

## New Taxa and Combinations in the Genus *Diplycosia* (Ericaceae) of Borneo and Peninsular Malaysia.

G.C.G. ARGENT

Royal Botanic Garden Edinburgh,  
Edinburgh EH3 5LR, U.K.

### Abstract

Seven new species of *Diplycosia* and one new form are described: *D. abanii*; *D. mogaena*; *D. rhombica*; *D. mantorii*; *D. othmanii*; *D. paulsmithii*; *D. ngii* and *D. salicifolia* Sleumer forma *gigantea*. The genus *Pernettyopsis* King & Gamble is reduced to synonymy with *Diplycosia* and the relevant new combinations are made. Advice on collecting material of the genus is given.

### Introduction

The genus *Diplycosia* Blume was effectively monographed for Flora Malesiana (Sleumer 1966—1967), as all but two of the 97 species then recognised occurred in the Malesian region. Since then there has been little interest in a genus of small epiphytic shrubs with rather insignificant flowers and no known economic value. A few new species have been described (Argent 1982, 1989) and new accounts of the Kinabalu species have been published (Argent in Wong & Phillipps, 1996; Beaman *et al*, 2001), but there is little there to advance our understanding of the relationships within the genus. Molecular work (Kron, 2001) suggests that the genus is nested within *Gaultheria* although morphologically it remains quite distinct and only very rarely is there any problem in referring even sterile plants to one or other of these genera. The genus is most diverse in Borneo with well over half the total number of described species and Mt Kinabalu remains by far the richest single locality with 27 species known from its environs. In the present paper, one new species from Peninsular Malaysia and six new species and one new form from Borneo are described emphasizing Borneo as the centre of diversity of the genus.

The genus is under-collected partly because of the small flowers but also because many species are epiphytes growing in peaty accumulations on large trees and are thus inaccessible. Even when they are collected the resulting specimens are often poor. Collections made with field descriptions of flowers often lack them in the herbarium as the flowers easily fall off in drying and careless handling. Details of indumentum (of great importance in discriminating taxa) are often difficult to interpret because young stems

(which do not carry flowers) are not collected and old ones lose bristles and hairs or conversely appear to gain them with the erect branches of algal epiphytes. Field descriptions of the fruit may eventually lead to useful subdivisions within the genus but these are rarely adequate and need to be made preferably with field sketches of the fruit structure which, because of its fleshy nature, is lost on pressing and drying. Variations in both wild and cultivated specimens observed have led to the proposal in this paper to reduce the genus *Pernettyopsis* King & Gamble to synonymy with *Diplycosia*. There are undoubtedly many more species to be recognised and described especially from the mountains in Borneo but more, carefully prepared collections are needed. Specimens should preferably possess open flowers, some of which should be separated on collection into a numbered packet so that they are less likely to be lost on drying and handling. Next most important is to look carefully for some new young but fully or nearly fully expanded leafy shoots which will show the indumentum structure clearly. If there are mature fruits, a quick sketch showing which parts are fleshy and the relative position and length of calyx lobes to ovary might ultimately prove illuminating. Sterile specimens with the indumentum in good condition are still worth collecting as these can often still be identified to a species.

*Diplycosia* species are not especially easy to cultivate although we have maintained at least one of our collections in the Royal Botanic Garden Edinburgh for more than 25 years. It would undoubtedly give interesting information as to variability if more species could be grown satisfactorily. Some species are extremely attractive plants with a dense golden-brown indumentum but unfortunately these have proved to be the most difficult to keep alive in cultivation.

### New Taxa

#### 1. *Diplycosia abanii* Argent, *sp. nov.*

(Named after the collector of the species from the Forestry Department in Sandakan, Sabah.)

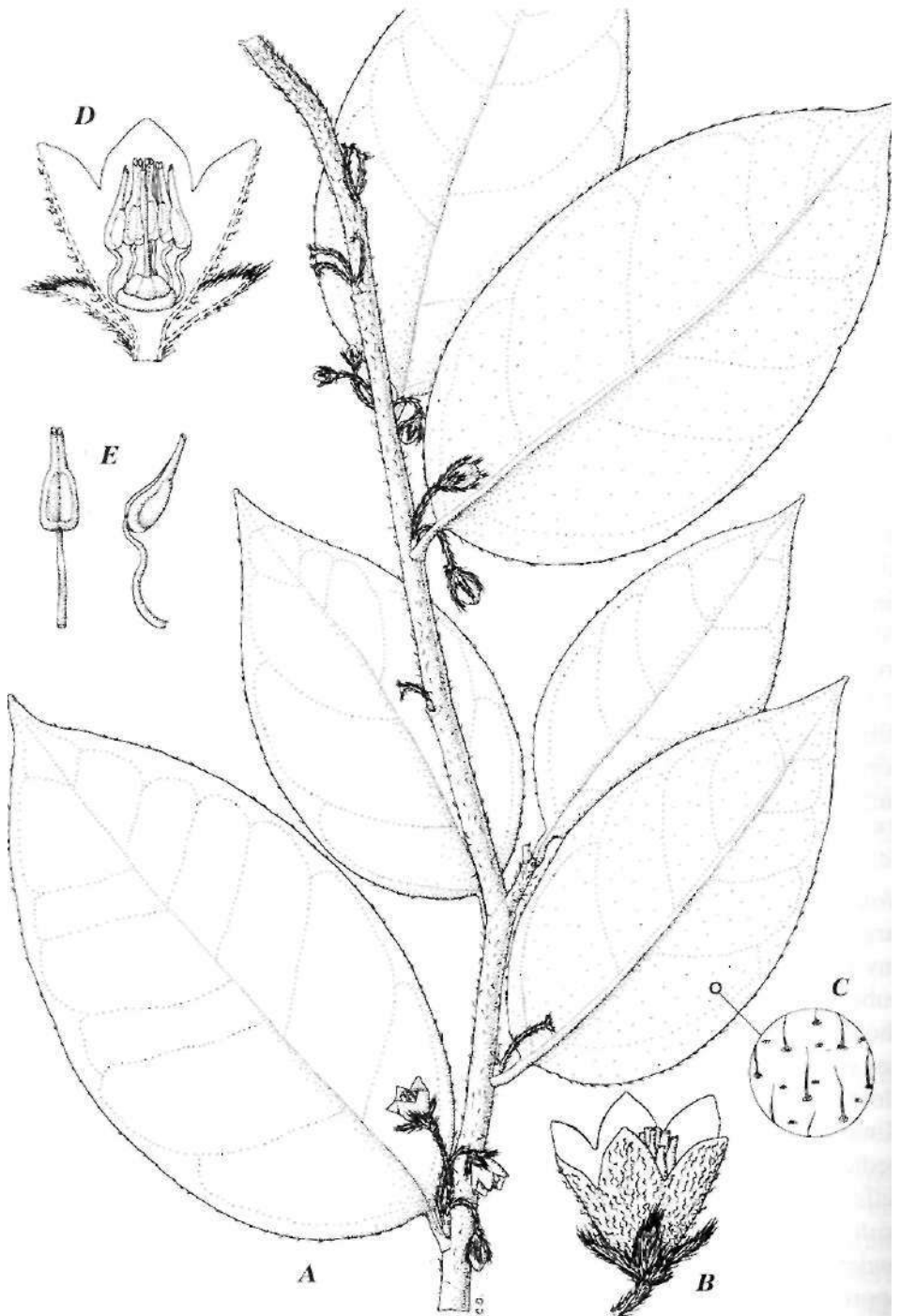
*Diplycosiae clementium* Sleumer similis sed setis in pedicellis calyceque adpressis, foliis laevibus (haud rugosis) cum reticulo obscuro, venis lateralibus abaxialibus haud elevatis et setis in pagina inferiore foliorum brevioribus magis sparsis et semiadpressis (non patentibus) praecipue differt.

**Typus:** Borneo: Sabah, Beluran District, Bukit Monkobo, 15 March 1982, *Aban Gibot* SAN 95227 (holo SAN; iso A *nv*, BO, K *nv*, KEP *nv*, L, SAR *nv*, SING *nv*).

**Figure 1**

Shrub 1-2 m tall, stems covered in coarse, brown, semi-appressed bristles but with no obvious finer indumentum. Petiole 4-7 x 1-2 mm, with semi-appressed bristles, becoming glabrescent with age. Leaf blade ovate to broadly elliptic, 6-10 x 2.5-4.5 cm, glabrescent above, sparsely setose below with variable length setae which are more or less appressed, these breaking off to leave a black punctate surface where old and abraded, not especially setose on the midrib; coriaceous, base rounded; margin entire, slightly revolute at first fringed with rather fine semi-erect bristles; apex shortly acuminate, usually with a fine acute point but occasionally rounded, the terminal gland small and not especially conspicuous, midrib impressed above, distinctly prominent beneath, lateral veins plane or minutely impressed above, plane beneath, pinnate, 3-7 per side, spreading at *c.* 45 degrees and then arching round to link with the one above and thus creating a rather indistinct, looping intramarginal vein. Flowers fasciculate or solitary, 1-2 per axil; pedicels at anthesis 10-12 mm long and less than 1 mm thick, densely covered with appressed bristles that are up to 2.5 mm long. Bracteoles *c.* 1 mm long, almost semi-circular, the backs and edges with long semi-appressed to appressed bristles. Calyx *c.* 4 mm long with erect, appressed bristles, tube *c.* 1.5 mm long, lobes *c.* 2.5 mm long. Corolla *c.* 5.5 mm long with a slightly verrucose surface and some crimped hairs outside, glabrous inside, lobes 3.5 mm long, triangular with broadly acute points. Stamens *c.* 4 mm long, filaments sigmoid, glabrous, *c.* 2 mm long; anthers *c.* 2.75 mm long, echinulate. Disc glabrous; ovary glabrous, style *c.* 3.5 mm long, cylindrical, glabrous. Fruit not seen.

*Notes:* This distinctive species keys out in Sleumer (1966-67) with the larger leaved, coarsely hairy species. The type specimen does not have any young shoots and so it is not absolutely certain that there is not a fine puberulous indumentum in the young state but none of the stems examined show any evidence of this. In any case this specimen does not agree with any of the species that have this character. *Diplycosia abanii* appears most closely related to *D. clementium* Sleumer, a common species on Mt. Kinabalu and also recorded from N Sarawak. Both have the slender pedicels, hairy corolla and a similar general venation pattern, but *D. abanii* differs in its longer patent bristles on all conspicuous parts, rugose leaves with much more pronounced venation, the main lateral veins on the underside of the leaves being strongly raised. *D. aurea* Sleumer has appressed bristles but these are much denser on the undersides of the leaves and the pedicels are quite different, being much thicker, 1.5-2 mm wide and the bracteoles are larger and more densely hairy. Bukit Monkobo



**Figure 1.** *Diplycosia abanii*. All from *Aban* 95227: A. habit x 1; B. flower x 3; C. abaxial leaf surface x 25; D. half flower x 3; E. stamens x 5.

is an isolated peak away from the main mountain ranges that might well be expected to have other endemic species. The fruits are described as hairy and brownish on the label but this undoubtedly refers to the bristly calyx which becomes fleshy and forms the 'false fruit'; the ovary itself is glabrous. The collection is described as coming from "hill top mossy forest" and is probably restricted to the small area of this type of forest about the summit of Bukit Monkobo where it is probably an epiphyte.

## 2. *Diplycosia mogeana* Argent, *sp. nov.*

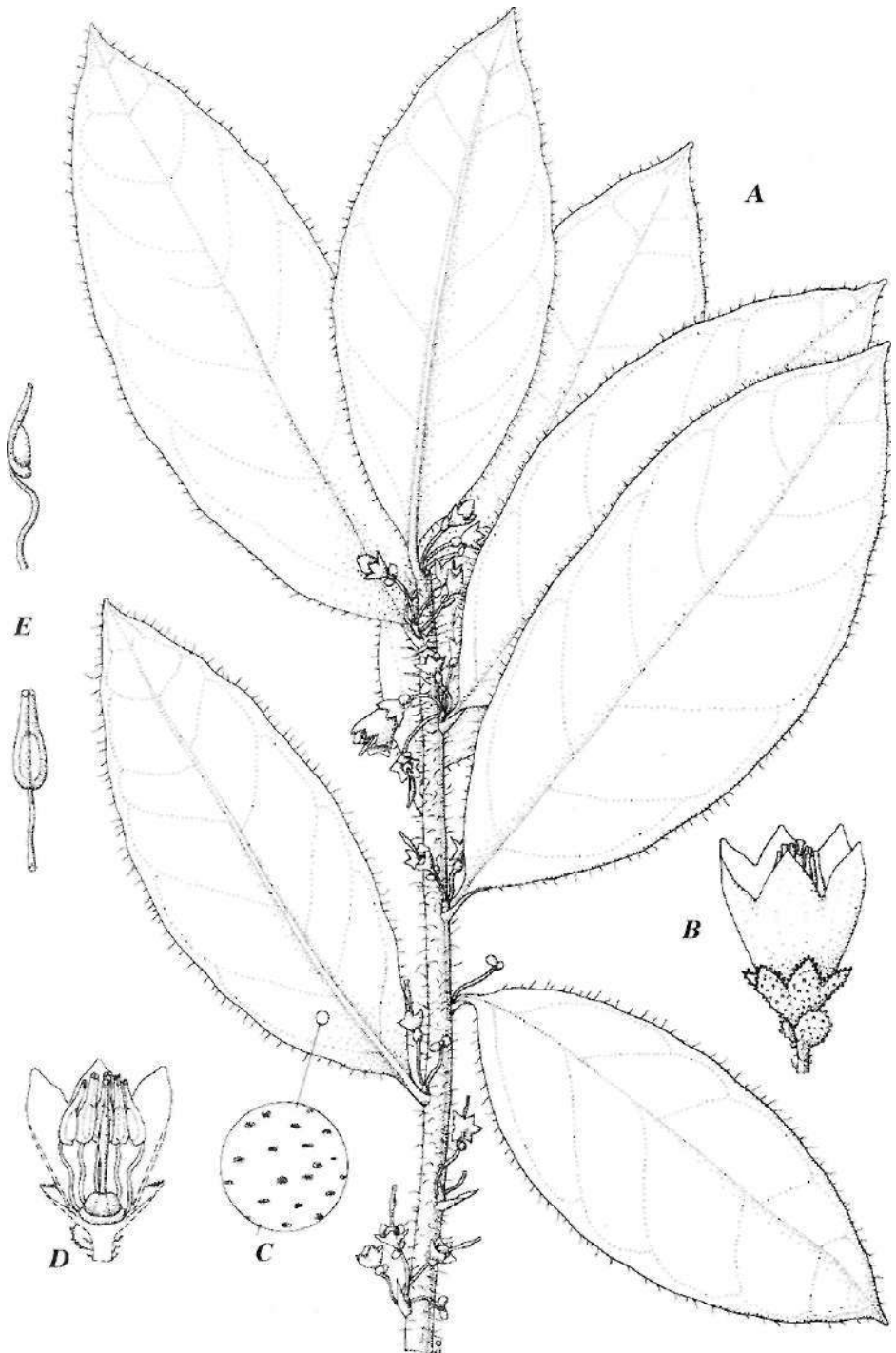
(Named in honour of the collector of the type material, Dr Joannis Mogeia, formerly curator of Herbarium Bogoriense).

*Diplycosiae clementium* Sleumer et *D. abanii* Argent (supra) affinis sed ab ambabus foliorum basibus cuneatis, calyce sine setis et corolla glabra differt.

**Typus:** Borneo: Central Kalimantan, Bukit Raya and upper Katingan (Mendayai) River area *c.* 10 km. NNW of Tumbang Tosah at camp 2, *c.* 112° 50'E 0° 30'S, 1<sup>st</sup> Dec. 1982, *Mogeia 3814* (holo BO; iso L).

### Figure 2

Semi-epiphytic shrub 1 m tall, stems at first covered in coarse, brown, patent bristles but with no finer indumentum. Petiole 6-8 x *c.* 2 mm, with irregularly patent bristles which often persist for some time. Leaf blade elliptic, 6-11.3 x 2.5v3.5 cm, glabrescent above leaving the surface obscurely punctate, sparsely setose below on the veins, the surface distinctly punctate with hair bases and a few much larger black gland-like structures; coriaceous, base cuneate; margin entire but with rather persistent setae along the edge, flat or very slightly revolute, apex narrowly acute or slightly acuminate, with a fine acute point, the terminal gland small and not especially conspicuous, midrib very slightly impressed above and distinctly prominent beneath, lateral veins plane above, distinctly prominent beneath, venation pinnate with 3-7 lateral veins per side, spreading at *c.* 45° in the basal half but much more widely in the upper part, each arching round to link with the one above. Flowers fasciculate or solitary, up to 3 per axil; pedicels 2-6 mm at anthesis, *c.* 1 mm thick and apparently increasing in thickness in fruit, densely covered with semi-erect bristles that are often curved. Bracteoles *c.* 1 mm diam., almost semi-circular, the backs with a few bristles at the base and the edges glandular fimbriate. Calyx *c.* 4 mm, tube *c.* 1.5 mm long, the lobes triangular, *c.* 2.5 mm long, glandular fimbriate along the edges otherwise glabrous. Corolla *c.* 6 x 5 mm, glabrous, lobes 2 x 2 mm with rather thick blunt points, glabrous inside, lobes 3.5 mm long, triangular with broadly acute points. Stamens *c.* 4 mm long, filaments sigmoid, glabrous, *c.* 2 mm long; anthers *c.* 2.75 mm long, echinulate. Disc



**Figure 2.** *Diplycosia mogeana* All from *Nooteboom* 4586: A. habit x 1; B. flower x 3; C. abaxial leaf surface x 25; D. half flower x 3; E. stamens x 3.

glabrous; ovary glabrous, style c. 4.5 mm, swollen about the middle, glabrous. Fruit not seen.

*Notes:* This species keys out in Sleumer (1966-67) to couplet 24 but the characters do not fit either species remaining beyond this lead: *Diplycosia rufescens* Schltr. from Papua New Guinea and *D. triangularanthera* J.J.Sm. from Sulawesi are unlikely allies purely from a geographical point of view as very few *Diplycosia* species occur on more than one island. Both of these species have much smaller leaves and flowers than *D. mogeana*. Of the Bornean species, it is most similar to *D. clementium* Sleumer and *D. abanii* Argent (described above) but it differs from both in having cuneate leaf bases and lacking bristles on the calyx and hairs on the corolla. The type is described as a semi-epiphytic shrub growing in primary mossy rain forest at 1600 m, c. 1 m tall with pale greenish flowers and the leaves very pale beneath. The Nootboom collection, however, is described as a treelet 3 m tall with white flowers growing at 1500 m.

*Specimen examined:* Borneo, Kalimantan, Bukit Raya, 112° 42'E 0°39'S, 24<sup>th</sup> Jan 1983, *Nootboom 4586* (L),

### 3. *Diplycosia rhombica* Argent, *sp. nov.*

(Named from the distinctive narrowly rhomboidal shape of the leaves).

*Diplycosiae microsalicifoliae* Argent similis sed ambitu folii rhomboideo et pedicellis multo (plus quam triplo) longioribus, petiolis cum indumenti vestigiis praeditis recedit.

**Typus:** Borneo, Sabah, Lahad Datu District, on the ridge top of Mt Tribulation, 4° 51'N 117° 39'E, 16<sup>th</sup> Aug 1976, *Cockburn SAN 84884* (holo K; iso BO *nv*, KEP *nv*, L *nv*, SAR *nv*, SING *nv*).

#### Figure 3A

Small shrub to c. 60 cm tall. Branches densely leafy, grooved and angled when dry, glabrous or with traces of a very fine, minute, whitish pubescence. Petiole 2-4 x c. 1 mm, weakly grooved above, sometimes slightly verruculose and with few small simple white hairs. Leaf blade narrowly rhomboid or narrowly elliptic, (25-)35-53 x (5-)8-13 mm, somewhat coriaceous; base narrowly attenuate; margin entire, flat and smooth or sometimes slightly undulate; apex acute with a prominent apical gland which often forms a mucronate tip, glabrous and smooth above, punctate with black glands below but otherwise hairless; veins ± obsolete except for the slender midrib which is not raised above and only minutely so beneath. Flowers solitary

or in pairs from the leafy axils. Pedicels, glabrous, up to 16 x 0.3 mm. Bracteoles broadly ovate, *c.* 8 mm long, fimbriate, with glands along the margins. Calyx *c.* 2.3 mm long, lobes 0.8 mm long, deltoid, fimbriate, with glands along the margins, and occasionally on the abaxial surface, otherwise glabrous, lacking a conspicuous terminal gland but with a subapical swelling on the abaxial side of each lobe. Corolla (submature) to *c.* 2 mm long, pink, subglobose, glabrous, lobes *c.* 0.3 mm. Filaments linear, flattened, glabrous, *c.* 1 mm long; anther cells *c.* 0.8 mm long, finely granular echinulate, tubules narrow, *c.* 0.3 mm long. Disc glabrous; ovary glabrous *c.* 1 mm long, style, *c.* 1mm, glabrous, slightly swollen near the middle. Fruit not seen.

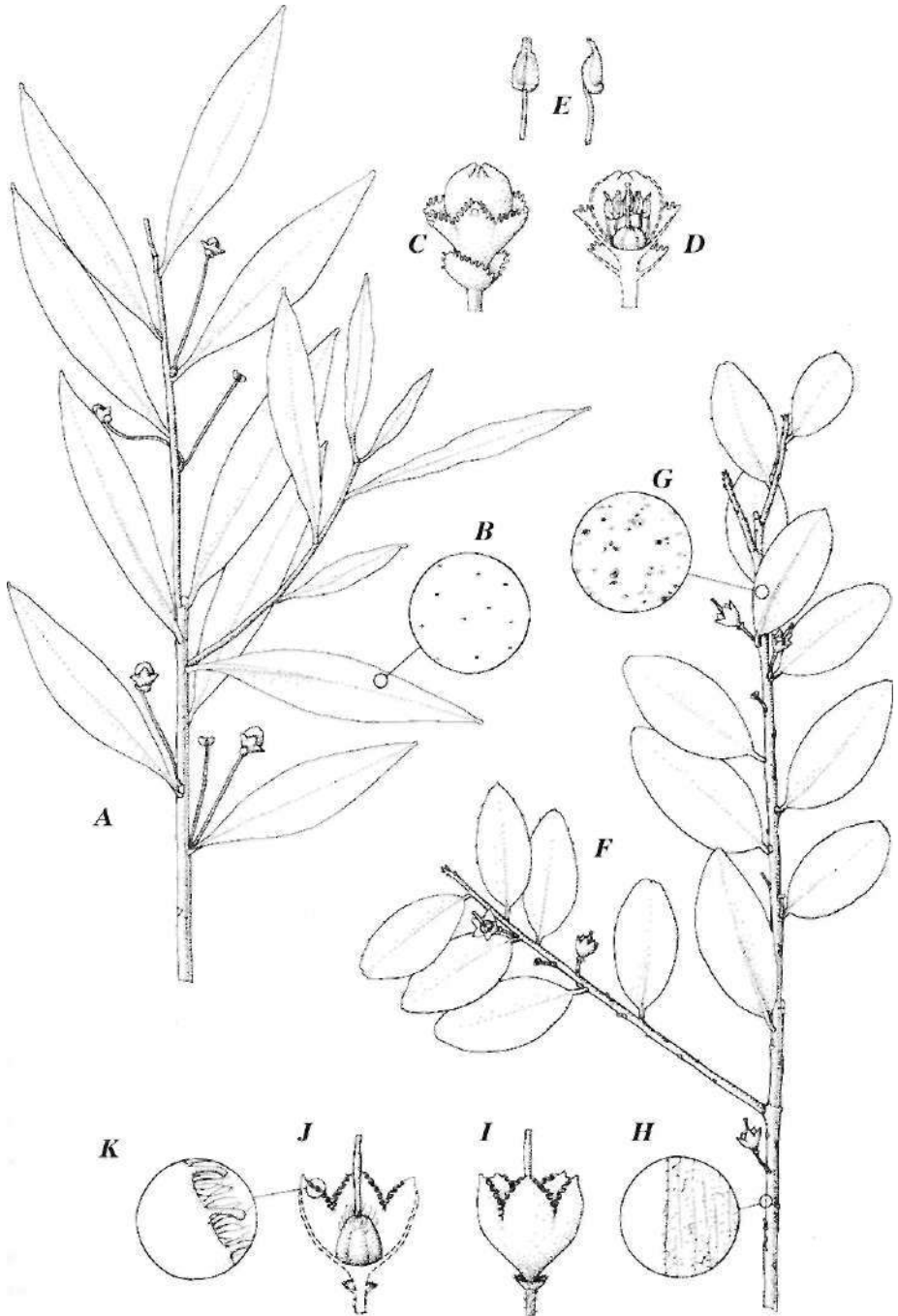
*Notes:* This very distinct species unfortunately lacks fully open flowers and there are no young branches to unequivocally display the indumentum. Most branches examined are completely glabrous, but there are traces of a fine white indumentum in a few places on the stems and several of the petioles have traces of a simple, short white indumentum, which is usual only in species which have hairy stems when young. Superficially *Diplycosia rhombica* looks similar to some forms of *D. microsalicifolia* Argent (1982) but the very long filiform pedicels more than 10 mm long are quite different to the short, 3-5 mm pedicels of *D. microsalicifolia*. It keys out in Sleumer (1966-1967) on the basis of the stem having a fine white puberulence to *D. kemulensis* J.J.Sm. but that species has much larger triplinerved leaves and short pedicels only 4 mm long and is described as having 4-merous flowers. If keyed as if the branches are completely glabrous, *D. rhombica* agrees with neither alternative at couplet 103 as the pedicels are completely glabrous and it is quite different from the three Bornean species beyond this point in the key, *D. urceolata* Stapf, *D. commutata* Sleumer and *D. heterophylla* Blume var. *latifolia* (Blume) Sleumer, as in these species all three have prominent lateral veins in the leaves, which this new species does not. Mt Tribulation, from which *D. rhombica* comes, is an isolated ultramafic mountain both features commonly associated with endemism and it is not surprising to find this novelty growing near the summit at *c.* 800 m (2,600 ft.). It is reminiscent of *D. sphenophylla* Sleumer on Kinabalu that also appears to be restricted or at least most common in ultramafic areas.

#### 4. *Diplycosia mantorii* Argent, *sp. nov.*

(Named after the collector, Asik Mantor).

Caulibus pubescentia humili rigida brevi patenti tantum instructis, foliis usque ad 26 x 12 mm venis lateralibus fere perfecte obscuris, pilis longis





**Figure 3.** *Diplycosia rhombica* All from Cockburn SAN 84884: **A.** habit x 0.8; **B.** abaxial leaf surface x 25; **C.** flower x 3; **D.** half-flower x 3; **E.** stamens x 5. *Diplycosia mantorii* Type: **F.** habit x 1; **G.** abaxial leaf surface x 25; **H.** stem surface x 25; **I.** flower lacking stamens and corolla x 3; **J.** partial l.s. section to show ovary and style x 3; **K.** margin of calyx lobe x 25.

ovarii e parte superiore exorientibus insignis.

**Typus:** Borneo, Sabah, Penampang District, Tunggol FH. Km 45, Jin. K. Kinabalu, c. 6° 14'N. 116° 25'E 17 July 1986, *Asik Mantor SAN 113779* (holo K; iso KEP, SAN).

### Figure 3B

Climber to 4 m tall. Branches laxly leafy. Stems covered in a very short (c. 0.02 mm long) rigid, patent, pubescence together with a few much longer caducous, glandular hairs on the youngest stems. Petiole 1.5-2 x c. 1 mm, weakly grooved above, with the same short pubescence as the stems. Leaf blade elliptic, 13-26 x 5-12 mm, glabrous above with a distinctly finely undulate surface when dry, somewhat irregularly punctulate below, puncta probably representing gland bases, coriaceous; base broadly cuneate; margin more or less entire when mature and very slightly revolute but finely denticulate when young with glandular hairs in the angles, these sometimes leaving minute puncta after being shed; apex rounded, sometimes mucronate and/or retuse, the terminal gland occasionally conspicuous but mostly obscure.; midrib slightly depressed but mostly rather obscure above, slightly raised and much more distinct below, lateral veins almost entirely obscure, occasionally 1-2 traces from near the base arching upwards. Flowers solitary, mostly from upper leaf axils; pedicels short and slender, 2-3 x 0.5 mm, covered with fastigiate glandular hairs. Bracteoles small, c. 0.5 mm wide, ± semi-circular and fimbriate round the edges. Calyx c. 4 mm long, tube c. 2 mm long, glabrous, lobes c. 2 mm long, triangular with broadly acute points, densely hairy and glandular along the margins otherwise glabrous, without any distinctively large gland at the apex. Corolla and stamens not seen. Disc glabrous; ovary with long but rather sparse erect hairs on the upper half, style c. 2.5 mm long, with a few appressed hairs near the base, otherwise glabrous. Fruit not seen.

*Notes:* If the anthers were known this species might key out in Sleumer (1967) to *D. consobrina* Becc, which is recorded from low altitude on Gunung Serapi (Mt. Mattang) in Sarawak, but that species has bristles on the stems and has distinctly 3- or 5-veined leaves. Ignoring stamen morphology, it keys out with some difficulty in both Sleumer (1967) and Argent (1989) to *D. kemulensis* J.J.Sm, but that species is from much higher altitudes and has larger triplinerved leaves and a glabrous ovary. This very distinctive new species looks superficially like *D. elliptica* Ridl, but is totally lacking in the long bristles that clothe the stem in that species, it also lacks the stipule-like axillary perulae that are usually distinctive in *D. elliptica*, and *D. mantorii* has dense glandular hairs on the pedicels

compared with the almost glabrous pedicels of *D. elliptica*. *D. mantorii* is from one of the low hills rising from the coastal plain between Kota Kinabalu and Kota Belud and although described as a climber, it is almost certainly an epiphyte probably rooting along its stems into moss or peaty accumulations as opportunities occur. More material with good flowers is needed to complete the description but *D. mantorii* is unlikely to be confused with any other *Diplycosia* species.

Another collection *Argent 25108518*, also from Sabah, but from much further south at Long Pa Sia, Sipitang District, agrees very closely with the above specimen differing only in the larger leaves up to 3 cm long. It is also incomplete, having only old pedicels with the bracteoles still attached although the field note states "fruits grey-blue with short pedicels".

### 5. *Diplycosia salicifolia* Sleumer forma *gigantea* Argent, *forma nov.*

A forma *salicifolia* foliis multo latioribus (usque ad 5 cm latis versus 2 cm latis) et caulibus novellissimis minute pubescentibus differt.

**Typus:** Malaysia, Sabah, Long Pa Sia, Sipitang District, c. 4° 26'N 115° 44'E. 25<sup>th</sup> Oct. 1985 *Argent & Lamb 2510859* (holo SAN; iso *Anv*, E, L).

*Notes:* The type specimen was growing with vigorous hanging stems to 3 m long in submontane forest as an epiphyte on a tree just above the flood zone of a river at c. 1100 m altitude. It is without flowers but has pedicels and bracteoles in good condition. In all observable respects it agrees with *Diplycosia salicifolia* except in the very much larger leaves up to 5 cm wide (up to 2 cm in the type form) and the puberulous stems (glabrous in forma *salicifolia*). The vigorous stems and broader leaves might be accounted for by the lower altitude and different habitat from that of the type form, which was from a ridge on Gunung Mulu between 2010-2200 m. However, another collection from the Long Pa Sia area in the Sandakan herbarium, *Lamb & Doloi 69*, from a similar altitude to this new form, is much more similar to the typical form. These collections represent new records of *D. salicifolia* from Sabah and reinforce the relationship of the flora of the Long Pa Sia region with that of the G. Mulu and G. Murud complex in northern Sarawak.

### 6. *Diplycosia othmanii* Argent, *sp. nov.*

(Named after the senior collector of the type specimen, Hj. Othman of the Sarawak Forest Department).

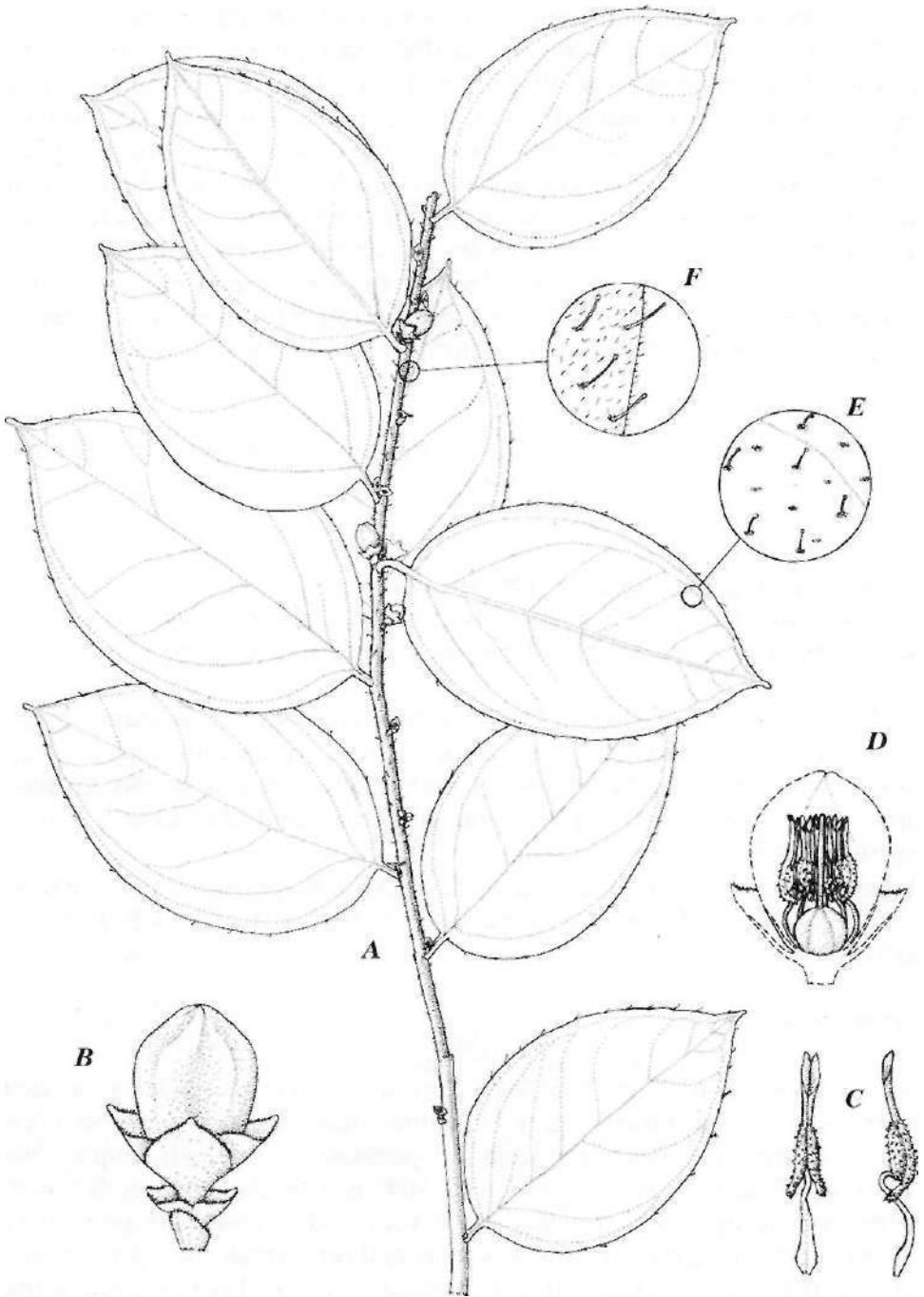
Foliis majusculis ad apicem caudatis venis arcuatis supra basem exorientibus, pedicellis brevissimis et antheris sagittatis brachiis basalibus longis distincta.

**Typus:** Borneo, Sarawak, Ulu Sg. Mengiong, Balleh, Kapit District, 19 Oct 1988, *Othman & Rantai Jawa S55787* (holo SAR; iso E, K, KEP nv., L).

#### Figure 4

Epiphytic shrub. Branches laxly leafy, covered in long gland-tipped bristles and with a short, white, patent indumentum. Petiole 3-4 x *c.* 1 mm, with both long glandular hairs and short, white, patent bristles. Leaf blade broadly elliptic to ovate, 4.5-5.3 x 2.1-3.3 cm, glabrescent above, laxly covered with rufous bristles, with dark bases beneath; leathery, base rounded or broadly tapering, shortly contracted into the petiole, margin flat, minutely crenulate and at first fringed with bristles, apex mucronate to shortly caudate, the terminal gland small, major lateral veins 2-3 on each side, curved ascending, mostly arising above the blade base, narrowly impressed above, very slightly raised beneath. Flowers axillary, solitary or in pairs. Pedicels very short *c.* 1.5 mm long. Bracteoles almost sessile, semicircular, *c.* 1 mm wide, glabrous except for the shortly white ciliate margin. Calyx up to *c.* 2.7 mm long, glabrous outside, lobes deltoid, *c.* 1 mm long, fringed with very short, white hairs, without any trace of terminal or marginal glands. Corolla *c.* 4.8 mm long, glabrous. Stamens *c.* 3.8 mm long; the filaments *c.* 2 mm long, flattened, glabrous, expanding just above the base and then tapering upwards; anthers 2.4 mm long, thecae *c.* 1.2 mm long, dark brown, coarsely echinulate and with long basal free 'arms' to *c.* 0.5 mm long, tubules smooth, paler brown to *c.* 1.2 mm long, opening with a broad oblique pore which extends to half the tubule length. Disc glabrous; ovary glabrous, subspherical, to *c.* 1.6 mm, style glabrous, *c.* 2.4 mm long. Fruit not known.

*Notes:* Similar to *Diplycosia pilosa* Blume from West Java at least in some key characteristics, but *D. othmanii* has very different leaf venation with its weakly raised pinnate lateral veins compared to the very distinct strongly abaxially raised and arching lateral veins of *D. pilosa*, *D. othmanii* also lacks the distinct revolute edge of *D. pilosa*. The most distinctive features of *D. othmanii* are the very short pedicels, the caudate leaf apices and the long spreading prolongations at the base of the anthers. It keys out in Sleumer (1966-1967) with *D. microphila* Becc. and *D. kostermansii* Sleumer, but it has much larger leaves than either of these species. Alternatively, it would key out in Argent (1989) to *D. memecyloides* Stapf, but that species has no long glandular bristles on the stems. The leaf venation, where the main veins usually arise from well above the base of the blade, is also distinctive.



**Figure 4.** *Diplycosia othmanii* All from *Othman & Jawa S 55787*: A. habit x 1.2; B. flower bud x 4; C. stamens x 6; D. half flower bud x 4; E. abaxial surface of the leaf x 25; F. surface of the stem x 25.

A second collection, S 8679, agrees well with the type although it has no flowers. It is slightly more slender than the type with the leaves up to 21 mm wide and with less pronounced caudiform apices and broadly tapering rather than rounded bases. It is possible that the description of green fruits on the label actually applies to the flowers as the specimen has no fruits. The type was described by the collector as an epiphyte at 5 m in mixed dipterocarp forest, it is unclear whether 5 m refers to altitude or the height up the host tree. That it grows in dipterocarp forest suggests that this species is found at low altitudes and the Brunig collection confirms this as it was collected at *c.* 15 m altitude (50 ft) in very wet *kerapah* (swampy heath forest) at the foothill of a terrace in a mossy sheltered position.

*Specimen examined:* Borneo, Sarawak, Bintulu District, Sungai Penyilam, 17<sup>th</sup> Feb 1961, *Brunig S 8679* (SAR).

### **7. *Diplycosia paulsmithii* Argent, sp. nov.**

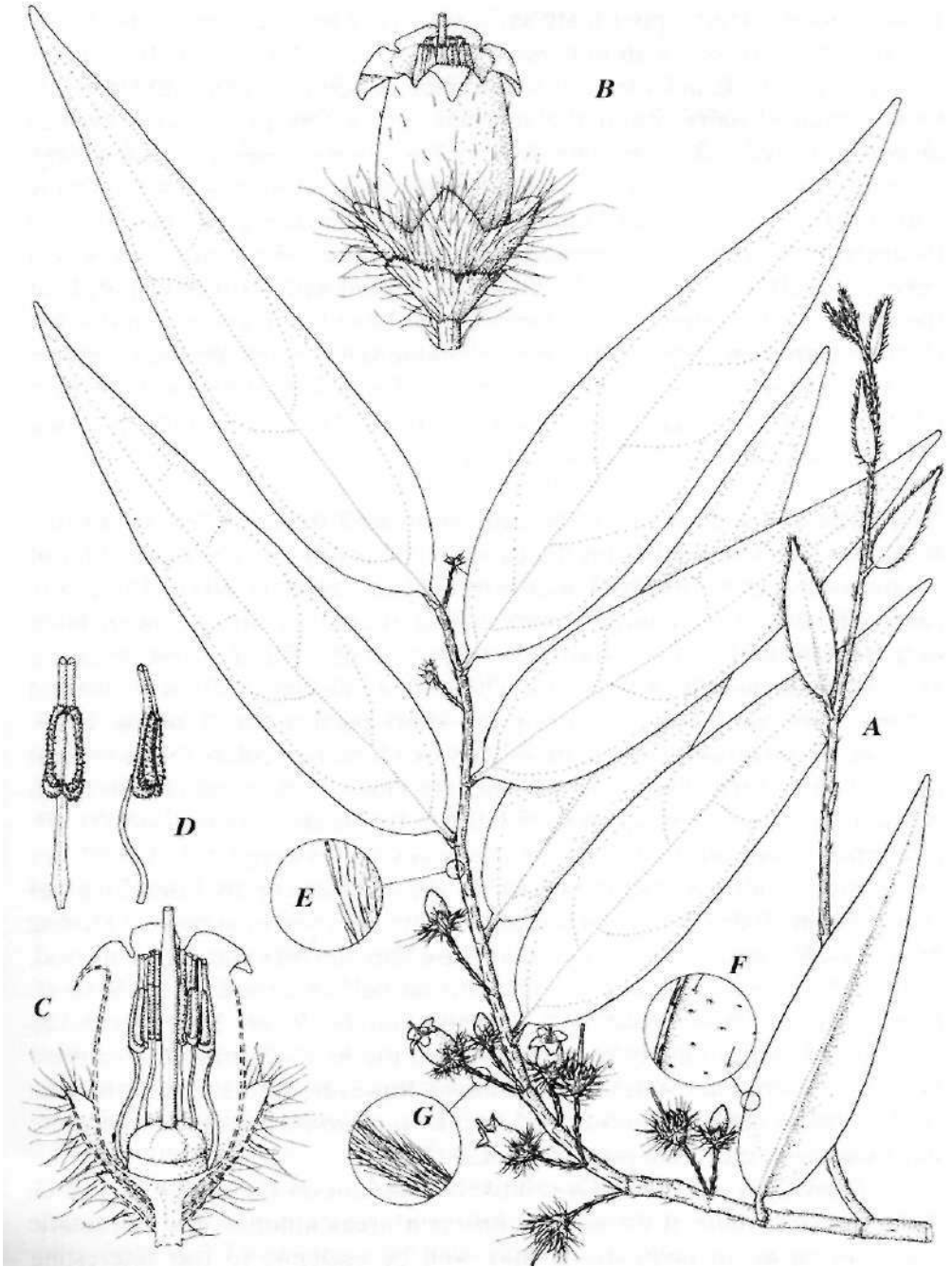
(Named after Paul Smith, plant collector, keen observer and explorer in SE Asia who was one of the collectors of the type specimen).

*A Diplycosia aurea* Sleumer foliis anguste lanceolatis plus quam triplo longioribus quam latioribus (in *D. aurea* ovatis, praecipue minus quam duplo longioribus quam latioribus), indumento abaxiali sparso fugacio, marginibus planis, floribus plerumque solitariis, haud in fasciculos densos aggregatis differt.

**Typus:** Borneo, Sabah, Gunung Tambuyukon, Kota Marudu District, 9 Oct 1995, *Argent & Smith 395* (holo SNP; iso A, E, K, KEP, L, SAN, SING).

### **Figure 5**

Spreading shrub to 70 cm tall. Branches laxly leafy. Stems laxly covered in appressed bristles. Petiole 2-4 x *c.* 1 mm, grooved above and with a few course appressed bristles. Leaf blade lanceolate or narrowly elliptic, 50-100 x 12-27 mm, coriaceous, glabrous and smooth above when dry, with rather sparse appressed bristles when very young and later punctulate from the remaining bases below; base rounded occasionally broadly cuneate; margin flat, entire, often with a persistent fringe of bristles, apex acute without a prominent terminal gland, midrib narrowly and slightly depressed above, distinctly raised below, lateral veins pinnate, arching upwards, mostly rather obscure, although with one or two clearly distinct in larger leaves.



**Figure 5.** *Diplycosia paulsmithii* All from Argent & Smith 395: A. habit x 1 B. flower x 3; C. half flower x 3; D. stamens x 6; E. surface of young stem x 25; F. young abaxial leaf surface x 25; G. pedicel indumentum x 25.

Flowers mostly from upper leafy axils, solitary, 2 or 3 per axil; pedicels 7-9 x c. 0.5 mm, covered with appressed bristles, 4- and 5-merous flowers on the same plant. Bracteoles c. 1.5 mm wide,  $\pm$  semi-circular and fimbriate with glandular hairs round the margins and a few long coarse bristles abaxially. Calyx c. 2.5 mm long, tube c. 1 mm long, lobes, c. 1.5 mm long, triangular with broadly acute points, moderately densely setose abaxially with bristles up to 3 mm long, shortly glandular along the margins, no distinctively large gland at the apex. Corolla white c. 4 x 5 mm, tube with a very few sparse bristles outside, the lobes deltoid with a touch of purple at the apex, erect on opening but becoming reflexed, c. 1 x 1 mm, a distinct cluster of small bristles on the outside. Stamens 4.6 mm long, the filaments c. 2.1 mm long, glabrous, with anthers c. 2.5 mm long, tubules straight, c. 0.6 mm long. Disc glabrous; ovary glabrous, style, c. 3.3 mm, tapering upwards and glabrous. Fruit not known.

*Notes:* this is distinctive with the fully appressed stem bristles contrasting with the spreading bristles on the calyx. If the bristles on the undersides of young leaves can be observed, it keys directly in Argent (1989) to *Diplycosia aurea* Sleumer, but it differs both in leaf shape and in the much laxer indumentum that is fugaceous and not persistent. The inflorescences are very different in the two species. They are fasciculate tufts with matted golden hairs completely obscuring the short pedicels in *D. aurea*. In *D. paulsmithii* the flowers tend to be solitary or where fasciculate the individual pedicels are clearly discernable as they are more slender and covered with much less dense semi-appressed hairs. In Sleumer (1966—1967), *D. paulsmithii* keys out with the bristly species but at couplet 4, it does not agree with either lead as the bristles on the calyx are up to 3 mm long but they point in all directions and are clearly not appressed or suberect. Having bristles on the underside of the leaf (before they fall off) that are appressed, it again keys out to *D. aurea*. The second half of couplet 4 leads to *D. lilianae* J.J.Sm. from West New Guinea and *D. loheri* Merr. from the Philippines, both unlikely candidates given the local distributions of most montane *Diplycosia* species. *D. paulsmithii*, however, differs from *D. lilianae* as the bristles are not gland-tipped, and *D. paulsmithii* lacks the fine white hairs on the pedicels characteristic of *D. loheri*.

*Diplycosia paulsmithii* is relatively common on the upper part of G. Tambuyukon where it grows in semi-open areas amongst the ultramafic rocks, often as an epiphyte. It may well be endemic to this interesting mountain.

*Specimens examined:* Gunung Tambuyukon, camp III to summit *Nais et al.* SNP 4798, 5<sup>th</sup> Oct 1990 (KEP, SNP); cultivated specimen, the same locality,



flowering 20 Feb 2002 Accession No. 19952784 (E, SAN, SNP).

**8. *Diplycosia ngii* Argent, *sp. nov.***

(Named after the collector Dr, Francis S.P.Ng, sometime Deputy Director General, Forest Research Institute Malaysia, Kepong, who has made an outstanding contribution to botany in Malaysia).

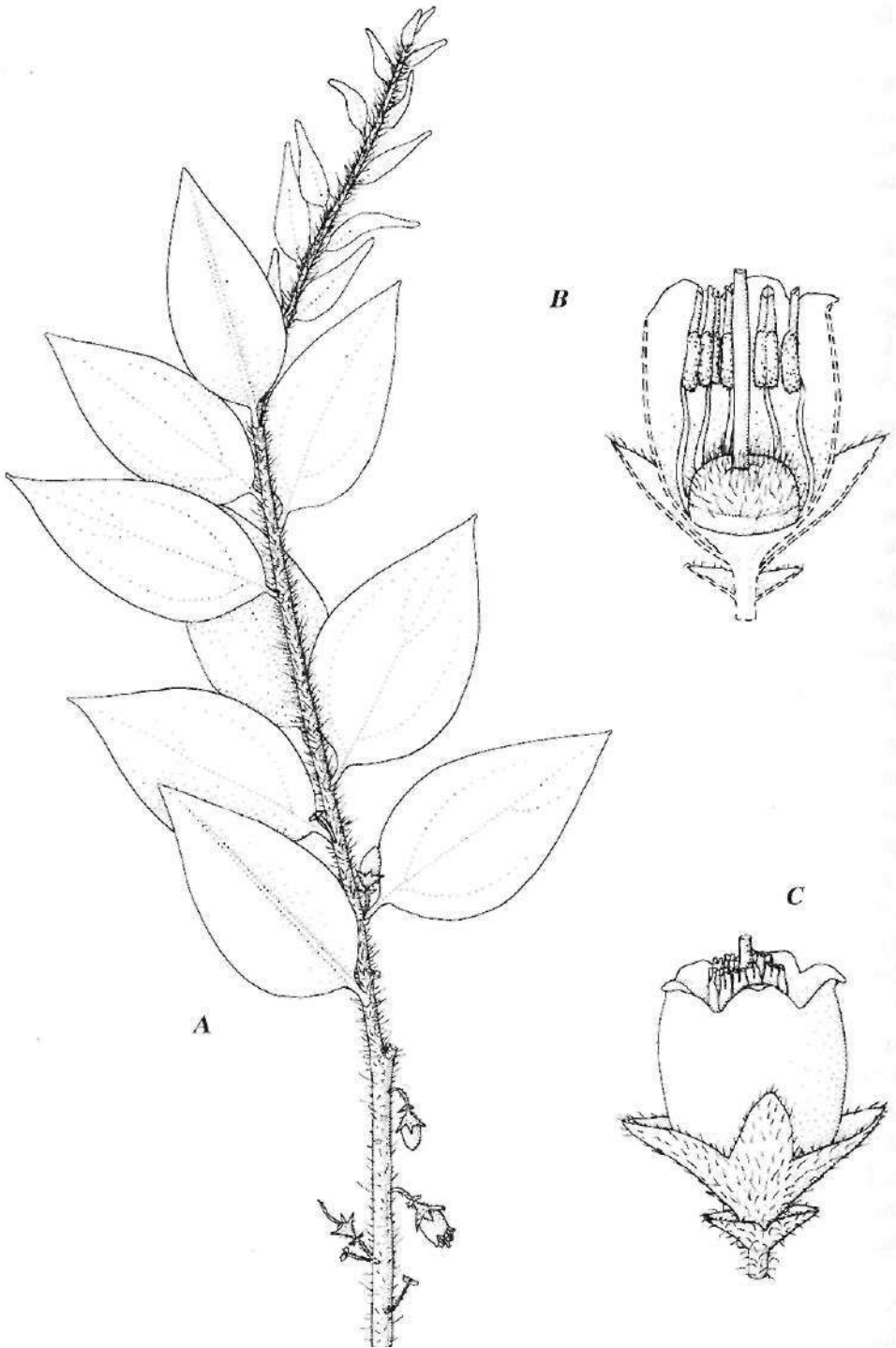
*Diplycosiae pseudorufescenti* similis sed indumento tenui albo sub setis grossis brunneis carenti, calyce abaxialiter breviter piloso (haud omnino glabro), foliis majoribus et pedicellis longioribus differt.

**Typus:** Peninsular Malaysia, Pahang, Gunung Jasar, summit area, 23 Aug 1977, Ng *FRI 27145* (holo KEP).

**Figure 6**

Shrub to 2 m tall. Branches laxly leafy. Stems terete, densely and subpatently setulose, covered with rufous semi-appressed bristles of differing lengths, without any finer pubescence. Petiole appressed setulose, 2-4 x 1-1.5 mm. Leaf blade ovate to ovate-elliptic, 23-35 x 12-19 mm. Young leaves densely appressed rufous-setulose on both sides, the mature leaves becoming glabrous above but mostly remaining appressed setulose below, finally in old leaves all the bristles are denuded to give a punctate surface, coriaceous; base rounded or more rarely broadly tapering; margin more or less revolute, at first with small bristles but these mostly early caducous to leave it minutely crenulate with impressed bristle bases; apex shortly acuminate, occasionally acute, terminal gland obscure, midrib impressed above, prominent beneath, lateral veins mostly two, basal or supra-basal, ascending, usually becoming obscure in the lower half of the leaf and before they reach the margin, occasionally visible to just over half way, rather obscure abaxially. Flowers axillary, solitary or paired pedicels c. 3 mm at flowering, later up to c. 6 mm long when in fruit, puberulous with crisped hairs, basal bracts, several, minute. Bracteoles c. 2 mm across, ovate, with involute sides and so appearing acute, shortly hairy abaxially. Calyx to c. 3 mm long, shortly hairy abaxially, lobes c. 2 mm long, acute with involute margins. Corolla tubular campanulate, glabrous, c. 4 mm long, lobes reflexed, to c. 0.5 mm long. Stamens c. 3.5 mm long, filaments slender, sigmoid, glabrous, c. 1.5 mm long, anthers c. 2.5 mm long, the cells c. 1.5 mm long, tubules c. 1 mm long. Disc glabrous; ovary rather densely grey-pubescent with erect hairs, style c. 3.5 mm long, glabrous. Fruit not known.

*Notes:* *Diplycosia ngii* keys out in Sleumer (1966-67) to *D. pseudorufescens* Sleumer, but differs from this species in not having the fine white patent puberulous tomentum under the coarse brown setose hairs, the leaves are



**Figure 6.** *Diplycosia ngii* All from Ng 27145: A. habit x 1; B. half flower x 9; C. flower x 9.

larger and the apical gland is not distinct, the calyx is shortly hairy abaxially (not glabrous) and the pedicels become much longer, up to 6 mm in fruit whereas in *D. pseudorufescens* they are not more than 3 mm. Type specimens of both subspecies of *D. pseudorufescens* have been examined but it has not been possible to locate the specimen collected on Gunung Korbu (Kerbau), Perak (Sleumer, 1966-67). Sleumer implied that this collection has the same characteristics of indumentum as the Kinabalu plants, the type locality of both subspecies of *D. pseudorufescens*. Clemens 29282 from Mt. Kinabalu is described with fruit, which suggests a real difference in the final pedicel length between *D. pseudorufescens* and *D. ngii*. The indumentum of bristles on the stems is reminiscent of *D. sumatrensis* Merr. from Sumatra (Indonesia) but both leaves and flowers are much smaller in this new species, which at present is only known from the type collection.

### **Reduction of *Pernettyopsis* to Synonymy with *Diplycosia*.**

*Pernettyopsis* was described by King & Gamble (1905) with two species (*P. malayana* King & Gamble and *P. subglabra* King & Gamble) from Peninsular Malaysia. The second species was later reduced to synonymy by Sleumer (1966-1967) along with a third (*P. breviflora* (Ridl.)Ridl., which Ridley (1915) had originally described as a species of *Diplycosia*! Sleumer stated that "the wooly indumentum on the calyx lobes is apparently deterrent and early gone and the length of the pedicels varies" and concluded that there was material of only one species. *Pernettyopsis* was described as different from *Diplycosia* in that the fruit was a berry, the calyx was unchanged in fruit, i.e. was not accrescent and succulent, and was about as long as the corolla. A further species, *P. megabracteata* Argent, was described from Borneo in 1982. This latest species technically agreed with the description of *Pernettyopsis* but was very different to the original species having extraordinarily long acuminate bracteoles and very differently shaped flowers: ovoid cylindrical and more than twice as long as broad in *P. megabracteata*; short urceolate and hardly longer than broad in *P. malayana*.

The distinction between the fruits had already been questioned (Argent, 1982) and the definition of *Diplycosia* fruits as thin-walled capsules (Sleumer, 1966-1967) cannot be maintained. *D. acuminata* in Peninsular Malaysia clearly has an ovary that becomes enlarged and fleshy and behaves as a true berry. The calyx lobes of this species, although also accrescent, are much less so than in most other *Diplycosia* species and show a clear transition to the state in *Pernettyopsis*. Of many other species observed in the wild, the ovary never appears to split naturally and the fruit behaves

like a false berry although most of the 'attractive' flesh is associated with the calyx. That the calyx lobes are as long as the corolla in the two *Pernettyopsis* species would appear to be of no great significance as the flowers are of totally different shapes. Some of the very bristly *Diplycosia* species in Borneo, such as *D. rufa* Stapf, *D. aurea* Sleumer and *D. hirtiflora* Argent, also have long calyx lobes. There thus seems little point in maintaining the genus *Pernettyopsis* that is so weakly supported morphologically. Of the two currently recognized species, the original one (*sensu* Sleumer, 1966-1967) is frequently confused with *Diplycosia* and the second, although superficially very distinct from all other known *Diplycosia* species (Argent, 1982), is at least as different from the original *P. malayana*. Both these *Pernettyopsis* species share all the important structural characteristics of inflorescence and flower with *Diplycosia*. We do not have the anatomical evidence of Middleton (1989) but the conclusions drawn are parallel to those of Middleton & Wilcock (1990) to justify the inclusion of the genus *Pernettya* Gaudich. within *Gaultheria* Kalm *ex* L. Thus the genus *Pernettyopsis* is formally synonymised below with two resulting new combinations.

### New Combinations

***Diplycosia*** Blume, Bijdr. (1826), 857. **Type species:** *D. heterophylla* Blume, Bijdr 858 (1826).

**Synonym:** *Pernettyopsis* King & Gamble, J. As. Soc. Bengal, 74, 2 (1905) 79.

**Type species:** *P. malayana* King & Gamble, J. As. Soc. Bengal, 74, 2 (1905) 79.

***Diplycosia malayana*** (King & Gamble) Argent, *comb. nov.*

**Basionym:** *Pernettyopsis malayana* King & Gamble, J. As. Soc. Bengal, 74, 2 (1905) 79.

**Lectotype:** *Scortechini* 402, Peninsular Malaysia, Gunung Batu Puteh.

**Synonyms:** *Pernettyopsis subglabra* King & Gamble, J. As. Soc. Bengal, 74, 2 (1905) 79.

**Type:** *Scortechini* 752, Perak.

*Diplycosia breviflora* Ridl., J. Fed. Mal. St. Mus. 6 (1915) 158.

**Type:** Ridley *s.n.* Pahang, Gunung Tahan.

*Pernettyopsis breviflora* (Ridl.) Ridl., Fl. Mal. Pen. 2 (1923) 222.

***Diplycosia megabracteata*** (Argent) Argent, *comb. nov.*

**Basionym:** *Pernettyopsis megabracteata* Argent, Bot. J. Linn. Soc. 85 (1982) 10-12 f. 4. (1982).

**Type:** *Argent 824*, Sarawak, Gunung Mulu.

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