished:—

- |   |    |                         |
|---|----|-------------------------|
| Inflorescence erect, flowers orange                               | .. | 1. <i>A. miniatum</i>   |
| Inflorescence horizontal or drooping, flowers<br>white and purple | .. | 2. <i>A. micranthum</i> |

1. ***Ascocentrum miniatum*** (Lindl.) Schltr., Orch. Deutsch. N. Guin. 975. 1914. J.J.S., Orch. Jav. Fig. Atl. f. 483. Bull. Btzg., Ser. 2, XIV: 49. 1914.—*Saccolabium miniatum* Lindl., Bot. Reg. 1847, sub. t. 26; t. 28. J.J.S., Fl. Buit. 6: 648. Ridl., Flora 4: 172.

Stems to about 10 cm. long, thick, internodes 2-3 mm.; leaves very fleshy, 10-20 cm. long, barely 1 cm. wide if flattened, upper surface channelled with the halves convex, tip lobed and toothed; inflorescence erect, to about 12 cm. long, the scape 2 to 3 cm.; pedicel and ovary slender, 1 cm. long; flowers bright orange, or orange-yellow; sepals and petals about 6 by 3 mm.; lip with spur 8 mm. long, 1.5 mm. thick, laterally flattened, thin-walled, pointing vertically downwards; midlobe bent downwards, 4 by 1.5 mm., upper surface grooved; pollinia on a short narrow stipes with a relatively large disc. Distributed from the Himalayas to Java; in Malaya only found in the north (Perlis and Langkawi) in exposed places. There are two varieties, one with bright orange, the other with paler flowers. This species is easily cultivated, in any airy place under light shade, and flowers well in Singapore. **Fig.** 232.

2. ***Ascocentrum micranthum*** (Lindl.) Holtt, Gard. Bull. 11: 275. 1947.—*Saccolabium micranthum* Lindl., Gen. et Sp. Orch. 220. 1833.—*Cleisostoma micranthum* King & Pantl., Ann. Calc. 8: 234, t. 312. 1898.—*Saccolabium fissum* Ridl., J.L.S. 32: 361. 1896. Flora 4: 173.

Stems erect, 8 cm. or more long, internodes 7 mm.; leaves fleshy, to 11 by 14 cm., tip rather deeply and unequally bilobed, lobes rounded; inflorescence to 7 cm. or more long, the scape 1.5 cm., scape and rachis rather fleshy; flowers white with purple on lip and anther (or with sepals and petals purple-spotted); sepals barely 3 mm. long, very broad, tips blunt; petals about as long but only half as wide; spur of lip parallel to ovary and close to it, about as long as midlobe; midlobe fleshy, oblong,

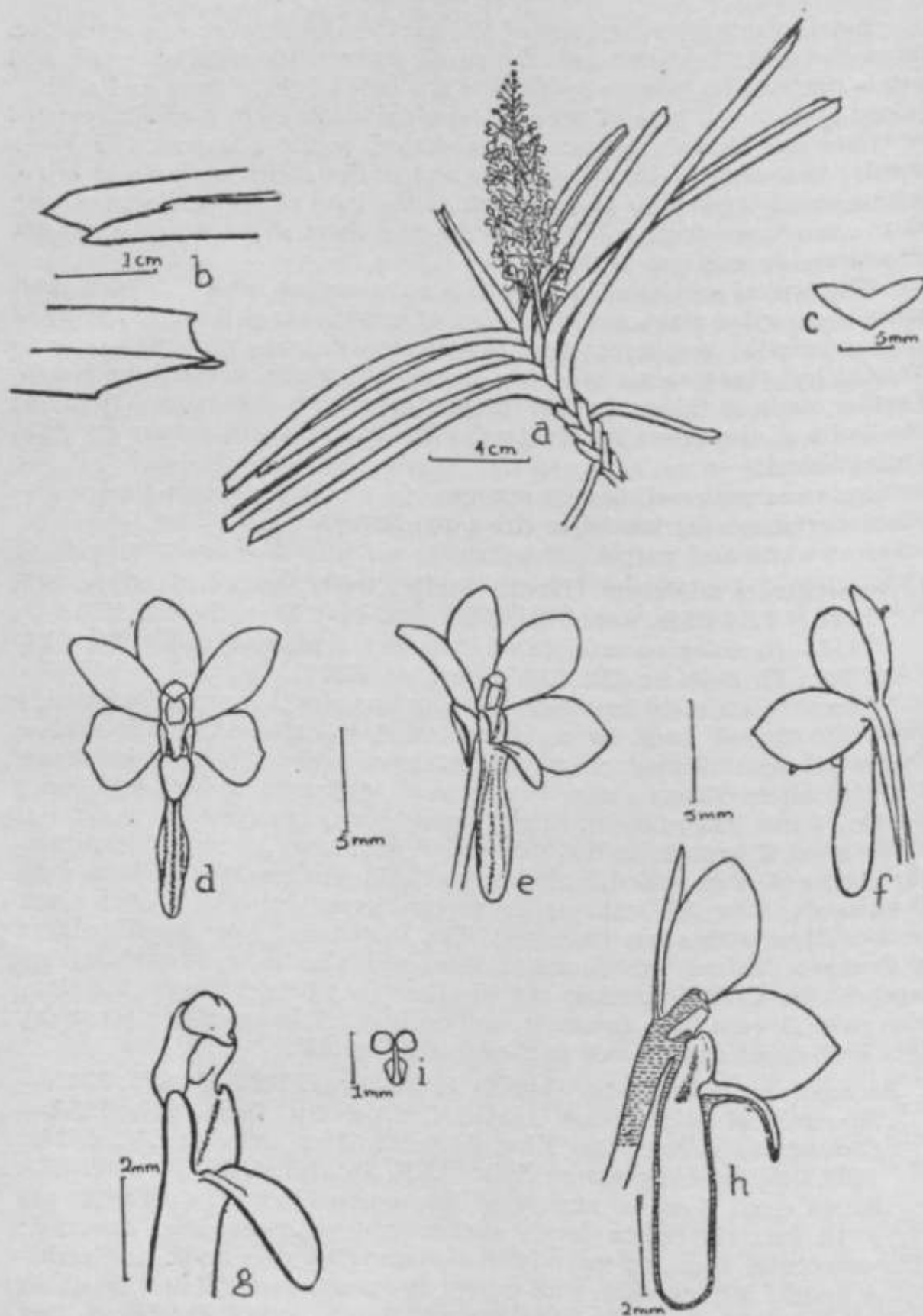


Fig. 232. *Ascocentrum miniatum*. a, plant with inflorescence, b, leaf tips, c, cross section of leaf, d, e, f, flower from front and from back, g, column and lip, h, section through column, lip and spur, i, poilinia.





mountain species, known from Java, and from two collections in Malaya, one from Perak and one from Cameron Highlands. **Fig.** 233.

### 33. ANGRÆCUM

This genus is confined to Africa and Madagascar and the other islands in the Indian Ocean. The flowers are nearly all white, or greenish white, with a long slender spur; they are adapted to moth-pollination. There are two pollinia, each on separate disc and stipes. The lip is not lobed, and in some species stands erect at the top of the flower. The habit of most species is very like that of a non-terete *Vanda*, but some have longer climbing stems, and some shorter stems.

In addition to *Angræcum* proper, a number of allied genera also occur in the African region, one of them (not in Malaya) having a distribution to Japan. There appears to be no satisfactory general agreement about the limitation of the genera in the group, and no survey of it can be attempted here. It is worth noting that the only *Angræcum* which flowers at all freely in Singapore is *A. Eichlerianum* from West Africa. It seems likely that West African species are more likely than Madagascan and East African species to flower in our uniformly wet climate, and further trials of West African species, when obtainable, would be worth while, e.g. *A. infundibulare*, *A. caudatum* (*Listrostachys caudata*), and *A. Chail-Ivnum* (*Listrostachys*). Below are briefly described four species known to be cultivated in Singapore and in Java.

#### **A. eburneum**

Habit of *Vanda*, with large leathery leaves to 50 by 5 cm.; scape obliquely ascending, rachis straight, bearing several flowers close together; flowers 6-10 cm. wide, the sepals and petals narrow, greenish-white, the broad white lip at the top of the flower, the spur 8 cm. long. A species from Madagascar, which flowers well in the lowlands of Java but less well in Singapore. It probably needs a regular seasonal climate, and should be tried in the north of Malaya. It is a very fine species. Dakkus states that it needs plenty of light. Plants only flower when they have attained a large size.

#### **A. Eichlerianum**

Stems climbing, bearing alternate leaves which are flattened against the supporting tree; leaves to about 10 by 4 cm.; flowers solitary or rarely two together, on a slender stem as long as the leaves; flowers about 7 cm. wide, the sepals and petals broad with acute back-curved tips, greenish white; lip at the bottom of the flower, large, white, greenish towards the base, broad and concave, suddenly narrowed to an acute tip; spur 5 cm. long. Native in West Africa; grows and flowers well in Singapore, in light shade.

#### **A. leonis**

Stem short; leaves 12-20 cm. long, curved downwards; inflorescence obliquely ascending and drooping, bearing 3 to 7 flowers; flowers 6 cm. wide, the sepals and petals very pale yellowish, acute, the lip white, 4 cm.

long and 3 cm. wide, suddenly pointed, the spur 15 cm. long. This attractive species is native in the *Comoro* Islands, near Madagascar, and is reported to flower very freely in the lowlands of Java. We have no report on its behaviour in Malaya.

*A. sesquipedale*

Habit of *Vanda*, with leaves to 30 cm, long; the inflorescence about 30 cm- long, bearing 2 to 4 flowers; flowers about 15 cm. wide, white, with pointed sepals and petals and a triangular Hp, the spur up to 30 em. long. Native in Madagascar; grows well in Singapore and flowers occasionally. Dakkus reports that this species, the finest in the genus, grows well in Java at 1,000-1,600 feet altitude. Fig, 234.

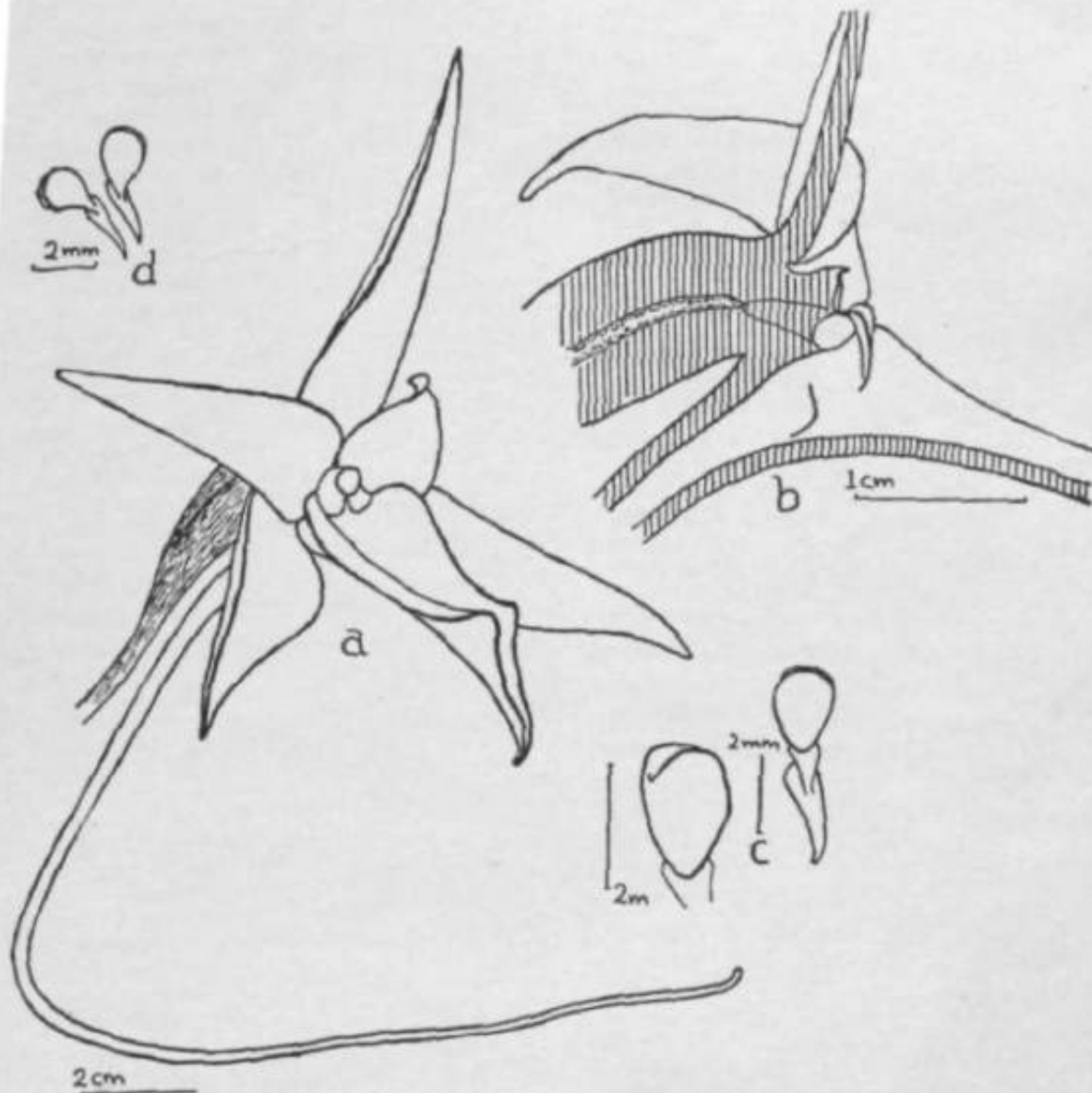


Fig. 234. *Agraetm sesquipedale*. a, flower, b, section through column, c, d, pollinia.

**Hybrids of Angraecum****A. Veitchii (*eburneum* X *sesquipedale*)**

Plants of this hybrid, raised in Britain, have been imported to Singapore and prove free-flowering. Though the flowers are not finer than the parent species, the hybrid is thus a much more useful plant than either.

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