

**OLD WORLD GESNERIACEAE VII: *CYRTANDRA*
SCHIZOSTYLA, *C. VELUTINA* AND THEIR
RESPECTIVE ALLIES IN BORNEO**

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Two groups of species are dealt with: first, *Cyrtandra schizostyla* together with three new species, all notable for the extraordinary elaboration of their anthers; second, *C. velutina* and *C. diplotricha* together with four new species, notable for their remarkably slender, soft-walled fruits. All species are fully described and identification keys provided.

Keywords. Borneo, *Cyrtandra*, *Gesneriaceae*, new species.

1. *CYRTANDRA SCHIZOSTYLA* AND ITS IMMEDIATE ALLIES

Cyrtandra schizostyla C.B.Clarke, *C. deinandra* B.L.Burt, *C. pumilio* B.L.Burt and *C. hiranoi* B.L.Burt comprise a group of species having in common a short or very short stem crowned with a tuft of leaves, lacinate bracts, calyx divided nearly to the base, corolla white with two yellow to orange bars on the lower lip, the bars sometimes confluent, tube funnel-shaped, anthers triangular in outline and displaying considerable elaboration (Fig. 1), thecae not confluent, disc unilateral, ovary papillose, style pubescent, stigmatic lobes well developed, and fruit of moderate size (c.10–20 × 4–7mm). Their general affinity appears to lie with *C. erythrotricha* B.L.Burt, which agrees in all respects except marked elaboration of the anthers (Fig. 1A).

Key to species

- 1a. Largest leaves 45–75mm broad _____ 2
 1b. Largest leaves 6–25mm broad _____ 3
- 2a. Lower surface of leaf with hairs confined to veins, blade glabrous _____
 _____ **1. *C. hiranoi***
- 2b. Lower surface of leaf densely hairy all over _____ **2. *C. pumilio***
- 3a. Stem c.100–250mm long _____ **3. *C. schizostyla***
 3b. Stem c.10mm long _____ **4. *C. deinandra***

1. *Cyrtandra hiranoi* B.L.Burt, **sp. nov.** *C. erythrotrichae* B.L.Burt generaliter affinis sed minus robusta (caulibus 0–60 × 4–5mm nec 150 × 8mm) foliis petiolis

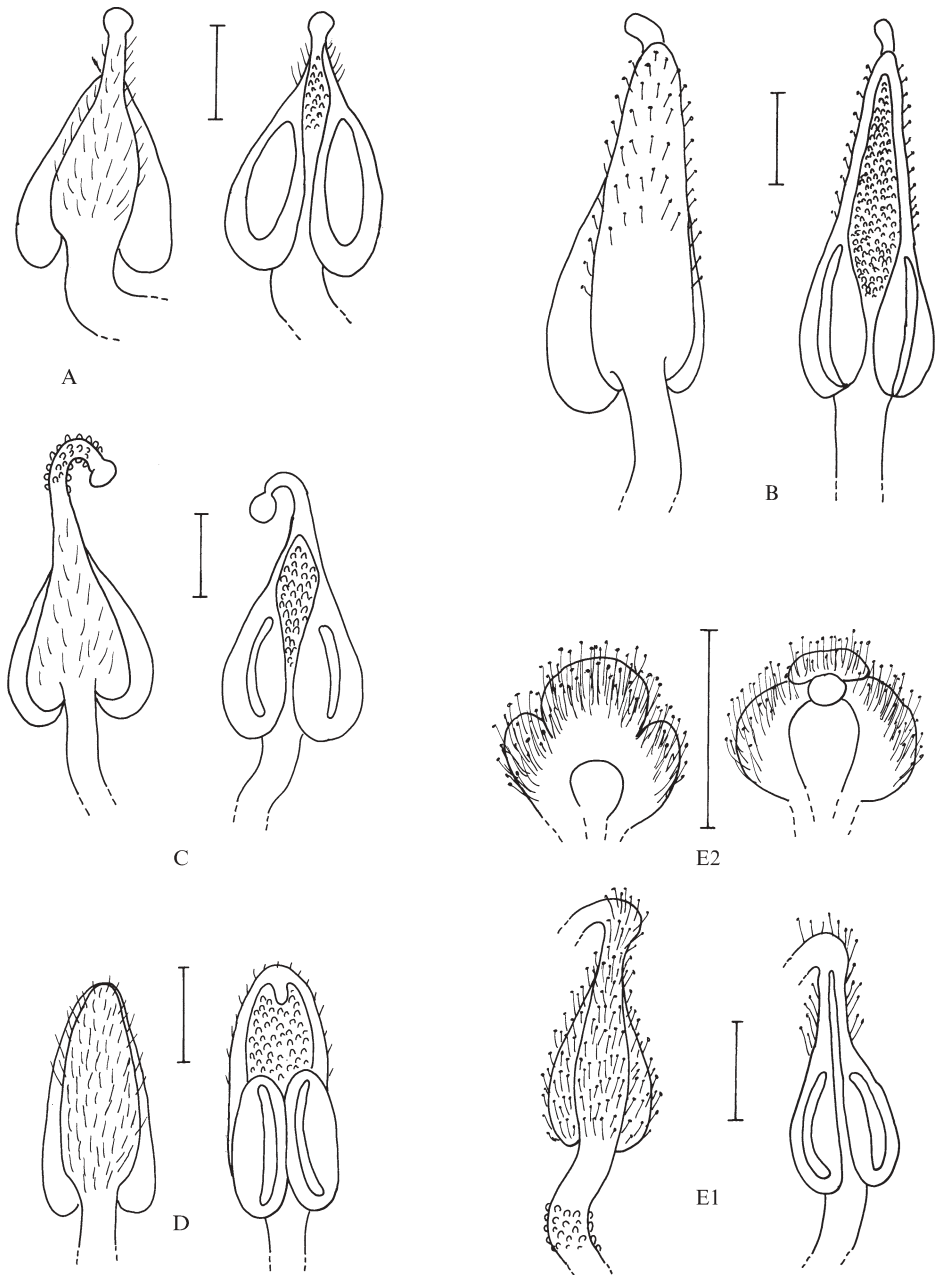


FIG. 1. Diagrams of front (left) and back (right) views of anthers. A, *Cyrtandra erythrotricha* (Burt & Woods 2361); B, *C. hiranoi* (Hirano & Hotta 1433); C, *C. pumilio* (Paie S19860); D, *C. schizostyla* (Ashton S17775); E1, *C. deinandra*, ligature omitted, E2, ligature (Ashton S21240). Scale bars = 1mm.

brevioribus (20–55mm nec 75–90mm) subtus in venis tantum pilosis (nec omnino) thecis dimidium antherae tantum (nec fere totam lonitudinem) aequantibus distinguenda.

Type: Borneo, Sarawak, Bintulu distr., eastern ridge of Bukit Kana [c.2°42'N, 112°54'E], 800–950m, 20 xi 1963, *Hirano & Hotta* 1433 (holo. E, iso. KYO).

Herb; stem 0–60mm long, simple, appressed-pubescent, base decumbent, rooting. *Leaves* opposite, slightly anisophyllous, few crowded together, largest 120–170 × 45–60mm, elliptic, apex obtuse to acute, base cuneate to rounded, margins obscurely serrulate, lateral veins 6–7 each side of midrib, tertiary veins very coarsely reticulate, upper surface either glabrous or with coarse scattered hairs to c.3mm long, lower surface with blade glabrous, veins and veinlets coarsely hairy, hairs to 1mm long, brown (probably purplish when fresh); petioles 20–55mm long, appressed-pubescent, hairs to 2mm. *Inflorescence* few-flowered, axillary, flowers crowded; peduncle 5–14mm, appressed-pubescent. *Bracts* c.17 × 15mm, broadly ovate in outline, deeply dissected, lobes 2–3 each side, narrowly deltoid, tip subacute, tipped with a gland, inside glabrous, outside densely pubescent, hairs to 1.5mm long, mostly acute, a few gland-tipped; bracteoles wanting. *Pedicels* c.4–7mm. *Calyx* 5-lobed nearly to base, lobes c.7 × 1mm, narrowly deltoid, sparsely hairy outside. *Corolla* white with 2 dark yellow bars running from sinuses of anticous lobes down floor of tube, 30mm long, tube 22mm, cylindric at base, upper two-thirds widening to mouth, narrowly funnel-shaped, anticous lip 9 × 14mm, anticous lobe 5 × 4mm, more or less oblong-elliptic, posticous lobes 5 × 4mm, rounded, thinly hairy all over outside, hairs to 0.6mm, acute, inside glabrous except for patch of minute glandular hairs below sinus of posticous lip. *Stamens* inserted 9mm above base of tube, filaments 3mm, twisted once, glabrous, anthers 3.5mm, deltoid in outline, only half the length fertile (Fig. 1B), thecae not confluent, densely glandular in apical sterile part, as on upper part of connective, cohering face to face by a conspicuous ligature; staminodes wanting. *Disc* c.2 × 1mm, unilateral. *Ovary* c.5 × 1.2mm, very minutely hairy in upper half. *Style* c.6.5mm, puberulous, hairs mixed acute and gland-tipped. *Stigmatic lobes* 2 × 1mm at maturity, puberulous on backs. *Fruit* not seen.

Other specimens examined. SARAWAK. Along valley of Ulu Sungai Bejangung, eastern part of Bukit Kana, 700–850m, 21 xi 1963, *Hotta* 15382 (E, KYO).

Cyrtandra hiranoi is easily distinguished from *C. erythrotricha* not only by its anthers, but also by its much less robust habit (stems c.0–60 × 4–5mm, not c.150 × 8mm), shorter petioles (20–55mm, not 75–90mm), lower leaf surface hairy only over the veins (not all over). They differ further in leaf anatomy: *C. hiranoi* has a one- or two-layered hypodermis with broad thin-walled sclereids; under a lens the surface appears minutely pitted. In contrast, *C. erythrotricha* has long osteosclereids in a one-layered hypodermis and under a lens the surface is patterned with more or less parallel 'knotted strings'. In both, astrosclereids occur in the mesophyll.

The two collections seen were made close together on Bukit Kana. The only ecological information given is 'on wet rocks in open places', presumably in forest along a stream.

2. *Cyrtandra pumilio* B.L.Burtt, sp. nov. a *C. hiranoi* B.L.Burtt foliis subtus inter venas pubescentibus (nec glabris) venis tertiariis reticulationem tenuiorem formantibus, osteosclereideis in hypoderme praesentibus (nec sclereideis absentibus), connectivo antherae dense pubescente pilis acutis (nec connectivo glanduloso-puberulo) distinguitur.

Type: Borneo, Sarawak, Baleh, N Amau, [Sungai] Mujong [c.2°1'N, 113°10'E], c.300m, 14 iv 1964, *Paie* S19860 (holo. E).

Herb; stem c.20 × 6mm, decumbent, rooting. *Leaves* opposite, isophyllous, few crowded together, largest 105–150 × 46–73mm, broadly elliptic to broadly obovate, apex obtuse to broadly acute, base cuneate, margins entire to minutely denticulate (teeth are hydathodes at vein-endings), lateral veins 6 each side of midrib, tertiary veins reticulate, upper surface glabrous, lower with blade clad in coarse brown patent hairs to 1mm long, these dense over all veins; petioles 30–50mm long, hairy as veins. *Inflorescence* an axillary, highly condensed, dichasial cyme, 5–6-flowered; peduncles c.3–12mm, densely pubescent. *Bracts* c.15–20 × 2–10mm, narrowly elliptic to narrowly obovate, entire when very narrow, progressively 2–4 lacinate when broader, outside and margins densely pubescent, hairs to 1mm, mostly acute, few gland-tipped; bracteoles c.6 × 0.5mm, entire. *Pedicels* 4–6mm. *Calyx* 5-lobed nearly to base, lobes 5–8 × 1mm, narrowly deltoid, hairs to 0.6mm on backs and margins. *Corolla* white with 2 broad dark yellow bands running from bases of anticous sinuses down floor of tube, c.20–28mm long, tube 13–21mm, narrowly funnel-shaped, anticous lip 7 × 10mm, anticous lobe 3 × 3mm, posticous lobes 4 × 2mm, all lobes rounded, hairy all over outside, hairs to 0.5mm, acute, inside minutely glandular-puberulous below posticous sinus otherwise glabrous. *Stamens* inserted c.9mm above base of tube, c.2.5mm long, twisted once, glabrous, anthers 3.8–4mm long, deltoid in outline, only half the length fertile (Fig. 1C), thecae not confluent, connective densely pubescent on back, hairs to c.0.4mm, acute, uppermost part papillose, cohering face to face by a conspicuous ligature; staminodes wanting. *Disc* 2 × 0.8mm, unilateral. *Ovary* 5 × 0.8mm, papillose. *Style* 5mm, pubescent, hairs acute. *Stigmatic lobes* 2–3 × 1.3–1.6mm at maturity, puberulous on backs. *Fruit* not seen.

Other specimens examined. SARAWAK. Long Bah [Sungai Bah 2°24'N, 113°24'E], 14 viii 1954, *Brooke* 9004 (L).

Cyrtandra pumilio (*pumilio* = dwarf) is another species in this small group of allies having a remarkable anther structure (Fig. 1C). Its habit, few leaves tufted at the stem-apex, and reticulate tertiary venation, prominent on the lower leaf surface by virtue of the brown indumentum, give it a strong resemblance to *C. hiranoi*. The reticulate venation of *C. pumilio* is much finer than that of *C. hiranoi*, the blade, in

addition to the veins, is hairy (glabrous in *C. hiranoi*), and the leaves differ anatomically. In *C. pumilio*, the hypodermis is one-layered, composed of very large cells, some becoming osteosclereids, whereas in *C. hiranoi* the hypodermis is one- to two-layered with broad thin-walled sclereids. Under a lens, the dried epidermis of *C. pumilio* appears knotty whereas in *C. hiranoi* it is smooth. Both have astrosclereids in the mesophyll.

The anther-connectives of the two species differ in indumentum (Fig. 1C, 1B).

Cyrtandra pumilio is known from two collections made not far apart on the Mujong and its tributary the Bah. The label on *Paie* S19860 records 'clay-rich soil, hillside, mixed Dipterocarp forest'; that on *Brooke* 9004 notes 'on the ground in the forest'. *Paie* also recorded 'pale grey-green fruit' but no fruit is present on the specimen seen; furthermore, all the inflorescences were detached and mounted separately. On *Brooke* 9004 the flowering specimen is intact.

3. *Cyrtandra schizostyla* C.B. Clarke in DC., Monogr. phan. 5: 204 (1883); B.L. Burtt, Notes Roy. Bot. Gard. Edinburgh 30: 38 (1970).

Type: Sarawak, [Bukit] Sakarang [c.0°15'N, 112°E], 186– [last figure unclear], *Beccari* 3842 (lecto. FI, photo. E).

Herb; stem c.100–250 × 5–7mm, simple, base decumbent, rooting, densely leafy and floriferous above, nude in lower half, young parts densely appressed-pubescent, hairs brown, c.1.5mm long. *Leaves* probably isophyllous, largest 120–160 × 14–25mm, narrowly elliptic, apex acute, base narrowly cuneate, shortly decurrent down petiole, margins entire, lateral veins c.6 each side of midrib, tertiary veins reticulate, upper surface glabrous, lower surface with blade glabrous, all veins prominent, densely appressed-pubescent, hairs c.1mm long, brown; petioles 35–70mm long, hairy as midrib. *Inflorescences* up to 4 in each leaf axil, flowers few; peduncle 8–10mm long, appressed-pubescent. *Bracts* c.16–20 × 5–9mm, more or less ovate in outline, strongly lacinate in upper part, lobes up to 4 each side, narrowly deltoid, whole bract glabrous inside, pubescent outside, some hairs on laciniae gland-tipped; bracteoles present only when inflorescence cymose. *Pedicels* c.5–7mm, appressed-pubescent. *Calyx* 5-lobed almost to base, lobes c.11 × 1.2mm (fruiting stage), narrowly deltoid, very acute, both gland-tipped and acute hairs to 0.8mm on margins and outside, inside glabrous. *Corolla* white with a bright orange (dried state) patch at base of lower lip and extending down floor of tube, 24mm long, tube 16mm, cylindrical below, expanded in upper half, anticus lip 8 × 10mm, anticus lobes 5 × 3.5mm, posticus lobes 6 × 3mm, fused for half their length, all oblong-elliptic, acute hairs to c.0.5mm long all over outside of corolla, inside minutely glandular on lower half of both lips. *Stamens* inserted 10mm above base of tube, filaments c.2mm long, strongly twisted, glabrous, anthers 2.5mm long, deltoid in outline, a little over half the length fertile (Fig. 1D), thecae not confluent, upper sterile part minutely glandular on inner face, connective minutely pubescent on back, hairs acute, pair of anthers cohering face to face by a prominent ligature; staminodes wanting. *Disc* 2 × 1mm, unilateral. *Ovary* 4 × 1.2mm, minutely glandular. *Style* 6mm, puberulous, hairs

mixed acute and glandular. *Stigmatic lobes* 2×0.8 mm, glandular-puberulous on backs. *Fruit* c. 1.7×4.5 mm, pericarp verrucose, glandular hairs persistent. *Seeds* c. 0.5×0.25 mm, testa dark red-brown.

Other specimens examined. SARAWAK. Batang Lupar at Marop [c. $1^{\circ}30'N$, $111^{\circ}E$], iv 1867, Beccari 3316 (syntype FI, photo. E). Ulu Pelagus [c. $2^{\circ}01'N$, $112^{\circ}56'E$], 19 iv 1963, Ashton S17775 (E, L).

Cyrtandra schizostyla is immediately distinguished from its close allies by the crowded mass of narrowly elliptic leaves and inflorescences at the apex of the stem, giving the plant a curiously top-heavy look. Only *C. deinandra* has similar-looking leaves but they differ in number, indumentum and venation (see further below, under *C. deinandra*). The epithet *schizostyla* refers to the relatively large clavate stigmatic lobes that are found in several groups of *Cyrtandra* species, including this one.

We are indebted to Dr Chiara Nepi, curator of historical collections in the Herbarium Universitatis Florentinae (FI), for comparing leaf samples and drawings of anthers with Beccari's two collections of *C. schizostyla* and thus confirming our correct usage of the name.

4. *Cyrtandra deinandra* B.L.Burtt, sp. nov. ex affinitate *C. schizostylae* C.B. Clarke sed statim distinguenda habitu nano, caule fere absente (nec bene effecto) foliis paucis (nec numerosis) $35-85 \times 6-14$ mm (nec $120-160 \times 14-25$ mm) supra hirsutis (nec glabris) venis tertiariis immersis (nec manifestis) inflorescentiis paucis solitariis (nec numerosis usque ad 4 in quaque axilla).

Type: Borneo, Sarawak, Ulu Mujong [c. $2^{\circ}1'N$, $113^{\circ}10'E$], Ga Amau, 900m, 15 iv 1964, Ashton S21240 (holo. E).

Dwarf, almost rosulate herb; stem to c. 10×2.5 mm with woody taproot c. $30-50 \times 2$ mm at apex. *Leaves* few, opposite, isophyllous, largest $35-85 \times 6-14$ mm, narrowly oblanceolate, apex acute to very acute, base long-attenuate, margins remotely serrulate (teeth are hydathodes at vein endings), lateral veins 5-6 each side of midrib, tertiary veins immersed, upper surface hirsute, hairs coarse, brown, to 2mm long, below glabrous except for brown appressed hairs on midrib and lateral veins; petioles 10-25mm long, hairy as midrib. *Inflorescence* a 5-flowered dichasial cyme or variously reduced to only 1 flower, solitary in leaf axils; peduncle 0-5mm long, pubescent. *Bracts* to c. 16×4 mm, narrowly obovate in outline, deeply dissected, a pair of teeth each side, glabrous above, below brown hairs to 1mm long on veins and margins; bracteoles to c. 7.5×0.5 mm, very narrowly elliptic, subentire. *Pedicels* 3-4mm. *Calyx* 5-lobed nearly to base, lobes c. 5×1.2 mm, narrowly deltoid, coarse brown hairs to 2mm outside and on margins. *Corolla* 'pale mauve' with 2 orange (dried state) bars running from sinuses of anticous lip down floor of tube, corolla 24mm long, tube 17mm, narrowly funnel-shaped, anticous lip 7×11 mm, anticous lobe 5.5×3 mm, posticous lobes 4×3 mm, joined for half their length, all lobes

oblong-elliptic, outside pubescent, hairs to 1mm, acute, inside glandular-puberulous on posticous lip. *Stamens* inserted 9mm above base of tube, filaments c.1.5mm, twisted once, very minutely glandular at extreme apex, anthers 2.5mm long, only half the length fertile, thecae not confluent, back of anther and elaborate ligature glandular-pubescent, groove above the thecae filled with appressed hairs (Fig. 1E); lateral staminodes 1.5mm, posticous staminode 0.4mm. *Disc* 1.8 × 1mm, unilateral. *Ovary* (post fertilization) 7 × 1.5mm, papillose. *Style* 5mm, puberulous, hairs acute. *Stigmatic lobes* 1.5 × 1.5mm. *Fruit* c.11 × 5mm, pericarp verrucose. *Seeds* c.0.25 × 0.2mm, testa dark red-brown.

Cyrtandra deinandra is known only from the type collection made in damp ground at the base of a sandstone cliff on the headwaters of the Sungai Mujong, which flows into the Baleh just above the confluence of the river with the Rajang, all very fruitful territory for the genus. It shares with *C. schizostyla*, *C. hiranoi* and *C. pumilio* striking elaboration of the anthers (*deinandra* = marvellous anthers); they also have in common lacinate bracts, very deeply divided calyces, the lower lip of the corolla marked with substantial patches of yellow/orange (the pigment being in the plastids, therefore clearly visible in dried specimens), and similar gynoecea.

Cyrtandra deinandra is diagnosed against *C. schizostyla*, a much more robust plant that has a stout well-developed stem with many (not few) leaves on the upper half, leaves glabrous above (not hirsute), the tertiary venation clearly visible (not immersed) and many very crowded inflorescences (not very few), up to four arising from each axil (not always solitary).

The leaves of these two species are similar anatomically, the osteosclereids in the hypodermis imparting to the epidermis (at least in the dried state) a wrinkled, 'knotty', appearance.

2. *CYRTANDRA VELUTINA* AND ITS IMMEDIATE ALLIES

A group of species allied to *C. velutina* C.B. Clarke and *C. diplotricha* B.L. Burtt has a distinctive fruit: very slender and soft-walled. Both Clarke and Burtt were prompted by the thinness of the fruits they saw to describe them as immature, whereas they are mature and contain ripe seeds. In the original description of *C. diplotricha* (No 4 in this paper), three unnamed allied species were discussed, namely *Hallier* 2500 and *Hans Winkler* 1522 described hereunder as *C. paravelutina*, *Anderson* S28652 (now type of *C. fuscovenosa*) and *Meijer* 2265 (now type of *C. ramunculosa*); another species, allied to *C. ramunculosa*, is now recognized but the material is inadequate to typify a name.

The species are characterized by thin, somewhat twiggy, branched stems, calyx 5-lobed nearly to the base, corolla white, roughly 10–15mm long, stigmatic lobes less than 0.5mm long at anthesis, and very slender soft-walled fruits. The pericarp comprises an epidermis, one row of relatively large cells, and an inner fibrous layer (Fig. 2); the matrix remains mucilaginous at maturity (in contrast to the stony

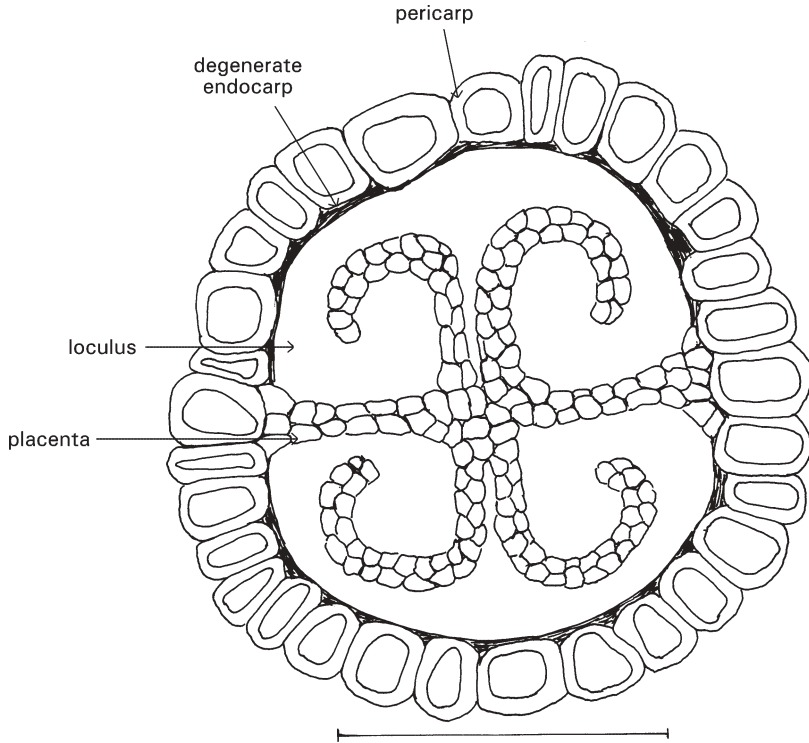


FIG. 2. *Cyrtandra diplotricha*: diagram of transverse section of fruit, seeds omitted (Anderson S28899). Scale bar = 1mm.

matrix in fruits with a hard, verrucose, pericarp, the commonest form among Bornean species). Externally, the pericarp is patterned with longitudinal rows of shallow, elongated 'blisters'.

A second group, in the affinity of *C. bullifolia* B.L.Burt, also has slender soft fruits, but the pericarp is many-layered and the corolla much larger (c.45–50mm long).

Key to the species

- 1a. Indumentum of two types on vegetative parts: fine pale strongly appressed hairs and coarse brown patent setae to 7mm long _____ **4. C. diplotricha**
- 1b. Indumentum of only one type (though hairs may differ in colour) _____ 2
- 2a. Lower surface of leaf sericeous _____ 3
- 2b. Lower surface of leaf variously hairy but not sericeous _____ 5
- 3a. Flowers springing directly from leaf axils _____ **1. C. velutina**
- 3b. Flowers in a pedunculate inflorescence _____ 4

- 4a. Midrib and lateral veins on lower leaf surface clad in dark hairs contrasting with the silvery-sericeous blade _____ **5. *C. fuscovenosa***
 4b. Hairs on lower leaf surface concolorous _____ **6. *C. paravelutina***
 5a. Hairs on stem patent; minor leaf of each pair c.8–50 × 4–13mm; calyx lobes c.3.7–4.5mm long _____ **2. *C. ramunculosa***
 5b. Hairs on stem appressed; minor leaf of each pair 6–10 × 2–7mm; calyx lobes c.2mm long _____ **3. *C. sp.* aff. *C. ramunculosa***

1. *Cyrtandra velutina* C.B. Clarke in DC., Monogr. phan. 5: 208 (1883); B.L. Burtt, Notes Roy. Bot. Gard. Edinburgh 30: 40 (1970).

Type: Borneo [Kalimantan], *Korthals* 248 [no date] (lecto. (Burtt, 1970) L, isolecto. K).

Weak-stemmed herb; stem c.155–450mm long, 3.5mm diam. at base, woody there, 2mm near apex, simple or sparingly branched near base, initially pubescent, hairs usually appressed, glabrescent. *Leaves* opposite, moderately anisophyllous, minor leaves c.30–60 × 12–20mm, largest major leaves c.85–150 × 27–55mm, elliptic, apex acuminate, base narrowly cuneate, margins entire, lateral veins 10–12 each side of midrib, tertiary veins very coarsely reticulate, scarcely visible, upper surface with scattered acute hairs to c.1.2–1.8mm long, lower surface silky-villous, hairs very delicate, to c.2mm long; petiole 7–17mm long (shorter in minor leaves), hairy as midrib. *Inflorescence*: few flowers fascicled in leaf axils. *Bracts* paired, c.3 × 1mm, sericeous, bracteoles similar but much smaller. *Pedicels* 3–4mm long, sericeous. *Calyx* 5-lobed almost to base, lobes 3–5 × 0.8mm, narrowly deltoid, tipped with a minute gland, sericeous outside. *Corolla* white (only buds seen, but flower will be small), pubescent outside. *Stamens*: anthers 1 × 0.7mm in bud, cohering face to face by small pubescent apiculi, connective fringed with minute hairs. *Disc* unilateral, c.0.6 × 0.4mm. *Ovary* 1.2 × 0.25mm. *Style* not seen. *Fruit* c.33 × 1.5mm, very minutely glandular-puberulous, pericarp thin, soft, patterned with shallow longitudinally elongated ‘blisters’ (almost colliculate). *Seeds* c.0.25 × 0.2mm, testa bright red-brown.

Other specimens examined. KALIMANTAN. Gunong Sahoembang, *Korthals* s.n. [no date] (L). Gunong Pamatton [Pamatho? third syllable illegible], Bangarmassing [=Bandjarmasin 3°20'S, 114°36'E], 1857–1858, *Motley* 1223 (K). Gunong Beratus, Piek van Balikpapan [1°02'S, 116°20'E], terrace Béoel, 700m, 2 vii 1952, *Meijer* 536 (L). E. Kutei, Sungai Susuk region, 50m, 2 vii 1951, *Kostermans* 5627 (K, L).

Clarke saw no flowers of *C. velutina* and they are wanting on all other specimens seen, though Motley and Kostermans both recorded white flowers; a few young buds are present. Fully developed calyces are present on all sheets because they persist at the base of the fruits, as does the unilateral disc. Clarke was misled by the extreme slenderness of the fruits into thinking that they were immature.

Meijer found his specimens in primary Dipterocarp forest on sandstone rocks, Kortermans in ‘Loam soil with coral limestone’.

2. *Cyrtandra ramunculosa* Hilliard & B.L.Burt, **sp. nov.** *C. velutinae* C.B.Clarke affinis sed habitu ramunculosa (nec caulibus simplicibus vel parce ramosis) et pilis grossis brunneis ad apicem ramulorum in foliis bracteis calycibus et corollis extrinsecus (nec in caulibus, pagina inferiore foliorum, bracteis, calycibus sericeis, corolla extrinsecus pubescente) facile distinguenda.

Type: Borneo, Kalimantan, N of Tarakan, Nunukan Timur [4°05'N, 117°40'E], xi 1953, *Meijer* 2265 (holo. L, iso. K).

Twiggy shrub to 1.5m tall (*Endert* 2606); branches slender, leafy only towards apex; bark pale, finely longitudinally striate, glabrous; twigs villous, hairs brown, patent, soon glabrescent. *Leaves* opposite, strongly anisophyllous, minor leaves c.8–50 × 4–13mm, ovate, sessile, largest major leaves c.70–170 × 18–50mm, elliptic, apex gradually acute, base narrowly cuneate, margins entire to obscurely serrulate, brown-hairy, lateral veins 8–10 each side of midrib, tertiary veins very coarsely reticulate, scarcely visible, upper surface with scattered coarse brown hairs to 3mm long, lower surface with coarse brown hairs on midrib and lateral veins, mostly shorter and finer on lesser veins and blade; petiole 7–15mm long, hairy as midrib. *Inflorescence*: flowers 1–2 in leaf axils. *Bracts* paired, c.5 × 1–2.5mm, narrowly lanceolate to ovate, densely clad in long brown bristly hairs to 2–4mm long. *Pedicels* 3–8mm, patent hairs to 0.5–1.5mm. *Calyx* 5-lobed nearly to base, lobes c.3.7–4.5 × 0.4mm, narrowly deltoid, clad in brown bristly hairs to 1.7mm. *Corolla* (only one seen) 'light yellow with two yellow keels on labellum, upper labellum dots violet', c.13mm long, tube 10mm, narrowly funnel-shaped, anticus limb c.3 × 3mm, anticus lobe c.1.5 × 1.2mm (damaged), posticus lobes c.1.1 × 1.1mm (damaged), outside on upper part brown bristly hairs to 1.2mm, inside glabrous. *Stamens* inserted 7mm above base of tube, filaments 1.5mm, anthers 1 × 0.8mm, cohering apically by a small apiculus. *Disc* 1.5 × 0.8mm, unilateral. *Ovary* 5 × 0.25mm, very minutely puberulous. *Style* 1.5mm, puberulous. *Stigmatic lobes* 0.2 × 0.2mm. *Fruit* c.35 × 1.5mm, pericarp thin, soft, patterned with shallow longitudinally elongate 'blisters'. *Seeds* 0.2 × 0.15mm, testa bright red-brown.

Other specimens examined. KALIMANTAN. W. Koetai, L. Iboet, 30m, 17 viii 1925, *Endert* 2606 (K, L).

Cyrtandra ramunculosa is a small twiggy shrub (*ramunculosa* = twiggy) in which all vegetative parts as well as the calyx and upper part of the corolla are clothed in coarse brown hairs; both habit and indumentum at once distinguish it from its ally, *C. velutina*, with simple or sparingly branched stems and sericeous indumentum.

The type of *C. ramunculosa* was collected in the northern part of the island of Nunukan Timur, in low-lying forest; *Endert* collected his plant at an altitude of 130m at Lake Iboet, not traced but well up the Sungai Mahakam (Sungai Kutai) in what was then the Dutch district of Kutai at very roughly 1°N, suggesting that the species is widely distributed in the northern half of Kalimantan.

3. *Cyrtandra* sp. nov. in the affinity of *C. ramunculosa*.

Kalimantan, NW of Tabang [0°34'N, 116°02'E], along Sungai Belayan [Belajan], around Jelini, in tropical rainforest, 100–150m, 8 i 1979, *Murata et al.* 1230 (L). East Borneo, Berouw, top of Mt. Ilas Mapulu, 800m, limestone, 23 ix 1957, *Kostermans* 14051 (L).

Twiggy shrublet; young twigs leafy towards apex, densely pubescent, hairs to 1mm, appressed, pale golden-brown, rapidly falling, main stem (*Murata et al.* 1230) 3.5mm in diam., bark pale, shiny, longitudinally striate. *Leaves* opposite, strongly anisophyllous, minor leaves c.6–10 × 2–7mm, ovate, acuminate, hairy as major leaves, largest major leaves 85–125 × 20–30mm, elliptic, apex gradually acuminate, base narrowly cuneate, margins serrate, lateral veins c.11 each side of midrib, tertiary veins immersed, upper surface finely pubescent, hairs to c.1.2mm, lower surface pubescent, soft to the touch, hairs on margins and midrib to 1.2mm, much shorter elsewhere; petiole 3–5mm, hairy as midrib. *Inflorescence*: flowers 1 (possibly another much later) in leaf axils. *Bracts* paired, c.3 × 0.8mm, narrowly elliptic, densely pubescent, bracteoles similar but much smaller. *Pedice*l c.3mm, pubescent. *Calyx* 5-lobed nearly to base, tube 0.3mm, lobes 2 × 0.8mm, hairs to 1mm outside. *Corolla* not seen, white with 2 yellow bars on lower lip. *Stamens* not seen. *Gynoecium* not seen. *Disc* unilateral. *Fruit* c.25 × 1.8mm, pericarp thin, soft, patterned with shallow longitudinally elongate 'blisters'. *Seeds* c.0.2 × 0.15mm, testa red-brown.

This plant resembles *C. ramunculosa* in habit and in its strongly anisophyllous leaves. It differs in indumentum, lacking the coarse brown hairs on stems and leaves and being instead softly pubescent. Also, the leaf margins are distinctly serrate, the petioles shorter (3–5mm versus 7–15mm) and the calyx lobes shorter (2mm versus 3.7–4.5mm). Fruits are present but no flowers and we judge the material to be inadequate to typify a name. *Murata's* specimen was collected on the Belajan river, a major tributary of the Mahakam, so it is not unlikely that it is sympatric with *C. ramunculosa*. The precise locality of *Kosterman's* specimen has not been traced.

4. *Cyrtandra diplotricha* B.L.Burtt, *Edinburgh J. Bot.* 47: 212 (1990).

Type: Borneo, Sarawak, Nanga Balang, extreme headwaters of Batang Balleh, 1°35'N, 114°30'E, 950ft, 18 vii 1969, *Anderson* S28899 (holo. E, iso. A).

Shrublet to 750mm tall; main stem c.3mm diam. midway (base not seen), young parts clad in double indumentum of pale, inconspicuous, strongly appressed hairs and brown spreading setae up to 7mm long, glabrescent, bark then pale, glossy, longitudinally finely striate. *Leaves* opposite, distinctly anisophyllous, minor leaves c.27–110 × 7–34mm, largest major leaves 150–205 × 34–42mm, all elliptic, very slightly falcate, apex long-acuminate, base narrowly cuneate, slightly oblique, margins serrulate, lateral veins 11–14 each side of midrib, tertiary veins scarcely visible (pinnate), both surfaces with a double indumentum of pale, strongly appressed hairs to c.2mm long and spreading brown setae c.5–6mm long scattered all over upper surface and margins, on lower surface confined to veins; petiole

10–30mm long (shorter on minor leaves), hairy as midrib. *Inflorescence*: up to 3 flowers direct from each leaf axil. *Bracts* wanting. *Pedicels* 5–10mm long, brown appressed-pubescent together with a few spreading brown setae and a few much shorter gland-tipped hairs. *Calyx* divided nearly to base, lobes 5, 5–6 × 0.5–0.75mm at base, narrowly deltoid, outside scattered hairs to c.0.8mm long, some gland-tipped, together with a few brown setae to c.2.5mm long. *Corolla* white with 2 reddish verrucose bosses below sinuses of lower lip, 10mm long, tube 7mm, cylindrical below then expanded in upper half, anticus lip 3 × 5mm, anticus lobe c.1.8 × 1.8mm, posticus lobes 1.5 × 1.7mm, all lobes rounded, outside puberulous particularly on limb, hairs acute, c.0.5mm, inside glabrous. *Stamens* inserted 5mm above base of tube, filaments c.2.5mm long, strongly twisted, anthers 1 × 0.8mm, cohering apically by small ligature, with few minute glandular hairs on connective and upper part of filament; staminodes wanting. *Disc* 1 × 0.8mm, cupular, rim minutely toothed. *Ovary* c.5 × 0.6mm, minutely puberulous, hairs acute. *Style* c.2mm, glandular-puberulous, hairs to 0.15mm. *Stigmatic lobes* (at anthesis) 0.4 × 0.4mm, backs glandular-puberulous. *Fruit* c.22 × 2mm, pericarp thin, soft, puberulous, patterned with shallow, longitudinally elongated ‘blisters’ (almost colliculate). *Seeds* c.0.2 × 0.15mm, testa light red-brown.

Other specimens examined. SARAWAK. Kapit distr., Nanga Balang, extreme headwaters of Batang Balleh, 950ft, 29 vi 1969, *Anderson* S28313 (A, E).

When *C. diplotricha* was first described, mention was made of a number of specimens in its affinity. These are here dealt with as *C. fuscovenosa* (*Anderson* S28652), *C. paravelutina* (*Hallier* 2500, *Winkler* 1522) and *C. ramunculosa* (*Meijer* 2265).

5. *Cyrtandra fuscovenosa* Hilliard & B.L.Burt, sp. nov. a *C. diplotricha* B.L.Burt partibus caulis juvenilibus dense appresso-pubescentibus, pilis ad 2mm longis fuscis (nec pilis albis inconspicuis appressis cum pilis grossis patentibus fuscis ad 7mm longis intermixtis) pagina inferiore folii argenteo-sericea venis tertiariis obscuris, costa et venis lateralibus ob pilos appressos brunneos prominentibus (nec infra tenuiter pilosis venis tertiariis visibilibus, venis omnibus pilis grossis patentibus brunneis ad 4mm longis indutis) inflorescentia pedunculata (nec floribus 1–3 e brachyblasto axillari) distinguenda.

Type: Borneo, Sarawak, extreme headwaters of Balleh river, 1°35'N, 114°33'E, western slopes of Bukit Tibang, 3200ft, 11 vii 1969, *Anderson* S28652 (holo. E, iso. L).

Creeping shrublet, height unknown, main stems c.4mm diam., branched, occasionally rooting, branchlets appressed-pubescent, hairs to 2mm, brown, stems glabrous, bark pale, shiny, longitudinally striate. *Leaves* opposite, anisophyllous, minor leaves c.35–65 × 14–18mm, largest major leaves 73–140 × 25–36mm, elliptic, apex gradually acute, base narrowly cuneate, margins serrulate, lateral veins 11 each side of midrib, tertiary veins invisible, upper surface with scattered coarse hairs to 2mm long, lower

surface densely silvery sericeous, veins dark, thickly clad in brown appressed hairs to 2.5mm long, similar hairs also along margins; petioles 24–60mm (shorter in minor leaves), thickly clad in brown hairs, appressed to spreading. *Inflorescence* solitary in leaf axils, several-flowered; peduncle 13–25mm, hairy as petiole. *Bracts* paired, 8–14 × 4–7mm, ovate, acute, outside thickly clad in brown bristly hairs to 1.8mm long; bracteoles similar but much smaller. *Pedicels* 8–9mm in fruit, thickly clad in brown patent hairs to 3mm long, mostly acute, a few at apex gland-tipped. *Calyx* 5-lobed almost to base, lobes 5–6 × 0.8mm, narrowly deltoid, thickly clad in patent brown hairs to 2–2.5mm long, mostly acute, a few gland-tipped. *Corolla* white, c.18mm long (Yii *et al.* S52173), tube 11mm, cylindric at base, gradually widened upwards, anticous lip 7 × 12mm, anticous lobe 5 × 5mm, posticous lobes 4 × 5mm, all lobes rounded, outside spreading hairs to c.1.2mm long, most acute, some gland-tipped, inside a patch of minute glandular hairs below posticous sinus. *Stamens* inserted 5mm above base of tube, filaments 2.2mm long, twisted once, anthers 1 × 0.8mm, cohering apically by small ligatures, few glandular hairs on connective; lateral staminode 1mm, posticous staminodes 0.15mm. *Disc* c.0.8 × 0.5mm, cupular, rim minutely toothed. *Ovary* 3.5mm long, minutely puberulous, hairs mixed acute and gland-tipped. *Style* 1.5mm, glandular-pubescent, hairs to 0.3mm. *Stigmatic lobes* (at anthesis) 0.4 × 0.4mm, backs glandular-pubescent. *Fruit* c.25 × 2mm, pericarp thin, soft, patterned with shallow longitudinally elongated ‘blisters’ (almost colliculate). *Seeds* not fully ripe.

Other specimens examined. SARAWAK. Bukit Batu Tiban, Ulu Sungai Balleh, 1200m, 21 iv 1986, Yii *et al.* S52173 (K).

Cyrtandra fuscovenosa is allied to *C. diplotricha*, both species being currently known only from the extreme headwaters of the Balleh river, on the border with Kalimantan. They differ markedly in inflorescence (pedunculate in *C. fuscovenosa*, flowers fascicled in *C. diplotricha*) and in indumentum. The stems of *C. fuscovenosa* are appressed-pubescent, hairs brown; in *C. diplotricha* there are inconspicuous white appressed hairs mixed with long coarse spreading brown bristly hairs, also present on the leaf margins. In *C. fuscovenosa*, the lower leaf surface is silvery sericeous, the indumentum hiding the tertiary veins, while the midrib and lateral veins stand out clearly because of their dark colour (whence the epithet *fuscovenosa*). In *C. diplotricha*, the lower leaf surface is only thinly hairy, tertiary veins, faintly visible, no colour contrast between blade and veins.

Anderson recorded *C. fuscovenosa* as growing on ‘igneous (Andesite) rocks at the base of a waterfall’, in a very wet and shaded habitat; Yii recorded submontane moss forest, the plants growing on a rocky cliff.

6. *Cyrtandra paravelutina* Hilliard & B.L.Burt, **sp. nov.** *C. velutinae* C.B.Clarke affinis sed inflorescentiis pedunculatis (nec floribus e brachyblasto axillari orientibus), calyce pilis patentibus aliis acutis aliis glandulosis (nec omnibus sericeis) induto, disco cupulari (nec unilaterali) distinguenda; a *C. fuscovenosa* B.L.Burt pilis

in pagina foliorum inferiore concoloribus (nec in costa et venis lateralibus fusco-brunneis sed pilis pallidis in lamina intervenosa), corolla c.10mm longa (nec c.18mm) differt.

Type: Borneo, Kalimantan, auf dem Bukit Tiling [0°39'N, 113°8'E], 900m, 9 ii 1925, *Hans Winkler* 1522 (holo. E, iso. HBG, photo. E).

Weak-stemmed herb; longest piece of stem seen 300mm, 3mm diam. at base, simple or sparingly branched, pubescent, hairs strongly appressed, to 1mm long, silky, eventually glabrescent, bark pale, glossy, finely longitudinally striate. *Leaves* opposite, isophyllous and anisophyllous on any one branchlet, largest major leaves c.140–170 × 40–50mm, elliptic, apex gradually acuminate, base narrowly cuneate, margins serrulate, each tooth a dark hydathode, lateral veins 10–11 each side of midrib, tertiary veins hidden by indumentum, upper surface thinly appressed-pubescent, hairs dense over midrib, lower surface and margins sericeous; petiole 16–48mm long, hairy as midrib. *Inflorescences* solitary in leaf axils, flowers few, peduncle 8–12mm long, appressed-pubescent. *Bracts* paired, c.10–11 × 2–5.2mm, both surfaces densely appressed-pubescent, hairs to 2mm long; bracteoles similar but much smaller. *Pedicels* c.10mm long, pubescent, hairs spreading, gland-tipped or not. *Calyx* 5-lobed nearly to base, lobes 5–6 × 1mm, narrowly deltoid, hairs to 1.8mm long on backs and margins, sometimes gland-tipped. *Corolla* colour not recorded, only well-grown buds seen, 6mm long, tube 3mm, cylindric below, expanded above, anticous lip 3 × 4mm, anticous lobe 2 × 2mm, posticous lobes 1.5 × 1.5mm, all lobes rounded, outside pubescent, hairs mostly acute, a few gland-tipped, inside glabrous. *Stamens* inserted 2mm above base of tube, filaments 1mm long, conspicuously ridged about midway (marking point where filament will twist?), anthers 0.8 × 0.7mm, cohering apically by small ligatures. *Gynoecium* very young, disc cupular, ovary glabrous except for few hairs at apex, style glandular-puberulous, stigma bilobed. *Fruits*: no complete fruits seen, basal part present on *Hallier* 2580, pericarp very thin, soft, 'blistered'. *Seeds* c.0.25 × 0.2mm, testa red-brown.

Other specimens examined. KALIMANTAN. Lianggagang [Liangamangan 0°19'S, 113°11'E], 1893–1894, *Hallier* 2580 (L).

Cyrtandra paravelutina is so named because of its strong superficial resemblance to *C. velutina*, from which it is easily distinguished by its pedunculate inflorescence and gynoecium with a cupular disc. Its closest ally appears to be *C. fuscovenosa*, which also has a pedunculate inflorescence and a cupular disc, but in that species the dark veins on the lower leaf surface contrast with the silvery blade, whereas in *C. paravelutina* the blade is concolorous. Also, the flowers are roughly half the size of those of *C. fuscovenosa*.

Cyrtandra paravelutina is currently known only from W Kalimantan, roughly in the area of the Madi Plateau. No information on habitat, habit or flower colour was recorded.

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