

ANNOTATED KEY TO THE GENERA OF ZINGIBERACEAE  
OF THAILAND

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INTRODUCTION

The author has studied the Zingiberaceous flora of Thailand and Indochina for the past several years during which several expeditions were made to collect material for taxonomic and cytological studies. Still we are far from having sufficient information on this family for producing a satisfactory treatment for the Flora of Thailand. It may, however, be that the time has come to present an outline of this group of plants in Thailand in such a way that it reflects our present knowledge of the distribution of genera and at the same time encourage local botanists and future collectors to pay more attention to these plants.

Our lack of knowledge of the family is in part due to the delicacy of the flowers which are usually spoiled during traditional drying methods. Collecting Zingiberaceae should always be done by preserving some flowers or even better whole inflorescences in alcohol or FAA and by taking colour photographs of the floral parts. There are quite a number of "well-known" species of which we do not know the flower-colours or inflorescence-structure.

The present treatment contains a key to the genera found in Thailand as well as genera found in bordering areas, i.e. northern Malaysia, western Burma, Laos, Cambodia and southern Vietnam. Taxa only reported from Tonkin, Singapore and southern Malaysia are not included in this treatment.

In the third part the genera are briefly characterized and a summary of their distribution given. Some of the commonest species found in Thailand are mentioned and the number of species expected to be found in Thailand given. Literatures with special reference to Thai species are listed. A stroke under the year of a publication shows that it contains one or more illustrations showing Thai species of at least closely related taxa.

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It is hoped that this paper will stimulate new interest in the studies of the Thai Zingiberaceae and the author, whose ultimate goal is a revision of the *ca* 200 species for Thailand, will be glad to receive comments and suggestions from all fellow-botanists interested in those beautiful plants.

KEY TO GENERA OF ZINGIBERACEAE  
OF THAILAND

- 1. Leaves spirally arranged with closed tubular sheaths; inflorescence terminal or lateral on separate shoots near the ground 1. *Costus*
- 1. Leaves distichous with sheaths open on opposite side of lamina
  - 2. Ovary unilocular with parietal placentation (seen in transverse section of ovary)
    - 3. Filament short, not exceeding the petals; labellum broadly ovate 2. *Hemiorchis*
    - 3. Filament long, exserted
      - 4. Labellum tri-lobed or trifid, middle lobe narrower than side-lobes 3. *Gagnepainia*
      - 4. Labellum bi-lobed or entire
        - 5. Lateral staminodes short elliptic, resembling and arising at the same level as the corolla-lobes 4. *Globba*
        - 5. Lateral staminodes long, linear or spatulate, arising on either side of the filament 5. *Mantisia*
  - 2. Ovary trilocular with axile placentation or unilocular with basal or free columnar placenta
    - 6. Style exserted well beyond the anther; anther-crest long, narrow with inflexed edges enclosing the style like a curved beak; plane of distichy of leaves parallel to rhizome 6. *Zingiber*
    - 6. Style not exserted far beyond the anther; anther-crest, if present, not enclosing the style; plane of distichy of leaves parallel or transverse to rhizome
    - 7. Distichy of leaves parallel to rhizome; lateral staminodes petioloid, free from labellum

- 8. Primary bracts adnate to each other laterally for about half their length and forming basal pouches 7. *Curcuma*
- 8. Primary bracts not laterally adnate
  - 9. Inflorescence surrounded by a campanulate involucre with 2 slits 8. *Stahlianthus*
  - 9. Inflorescence not surrounded by a campanulate involucre.
    - 10. Primary bract one per inflorescence, spathe-like, margins adnate to the main axis at the base; anthers with elongated appendages at base (spurs) 9. *Camptandra*
    - 10. Primary bracts more than one per inflorescence, free to the base; anthers with or without appendages
      - 11. Inflorescence born separately and sometimes appearing before the leaves
        - 12. Bracteoles absent; anther-crest *ca* 1 mm 10. *Haniffia*
        - 12. Bracteoles present; anther-crest over 2 mm 11. *Kaempferia p.p.*
      - 11. Inflorescence terminal on a leafy stem, sometimes stem very low and leaves poorly developed
        - 13. Leaves less than 0.5 cm broad; low herbs 11. *Kampferia p.p.*
        - 13. Leaves more than 1 cm broad; low to medium-sized herbs
          - 14. Anthers versatile with 2 long, basal spurs held at right angles to the thecae
            - 15. Dorsal petal very broad; flowers purple or white, rarely yellow 12. *Roscoea*
            - 15. Dorsal petal narrow; flowers yellow 13. *Cautlaya*
          - 14. Anthers sometimes free in lower  $\frac{1}{3}$ – $\frac{1}{4}$  but never versatile, never spurred, but occasionally with short, basal appendages
            - 16. Filament at least half as long as labellum, usually much longer 14. *Hedychium*
            - 16. Filament much shorter

17. Stem well developed, 10–60 cm long
18. Anther-crest conspicuous, often reflexed; labellum not strongly concave; flowers yellow or whitish  
15. *Caulokaempferia*
18. Anther-crest not produced; labellum strongly concave; flowers pink or creamy spotted with red  
16. *Boesenbergia*
17. Stem poorly developed, up to 10 cm long
19. Flowers more than 1 to each primary bract  
17. *Scaphoclamys*
19. Flowers 1 to each primary bract
20. Primary bracts arranged distichously, the uppermost flower opening first  
16. *Boesenbergia*
20. Primary bracts arranged spirally, the lowermost flower opening first
21. Rhizome thick, short and fleshy; bracteoles narrow, usually bi-lobed, shorter than primary bracts  
11. *Kaempferia p.p.*
21. Rhizome thin creeping; bracteoles entire, longer than primary bracts  
17. *Scaphoclamys*
7. Distichy of leaves transverse to rhizome; lateral staminodes absent of small teeth at base of labellum or short linear appendages at the base of the labellum
22. Inflorescence borne separately from the leaves
23. Inflorescence forming a compact head, main axis usually hidden by imbricate bracts
24. Peduncle erect up to 1 m, always held above the ground; involucre reddish to bright red  
18. *Nicolaia*
24. Peduncle very short, base of inflorescence often embedded in the ground
25. Base of labellum and filament forming a distinct tube above the petals; inflorescence always embedded in the ground  
19. *Achasma*

- 25. Base of labellum and filament not so joined
- 26. Leaf-shoot short, with 1-5 leaves
  - 20. *Elettariopsis*
- 26. Leaf-shoot tall, with many leaves
  - 27. Inflorescence surrounded by rigid, sterile bracts; corolla-tube more than twice the length of labellum
    - 21. *Hornstedtia*
  - 27. Inflorescence overlapped by scales of the short peduncle, no sterile bracts, bracts not rigid; corolla-tube shorter than or equal to the length of labellum
    - 22. *Amomum*
- 23. Inflorescence lax, main axis visible
  - 28. Inflorescence prostrate, much elongated, sometimes  $\pm$  subterranean and only the upper part of flowers above ground
    - 29. Flowers in several-flowered cincinni; anther-crest small and inconspicuous
      - 23. *Elettaria*
    - 29. Flowers born singly on the main axis; anther-crest conspicuous
      - 20. *Elettariopsis*
  - 28. Inflorescence erect or decurved
    - 30. Labellum deeply divided into 2 narrow lobes; filament with lateral appendages
      - 24. *Geocharis*
    - 30. Labellum not so divided; filament unappendaged
      - 25. *Geostachys*
- 22. Inflorescence on the leafy shoot

31. Inflorescence apparently lateral, breaking through the leaf-sheaths at the side of the aerial pseudo-stem

26. *Plagiostachys*

31. Inflorescence clearly terminal.

32. Leaves cordate or subsagittate; labellum connate intramarginally to the base of a long *Globba*-like filament 27. *Pommereschea*

32. Leaves never cordate or subsagittate

33. Inflorescence bearing single flowers directly on the main axis

28. *Cenolophon*

33. Inflorescence bearing lateral cincinni of 2 or more flowers 28. *Alpinia*

## COMMENTS ON THE GENERA

### I. Costoideae

#### 1. *Costus* L.

The genera with spirally arranged leaves are often regarded a separate family, Costaceae. Only the genus *Costus* is represented in Thailand. One widespread and polymorphous species occurs throughout the country, *i.e.* *C. speciosus* (Koenig) Sm., this has an inflorescence terminating the leafy shoot. Another group has inflorescences near the ground borne on separate shoots; 2 or 3 species belonging to this group occur in Thailand, *e.g.* the endemic *C. dhaninivatii* K. Larsen.

Literature: SCHUMANN, 1904: 378; GAGNEPAIN 1908: 118; LOESENER, 1930: 628; LARSEN, 1965b: 149; HOLTUM, 1971: 240; BURTT & SMITH, 1972a: 185, 200.

## II. Globbeae

### 2. *Hemiorchis* S. Kurz

This genus containing three species has not yet been found in Thailand. It is distributed from the Khasia Mountains and Sikkim to Burma (Tenasserim). It may very well occur in western Thailand which belongs to the Tenasserim flora-province.

### 3. *Gagnepainia* K. Schum.

This genus was separated out from *Hemiorchis* by SCHUMANN (1904), 3 species originally described from Cambodia and South Vietnam (Cochinchina) have all been found in Thailand, where they are distributed from the peninsular part (Pattalung-area) and to the central and eastern provinces.

The small green-flowered herbs having a certain resemblance with terrestrial orchids occur mainly at lower altitudes.

One collection does not match any of the three species so far described.

Literature: SCHUMANN, 1904: 129; GAGNEPAIN, 1908; 41; LOESENER, 1930: 581.

### 4. *Globba* L.

This genus is one of the largest genera of *Zingiberaceae* in Thailand. It is widespread in South-East Asia where it has its centre of variation in the Indo-Chinese monsoon area. It is a group which still needs a good deal of field study. From Malaya 13 species are reported, in Thailand about 25 species occur.

The small, mostly yellow-flowered herbs are found all over the country, and easily recognizable. They occur from the lowland to the summit of the highest mountains. Very important for the determination of the species are the preservation of the anthers, as the appendages are used for classification into sections. There are a few white to violet-flowered species and some which develop bulbils instead of the lower flowers. A number of endemic species occur in central and northern Thailand.

For specimens collected south of the Isthmus of Kra a new key by STEW-NGO (1972) is useful for determination.

Literature: SCHUMANN, 1904 : 132; GAGNEPAIN, 1908 : 28; CRAIB, 1912 : 398; LOESENER, 1930 : 581; HOLTUM, 1950 : 21; LARSEN, 1972 : 229; SIEW-NGO, 1972 : 253; BURTT & SMITH, 1972a : 188, 201.

### 5. *Mantisia* Sims

Closely related to *Globba*. Two species were described under the genus *Globba* in 1810, both from north-eastern India. Commonly cultivated is *M. saltatoria* Sims, which on account of its peculiar flowers has the name "The dancing girls". Recently a new species from Burma was described by BURTT & SMITH (1972). The genus should be looked for in North-Western Thailand.

Literature: SCHUMAN, 1904 : 161; LOESENER, 1930 : 585; BURTT & SMITH, 1972a : 209.

## III. Zingibereae

### 6. *Zingiber* Boehm.

The genus *Zingiber* is not closely related to any other genus in the family. It is a genus of ca 100 species, distributed throughout tropical Asia to northern Australia. They are medium-sized herbs 50-150 cm high and most often with a "cone-like" inflorescence formed by the closely imbricate bracts. In some species the bracts remain green or yellow, in others they turn red during the ripening of the fruits. The long, beak-like anther-connective enclosing the style is very characteristic.

About 15 species are found in Thailand including 2 cultivated ones. Most important economically is *Z. officinale* Roscoe and *Z. zerumbet* (L.) Sm. A few endemic species occur in central and northern Thailand. We are badly in need of more collections with flowers in alcohol.

Literature: SCHUMANN, 1904 : 165; GAGNEPAIN, 1908 : 75; LOESENER, 1930 : 586; HOLTUM, 1910 : 48; BURTT & SMITH, 1972a : 180, 195.

## IV. Hedychieae

### 7. *Curcuma* Roxb.

A genus with over 50 species distributed all over the Indo-Malesian area and in southern China. Several species are indigenous in Thailand. *Cucuma domestica* Valet. is widely cultivated. The most common wild



species is *C. parviflora* Wall. with green floral bracts and a white coma. Recently *C. roscoeana* Wall. has been found in N. Thailand and a new endemic *C. burttii* Larsen & Smith recognized from Central Thailand.

Literature: SCHUMANN, 1904: 99; GAGNEPAIN, 1908: 57; LOESENER, 1930: 575; HOLTUM, 1950: 65; BURTT & SMITH, 1972a: 185; 209, 224; LARSEN, & SMITH, 1978: 269.

#### 8. *Stahlianthus* O. Kuntze

A small genus of low herbs with 7 recognized species. Schumann included it in *Kaempferia*. The distribution ranges from the eastern Himalayan region to Burma, Thailand and Indo-China; one species also occurs on Hainan. At least one species, *S. campanulatus* O. Kuntze, is found in Central Thailand. The genus is easily recognized by the campanulate involucre enclosing the whole inflorescence.

Literature: SCHUMANN, 1904: 62; GAGNEPAIN, 1908: 44; LOESENER, 1930: 563.

#### 9. *Camptandra* Ridley

A genus with 3-4 species on the Malay Peninsula and Borneo. A distribution map is given in LARSEN & SMITH (1972). Some species described as *Camptandra* have now been referred to *Caulokaempferia* (see page 113). One species, *C. parvula* (King ex Bak.) Ridley, is common all over the Malay Peninsula and may be expected in S. Thailand.

They are small herbs 10-50 cm, with a leafy stem and a terminal inflorescence surrounded by a large concave, spathe-like bract.

Literature: SCHUMANN, 1904: 62; LOESENER, 1930: 573; HOLTUM, 1950: 78; LARSEN & SMITH, 1972a: 293.

#### 10. *Haniffia* Holtum

This genus is known from only four collections of which three refer to one species, *H. cyanescens* (Ridley) Holtum (Syn.: *Elettariopsis cyanescens* Ridley, *Kaempferia cyanescens* Ridley). This species occurs in Malaysia and S. Thailand. The fourth collection from Bacho Falls in the Naratiwat province, S. Thailand, is mentioned by Holtum as deposited in

Singapore. The material, which does not match *H. cyanescens*, is said to be too poor for description of a new taxon. More material has to be collected at Bacho.

L i t e r a t u r e : H O L T T U M , 1950 : 123.

### 11. *Kaempferia* L.

As the genus is circumscribed here, it contains *ca* 50 species, some in tropical Africa, but most in tropical Asia. In the treatment of SCHUMANN, 1904, the genus *Kaempferia* includes several taxa now referred to other genera e.g. *Caulokaempferia* and some *Boesenbergia* species. Also the treatment of GAGNEPAIN, 1908 includes a number of taxa which have to be excluded.

All the Thai species of *Kaempferia* are low herbs with a deeply divided labellum. They can be divided in three groups:

1) The *K. galanga*-group is characterized by broadly ovate leaves often appressed to the ground. Representations for this group are *K. galanga* L. and *K. pulchra* Ridley. In the Tenasserim area along the rivers Kwae Noi and Kwae Yai a considerable variation occurs and new taxa from this area may be described in the future.

2) The *K. filifolia*-group. In the eastern part of Thailand and in Indo-China a group with upright, narrow, filiform leaves occur. In Thailand, *K. filifolia* K. Larsen represents this group.

3) The *K. rotunda*-group is characterized by the inflorescence occurring in the end of the dry season while the leaves which are large and *Boesenbergia*-like appear in the rainy season. It is common in the deciduous dipterocarp forests of Thailand and Indo-China. It also seems to be cultivated elsewhere.

L i t e r a t u r e : S C H U M A N N , 1904 : 64; G A G N E P A I N , 1908 : 45; L O E S E N E R , 1930 : 564; H O L T T U M , 1950 : 117; L A R S E N , 1962c : 198; B U R T T & S M I T H , 1972a : 185, 216.

### 12. *Roscoea* Sm.

The genus consists of 15 species of low herbs distributed throughout the Himalayas to China. Its main centre is the Yunnan province of China.

So far the genus has not been observed in Thailand, but the Yunnan element is rather characteristic for several plant communities in the high mountains of N. Thailand. Most species are blue or violet-flowered.

Literature: SCHUMANN, 1904 : 115; LOESENER, 1930 : 578; BURTT & SMITH, 1972a : 207.

### 13. *Cautlaya* Hook.f.

A genus closely related to *Roscoea*, it contains only 5 species restricted to the Himalayan region. The flowers are yellow. From the higher altitudes of Doi Intanond, the epiphytic species *C. gracilis* (Sm.) Dandy (Syn. : *C. lutea* (Royle) Hook.f.) has been observed by the author and also has been collected on other expeditions.

Literature: SCHUMANN, 1904 : 122; LOESENER, 1930 : 598; BURTT & SMITH, 1972a : 218.

### 14. *Hedychium* Koenig

About 50 species distributed from Madagascar throughout the Indo-Malesian area to south-western China. One of the best known genera of Zingiberaceae. Easily recognizable by its many-flowered, terminal inflorescence. It is usually medium-sized herbs 50–150 cm tall, some are epiphytic.

In Thailand 7–8 species occur, among which one species, *H. coronarium* Koenig is commonly cultivated all over the tropics. Easily recognizable is *H. coccineum* Buch.-Ham. with narrow leaves and red flowers. Thai species occur mostly in the mountains of the northern and eastern provinces.

Literature: SCHUMANN, 1904 : 40; GAGNEPAIN, 1908 : 70; LOESENER 1930 : 560; HOLTUM, 1950 : 72; LARSEN, 1965 : 71; BURTT & SMITH, 1972a : 197.

### 15. *Caulokaempferia* K. Larsen

This genus of which 12 species have been described, was separated from *Kaempferia* by the author. It is distributed from eastern Himalayas to the Indo-Chinese peninsula (map of distribution in LARSEN & SMITH, 1972). They are low herbs mainly from higher altitudes; most species have a very restricted area. Since the publication of the distribution map, a new species was described by the author from Peninsular Thailand, *C. saksuwaniae* K.

Larsen. Most species are yellow-flowered and terrestrial. *C. saxicola* K. Larsen is often epiphytic and epilithic, *C. alba* K. Larsen & Smith is white-flowered and *C. thailandica* K. Larsen has a whitish labellum with pink tint.

Literature: LARSEN, 1964: 165; 1973a: 157, LARSEN & SMITH, 1972: 287; BURTT & SMITH, 1972a: 210.

#### 16. *Boesenbergia* O. Kuntze

A genus of ca 50 species, still insufficiently known in many respects. Its distribution is Indo-Malaysian with its main centre of variation on the Indo-Chinese Peninsula (including lower Burma, Malay Peninsula, Thailand, Laos, Cambodia and Vietnam). Eight species were reported by Holtum from Malaysia, more than twice that number occur in Thailand. A number of still undescribed species have been collected by the author and will be dealt with in a separate publication. In earlier works, e.g. SCHUMANN, 1904, the species are partly found under the genus *Gastrochilus* and partly under *Kaempferia*.

They are low herbs generally easily recognizable by the more or less concave labellum, crisped along the margin; the colour is often creamy, spotted with red or they may be entirely pink, as in the most common species in Thailand, *B. rotunda* (L.) Mansf. (Syn.: *B. pandurata* (Roxb.) Schltr.). This species with terminal inflorescence is also cultivated as a spice. In Thailand one species only has an elongated stem, also with terminal inflorescence, *B. pulcherrima* (Wall.) O. Kuntze, another common species *B. longiflora* O. Kuntze belong to a group with lateral inflorescences.

Literature: SCHUMANN, 1904: 91; LOESENER, 1930: 568; HOLTUM, 1950: 106; BURTT & SMITH, 1972a: 184; LARSEN & SMITH, 1972: 288.

#### 17. *Scaphoclamys* Baker.

This genus has been widely misunderstood and its members are found in SCHUMANN, (1904) under *Kaempferia*, *Gastrochilus* and *Curcuma*. An excellent account of this Malesian genus was published by HOLTUM (1950), who enumerates 20 species from the Malay peninsula. BURTT & SMITH (1972a) refer the Bornean *Haplochorema polyphyllum* K. Schumann to this genus.

This genus was first reported from Thailand by LARSEN (1962), with one species found at Bacho and Bukit in the Pattani province, *S. biloba* (Ridl.) Holttum. Other species may occur in the evergreen rainforests still insufficiently explored along the Malaysian border.

Literature: HOLTUM, 1950 : 82; LARSEN, 1962b : 191; BURTT & SMITH, 1972b : 315.

## V. Alpinieae

### 18. *Nicolaia* Horan.

This Malesian genus with *ca* 20 species, is in most floristic literature treated under the invalid name *Phaeomeria*. They are tall herbs with a magnificent, lateral inflorescence, often forming dense stands in evergreen rainforests. The inflorescence is densely ovate or conical with red bracts and red to yellow flowers. Some species are cultivated throughout the tropics, mainly *N. speciosa* (Bl.) Horan.

Three species occur in Thailand. This genus has been dealt with by LARSEN (1970).

Literature: SCHUMANN, 1904, 259; LOESENER, 1930 : 593; HOLTUM, 1950 : 178; LARSEN, 1970 : 574; BURTT & SMITH, 1972a : 210.

### 19. *Achasma* Griff.

The three genera *Hornstedtia*, *Nicolaia* and *Achasma* are clearly related. SCHUMANN (1904) includes *Achasma* in *Hornstedtia*, but there are good reasons for keeping them apart. The genus has an Indo-Malesian distribution and consists of *ca* 20 species. Holttum lists 6 species from the Malay Peninsula. At least two species occur in Thailand, *M. macrocheilos* Griff. and *M. megalocheilos* Griff., but the genus is still in need of being collected more intensively in the Malaysian border area; one species occurs in Central and Northern Thailand.

They are tall herbs up to 4 m high with leafy shoots and the inflorescence on a separate shoot often some distance apart. The inflorescence is partly embedded in the ground. The long protruding labellum is red or yellow with red lines or patches.

Literature: SCHUMANN, 1904 : 187; LOESENER, 1930 : 594; HOLTUM, 1950 : 183; BURTT & SMITH, 1972a : 212, 220; BURTT & SMITH, 1972b : 307.

## 20. *Elettariopsis* Baker.

A small Malesian genus of *ca* 10 species, several of which are badly known and some may after closer study be transferred to *Elettaria* or *Amomum*, being closely related to both genera. A discussion of the genus is found in HOLTUM (1950).

They are rather small plants up to 60 cm with lateral inflorescences at ground level, varying from erect, head-shaped to long and prostrate with well-spaced flowers (or cincinni). The flowers are creamy in colour with red stripes on the labellum. The anther-crest is much elongate and as long as the pollen-sacs. *E. triloba* (Gagnep.) Loesener is distributed from Malay Peninsula to Laos and Vietnam and probably also occurs in Thailand. Schumann described one species, *E. schmidtii*, from the Thai island of Koh Chang.

Literature: SCHUMANN, 1904 : 272; GAGNEPAIN, 1908 : 102; LOESENER, 1930 : 602; HOLTUM, 1950 : 214; BURTT & SMITH, 1972b : 312.

## 21. *Hornstedtia* Retz.

A Malesian genus comprising *ca* 20 species which are tall herbs from the evergreen forests. The vegetative shoot is 2-3 m high, the inflorescence is lateral, characterized by its fusiform cone-like appearance. The labellum is red and always rather short which easily distinguishes *Hornstedtia* from *Achasma*. Many species are stilt-rooted.

One widely distributed and very variable species, *H. scyphiphora* (Koenig) Steud., is not infrequent in Peninsular Thailand. HOLTUM (1959) lists 7 species from Malaya, including the above, and there may be more than one species in Thailand.

Literature: SCHUMANN, 1904 : 187; LOESENER, 1930 : 590; HOLTUM, 1950 : 165; BURTT & SMITH, 1972a : 195.

## 22. *Amomum* Roxb.

This is one of the largest genera of Zingiberaceae with *ca* 100 species. It is distributed from India throughout tropical Asia to Australia. The

often tall vegetative shoots and the lateral, basal inflorescences resemble those of *Hornstedtia* and *Achasma*, but the inflorescence always lacks an involucre of sterile bracts. Furthermore it tends to elongate after flowering. The short corolla tube is a good distinguishing character. Most species occur in the evergreen forests of the lowland. From the Malay Peninsula Holttum reports 18 species. Most of these certainly are restricted to the Malayan evergreen forests, but some do occur rather frequently in Thailand, such as *A. uliginosum* Koenig and *A. lappaceum* Ridl. *A. krervanh* Pierre ex Gagnep. is cultivated and grows wild in the Cardamom mountains on the border between Thailand and Cambodia. It is exported as Siamese Cardamom. It seems to be closely related to *A. testaceum* Ridl.

Literature: SCHUMANN, 1904 : 221; GAGNEPAIN, 1908 : 102; LOESENER, 1930 : 599; HOLTUM, 1950 : 192; BURTT & SMITH, 1972a : 210.

### 23. *Elettaria* Maton

A small genus with about 7 species, distributed from Sri Lanka to Borneo. Only one indigenous species occurs on the Malay Peninsula, i.e. *E. longituba* (Ridl.) Holttum. No indigenous species are reported from Burma or Indochina. *E. cardamomum* (L.) Maton (Syn.: *Amomum cardamomum* L., *Cardamomum officinale* Salisb., *Alpinia cardamomum* (L.) Roxb., *Amomum repens* Sonn.) the true cardamom is to some extent cultivated in Thailand as it is throughout the tropics.

Literature: SCHUMANN, 1904 ; 267; GAGNEPAIN, 1908 : 107; HOLTUM, 1950 : 236, BURTT & SMITH 1972a : 182.

### 24. *Geocharis* Ridley.

A small Malesian genus of 4-5 species of which 2 species are found on the Malay Peninsula. Very few collections exists. The leafy shoot is from 50-200 cm, and the inflorescence lateral on a rather long, slender, erect peduncle. The flowers are born singly, the fruits are elongated. It has characteristic cross-bars between the ribs of the leafsheaths as *Hornstedtia scyphiphora*. The flowers are yellow with an orange labellum. *G. secundiflora* (Ridl.) Holttum, found as far north as Kelantan, may be expected in Peninsular Thailand.

Literature: HOLTUM, 1950 : 220.

### 25. *Geostachys* Ridley

About 16 species belong to this genus known from the Malay Peninsula where it has its largest number of species, also in Sumatra, Thailand and Cambodia. It is related to *Alpinia*. The species are medium-sized herbs up to one metre tall with leafy shoots and lateral inflorescences close to, but always above the ground. The flowers are creamy in colour, often with pink or red markings on the labellum. Most species are stilt-rooted and occurring in the evergreen forest, often in the mountains. It shows the same tendency as *Caulokampferia* to develop local endemisms at higher altitudes. In Thailand 3-4 species occur, one still undescribed. The genus will be treated by the author in a forthcoming paper.

Literature: SCHUMANN, 1904: 277; GAGNEPAIN, 1908: 100; LOESENER, 1930: 605; HOLTUM, 1950: 224; LARSEN, 1962a: 43; 1972: 241; STONE, 1980: *in press*

### 26. *Plagiostachys* Ridley

A small Malesian genus with *ca* 15 species characterized by a rather tall leafy shoot 1-3 m high, and by the inflorescence which is apical on a short stem of the leafy shoot, breaking through the leaf-sheaths and therefore appearingly lateral. Schumann has some species under *Alpinia*, but as pointed out by HOLTUM (1950), it seems closer to *Amomum* than to *Alpinia*. No species has so far been found in Thailand or Indo-China.

Literature: LOESENER, 1930: 627; HOLTUM, 1950: 160; BURTT & SMITH, 1972b: 315.

### 27. *Pommereschea* Wittmarck

Two closely related species have been described from Upper Burma. Until recently they were known only from the classical localities in Burma. In 1973, the author published the discovery of *P. lackneri* Wittmarck from Northern Thailand where it is known from Doi Chiang Dao, an isolated limestone mountain. It has been collected here on several expeditions at altitudes from 1100-2200 m.

Literature: SCHUMANN, 1904: 279; LOESENER, 1930: 607; LARSEN, 1973b: 472.



### 28. *Cenolophon* Blume

A small genus with 10–12 species ranging throughout South-East Asia. The genus is recognizable by having flowers borne singly on main-axis, the primary bracts being small to absent and by the well-developed anther-crest. The flowers are creamy.

One species *C. oxymitrum* (K. Schum.) Holttum is common in Southern and Central Thailand in evergreen forests, as well in lowland evergreen forests as in hillside evergreen forests at higher altitudes. So far no other species has been reported from Thailand, but 2–3 Malayan species occurring just south of the border may be expected in the pensular evergreen forests. On Koh Chang, the flowers of *C. oxymitrum* are smaller than on plants from the mainland.

Recent palaeontological studies have shown that a species very close to *C. oxymitrum* is found in central and northern European tertiary deposits (FRIEDRICH & KOCH, 1972).

Literature: HOLTUM, 1950 : 132; BURTT & SMITH, 1972a : 212; 1972b : 310.

### 29. *Alpinia* Roxb.

HOLTUM (1950) in his treatment of the Malayan *Alpinieae*, accepted as distinct genera *Catimbium* and *Languas* in addition to *Cenolophon* and *Geostachys*. BURTT & SMITH (1972) showed that *Languas* includes *Alpinia galanga*, the conserved type of *Alpinia*. *Catimbium* was also shown by these authors to be untenable. The present author therefore follows BURTT & SMITH in the treatment of the genus *Alpinia*.

Three groups are distinguishable in Thailand.

1. The *Alpinia galanga*-group also by SCHUMANN (1903) called *Alpinia* subgen. *Autalpinia* sect. *Hellenia*, by Holttum, *Languas*. Following the present rules of botanical nomenclature the name should be *Alpinia* subgen. *Alpinia* sect. *Alpinia*. The richly branched inflorescence with numerous rather small, green flowers are characteristic. Most botanists are well familiar with the commonly cultivated *A. galanga* (L.) Willd. It may also be indigenous to Thailand, other species have not been reported from Thailand so far.

2. The *Alpinia conchigera*-group, by Schumann called *Alpinia* subgen. *Dieramalpinia* sect. *Strobidia*. Most of Schumann's *Dieramalpinia* would fit Holttum's genus *Alpinia*. This group has also rather small flowers with funnel-shaped secondary bracts. It is a large group distributed throughout South-East Asia to Australia, but essentially eastern Malesian. Two species occur in Thailand, *A. conchigera* Griff. and the closely related *A. siamensis* K. Schum.

3. The *Alpinia zerumbet*-group, by Schumann *Alpinia* subgenus *Catimbium* and by Holttum *Catimbium* Lestid. This generic name is illegitimate. This group is characterized by its deciduous, not funnel-shaped bracts, the large secondary bracts enclosing the whole cincinnus and the large, white flowers with orange-yellow and reddish labellum. There may be about 25 species in this group distributed from southern China and Japan throughout South-East Asia to Papua. In Thailand *A. zerumbet* (Pers.) Burtt & Smith [Syn.: *A. speciosa* (Wendl.) K. Schum., *Catimbium speciosum* (Wendl.) Holttum] is common and there are 5-6 other species distributed throughout the country in the lowlands and up to high altitudes.

Literature: SCHUMANN, 1904: 308; GAGNEPAIN, 1908: 85; LOESENER, 1930: 611, HOLTUM, 1950: 125; BURTT & SMITH, 1972a: 178, 186, 197, 200, 204; 1972b: 305.

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