EDINBURGH JOURNAL OF BOTANY 63 (2&3): 209–229 (2006) 209
doi:10.1017/S0960428606000564 © Trustees of the Royal Botanic Garden Edinburgh (2006)
Issued 30 November 2006

OLD WORLD *GESNERIACEAE* XII: FURTHER MISCELLANEOUS SPECIES OF *CYRTANDRA* IN BORNEO

O. M. HILLIARD & B. L. BURTT

Nineteen miscellaneous species of Bornean *Cyrtandra* are dealt with. *Cyrtandra atrichoides*, *C. congestiflora*, *C. crockerella*, *C. dulitiana*, *C. kanae*, *C. libauensis*, *C. plicata*, *C. vaginata* and *C. disparoides* subsp. *inconspicua* are newly described. Descriptions and discussion are provided for *C. erythrotricha* and *C. poulsenii*, originally published with diagnoses only. *Cyrtandra axillaris*, *C. longicarpa* and *C. microcarpa* are also described, while *C. borneensis*, *C. dajakorum*, *C. glomeruliflora*, *C. latens* and *C. prolata* are reduced to synonymy.

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

INTRODUCTION

A good many species of *Cyrtandra* in Borneo still remain undescribed; some available specimens are known to us only in the sterile state or are otherwise inadequate to typify a name. In this paper eight species and one subspecies are newly described. Burtt (1996) published new species with diagnoses only: *C. erythrotricha* B.L.Burtt and *C. poulsenii* B.L.Burtt are now fully described while *C. glomeruliflora* B.L.Burtt is reduced to synonymy under *C. poulsenii*. Full descriptions of *C. axillaris* C.B.Clarke and *C. microcarpa* C.B.Clarke are also given for the first time with the reduction of *C. latens* C.B.Clarke and *C. dajakorum* Kraenzl. to synonymy under *C. axillaris*.

Cyrtandra atrichoides Hilliard & B.L.Burtt, **sp. nov.** a *C. atrichos* C.B.Clarke foliis latioribus ad basin late alatis (nec basi breviter decurrente), pedunculis 3–4 mm longis (nec 7–10 mm), bracteis profunde et acute dentatis (nec subintegris nec dentibus paucis parvis praeditis), labio inferiore corollae sine umbonibus (nec umbonibus duobus parvis flavis vel aurantiacis praedito) distinguenda. – Type: Sarawak, S Hose Mts, Ulu Melinau, 2°8′20″N 113°43′E, c.4500 ft, 13 iv 1980, *Burtt* 12869 (holo E; iso K, L).

Herb, stem simple (?), up to c.1 m tall, 5–10 mm in diameter near apex, base with prop roots (*Burtt* 12869) but only leafy upper parts seen, longitudinally furrowed and ridged at least when dry, minutely puberulous. *Leaves* opposite, isophyllous, crowded, largest leaves 240–440 × 65–95 mm, broadest above the middle, tapering in lower half into the broadly winged base, apex acute, margins subentire to

Royal Botanic Garden Edinburgh, 20A Inverleith Row, Edinburgh EH3 5LR, UK.

serrulate, lateral veins 10–15 each side of midrib, lesser veins reticulate, all slightly raised, upper surface smooth, glabrous, dark green, lower surface velvety when very young, hairs light golden-brown, quickly glabrescent, veins minutely appressed-puberulous, red, blade glabrous, granulate (astrosclereids present in mesophyll). *Inflorescence* a many-flowered dichasial cyme solitary in leaf axils at apex of stem. *Peduncle* 3–4 mm long, very stout, minutely puberulous. *Bracts* c.20–30 × 15–30 mm, broadly elliptic in outline, acute, margins deeply and sharply toothed, upper surface clad in scattered hairs to c.0.25 mm long, veins on lower surface raised, densely pubescent, hairs to c.0.5 mm long; bracteoles similar, progressively smaller. *Pedicels* c.8–16 mm long in fruit. *Calyx* 5-lobed almost to base, tube c.0.5 mm, lobes c.2.5–3 × 0.8–1 mm, narrowly deltoid, almost glabrous, persistent at base of fruit. *Corolla* colour unknown, possibly c.20 mm long (no complete corolla seen), tube c.15 mm, cylindric in lower half, expanded above, all lobes rounded (seen in bud), posticous lobes fringed on inside with minute glands, outside of corolla glabrous. *Stamens* inserted c.8 mm above base, filaments seen only in bud, anthers c.1.5 × 1.5 mm, glabrous, cohering face to face by a minute apiculus, two minute lateral staminodes seen in bud. *Disc* 2 × 1.8 mm, unilateral. *Ovary* c.5 mm long, glabrous, tapering into style of which 13 mm present, minutely puberulous. *Stigma* (in bud) minutely bilobed. *Fruit* c.23 × 3.5 mm, fusiform, pericarp finely verrucose. *Seeds* immature.

SARAWAK. S Hose Mts, Ulu Melinau, 2°8′20″N 113°43′E, c.4500 ft, *Burtt* 12869 (holo E; iso K, L); Kapit [distr.], Ulu Balleh [c.1°45′N 113°45′E], 19 i 1970, *Othman Ismawi* S29657 (E, K n.v., L).

The trivial name *atrichoides* draws attention to the close relationship of the species to *Cyrtandra atrichos*, their being alike in habit, inflorescence and floral detail. The most striking difference is in the leaves, broadly winged to the base in *C. atrichoides*, leaf base decurrent but petiole not winged in *C. atrichos*. Minor differences include peduncles 3–4 mm long in *C. atrichoides* (not 7–10 mm), bracts deeply and sharply toothed (not subentire or with a few small teeth) and corolla lacking two orange/yellow bosses on the lower lip (these present on the white corolla of *C. atrichos*). Neither collector of *C. atrichoides* recorded flower colour; the flowers are hidden by the bracts and the corolla falls quickly leaving the fruits to develop slowly.

The habitat of *C. atrichoides* is sloping streambanks, and Burtt recorded prop roots supporting the stems; no basal parts are present on any of the material seen.

Cyrtandra axillaris C.B.Clarke in A.DC., Monogr. Phan. 5: 260 (1883); Burtt, Notes Roy. Bot. Gard. Edinburgh 30: 26 (1970). – Type: Kalimantan, Sebalouw [0°53′N 109°34′E], *Teysmann* 10886 (holo FI n.v.; digital images E).

Cyrtandra latens C.B.Clarke in A.DC., Monogr. Phan. 5: 215 (1883); Burtt, Notes Roy. Bot. Gard. Edinburgh 30: 34 (1970). – Type: Sarawak in monte Gading [1°44′N 109°50′E], viii 186-, *Beccari* 2300 (holo FI n.v.; digital images E).

Cyrtandra dajakorum Kraenzl., Mitt. Inst. Allg. Bot. Hamburg 7: 108 (1927); Burtt, Notes Roy. Bot. Gard. Edinburgh 30: 35 (1970). – Type: West Borneo

[Kalimantan], auf dem Bukit Obat [c.1°5′N 115°30′E], um 15 m, 29 i 1925, *Hans Winkler* 1332 (holo HBG n.v.; photo. E).

Herb, stem simple, c.40–150 mm tall, woody, c.6–12 mm in diameter at base, often decumbent, rooting there, young stem strongly appressed-pubescent, hairs brown, c.0.25 mm long, leafy only in upper part. *Leaves* opposite, few to several more or less crowded at stem apex, strongly anisophyllous or occasionally isophyllous, minor leaves stipule-like, c.9–25 × 2–3 mm, strongly appressed-pubescent, largest major leaves c.110–240 × 25–135 mm, narrowly to broadly elliptic or subrotund, apex acute, base cuneate, sometimes oblique, margins obscurely serrulate to serrate, lateral veins 7–9 each side of midrib, tertiary veins often nearly invisible, when visible very coarsely reticulate becoming subscalariform towards margins, upper surface glabrous, granulate at first, the granules coalescing into short 'knotted' strings, lower surface densely appressed-puberulous all over when very young (c.15 mm long), at maturity appressed brown hairs c.0.25 mm long often confined to midrib and lateral veins, sometimes scattered hairs persisting on blade; petiole c.25–150 mm long (generally, the smaller the leaf, the shorter the petiole), hairy as the midrib. *Inflorescence* a many-flowered axillary dichasial cyme, very congested to lax. *Peduncle* c.3–30 mm long, puberulous. *Bracts* c.15–26 × 4–12 mm, lanceolate to ovate, base contracted into a petiolar part, margins serrate, lower surface with scattered hairs, upper similar or glabrous; bracteoles similar, but rapidly narrower, eventually linear, entire. *Pedicels* 2–8 mm long, puberulous. *Calyx* 5-lobed nearly to base, tube c.0.2–0.5 mm long, lobes c.1–2 × 0.6–1 mm, deltoid, outside minutely puberulous. *Corolla* white to pale pink, palate and short way down tube yellow, 15–18 mm long, tube 10–11 mm, narrowly cylindric in lower half or one third, abruptly expanded above, anticous lip 5–7 × 9–12 mm, anticous lobe 3–4 × 4–5 mm, posticous lobes 2–3.5 × 3–4 mm, corolla minutely puberulous outside, hairs reddish, inside anticous lip minutely glandular, particularly on anticous lobe, posticous lobes also glandular, glands extending down roof of tube to point of insertion of stamens. *Stamens* inserted c.6 mm above base of tube, filaments 3 mm, swollen in upper part and glandular there, glands also on margins of connective, anthers c.1 × 1.2 mm, cohering face to face by a minute apiculus; lateral staminodes c.0.1–0.2 mm, posticous staminode c.0.15 mm. *Disc* c.1–1.5 × 1.5 mm, unilateral. *Ovary* c.3 × 1 mm, very minutely papillose. *Style* c.4 mm, glandular-puberulous. *Stigmatic lobes* c.0.8 × 0.8 mm. *Fruit* 6–12 × 3–4 mm, fusiform, pericarp verrucose. *Seeds* 0.25–0.3 × 0.2 mm, testa dark red-brown.

Selected specimens examined. SARAWAK. Long Ugong to Long Semadoh, c.4°10′N 115°35′E, 18 x 1967, *Burtt & Martin* B5567 (E); Sungai Tatau [3°05′N 112°47′E], c.300 ft, 7 vi 1956, *Purseglove* 5426 (E, SING n.v.); Hill S of Punan Lusong, W of Breoran river, 1700–1800 ft, 26 viii 1978, *Burtt* B11306 (E, K, KYO, L); Bukit Raya, near Pelagus Rapids on Rejang, c.2°10′N 113°E, c.1400 ft, 20 vii 1962, *Burtt & Woods* B2573 (E, K, L); Between Gunong Berumput base camp and Kampong Keranji [1°41′N 109°39′E], 16 viii 1962, *Burtt & Woods* B2877 (E); Lundu distr., Gunong Gading [1°44′N 109°50′E], 5 viii 1962, *Burtt & Woods* 2673 (E, K, L); Balang/Balleh watershed ridge, extreme headwaters Balleh river, 1°35′N 114°30′E, *Anderson* S28745

(E, SAR); Sungai Sabah Tepang, foot of Bukit Gaharu [c.1°10′N 110°34′E], 31 vii 1962, *Burtt* B2636 (E).

KALIMANTAN. Headwaters of Sungai Kahayan, 5 km NE of Haruwu village, ridge W of Nyoohay tributary of Sungai Miri, 0°28′S 113°44′E, 225 m, 23 iii 1988, *Burley*, *Tukirin et al.* 369 (E); Upper Samba river, 60–80 km NNW of Tumbang Samba, c.0°50′S 112°50′E, at Tumbang Tosah, c.400 m, 9 xii 1982, *Mogea* 4052 (L).

Many years ago, one of us drew attention to the probable synonymy of *C. latens* and *C. dajakorum* with *C. axillaris* (Burtt, 1970) but only now is the formal reduction made, when a good deal more material is available and we have been greatly helped by excellent digital images of the leaf surfaces of Clarke's types (see Acknowledgements). Clarke saw little material and no flowers of either of his species, and the opportunity is now taken to provide a full description.

There are dendrosclereids in the hypodermis of the leaves, which leave a characteristic pattern of 'knotted strings' on the upper surface of the leaves, easily seen with a lens at least when the leaf is dry. This is an important character in distinguishing *C. axillaris* from its close ally, *C. microcarpa* (see below). The stem of *C. axillaris* is strongly appressed-puberulous, the hairs brown (glabrous in *C. microcarpa*), the petiole, midrib and often the lateral veins of the leaf are similarly hairy, and some hairs may persist on the blade (entire leaf surface glabrous in *C. microcarpa*). There are also small floral differences.

Careful observation is needed of *Cyrtandra* species growing along the pathside at the Pelagus Rapids on the Rajang. *Burtt & Woods* B2541 and B2588 (E) from that locality differ from typical *C. axillaris* in having much longer patent (not appressed) hairs on the lower leaf surface, the hairs being plentiful (not sparse nor wanting) on the blade; in contrast, *Burtt & Woods* B2585 (E), Pelagus Rapids, has the indumentum typical of *C. axillaris* but lacks sclereids in the hypodermis of the leaf. Normal *C. axillaris* was collected on nearby Bukit Raya (*Burtt & Woods* B2573, E). *Clemens* 21646 (Upper Rajang river, Gat [Gaat, 1°53′N 113°26′E?], 1929, K) matches *Burtt & Woods* B2585. Only field work will elucidate this problem.

Cyrtandra congestiflora B.L.Burtt, **sp. nov.** *C. winkleri* Lauterb. affinis sed planta multo tenuiore caulibus c.25–150 mm longis et 3–4 mm diametro (nec 200–400 mm longis, minime 10 mm diametro), indumento caulium foliorum bractearum calycis e pilis setosis brunneis plerumque 2–3 mm longis (nec pilis tenuissimis pallidis arachnoideis) distinguenda. – Type: Borneo, Sabah, Lahad Datu district, Tabin Wildlife Reserve near Wildlife Department's headquarters, on slope by trail in primary mixed dipterocarp forest, 5°11′N 118°30′E, c.150 m, 24 ii 2000, *Kjeldsen* 37 (holo E; iso (all n.v.) AAU, KEP, SAN, UMS).

Herb, stem simple, c.25–150 mm long, 3–4 mm in diameter, base decumbent, rooting, becoming stoloniferous and producing further erect stems, upper part of stem densely patent-pubescent, hairs c.2 mm long, glabrescent. *Leaves* opposite,

iso- or slightly anisophyllous, crowded on upper part of stem, rosette-like, largest leaves 100–230 × 27–76 mm, mostly broadest above the middle, apex acute or somewhat obtuse, base tapering into wings up to c.2–7 mm broad near base, margins serrulate to serrate, lateral veins 6–10 each side of midrib, tertiary veins very coarsely reticulate, upper surface smooth, scattered bristles 2–3 mm long, glabrescent, lower surface with bristles to 2 mm long on midrib and lateral veins, shorter on lesser veins, blade glabrous. *Inflorescence* a tightly congested cyme, solitary in each leaf axil. *Peduncle* to 2 mm long, very stout. *Bracts* c.13–22 × 9–14 mm, ovate, acute, margins sparingly toothed, both surfaces and margins clad in scattered stiffly patent hairs to 2.5–3 mm long; bracteoles similar, progressively smaller. *Pedicels* c.1 mm long. *Calyx* tube 6–8 mm long, lobes 8–9 mm, deltoid at base, then margins infolded and strongly fused to form a needle-like projection c.3 times as long as deltoid base, bristly hairs 2–3 mm long on midline and margins of lobes. *Corolla* white with yellow blotch on anticous lobe, c.23 mm long, tube 14–15 mm, narrowly cylindric in lower half, abruptly expanded in upper, anticous lip c.9 × 12–15 mm, anticous lobes 5 × 5–7 mm, posticous lobes 4–4.5 × 4–6 mm, all lobes rounded, inside patch of glandular hairs below posticous sinus, outside coarse bristly hairs to 2.5 mm, margins excluded. *Stamens* inserted c.8.5–9 mm above base of tube, filaments 3–4 mm long, twisted once, anthers c.2 × 1.2 mm, glabrous, cohering face to face at extreme tips, lateral staminodes c.2 mm long, posticous staminode c.0.5–1 mm. *Disc* 1–2 × 1.5–2 mm, cupular. *Ovary* c.3–5 × 1–1.5 mm, glabrous. *Style* c.5–5.5 mm, minutely glandular-puberulous in upper half. *Stigma* minutely bilobed. *Fruit* c.8–9 × 4–5 mm, ovoid, pericarp slightly verrucose. *Seeds* immature.

SABAH. Lahad Datu district, Tabin Wildlife Reserve, 5°11′N 118°30′E, c.150 m, 24 ii 2000, *Kjeldsen* 37 (holo E); Lahad Datu district, Segama river, near Lakanan river, 5°10′N 117°56′E, 250–300 m, 12 vi 1984, *Beaman* 10101 (MSC, US); Ulu Segama, Gunong Danum, east ridge, c.900 m, 18 iii 1987, *Argent et al.* 1987140 (E); Lahad Datu district, Bukit Silam, 9 vii 1994, *Perumal & Dewol* SAN134995 (SAN); Kinabatangan district, Tabin Wildlife Reserve, 5°18′N 118°44′E, 40 m, 22 x 2000, *Poulsen* 1688 (E); Tamegang Timber Camp near Kampong Pangkaian, 23 xi 1968, *Kokawa & Hotta* 1504 (L), ibid., 20 xi 1968, *Kokawa & Hotta* 1312 (L).

Cyrtandra congestiflora is allied to *C. winkleri*, currently known only from Kalimantan. Both species have leaves crowded on the upper part of the stem, almost sessile congested cymes in the leaf axils, relatively large broad bracts, many bracteoles, tubular calyces that initially completely enfold the corolla then split into five lobes as the corolla expands, similar floral details and small fat fruits c.7–9 × 4–5 mm. In neither species are there any sclereids in the hypodermis of the leaf (hypodermis sometimes wanting), but astrosclereids are present in the mesophyll (M. H. Bokhari).

Plants of *C. congestiflora* are much more delicate than those of *C. winkleri*: slender stems c.25–150 mm long, 3–4 mm in diameter at the base whereas in *C. winkleri* they are at least 400 mm long and 10 mm in diameter. Their indumentum is strikingly

different: patent brown bristly hairs mostly 2–3 mm long on stem, leaves, bracts, calyx and corolla in *C. congestiflora*, pale and cobwebby in *C. winkleri*.

Cyrtandra congestiflora is a plant of the forest floor. When the stem is very short the leaves are almost rosetted at ground level; even when the stem is longer, the lower, leafless, part is strongly decumbent and rooting, bringing the leaves down near the ground. Some collectors have recorded white patches on the leaf surface. The epithet *congestiflora* refers to the highly congested inflorescences themselves congested because of the brevity of the nodes.

Cyrtandra crockerella Hilliard, **sp. nov.** a *C. didissandriforme* Merr. habitu e basi ramosa (nec simplice) petiolis foliorum 10–45 mm longis (nec foliis fere sessilibus ad basin anguste alatis), floribus 1–3 in axillis foliorum superiorum, pedicellis 5–10 mm longis (nec floribus 4, vel numerosioribus?, plerumque ad nodos defoliatos in parte caulis inferiore, pedicellis 18–22 mm longis) distinguenda. – Type: Borneo, Sabah, Apin-Apin, 5°28′N 116°16′E, 350 m, 15 vii 2000, *Mendum, Gale & Surat* M43 (holo E; iso K, L).

Bushy herb, stem initially simple (and will flower at this stage) later branching at or near ground level to form a clump of stems c.300–800 mm tall, young parts villous, hairs c.2–2.5 mm long, patent. *Leaves* opposite, isophyllous, on upper part of stem only, internodes c.10–60 mm long, largest leaves 85–190 × 25–56 mm, elliptic, apex acute to shortly acuminate, base narrowly cuneate, margins serrulate, lateral veins 10–12 each side of midrib, tertiary veins finely reticulate, upper surface mamillate, 1 bristle c.0.5 mm long in each reticulum (each reticulum can range from strongly convex, with a corresponding cavity on the lower leaf surface, to flat and retaining its more or less centrally placed bristle), delicate hairs to 2 mm long on midrib, lower surface densely hairy and soft to touch, hairs delicate, patent, to 2 mm long on midrib and lateral veins, shorter on lesser veins and blade; petiole 10–45 mm long, villous. *Inflorescence* 1–3-flowered in axils of leaves. *Bracts* c.5–6 × 0.5–1 mm, linear, patent hairs to 0.5 mm on both surfaces, bracteoles similar, often threadlike. *Pedicels* 5–10 mm long, pubescent, hairs patent. *Calyx* 5-lobed nearly to base, lobes 5–7 × 0.8–1.2 mm, narrowly triangular, outside patent acute hairs to 1 mm long. *Corolla* white with two faint yellow bands on palate merging into five purple streaks on floor of tube, 47–52 mm long, tube 36–38 mm long, lower half narrowly cylindric then abruptly expanded in upper half, anticous lip c.14 × 24 mm, anticous lobe 10 × 12 mm, posticous lobes c.10 × 9 mm, all lobes suborbicular, corolla glandular-pubescent outside, hairs c.0.5 mm long, inside small patch of glandular hairs below posticous sinus, minute scattered glandular hairs on palate. *Stamens* inserted c.23 mm above base of tube, filaments 9–12 mm long, slightly swollen about the middle, anthers 1.7 × 1.5 mm, cohering face to face by minute apiculi, few glandular hairs on margins of connective, lateral staminodes 5–7 mm, posticous staminode 2 mm. *Disc* 1.5–2 × 1.5–2 mm, cupular. *Ovary* c.10–14 × 0.8–1.5 mm, minutely gland-dotted. *Style* 9–13 mm long, glandular-puberulous. *Stigmatic lobes* very short and

broad, whole stigma c.1.5 × 0.8 mm. *Fruit* (few seen, none fully ripe) c.40 × 2.5 mm, probably fusiform, pericarp foveate. *Seeds* immature.

SABAH. Southern slope of Mt Kinabalu [6°05′N 116°33′E], eastern route, Penosok Plateau, at footpath from Kundusan to the Royal Society base camp, flat plateau between Sungai Liwagu and Sungai Muanan, 1420 m, 21 vii 1963, *Fuchs, Sleumer & Meijer* 21096 (L); Mt Kinabalu, 19 x 1931, *Clemens* 26787 (K, L); Mt Kinabalu, Tenompok, 5000 ft, 20 viii 1931, *Clemens* 26183 (K, L); Dallas [Dalas, 6°02′N 116°28′E], x–xi 10/1931, *Clemens* 26787–27018 (L); Kinabalu, Poring, viii–ix 1981, *Eddie* AUL43 (E, cult. no. 7823); Ranau district, valley below and to W of Mamut Copper Mine, 6°01′N 116°39′E, 1050 m, 3 v 1984, *Sands* 3961 (K).

Cyrtandra crockerella is closely allied to both *C. didissandriformis* and *C. areolata* (Stapf) B.L.Burtt. It differs from *C. didissandriformis* in a number of characters including habit, having clumps of stems branching at or near the base (though a young, single-stemmed plant will flower) whereas the stem of *C. didissandriformis* appears always to be simple, petioles 10–45 mm long (not leaves virtually sessile, being narrowly winged to the base), flowers 1–3 in the leaf axils, pedicels 5–10 mm long (flowers 4, or more?, mostly at the lower, leafless, nodes, pedicels c.18–22 mm long), the bracts and the calyx lobes clad in patent hairs (not hairs appressed). *Cyrtandra crockerella*, as the epithet implies, appears to be common on the Crocker Range in eastern Sabah and on the lower slopes of Mt Kinabalu, whereas *C. didissandriformis* is known only from the environs of Sandakan on the west coast. *Cyrtandra areolata* has the same geographical range as *C. crockerella* but is readily distinguished by its simple stems clad in appressed hairs, many flowers in the leaf axils, longer (8–15 mm), appressed-hairy calyx lobes, possibly smaller flowers (35–40 mm long) and possibly longer fruits (55–65 mm). In all these species the upper surface of the leaf is mamillate.

Cyrtandra disparoides B.L.Burtt subsp. **inconspicua** B.L.Burtt, **subsp. nov.** a subsp. *disparoide* foliis maximis 140–255 × 23–43 mm, ellipticis (nec 220–350 × 65–95 mm plerumque obovatis) distinguenda. – Type: Borneo [Sarawak], Saribas, Kalong, vii 1892, *Haviland* 1574 (holo K).

Herb, stem up to c.220 mm tall, 4 mm in diameter at base, base decumbent, rooting, more or less stoloniferous and sending up new stems, internodes short, c.12–25 mm, initially pubescent, leafy throughout. *Leaves* opposite, strongly anisophyllous to almost isophyllous, largest leaves 140–255 × 23–43 mm, elliptic, apex acuminate, base winged, auriculate at node, margins serrulate, upper surface initially thickly clad in delicate silky hairs c.1.5 mm long, glabrescent but persisting as a tuft at the apices of the teeth, lower surface persistently hairy over all veins, blade glabrous, 'bumpy', lateral veins c.10–13 each side of midrib, tertiary veins reticulate. *Inflorescence* an axillary few-flowered dichasial cyme, sessile or nearly so. *Bracts* c.10–18 × 4–5.5 mm, lanceolate, acuminate, margins with 2–4 sharp teeth each side, cut up to halfway to midrib, both surfaces clad in very delicate hairs, bracteoles similar but smaller. *Pedicels* 4–5 mm long, puberulous. *Calyx* 5-lobed nearly to base,

lobes c.2 × 0.4 mm, puberulous outside, hairs very delicate. *Corolla* white with two yellow bars on lower lip, c.10 mm long, tube 7 mm, anticous lobe c.2 × 2 mm, others slightly smaller, all suborbicular, outside puberulous, inside anticous lobe minutely glandular. *Stamens* inserted 5 mm above base of tube, filaments c.2 mm long, glabrous, anthers 0.8 × 0.5 mm, cohering face to face by minute apiculi; staminodes not seen. *Disc* 1 × 0.8 mm, unilateral. *Ovary* 3 × 0.8 mm, glabrous. *Style* 3.5 mm, puberulous. *Stigmatic lobes* c.0.3 × 0.3 mm. *Fruit* c.8 × 2.5 mm, ovoid, pericarp verrucose. *Seeds* c.0.4 × 0.2 mm, testa light red-brown.

SARAWAK. Saribas, Kalong, vii 1892, *Haviland* 1574 (holo K); Sungai Bena, tributary of Sungai Sut, c.1°55′N 113°5′E, 23 vii 1962, *Burtt* B2624 (E); Ulu Sungai Sedampa, extreme headwaters of Batang Balleh, 1°34′N 114°30′E, 1500 ft, 2 vii 1969, *Anderson & Paie* S28369 (SAR, photocopy E).

KALIMANTAN. W Kalimantan, Sintang, Bukit Baka National Park, 0°38′S 112°17′E, 310 m, 17 x 1993, *Church* 171 (A, L), ibid., bank above Sungai Ella and environs, 320 m, 21 x 1993, *Church* 292 (A, E, L).

There is little to distinguish subsp. *inconspicua* from typical *C. disparoides* other than the size and shape of the leaves, namely the largest 140–255 × 23–43 mm, elliptic, not 220–350 × 65–95 mm, mostly obovate. The flowers may be somewhat smaller (10 mm not 14 mm) but only two have been seen. The short stature and narrow leaves suggested the subspecific epithet.

Cyrtandra disparoides subsp. *disparoides* appears not to have been collected in western Kalimantan. However, the type came from the SE end of the Hose Mts below Bukit Mabang and it has also been collected in the Sungai Bena area (*Burtt* 12950, 12993, E), whence came *Burtt* 2624 (subsp. *inconspicua*), so at least in this locality the two subspecies are sympatric. Both lack sclereids in the hypodermis of the leaves but astrosclereids occur in the mesophyll with arms protruding upwards between the palisade cells (M. H. Bokhari).

Cyrtandra dulitiana Hilliard, **sp. nov.** a *C. bullifolia* B.L.Burtt foliis ad apicem caulis aggregatis internodiis haud vel vix visilibus (nec foliis bene separatis internodiis 50–60 mm longis) inflorescentia cymam magnam axillarem formante, pedunculo 5–20 mm longo (nec floribus 2 vel pluribus fasciculatis in axillis foliorum), fructibus maturis c.37 mm longis (nec 65–75 mm) distinguenda. – Type: Sarawak, near Long Kapa, Mount Dulit (Ulu Tinjar) [3°18′N 114°11′E], c.700 m, 30 ix 1932, *Richards* 2089 (holo K; iso L).

Herb, stem simple, stout, c.8–13 mm in diameter, c.360–400 mm long, lower part leafless, decumbent, rooting, upper part well clad in coarse patent hairs to 3 mm long. *Leaves* opposite, isophyllous, relatively few crowded at apex of stem, strongly overlapping, suggesting they stand erect, largest 270–365 × 55–100 mm, elliptic, apex tapering to acute, base broadly winged, wings 10–20 mm broad, margins serrulate to crenulate, lateral veins 11–13 above the wings, tertiary veins finely reticulate, upper surface mamillate, each mamilla crowned with a blister, the

mamillae flattening out as the leaf expands, then each reticulum marked out by the tertiary veins retaining the bristle (or its stump), otherwise surface glabrous except for coarse hairs to 1.5 mm long crowded along the midrib, lower surface with coarse hairs to 2.5 mm long on the midrib, much shorter on the lateral veins, minute hairs on the tertiary veins, lesser veins and blade glabrous or nearly so. *Inflorescence* a lax well-branched dichasial cyme solitary or occasionally paired in each leaf axil. *Peduncle* 5–20 mm long, stout, pubescent. *Bracts* c.3 × 1.5 mm, densely pubescent, bracteoles similar but smaller. *Pedicels* 15–40 mm long, patent pubescent. *Calyx* 5-lobed almost to base, lobes 4.5–5 × 1–1.5 mm, narrowly deltoid, outside patent acute hairs to 0.3–0.4 mm. *Corolla* 'white with pale pink blotch on inside of upper lip, yellow blotch on lower lip', c.47 mm long, tube 37 mm, lower half narrowly cylindric, then abruptly expanded in upper half, glandular-puberulous outside, anticous lip c.10 × 24 mm, anticous lobe c.8 × 9 mm, posticous lobes 8 × 7 mm, all lobes rounded, glandular-puberulous outside, inside a patch of minute glandular hairs below posticous sinus. *Stamens* inserted 23 mm above base of tube, filaments c.12 mm long, well twisted post anthesis, anthers 2 × 1.5 mm, glabrous, cohering face to face by a minute apiculus, lateral staminodes 6 mm long, posticous staminode 1.5 mm. *Disc* 1.5–2 × 1.5–1.6 mm, cupular. *Ovary* c.12 × 1 mm, clad in minute globular glands. *Style* 12–17 mm long, glandular-puberulous. *Stigmatic lobes* 1 × 1 mm. *Fruit* 37 × 3 mm (only one seen, ripe), narrowly fusiform, pericarp foveate. *Seeds* c.0.3 × 0.2 mm, testa light red-brown.

SARAWAK. Near Long Kapa, Mount Dulit (Ulu Tinjar) [3°18′N 114°11′E], c.700 m, 30 ix 1932, *Richards* 2089 (holo K; iso L), ibid., c.600 m, 27 viii 1932, *Richards* 1474 (K); Dulit Range, Sungai Tinjar, 950 m, 18 viii 1986, *Awa & Yii* S46798 (E, K).

In life, *C. dulitiana* must be a striking plant. It is of relatively short stature, but the stems are very stout and terminate in a tuft of big, probably erect, leaves whose broadly winged bases overlap. A lax, pedunculate cyme of large white flowers develops in each leaf axil. The plants grow in the rainforest clothing Mt Dulit, at c.600–950 m above sea level. Its affinity lies with *C. bullifolia* from which it is easily distinguished not only by its pedunculate inflorescences, in contrast to few-flowered fascicles in the leaf axils, but also by its leaves crowded at the stem apex, the short nodes (to 20 mm) mostly hidden by the broadly winged overlapping leaf bases; in *C. bullifolia* the nodes are at least 50–60 mm long. The ripe fruits of *C. dulitiana* are c.37 mm long (only one seen) whereas in *C. bullifolia* they measure about 65–75 mm.

Cyrtandra erythrotricha B.L.Burtt in Coode et al. (eds) A checklist of the flowering plants and gymnosperms of Brunei Darassalam: 436 (1996). – Type: Sarawak, Lambir Hills, c.4°7′N 113°55′E, 4 vii 1962, *Burtt & Woods* B2361 (holo E; iso A, K, KYO, L, SAR, SING, SYD).

Dwarf herb, stem simple, up to c.150 mm tall, stout, woody, c.6–8 mm in diameter at base, base decumbent, rooting, young parts almost villous, hairs reddish. *Leaves*

opposite, isophyllous, crowded at stem apex, largest 150–240 × 30–70 mm, elliptic, apex acute, base narrowly cuneate, very shortly decurrent, margins entire or minutely serrulate (each tooth a hydathode), lateral veins c.10 each side of midrib, tertiary veins coarsely reticulate, upper surface glabrous, pustulate at first, pustules soon linking to form short 'knotted strings' (easily seen with a × 10 lens at least when dry), lower surface and margins almost villous, hairs to c.2 mm long, red at first, becoming brown later; petioles c.50–100 mm long, hairy as blade. *Inflorescences* several in each leaf axil, few-flowered cymose clusters embraced by a pair of bracts, bracteoles wanting. *Peduncle* c.6–16 mm long, densely hairy. *Bracts* c.10–24 × 8–20 mm, broadly ovate in outline, deeply laciniate in upper half, lacinae gland-tipped, outside and margins clad in acute red hairs to 1 mm long, inside gland-dotted. *Pedicels* c.5–7 mm long in fruit, pubescent. *Calyx* 5-lobed almost to base, lobes 4–7 × 1–1.5 mm, narrowly triangular, acute, outside scattered hairs to 0.5 mm long mainly on midrib. *Corolla* white with a large yellow bilobed patch on palate, c.25–30 mm long, tube 12–18 mm, cylindric in lower half, widening towards mouth, anticous lip c.8–13 × 14–23 mm separated from posticous lip by a broad sinus, anticous lobe c.4–9 × 4–8 mm, posticous lobes c.3–8 × 3–7 mm, all lobes oblong-obovate, corolla densely pubescent outside, hairs acute, to c.0.25 mm long, inside gland-dotted all over lobes and tube down to point of insertion of filaments. *Stamens* inserted c.10–14 mm above base of tube, filaments c.3 mm long, strongly twisted after anthesis, anthers c.2.2–2.5 × 1–1.5 mm, triangular in outline, thecae not confluent, connective puberulous, hairs extending onto the very conspicuous apiculi by which the anthers cohere face to face, lateral staminodes minute or absent, posticous staminode absent. *Disc* c.1.5–2 mm, unilateral. *Ovary* c.3 × 1.5 mm, minutely puberulous. *Style* c.11 mm long, clad in delicate gland-tipped hairs to c.0.5 mm long. *Stigmatic lobes* c.1.5–2 × 1.5 mm, suborbicular or spathulate. *Fruit* 8–15 × 4–7 mm, ovoid, pericarp verrucose, puberulous, hairs acute, to 0.2 mm long. *Seeds* c.0.3 × 0.2 mm, testa red-brown.

SARAWAK. [Bintulu] N Setungan, Ulu Segan [c.2°30′N 113°E], 4 x 1964, *Joseph Sipi Tawi* S22014 (E); Lambir National Park, ridge E of Bukit Lambir, 12–1500 ft, 25 ix 1978, *Burtt* B11616 (E); Lambir Hills, c.4°7′N 113°55′E, 4 vii 1962, *Burtt & Woods* B2361 (holo E; iso A, K, KYO, L, SAR, SING, SYD).

Cyrtandra erythrotricha was published with a diagnosis only; the opportunity is now taken to give a full description. The species was diagnosed against *C. glomeruliflora* (see below) to which it is similar in facies, but differs fundamentally in its 5-lobed calyx divided nearly to the base (not initially enveloping the corolla and splitting into two as the corolla expands), anthers triangular in outline, ligatures very conspicuous, thecae not confluent (not anthers rounded in outline, ligatures minute, thecae confluent), and disc unilateral (not cupular).

The relationship of *Cyrtandra erythrotricha* (Greek meaning red hair, a striking feature of the vegetative parts of the plant) lies with *C. deinandra* B.L.Burtt, *C. hiranoi* B.L.Burtt, *C. pumilio* B.L.Burtt and *C. schizostyla* C.B.Clarke (see

Hilliard & Burtt, 2005a). These species are noted for the remarkable elaboration of their anthers; *C. erythrotricha* does not show such features but the very well-developed apiculi might prove to be the first step in that direction. The five species otherwise share a whole suite of characters including dwarf habit, laciniate bracts, deeply 5-lobed calyx, anthers triangular in outline, thecae not confluent, ovary papillose, style hairy, stigmatic lobes well developed, fruit small, c.8–20 × 4–7 mm, pericarp verrucose, puberulous.

Cyrtandra erythrotricha has a known range from Brunei through the Lambir Hills of northern Sarawak as far south as the headwaters of the Sungai Segan near Bintulu. It was found by B. L. Burtt on a sandy cliff and nearby damp, litter-free, sandy ground; Tawi (cited above) recorded 'clay rich soil, alluvium, primary forest'.

Four of the species mentioned above have long vertical osteosclereids in the hypodermis of the leaf, astrosclereids in the mesophyll (M. H. Bokhari); it is the osteosclereids that produce the 'knotted strings' visible on the upper leaf surface; *C. hiranoi* has broad, thin-walled, sclereids in the hypodermis, and the upper leaf surface is minutely pitted.

Cyrtandra kanae B.L.Burtt, **sp. nov.** *C. antuanae* B.L.Burtt affinis, sed foliis statim distinguenda: costa, nervae laterales et venae tertiariae subtus prominentes pilis brunneis grossis ad 2 mm longis indutae (nec cum venis tertiariis vix visibilibus, costa et venis lateralibus minute pubescentibus tantum). – Type: Sarawak, Bintulu district, along the valley of Ulu Sungai Bejangung, eastern part of Bukit Kana, 700–850 m, on wet rock, flowers white, 21 xi 1963, *Hotta* 15412 (holo KYO; iso E).

Herb, stem simple, up to c.80 mm long, woody, c.10 mm in diameter at base, base decumbent, rooting, young parts villous, hairs to 2 mm long. *Leaves* few, so densely crowded at apex of stem difficult to judge whether isophyllous or very strongly anisophyllous, fully developed leaves 120–200 × 55–80 mm, broadly elliptic or sometimes broadest above the middle, apex acute, base cuneate, margins serrulate, lateral veins 7–8 each side of midrib, tertiary veins coarsely reticulate, upper surface with coarse hairs to 3 mm long scattered on blade, denser over midrib, eventually glabrous, blade covered in rather crowded 'scales' c.0.2 mm in diameter, later collapsing into pits, blade on lower surface glabrous, midrib, veins and margins densely clad in coarse brown hairs to 2 mm long, longest on midrib, making venation stand out boldly; petiole c.50–150 mm long, villous, hairs to c.2 mm long. *Inflorescence*: several flowers springing directly from leaf axil. *Bracts* c.10–12 × 1.5–2 mm, lanceolate, both surfaces densely puberulous, bracteoles similar but smaller. *Pedicels* c.20–40 mm long, acute patent hairs to 2 mm long. *Calyx* tube c.9 mm long, lobes 5, c.16–20 mm long, base deltoid, c.3 × 2 mm, then margins infolded and fused into an acicular portion c.13–17 mm long, outside hairs 0.5–1 mm long on acicular parts and continuing down midline to base. *Corolla* white, c.50 mm long, tube c.35 mm, narrowly cylindric near base, gradually widening upwards towards mouth, anticous lip c.18 mm long (material rotten and almost impossible to dissect),

anticous lobe c.13 × 12 mm, oblong, tip rounded, posticous lobes c.10 × 10 mm, suborbicular, outside silky hairs to 3 mm long, inside glandular-puberulous below posticous sinus. *Stamens* inserted c.14 mm above base of tube, filaments c.13 mm long, twisted about the middle to bring the anthers face to face, anthers c.2.5 mm long, oblong, cohering strongly at their tips, lateral staminodes 2 mm long, posticous staminode 1 mm. *Disc* 2.5 × 2 mm, cupular. *Ovary* 8 × 1.25 mm, glabrous. *Style* 21 mm, minutely glandular-puberulous. *Stigma* c.3 mm in diameter, bilobed. *Fruit* c.20 × 5 mm, ellipsoid, pericarp verrucose. *Seeds* c.0.2 × 1.5 mm, testa dark red-brown.

SARAWAK. Bintulu district, along the valley of the Ulu Sungai Bejangung, eastern part of Bukit Kana, 700–850 m, on wet rock, flowers white, 21 xi 1963, *Hotta* 15412 (holo KYO; iso E); Eastern ridge of Bukit Kana, 800–950 m, on wet rock, 20 xi 1963, *Hirano & Hotta* 1433a (E, KYO).

Currently, *C. kanae* is known only from Bukit Kana, whence the trivial name. It is closely allied to *C. antuana*, known only from Lubok district. In habit and floral details the two species are similar. The most striking difference between them is the shape, venation and indumentum of the leaves. The leaves of *C. kanae* are mostly broadly elliptic (not mostly broadest above the middle), tertiary venation clearly visible on the lower surface (not scarcely visible). In *C. kanae*, midrib, lateral and tertiary veins are densely brown-hairy and therefore stand out clearly, whereas in *C. antuana* the midrib and lateral veins are only minutely puberulous and are therefore not at all prominent. The types of sclereids in the leaves also differ: in *C. kanae* broad thin-walled sclereids in the hypodermis, none in the spongy mesophyll; in *C. antuana*, broad thin-walled osteosclereids in the hypodermis, long-armed astrosclereids in the spongy mesophyll (M. H. Bokhari).

Cyrtandra libauensis Hilliard, **sp. nov.** *C. disparoidei* B.L.Burtt affinis parte caulis juvenile pilis albis patentibus induta (nec pilis rufis paullo intertextis), foliis maturis pagina superiore tenuiter pilosa (nec glabra), pagina inferiore pilis densis patentibus induta (nec pilis ad venas fere restrictis appressis), marginibus integris (nec serratis), calycis lobis c.5 mm longis (nec c.2.5 mm), fructibus 15 mm longis (nec 7 mm) differt. – Type: Sarawak, Sungai Libau, Sungai Entulu, Sungai Mengiong, Batang Baleh, Kapit [division], [c.1°30′N 113°30′E], 20 vii 1987, *Lee* S54680 (holo E; iso K n.v.).

Herb, stem probably simple, height unknown but at least 300 mm, c.3–4 mm in diameter, base decumbent, rooting, upper part thickly clad in patent hairs to 1.5 mm long (silvery white *fide* collector), internodes c.35–80 mm long. *Leaves* opposite, slightly anisophyllous, minor leaves c.50–80 × 17–30 mm, major leaves c.90–140 × 32–37 mm, elliptic, apex acuminate, base narrowly cuneate, decurrent down upper part of petiole, margins entire, lateral veins c.13–18 each side of midrib, tertiary veins obscure, coarsely reticulate, upper surface of mature leaves clad in scattered hairs to 2 mm long, lower surfaces more thickly clad in similar hairs to 2 mm long on midrib,

shorter elsewhere; petiole 15–25 mm long, hairs patent. *Inflorescence* a few-flowered almost sessile dichasial cyme, solitary in axils of leaves. *Bracts* c.5–6 × 1 mm, lanceolate, clad in acute hairs c.1 mm long, bracteoles similar but smaller. *Pedicels* to 10 mm long in fruit, patent hairs to 1.5 mm. *Calyx* 5-lobed nearly to base, tube c.0.8 mm on posticous side, lobes c.5 × 1 mm, narrowly deltoid, patent acute hairs to 1 mm long outside. *Corolla* colour unknown, c.10 mm long (flower old and withered), tube 5 mm, more or less cylindric, anticous lip 5 × 5 mm, all lobes rounded, corolla with acute hairs to 1 mm long outside, glabrous inside, palate strongly rugose. *Stamens* not seen, anthers (in bud) 1 × 0.8 mm, cohering face to face by minute apiculi, staminodes not seen. *Disc* 1 × 1.25 mm, unilateral, fleshy. *Ovary* 7 × 1.5 mm, very minutely puberulous. *Style* 1 mm, glandular-puberulous. *Stigmatic lobes* c.0.6 × 0.6 mm. *Fruit* c.15 × 5.2 mm, ellipsoid, pericarp soft, warty, only one cell thick, stone cells in placentae, loculi filled with mucilage. *Seeds* c.0.25 × 0.2 mm, testa reddish.

SARAWAK. Sungai Libau, Sungai Entulu, Sungai Mengiong, Batang Baleh, Kapit [division], [c.1°30′N 113°30′E], 20 vii 1987, *Lee* S54680 (holo E; iso K n.v.); Ulu Sungai Entulu, Sungai Mengiong, Batang Baleh, Kapit division, 26 vii 1987, *Lee* S54774 (K).

This distinctive-looking plant is known only from two collections made by Bernard Lee of the Sarawak Forestry Department during a trip to the headwaters of the Baleh river close to the border with Kalimantan. There are two withered flowers and a few fruits on the type specimen, fruits only on the other. Its affinity appears to lie with *C. disparoides*, which is known from the same general area. They differ *inter alia* in indumentum: young parts of stem of *C. libauensis* clad in silvery white patent hairs (not somewhat matted rufous ones), upper surface of mature leaves thinly hairy (not glabrous), lower surface densely hairy, hairs spreading (not hairs almost confined to veins, appressed). Also, the calyx lobes are c.5 mm long (not c.2.5 mm), fruits c.15 mm long (not 7 mm).

The collector recorded 'terrestrial herbs; near stream' and 'herb growing on rock face; near stream'.

Cyrtandra longicarpa Merr., J. Malayan Branch Roy. Asiat. Soc. 1: 24 (1923). – Type: Sabah, Batu Lima near Sandakan, x 1920, *Ramos* 1359 (holo not traced, probably destroyed in WW II). Sandakan and vicinity, x 1920, *Ramos* 1265 (neo K, designated here; isoneo L, P, US).

Cyrtandra prolata B.L.Burtt in Coode et al. (eds) A checklist of the flowering plants and gymnosperms of Brunei Darussalam: 437 (1996). – Type: Sarawak, Lambir N.P., Sungai Liam Libau, 18 ix 1978, *Burtt* 11518 (holo E; iso K, L).

Herb, stem simple, erect, c.80–160 mm long (looks longer because of apical tuft of long erect leaves), woody, c.6–8 mm in diameter, pubescent when young. *Leaves* opposite, strongly anisophyllous to almost isophyllous, few crowded at apex of stem, minor leaves, when much reduced, c.14–25 × 4–8 mm, oblong-lanceolate, or, when

similar to major leaves, up to about two-thirds their size, major leaves 240–380 × 70–100 mm (including petiolar part), elliptic or somewhat oblanceolate, apex acute, base long-cuneate then narrowly winged to base, wings c.1–4 mm broad at base, margins serrate, serrulate or subentire, lateral veins c.10–14 each side of midrib, looping upwards and running parallel to margins, tertiary venation coarsely reticulate becoming subscalariform towards margins, upper surface glabrous at maturity, scattered whitish hairs in extreme youth, some often persisting on base of midrib, lower surface with hairs to c.0.3–0.5 mm long on midrib, few on lateral veins and margins, blade glabrous. *Inflorescence* a few- to many-flowered highly congested cyme in leaf axils, persisting at nodes when leaves fallen. *Peduncle* c.2–5 mm long, stout. *Bracts* conspicuous, opposite, not connate, c.15–30 × 7–15 mm, ovate, acute, margins entire or toothed, hairy as leaves, bracteoles c.8–15 × 1.3–2.5 mm, narrowly lanceolate, sparsely hairy. *Pedicels* 12–40 mm long, glabrous or with a few hairs. *Calyx* 5-lobed nearly to base, tube c.0.2–0.4 mm long, lobes 5.5–10 × 1–2 mm, narrowly deltoid, each lobe gland-tipped, glabrous or very nearly so. *Corolla* creamy-white to pale yellow (see below for more detail), c.45–60 mm long, tube 38–45 mm, narrowly cylindric below, abruptly expanded in upper two-thirds, anticous lip c.12–18 × 24–30 mm, anticous lobe 10–13 × 10–12 mm, posticous lobes c.12 × 10–12 mm (*Burtt* 8279 records 'almost regular flower'), all lobes rounded, corolla glandular-pubescent outside, hairs c.0.2–0.8 mm long, inside a patch of minute glandular hairs below posticous sinus and on palate. *Stamens* inserted 24–26 mm above base of tube, filaments c.10–12 mm long, strongly twisted, swollen in upper half and minutely glandular there, anthers c.4.5 × 2 mm, including a very conspicuous apiculus by which they cohere face to face, fertile part almost triangular in outline, thecae not confluent; lateral staminodes 7–8 mm long, posticous staminode c.2 mm. *Disc* 2.5–3.3 × 1.8–2.2 mm, cupular. *Ovary* c.18–25 × 1–2 mm, grading imperceptibly into the *style* c.13–17 mm long, ovary so minutely glandular that superficially it seems glabrous, style glandular-puberulous at least in upper part. *Stigmatic lobes* 3–4 × 1–1.5 mm, spathulate. *Fruit* c.55–60 × 4 mm, fusiform, pericarp soft (no 'stone' cells), initially 'blistered', at maturity tessellate. *Seeds* 0.25 × 0.2 mm, not fully mature.

SARAWAK. Lambir N.P., Sungai Liam Libau, 18 ix 1978, *Burtt* 11518 (E, K, L type of *C. prolata*); Lambir Hills, c.4°7′N 113°55′E, 6 vii 1962, *Burtt & Woods* B2414 (A, E, K, KYO, L, SING, SYD); Gunong Mulu National Park, between S. Trekan and S. Medalam, 15 vi 1975, *Burtt* B8279 (E).

SABAH. Sandakan and vicinity, x 1920, *Ramos* 1265 (para K, L, P, US); Near Sipitang, Gunong Lumarku, c.4°53′N 115°46′E, c.650 m, 20 iii 1980, *Argent & Lamb* 1486 (E); Sandakan, mile 17, Labuk road, 16 iv 1952, *Cox* 318 (E); Tambunan district, Crocker Range, km 59.5 on Kota Kinabalu–Tambunan road, 5°46′N 116°21′E, 1400 m, 2 xi 1983, *Beaman* 7370 (E, GH, K, US).

BRUNEI. Tutong district, Layong–Gadong pipeline track, Lammin, 4°42′N 114°45′E, 20 m, 14 xi 1990, *Dransfield* 6889 (E).

The holotype of *C. longicarpa* has not been traced, but several specimens of the paratype (*Ramos* 1265) are available and the Kew duplicate is chosen here as a

neotype. Merrill obviously considered *Ramos* 1359 and *Ramos* 1265 to be the same species. Certainly, *Ramos* 1265 accords well with Merrill's description except that the flowers are described as 2.5 cm long, not at least 4.5 cm (flower badly wilted) as in *Ramos* 1265, anthers 3 mm (not 4 mm) and stigmatic lobes 1 mm (not 3 mm). There are two possibilities to account for the discrepancies: either Merrill was describing a large bud, or at least one of his numerals is a misprint. (There is an obvious misprint in line 2 of the second paragraph, streets where streams is meant.) Misleading floral measurements and insufficient material to show variation in the breadth of the petiolar wings led one of us (B.L.B.) to redescribe *C. longicarpa* as *C. prolata*. In the vicinity of Sandakan, Gunong Mulu National Park, and in the Crocker Range, the wings at the base of the leaf may be as little as c.1 mm broad, but in the Crocker Range they may also be 4 mm broad, in Brunei and Sarawak 2–3 mm.

Merrill did not mention flower colour. In the specimens now seen, collectors have recorded 'white', 'white with lemon yellow mouth and broad brown stripes within tube', 'pale cream marked yellow in throat', and 'pale yellow'.

The plants favour damp banks in forest, often along streams, from c.20–1400 m above sea level. The leaves lack both a hypodermis and sclereids (M. H. Bokhari).

Cyrtandra microcarpa C.B.Clarke in A.DC., Monogr. Phan. 5: 244 (1883). – Type: Sarawak, prope Kuteing [Kuching], 186-, *Beccari* 1222 (lecto FI, chosen here; iso K). *Beccari* 764, 1335 (syn FI).

Cyrtandra borneensis C.B.Clarke in A.DC., Monogr. Phan. 5: 244 (1883). – Type: Borneo, *Lobb* s.n. (holo K).

Herb, stem simple, c.120–200 mm tall, woody, c.5–8 mm in diameter at base, erect or decumbent at base and rooting there, glabrous. *Leaves* opposite, few to several, more or less crowded at stem apex, either isophyllous or strongly anisophyllous, sometimes both states on one plant, minor leaves stipule-like, major leaves c.190–260 × 55–120 mm, elliptic to broadly elliptic, apex acute to acuminate, base cuneate to somewhat rounded, margins almost entire to minutely serrulate, lateral veins 7–10 each side of midrib, tertiary veins invisible or nearly so, both surfaces glabrous, lower almost granulate; petiole 45–140 mm long, glabrous. *Inflorescence* a highly condensed dichasial cyme, solitary in leaf axils, flowers c.11–15. *Peduncle* c.12–24 mm long, glabrous. *Bracts* 13–20 × 11–20 mm, ovate, margins entire, glabrous, free from each other, persistent, forming a pseudocupule; bracteoles similar but much narrower, innermost linear. *Pedicels* 4–5 mm long, glabrous. *Calyx* 5-lobed nearly to base, tube c.0.2 mm long, lobes c.1.5 × 0.8 mm, deltoid, glabrous. *Corolla* (only two flowers seen) white with two yellow lines on palate, c.15 mm long, tube 11 mm, narrowly cylindric in lower part, abruptly expanded above, anticous lip 4 × 7 mm, anticous lobe c.2.5 × 3 mm, posticous lobes 1.8 × 2 mm, all lobes rounded, glabrous inside and out. *Stamens* inserted c.7 mm above base of tube, filaments c.2 mm long, glabrous, anthers c.1.5 × 1.1 mm, cohering face to face by a minute apiculus; lateral staminodes c.1 mm long, posticous staminode c.0.5 mm. *Disc* 1.5 ×

0.8 mm, unilateral. *Ovary* 4 × 0.7 mm, glabrous. *Style* 5 mm, glabrous. *Stigma* capitate, c.1.25 mm in diameter. *Fruit* c.9–10 × 4 mm, ellipsoid, pericarp verrucose. *Seeds* 0.4 × 0.2 mm, testa bright red-brown.

SARAWAK. prope Kuteing [Kuching], 186-, *Beccari* 1222 (lecto FI; iso K); ibid., *Beccari* 764, 1335 (syn FI); Mt Matang, 29 v 1962, *Burtt & Woods* B1951 (E); Gunong Matang, Sungai China, c.1°38′N 110°8′E, 14 vii 1962, *Burtt & Woods* 2497 (E), ibid., 22 xi 1962, *Paie & Ashton* (E, K); South of Bukit Krian, Bau, c.50 m, 5 ix 1964, *Anderson*, *Ashton & Chai* S20283 (E); Bukit Goram [1°54′N 112°51′E], c.750 m, 30 v 1977, *Chai* S36178 (E).

BORNEO. *Lobb* s.n. (*C. borneensis*, holo K).

In an herbarium annotation, Burtt reduced *C. borneensis* to *C. microcarpa*; that reduction is validated here. *Cyrtandra microcarpa* is closely allied to *C. axillaris* (see above) and careful scrutiny is often needed to distinguish them. In *C. microcarpa*, the hypodermis of the leaf lacks sclereids, and the upper surface is smooth, whereas in *C. axillaris* dendrosclereids are present in the hypodermis, lying at right angles to the epidermis. It is these dendrosclereids that presumably give the upper surface its characteristic pattern of 'knotted strings'. *Cyrtandra microcarpa* is entirely glabrous; *C. axillaris* has hairy stems, at least the main veins on the lower leaf surface are hairy, and the corolla has hairs both inside and out. The bracts are persistent in *C. microcarpa*, caducous in *C. axillaris*.

Cyrtandra microcarpa is a plant of the forest floor.

Cyrtandra plicata Hilliard, **sp. nov.** *C. kanae* B.L.Burtt affinis sed foliis plicatis (nec planis), venis tertiariis obscuris (nec prominentibus), lamina supra glabris (nec primum pilosis) statim distinguenda. – Type: W Kalimantan, Serawai, Kaki Bukit Raya base camp; foothills SW of Bukit Raya, 0°39′12.7″S 112°39′49.8″E, 1600 m, 19 x 1995, *Church, Ismael & Ruskandi* 2597 (holo A).

Herb, stem c.40–150 mm long, c.6–8 mm in diameter, erect from a decumbent, rooting base, young parts villous, hairs (in dried state) brown, 1.5 mm long. *Leaves* few, so densely crowded at apex of stem difficult to judge whether subisophyllous or strongly anisophyllous, fully developed leaves c.150–265 × 40–60 mm, including the very narrowly winged base, broadest in upper part, apex obtuse to subacute, margins subentire to shallowly serrate, lateral veins c.11–14 each side of midrib, tertiary veins very obscure, lateral veins so strongly raised on lower surface that leaf is plicate (corrugated), upper surface glabrous, initially clad in pale 'scales' c.0.2 mm in diameter, these eventually collapsing into pits linked by wrinkles, lower surface villous, hairs up to c.2 mm long, brown when dry, recorded by collectors as purple or red. *Inflorescence* a few-flowered tightly congested cyme in leaf axils. *Peduncle* up to c.7 mm long. *Bracts* (only one pair seen) c.12 × 5 mm, elliptic, both surfaces villous, hairs to 1.5 mm long, bracteoles similar but smaller. *Pedicels* 10–12 mm long, villous. *Calyx* initially envelops corolla, lobes splitting apart as this expands, tube c.10 mm long, lobes c.14 mm long, base of lobes deltoid, c.5 × 2.3 mm, then margins strongly

infolded and fused, forming an acicular part c.9 mm long, outside villous, hairs to 3 mm long. *Corolla* white, yellow inside tube, c.50 mm long, tube c.35 mm, lower part narrowly cylindric, c.15 mm long, then expanding upwards for c.20 mm, throat c.10 mm in diameter, limb c.15 mm long, lobes c.10 mm (no complete limb seen), outside silky hairs to 5 mm long, inside glabrous. *Stamens* inserted 21 mm above base of tube, filaments c.12 mm, straight, anthers c.2.5 × 2 mm, cohering face to face by small apical apiculi, lateral staminodes 4 mm long, posticous staminode 3 mm. *Disc* 3 × 1.5 mm, cupular. *Ovary* c.5 × 0.7 mm grading imperceptibly into style, glabrous. *Style* c.15 mm, glandular-puberulous in upper half. *Stigma* c.2 × 1 mm, slightly bilobed. *Fruit* c.15 × 5 mm, fusiform, pericarp verrucose. *Seeds* c.0.4 × 0.25 mm, testa dark red-brown.

KALIMANTAN. W Kalimantan, Serawai, Kaki Bukit Raya base camp; foothills SW of Bukit Raya, 0°39′12.7″S 112°39′49.8″E, 1600 m, 19 x 1995, *Church, Ismael & Ruskandi* 2597 (holo A); Serawai, Uut Labang; immediate environs surrounding camp, 0°36′6.1″S 112°38′56.2″E, 750 m, 6 x 1995, *Church et al.* 2224 (E); Bukit Raya, c.112°50′E 0°30′S, 500–1700 m, 7 xii 1982, *Mogea* 4002 (L).

The epithet *plicata* (pleated, ribbed) draws attention to the outstanding feature of this species, namely its strongly ribbed leaves. These ribbed leaves, together with their very obscure tertiary venation, immediately distinguish it from *C. kanae*, which appears to be a close ally. Both species have simple stems, few leaves almost rosetted at the stem apex, calyx lobes drawn out into long acicular tips, and large white flowers with yellow in the throat, clad outside in long silky hairs, terminating long pedicels springing almost directly from the leaf axils. They share all these characters with *C. antuana* B.L.Burtt. The leaves of *C. plicata* and *C. kanae* are villous below while in *C. antuana* only the veins are minutely puberulous, the blade being glabrous.

Cyrtandra plicata is currently known only from the environs of Bukit Raya (in Kalimantan), which lies roughly two degrees of latitude south of the Sarawak border at 0°30′S and nearly 113°E. In Sarawak, Bukit Kana lies at 2°42′N and roughly 113°E, while *C. antuana* was found at approximately 1°12′N 112°E. The three species, known only from a few collections, thus appear to occupy a very restricted area but will surely prove to have a wider distribution when they are better known.

Cyrtandra poulsenii B.L.Burtt in Coode et al. (eds) A checklist of the flowering plants and gymnosperms of Brunei Darassalam: 436 (1996). – Type: Brunei, Temburong, Batu Apoi F.R., Setap Shale Formation, ridge W of Kuala Belalong Field Studies Centre, in Danish plot, 115°9′E 4°33′N, 250 m, 1 iv 1991–1 iv 1992, *Poulsen* 119 (holo AAU; iso E, K).

Cyrtandra glomeruliflora B.L.Burtt in Coode et al. (eds) A checklist of the flowering plants and gymnosperms of Brunei Darassalam: 436 (1996). – Type: Brunei, Seria, hill in the vicinity of Kampong Mendaram (Iban's long-house), 50–150 m, 17 xii 1963, *Hotta* 12632 (holo E; iso KYO).

Herb. *Stem* c.80–350 mm tall, woody, decumbent at stoloniferous base, base 3–6 mm in diameter, whole stem clad in brown setae to 3 mm long, patent at least on upper part, in older plants leaves confined to upper part. *Leaves* opposite, more or less isophyllous, largest leaves c.100–175 × 20–50 mm, elliptic to elliptic-obovate, apex acute, base narrowly cuneate, very shortly decurrent, margins serrulate (each tooth a dark hydathode), lateral veins 6–9 each side of midrib, tertiary veins scarcely visible, upper surface thinly clad in brown setae 2–3 mm long, finely granulate, granules coalescing into short, fine, 'knotted strings', lower surface with similar setae on midrib and margins, shorter finer hairs on blade; petiole c.10–20 mm long, hairy as midrib. *Inflorescence* a highly congested, many-flowered, almost globular cyme, sessile in leaf axils or at the nodes when lower leaves shed. *Bracts* paired, opposite, c.10–14 × 5–9 mm, ovate in outline, margins entire to strongly toothed, both surfaces clad in brown setae 2–4 mm long; bracteoles similar but progressively smaller, one pair embracing each flower. *Flowers* sessile. *Calyx* c.5–7 mm long, completely enveloping young corolla, essentially obscurely 5-lobed, but splitting into two short lips as the corolla enlarges, clad outside in setae 2–3 mm long. *Corolla* white, a yellow patch or stripes on palate, c.14–15 mm long, tube c.10–12 mm, cylindric in lower half, funnel-shaped in upper, anticous lip c.4.5 × 8 mm, anticous lobe c.2.1 × 2.8 mm, posticous lobes c.2.5 × 2.5 mm, outside brown hairs to 2 mm long, cylindric part of tube glabrous, inside glabrous. *Stamens* inserted c.6 mm from base of tube, filaments c.3 mm, anthers c.1.25–1.6 × 1.1–1.2 mm, cohering face to face by a very small ligature; lateral staminodes 0.8 mm, posticous staminode 0.2 mm. *Disc* c.1 × 1 mm, cupular. *Ovary* 1.5–2 × 0.8–1 mm, glabrous. *Style* c.8 mm, very minutely puberulous. *Stigmatic lobes* minute. *Fruit* 5 × 4 mm, ovoid, pericarp strongly verrucose. *Seeds* c.0.25 × 0.2 mm, testa red-brown, reticulate.

BRUNEI. Temburong, Batu Apoi F.R., Setap Shale Formation, ridge W of Kuala Belalong Field Studies Centre, in Danish plot, 115°9′E 4°33′N, 250 m, 1 iv 1991–1 iv 1992, *Poulsen* 119 (holo AAU; iso E, K). Belait, Labit, 4°21′N 114°27′E, Rampayoh, Rampayoh river valley, trail between first and second waterfalls, 50–100 m, 30 vii 1993, *Sands* 5985 (E). Labi, 4°21′N 114°38′E, Menaram, Wong Kadir, 150 m, 19 iii 1993, *Coode* 7247 (E). Seria, hill in the vicinity of Kampong Mendaram (Iban's long-house), 50–150 m, 17 xii 1963, *Hotta* 12632 (*C. glomeruliflora*, holo E; iso KYO).

Cyrtandra poulsenii and *C. glomeruliflora* were published as diagnoses only. Now that further material is available, it is clear that there is only one species. The opportunity is therefore taken to make the formal reduction and provide a full description.

A close ally of *C. poulsenii* is possibly *C. undata* B.L.Burtt, recently described from Sarawak in the vicinity of Kuching (Hilliard & Burtt, 2006). The two species are similar in habit, in having dendrosclereids (uncommon in Bornean species) in the hypodermis of the leaf, and in their highly congested inflorescences, small white flowers with yellow markings on the palate, and small, strongly verrucose, fruits. They are strikingly different in indumentum (*C. undata* lacks the setae that are so

conspicuous a feature of *C. poulsenii*), petioles 10–20 mm long, wingless, in *C. poulsenii*, 75–100 mm long, winged, in *C. undata*, as well as a number of other characters.

The epithet honours Dr Axel Poulsen, Danish botanist who works on SE Asian plants, currently *Zingiberaceae*. He recorded 'Setap shale formation, mixed dipterocarp forest', Coode 'mixed dipterocarp forest, sandstone', Sands 'Disturbed Dipterocarp forest, Lambir formation; sandstone and shale with thin limestone and marl. Earth bank of gully side in deep shade'.

Cyrtandra vaginata B.L.Burtt, **sp. nov.** *C. phoenicolasiae* Lauterb. affinis, sed foliis supra mamillatis subtus invaginata-punctatis, nec caule nec petiolis nec bracteis setis longis brunneis nitidis dense ut in *C. phoenicolasia* ornatis facile distinguitur. – Type: Sarawak, Nanga Balang, extreme headwaters of Batang Baleh, Kapit district, 1°35′N 114°30′E, 950 ft, 30 vi 1969, *Anderson & Paie* S28320 (holo E; iso K, L).

Perennial herb, stems up to c.5 mm in diameter, eventually forming a clump, individual stems simple or branching at ground level from the decumbent stoloniferous base, erect part of stems c.150–600 mm long, thickly clad in dark brown (purplish in life) strongly appressed hairs to 1.5 mm long. *Leaves* well spaced on upper part of stem, opposite, either isophyllous or one roughly half the size of the other, largest major leaves, including the petiolar part, 100–225 × 20–100 mm, narrowly to broadly elliptic, apex acute, base cuneate, decurrent, petiolar part up to c.10 mm long, ornamented with a flap of tissue c.3–10 mm broad infolded along its midline and often free from the midrib in its uppermost part, smooth and glabrous above, margins and back densely clad in brown hairs up to c.2 mm long; lateral veins 8–10 each side of midrib, tertiary veins finely reticulate, upper surface mamillate, rough to the touch from a bristle-like hair c.2 mm long from apex of each hump and similar but strongly appressed bristly hairs along midrib, on lower surface midrib and all lesser veins thickly clad in strongly appressed reddish hairs finer than those on upper surface and soft to the touch. *Inflorescence* a highly congested dichasial cyme mostly at leafless nodes on lower part of stem, flowers up to c.11 in each cyme. *Peduncle* c.2–5 mm long, clad in appressed red-brown hairs. *Bracts* c.13–30 × 2.5–5 mm, lanceolate, tip very acute to long-acuminate, both surfaces clad in appressed red-brown hairs; bracteoles similar but smaller. *Pedicels* 3–6 mm long, appressed-pubescent. *Calyx* 5-lobed nearly to base, lobes 3.5–7 × 0.5–1 mm, narrowly deltoid, outside reddish appressed hairs to c.1.2 mm long. *Corolla* white with two dark yellow ridges on palate, c.15–22 mm long, tube 10–15 mm, narrowly cylindric in lower half, abruptly expanded above, anticous lip c.5–8 × 10–14 mm, anticous lobe c.3–5 × 3–7 mm, posticous lobes c.2.5–4 × 2.5–6 mm, all lobes rounded, corolla clad outside in acute red hairs to 1.2 mm long, inside glabrous. *Stamens* inserted 6–8 mm above base of tube, filaments c.4–5 mm long, twisted once, anthers 0.8–1.2 × 0.8–1 mm, cohering face to face by minute apiculi; lateral staminodes 1.5 mm or wanting, posticous staminode wanting. *Disc* 1–1.5 × 0.8–1 mm, unilateral. *Ovary* c.4–6 ×

0.8–1 mm, some minute hairs on upper part, glabrous below. *Style* 4–5 mm long, glandular-puberulous. *Stigmatic lobes* c.0.5 × 0.5 mm. *Fruit* 10–13 × 2.5–4 mm, fusiform, pericarp verrucose. *Seeds* c.0.2 × 0.15 mm, testa red-brown.

SARAWAK. Nanga Balang, extreme headwaters of Batang Baleh, Kapit district, 1°35′N 114°30′E, 950 ft, 30 vi 1969, *Anderson & Paie* S28320 (holo E; iso K, L); Sungai Iban, Ulu Belaga [c.2°42′N 113°47′E], 11 xi 1982, *Lee* S45499 (E); Belaga district, Bukit Dema to Sungai Brearan, c.2°25′N 114°12′E, *Burtt* B11346 (E); Sungai Bena area, 1°56′N 113°8′E, 24 iv 1980, *Burtt* 12968 (E); Sungai Bena area, 1°56′N 113°8′E, 24 iv 1980, *Burtt* 12961 (E); Ulu Sungai Apa, tributary of Sungai Sut, between Bukit Goram [1°54′N 112°51′E] and Bukit Bakak, 4 iii 1975, *Chai* S36239 (E); Ulu Sungai Sedampa, extreme headwaters of Batang Baleh, 1°34′N 114°30′E, *Anderson & Paie* S28366 (E); Sungai Kapit beyond Rumah Ungat [c.1°30′N 113°10′E], 23 ii 1975, *Chai* S36008 (E, L); Sungai Rusa, Entawau, Baleh, 22 xi 1979, *Othman Ismawi* S41571 (E); Menyiong, Ulu Baleh, 7 xi 1979, *Othman Ismawi* S41293 (E, L); Sungai Sedupak, Ulu Sungai Baleh, 14 iv 1986, *Yii et al.* S52073 (SAR); Sungai Sebatu, Sungai Entulu, Sungai Mengiong, Batang Baleh, 16 vii 1987, *Lee* S54580 (E, L).

Cyrtandra vaginata is allied to *C. phoenicolasia* but is immediately distinguished by its leaves, mamillate above with corresponding invaginations on the lower surface (not smooth). The hairs on stems, leaves and bracts are strongly appressed (not strikingly patent). A very interesting similarity between the species is the development of a somewhat shield-shaped flap of tissue astride the midrib at the base of the petiolar part of the leaf on its upper surface. The flap in *C. vaginata* is longer than broad (not almost as broad as long) and the margins are infolded, forming a sheath or vagina, which suggested the specific epithet. *Cyrtandra vaginata* lacks the almost globular pouches formed by the union of the broadly winged bases of opposing pairs of leaves that is so striking a feature of *C. phoenicolasia* (see Hilliard & Burtt, 2005b). Floral differences include calyx lobes 3.5–7 mm long in *C. vaginata* (not 1–1.5 mm) and fruits 10–13 mm long (not 6–7 mm).

Cyrtandra vaginata grows in forest, on cliffs in stream gulleys and on rocky streambanks, sometimes on slopes, c.300–500 m above sea level. Currently it is known only from SE Sarawak, where it is sympatric with *C. phoenicolasia* at least on the upper reaches of the Baleh. Several collectors have noted that the dark green of the leaves may be variegated with silvery streaks and blotches.

ACKNOWLEDGEMENTS

We are, as ever, grateful to the following herbaria for the loan of specimens: A, K, KYO, L, MSC, SAR, US, and to Prof. M. H. Bokhari (Multan, Pakistan) for information on leaf anatomy. Dr Chiari Nepi (FI) sent us splendid digital images of the leaf surfaces of the type specimens of *C. axillaris* and *C. latens* in Beccari's herbarium.

REFERENCES

BURTT, B. L. (1970). Studies in the Gesneriaceae of the Old World III: some species of *Cyrtandra*, chiefly Bornean. *Notes Roy. Bot. Gard. Edinburgh* 30: 23–42.

BURTT, B. L. (1996). In: COODE, M. J. E., DRANSFIELD, J., FORMAN, L. L., KIRKUP, D. W. & SAID, I. M. (eds) *A Checklist of the Flowering Plants and Gymnosperms of Brunei Darussalam,* p. 436. Brunei Darussalam: Ministry of Industry and Primary Resources.

HILLIARD, O. M. & BURTT, B. L. (2005a). Old World *Gesneriaceae*: VII. *Cyrtandra schizostyla*, *C. velutina* and their respective allies in Borneo. *Edinburgh J. Bot.* 61: 131–145.

HILLIARD, O. M. & BURTT, B. L. (2005b). Old World *Gesneriaceae*: X. Bornean species of *Cyrtandra* allied to *C. phoenicolasia*. *Edinburgh J. Bot.* 61: 173–183.

HILLIARD, O. M. & BURTT, B. L. (2006 ['2005']). Old World *Gesneriaceae*: XI. More miscellaneous species of *Cyrtandra* in Borneo. *Edinburgh J. Bot.* 62: 145–163.

Received 5 June 2006; accepted for publication 31 July 2006