

DIPLYCOSIA IN BORNEO

Two New Species and a Provisional Key to *Diplycosia* and Close Allies

G. C. G. ARGENT

ABSTRACT. *Diplycosia hirtiflora* and *D. lotungensis* (Ericaceae) are described as new species. A provisional key to Bornean species of *Diplycosia*, *Gaultheria* and *Pernettyopsis* is provided.

It is now over 30 years since Professor Sleumer's revision of the genus *Diplycosia* (Sleumer, 1957) and over 20 years since the account was produced for *Flora Malesiana* (Sleumer, 1966-67). New collections of *Diplycosia* have been made but there is very little progress in the understanding of the group. Almost all *Diplycosias* have small insignificant flowers which are commonly overlooked or badly pressed resulting in the loss of many or all flowers by the time they become mounted herbarium specimens. No subgeneric groupings have been proposed since Benthams & Hooker's *Eudiplycosia* and *Gaultheriopsis* (1873-76: 584) were discounted by Sleumer (1957) and only one chromosome count (*D. heterophylla*: $n=18$) appears to have been made (Ratter & Milne, 1973). However, significant differences have been noted in calyx and ovary development in a few species varying from a large fleshy berry surrounded by accrescent fleshy calyx lobes (*D. acuminata* Becc.) to a small almost dry capsule enclosed entirely by the fleshy calyx (*D. heterophylla* Blume and most other species examined). This calls into question the status of the genus *Pernettyopsis* King & Gamble which is only one stage further removed in 'fruit' structure and on this ground alone *Pernettyopsis* could not be maintained (Argent, 1982). 'Fruit structure' would still appear to be the most promising feature for future subgeneric groupings, but this will require more field observation and the careful preservation of fruits in pickle.

Diplycosia hirtiflora Argent, sp. nov. Fig 1.

Frutex 1m altus. *Ramunculi* teretes, setis patentibus, grossis, fuliginis, 2-4mm longis. *Folia* 50-75 × 20-32mm, elliptica usque elliptico-lanceolata, apice acuto quamquam summo extremo obtuso ut videtur acumine glanduloso, base late cuneata usque rotundata; margine subtiliter et paulo irregulariter denticulato, reliquiis setarum marginalium ex sinibus inter dentes exorientibus; pagina supra glabra, praeter costam subtiliter impressam laevis, venis lateralibus 1-3 ascendentibus tenuibus paulo obscuris in dimidio proximali exorientibus et usque ad 8 in dimidio distali rectis brevibusque; pagina infra praeter costam elevatam laevis, reliquiis setarum semi-adpressarum vel aliquantum curvatarum plerumque c.1mm longarum c.1mm distantium tecta, pagina post lappum setarum atropunctata. *Petiolus* 2-5 × 2mm, in facie superiore sulcatus, setis tectus. *Flores* 1-5, ab axillis foliorum exorientes. *Pedicellus* 6-8 × c.1mm, longe setosus, setis ad 4.5mm longis. *Bracteolae* late ovatae, apiculatae 1.5 × 2mm, abaxiale setosae, et ad marginem ciliatae. *Calyx* externus grosse setosus, tubus 1.5mm; lobi ovato-deltoides, carnosius, 2.5-3.5 × 2mm, setis in caespitulum terminalem aggregatusculis, margine cartilagineo. *Corolla* 4-5.5 × 3.5mm, breviter cylindrica, extus setis grossis furcis tecta, intus glabra; lobi deltoides, acuti, erecti, 1.25 × 1mm. *Stamina* 10, 3mm longa; filamenta 1.5mm longa, glabra, recta; thecae antherarum echinulatae, 1.5mm, tubuli 0.4mm introversi. *Ovarium* glabrum; stylus glaber, 2-3mm longus; stigma non expansum, punctatum.

Shrub 1m high. Twigs terete, covered in coarse spreading, dark brown bristles 2-4mm long. Leaves 50-75 × 20-32mm, elliptic to elliptic-lanceolate; apex acute, although the extreme summit obtuse in an apparent glandular

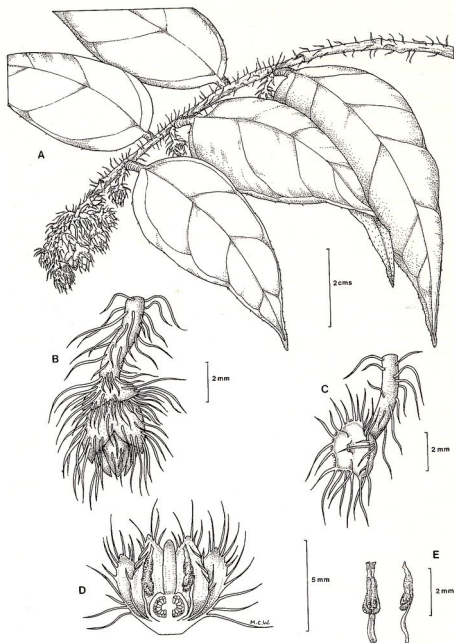


FIG 1. *Diplycosia hirtiflora*. A, habit; B, flower bud; C, pedicel with bracteoles; D, flower, L.S.; E, stamens in front and side views.

point, base broadly cuneate to rounded; margin finely and rather irregularly serrulate from the indentations of which are the remains of marginal bristles; upper surface glabrous, smooth except for the slightly sunken midvein, 1-3 ascending fine and rather obscure lateral veins arising in the proximal half and up to 8 short straight lateral veins in the distal half; lower surface with raised midvein otherwise smooth, covered with the remains of semi-appressed straight or somewhat curved bristles mostly c. 1mm long and approximately 1mm apart which leave the surface darkly punctate when the hairs have fallen. Petioles 2-5 x 2mm, grooved in the upper side and covered in bristles. Flowers 1-5 from the axils of leaves. Pedicel 6-8 x c. 1mm, long setose with bristles up to 4.5mm. Bracteoles broadly ovate, apiculate 1.5 x 2mm, setose abaxially and with a ciliate margin. Calyx coarsely bristly outside, tube 1.5mm; lobes ovate deltoid, fleshy 2.5-3.5 x 2mm with the bristles tending to be gathered into a terminal tuft, the margin cartilaginous. Corolla 4-5.5 x 3.5mm, shortly cylindric with coarse brown bristles outside, glabrous inside; lobes deltoid, acute, erect 1.25 x 1mm. Stamens 10, 3mm; filaments 1.5mm, glabrous, straight; anther cells echinulate, 1.5mm, tubules 0.4mm, turned inwards. Ovary glabrous; style glabrous, 2-3mm; stigma not expanded, point like.

Type. Malaysia, Sabah, Ranau District: Bukit Hampuan at SE base of Kinabalu 6°00'N, 116°40'E, dipterocarp, Fagaceae, *Casuarina*, *Agathis* forest on ultramafic geology, 1330m, 7 xii 1983, J. H. Beaman 7675 (holo. E, iso. UKMS).

This species is probably most closely related to *D. clementium* Sleumer which is very common on parts of G. Kinabalu but differs in the smaller flowers on shorter pedicels, and smoother less rugose leaves. There is also a difference in the indumentum which is very apparent when comparing the two species side by side, but less easy to diagnose for a key (see couplet 55, p.25). It is also closely related to *D. rufa* Stapf, another common species on G. Kinabalu but is much less hairy with more acuminate leaves and smaller flowers. It is interesting to note that the calyx of *D. hirtiflora* tends to approach the length of the corolla and is thus somewhat intermediate in one of the characters separating *Pernettyopsis* from *Diplycosia*. Unfortunately there is no fruiting material available for study.

***Diplycosia lotungensis* Argent, sp. nov. Fig. 2.**

Frutex patulus epiphyticus. *Ramunculi* teretes, setis atrobrunneis patentibus ad 3.5mm longis sed in longitudine multo variabilibus modice tecti. *Folia* 33-75 x 12-25mm, nunc elliptica nunc elliptico-lanceolata, apice acuto in glandula terminali prominenti terminanti, base late cuneata usque rotundata; margine fere integro vel paulo sinuato ad subtiliter denticulato, primum setis semi-erectis fimbriato; pagina supra praeter pilos ad basem paucos glabra, costa parum impressa; veni laterales in quoque latere 1-3 ascendentes in dimidio proximali exorientes, et in quoque latere in dimidio distali venis lateralibus minoribus, in numero usque ad 3, paene rectis; pagina inferna, praeter costa elevatam, laevis, sparse, pilosa, setis in longitudine e punctis glanduliferis (et) minutis ad setos usque 2.5mm longos variantibus. *Petiolus* 5-6 x 1.5-2mm, in faciei superiore distaliter sulcatus, setis grossis et aliquot pilis minoribus glandulis similibus sparse tectus. *Flores* solitarius. *Pedicellus* 4-8 x 1mm, setis subdense tectus. *Bracteolae* minutae, fere hemisphaericae sed apice lato paulo incrassato glanduloso, 1 x 2mm, setis grossis paucis et aliquot pilis minoribus, et secus marginem pilis glanduliferis subtiliter fimbriatae. *Calyx* viridis, setis grossis etiam pilis parvis glandulosus tectus; tubus 3mm longus; lobi breviter ovati, obtusi sed subapiculati puncto glanduloso 2 x 2.5mm, ad marginem pilis glanduliferis fimbriati. *Corolla* alba translucens, subglobosa, 7 x 10mm, in sinibus inter lobos exceptis gross setosa, setis ex apicibus verruculorum exorientibus; lobi 3 x 4.5mm, in parte tertia superiore reflexi, extus setosi.

Stamina 4.5–5.5mm longa; filamenta alba, 3mm longa, glabra, sinuata; antherae brunneae, 2.5–3mm longae; thecae echinulatae, tubuli 0.75mm longi, poris obliquis ad stylum adpressis, apicibus reflexis. *Ovarium*, annulo pilorum magnorum irregularium circum styli insertionem excepto, glabrum; stylus viridis, 5.5mm longus, glaber; stigma irregulariter dilatatum.

Spreading epiphytic shrub. Twigs terete, moderately covered in patent dark brown bristles which are up to 3.5mm but highly variable in length. Leaf blade 33–75 × 12–25mm elliptic or elliptic lanceolate, apex acute, ending in a prominent terminal gland, base broadly cuneate to rounded; margin almost entire, or slightly sinuate to finely denticulate, at first fringed with semi-erect bristles; upper surface glabrous except for a few hairs near the base, the midvein slightly sunken; lateral veins 1–3 ascending on each side arising in the proximal half and up to 3 smaller nearly straight laterals on each side in the distal half; lower surface with raised midvein otherwise smooth, sparsely hairy with bristles varying in length from minute glandular points up to 2.5mm. Petioles 5–6 × 1.5–2mm, grooved on the upper surface distally, sparsely covered in coarse bristles and some smaller gland-like hairs. Flowers mostly solitary, occasionally up to 3 per axil. Pedicel 4–8 × c.1mm, subdensely covered in bristles. Bracteoles minute, almost hemispherical but with a broad slightly thickened glandular apex, 1 × 2mm, covered in a few coarse bristles, some shorter hairs and finely fringed with glandular hairs on the margin. Calyx green, coarsely bristly with erect bristles and also with small glandular hairs, tube 3mm; lobes shortly ovate, obtuse but subapiculate with a glandular point 2 × 2.5mm, fringed with glandular hairs on the margin. Corolla translucent white, subglobular, 7 × 10mm, covered in coarse appressed bristles except in the sinuses between the lobes, the bristles arising from the points of the verruculose surface; lobes 3 × 4.5mm, reflexed back in the upper third. Stamens 4.5–5.5mm; filaments white, 3mm, glabrous, sinuate; anthers brown 2.5–3mm, the cells echinulate, tubules 0.75mm with oblique pores which lie appressed to the style, the tips reflexed back. Ovary glabrous except sometimes with a ring of large irregular hairs around the insertion of the style; style green, 5.5mm, glabrous; stigma sometimes irregularly flared.

Type. Malaysia, Sabah, Gunong Lotung, in kerangas forest, 1200m, iv 1982, flowered in cultivation RBG Edinb. 15 x 1987, *G. Argent* 821531 (holo. SAND, iso. E).

This species was originally collected on an expedition to Gunong Lotung in April 1982 when it was found to be quite common as an epiphyte in the rather open acid kerangas forest dominated by *Casuarina*. However, all the plants were totally sterile and so it is only with the flowering of cultivated material that this species can be described.

Diplycosia lotungensis is a moderately densely bristly species, but less densely so and with shorter bristles than *D. rufa*, and with distinctive elliptic to elliptic-lanceolate sometimes slightly curved leaves. It is superficially similar to *D. hirtiflora* but has larger flowers with differently shaped corollas with hairs which do not overtop the lobes.

The following key is based on that in *Flora Malesiana* (Sleumer, 1966–67) but includes all species described since then as well as considerable modifications made in the light of many new field observations. Specific names without genus are *Diplycosias*, and where they are preceded by a number this refers to the serial number used in *Flora Malesiana* (Sleumer, 1966–67) so allowing the reader quick access to full descriptions.

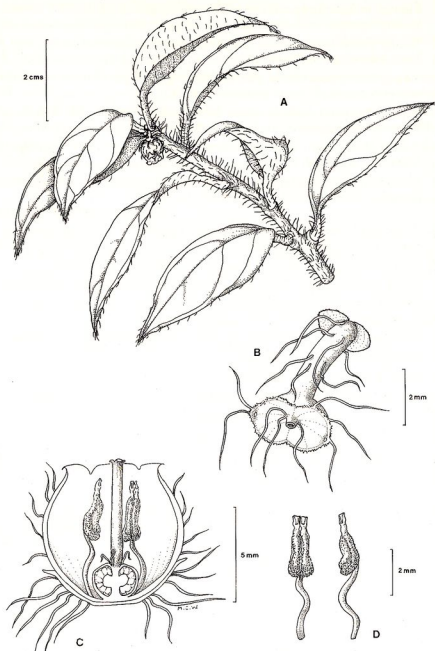


FIG 2. *Diplycosia lotungensis*. A, habit; B, pedicel with bracteoles; C, flower, L.S.; D, stamens in front and side views.

KEY TO BORNEAN SPECIES OF DIPLYCOSIA, GAULTHERIA & PERNETTYOPSIS

1. Flowers in racemes, anthers prolonged upwards into 4 long spurs
Gaultheria borneensis
- + Flowers in fascicles or solitary, anthers prolonged upwards into 2 tubules, without spurs2
2. Young shoots hairy with at least a fine patent pubescence visible with a hand lens, often visibly setose3
- + Young shoots completely glabrous bearing no trace of hairs or bristles except occasionally some glandular points38
3. Young shoots exclusively setose (sometimes greyish or blackish fungi may wrongly suggest a fine patent pubescence)4
- + Young shoots both very laxly to very densely setose and/or minutely hairy with short soft hairs23
4. Calyx bracts and bracteoles long acuminate more than 1cm long, forming conspicuous downward pointing tufts (G. Mulu)
Pernettyopsis megabracteata
- + Calyx and/or bracteoles rounded or short acuminate less than 5mm long, not forming conspicuous tufts5
5. Calyx dorsally densely and \pm long setose (setae more than 1mm)6
- + Calyx dorsally rather laxly and shortly setulose (setae less than 1mm), puberulous, muriculate or glabrous14
6. Underside of leaves with \pm coarse patent bristles7
- + Underside of leaves with fine, distinctly appressed bristles9. **aurea**
7. Veins 4 or more pairs, \pm distinct8
- + Veins 1-3 pairs, less conspicuous.....9
8. Leaves over 5cm wide, ovate apiculate7. **saurauoides**
- + Leaves up to 5cm wide (generally 3cm), ovate lanceolate acuminate...55
9. Corolla \pm shortly setulose-hairy at least in its upper part.....10
- + Corolla entirely glabrous13
10. Leaves more than 3cm long.....11
- + Leaves 1-3cm long12
11. Leaves densely bristly below without gland dots between bristles; spacing between bristles much less than length of bristle; stem bristles more than 5mm.....1. **rufa**
- + Leaves sparsely bristly below, gland dotted between bristles; spacing between bristles \pm length of bristle; stem bristles up to 3.5mm
lotungensis
12. Ovary laxly hairy2. **chrysothrix**
- + Ovary glabrous3. **carrii**
13. Leaves up to 1.5 \times 0.6cm4. **abscondita**
- + Leaves more than 2 \times 1.5cm5. **barbigera**
14. Flowers generally 1 or 2 per axil occasionally 3.....15

- + Flowers 3-9 at least in the lowest axils, the uppermost sometimes only 1-2 flowered18
- 15. Leaves more than 11cm; pedicels more than 2cm15. **penduliflora**
- + Leaves less than 11cm; pedicels up to 2cm16
- 16. Leaves broadly ovate to almost circular more than 7mm wide.
25. **pseudorufescens**
- + Leaves lanceolate or narrowly lanceolate less than 7mm wide17
- 17. Stems densely covered with bristles only. Leaves mostly acutely pointed at 30° or less.....16. **ciliolata**
- + Stems laxly covered with bristles and very short hairs. Leaves mostly acutely pointed at 45° or more.....68. **myrtillus**
- 18. Leaves narrowly lanceolate, 3-6mm wide43. **kalmifolia**
- + Leaves variously shaped more than 7mm wide.....19
- 19. Corolla 9-11mm; leaves with ± persistent marginal bristles
44. **kinabaluensis**
- + Corolla up to 8mm; leaves with ± early caducous marginal bristles20
- 20. Scales very numerous, ovate acuminate to lanceolate 2-4mm; bracteoles 2-3mm81. **pittosporifolia** var. **punctiloba**
- + Scales mostly few, rarely rather numerous, ± ovate, obtuse, up to 1.5mm; bracteoles 1-1.5mm21
- 21. Leaves with 3-5 arching veins, originating from or near the base; upper lateral veins if any, much less distinct49. **orophila**
- + Leaves ± pinnately veined; basal and upper veins equally distinct22
- 22. Pedicels 3-8mm, with hairs or bristles ± appressed and non-glandular
52. **scabrida**
- + Pedicels 10-13mm, with hairs glandular and horizontally spreading
54. **fimbriata**
- 23. Stipule-like axillary scales persistent, obvious, at least at the uppermost leaves, as long as or slightly longer than the petiole24
- + Stipule-like axillary scales absent, or very small or early caducous26
- 24. Leaves subcaudate acuminate, ± acute at the apex.....56. **acuminata**
- + Leaves shortly or not attenuate, obtuse to rounded at the apex25
- 25. Leaves subspherical, hardly longer than broad, up to 8mm long
57. **crenulata**
- + Leaves ovate to elliptic, usually distinctly longer than broad, over 10mm long58. **elliptica**
- 26. Leaves linear27
- + Leaves not linear29
- 27. Leaves up to 2cm long (Central Borneo)64. **piceifolia**
- + Leaves over 3cm long28
- 28. Pedicels over 4mm long (Kinabalu, above 1000m)65. **pinifolia**
- + Pedicels up to 2mm long (Lowland peat swamp forest, up to 1000m)
66. **lavendulifolia**

44. Pedicels \pm densely covered with short rufescent eglandular, subappressed or spreading permanent hairs with possibly also some muriculate hairs
86. *urceolata*
- + Pedicels \pm sparsely covered with fine hairs and/or bristle-like, rather thick, glandular or muriculate hairs, mostly \pm glabrescent during anthesis45
45. Leaves up to 2.5cm wide; pedicels up to 4mm88. *commutata*
- + Leaves over 3.5cm wide; pedicels over 4mm
96. *heterophylla* var. *latifolia*
46. Pedicel more than 2cm long15. *penduliflora*
- + Pedicel less than 2cm long47
47. Leaves distinctly pinnately veined; the lowest pair short and straight to the margin, the remaining 3 or 4 pairs arching inwards91. *punctulata*
- + Leaves variously veined, the lowest pair however always arching well up the leaf, the upper veins \pm straight48
48. Leaves more than 3 times as long as broad, gradually attenuate to the apex from near the base49
- + Leaves less than 3 times as long as broad, contracted in the upper half or near the apex, occasionally rounded51
49. Calyx lobes acute; petiole c.1.5cm long95. *viridiflora*
- + Calyx lobes obtuse; petiole rarely more than 1cm long50
50. Leaves at the base, shortly attenuate, or rounded to subcordate
93. *ensifolia*
- + Leaves at the base long attenuate, cuneate53
51. Calyx lobes finely acute; bracteoles long, apiculate.....95. *viridiflora*
- + Calyx lobes obtuse or blunt; bracteoles rounded or only shortly pointed
52
52. Largest leaves up to 2cm wide, with lateral veins obscure or absent53
- + Largest leaves over 3cm wide with prominent arching lateral veins54
53. Pedicels up to 5mm long, style c.2.5mm*microsalicifolia*
(in Argent, 1982: 8)
- + Pedicels more than 7mm long, style c.5mm94. *salicifolia*
54. Leaves \pm ovate often with a fine point (Kinabalu, above 2400m)
92. *cinnamomifolia*
- + Leaves \pm elliptic or oblong elliptic (Widespread, rarely growing above 2400m)96. *heterophylla*
55. Leaves smooth above, bristles quickly shed from the underside leaving black gland-like bases; pedicels up to 8mm; style up to 3mm*hirtiflora*
- + Leaves rugose with impressed veins above, bristles persistent on undersides leaving rusty brown spots when removed; pedicels more than 8mm; style c.5mm8. *clementium*

ACKNOWLEDGEMENTS

I am most grateful to Professor J. H. Beaman for sending his collections of Ericaceae for determination, and also to Yayasan Sabah for the helicopter support they gave to the field work on Gunong Lotung which resulted in the second new species.

The Sabah Parks and Forestry Department staff have always been most helpful in arranging field work in their reserves and this allowed many of the observations, which have been incorporated in the key, to be made. T. Lamb and C. Marsh have been especially helpful and good field companions, M. Warwick has most ably drawn the text figures, and Dr R. Mill kindly provided the Latin descriptions.

REFERENCES

- ARGENT, G. C. G. (1982). New taxa and combinations and comments on Ericaceae. *Bot. J. Linn. Soc.* 85: 2-17.
- BENTHAM, G. & HOOKER, J. D. (1873-76). *Genera Plantarum* Vol. 2. Reeve & Co., London.
- RATTER, J. A. & MILNE, C. (1973). Some angiosperm chromosome numbers. *Notes RBG Edinb.* 32: 429-438.
- SLEUMER, H. (1957). Florae Malesianae Praecursores 14: A revision of the genus *Diplycosia* (Ericaceae). *Reinwardtia* 4: 119-161.
- (1966-67). Ericaceae. *Flora Malesiana* 6: 469-914.