

***Pleuroschisma*, a New Section of *Cyrtandra* (Gesneriaceae) from Borneo**

O.M. HILLIARD¹, B.L. BURTT¹ AND M.H. BOKHARI²

¹Royal Botanic Garden Edinburgh, EH3 5LR, U.K.

²Multan, Pakistan

Abstract

Twelve Bornean species of *Cyrtandra* constitute a new section, Section *Pleuroschisma*, the name derived from an important diagnostic character, namely the unique fruit with a median septicial split on each side (not reaching either apex or base of the fruit). Nine of the species and two varieties are newly described, *C. angustieliptica* Hilliard & B.L.Burtt, *C. coacta* Hilliard & B.L.Burtt, *C. insolita* Hilliard & B.L.Burtt, *C. linauana* B.L.Burtt, *C. seganica* Hilliard & B.L.Burtt, *C. tessellata* Hilliard & B.L.Burtt, *C. tunohica* Hilliard & B.L.Burtt, *C. pendulifera* Kraenzl. var. *grossipilosa* Hilliard & B.L.Burtt and *C. sarawakensis* C.B.Clarke var. *longipilosa* Hilliard & B.L.Burtt. Two species recognized remain nameless because the material is inadequate to typify a name.

Introduction

There are already 40 sectional names in *Cyrtandra* and the limits and interrelationships of the groups so designated are far from being understood; the addition of yet another sectional name to the list may seem somewhat irresponsible. Nevertheless, the fruit characters that are used to diagnose this section - the smooth fruit wall (due to a thin layer of sclerenchyma beneath the epidermis, Fig. 3), and the septicial splits with inrolled margins (Fig. 1) form a unique combination in this small group. It is the lateral splits in the fruit-wall that form the basis for the sectional name *Pleuroschisma*; these splits, it should be noted, are septicial and there is some reason to suppose that septicial dehiscence may have been the primitive condition in the family as it is found in *Ramonda*, *Haberlea*, in the type species of *Corallodiscus*, all on the northern fringe of the subfamily Cyrtandroideae, and in the tribe Coronantherae, a basal tribe of subfamily Gesnerioideae found in New Caledonia, E. Australia, New Zealand and southernmost S. America. Its presence elsewhere in the family (e.g. in *Leptoboaea*) may be secondary. It must be noted, however, that the lateral splits in this new section of *Cyrtandra* do not reach from apex to base of the fruit (Fig. 1) and do not give rise to free fruit-valves, as in a fully septicial fruit. These features set section smaller.

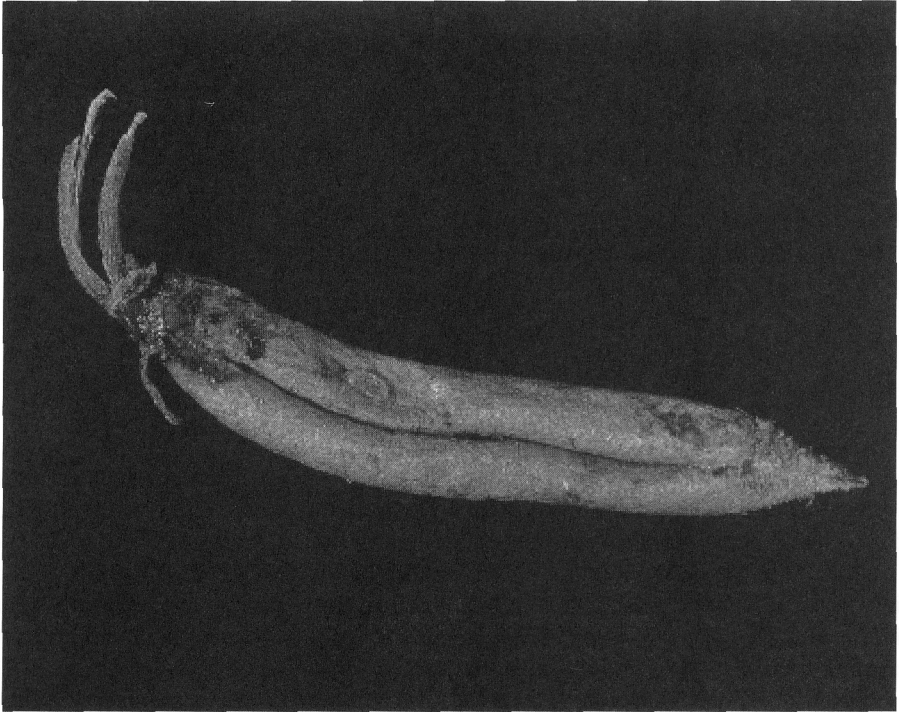


Figure 1. Mature fruit of *Cyrtandra sarawakensis*

The two halves remain held together at apex and base. *Burtt B4712* x4.

Pleuroschisma apart from all the other sections.

As so often in herbarium work on *Cyrtandra*, we have been much hampered by lack of flowers on many specimens, although mentioned in the collector's field notes. Nevertheless, it is not the flowers that provide the diagnostic features of the Section: it is the fruits. We have therefore felt justified in naming *C. tessellata* (no. 6), *C. seganica* (no. 7) and *C. insolita* (no. 11), which we know only in fruit. In the eight species where we have seen flowers, the major floral characters are uniform: calyx divided almost to the base into five deltoid lobes, corolla c. 35–40 mm long, white, cream or palest yellow with two orange/yellow bars in the throat, puberulous outside, disc cupular, occasionally deeply excavated on one side, ovary crowned with a coma of relatively long hairs, otherwise so minutely gland-dotted or pustulate as to appear glabrous on casual inspection, style puberulous, stigma distinctly bilobed, lobes relatively large, clavate in outline.

Leaf-venation provides a useful character in distinguishing some of the species, both the number of lateral veins on each side of the midrib, and the pattern described by the tertiary venation, of which three main types have been distinguished; for these we use the terms subscalariform, reticulate and pinnate (Fig. 2, A,B,C,D). In some species, the tertiary venation is invisible (e.g. *C. insolita*).

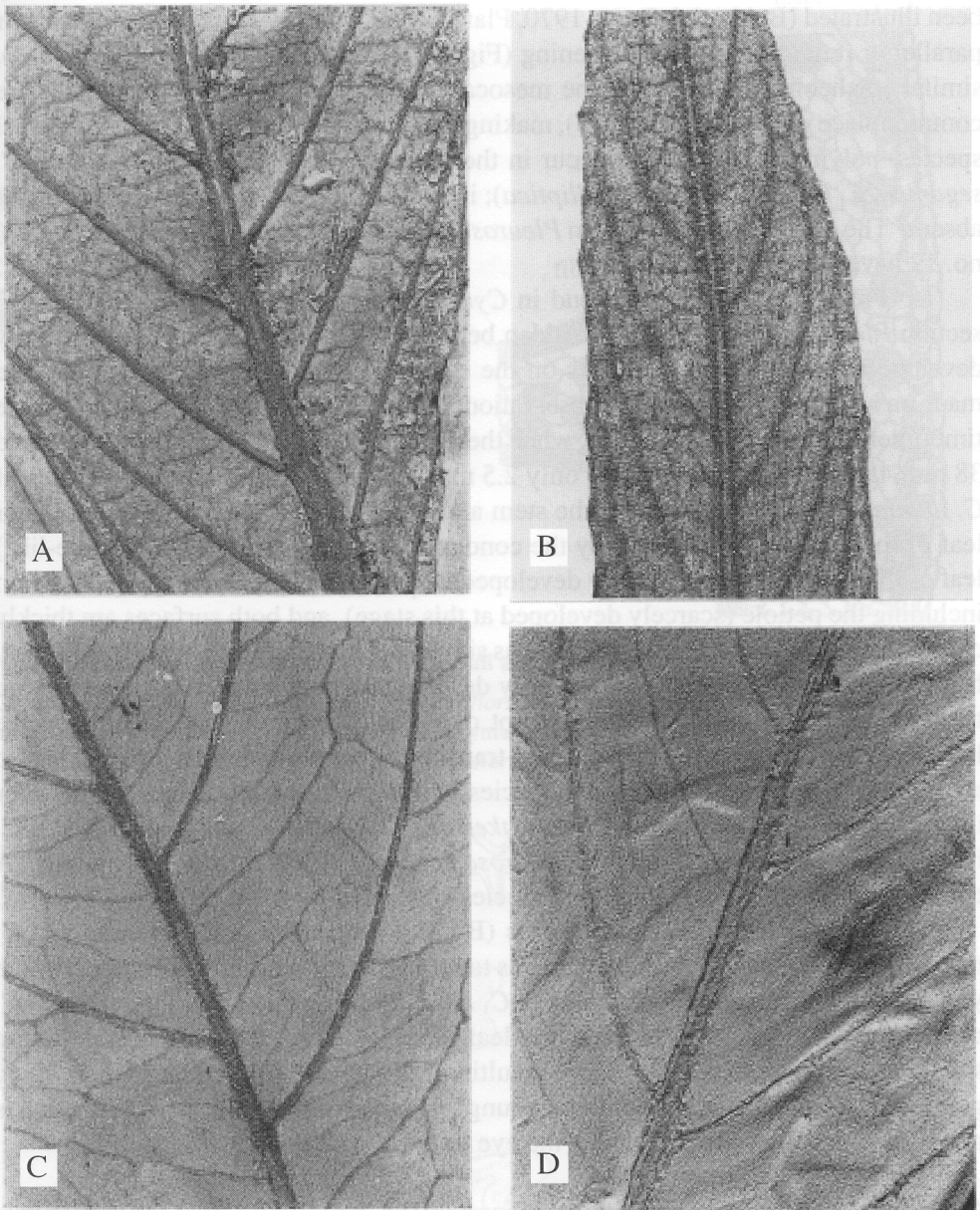


Figure 2. Types of tertiary venation found in *Cyrtandra* sect. *Pleuroschisma*

A. subscalariform (*C. sarawakensis*, Burt B1947, about actual size). B. finely reticulate (*C. tessellata*, Hotta 1417, slightly enlarged). C. coarsely reticulate (*C. sp. nov.* no. 12, Burt B2658, x2). D. pinnate (*C. coacta*, Beaman 10656, slightly enlarged).

The distinctive leaf anatomy, with tracheoids in the hypodermis, has already been illustrated (Bokhari & Burt, 1970, Plate 2, G,H): the tracheoids may have either parallel or reticulate bars of thickening (Fig. 4). In some species (e.g. *C. hoseana*), similar tracheoids are found in the mesocarp of the fruit; spheroidal sclereids are commonplace and abundant (Fig. 3), making fruit-sectioning very difficult. In several species, polymorphic sclereids occur in the mesophyll of the leaf (*C. tessellata*, *C. seganica*, *C. hoseana*, *C. angustieliptica*); in *C. penduliflora*, they may be present or absent. The other species in section *Pleuroschisma* lack sclereids. (*C. insolita* and sp. no. 12 have not been examined).

Protection of the apical bud in *Cyrtandra* is achieved in several ways. In section *Pleuroschisma* the bud is hidden between the erect petioles of the two fully developed uppermost major leaves on the stem. The following observations were made on herbarium material, and observations are needed on living plants to determine time-intervals in leaf development: when the developing leaf in *C. linauana* measured 38 mm, the young apical bud was only 2.5 mm long. We examined the stem apex of *C. linauana*, removing the tip of the stem and rehydrating it. The very young major leaf of the apical bud is hidden by the conduplicate base of the minor (stipule-like) leaf of the uppermost pair of fully developed leaves. It is plane, measured 38 x 8 mm including the petiole (scarcely developed at this stage), and both surfaces are thickly clad in long silky hairs. The minor leaf has similar indumentum and is well developed, being 20 mm long. In contrast, the fully developed leaves below the apex show no trace of the juvenile indumentum except over the midrib and lateral veins on the lower surface. There is the same abrupt transition from a very small juvenile leaf to a fully developed one in five other species where we had stem-apices suitable for inspection (*C. penduliflora*, *C. sarawakensis*, *C. coacta*, *C. angustieliptica*, *C. insolita*). These species in section *Pleuroschisma* are all strongly anisophyllous. A comparable condition in isophyllous species was noted by Burt (2001, p.399).

Field observations by one of us (B.L.B.) found that in *C. hoseana* and *C. penduliflora*, as the new apical leaf begins to grow out, the petiole is held erect but the young lamina is pendulous, the hairs in *C. hoseana* being silvery white, while in *C. penduliflora* they are dark red. As the leaf blades enlarge, the hairs become more spread out, and are eventually shed, resulting in the blade of the mature leaf being glabrous above. Whether or not these young leaves perform any attractive function is not known, but they certainly catch the eye of the plant-hunter.

Cyrtandra section *Pleuroschisma* Hilliard & B.L.Burt *sect. nov.* ab sectionibus omnibus ad huc descriptis fructibus duris laevibus (strato annulari subepidermali schlerenchymatis uni- vel bi-seriato), parietibus in medio longitudinis fissuris duabus septicialibus marginibus involutis notatis, foliis cellulis tracheoidalibus hypodermalibus praeditis facile distinguenda.

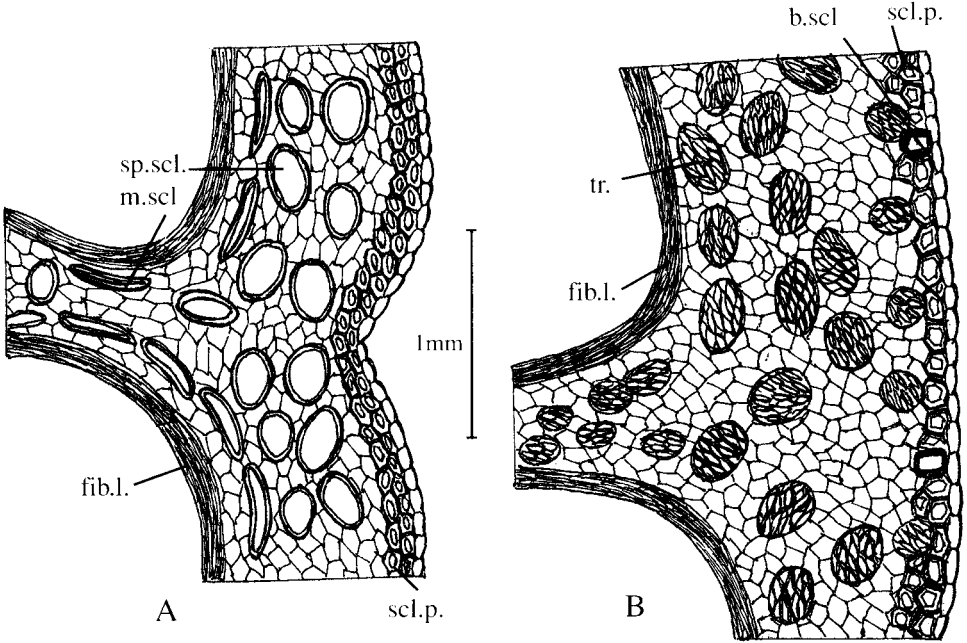


Figure 3. Transverse sections of part of fruit wall and septum

A. *Cyrtandra sarawakensis*; B. *Cyrtandra penduliflora*. b. scl. = brachysclereid; fib. l. = fibrous layer; m. scl. = macrosclereid; scl. p. = sclerified parenchyma [sclerenchyma]; sp. scl. = spheroidal sclereid; tr. = tracheoid [with reticulate thickening]. M.H. Bokhari del.

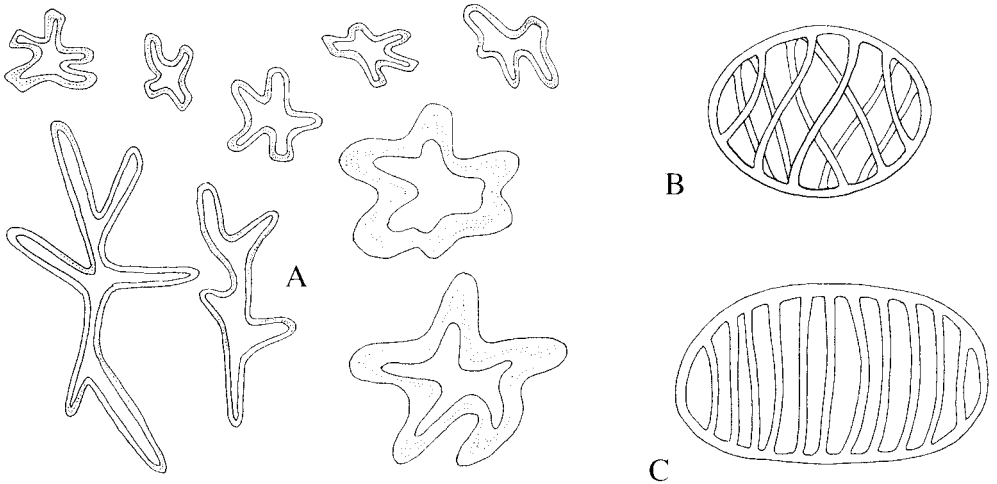


Figure 4. Sclereid and tracheoid types.

A. polymorphic sclereids. B. tracheoid with reticulate bars. C. tracheoid with parallel bars. M. Mendum after pencil sketches by M.H. Bokhari.

Species typica: *C. sarawakensis* C.B. Clarke

Distribution: Endemic to Borneo.

Simple-stemmed perennial herbs (*C. insolita* bushy), leaves usually strongly anisophyllous, tracheoids, as far as is known, in hypodermis, inflorescence a dichasial cyme, bracts free, bracteoles present or absent, calyx divided almost to base, corolla medium-sized, white to palest yellow ground colour, disc cupular, ovary crowned with a coma of relatively long hairs, style pubescent, stigmatic lobes large, clavate, fruit with two septicial grooves (later splits).

Key to Species

- 1a. Lateral veins in largest mature leaves up to 10 each side of midrib2
- 1b. Lateral veins 11–20 on each side of midrib.....4
- 2a. Hairs (lower leaf surface) on midrib and lateral veins very inconspicuous, short (to 1 mm), strongly appressed, pedicels c. 20 mm long, calyx lobes 10–15 mm.....**8. *C. linauana***
- 2b. Hairs (lower leaf surface) on midrib and lateral veins long, silky, strongly appressed, sometimes matted together to produce a papery surface, pedicels c. 5–8 mm, calyx lobes to 8 mm.....3
- 3a. Largest leaves c. 60–165 mm broad, petioles 75–135 mm, bracts c. 35–40 x 10–16 mm, conspicuous, strongly veined.....**3. *C. coacta***
- 3b. Largest leaves c. 36–60 mm broad, petioles 40–45 mm, bracts c. 5.5–7 x 1.8–2 mm, inconspicuous, only midrib visible.....**10. *C. angustieliptica***
- 4a. Hairs (lower leaf surface) on midrib spreading.....5
- 4b. Hairs (lower leaf surface) on midrib strongly appress.....10
- 5a. Peduncle c. 45–240 mm long, inflorescence lax, trailing.....
.....**1. *C. penduliflora* var. *grossipilosa***
- 5b. Peduncle c. 2–30 mm long, inflorescence neither lax nor trailing.....6
- 6a. Bracts c. 20–50 x 7–25 mm, 3–5 veins, clearly visible, calyx lobes 2–4 mm long.....7
- 6b. Bracts c. 15–18 x 2–3 mm, only midrib visible, calyx lobes c. 6–10 mm long.....9
- 7a. Inflorescence a several- to many-flowered cyme, both bracts and bracteoles present.....8
- 7b. Flowers 1–3, clustered and, at least when young, hidden by two foliaceous bracts, bracteoles wanting.....**11. *C. insolita***
- 8a. Petioles 80–150 mm long, peduncles 5–30 mm.....
.....**2. *C. sarawakensis* var. *longipilosa***

- 8b. Petioles 30–70 mm long, peduncles 0–2 mm..... **5. *Cyrtandra* sp. nov.**
- 9a. Largest leaves c. 26–34 mm broad, lower surface displaying finely reticulate tertiary venation, petiole c. 20–25 mm long**6. *C. tesselata***
- 9b. Largest leaves c. 85–110 mm broad, lower surface displaying coarsely reticulate venation, petiole c. 45–50 mm long.....**12. *Cyrtandra* sp. nov.**
- 10a. Peduncles c. 50–175 mm long, inflorescence lax, trailing...
.....**1. *C. penduliflora***
- 10b. Peduncles c. 1–30 mm long, inflorescences neither lax nor trailing..... 11
- 11a. Bracts c. 10–20 mm broad..... 12
- 11b. Bracts c. 3–7.5 mm broad..... 13
- 12a. Tertiary venation on lower leaf surface subscalariform, hairs on stem, leaves (including petioles), bracts, bracteoles, pedicels and calyx appressed, all hairs separate.....**2. *C. sarawakensis***
- 12b. Tertiary venation more or less pinnate, hairs on all parts (as above) matted together giving a papery look to the surface.....**3. *C. coacta***
- 13a. Stem silky-villous, tertiary venation (lower leaf surface) coarsely reticulate, almost invisible, largest mature leaves c. 85–95 mm broad, ratio length: breadth c. 2.5–3.3:1.....**9. *C. hoseana***
- 13b. Stem pubescent, tertiary venation more or less subscalariform, leaves c. 35–60 mm broad, ratio length: breadth 4–5.7:1..... 14
- 14a. Largest leaves c. 35–50 mm broad, lateral veins 13–15 on each side of midrib, bracts 20–30 x 4–7.5 mm, at least midrib clearly visible.....**4. *C. tunohica***
- 14b. Largest leaves c. 55–60 mm broad, lateral veins 18 on each side of midrib, bracts c. 20 x 4 mm, midrib scarcely visible.....**7. *C. seganica***

1. *Cyrtandra penduliflora* Kraenzl., Mitt. Inst. Allg. Bot. Hamburg 7:100 (1927); B.L. Burtt, Notes Roy. Bot. Gard. Edinb. 30:36 (1970).

Lectotype (Burtt, 1970): Kalimantan, Bukit Obat [c.0°56'N 113°20'E], 150m, *Winkler 1328* (lecto HBG, isolecto E).

Unbranched herb, stem to c. 600 mm long, 9–16 mm in diam., base often decumbent, rooting, prop roots present, young parts strongly appressed-pubescent. *Leaves* opposite, strongly anisophyllous, few forming a fan at apex of stem, reduced leaves stipule-like, c. 20–46 x 5–14 mm, lanceolate, acuminate, strongly appressed-pubescent, largest developed leaves c. 210–300 x 150–200 mm, very broadly elliptic, apex abruptly acute, base cuneate, very narrowly decurrent, briefly or to c. 40 mm, margins entire to obscurely to more distinctly irregularly serrate, lateral veins 11–13 on each side of midrib, tertiary venation more or less pinnate, upper surface glabrous

at maturity, coarsely pitted, lower surface with fine appressed hairs on veins and blade; petiole 130–210 mm long, hairy as midrib. *Inflorescence* an axillary very lax dichasial cyme, loosely branched, trailing, tending to spring from axils of fallen leaves, peduncle c. 50–175 mm long, pubescent. *Bracts* (lowermost pair) c. 15–57 x 4–18 mm, lanceolate, acuminate, finely pubescent. *Pedicels* 6–20 mm long, puberulous. *Calyx* 5-lobed almost to base, lobes subequal, c. 6–14 x 1.5 mm, deltoid, outside puberulous, inside minutely gland-dotted. *Corolla* c. 37 mm long (no complete flowers seen, only a big bud), white with an orange-yellow blotch or two bars in throat, puberulous all round mouth. *Stamens* inserted c. 15 mm above base of tube, filaments c. 5 mm long, glabrous, anthers 3.5 x 1.8 mm, cohering face to face by a small ligature, connective glabrous or a very few glandular hairs. *Disc* 1 x 1.8 mm, cupular. *Ovary* 6 x 1 mm, minutely pustulate, coma of hairs at apex. *Style* 12 mm, glandular-puberulous. *Stigmatic lobes* c. 1.5 x 1 mm (will enlarge), clavate. *Fruit* c. 20–45 x 5–7 mm, pericarp smooth. *Seeds* c. 0.3 x 0.25 mm, testa red-brown.

Notes: *Cyrtandra penduliflora* is a plant of the forest floor, often on steep banks, the stem supported by prop roots. It is distinctive by virtue of its trailing inflorescences, the peduncles mostly very long, the cyme always very lax, far laxer than in any other species of this group. The leaves are broad in relation to length, those of the type specimen, collected in southern Kalimantan, measuring roughly 300 x 200 mm, and exactly matched by those of *Burt* 2610 from Sarawak collected 1° of latitude north of the type collection and at very nearly the same degree of longitude (1°56'N 113°06'E versus 0°56'N 113°20'E), but nearly all specimens have the leaves very broad in relation to their length.

Tracheoids with parallel bars of thickening occur in the hypodermis; polymorphic sclereids are often present in the spongy mesophyll but they may be absent.

Other specimens examined: **Sarawak.** Miri distr., Niah Forest Reserve, [c. 3°52'N 113°44'E], *Anderson S31663* (E). Bintulu distr., Ulu Sungai Sinonok, 20–60 m, *Hotta 14247* (E, KYO). Tatau, Batang Anap, Ulu Sg. Kana [c. 2°54'N 112°50'E], *Mokhtar & Jugah S41779* (E). Sungai Kakus [c. 2°48'N 112°42'E], 30–80 m, *Hirano & Hotta 220* (E, KYO). Ulu Kakus [c. 2°48'N 112°42'E], Anap, *Haron S29980* (K, E). Ulu Segan [c. 2°30'N 113°E], N Setungan, c. 50 m, *Ashton S22019* (E). Pelagus Rapids on Rajang ['Rejang'], c. 2°10'N 113°E, *Burt & Woods B2559* (E). Sungai Bena [c. 1°56'N 113°06'E], a tributary of Sungai Sut, *Burt B2610* (E). Sungai Jelok, near Bukit Sengkajang [1°14'N 111°31'E], Lanjak-Entimau P.F. c. 2100 ft, *Chai S34034* (E, K). Bukit Ubah Ribu, Ulu Sungai Kaup, Lubok Antu [1°03'N 111°50'E], c. 200 ft, *Chai S33761* (E).

***Cyrtandra penduliflora* var. *grossipilosa* Hilliard & B.L.Burt var. nov.** a planta

typica pilis longis grossis patentibus in caulibus petiolis et subtus in costis (nec pilis tenuibus valde appressis) filamentorum apicibus et antherarum connectivo dense glanduloso-puberulo (nec glabro vel fere glabro) differt.

Type: Sarawak, ascent to Gunung Mulu [4°01'N 114°52'E], 13 vi 1962, *Burt & Woods B2060* (holo. E).

Unbranched herb, stem up to 1 m long, 15 mm diam., base often decumbent, rooting, young parts villous, hairs coarse, spreading. *Leaves* opposite, strongly anisophyllous, few at apex of stem, reduced leaves stipule-like, largest developed leaves 190–370 x 85–160 mm, elliptic, apex acute to acuminate, base cuneate, very narrowly decurrent, margins entire to irregularly toothed, lateral veins 12–18 on each side of midrib, upper surface glabrous at maturity, coarsely pitted, lower surface with coarse spreading hairs scattered among short appressed ones on the midrib, similar appressed hairs on the blade; petiole 100–150 mm long, hairy as midrib. *Inflorescence* as in the typical plant, peduncle c. 45–240 mm long. *Bracts* c. 24–45 x 4–13 mm, finely pubescent. *Calyx* lobes c. 6–9 mm long, outside puberulous, inside minutely gland-dotted. *Corolla* (only one flower seen) 41 mm long, white to pale yellow with 2 orange-yellow bars in throat, outside puberulous, mouth glandular-puberulous inside, tube 27 mm long, cylindric in lower part, expanded above, upper lobes c. 8 x 8 mm, lower lip c. 14 x 22 mm, median lobe 9 x 8 mm, all lobes suborbicular. *Stamens* inserted 22 mm above base of tube, filaments c. 5 mm long, glandular-puberulous in upper part, strongly twisted post anthesis, anthers 3 x 2 mm, cohering face to face by a small apiculus, connective densely glandular-puberulous. *Disc* 1 x 1.5 mm, cupular. *Ovary* 6 x 1.2 mm, very minutely pustulate, coma of hairs at apex. *Style* 13 mm long, glandular-pubescent. *Stigmatic lobes* 3 x 2.5 mm, clavate. *Fruit* c. 25–35 x 5 mm, pericarp smooth. *Seeds* c. 0.4 x 0.2 mm, testa red-brown.

Notes: This plant differs from typical *Cyrtandra penduliflora* in the coarse spreading hairs on the stem and along the midrib on the undersurface of the leaf (versus fine strongly appressed ones). The tertiary venation also differs subtly: in the typical plant, the tertiary veins are not clearly visible on the lower surface of the leaf and they are more or less pinnate in arrangement; in the variety they are clearly visible, subscalariform, with a fine reticulum of lesser veins between them. The leaves closely resemble those of *C. sarawakensis*, distinguished at once by its compact inflorescence. The label on *Sands 5390* (cited below) described the leaves as 'paler beneath with reddish-brown veins'; *Church 2210* 'whitish-green beneath with purple veins distinctly raised'. There is also a difference in the shape of the leaves, those of the typical plant being broader in relation to length than in the variety, ratio of length to breadth being 1.2–1.6:1 versus 1.7–2.5:1; in absolute terms c.150–200 mm versus 85–160 mm (largest leaves).

Anatomically there is some difference in the thickenings of the tracheoids in the hypodermis: parallel bars in the typical plant, reticulate thickenings in the variety often mixed with others with parallel bars.

The anther-connective in the typical plant is glabrous or nearly so, that in the variety densely glandular-puberulous.

From what is known of the distribution of the species, the variety tends to be more northern and eastern than the typical plant though the few collections from Kalimantan indicate close proximity.

Other specimens examined: **Brunei.** Temburong river at Wong Nguan rapids, 4°31'N 115°15'E, 120m alt., *Coode 6649* (E). Temburong distr., Sungai Belalong, 4°30'N 115°10'E, c. 100 m, *Argent et al. 911* (E). Slopes above Temburong headwaters NE of Gunung Retak, 4°22'N 115°17'E, *Sands 5309* (E). Tutong, Ladan Hills Forest Reserve, upstream from Belabau on E bank of Tutong river, 4°26'N 114°46'E, 20 m, *Coode 6409* (E). Sungai Tokat, a branch of Sungai Batu-Apoi, 50–100 m, *Hotta 13759* (E). **Sarawak.** Limbang [4°45'N 115°E], Ulu Medamit [4°27'N 114°55'E], Sungai Ensungei, Tanjong Long Amok, *George et al. S42368* (E). Gunong Api, Ulu Melinau, Tutoh, 4°07'N 115°15'E, 400 ft, *Anderson S31784* (E). Melinau Gorge pathway, c. 4°05'N 114°50'E, *Burt & Woods B2239* (E). Gunong Mulu National Park, Gua Rusa, c. 4°02'N 114°50'E, *Argent et al. 809* (E). Ulu Belaga, Sungei Semawat, 3°N 113°54'E, c. 250 m, *Hansen 623* (E). Dulit Range [c.3°16'N 114°14'E], Sungai Sirui, 200 m, *Awa & Yii S46629* (E). Valley of Sungai Keyan Linau-Balui divide, Sungai Nawai, c. 2°26'N 114°10'E, c. 2600 ft, *Burt B11456* (E). South of Punan Lusong, c. 2°28'N 114°12'E, *Burt B11294* (E). **Kalimantan.** Sintang, Bukit Baka National Park, Sungai Ella and environs, 0°38'S 112°17'E, 320 m, *Church 280* (A, E, HBG). Serawai, Uut Labang, 750 m, 0°36'6"S 112°38'56'E, *Church 2210* (E).

2. *Cyrtandra sarawakensis* C.B. Clarke, DC., Monog. phan. 5:209 (1883); B.L.

Burt, Notes Roy. Bot. Gard. Edinb. 30:38 (1970).

Lectotype (Burt 1970): Sarawak, Kuching, July 1865, *Beccari 153* (lecto FI, isolecto K, P).

Unbranched herb, stem c. 110–230 x 7–20 mm, erect or decumbent and rooting, young parts densely appressed-pubescent, hairs c. 2 mm long. *Leaves* opposite, strongly anisophyllous, c. 3–8 forming a fan at apex of stem, reduced leaves stipule-like, c. 30 x 3 mm, lanceolate, acuminate, closely appressed-pubescent; largest developed leaves c. 225–300 x 57–125 mm, elliptic, apex very acute, base cuneate, very narrowly decurrent, margins subentire to serrate, lateral veins 16–20 on each side of midrib, tertiary veins subscalariform, upper surface glabrous at maturity, coarsely pitted, lower surface appressed-pubescent on blade, long (to 3mm) delicate appressed hairs on midrib and lateral veins (tawny or purple in life); petiole c. 80–150 mm, hairy as

midrib. *Inflorescence* a several-flowered congested cyme, borne mainly in axils of fallen leaves, peduncle c. 5–30 mm long, stout, puberulous. *Bracts* persistent, c. 20–35 x 7–20 mm, lanceolate, acuminate, margins entire or toothed, strongly veined, both surfaces appressed-pubescent; bracteoles similar but smaller. *Pedicels* c. 10–12 mm, puberulous. *Calyx* 5-lobed almost to base, tube c. 0.5 mm, lobes subequal, 4.5–8 x 1–1.5 mm, narrowly deltoid, patent-puberulous outside, inside minutely gland-dotted. *Corolla* to c. 44 mm long, palest yellow, 2 orange-yellow bars on palate, outside puberulous, hairs acute, tube c. 27 mm long, narrowly cylindrical below, abruptly expanded above, two upper lobes c. 9 x 9 mm, lower lip 3-lobed, c. 14 x 24 mm, median lobe c. 8 x 8 mm, all lobes suborbicular, glandular-puberulous inside, with patch of longer hairs adjacent to sinus of upper lobes. *Stamens* inserted 20–25 mm above base of tube, c. 6 mm long, strongly twisted after anthesis, minute glandular hairs fringing connective; lateral staminodes c. 2 mm long, posticous staminode c. 1 mm. *Disc* c. 2 x 2 mm, cupular. *Ovary* c. 7 x 1.4 mm, minutely gland-dotted, coma of hairs at apex. *Stigmatic lobes* c. 3.5 x 1.2 mm, spatulate, conspicuous, stigmatic papillae relatively long. *Fruit* c. 20–25 x 4–5 mm, pericarp smooth. *Seeds* c. 0.25 x 0.2 mm, testa bright red-brown, reticulate.

Notes: *Cyrtandra sarawakensis* was originally collected by Beccari at Kuching. Beccari had a hut on Mt. Matang, not far from Kuching, and this is possibly the type locality; *Burt & Woods B1947* (cited below) precisely matches the isolectotype specimen in Paris. The other collections seen came from the Semengoh Forest Reserve a few miles south of Kuching. Many species of *Cyrtandra* seem to have a very limited distribution and this may be the case here. The distinguishing features of *C. sarawakensis* are the many lateral veins, tertiary veins subscalariform and clearly visible especially on lower surface, hairs on veins (lower surface) strongly appressed, peduncles c. 5–30 mm long, bracts broad, strongly and conspicuously veined. It is a plant mainly of the forest floor.

Tracheoids with parallel bars occur in the 1–2-layered hypodermis of the leaf, and there are no sclereids in the spongy mesophyll. Stomatal turrets are well developed.

Other specimens examined: **Sarawak.** Mt. Matang [1°36'N 110°11'E], *Burt & Woods B1947* (E); Matang, Ulu Sungai Rayu, *Lee S54099* (E); Semengoh Forest Reserve, 12 miles S of Kuching [1°28'N 110°22'E], *Burt & Martin B4712* (E); Semengoh Forest Reserve, *Burt & Woods B2487* (E).

Cyrtandra sarawakensis* var. *longipilosa Hilliard & B.L. Burt **var. nov.** a planta typica primum pilis in caule et costa grossis et patentibus (nec tenuibus et valde appressis) et calycis lobis plerumque longioribus 4.5–8 mm (nec 2.5–4 mm) et apicibus foliorum longe acuminatis (nec acutis) differt.

Type: Sarawak [c.2°N 114°10'E, Hose Mts.], Melinau Community Forest, near base camp at Nanga Tunoh, *Burt & Martin B4772* (holo. E).

Notes: The variety has been collected north and east of Kuching. It resembles *Cyrtandra sarawakensis* in nearly all features, including habit, number of lateral veins in leaves, subscalariform tertiary venation, bracts and other floral characters, but it differs in its long-acuminate (not merely acute) leaf tips, hairs on stem, petiole and midrib on under surface of leaves being coarse and spreading (not fine and closely appressed) and possibly also in length of calyx lobes, 2.5–4 mm (not 4.5–8 mm).

The coarse spreading hairs are brightly coloured in life, and in the dried state the colour often persists in the cross walls of the hairs; the hairs on *C. sarawakensis* may also be coloured, but, being so much finer, the colour is more difficult to see in dried specimens. The occurrence of a variety with long coarse spreading hairs as opposed to appressed ones is paralleled in *C. penduliflora*, a species with tertiary venation indistinguishable from that of *C. sarawakensis*; *C. penduliflora* differs markedly in its lax inflorescence, and many specimens have fewer lateral veins in the leaves.

Other specimens examined: **Sarawak.** Tatau, path to Bukit Buan, 300 ft. [c.2°56'N 112°55'E], *Purseglove 5469* (E). Tatau, Ulu Anap [c. 2°56'N 112°49'E], *Mokhtar S44815* (E). Bukit Kana [2°42'N 112°54'E], 600–850 m, *Hirano & Hotta 1299* (KYO); Bukit Kana, 50–150 m, *Hirano & Hotta 15480* (E). Ulu Anap, Bukit Mersing [2°30'N 113°06'E], c.1000 m, *Ashton S17679* (E). Hose Mts., Bukit Temedu [2°24'N 113°41'E], c. 1100 m, *Ashton S19007* (E). Pelagus Rapids on Rajang River [‘Rejang’], also on Bukit Raya nearby, c. 2°10'N 113°E, *Burt & Woods B2544* (E). Bukit Raya, *Smith S 27719* (E). SE end Hose Mts., Bukit Nibong, c. 2°6'W 113°42'E, *Burt & Martin B4845* (E). Sungai Bena, a tributary of Sungai Sut, c. 1°55'N 113°5'E, *Burt B2609* (E). Lundu distr., Gunung Gading [1°44'N 109°50'E], *Burt & Woods B2685* (E). Bukit Lumut, Ulu Amau [1°27'N 112°04'E], c. 950 m, *Ashton S21264* (E). Bukit Goram, Ulu Sungai Kapit [1°34'N 112°45'E], *Chai S36172* (E).

3. *Cyrtandra coacta* Hilliard & B.L.Burt, **sp. nov.** a *C. sarawakense* C.B.Clarke venis lateralibus foliorum 9–15 (nec 15–20), venis tertiaris plus minusve pinnatis (nec subscalariformibus) pilis in bracteis et in foliorum pagina inferiore papyraceo-coactis (nec pilis singulatis manifestis) distinguenda.

Type: Sabah, Ranau distr., road from Lohan to Mamut Copper Mine near Tank 47.6°01'N 116°41'E, 1100 m, 9 vii 1984, *Beaman 10656* (holo E).

Unbranched herb to c. 800 mm tall, stem horizontal at base then curving upwards, clad in a papery indumentum of matted hairs, leafy and floriferous on erect part. *Leaves* opposite, strongly anisophyllous, reduced leaf stipule-like, c. 25 x 2 mm, lanceolate, enveloped in papery indumentum; developed leaf c. 180–360 x 60–110(–165) mm, elliptic to broadly elliptic, apex acute to almost acuminate, base cuneate, very shortly decurrent, margins entire to obscurely or distinctly remotely serrate, lateral veins 9–15 on each side of midrib, tertiary veins more or less pinnate, upper surface glabrous, finely and closely pitted, lower surface papery, any loose hairs very delicate, to c. 3 mm long; petiole 75–135 mm, enveloped in papery indumentum. *Inflorescence* a several-flowered, very congested, axillary cyme, almost sessile. *Bracts* persistent, c. 35–40 x 10–16 mm, lanceolate, strongly veined, enveloped in papery indumentum, bracteoles similar but smaller. *Pedicels* c. 5 mm. *Calyx* 5-lobed almost to base, lobes subequal, c. 3.5 x 1 mm, narrowly deltoid, tube c. 0.5 mm, outer surface with papery indumentum, inside minutely gland-dotted. *Corolla* c. 40 mm long, white or cream with 2 orange-yellow bars in throat below the two sinuses of lower lip, outside minutely puberulous, hairs acute, tube c. 25.5 mm, cylindrical below for c. 12 mm then abruptly expanded, two upper lobes c. 9 x 6.5 mm, lower lip 3-lobed, c. 14.5 x 12 mm, median lobe c. 9 x 7.5 mm, all lobes more or less suborbicular, glandular-puberulous inside and down tube to insertion of filaments. *Stamens* inserted c. 19 mm above base of tube, filaments c. 5 mm, strongly coiled post anthesis, glandular-puberulous at apex, anthers c. 2 x 1.5 mm, cohering face to face by a prominent ligature, connective densely glandular-puberulous; lateral staminodes c. 2 mm, posticous staminode c. 1 mm. *Disc* 1.5 x 2 mm, cupular. *Ovary* c. 8 x 2 mm, minutely pustulate, coma of hairs at apex. *Style* c. 15 mm, glandular-puberulous. *Stigmatic lobes* c. 3 x 1.5 mm, clavate, conspicuous, stigmatic papillae relatively long. *Fruit* c. 20 x 6 mm (*Mendum & Lamb 23A*), pericarp smooth. *Seeds* c. 0.5 x 0.25 mm, testa red-brown.

Notes: This species has the aspect of *Cyrtrandra sarawakensis* but is at once distinguished by the indumentum on the vegetative parts: on stem, leaves (including petioles), bracts, bracteoles, pedicels and calyx, the hairs are matted together (*coactum* meaning felt), giving a papery look to the surface; in *C. sarawakensis*, hairs on the corresponding parts are appressed, the individual hairs all separate. The very striking difference is easily seen along the midrib on the lower surface where the matted hairs of *C. coacta* form a papery-looking skin in sharp contrast to the strongly appressed but distinctly separate hairs in typical *C. sarawakensis* and the long coarse spreading hairs in var. *longipilosa*. The indumentum of *C. hoseana* and *C. angustieliptica* is not unlike that of *C. coacta* but both species differ, *inter alia*, in their narrow bracts lacking conspicuous venation.

In *C. coacta*, there are 9–15 lateral veins on each side of the midrib, in *C. sarawakensis* 15–20, while the tertiary veins are more or less pinnate in *C. coacta*,

subscalariform in *C. sarawakensis*. Furthermore, the leaves differ in anatomical detail: the tracheoids in the hypodermis of *C. coacta* have reticulate bars and there are no stomatal turrets; in *C. sarawakensis* the tracheoids have parallel bars and there are prominent stomatal turrets.

The stamens may differ too, but too few flowers have been seen to be certain: in *C. coacta*, the connective in the anther and the top of the filament are densely glandular-puberulous; in *C. sarawakensis* both are glabrous or very minutely glandular.

Cyrtandra coacta is known mainly from Sabah and the northern part of Sarawak (*Yii et al. S51691* came from the upper reaches of the Baleh River, in east central Sarawak), while *C. sarawakensis* is found in the southern part.

Other specimens examined: **Sabah.** Sinsuron road, 850–900 m, 5°40'N 116°22'E, *Mendum & Lamb 23* (E), Sinsuron road, *Mendum & Lamb 23A* (E); Lahad Datu distr., Research Centre, Ulu Sungai Segama, 200m, *Argent et al. SAN 108203* (E). Mt. Kinabalu, eastern shoulder, 6°05'N 116°36–40'E, 3400 ft, *Chew et al. 963* (E, K), *Chew et al. 647* (E, K). **Sarawak.** Seventh division, Ulu Belaga, Sungai Semawat, 3°N 113°54'E, c. 250 m, *Hansen 715* (E). NE slope Bukit Kama [2°42'N 112°54'E], c. 450 m, *Hirano & Hotta 1239* (E, KYO). Ulu Sungai Balan, Bukit Batu Tiban, *Yii et al. S51691* (E).

4. *Cyrtandra tunohica* Hilliard & B.L.Burt **sp.nov.**, a *C. seganica* Hilliard & B.L.Burt foliis minoribus (maxime 170–200 mm, nec 300 mm longis) et pro rata angustioribus (4–5.7:1, nec 2.5–4.5:1), bracteis plerumque majoribus (20–30 x 4–7.5 mm prope basin, nec 20 x 4 mm), costa et venis lateralibus praecipue in pagina inferiore visibilibus (nec costa vix, lateralibus haud visibilibus), calycis lobis 2–4 x 1 mm (nec 4.5–6 x 1.5 mm) distinguenda.

Type: Sarawak, Kapit distr., Sungai Melinau [Hose Mts.], Nanga Tunoh, c.2°3'40"N 113°38'20"E, c.450ft, *Burt B12664* (holo E).

Unbranched herb, stem c. 5–6 mm in diam, near apex, height unknown, base decumbent and rooting, erect part to c. 150 mm long, upper part finely pubescent, soon glabrescent. *Leaves* opposite, crowded near apex of stem, slightly to strongly anisophyllous even on one stem, highly reduced leaves, when present, to c. 65 x 2mm, almost filiform, major developed leaves 170–200 x 35–50 mm, narrowly elliptic, apex acuminate, base narrowly cuneate, very narrowly and shortly decurrent, margins obscurely serrate to crenulate, lateral veins 13–15 (as few as 10 in minor leaves), tertiary venation subscalariform, upper surface glabrous at maturity, pitted, lower surface thinly hairy on blade, more densely so on veins, all hairs to c. 1 mm long, appressed; petiole 50–70 mm long, hairy as midrib. *Inflorescence:* few-flowered congested cymes, axillary,

extending from near apex of stem to well down below the leaves, almost sessile. *Bracts* persistent, 20–30 x 4–7.5 mm, lanceolate, long-acuminate, both surfaces puberulous, midrib and lateral veins clearly visible especially on lower surface; bracteoles similar but much smaller. *Pedicels* c. 1–8 mm, puberulous. *Calyx* 5-lobed almost to base, tube c. 0.5 mm, lobes subequal, 2–4 x 1 mm, narrowly deltoid, outside and margins closely appressed-pubescent, inside minutely gland-dotted. *Corolla* c. 30 mm long, cream with yellow marks on palate, outside puberulous, hairs acute, tube c. 20 mm long, lower half narrowly cylindrical, upper part expanded, two upper lobes c. 5 x 3.5 mm, lower lip 3-lobed, median lobe c. 5 x 3.5 mm, all lobes subrotund, glandular-puberulous inside, hairs extending down into throat. *Stamens* inserted c. 14 mm above base of tube, filaments c. 4 mm long, strongly twisted, anthers 2 x 1.2 mm, cohering face to face by a small ligature, both anthers and filaments glabrous; lateral staminodes c. 2 mm, posticous staminode c. 0.5 mm. *Disc* 1–1.2 x 1.2–1.8 mm, cupular. *Ovary* c. 3.5–7 x 0.8–2 mm, very minutely gland-dotted, crowned with coma of relatively long hairs. *Style* 5–6 mm long, puberulous. *Stigmatic lobes* 3–4 x 1–2 mm, clavate. *Fruit* 10–18 x 4–6 mm, pericarp smooth, deeply grooved longitudinally. *Seeds* 0.3–0.5 x 0.2–0.3 mm, testa red-brown.

Notes: The outstanding feature of *Cyrtrandra tunohica* as we know it is variation in the degree of anisophylly; in the rest of the species in this section of *Cyrtrandra*, the minor leaf is always reduced to a stipule-like outgrowth (with the caveat that several species are ill-known). In *C. tunohica*, the size of the leaves in each pair ranges from subequal (when the stem is much more leafy than is usual in this section as a whole) through degrees of reduction culminating in an extraordinarily long, almost filiform, stipule-like leaf; this occurs on a single stem. As the species is known from only one locality, the taxonomic value of this character remains to be assessed. The plants (very few) were found on the steep shady earth bank of a stream gully, and were seen only once, despite further fieldwork in the area on this and other occasions.

In its relatively narrow leaves, *C. tunohica* resembles both *C. seganica* and *C. angustielliptica*; it is easily distinguished from both by its bracts, 4–7.5 mm broad near the base (not 1.8–4 mm) and with both midrib and lateral veins raised on the lower surface and thus clearly visible (in contrast to nearly or quite invisible). It is further distinguished from *C. seganica* by its leaves, the largest 170–200 mm long (not c. 300 mm) and relatively narrower (ratio of length to breadth 4–5.7:1 versus 2.5–4.5:1), short (to c. 1 mm long) appressed hairs along the midrib on the lower surface (not long coarse spreading hairs), and c. 13–15 (not 18) lateral veins on each side of the midrib.

Not only do the bracts differ from those of *C. angustielliptica*, but so do the leaves in several details: lateral veins 13–15 in major leaves (not 7–10), hairs on undersurface of leaves up to c. 1 mm long, sparse on the blade (in contrast to silky-villous, hairs c. 2 mm long, the blade eventually glabrous, hairs persistent on midrib), tertiary veins clearly visible (not invisible or very nearly so).

The leaf of *C. tunohica* has tracheoids with reticulate thickening in the hypodermis and lacks sclereids in the mesophyll; *C. seganica* and *C. angustieliptica* have similar tracheoids but differ in having polymorphic sclereids in the mesophyll.

Other specimen examined: **Sarawak**, Kapit distr., Sungai Melinau [Hose Mts.], Nanga Tunoh, c. 2°3'N 113°38'E, *Burt B12665* (E).

5. *Cyrtandra* sp. nov.

Unbranched herb, stem very stout, c. 12 mm diam., c. 300–600 mm tall, young parts villous, lower parts glabrous. *Leaves* opposite, few crowded near apex of stem, strongly anisophyllous, reduced leaves stipule-like, c. 40 x 2 mm, narrowly linear-lanceolate, villous; largest developed leaves c. 195–260 x 80–90 mm, elliptic or oblanceolate, apex abruptly acuminate, base narrowly cuneate, very narrowly decurrent, margins entire, lateral veins 16–18, tertiary veins finely reticulate, upper surface glabrous, coarsely pitted (at maturity; densely pubescent when juvenile), lower surface densely pubescent, veins pilose; petiole c. 30–70 mm long, villous. *Inflorescence* a many-flowered, highly congested dichasial cyme, axillary, forming bracteate clusters borne on the leafless part of the stem; peduncle very stout, to 2 mm long. *Bracts* persistent, primary pair c. 20 x 7 mm, lanceolate, acute, midrib and lateral veins prominent, outside densely pubescent, inside hairs mainly near apex and base; bracteoles similar but narrower, a pair subtending each pedicel. *Pedicels* c. 5 mm, puberulous. *Calyx* 5-lobed almost to base, tube c. 0.5 mm, lobes c. 4 x 1 mm, outside puberulous, hairs patent, inside minutely gland-dotted. *Corolla* c. 30 mm long, white, 2 orange-yellow bars on palate, outside puberulous, hairs acute, tube c. 20 mm long, lower part narrowly cylindrical, upper part expanded, two upper lobes c. 5 x 3.5 mm, lower lip 3-lobed, median lobe c. 5 x 4 mm, all lobes subrotund, glandular-puberulous on lower lip, hairs extending down floor of tube, a median tuft of eglandular hairs at base of each upper lobe, a few glandular hairs towards outer margins. *Stamens* inserted c. 17 mm above base of tube, filaments c. 4–5 mm long, twisted once near base, anthers 2.2 x 1 mm, cohering face to face by a conspicuous ligature, connective minutely glandular, glands extending briefly down back of filaments; lateral staminodes c. 2 mm, apex strongly hooked, tip globular, pale yellow (as anthers), posticous staminode c. 1 mm. *Disc* 1.8 x 2 mm, almost cupular (deeply notched on one side). *Ovary* 7 x 2 mm, glabrous except for conspicuous coma. *Style* 10 mm (at anthesis), pubescent, hairs acute. *Stigmatic lobes* c. 2 x 1.5 mm (post anthesis), spatulate, stigmatic papillae conspicuous. *Fruit* 23 x 6 mm (one seen), pericarp smooth, split longitudinally, only apex and base cohering. *Seeds* c. 0.25 x 0.2 mm, testa red-brown.

Notes: This species is allied to *Cyrtandra tunohica* and *C. sarawakensis* var.

longipilosa. It is distinguished from *C. tunohica* by the relatively long patent indumentum on stems, petioles and backs of leaves (versus hairs short, appressed), leaves c. 80–90 mm broad (not 35–50 mm) and many- (not few-) flowered inflorescence. It differs from *C. sarawakensis* var. *longipilosa* by its shorter petioles (30–70 mm, not 80–150 mm) and almost sessile inflorescence. Also, the pubescence on the undersurface of the leaf blade is dense and patent (not appressed). This is obvious in *Haron S29978* (K), but not so well marked on the duplicate (E); it is also obvious in *Jugah Kudi S23712* (K) where the finely reticulate tertiary venation shows up well.

The two collections seen are not good: *Haron S29978* was obviously pressed when badly withered; the sheet at Kew is particularly bad, but this is the one with a nearly complete corolla and several buds, from which the floral details were extracted. Only an old fruit survives on the sheet in Edinburgh, and the base of a fruit on *Jugah Kudi S23712* appears to have eight loculi! The need for good collections before the species can be named is obvious.

The leaves have a 1–2-layered hypodermis, and tracheoids with parallel bars in the hypodermis.

Specimens examined: Sarawak, Anap, Ulu Kakus [c.2°30'N 113°E], *Othman Haron S29978* (E, K); Balingian, Ulu Sungai Arip, Bukit Iju [roughly 2°40'N 112°40'E], *Jugah Kudi S23712* (K, L).

6. *Cyrtrandra tessellata* Hilliard & B.L.Burt **sp. nov.** a *C. tunohica* (etiam folia anguste lanceolata gerente) caulibus et pagina foliorum inferiore villosis (nec breviter pubescentibus), petiolo 20–25 mm longo (nec 50–70 mm) villoso (nec pubescente), bracteis c. 15 x 1.8–2 mm venatione invisibili (nec 20–30 x 4–7.5 mm venatione elevata conspicua), calycis lobis c.6–8 mm longis (nec 2.4 mm) differt.

Type: Sarawak, Bintulu distr., en route (survey route) from Sungai Mah to Sungai Shinonok, Ulu Sungai Minah, alt. 40–150 m, *Hotta 14117* (holo KYO).

Herb, probably unbranched, height unknown, stem collected 50 x 10 mm, villous, hairs 3–4 mm long, leafy throughout, internodes c. 10 mm long. *Leaves* opposite, strongly anisophyllous, reduced leaves stipule-like, c. 30 x 3 mm, narrowly lanceolate, long-acuminate, major mature leaves 150–230 x 26–34 mm, narrowly elliptic, apex gradually very acute, base narrowly cuneate, margins very obscurely serrulate, lateral veins 12–14 on each side of midrib, upper surface glabrous at maturity, pitted, lower surface villous, longest hairs (2–3 mm) on midrib, shorter on lesser veins, tertiary venation finely reticulate, all veins raised, hairs brownish (dried state) making venation very conspicuous; petiole 20–25 mm long, villous. *Inflorescence* a few-flowered axillary cyme, peduncle c. 4 mm, very stout. *Bracts* c. 15 x 1.8–2 mm, narrowly lanceolate, densely pubescent, venation obscure; bracteoles similar but

Pedicels c. 10 mm (in fruit), pubescent. *Calyx* 5-lobed almost to base, tube c. 0.5 mm, lobes 6–8 x 1 mm in fruit, narrowly deltoid, outside and margins puberulous, hairs patent, inside minutely gland-dotted. *Corolla* not seen, only very young buds present, puberulous outside, hairs acute, lobes minutely glandular inside (tube scarcely developed). *Stamens*: filaments scarcely developed, anthers 2 x 0.8 mm, minutely glandular on margins of connective. *Disc* cupular. *Ovary* and *style* very young, style pubescent. *Fruit* c. 35 x 5 mm, pericarp smooth, traces of coma still visible at apex. *Seeds* c. 0.25 x 0.2 mm, testa bright red-brown.

Notes: This species is so distinctive that lack of flowers should not preclude its formal recognition. The leaves are closely set down the 150 mm length of the piece of stem on the herbarium sheet, in contrast to most of its allies where the leaves appear to be quickly deciduous leaving a few, forming a fan, at the apex of the stem. Unfortunately, the collector gave no notes either on habit or habitat of his plant. The major leaves are short-petioled, narrowly elliptic, and at maturity glabrous above but villous below, with midrib, lateral and tertiary veins raised (the latter forming a fine reticulum) and conspicuous, partly owing to the dark hairs clothing them. Similar tertiary venation has not been seen in any other species in this section.

Cyrtandra tessellata is diagnosed above against *C. tunohica*, which has similarly narrowly lanceolate leaves, but the indumentum on stem, petioles and leaf undersurface in *C. tessellata* is villous (not merely shortly pubescent), the petioles are remarkably short (20–25 mm versus 50–70 mm), the bracts are c. 15 x 1–2 mm, venation invisible (not 20–30 x 4–7.5 mm, venation raised and conspicuous), calyx lobes c. 6–8 mm long (not 2–4 mm). In sharp contrast to that of *C. tessellata*, the tertiary venation in the leaves of *C. tunohica* is rather indistinct, and tends to be subscalariform.

The leaf anatomy of *C. tessellata* is unlike that of *C. tunohica*: vertically long tracheoids with parallel bars in the hypodermis, polymorphic sclereids in the mesophyll; the tracheoids in *C. tunohica* have reticulate bars and there are no sclereids in the mesophyll.

7. *Cyrtandra seganica* Hillard & B.L.Burt, sp. nov. a *C. sarawakense* C.B. Clarke bracteis tantum c. 4 mm latis (nec 7–20 mm) sine venatione conspicua (nec costa et venis lateralibus prominentibus) et folia angustiora prorata longitudinis (5.5:1 nec 2.5–4.5:1) facile distinguenda.

Type: Sarawak, Bintulu distr., Ulu Segan [c. 2°30'N 113°E], rocky stream bank, 750 ft., *Ilias Paie* S27215 (holo E).

Unbranched herb, height unknown, stem c. 8 mm diam. near apex, apex densely pubescent, rest of stem quickly glabrous. *Leaves* opposite, strongly anisophyllous, few at apex of stem, reduced leaves stipule-like, c. 25 x 3 mm, lanceolate, acuminate, densely pubescent, hairs spreading; developed leaves c. 300 x 55–60 mm, elliptic, acute, base narrowly cuneate, very narrowly decurrent for c. 35 mm, margins entire, lateral veins c. 18 on each side of midrib, tertiary venation subscalariform, upper surface glabrous, pitted, lower surface with very small fine strongly appressed hairs on blade, coarse much longer (c. 1 mm) hairs on midrib and lateral veins, probably appressed and probably purplish in life (specimens well glued); *petiole* c. 55–70 mm long, hairy as midrib. *Inflorescence*: few-flowered congested cymes borne mainly in axils of fallen leaves, peduncle c. 4–8 mm long, very stout, puberulous. *Bracts* persistent, c. 20 x 4 mm, narrowly lanceolate, acuminate, margins entire, both surfaces puberulous, hairs spreading, midrib scarcely visible; bracteoles similar but smaller. *Pedicels* c. 8–10 mm. *Calyx* lobed nearly to base, lobes subequal, 4.5–6 x 1.5 mm, narrowly deltoid, tube c. 0.5 mm, outside and margins puberulous, inside minutely gland-dotted. *Corolla* not seen. *Fruit* c. 18–36 x 4–5.5 mm, pericarp smooth. *Seeds* immature.

Notes: *Cyrtandra seganica* is currently known with certainty only from the type collection. In the venation of the leaves, including the subscalariform arrangement of the tertiary veins, it resembles *C. sarawakensis*, but the leaves are narrower in relation to their length (ratio of length to breadth 5.5:1 versus 2.5–4.5:1). There is a striking difference in the bracts, only c. 4 mm broad near the base and with the midrib but faintly visible in *C. seganica*, in contrast to bracts c. 7–20 mm broad with prominent venation in *C. sarawakensis*. The leaves are similar anatomically in having tracheoids with parallel bars in the hypodermis, but differ in the presence of many polymorphic sclereids in the mesophyll of *C. seganica* whereas the leaves of *C. sarawakensis* lack sclereids.

Two collections from further south and west resemble *C. seganica* in leaf-venation and in narrow bracts. They appear to differ in the shape of the leaves (oblongate) and also in the ratio of length to breadth (3.25–4.6:1), this being within the range of *C. sarawakensis*. The leaves also appear to differ anatomically, in that the tracheoids have reticulate bars, not parallel bars; polymorphic sclereids occur in the mesophyll. These two collections come from Sarawak from Datu Permanent Forest [Bukit Datu? at 1°29'N 110°50'E], 420 m alt., on the ridge between two streams, *Lee S41904* (E) and 17th mile Bau/Lundu road, Gunong Undan (1° 27'N 109° 59'E), stream bank, 50m, *Yii S45942* (E).

Much more needs to be known about all three plants described here.

8. *Cyrtandra linauana* B.L.Burt, **species nova** ex affinitate *C. sarawakensis* C.B.Clarke et *C. hoseanae* B.L.Burt, ab ambabus nervis lateralibus foliorum 7–8 (nec 12–20) et calycis lobis 10–15 mm longis (nec usque ad 8 mm) differt.

Type: Sarawak, Belaga distr., hill just N of Long Linau [c.2°40'N 114°E], *Burt 11478* (holo E; iso BO, L, SAR).

Herb, stem simple, c.100 mm tall, 8 mm diam., puberulous, hairs very closely appressed. *Leaves* opposite, strongly anisophyllous, 5 pairs crowded near apex of stem, lower ones fallen, reduced leaf stipule-like, c. 35 x 5 mm, lanceolate, long-acuminate; developed leaf c. 210–300 x 82–83 mm, elliptic, somewhat falcate and eccentric, apex rather abruptly acuminate, base cuneate, very shortly and narrowly decurrent, margins entire, lateral veins 7–8 on each side of midrib, tertiary venation coarsely reticulate, upper surface mottled silver (living material), glabrous, pitted, lower surface with blade glabrous, midrib and lateral veins strongly appressed-pubescent, hairs very inconspicuous; petiole 70–80 mm, thickly appressed-pubescent. *Inflorescence* an axillary dichasial cyme, flowers few, branches of cyme very short (3–4 mm), bearing only 4 flowers (apical bud on each branch suppressed), peduncle c. 5–8 mm, very stout. *Bracts* persistent, c. 20 x 2 mm, narrowly lanceolate, acuminate, both surfaces strongly appressed-pubescent, bracteoles similar but smaller, a pair subtending each pedicel. *Pedicels* c. 20 mm, appressed-pubescent. *Calyx* 5-lobed almost to base, tube c. 0.5 mm, lobes 10–15 mm, narrowly linear-lanceolate, outside appressed-pubescent, inside minutely gland-dotted. *Corolla* 26–30 mm long, white, throat yellow shading to orange, outside minutely puberulous, hairs acute, red, tube 17–18 mm long, cylindric in lower third, abruptly expanded above, two upper lobes 7–8 x 5 mm, lower lip 3-lobed, c. 9–12 mm long, median lobe 7–8 x 5 mm, all lobes oblong-elliptic, glandular-puberulous inside. *Stamens* inserted 8.5 mm above base of tube, filaments 2.5 mm, glabrous, anthers 2.2x1.2mm, cohering face to face by a prominent ligature, connective fringed with stout red hairs; lateral staminodes 3 mm, posticous staminode 1.2 mm. *Disc* 1.5 x 2 mm, cupular but deeply excavated on one side. *Ovary* 5 x 1 mm, minutely pustulate, coma of hairs at apex. *Style* 7mm, glandular-puberulous. *Stigmatic lobes* 4 x 1.8 mm, clavate, conspicuous. *Fruit* 24 x 3.8 mm, pericarp smooth.

Notes: *Cyrtandra linauana* resembles both *C. sarawakensis* and *C. hoseana* in the size, shape and stance of its leaves but differs from both in having only 7–8 lateral veins on each side of the midrib (not 12–20). The tertiary venation also differs: in *C. linauana* it is rather indistinct and very coarsely reticulate though the veinlets may be more subscalariform towards the margins; in *C. sarawakensis* the veins are prominent and closely subscalariform; in *C. hoseana* they are very nearly invisible.

The tracheoids in the hypodermis have reticulate bars as in *C. hoseana* but there are no sclereids in the spongy mesophyll. In *C. sarawakensis* the tracheoidal bars are parallel and, as in *C. linauana*, there are no sclereids in the spongy mesophyll; *C. hoseana* has polymorphic sclereids.

The inflorescences of all three species differ: in *C. linauana*, the bracts are only c. 2 mm broad and the venation is not or scarcely visible; pedicels c. 20 mm long, making the inflorescence rather lax. In *C. sarawakensis*, the bracts are very conspicuous, being broad, venation prominent, pedicels c. 9–13 mm long, inflorescence congested. In *C. hoseana*, the bracts are c. 3–4 mm broad, venation inconspicuous, pedicels c. 5–10 mm long, inflorescence congested. Stout red hairs fringe the connective in *C. linauana*; in *C. sarawakensis* and *C. hoseana*, the connective is either glabrous or glandular.

Cyrtrandra linauana is known with certainty only from the type collection made at c. 2°40'N 114°E. There is another collection, made at c. 2°48'N 112°59'E, that is clearly very close to *C. linauana*, namely *Hirano & Hotta 881* (KYO, E) from Bukit Keyan, Ulu Sungai Kakus, alt. 100–300 m. It differs in several details: leaves not falcate and with 10 lateral veins, otherwise identical with those of *C. linauana*, flowers fascicled in the leaf axils, pedicels c. 15 mm long, calyx lobes 6.5–9 mm. The most significant difference is the fascicled flowers in contrast to the shortly pedunculate dichasial cyme of *C. linauana*, where the long pedicels produce a very lax inflorescence.

The leaves of *C. angustieliptica* have a deceptive similarity to those of *C. linauana*. That species is, however, distinguished by the short (to c. 1 mm) appressed and inconspicuous hairs on stem, petiole and midrib of leaves on lower surface (not 2–3 mm long, silky, appressed hairs matted together and easily seen), bracts c. 20 mm long (not 5–8 mm), connective of anthers fringed with stout red hairs (versus glandular puberulous ones all over). The inflorescence of *C. angustieliptica* is a nearly sessile, very congested, cyme.

9. *Cyrtrandra hoseana* B.L.Burt. Notes Roy. Bot. Gard. Edinb. 30:33 (1970).

Type: Sarawak, Lambir Hills, c. 4°7'N 113°55'E, sandstone banks, *Burt & Woods B2365* (holo E, iso SAR).

Unbranched herb, stem 20–150 cm long, c. 8 mm diam. near apex, hanging from sandstone cliffs and banks, sometimes supported by prop roots, young parts silky villous, hairs strongly appressed. *Leaves* opposite, strongly anisophyllous, few arranged in a fan at stem apex, reduced leaves stipule-like, c. 20 x 10 mm, broadly lanceolate, appressed silky-villous; largest developed leaves c. 255–320 x 85–95 mm, elliptic, apex abruptly acute, base cuneate, shortly and very narrowly decurrent, margins entire to obscurely serrulate, lateral veins 12–15 on each side of midrib, tertiary venation coarsely reticulate, upper surface glabrous at maturity, coarsely pitted, lower

surface with long, strongly appressed, silky hairs on midrib and lateral veins, blade glabrous or almost so at maturity; petiole c. 45–60 mm, hairy as midrib. *Inflorescence* an axillary, very congested, cyme, mainly in axils of fallen leaves, few-flowered, peduncle 2–6 mm long. *Bracts* c. 15–18 x 3–4 mm, persistent but inconspicuous, lanceolate, acuminate, closely appressed-puberulous, only midrib visible on lower surface. *Pedicels* c. 5–10 mm long, puberulous. *Calyx* 5-lobed almost to base, lobes subequal c. 2.2–3.5 x 1.25 mm, deltoid, outside appressed-pubescent, inside minutely gland-dotted. *Corolla* c. 32 mm long, white or creamy white outside, 2 orange-yellow bars in throat, outside puberulous, hairs acute, red, tube c. 20 mm long, lower half narrowly cylindric, abruptly expanded above, two upper lobes c. 5 x 7 mm, lower lip 3-lobed, c. 12.5 x 20 mm, median lobe c. 6 x 7 mm, all lobes subrotund, glandular-puberulous inside and for a short way down tube. *Stamens* inserted c. 16 mm above base of tube, filaments c. 5 mm, curved and twisted once, minute globular glands at apex, anthers c. 3 x 1.6 mm, cohering face to face by a small ligature, connective with a few glandular hairs and globular glands; lateral staminodes c. 1.2 mm, posticous staminode c. 1 mm. *Disc* 1 x 1.8 mm, cupular. *Ovary* 8 x 1.6 mm, very minutely gland-dotted, coma of hairs at apex. *Style* 10 mm, glandular-puberulous. *Stigmatic lobes* not fully developed, c. 2 mm long, clavate. *Fruit* c. 27–45 x 5 mm, pericarp smooth. *Seeds* c. 0.4 x 0.25 mm, testa red-brown.

Notes: So far, *C. hoseana* is known with certainty only from the Lambir Hills. Now that more material is available, it is clear that *Burt & Woods B2212* (E, SAR) from the Melinau Gorge, which was cited in the original description, is a distinct species, described here as *C. angustieliptica*.

It is worth noting again that 'the youngest leaf is very densely covered with shining silky hairs and it hangs downwards at the top of the shoot, like a tiny silvery flag' (Burt, 1970). In this species, the tertiary veins are scarcely discernible on the lower surface of the leaf, but form a coarse reticulum that may just be visible on the upper surface (compare the tertiary veins of *C. sarawakensis*).

Tracheoids with reticulate bars occur in the 1–2-layered hypodermis, and a few polymorphic sclereids in the mesophyll.

Other specimen examined: **Sarawak**, Lambir National Park, Sungai Lapoh and nearby, *Burt 11546* (E).

10. *Cyrtandra angustieliptica* Hilliard & B.L. Burt sp. nov. a *C. hoseana* B.L. Burt foliis 36–60 mm latis (nec 85–90 mm) apice acuminato (nec abrupte acuto), venis lateralibus utrinque costae 7–10 (nec 12–15), calycis lobis 5–8 mm longis (nec 2.2–3.5 mm) distinguenda.

Type: Sarawak, Sungei Melinau Gorge, c. 4°5'N 114°50'E, sandstone hillock, *Burt & Woods B2212* (holo E).

Unbranched herb, stem of unknown height, c. 6–7 mm in diam. near apex, young parts silky-villous, hairs strongly appressed, matted together. *Leaves* opposite, strongly anisophyllous, reduced leaves stipule-like, c. 18 x 6 mm, lanceolate, silky-villous as stem, developed leaves up to c.10, largest 170–275 x 36–60 mm, elliptic, apex acuminate, base cuneate, margins entire to obscurely serrulate but teeth made conspicuous by apical tuft of hairs, lateral veins 7–10 on each side of midrib, tertiary venation obscure, upper surface glabrous at maturity, coarsely pitted, lower surface with long, strongly appressed, silky hairs on midrib and lateral veins, these also on blade but this eventually glabrous; petiole c. 40–45 mm, hairy as midrib. *Inflorescence* an axillary very congested cyme, flowers few, peduncle c. 2 mm. *Bracts* c. 5.5–7 x 1.8–2 mm, persistent but inconspicuous, lanceolate, acuminate, both surfaces densely appressed-pubescent. *Pedicels* c. 8 mm, puberulous. *Calyx* 5-lobed almost to base, tube c. 0.5 mm long, lobes subequal, 5–8 x 1.2 mm (in flower and fruit), deltoid, outside densely appressed-pubescent, inside minutely gland-dotted. *Corolla* c. 30–35 mm long, white or creamy white outside, 2 orange-yellow bars in throat, outside puberulous, hairs acute, tube c. 22–28 mm, lower half cylindric, upper part expanded, two upper lobes c. 5 x 5 mm, lower lip 3-lobed, median lobe c. 6 x 7 mm, all lobes subrotund, glandular-puberulous inside and short way down tube. *Stamens* inserted c. 16 mm above base of tube, filaments c. 5 mm, curved and twisted once, glandular-puberulous at apex, anthers c. 2 x 1.5 mm, cohering face to face by a small ligature, connective glandular-puberulous; lateral staminodes c. 2 mm, posticous staminode not seen. *Disc* c. 1.5 x 1.8 mm, cupular. *Ovary* c. 6 x 1.2 mm, very minutely papillose, coma of hairs at apex. *Style* c. 6 mm elongating to c.10 mm, glandular-puberulous. *Stigmatic lobes* c. 3 x 2 mm, clavate. *Fruit* 25–48 x 5 mm, pericarp smooth. *Seeds* c. 0.3 x 0.2 mm, testa red-brown.

Notes: In his original description of *Cyrtrandra hoseana*, Burt cited *Burt B2212* (above) as that species, but in the herbarium he later segregated it and further collections as differing in their narrower leaves. Not only are the leaves narrower, they are also shorter (170–275 x 36–60 mm versus 255–320 x 85–95 mm) and there are significantly fewer lateral veins than in *C. hoseana* (7–10 versus 12–15); also, the leaf tips are acuminate (not abruptly acute). They may differ further in the length of the calyx lobes (5–8 mm versus 2.2–3.5 mm, but see comments below). As in *C. hoseana* the tertiary veins are scarcely visible on the lower surface of the leaf; anatomically the leaves are similar, having tracheoids with reticulate bars in the hypodermis and polymorphic sclereids in the mesophyll.

Cyrtrandra angustieliptica is known only from the Melinau Gorge (in Gunung Mulu National Park) at c.100 m above sea level. A plant with leaves exactly like those of *C. angustieliptica* in all morphological details has been collected several

times on the extreme headwaters of the Balleh, at c.1000–1700 ft altitude on a ridge between Sungai Balang and Sungai Balleh [1°35'N 114°30'E at 1200 ft by *Anderson & Paie* S28329 (E); at c.1000 ft by *Anderson & Paie* 28739 (E); at c.1000 ft by *Anderson* S28741 (E) and at 1700 ft by *Paie* S28409 (E, L)]. However, these specimens differ anatomically in having no sclereids in the spongy mesophyll (a character possibly of little taxonomic significance), and the calyx lobes are 2.5–5 mm long (not 5–8 mm), corolla 20–25 mm (not 30–35 mm), filaments and anthers glabrous (not glandular), and the disc unilateral (not cupular).

Other specimens examined: Sarawak. Gunung Mulu National Park, Melinau Gorge, *Burt* B8274 (E); Melinau Gorge, c. 100 m, *Nielsen* 537 (E).

11. *Cyrtandra insolita* Hilliard & B.L.Burt **sp. nov.** nullae arcte affinis; pedunculo longo axillari bracteis duabus flores breviter pedicellatos 1–3 involucrentibus facile recognoscenda.

Type: Sarawak, Kapit, Upper Rajang [‘Rejang’] River, 1929, *Clemens* 21236 (holo K).

Shrub (fide collector), 3 stems seen, 170–250 mm long, woody, leafy only at apex, young parts densely pubescent. *Leaves* opposite, strongly anisophyllous, reduced leaves stipule-like, c. 20 x 3 mm at base, linear-lanceolate, villous; developed leaves few, c. 160–190 x 55 mm, elliptic, apex long-acuminate, base cuneate, decurrent down petiole, margins obscurely serrulate, lateral veins c. 20 on each side of midrib, tertiary veins invisible, upper surface silky villous at first, soon glabrescent, coarsely pitted, lower surface densely pubescent, hairs very delicate, c. 4 mm long on midrib, shorter on blade; petiole c. 10 mm long, villous. *Inflorescence* mainly in axils of fallen leaves, 1–3-flowered, flowers springing from apex of peduncle and enfolded by bracts, peduncle 15–45 mm long, villous. *Bracts* 2, persistent, foliaceous, c. 35–45 x 10–22 mm, lanceolate, long-acuminate, 5-nerved, both surfaces villous; bracteoles wanting. *Pedicels* 4–5 mm, pubescent. *Calyx* 5-lobed almost to base, lobes subequal, 2 x 1.5 mm, deltoid, outside pubescent, inside gland-dotted. *Corolla* not seen. *Anthers* (in very young bud) 1.5 x 1.1 mm, glabrous. *Gynoecium* very young, but stigma clearly bilobed, disc cupular. *Fruit* c. 30 x 5 mm, pericarp smooth (young fruits retain an apical coma). *Seeds* c. 0.3 x 0.25 mm.

Notes: *Cyrtandra insolita* (*insolitus* = extraordinary) is highly distinctive among other species in this Section, from which the pair of foliaceous bracts enfolding one to three flowers at the apex of the long peduncle immediately mark it out. The other species all have few- to many-flowered cymes. Also, these species are unbranched herbs of the forest floor; Mrs Clemens described her plant as ‘shrub in thickets’.

12. *Cyrtandra* sp. nov.

Unbranched herb, stem woody, height unknown, 10 mm diam., pilose, hairs coarse, spreading, red-purple, as on other vegetative parts. *Leaves* opposite, strongly anisophyllous, few at apex of stem, reduced leaves stipule-like, c. 75 x 6 mm at base, linear-lanceolate, long-acuminate, pilose; largest developed leaves 300–350 x 85–110 mm, elliptic, apex acuminate, base narrowly cuneate, decurrent, margins finely and remotely toothed (teeth being extensions of the veins beyond the margins), lateral veins 15–16 on each side of midrib, tertiary veins coarsely reticulate, upper surface glabrous, pitted, lower surface with short, fine appressed hairs on blade, long coarse spreading hairs on midrib; petiole c. 45–50 mm long, hairy as midrib. *Inflorescence* a congested several-flowered cyme, solitary in axils of fallen leaves, peduncle c. 6–12 mm long, pubescent. *Bracts* persistent, c. 18 x 3 mm, lanceolate, acuminate, midrib visible on lower surface, both surfaces densely pubescent; bracteoles similar but smaller, a pair subtending each pedicel. *Pedicel* c. 20 mm long (in fruit), densely puberulous. *Calyx* 5-lobed almost to base, tube c. 1 mm long, lobes subequal, c. 10 x 1.5 mm (in fruit), narrowly deltoid, outside densely puberulous, inside minutely gland-dotted. *Corolla* not seen. *Fruit* c. 30 x 5.5 mm, pericarp smooth, remains of coma visible at apex. *Seeds* not fully ripe.

Notes: This plant needs to be re-collected. Gunung Gaharu lies c. 96 km SE of Kuching on the road to Serian. The specimen seen is a unicate, in fruit but without flowers. It much resembles *Cyrtandra sarawakensis*, particularly var. *longipilosa*, but is at once distinguished by the reticulate, not subscalariform, tertiary venation of the leaves, and by its much narrower bracts.

Specimen examined: **Sarawak**, Gunung Gaharu, c. 2000 ft., *Burt* 2658 (E).

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References

- Bokhari, M.H. and B.L. Burtt. 1970. Studies in the Gesneriaceae of the Old World XXXII: Foliar sclereids in *Cyrtandra*. *Notes Royal Botanic Garden Edinburgh*, **30**: 11–21.
- Burtt, B.L. 1970. Studies in the Gesneriaceae of the Old World XXXIII: Some species of *Cyrtandra* chiefly from Borneo. *Notes Royal Botanic Garden Edinburgh*, **30**: 23–42.
- Burtt, B.L. 2001. A survey of the genus *Cyrtandra* (Gesneriaceae). *Phytomorphology Golden Jubilee Issue 2001: Trends in Plant Sciences*. pp. 393–404.