

Bornean species of *Cyrtandra* (Gesneriaceae) closely allied to *C. chrysea* and *C. eximia*.

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Bornean species of *Cyrtandra* (Gesneriaceae) closely allied to *C. chrysea* and *C. eximia*

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Summary. *Cyrtandra chrysea* C. B. Clarke and *C. eximia* C. B. Clarke, together with seven new species, constitute a group distinguished by a suite of characters including the deeply divided calyx, the small white corolla variously patterned with pale to deep purple, the unilateral disc, the ovary constricted at base and the small fruit. All nine species are fully described and an identification key provided. Six species (*C. decipiens*, *C. lanata*, *C. dasymallos*, *C. nibongensis*, *C. villifructus*, *C. kostermansii*) are described as new; the material of a further species is insufficient to typify a name.

Among species of *Cyrtandra* in Borneo, the disc (nectary) is commonly cupular, but in a minority it is unilateral. Among these is a number in which the disc is not only unilateral, but also very fleshy, and the ovary is constricted at the base to accommodate it (Fig. 1). The group of species enumerated below not only has a unilateral disc, but the fruit is small (up to c. 18 mm long). There are other species (number not clear) with a similarly constricted ovary, but they differ in one or more characters, for example the colour of the markings on the palate, different types of indumentum, or the size of the fruit. The ovary, as a result of the basal constriction, looks stipitate, but that is not so: it is fully fertile to the base, and the constriction rapidly disappears as the fertilized ovary begins to swell.

The species with which we are now concerned include *Cyrtandra chrysea* and *C. eximia*, and seven undescribed species closely allied to them; the material of one of these new species is inadequate to typify a name. Many of the species are simple-stemmed, or at most sparingly branched. Some can reach a height of 4 m, and all are *leafy only towards the apex of the stem*. At least six of them are floriferous down to ground level. Other characters that all the species have in common are: *leaves with smooth upper epidermis* (no raised pattern induced by sclereids in the hypodermis), margins entire or serrulate, *many-flowered tightly congested dichasial cymes* either sessile (superficially, flowers look fascicled) or shortly pedunculate (peduncles up to c. 40 mm), bracts paired, not enveloping inflorescence, *calyx divided*

almost to the base, lobes narrowly triangular, acute, *corolla small* (up to c. 20 mm long), *white variously marked with pinkish- to reddish-purple*, *disc unilateral*, *ovary narrowed at base on ventral side to accommodate the fleshy disc*, *style pubescent*, *fruit small* (c. 9–18 mm long).



Fig. 1. Gynoecium of *Cyrtandra chrysea* (Mendum 126, E) showing the fleshy disc and the strongly constricted base of the ovary characteristic of this group. Scale bar = 1 mm.

Key to species

- 1a. Inflorescence pedunculate 2
- 1b. Inflorescence sessile 4
- 2a. Apex of stem clad in strongly appressed silky hairs; leaves with c. 16 lateral veins each side of midrib 1. *C. chrysea*
- 2b. Apex of stem clad in either velvety or silky-woolly hairs; leaves with either 22 – 24 lateral veins each side of midrib or these veins hidden by silky wool 3
- 3a. Stem velvety; leaves with 22 – 24 lateral veins each side of midrib 2. *C. decipiens*
- 3b. Stem silky-woolly; leaves with lateral veins obscured by indumentum 3. *C. lanata*
- 4a. Leaves discolorous (ignore uppermost, immature, leaves) 5
- 4b. Leaves \pm concolorous 6
- 5a. Leaves woolly below; lateral veins c. 16 each side of midrib 4. *C. dasymallos*
- 5b. Leaves sericeous below; lateral veins c. 22 – 25 each side of midrib 7. *C. nibongensis*
- 6a. Lower epidermis of leaf strongly tuberculate 8. *C. sp. nov.*
- 6b. Lower epidermis of leaf smooth, or surface hidden by indumentum 7
- 7a. Ovary (also fruit, at least when young) and style almost villous; relatively few gland-tipped hairs mixed with acute ones on bracts and calyx. 9. *C. villifructus*
- 7b. Ovary and style puberulous; hairs on bracts and calyx all acute 8
- 8a. Stems and leaves villous; tertiary veins not visible on lower surface of leaves; bracts c. 20 – 50 \times 3 – 17 mm; corolla white 5. *C. kostermansii*
- 8b. Stem and leaves clad in short brown hairs; tertiary veins \pm pinnate; bracts (bracteoles) c. 5 – 6 \times 1.3 – 1.8 mm; corolla whitish, with reddish-purple upper lip 6. *C. eximia*

1. *Cyrtandra chrysea* C. B. Clarke in DC., Monogr. Phan. 5: 212 (1883); B. L. Burtt, Notes Roy. Bot. Gard. Edinburgh 36: 163 (1978), excl. specimens cited from Sarawak and Clemens 33661, 50719, Kinabalu. Type: Borneo [Sabah], Kulawat, on hills, Lobb s.n. (holotype K).

Perennial herb 0.5 – 2.5 m tall, stems to c. 10 mm diam. on flowering part, branching mainly from base, densely sericeous, whitish, leafy only on upper part. Leaves opposite, isophyllous, discolorous, largest c. 80 – 270 \times 30 – 80 mm, elliptic, apex long-acuminate, base narrowly cuneate, very shortly decurrent, margins entire, lateral veins c. 16 on each side of midrib, tertiary veins scarcely visible, more or less pinnate, upper surface with scattered hairs to 1.5 – 2 mm long, lower surface densely sericeous; petiole 10 – 45 mm long, sericeous. Inflorescence a many-flowered dichasial cyme in upper leaf axils, congested, becoming somewhat lax in fruit; peduncle 5 – 40 mm long, sericeous. Bracts paired, c. 18 – 35 \times 3 – 10 mm, lanceolate, scattered hairs on upper surface, sericeous on lower; bracteoles similar but smaller. Pedicels 5 – 9 mm long, patent-pubescent. Calyx slightly bilabiate, 3 posticous lobes more united than 2 anticus ones, lobes 5 – 7.5 \times 0.5 – 1 mm, narrowly deltoid, hairs on backs and margins 1 – 1.5 mm long, usually spreading, occasionally appressed. Corolla white, c. 12 – 15 mm long, tube 6 – 7 mm, cylindric below then abruptly expanded and ventricose on anticus side, bilabiate, anticus limb c. 6 – 8 \times 6 – 10

mm, anticus lobe c. 2.5 – 3.5 \times 3 – 5 mm, posticus lobes c. 4.5 – 6 \times 3 – 3.5 mm, joined nearly to apex, outside puberulous, hairs to c. 0.8 mm long, inside a patch of minute glands below posticus sinus, palate transversely rugose. Stamens inserted c. 3.5 mm above base of tube, filaments c. 5 mm long, coiled post anthesis, anthers c. 1.3 – 1.5 \times 1 mm, cohering apically by a very small apiculus, connective and apex of filament minutely glandular; lateral staminodes c. 0.8 mm long, posticus staminode c. 0.2 mm. Disc c. 1.2 \times 1.2 mm, unilateral. Ovary c. 4 \times 1.5 mm, much narrowed at base, very minutely glandular in upper part, pustulate below. Style 2 – 3 mm long, glandular-puberulous. Stigma c. 0.8 \times 1 mm, obscurely bilobed. Fruit c. 7 – 9 \times 4 mm, pericarp verrucose. Seeds c. 0.25 \times 0.2 mm.

SPECIMENS SEEN. SABAH. Kulawat, Lobb s.n. (holotype K); Kebayan-Koung [not traced], 600 – 1300 ft, 3 Nov. 1931, Holttum SFN 25118 (E, K, L). Dallas [Dallas 6°2'N 116°28'E], 3000 ft, Aug. 1931, Clemens 26089 (K, L). Kinabalu National Park, Sg. Tipud Kaung, 1500 ft, 18 Sept. 1965, Meijer 54024 (K, L). Bambang [5°54'N 116°20'E], 10 Sept. 1987, Amin et al. SAN 121009 (E, K, L). Crocker Range, km 41 on Kota-Kinabalu – Tambunan road, 5°51'N, 116°17'E, 9 March 1984, Beaman 8814 (E, L); En route Agr. Exp. Stn. to Sungai Kalangan and Kpg. Tagudon, 1100 – 1500 m, Mt Alab [5°51'N 116°22'E], 13 Dec. 1968, Kokawa & Hotta 2088 (L); Keningau to Kimanis road, near repeater station, 1000 m, 5°50'N 115°50'E, 17

July 2000, *Mendum et al.* 58 (E); Tunggol FR, km 45, jalan Kota-Kinabalu, 5 July 1996, *Asik Mantor* SAN 115775 (K, L); km 45, Tunggul Penampang-Tambunan road, 12 Sept. 1991, *Krispinus* SAN 131376 (E, L); Sinsuron, km 54 jalan [road] Tambunan-Penampang, 1400 m, 24 Aug. 1989, *Asik Mantor* SAN 127900 (K); Sinsuron road, 850–900 m, 5°40'N 116°05'E, 4 Aug. 1998, *Mendum et al.* 28 (E); Kirokot, Tambunan, 8 May 1984, *Amin & Asik* SAN 59542 (K, L); track from Keningau past Crocker Range headquarters across range, 5°24'N 116°05'E, 1500 m, 17 Oct. 1999, *Davies et al.* SJD 99141 (E); Crest of Crocker Range on Kimanis road, 26 km N of Keningau, 5°28'N 116°01'E, 1325 m, 20 Sept. 1983, *Beaman* 7009 (E); Crocker Range, 18 June 1988, *Dewol & Jumrafiyah* SAN 124112 (E, K, L). KALIMANTAN. West Koetai, near Mt Kemoel [1°52'N 116°11'E], 1500 m, 17 Oct. 1925, *Endert* 4234 (A, K, L). Bukit Raya, c. 10 km NNW Tumbang Tosah, c. 0°30'S 112°50'E, c. 1200–1500 m, 2 Dec. 1982, *Mogea* 3864 (L).

NOTES. Among its close allies, the characteristic features of *Cyrtandra chrysea* are its habit (branching mainly from the base), strongly appressed whitish silky hairs on stems, petioles, undersurface of leaves and peduncles, and its relatively shortly pedunculate inflorescences, initially very congested and not expanding to more than c. 45 mm in diam. in the fruiting stage. The leaves are markedly discolorous, dark above where the hairs are well scattered, whitish below where the hairs are dense and strongly appressed.

Typical *Cyrtandra chrysea* appears to be confined to Sabah and Kalimantan. Within Sabah, it has been recorded from the foothills of Mt Kinabalu and along the Crocker Range, between roughly 6°N and 5°25'S and 116° to 116°30'E, as low as 460 m above sea level on the fringes of Kinabalu National Park, between c. 850 and 1400 m on the Crocker Range. Kalimantan is ill-collected and we have seen only two collections, one from Mt Kamoel at roughly 2°N 116°E, the other from Bukit Raja at roughly 0°30'S 113°E. Essentially a forest species, it continues to thrive along the roadside on the Crocker Range.

A specimen collected in Brunei (Temburong, Gunung Pagon, 4°18'N 115°20'E, 1 April 1983, *Coode* 7585 (K)) agrees in all respects with the criteria of *Cyrtandra chrysea* except for the inflorescence, which is a well-branched lax dichasial cyme with a spread of c. 130 mm in flower. That this plant is no more than a form of *C. chrysea* needs further investigation. It has osteosclereids in the hypodermis of the leaves; similar sclereids are sometimes present in the leaves of *C. chrysea*.

No specimens of *Cyrtandra chrysea* have been seen from Sarawak; a superficially similar plant from hills near Kuching is described hereunder as *C. decipiens*. A third species, also hitherto confused with *C. chrysea*, is

found on the middle to higher elevations of Mt Kinabalu, and is described below as *C. lanata*.

2. *Cyrtandra decipiens* *Hilliard & B. L. Burt* sp. nov.
a *C. chrysea* C. B. Clarke pilis in caule patentibus aureo-brunneis (nec valde appressis albidis), foliis plerumque majoribus 200–480 × 55–145 mm (nec 80–270 × 30–80 mm), venis lateralibus utrinsecus costae 22–24 (nec c. 16) distinguenda. Typus: Borneo, Sarawak, Matang Forest Reserve [1°36'N 110°11'E], 9 April 1981, *R. George* S41733 (holotypus E, isotypus L).

Perennial herb c. 1–2 m tall, stems to c. 10 mm in diam. on flowering part, velvety-pubescent, hairs 1–2 mm long, patent, golden-brown, leafy only on upper part. *Leaves* opposite, isophyllous, discolorous, largest 200–480 × 55–145 mm, elliptic, apex acuminate, base narrowly cuneate, very shortly decurrent, margins entire, lateral veins 22–24 each side of midrib, tertiary veins scarcely visible, upper surface with somewhat scattered patent hairs to c. 1 mm long, lower surface densely sericeous; petiole 20–70 mm long, velvety-pubescent, hairs spreading. *Inflorescence* a many-flowered dichasial cyme in upper leaf axils, congested; peduncle 7–15 mm long, velvety-pubescent. *Bracts* paired, c. 15 × 4–5 mm, lanceolate, densely sericeous; bracteoles similar but smaller. *Pedicels* 8–10 mm, pubescent, hairs to 2 mm long, patent. *Calyx* lobed nearly to base, 3 posticous lobes united scarcely more than 2 anticous ones, 7–8 × 1–1.2 mm, narrowly deltoid, velvety, hairs to 1 mm long, patent. *Corolla* white, 13–17 mm long, tube 8–10.5 mm, cylindric below then abruptly expanded and ventricose on anticous side, bilabiate, anticous limb c. 5–8 × 6.5–8 mm, anticous lobe c. 3 × 3 mm, posticous limb c. 4–5 × 2.4–7 mm, shortly bilobed, outside puberulous, hairs 0.5–0.6 mm long, inside minutely glandular below posticous sinus and on palate. *Stamens* inserted 6–8 mm above base of tube, filaments 4.5–5 mm long, coiled post anthesis; anthers c. 1.2 × 1 mm, cohering apically by a very small apiculus, connective minutely glandular; lateral staminodes c. 1.2 mm long, posticous staminode c. 0.6 mm. *Disc* c. 1 × 2 mm, lateral. *Ovary* c. 7 × 1.2 mm, much narrowed at base, papillose. *Style* 4–5.5 mm long, glandular-puberulous. *Stigma* c. 1.2 × 1 mm, obscurely bilobed. *Fruit* c. 15–17 × 4.2–5.5 mm, pericarp verrucose. *Seeds* c. 0.25 × 0.2 mm.

SPECIMENS SEEN. SARAWAK. Matang Forest Reserve, 9 April 1981, *R. George* S41733 (holotype E, isotype L). Mt Matang [1°36'N 110°11'E], near top, 2000 ft, 28 Oct. 1929, *Clemens* 7791 (= 22328) (K); ibidem, *Hullett* s.n. (K). Bau, below Bungoh Range [1°16'N 110°09'E], Kerangas forests, 2000 ft, 6 Dec. 1969, *Paie & Mamit* S29328 (E, K, L). About 50 miles from

Kuching, Kampong Sadir [c. 1°15'N 110°15'E], 3 Dec. 1973, Mamit S 33386 (L); Gunong Serapi, 1°36'N 110°11'E, c. 900 m, 1 March 1982, *Argent & Sinclair* 8220 (E, K).

NOTES. This species was much confused with *Cyrtandra chrysea*; hence its epithet, *decipiens*. It differs from *C. chrysea* in several readily seen characters, namely, stem thickly clad in patent, golden-brown hairs (not whitish strongly appressed ones), often larger leaves (200–480 × 55–145 mm, not 80–270 × 30–80 mm) with 22–24 lateral veins each side of the midrib (versus c. 16). The fruits of *C. decipiens* may prove to be about twice the size of those of *C. chrysea*, but too few have been seen to be certain. There are also interesting anatomical differences. First, each hair on the upper surface of the leaf of *C. decipiens* springs from a swollen basal cushion of about six cells, whereas in *C. chrysea* there is but one basal cell. Secondly, Prof. Bokhari, when investigating leaf anatomy for B.L.B., found that there is an osteosclereid in each of the 'cushion' cells and that brachysclereids are present in the hypodermis, whereas in *C. chrysea* it is osteosclereids that are sometimes present in the hypodermis.

Cyrtandra decipiens is at present known only from the hills south and south east of Kuching, at an altitude of c. 600–900 m. Rena George found her plants in marshy ground, while Mamit's came from sandy hillslopes, and Argent's from disturbed submontane forests.

3. *Cyrtandra lanata* Hilliard & B. L. Burt sp. nov. a *C. chrysea* C. B. Clarke indumento lanato (nec valde appresso), calycis lobis dorso et marginibus pilis ad 4 mm longis (nec 1–1.5 mm), corolla croceo-albida, labio antico purpureo-suffuso cum lineis intensius purpureis (nec albis) statim distinguenda. Typus: Borneo, Sabah, Kinabalu summit trail, 1950 m, 28 July 1998, *Cronk et al.* 20 (holotypus E).

Perennial herb, stem simple, 0.5–3 m tall, becoming woody at base and there to 40 mm diam., to c. 10 mm at flowering apex, thickly lanate, leafy on upper part. *Leaves* opposite, subsophyllous, discolorous, largest 110–300 × 18–85 mm, elliptic, apex long-acuminate, base narrowly cuneate, very shortly decurrent, margins entire, lateral veins mostly invisible, upper surface thickly clad in fine hairs 1.5–4 mm long, lower surface densely lanate; petiole 15–40 mm long, lanate. *Inflorescence* an axillary many-flowered dichasial cyme, congested, all parts densely lanate; peduncle 5–35 mm long. *Bracts* paired, c. 30–35 × 3 mm, narrowly elliptic, enveloped in silky wool; bracteoles similar but smaller. *Pedicels* 4–5 mm long, lanate. *Calyx* 5-lobed nearly to base but sometimes posticous lobes more united than anticous ones,

lobes c. 8 × 0.5–0.8 mm, narrowly deltoid, silky-lanate on backs, hairs to 4 mm long. *Corolla* creamy white, lower lip flushed purple, marked with darker purple lines, 11–15.5 mm long, tube 6–8 mm long, cylindric at base then rapidly expanded and ventricose on anticous side, bilabiate, anticous limb c. 6–7.5 × 8–12 mm, anticous lobe 3–4 × 3 mm, posticous limb 4–5 × 5–7 mm, shallowly notched, outside silky-villous, hairs to c. 3 mm long, inside a small patch of minute glandular hairs below the posticous sinus, palate and floor of tube rugose. *Stamens* inserted 3–4 mm above base of tube, filaments 4–5 mm long, coiled post anthesis, anthers c. 1.2 × 1.2 mm, cohering apically by a very small apiculus, connective minutely glandular; unilateral staminodes c. 1.5 mm, posticous staminode 0.8 mm. *Disc* c. 1.2 × 1.2–2 mm, unilateral. *Ovary* c. 4 × 1.5 mm, much narrowed at base, pustulate. *Style* 2–3 mm, glandular-puberulous. *Stigma* c. 1 × 1.2 mm, obscurely bilobed. *Fruit* 10–14 × 4.5–7.5 mm, pericarp verrucose. *Seeds* c. 0.25 × 0.2 mm.

SPECIMENS SEEN. SABAH. Kinabalu summit trail, 1950 m, 28 July 1998, *Cronk et al.* 20 (holotype E). [Kinabalu National Park] Penataran River [N of Kinabalu summit at c. 6°7'N 116°32'E], 9000 ft, 21 June 1933, *Clemens* 33661 (GH, K, L); ibidem, Silam-Silam trail, 1830 m, 23 Jan. 1976, *Stevens et al.* 676 (E, L); ibidem, mile 35 on Ranau road, 6500 ft, 16 March 1968, *Meijer* 61980 (K, L); ibidem, side of road to power station, 6000 ft, 26 Jan. 1976, *Saikeh Lantoh* SAN 82760 (K, L); ibidem, near the power station, c. 1800 m, 10 Oct. 1968, *Ogata* 11117 (L); ibidem, between Head Quarters and power station, 1650–1900 m, 6 Jan. 1969, *Kohawa & Hotta* 3124 (L); ibidem, Gurulau spur [c. 6°2'45"N 116°30'15"E], 7000 ft, 5 Dec. 1933, *Clemens* 50719 (A, K).

NOTES. *Cyrtandra lanata* has hitherto been confused with *C. chrysea* from which it is at once distinguished by the silky-woolly indumentum that envelops all but the upper surface of the leaves, in contrast to the sericeous, strongly appressed, indumentum of *C. chrysea*. The hairs on the upper leaf surface of *C. lanata* are more crowded and much longer than those of *C. chrysea*, as they are too on the calyx lobes, and the corolla is creamy-coloured flushed purplish on the lower lip and there striped with darker purple, whereas the corolla of *C. chrysea* is white or greenish-white. *Stevens et al.* 676 (cited above) was found to have leaves with a one-layered hypodermis with osteosclereids in the hypodermis; these are sometimes present in *C. chrysea*.

Cyrtandra lanata appears to be confined to the Kinabalu massif, between 1800 and 2700 m above sea level; *C. chrysea* has been recorded only from the fringes of the Kinabalu National Park at an altitude of only 460 m.

4. *Cyrtandra dasymallos* Hilliard & B. L. Burt *sp. nov.* a *C. lanata* Hilliard & B. L. Burt foliis valde anisophyllis (nec aequalibus vel subaequalibus), floribus fasciculatis (nec in cymis pedunculatis) calycis lobis 3–4 mm longis (nec 8 mm longis) facile distinguenda. Typus: Borneo, Sarawak, c. 4°5'N 114°50'E, 23 June 1962, Melinau gorge pathway, Burt & Woods B2248 (holotypus E).

Perennial herb, stem sparingly branched, height unknown but at least 1 m, flowering part woody, 10 mm in diam., young parts thickly silky-woolly, wool rapidly deciduous, hairs very fine and silky, at least 10 mm long, leafy only at apex. *Leaves* opposite, strongly anisophyllous, discolorous, reduced leaves c. 45 × 15–20 mm, almost sessile, indumentum as on developed leaves; largest developed leaves c. 160–210 × 40–52 mm, elliptic, apex long-acuminate, base narrowly cuneate, shortly decurrent, margins entire, undulate, lateral veins c. 16, upper surface well clad in fine silky hairs (to 10 mm long on midrib), lower surface densely lanate; petiole c. 15 mm long, lanate. *Inflorescence* a many-flowered, very congested, sessile, axillary dichasial cyme (flowers look fascicled on casual inspection), leaves quickly falling to leave innumerable inflorescences exposed on the bare wood, tufts of wool still clinging to them. *Bracts* and bracteoles many, largest seen 8 × 1 mm, narrowly ovate, thickly enveloped in silky-woolly hairs. *Pedicels* c. 3.5–4 mm long, lanate. *Calyx* 5-lobed almost to base, lobes c. 3–4 × 1 mm, narrowly deltoid, densely woolly outside, very minutely glandular inside. *Corolla* whitish, lower lip very pale purple, c. 10 mm long, tube 6 mm, cylindric at base then rapidly expanded and ventricose on anticous side, bilabiate, anticous limb c. 4 × 6 mm, damaged and anticous lobe not seen, posticous limb 3 × 5 mm, shallowly notched, outside silky-villous, inside a patch of minute glandular hairs below posticous sinus, patch of eglandular hairs on palate. *Stamens* inserted 4 mm above base of corolla tube, filaments 3 mm long, anthers 1 × 1 mm, cohering apically by a very small apiculus, all parts glabrous; lateral staminodes 1.2 mm long, posticous staminode 0.4 mm. *Disc* 0.8 × 0.8 mm, unilateral. *Ovary* 3 × 0.8 mm, very minutely glandular. *Style* 2.5 mm, puberulous. *Stigma* c. 0.8 × 1 mm, shortly bilobed. *Fruit* 11 × 4 mm, pericarp verrucose. *Seeds* c. 0.3 × 0.2 mm.

NOTES. *Cyrtandra dasymallos* is known only from the type collection, made in G. Mulu National Park in 1962. The silky-woolly indumentum that envelops all the young parts of the plant except the upper leaf surface give it a striking similarity to *C. lanata* from Mt Kinabalu (the epithets of both species mean woolly, one in Latin, the other in Greek). It differs from *C. lanata* in several respects, the most obvious

being the strongly anisophyllous leaves and the sessile inflorescence, as opposed to equal or subequal pairs of leaves and a distinctly pedunculate inflorescence. The inflorescences are distributed along the entire length (650 mm) of the longest stem collected. Only the uppermost 70 mm of the stem retains its woolly indumentum and four pairs of leaves, the rest of the stem being woody and leafless, with tufts of wool clinging to the uppermost nodes. The calyx lobes are 3–4 mm long in *C. dasymallos*, but c. 8 mm in *C. lanata*. As in *C. lanata*, osteosclereids are present in the hypodermis of the leaf, but in *C. dasymallos* these are also present in the midrib, making the midrib on the upper leaf surface transversely corrugated, in contrast to the smooth midrib of *C. lanata*.

5. *Cyrtandra kostermansii* Hilliard & B. L. Burt, *sp. nov.* a *C. chrysea* C. B. Clarke caulibus villosis (nec sericeis), foliis concoloribus (nec decoloribus) inflorescentia sessili (nec pedunculata) differt. Typus: Borneo, Kalimantan, Berau, Mt Njapa on Kelai river [1°45'N 117°25'E], 100 m alt., 18 Oct. 1963, *Kostermans* 21342 (holotypus K, isotypus L).

Habit unknown, height 1 m, longest stem seen 240 × 5 mm, woody, silky-villous, hairs patent. *Leaves* few at apex of stem, opposite, isophyllous, concolorous, largest leaves 155–175 × 57–70 mm, elliptic, apex long-acuminate, base narrowly cuneate, margins entire, lateral veins c. 16 each side of midrib, tertiary veins invisible (obscured by indumentum), upper surface thinly villous, lower surface densely villous, hairs appressed, to 5 mm long over midrib, shorter elsewhere; petiole 20–28 mm, villous, hairs appressed. *Inflorescence* a many-flowered, very congested sessile axillary dichasial cyme (flowers look fascicled on casual inspection), extending along whole length of leafless stem. *Bracts* leaflike, very conspicuous, 20–50 × 3–17 mm, both surfaces villous, bracteoles similar but smaller. *Pedicels* c. 6–7 mm long, villous. *Calyx* 5-lobed nearly to base, lobes 5–7 × 0.8–1 mm, narrowly deltoid, with long (c. 3 mm) spreading hairs on backs and margins, and minute globular glands inside. *Corolla* white, c. 14 mm long, tube 9 mm, cylindric at base, abruptly expanded above, ventricose on anticous side, limb bilabiate, anticous lip 5 × 8 mm, anticous lobe 3 × 3 mm, posticous lip 3 × 7 mm, notched, outside glandular-puberulous, inside minutely glandular-puberulous below anticous lobe and posticous sinus. *Stamens* inserted 4 mm above base of tube, filaments c. 6 mm long, twisted once near base, anthers 1.5 × 1.6 mm, cohering apically by a very small apiculus, connective and upper part of filaments glandular-puberulous; lateral staminodes c. 1.5 mm, posticous

staminode c. 0.5 mm. *Disc.* c. 1.5×1.2 mm, unilateral. *Ovary* c. 5.5×1 mm, very minutely puberulous. *Style* 3 mm, glandular-puberulous. *Stigmatic lobes* c. 1×0.8 mm, glandular-puberulous on backs. *Fruit* not seen.

NOTES. *Cyrtandra kostermansii* is known only from the type collection, made in NE Kalimantan. Its affinity clearly lies with *C. chrysea*, from which it is easily distinguished by the long spreading hairs on the stem and the concolorous leaves. In *C. chrysea* the stems as well as the undersurface of the leaves are clad in strongly appressed pale silky hairs; these hairs make the leaves strongly discolorous, the upper surface drying blackish, the lower creamy white. Also, the inflorescences of *C. kostermansii* are sessile, whereas in *C. chrysea* they are distinctly pedunculate.

Regrettably, Kostermans, who was a prolific collector, gave no information on either habit or habitat. The stems, though slender, are woody and slightly curved towards the base, where they have been snapped off, suggesting that they are branches rather than simple stems.

6. *Cyrtandra eximia* C. B. Clarke in DC., Monogr. Phan. 5: 210 (1883); B. L. Burtt, Notes Roy. Bot. Gard. Edinburgh 30: 30 (1970). Type: Borneo, Sarawak, Mt Matang, April 1866, *Beccari* 1440 (holotype FI, n.v., photo. E).

Pole plant, 0.5–4 m tall, stem up to 45 mm in diam. at base, c. 7 mm diam. near apex, unbranched except when damaged, uppermost part pubescent, hairs c. 1–2 mm long, more or less appressed, brown, gradually glabrescent to reveal longitudinally finely ridged and furrowed bark, leafy only at apex. *Leaves* opposite, slightly anisophyllous, largest leaves $280-700 \times 100-160$ mm, elliptic, apex long-acuminate, base cuneate, margins serrulate, lateral veins c. 15–25 each side of midrib, tertiary veins \pm pinnate, lesser veinlets forming a fine reticulum clearly visible on lower surface where all veins are raised and more densely pubescent than blade, upper surface with coarse scattered hairs over blade, dense over midrib and laterals, lower surface densely pubescent, hairs patent, blade visible, hairs finer than on upper surface, coarser, longer hairs along midrib; petiole 35–85 mm long, hairy as stem. *Inflorescence* a very congested, many-flowered sessile axillary cyme (flowers look fascicled on casual inspection), extending along whole length of stem. *Bracts* and bracteoles paired, c. $5-6 \times 1.3-1.8$ mm, lanceolate, both surfaces densely patent-pubescent. *Pedicels* 5–10 mm, patent-pubescent. *Calyx* 5-lobed almost to base, lobes c. $5-6 \times 1.2$ mm, narrowly deltoid, hairs on backs and margins spreading. *Corolla* whitish, upper lip deep reddish purple, lower

lip marked with red-purple lines, c. 11–12.5 mm long, tube 6.5–7 mm, cylindric below then abruptly expanded and ventricose on anticous side, bilabiate, anticous limb $4.5-5.5 \times 10-12$ mm, anticous lobe 3×3 mm, posticous limb $3.5-4 \times 4-5$ mm, notched, outside pubescent, hairs acute, inside minutely glandular all over lobes and upper part of tube. *Stamens* inserted c. 4.5 mm above base of tube, filaments 3–3.5 mm long, coiled post anthesis, anthers c. 1×1 mm, cohering apically by a very small apiculus, connective glandular-puberulous at apex, few scattered glands on filaments; lateral staminodes c. 1 mm long, posticous staminode 0.25 mm. *Disc* c. 1×2 mm unilateral. *Ovary* c. 6×1.8 mm, puberulous. *Style* c. 2 mm, glandular-puberulous. *Stigmatic lobes* c. 0.8×0.8 mm. *Fruit* 13–18 \times 3–6 mm, puberulous, glabrescent, pericarp verrucose. *Seeds* c. 0.3×0.2 mm.

SPECIMENS SEEN. SARAWAK. Mt Matang, April 1866, *Beccari* 1440 (holotype FI, n.v., photo E). Pelagus Rapids on Rajang, c. $2^{\circ}10'N$ $113^{\circ}E$, 21 July 1962, *Burtt & Woods* B2586 (E). North slopes of Gunong Matang, Sungai China, 14 July 1962, *Burtt & Woods* B2506 (E). Mt Matang, 29 May 1962, *Burtt & Woods* B1941 (E); ibidem, 2500 ft, 28 March 1965, *Anderson* S20971 (E). Gunong Matang, $1^{\circ}36'N$ $110^{\circ}11'E$, 2000–2100 ft, 27 Aug. 1991, *Frodin* 2166 (A, E, L). Gunong Undan [$1^{\circ}27'N$ $109^{\circ}59'E$], 17th mile Bau/Lundu road, 50 m, 30 April 1983, *Yii Puan Ching* S45933 (E); Lingga, Gunong Lesung, $1^{\circ}14'N$ $111^{\circ}09'E$, 420 m, 28 Nov. 1981, *Hansen* 1054 (E).

NOTES. *Cyrtandra eximia* is a 'pole' plant, the stem reaching 4 m in height and unbranched except when damaged, and flowering from near the apex to ground level (see Burtt 1970). In this same paper, a specimen from the Hose Mts is cited as *C. eximia*, but proves to be a different species, described below as *C. nibongensis*.

Among its allies, the outstanding features of *Cyrtandra eximia* are, first, its leaves with prominent venation on the undersurface forming a characteristic pattern (tertiary veins more or less pinnate, lesser veins finely reticulate) rendered even more prominent by the indumentum being patent and brown in colour, and, secondly, by its flowers, where the upper lip of the corolla is red-purple, with the tube and lower lip white, the lip marked with broken purplish lines.

The species appears to be confined to southern Sarawak, from the middle reaches of the Rajang south and east to the environs of Bau, at an altitude of c. 50–600 m above sea level.

There are no sclereids in the leaves, and a hypodermis may be present or absent.

7. *Cyrtandra nibongensis* Hilliard & B. L. Burtl sp. nov. a *C. eximia* C. B. Clarke tantum costa et venis lateralibus subtus visibilibus, venis minoribus a pilis densis valde appressis albidis fere obscuratis (nec venatione omni clare visibili, pilis patentibus brunneis), calyces lobis c. 3 mm longis (nec 5–6 mm), corollae labio superiore albo (nec rubro-purpurea) distinguenda. Typus: Borneo, Sarawak, SE end Hose Mts, Bukit Nibong, c. 2°6'N 113°42'E, 6 Aug. 1967, Burtl & Martin B 4830 (holotypus E).

Pole plant, stem unbranched, height not recorded, bark (slivers stripped off with inflorescences) pale, glabrous, finely longitudinally grooved and marked with delicate red more or less transverse lines, possibly eventually flaky. *Leaves* few at apex of stem, opposite, slightly anisophyllous, largest leaves 230–280 × 60–67 mm, elliptic, apex abruptly acuminate, base narrowly cuneate, margins entire, lateral veins c. 22–25 each side of midrib, tertiary veins coarsely reticulate, almost obscured by indumentum on lower surface, upper surface with scattered hairs to c. 1 mm long, appressed, dense over midrib, lower surface silky, pale (leaves strongly discoloured), hairs strongly appressed; petiole 25–40 mm long, silky, hairs strongly appressed. *Inflorescence* a many-flowered, very congested, sessile axillary cyme (flowers look fascicled on casual inspection) extending down whole length of stem. *Bracts* apparently wanting, bracteoles paired at base of each pedicel, up to c. 3 × 1 mm, lanceolate, pubescent. *Pedicels* c. 3 mm in fruit, pubescent, hairs brown. *Calyx* lobed nearly to base, tube c. 0.5–1 mm, lobes c. 3 × 1 mm, deltoid, pubescent outside, hairs appressed. *Corolla* white with 5 purple lines on lower lip, c. 14 mm long, tube c. 6 mm, cylindric below then abruptly expanded and ventricose on anticous side, limb bilabiate, anticous lip c. 8 × 9 mm, anticous lobe c. 3 × 3.5 mm, posticous lip c. 4 × 4 mm, distinctly notched, outside minutely puberulous, hairs acute, inside glabrous. *Stamens* inserted 4 mm above base of tube, filaments 3.5 mm, anthers c. 1 × 1.2 mm, cohering apically by a very small apiculus, connective and upper part of filaments glandular-puberulous; lateral staminodes c. 1 mm long, posticous staminode c. 0.4 mm. *Disc* c. 1.2 × 1.8 mm, unilateral. *Ovary* c. 4.5 × 1.2 mm, glandular-puberulous. *Style* 2 mm, glandular-puberulous. *Stigma* 1.2 × 0.8 mm, obscurely bilobed. *Fruit* c. 12 × 5 mm, pericarp minutely verrucose. *Seeds* c. 0.25 × 0.2 mm.

NOTES. *Cyrtandra nibongensis* is currently known to us only from the type collection made on Gunong Nibong at the SE end of the Hose Mts. It is allied to *C. eximia*, from which it is readily distinguished by its leaves, which are pale beneath with the silky strongly appressed hairs almost obscuring the tertiary

venation, in contrast to the undersurface of the leaves of *C. eximia* where all the venation stands out clearly, the hairs being patent and brown. The calyx lobes are shorter (c. 3 mm long, not 5–6 mm) and the corolla white except for purplish lines on the lower lip, whereas in *C. eximia* the two upper lobes are reddish-purple.

Only one plant of this species was seen, so, being a 'pole' plant, the stem was not collected. The need for further collections is obvious. The numerous inflorescences on the specimen seen ran down the whole length of the stem, in the axils of the fallen leaves. Slivers of bark were shaved off with the inflorescences collected. This bark is much smoother than that of *Cyrtandra eximia* being only very finely longitudinally grooved (not ridged and furrowed) with fine, red, more or less transverse lines a few mm apart. It possibly breaks up into flakes.

As in *Cyrtandra eximia* the leaves lack a hypodermis and there are no sclereids in the mesophyll.

8. *Cyrtandra* sp. nov.

Loosely branched herb, height unknown, stem initially thickly clad in brownish appressed hairs, soon glabrescent, old parts c. 10 mm across, square in section, deeply longitudinally grooved between the angles, bark smooth, glabrous. *Leaves* confined to apex of stem, opposite, only one, detached, mature leaf seen, c. 300 × 50 mm, elliptic, apex broken off, base narrowly cuneate, decurrent well down petiole, margins entire, lateral veins c. 16–20, tertiary veins coarsely reticulate, upper surface sparsely appressed-pubescent, hairs denser on midrib, to 1.5 mm long, lower surface with blade very sparsely pubescent at maturity, hairs denser over veins, blade closely and conspicuously tuberculate (stomatal turrets); petiole broken off short, appressed-pubescent. *Inflorescence* a many-flowered, sessile, dichasial cyme, distributed all down old stem in axils of fallen leaves. *Bracteoles* c. 6–7 × 0.5–0.8 mm, linear, appressed-pubescent, hairs brownish. *Pedicels* c. 4 mm, appressed-pubescent. *Calyx* 5-lobed almost to base, tube c. 1 mm, lobes c. 4 × 1.2 mm, narrowly deltoid, tips minutely verrucose, outside shortly pubescent. *Corolla* white with 5 mauve bars on lower lip, c. 14 mm long, tube 7 mm, narrowly cylindric at base, abruptly expanded above and ventricose on anticous side, limb bilabiate, anticous lip 7 × 12 mm, median lobe 4 × 5 mm, posticous lip 3 × 6 mm, slightly notched, outside densely appressed-pubescent, inside two patches of minute glandular hairs, one below notch in posticous lip, the other below the anticous lobe and running down floor of tube to insertion of stamens. *Stamens* inserted 5 mm above base of tube, 6 mm long, twisted once near base after anthesis, anthers c. 1.2 × 1.2 mm, cohering

apically by very small apiculus, connective and upper half of filament minutely glandular; lateral staminodes c. 0.5 mm, posticous staminode minute. *Disc.* c. 1.5 × 1.5 mm, unilateral, very fleshy. *Ovary* c. 5 × 1.7 mm, very minutely puberulous. *Style* c. 2 mm, minutely glandular-puberulous. *Stigmatic lobes* c. 0.8 × 0.8 mm very minutely glandular on backs. *Fruit* c. 12 × 5 mm, pericarp verrucose. *Seeds* (immature) c. 0.25 × 0.2 mm, testa dark reddish brown.

SPECIMEN SEEN. SARAWAK, SE end Hose Mts, Bukit Semanko, c. 2°6'N 113°42'E, 16 Aug. 1967, *Burtt & Martin* B4940 (E).

NOTES. Unfortunately, the material of this plant available to us is inadequate to typify a name, particularly as only one detached and broken mature leaf is present on the sheet (part of the collection seems to have been lost during curation). It can immediately be distinguished from its immediate allies by the presence of prominent, easily visible and crowded stomatal turrets on the lower leaf-surface; these turrets make the surface look tuberculate. Its closest ally is possibly *Cyrtandra nibongensis*, also from the Hose Mts, the leaves of which also have prominent stomatal turrets but these are completely hidden by the dense silky appressed hairs (we are indebted to our colleague, Prof. M. H. Bokhari, Lahore, for this information on stomatal turrets). The two species further resemble each other in their relatively narrow leaves, small bracteoles, short calyx lobes, similarly marked corollas, and glandular stamens; they differ markedly in indumentum.

Cyrtandra decipiens too has stomatal turrets hidden by the closely appressed silky indumentum, but differs, *inter alia*, in its pedunculate inflorescences.

9. *Cyrtandra villifructus* Hilliard & B. L. Burtt sp. nov. de ovario et fructu fere villosis a characteribus hujus gregis solum differt, de ceteris congruit. Typus: Borneo, Sarawak, western ridge of Gunong Mulu [4°01'N 114°52'E], 20 March 1964, *Hotta* 15091 (holotypus E, isotypus KYO).

Probably a 'pole' plant, stem to 1.5 m tall, 10 mm diam. near apex, densely pubescent, hairs patent, c. 1 mm long, brown, glabrescent, bark smooth with 4 longitudinal grooves, leafy towards apex. *Leaves* opposite, slightly anisophyllous, largest leaves 165 – 300 × 52 – 75 mm, elliptic, apex long-acuminate, base narrowly cuneate, margins entire to serrulate, lateral veins c. 15 – 18, tertiary veins hidden by indumentum on lower surface, upper surface relatively thinly puberulous, hairs patent, blade visible, lower surface densely brown-velvety, only midrib and lateral veins clearly visible; petiole 17 – 75 mm long, brown-velvety. *Inflorescence* a very congested, several-flowered axillary

cyme (flowers look fascicled on casual inspection), extending far down stem. *Bracts* quickly caducous, paired, 7 – 10 × 3 – 4 mm, lanceolate, densely patent-pubescent, a few hairs gland-tipped; bracteoles similar but smaller, linear. *Pedicels* 3 – 8 mm, densely patent-pubescent. *Calyx* 5-lobed almost to base, lobes 9 – 12 × 1.8 – 2 mm, narrowly deltoid, outside densely pubescent, hair brown, mixed glandular and eglandular, inside minutely gland-dotted, some short hairs on upper half. *Corolla* 'white, purple inside near mouth' (*Chai* S35900), c. 19 – 20 mm long, tube c. 12 – 14 mm, broadly cylindric below then expanded and ventricose on anticous side, bilabiate, anticous limb c. 8 × 10 – 12 mm, anticous lobe 5 × 5 mm, posticous limb c. 6 × 10 – 11 mm, notched, outside pubescent, hairs mixed glandular and eglandular, very delicate, inside a patch of obtuse hairs running from base of anticous lobe to point of insertion of stamens, a patch of small glandular hairs below sinus of posticous lip. *Stamens* inserted c. 7 mm above base of tube, filaments 5 – 6 mm, twisted once near base after anthesis, anthers 1.8 – 2.5 × 1.6 mm, cohering apically by very small apiculus, glabrous; lateral staminodes c. 1 mm or wanting, posticous staminode wanting. *Disc* 1.5 × 1.5 mm, unilateral. *Ovary* 10 × 3.5 mm, densely pubescent, hairs acute. *Style* 4 mm, hairy as ovary. *Stigmatic lobes* 3 × 1.2 mm, mixed glandular and eglandular hairs on backs. *Fruit* 12 × 5 mm (young), densely pubescent, fully developed pericarp not seen. *Seeds* c. 0.25 × 0.2 mm, red-brown, not fully ripe.

SPECIMENS SEEN. SARAWAK. Western ridge of Gunong Mulu [4°01'N 114°52'E], 20 March 1964, *Hotta* 15091 (holotype E, isotype KYO). Gunong Mulu National Park, Ulu Sungai Tutoh, along ridge path to summit of Gunong Mulu, 6000 – 6500 ft, 8 Jan. 1976, *Chai* S35900 (L).

NOTES. *Cyrtandra villifructus* stands out among its allies in having both ovary and fruit almost villous (whence the epithet). It is also the only species to have gland-tipped hairs among the acute ones on bracts and calyx lobes. The brown patent indumentum on stems and the lower surface of the leaves resembles that of *C. eximia*, but that species has prominent tertiary venation and differs further in several floral details.

Currently, the species is known only from Gunong Mulu in northern Sarawak. *Hotta* gave no information other than locality, which is probably exactly where *Chai* found it, growing in mossy forest between 1800 and 1980 m above sea level. He described the flowers as 'white, purple inside near mouth'. He also commented on the brown hairs on the undersurface of the leaves, calyx lobes and fruit. Unfortunately, there are no fully developed fruits on the specimen seen.

Cyrtandra villifructus has brachysclereids in the hypodermis of the leaf.

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