EDINBURGH JOURNAL OF BOTANY 62 (3): 145–163 (2005)
doi:10.1017/S096042860600014X
Issued 12 May 2006

OLD WORLD *GESNERIACEAE* XI: MORE MISCELLANEOUS SPECIES OF *CYRTANDRA* IN BORNEO

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Fourteen miscellaneous Bornean species of *Cyrtandra* are treated. Descriptions and discussion are provided for *C. integerrima* and *C. neiothiantha*, originally published with diagnoses only, and *C. warburgiana* is redescribed. *Cyrtandra arachnoidea*, *C. asikii*, *C. banyingii*, *C. keithii*, *C. lineariloba*, *C. mendumae*, *C. palimasanica*, *C. parvifructa*, *C. sublanea*, *C. tubibractea* and *C. undata* are newly described.

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

Introduction

It is clear not only that there is a large number of undescribed species of *Cyrtandra* in Borneo, but also that several named species need further elucidation. Such, for instance, is the case with *C. warburgiana* Lauterb., where the author did not see a fully developed flower and his measurements for calyx and corolla, given without comment, are those of a bud. One of us (B.L.B.) was pressed for time when compiling a checklist of *Gesneriaceae* in Brunei (Burtt, 1996) and provided only diagnoses of the new species published there.

Cyrtandra arachnoidea Hilliard & B.L.Burtt, **sp. nov.** *C. warburgianae* Lauterb. affinis sed indumento arachnoideo e pilis pallidis et saepissime intertextis paginam leviter corrugatam papyraceam formantibus bracteis c.25mm longis (nec 40–55mm) facile distinguenda.
Type: Sabah, Tawau distr., Tawau Hills Park near headquarters camp, 4°24′N, 117°53′E, elevation 300–400m, 15–16 vi 1984, *Beaman* 10173 (holo. E, iso. MSC).

Herb; stem decumbent at base, stoloniferous, rooting, leafless and producing most of the inflorescences, c.4–8mm in diam., erect part 150–600mm long, thickly clad in long delicate cobwebby hairs matted together to produce a wrinkled, papery surface, leafy. *Leaves* opposite, isophyllous, the largest 115–250 × 40–80mm, elliptic, apex acute, base cuneate, very narrowly decurrent down petiole, margins serrulate (each tooth a hydathode), lateral veins 7–9 each side of midrib, looping upwards and becoming submarginal, tertiary veins invisible, upper surface glabrous, very minutely pitted, lower surface pustulate, thickly clad in matted cobwebby hairs

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(most easily seen on margins) forming a papery surface; petiole 15–35mm long, hairy on lower surface as on stem and midrib, the individual hairs easily seen as a web in angle between petiole and stem. *Inflorescences* borne low down on bare stem and its stoloniferous base, each a highly condensed many-flowered cyme enclosed in a cupule. *Peduncle* c.8–35mm long, felted, with wrinkled papery surface. *Bracts* c.25–30mm, fused almost to apex to form a cupule, free margins undulate, glabrous. *Pedicels* c.3mm long, very stout. *Calyx* 16–21mm long, initially completely enveloping the corolla, later splitting into 5 beaked lobes c.3–5 × 2–3mm, with scattered delicate hairs 1–1.2mm long outside. *Corolla* 'yellowish with reddish-purple spots', 'light yellowish', 'pale yellowish', 'yellowish', 'white', c.35–50mm long, tube 28–37mm, lower third cylindric, upper part funnel-shaped, anticous lip c.7–13 × 18–20mm, anticous lobe c.6–8 × 6–8mm, posticous lobes c.5–6 × 6–7mm, all lobes rounded, with delicate hairs 4–5mm long outside, a patch of minute glandular hairs below posticous sinus inside, and sometimes a few glands scattered round mouth. *Stamens* inserted c.16–22mm above base of tube, filaments c.12mm long, thickened about the middle, twisted once at base, glabrous; anthers c.2.2mm long, cohering face to face by minute apiculi; lateral staminodes 2–4mm, posticous staminode 1mm. *Disc* 2–2.5 × 1.5–2mm, cylindric. *Ovary* c.6–7 × 1mm, glabrous. *Style* c.20–24mm, puberulous near apex. *Stigmatic lobes* c.1–1.2 × 1–1.2mm. *Fruit* 12–15 × 4–4.5mm, pericarp verrucose. *Seeds* c.0.25 × 0.2mm, testa red-brown.

SABAH. Kota Merudu, 23 xi 1981, *Aban et al.* SAN 94355 (SAN). Near Sandakan, Bettotan, 31 vii 1927, *Kloss* SFN 19030 (K, L). Sandakan, Long's Farm, 60m, 22 v 1966, *Hou* 202 (L). Sepilok Forest Reserve, along N boundary, 1 v 1962, *Jaswir Singh* SAN 34732 (L, mixed with *C. sandakanensis*). Beluran, Sungai Memanjang, 29 viii 1985, *Amin & Matin* SAN 111107 (K, SAN). Kalabakan, Gunong Rara Forest Reserve, side of Kuamut river, 8 xii 1990, *Maikin et al*. SAN 132168 (SAN).

Cyrtandra arachnoidea is allied to *C. warburgiana*, which has cupules about twice the size of those of *C. arachnoidea* and a very different indumentum. In *C. warburgiana* the hairs are short, stout and brown; in *C. arachnoidea* they are long, delicate, pale and cobwebby, mostly matted together to produce a wrinkled papery surface, easily seen on stems, petioles and very young unexpanded leaves. The true nature of the hairs is evident in the axils of the leaves where they form a delicate web (whence *arachnoidea*) between the stem and the base of the petiole; this web breaks down as the leaves age.

Like typical *C. warburgiana*, *C. arachnoidea* is a lowland plant. We have seen one record from western Sabah (Kota Merudu district, an apparently poorly botanized area), the rest being from eastern Sabah. It is likely that the plant also occurs in nearby parts of Kalimantan.

Beaman recorded 'Dipterocarp forest. Quaternary dacite lava'. No other ecological information is available.

The leaves have a 1-layered hypodermis without sclereids, though long-armed astrosclereids are present in the spongy mesophyll sending branches between the palisade cells (M.H. Bokhari).

Cyrtandra asikii Hilliard & B.L.Burtt, **sp. nov.** a *C. adnatae* B.L.Burtt pilis in caule, petiolis et costis inconspicuis valde appressis minus quam 0.1mm longis (nec c.1mm longis et manifestis), pagina inferiore foliorum glabra pilis in costa minutis exceptis (nec pilis conspicuis ad 1mm longis in costa et venis lateralibus et in pagina dispersis), foliis acuminatis (nec apice obtusis vel acutis), inflorescentibus 2–4 floris (nec 1-floris), stylo in dimidio superiore tantum puberulo (nec pilis ad 1.5mm longis per longitudinem totam) distinguenda.
Type: Sabah, Sunsuran, km 54 Jalan [road] Tambunan/Penampang, 1300m, 24 iii 1989, *Asik* SAN 127892 (holo. K).

Herb; stem c.100–250mm long, 4–7mm in diam. near base, unbranched, young parts thickly clad in minute, strongly appressed, dark brown hairs, leafy at apex, lower part somewhat knotted by bases of fallen leaves. *Leaves* opposite, isophyllous, the largest 150–170 × 35–40mm, narrowly obovate-elliptic to elliptic, apex gradually acuminate, base gradually cuneate, margins entire to obscurely serrulate, lateral veins sharply ascending (penni-parallel), ending at margins, tertiary veins almost invisible, coarsely reticulate becoming scalariform towards margins; upper surface glabrous, finely pitted, lower surface glabrous except for minute, strongly appressed, brown hairs on midrib; petiole 20–30mm long, hairy as midrib. *Inflorescence* almost sessile in leaf axils on upper part of stem; flowers 2–4 in a highly congested cyme enfolded by two bracts. *Bracts* c.12–17 × 5.5–8mm, broadly elliptic, fused about halfway on abaxial side, free on adaxial side, which is closely pressed against stem, margins undulate, with minute, strongly appressed hairs outside, glabrous inside; bracteoles 1 or 2, to 7 × 3mm. *Pedicels* almost absent. *Calyx* 10–11mm long, ±tubular, leathery, at first completely enveloping the corolla bud, splitting as the corolla expands into 5 lobes c.3 × 1mm (separation not always complete), lobes beaked, with keel (raised median vein) running to base of calyx; whole calyx well clad outside in brown bristly hairs to 0.7mm. *Corolla* 'whitish', 'cream-yellow with 4 lavender dotted lines running down inside', 'yellowish', c.35mm long, tube cylindric below, rapidly becoming funnel-shaped upwards [no further information available because all mature flowers seen ruined by insoluble glue], corolla lobes rounded, subequal, in bud, outside with brown hairs c.3–4mm long, inside with minute glands around mouth and running short way down tube, particularly on posticous side (seen in bud). *Anthers* (in bud) 3 × 1.5mm, broadly elliptic in outline, cohering apically by a small apiculus, thecae confluent, glabrous, as are filaments. *Disc* c.2.5 × 1.8mm, cupular. *Ovary* c.5 × 1.5mm, glabrous. *Style* 11–12mm, puberulous in upper half. *Stigmatic lobes* (mature) c.1 × 1mm. *Fruit* c.13 × 5.5mm, pericarp slightly verrucose, tending to become flaky. *Seeds* c.0.3 × 0.2mm, testa light red-brown.

SABAH. Tambunan distr., Gunong Trusmadi, 25 viii 1988, *Sumbing & Asik* SAN 125585 (K). Penampang distr., Crocker Range, km 41 on Kota Kinabalu–Tambunan road, 5°51′N, 116°17′E, 1050m, 1 x 1983, *Beaman* 7077 (MSC); Kinabalu, Penibukan [c.6°4′N, 116°30′E], 4000–5000ft, 10 i 1933, *Clemens* s.n. (GH).

Cyrtandra asikii is currently known from one locality (Penibukan ridge) on the western side of Mt. Kinabalu and thence southwards along the Crocker Range, growing in forest between c.1050 and 1300m above sea level. Its ally, *C. adnata*, appears to be endemic to Mt. Kinabalu.

The leaves of the two species have strikingly similar penni-parallel venation (uncommon in *Cyrtandra*) but otherwise differ in several respects: apex acuminate in *C. asikii* (not rounded to acute), margins almost entire, flat (not distinctly to obscurely serrate, undulate), upper surface smooth, finely pitted (not with raised beaded 'strings' developing from small pustules seen in young leaves, these indicating osteosclereids in the hypodermis), lower surface glabrous except for minute inconspicuous strongly appressed hairs on the midrib (not conspicuous hairs on both midrib and lateral veins as well as scattered on blade).

In both species, the inflorescences arise on the upper, leafy part of the stem in the leaf axils and the two bracts are partially fused on the abaxial side, but free or very nearly so on the adaxial side. The bracts differ in their indumentum, which is nearly invisible in *C. asikii*, easily seen in *C. adnata*; the stems differ in the same way. The inflorescence of *C. asikii* is 2–4-flowered, while that of *C. adnata* is strictly 1-flowered.

Cyrtandra banyingii Hilliard & B.L.Burtt, **sp. nov.** a *C. basiflora* C.B.Clarke sens. strict. foliis minoribus cujusque paris bene productis (nec stipuliformis) venis lateralibus in foliis majoribus 8 (nec 7–11) inflorescentia uniflora (nec 7-flora) bracteis in altero latere per 3–6mm, in altero per 8mm conjunctis (nec bracteis liberis vel partim conjunctis tantum in uno latere), calyce 9mm (nec 6mm), antheris apiculo conspicuo praeditis glabris, thecis haud confluentibus (nec apiculo parvo, antheris bene barbatis saltem ad basin, thecis confluentibus) differt.
Type: Sarawak, Hose Mts., base of Bukit Kajang, 1300m, 23 iii 1964, *Banying ak Nyudong* S16537 (holo. E, iso. L).

Herb; stem stiffly erect, c.600mm long, c.4mm in diam. at base, probably slightly decumbent and rooting there, with densely appressed-pubescent hairs c.1mm long, light rufous, upper half leafy, lower half nude except for a few very small vestigial leaves. *Leaves* opposite, anisophyllous, minor leaf c.30–80 × 5–25mm, largest major leaves c.110–150 × 40–65mm, elliptic to ovate-elliptic, apex long-acuminate, base cuneate, margins shallowly serrate (each tooth a hydathode), lateral veins 8, looping upwards and ending in margins, tertiary veins coarsely reticulate, above smooth and glabrous, below densely appressed-pubescent in extreme youth, at maturity hairs thinly scattered over blade, denser on veins, to c.1mm long on midrib, shorter elsewhere, golden; petiole c.25–28mm long, shorter on minor leaf, densely appressed-pubescent as on midrib. *Inflorescences* 1 or 2 from a node on lower nude part of stem, flowers solitary within each pair of bracts. *Peduncle* c.7mm long. *Bracts* 2, c.19 × 10mm, elliptic, united for c.3–6mm on adaxial side, for c.8mm on abaxial side, with scattered appressed hairs to c.0.4mm inside and out, denser over veins;

bracteoles absent. *Pedicel* c.1mm long, very stout. *Calyx* c.9mm long, ±tubular, initially completely enveloping corolla bud, splitting into 5 lobes c.3.5 × 2mm as corolla expands, strongly ridged from beaked apex of each lobe to base of tube, with a few minute appressed hairs on ridges, elsewhere minutely gland-dotted. *Corolla* white, yellow inside tube, 47mm long, tube 30mm, lower half narrowly cylindric then abruptly expanded into the funnel-shaped upper half, anticous lobe c.13 × 10mm, posticous lobes c.10 × 7mm, all lobes broadly elliptic; outside of corolla well clad in fine hairs to c.1.5mm, inside with a patch of minute glandular hairs below the posticous sinus, otherwise glabrous. *Stamens* inserted 15mm above base of tube, filaments c.11mm long, glabrous; anthers 4.5 × 2mm, glabrous, cohering apically by very conspicuous apiculi, base of thecae minutely tailed, thecae not confluent; lateral staminodes 4mm, posticous staminode 2mm. *Disc* 2 × 1.5mm, cupular. *Ovary* 10 × 1mm, glabrous. *Style* 13mm, pubescent, hairs very delicate, to 1mm long. *Stigmatic lobes* 1.2 × 1.2mm. *Fruit* not seen.

To have the companionship of Banying on a collecting trip in Sarawak was always a great pleasure. He is a short man but immensely strong, imbued with a deep forest sensitivity and common sense. It is with much gratitude that this species is dedicated to him (B.L.B.).

His is the only collection of *C. banyingii* that we have seen, made on 'a dacite hillside. Mixed Dipterocarp forest, 1300m alt.'. It is clearly allied to *C. basiflora*, both being similar in habit and bearing inflorescences on bare stems well below the leaves, the flowers closely embraced by a pair of bracts. The calyces too are similar in form, but smaller, c.9mm long in *C. banyingii*, c.16mm in *C. basiflora*. The leaves too are similar in shape, but in *C. banyingii* there are 8 lateral veins each side of the midrib, not 7–11, and the minor leaf of each pair is a miniature of the major leaf, not reduced to a stipule-like outgrowth as in *C. basiflora*. In *C. banyingii*, the inflorescence is 1-flowered (not c.7-flowered), the bracts are partly united on both margins (not free or partly united on one side only), and the anthers are glabrous, with a conspicuous apiculus (not well bearded at least at the base, and apiculus inconspicuous).

In both *C. banyingii* and *C. basiflora* there are no sclereids in the hypodermis of the leaf, so the upper surface is smooth; in *C. banyingii*, the mesophyll also lacks sclereids, and the lower surface is smooth; in *C. basiflora* there are astrosclereids in the mesophyll and the lower surface is granulate (M.H. Bokhari).

Cyrtandra integerrima B.L.Burtt in Coode et al., eds, A checklist of the flowering plants and gymnosperms of Brunei Darussalam: 436 (1996).
Type: Brunei, Temburong, Batu Apoi Forest Reserve, ridge top west of Kuala Belalong F.S. Centre, near Danish plot 1, mixed Dipterocarp forest, 250m, 20 v 1991, *Poulsen* 76 (holo. AAU, iso. K).

Herb; stem simple, to 350mm tall, c.3–6mm in diam. midway, base decumbent, rooting, young parts thickly clad in delicate brown hairs to c.1.5mm, leafy in upper part.

Leaves opposite, isophyllous, the largest 130–190 × 15–30mm, narrowly elliptic, apex gradually acute, base gradually cuneate, very narrowly decurrent down petiole, margins entire to distantly and obscurely serrulate, lateral veins 5–7 each side of midrib, tertiary veins invisible, upper surface glabrous, strongly wrinkled longitudinally (at least when dry), lower surface glabrous between veins at maturity, pustulate, veins densely brown-hairy; petiole c.7–30mm long, hairy as midrib. *Inflorescence* a strongly condensed, several-flowered cyme, solitary in each leaf axil. *Peduncle* c.1mm long, very stout. *Bracts* c.10–12 × 2mm, puberulous, hairs brown; bracteoles c.6–7 × 1–2mm, one pair subtending each pedicel, hairy as bracts. *Pedicels* 4–12mm long, brown-hairy. *Calyx* 9–12mm long, lobes 6–7 × 1–1.5mm, very narrowly deltoid, outside and margins with brown hairs to 1mm, inside glabrous. *Corolla* 'dark pink', 'white with red throat', 'white with pink-brown hairs outside, labellum with central yellow patch and two purple markings further in', 14mm long, tube 10mm, cylindric in lower half, expanded above, anticous lip 4 × 8.5mm, anticous lobe 3 × 4mm, suborbicular, posticous lip 3 × 7.5mm, notched, outside with delicate hairs to 1.5mm, inside glabrous. *Stamens* inserted 5.5mm above base of tube, filaments c.5mm long, strongly coiled, glabrous; anthers 2 × 1.5mm; lateral staminodes 1mm, posticous staminode 0.3mm. *Disc* 1 × 2mm, cupular. *Ovary* c.2.5 × 1.5mm, glabrous. *Style* c.8mm, upper half puberulous. *Stigmatic lobes* 1 × 0.8mm. *Fruit* 10–11 × 5mm, pericarp verrucose. *Seeds* c.0.25 × 0.2mm, testa almost black.

BRUNEI. Temburong [distr.] subdiv. Amo, upper Belalong river west of Bukit Belalong, 4°30′N, 115°08′E, 24 iii 1991, *Sands* 5584 (E, K, L). SARAWAK. [Mulu National Park], S. Melinau gorge, path east of camp, c.4°5′N, 114°50′E, 22 vi 1962, *Burtt & Woods* B2216 (E).

The opportunity is now taken to describe this plant, the name having been published as a diagnosis only. Sands' specimen came from the same area as the type specimen on Setap Shales, but Burtt & Woods' from further east, in northern Sarawak, a not unusual distribution pattern. All these collectors recorded leaves dark green above; the two Brunei collectors also recorded white patches between the veins. The lower surface was recorded by all three collectors as either pale or pink below.

There are no sclereids in the hypodermis of the leaf, but long-rayed astrosclereids are present in the spongy mesophyll (M.H. Bokhari).

Cyrtandra keithii Hilliard & B.L.Burtt, **sp. nov.** a *C. angulari* Elmer bracteis glabris (nec appresse pilosis), calyce c.10–12mm longo, glabro (nec c.5–7mm externe pilis sparsis praedito), lobis in dimidio superiore (nec prope basin) latissimis distinguenda.
Type: British North Borneo [Sabah] Pengkalan [4°33′N, 117°23′E], Tiaggau river, 340ft, 8 vi 1938, *Keith* BNB Forestry Dept. no. 9088 (holo. E).
Syn.: *C. angularis* auct. non Elmer; Burtt, Notes Roy. Bot. Gard. Edinburgh 30: 26 (1970), p.p.

Epiphytic shrub to 2m; flowering stems c.4–8mm in diam., extreme tips thickly clad in fulvous appressed hairs less than 1mm long, quickly shed and replaced by pale

shining bark. *Leaves* opposite, anisophyllous; minor leaf c.35–60 × 18–30mm, ovate, otherwise as major leaf, soon deciduous; largest major leaves c.175–215 × 32–65mm, elliptic to oblong-elliptic, apex abruptly acute to shortly acuminate, base cuneate, often oblique, margins ± entire, lateral veins 7–10, curving upwards and eventually merging into margins, tertiary veins almost invisible, reticulate; in extreme youth leaves densely appressed-hairy, hairs fulvous, silky, rapidly shed, in mature leaves upper surface smooth, glabrous, midrib 'knotted', lower surface glabrous except for a few hairs sometimes persisting on the midrib; petiole c.11–20mm long, some hairs often persisting. *Inflorescence* solitary in leaf axils, flowers 3–9, tightly clustered. *Peduncle* 6–20mm long. *Bracts* paired, 25–30 × 12–20mm, leathery, glabrous; bracteoles absent. *Pedicels* c.3mm long. *Calyx* tripartite almost to base, but essentially 5-lobed, 3 posticous lobes fused into one broadly rounded segment 10–12 × 5–11mm with 3 small teeth at apex; 2 anticous lobes 8–12 × 4–6mm, broadest in upper half, rounded or shallowly notched, glabrous. *Corolla* white, orange in throat, thick-textured, fleshy when fresh, c.32–37mm long, tube 22–27mm, cylindric in lower half, expanded above, anticous lip 10–22 × 22–26mm, anticous lobe 7–8 × 8–9mm, posticous lobes 9 × 8–11mm, all lobes suborbicular, corolla glabrous outside, inside with large patch of glandular hairs c.0.2mm long on roof of tube from posticous sinus down to insertion of staminodes. *Stamens* inserted 10–12mm above base of tube, filaments 11–13mm long, glandular-puberulous; anthers 3.2–3.4 × 2mm, cohering face to face by very small apiculi, connective clad in glandular hairs c.0.5mm long, each tipped with an orange glandular head, a few shorter hairs on upper part of filament; lateral staminodes 2–3mm, posticous staminode c.1mm. *Disc* 2 × 2.2mm, cupular, sometimes deeply notched on one side. *Ovary* c.11 × 1.5mm, glabrous. *Style* c.10mm, puberulous. *Stigma* c.1 × 1.8mm, very obscurely bilobed. *Fruit* 35–50 × 4–5mm, pericarp thin, soft, almost smooth. *Seeds* c.0.8 × 0.3mm, testa blackish, longitudinally striate.

SABAH. Sepilok Forest Reserve [c.5°48′N, 117°57′E], Compartment 13, 1 vii 1957, *Sinclair* 9351 (E). Sandakan distr., Sungai Dagat, 5 viii 1959, *Nicholson* SAN 19111 (K). Kuamut River, Kuala Kasuyun [c.5°13′N, 117°29′E], 18 vi 1938, *Keith* 9048 (K); Kuamut Highland [c.5°13′N, 117°30′E], South Meliau Basin, 700m, near Stepladder Falls, 19 iv 1988, *Campbell* 21/4/18 (E). Lamag [5°29′N, 117°49′E] distr., Tanegang Kechil, 8 vi 1965, *Banang* SAN 51914 (L). Lahad Datu distr., Palum Tambun river, Danum Valley Field Centre, 10 x 1990, *Campbell* EG171 (E); km 46 jln. Danum, 12 iii 1988, *George et al.* SAN 123709 (K); Danum valley and environs, 18 vi 1989, *Ridsdale* 2106 (L); Ulu Sungai Segamat, 500m, 16 i 1976, *Stevens et al.* 503 (A, L).

The epithet *keithii* commemorates Harry Keith, one-time Conservator of Forests and Director of Agriculture in British North Borneo, now Sabah. His photograph hangs in the herbarium of the Forest Research Institute, Sepilok.

Cyrtandra keithii bears a striking resemblance to *C. angularis* from the Philippines, with which one of us (B.L.B.) confused it many years ago. In both species the calyx is tripartite, c.10–12mm long, glabrous in *C. keithii* (c.5–7mm, hairy outside in *C. angularis*), the segments broadest at the apex (not at the base). Also, the bracts

are glabrous in *C. keithii*, hairy on both surfaces in *C. angularis*. There are also small floral differences.

Cyrtandra keithii is of particular interest because it shows characteristics of two different groups of species, *C. oblongifolia* (Blume) C.B.Clarke and its allies on the one hand, and *C. trisepala* C.B.Clarke and allies on the other. It lacks bracteoles as in the *C. oblongifolia* group (bracteoles present in the *C. trisepala* group), has a calyx strikingly like that of the *C. trisepala* group (eventually 5-lobed almost to the base in the *C. oblongifolia* group), and fruit long and narrow, pericarp soft and almost smooth as in the *C. oblongifolia* group (not short and broad, pericarp soft but strongly verrucose in the *C. trisepala* group). The anatomy of the fruit wall is also different in these two groups.

Though the calyx of *C. keithii* is more similar to that of *C. trisepala* and its allies than that of *C. angularis*, it is with the latter that the affinity of *C. keithii* lies. Both are epiphytes with drooping leaves, an uncommon habit among Bornean cyrtandras; Keith recorded the type specimen as growing 'on *Diospyros* sp. 40ft. up'. Sinclair collected his specimens in 'transitional mangrove between dry primary forest and tidal zone', Banang in 'primary forest, seasonal swamp', Ridsdale in 'logged lowland rainforest', Stevens in 'rather damp forest near river'. Altitudinal records range from sea level to 700m, along the east side of Sabah from Sepilok in the north to Tawau district in the south.

Cyrtandra lineariloba Hilliard & B.L.Burtt, **sp. nov.** a *C. toreniiflora* B.L.Burtt foliis maximis c.25–40mm latis (nec 40–72mm), bracteis c.8 × 2mm fere ad apicem in latere abaxiali, conjunctis et flores juveniles forte amplectentibus (nec 7–15 × 2.5–3.5mm inter se liberis nec flores amplectentibus), calyce pilis minutis 2-cellularibus externe ubique praedito (nec calyce glabro pilis minutis ad apices loborum exceptis) distinguenda.
Type: Sabah, Mt. Kinabalu, Penibukan, 4000ft, 5 xi 1933, *Clemens* 50235 (holo. K; iso. A, BM, L).

Herb; stems stoloniferous, rooting, probably forming clumps, erect part at least 300mm tall, c.3mm in diam. at base, glabrous, drying black, leafy in upper part. *Leaves* opposite, very slightly anisophyllous, minor leaf c.5–40mm shorter than major leaf, petioles slightly shorter, otherwise similar, largest major leaves 100–175 × 25–40mm, elliptic, apex acuminate, base cuneate, margins entire to obscurely serrulate, lateral veins 6–7 each side of midrib, looping upwards and linking to vein above, tertiary veins immersed, both surfaces glabrous; petiole 15–33mm long, glabrous. *Inflorescence* a 2-flowered cyme embraced by bracts, solitary in leaf axils; peduncle 1–1.5mm long (in young inflorescences). *Bracts* 2, c.8–2mm, elliptic, shortly beaked, united for 5mm on abaxial side, free on adaxial side, with a few minute hairs outside. *Pedicel* to c.5mm long, stout. *Calyx* (in bud) c.16mm long, tube 5mm, lobes 8–11 × 1–1.2mm, almost linear; whole calyx minutely gland dotted inside and out, these hairs composed of 2 cells in one plane (calyx dries black

and very brittle). *Corolla* (seen only in tight bud) 4mm long, completely enveloped by calyx, outside with stout 2-celled hairs less than 1mm long, inside glabrous. *Anthers* 2 × 0.6mm, almost triangular in outline, thecae not confluent, cohering face to face by prominent bulbous apiculi; staminodes well developed. *Disc* cupular. *Ovary*, *style* and *stigma* 3mm long at this stage, but well differentiated, ovary glabrous in lower half, distinctly hairy in upper, style hairy, stigmatic lobes well developed. *Fruit* not seen.

Cyrtandra lineariloba is known only from the Penibukan ridge on the western side of Mt. Kinabalu, where Rev. and Mrs Clemens collected 'over an extensive area of extremely difficult terrain' (Beaman *et al*. 2001, p. 24). The herbarium label bears no information other than 'W jungle; inflorescence green'.

We have not hesitated to describe this new species. It is clearly allied to *C. toreniiflora* from the eastern lowlands of Sabah and nearby Kalimantan. In both species the vegetative parts are glabrous and the stems dry black with longitudinal striae. The leaves of *C. lineariloba* are narrower and mostly shorter than those of *C. toreniiflora*, but in other respects they are similar. The most striking concordances between the species are three in number: the form of the calyx with its exceptionally long and narrow lobes (whence the epithet *lineariloba*); the presence of minute, stout, 2–3-celled obtuse hairs on the backs of the corolla lobes; and the triangular anthers with non-confluent thecae and particularly prominent apiculi. They differ in the inflorescence and bracts. In *C. lineariloba*, the bracts are united for most of their length on the abaxial side, free on the adaxial side, and tightly embrace the highly reduced 2-flowered cyme on its very short peduncle; in *C. toreniiflora* the bracts are free and fall quickly so that the flowers appear to spring almost directly from the leaf axil. The calyx of *C. lineariloba* dries black and, under a dissecting microscope, numerous minute pale glandular hairs are easily seen on its outer surface. These hairs appear to be 2-celled; under a compound microscope they are seen to be 3-celled and T-shaped, with a small stalk cell and two apical cells in the same plane. This type of hair is commonplace in *Scrophulariaceae* and may well be so in *Gesneriaceae* though we have rarely observed them in *Cyrtandra*; they occur, for example, in *C. apaensis* B.L.Burtt. In contrast, the calyx of *C. toreniiflora* is glabrous except for minute acute hairs at the tips of the lobes.

Cyrtandra mendumae Hilliard & B.L.Burtt, **sp. nov.** ab *C. neiothiantha* B.L.Burtt foliis latioribus (maximis 55–95mm latis, nec 30–50mm), inflorescentiis solitariis multifloris (nec trifloris, 2–3 e brachyblasto orientibus), calyce 20mm longo (nec 10mm) distinguenda.
Type: Sabah, Apin-Apin [5°28′N, 116°16′E], 350m, 15 vii 2000, *Mendum et al.* MM46 (holo. E, iso. SAN, n.v.).

Rhizomatous herb forming tight clumps of simple stems to c.2m tall, 7–10mm in diam. at base; stems 4-angled, brittle, finely appressed-pubescent at tips, soon

glabrous, bark yellowish-green to grey, stem leafy only at apex. *Leaves* opposite, isophyllous, up to c.6 pairs, internodes c.20–30mm long, largest blades 115–230 × 55–95mm, ovate, broadly elliptic or oblong, apex acute to shortly acuminate, base cuneate, margins somewhat obscurely serrulate (each tooth a hydathode), lateral veins 6–7 on each side of midrib, tertiary veins not clearly visible, upper surface almost villous in extreme youth with silky hairs c.1mm long, glabrous or very nearly so at maturity, smooth, lower surface appressed-pubescent, hairs very fine, c.0.25mm long in youth, glabrous or nearly so at maturity, smooth; petiole 35–55mm long, ± glabrous, bases of each pair united across the stem. *Inflorescence* a many-flowered, congested dichasial cyme solitary at nodes near ground level. *Peduncle* 5–15mm long, glabrous. *Bracts* c.30 × 20mm, broadly ovate, margins of opposing pair united in lower part to form a cupule, glabrous; bracteoles absent. *Pedicels* 4–8mm long. *Calyx* c.20mm long, initially enveloping corolla, later splitting into 5 deltoid, beaked, glabrous lobes c.4 × 2.5–3mm. *Corolla* 'white with maroon spots on lower 3 lobes', c.45mm long (only 2 flowers seen), tube 34mm, narrowly cylindric in lower half, funnel-shaped in upper, anticous lip c.11 × 22mm, anticous lobe 8 × 8mm, posticous lobes 7 × 7mm, all lobes rounded, outside with delicate silky hairs to 4mm long, inside glabrous. *Stamens* inserted 20mm above base, filaments 12mm long, slightly swollen near middle, glabrous; anthers 2.8 × 1.5mm, cohering face to face by minute apiculi; lateral staminodes 3mm, posticous staminode 1.5mm. *Disc* 3 × 2.4mm, cupular. *Ovary* 12 × 1.5mm, glabrous. *Style* 20mm, glabrous. *Stigmatic lobes* 1.5 × 2mm. *Fruit* (not fully ripe) 18 × 5mm, pericarp verrucose. *Seeds* not fully ripe.

SABAH. Mt. Kinabalu, eastern shoulder, 6°05′N, 116°36–40′E, 3000ft, 21 vi 1961, *Chew et al.* 658 (E, K). Kinabalu National Park, along Sungai Mamut, near Poring, 600–850m, 3 ii 1969, *Kokawa & Hotta* 4882 (L).

This species has been known to science for more than 70 years, but Mary Mendum was, so far as we know, the first to collect flowers. It is with both sadness and pleasure that we commemorate her, friend and colleague, in the epithet now given.

The closest ally of *C. mendumae* yet known is *C. neiothiantha* (below) from Brunei. They are alike in habit but differ in their leaves. In *C. mendumae* they are 55–95mm broad and initially hairy, with petioles 35–55mm long, in *C. neiothiantha* 35–50mm broad and glabrous, with petioles 12–18mm long. In *C. mendumae*, the inflorescence is many-flowered and solitary at the nodes whereas in *C. neiothiantha* it is 3-flowered with 2–3 arising from a brachyblast (short shoot) at the nodes. There are floral differences too, for which see descriptions.

Cyrtandra mendumae grows near streams in forest; 'very attractive to small black flies' (*Mendum et al.* MM46).

Cyrtandra neiothiantha B.L.Burtt in Coode et al., eds, A checklist of the flowering plants and gymnosperms of Brunei Darussalam: 436 (1996).
Type: Brunei, Temburong, east ridge above Kuala Belalong F.S. Centre, 4°30′N, 15°10′E, 7 iii 1991, *Argent & Mitchell* 91204 (holo. E).

Herb; stem simple, possibly stoloniferous ('clump-forming herb' of collectors), rooting, to 1m tall, 6mm in diam. at base, glabrous, finely longitudinally striate, leafy only on upper part. *Leaves* opposite, isophyllous, c.5 pairs at apex of stem, not crowded, c.150–190 × 35–50mm, elliptic, apex acuminate, base cuneate, shortly decurrent, margins entire, lateral veins 6 each side of midrib, tertiary veins invisible, upper surface glabrous, smooth, lower surface glabrous, granulate; petiole 12–18mm long, glabrous, bases of each pair united across the stem. *Inflorescences*: 3-flowered highly congested cymes, 2 or 3 arising from a very short brachyblast at nodes on lower, leafless part of stem and among adventitious roots, each cyme enclosed by a cupule. *Peduncle* 13–20mm long, glabrous. *Bracts* 16–20 × 14–16mm, broadly ovate, margins fused ± halfway to form a cupule, glabrous; bracteoles absent. *Pedicels* c.1mm long, very stout. *Calyx* c.10mm long, initially enveloping corolla bud, later splitting into 5 deltoid, beaked lobes c.3 × 1.8mm, outside with few dark appressed hairs c.0.4mm long, inside glabrous. *Corolla* 'pale yellow with two red guides deep in throat', c.35mm long, tube 27mm, narrowly cylindric in lower half, funnel-shaped above, anticous lip c.8 × 8mm, anticous lobe c.4.5 × 4.5mm, posticous lobes c.4 × 4mm, all lobes rounded, outside with delicate silky hairs to c.4mm long, inside minutely glandular all round mouth. *Stamens* inserted 21mm above base, filaments c.10mm long, swollen about the middle, glabrous; anthers 2.5 × 2.5mm, cohering face to face by minute apiculi; lateral staminodes 5mm, posticous staminode 2mm. *Disc* 3 × 1.5mm, cupular. *Ovary* c.6 × 1mm, glabrous. *Style* c.12mm, glabrous except for minute hairs near apex. *Stigmatic lobes* 1 × 1.5mm (in large bud). *Fruit* 15 × 5mm, pericarp verrucose. *Seeds* c.0.3 × 0.2mm, testa red-brown.

BRUNEI. Belait, Labi, Wong Kadir, *Coode* 7193; Temburong, Labu, *Forman* 883.

The name *C. neiothiantha* (Greek: flowering at base) was published only with a Latin diagnosis against *C. basiflora* C.B.Clarke, and the opportunity is now taken to describe it in full.

The leaves have a 1-layered hypodermis without sclereids, but short thick-armed astrosclereids occur in the spongy mesophyll (M.H. Bokhari).

Cyrtandra palimasanica Hilliard & B.L.Burtt, **sp. nov.** ab *C. digitaliflora* B.L.Burtt calyce tubulari in lobis acutos 5 plus minusve ad medium diviso (nec plus minusve campanulato dentibus 5 minutis et anthesi irregulariter fisso), corolla externe pilis 0.2mm longis (nec c.0.5mm) differt.
Type: Kalimantan, West Kutai, Mt. Palimasan near Tabang [0°34′N, 116°02′E] on Belajan river, 100m, 7 ix 1956, *Kostermans* 12750 (holo. L).

Herb; stem erect, woody, c.13mm in diam. at base of 170mm long piece on type specimen, glabrous. *Leaves* c.8 crowded at apex of stem, opposite, isophyllous, largest leaf present 290 × 97mm, elliptic, apex shortly acuminate, base cuneate, margins very obscurely denticulate (dark hydathodes), lateral veins 7–8 each side of midrib, these and midrib 'knotted' (sclereids?), tertiary veins pinnate but obscure, both surfaces glabrous, granulate (presumably from presence of astrosclereids in

mesophyll); petioles c.100–110mm long, glabrous, stout. *Inflorescence*: several flowers fascicled in leaf axils, springing from a very short stout brachyblast. *Bracts* apparently absent, though highly reduced leaves (largest 9×3.5mm) on brachyblast. *Pedicels* c.10mm long, glabrous. *Calyx* 14mm long, $\pm$ tubular, tube c.7mm long, 2 anticous lobes 7×3mm, 2 posticous lobes 7×2mm, median lobe c.5×2mm, all narrowly triangular, acute, glabrous, with 3 thick dark keels running down tube from sinuses. *Corolla* 'white', 40mm long, tube 31mm, funnel-shaped, anticous lip c.9×24mm, anticous lobe c.8×10mm, posticous lobes c.8×9mm, all lobes suborbicular, upper part of corolla with bulbous hairs outside (see discussion below), inside glabrous except for patch of minute glandular hairs below posticous sinus. *Stamens* inserted 16mm above base of tube, filaments c.14mm long, strongly twisted once, glabrous; anthers 3.2×2mm, $\pm$ triangular in outline, cohering apically by conspicuous apiculi, thecae scarcely confluent; lateral staminodes 4mm, posticous staminode 1mm. *Disc* 2×2mm, cupular. *Ovary* 8×1.5mm, crowned with a prominent coma. *Style* 16mm, with stout multiseriate hairs c.1mm long, these extending onto the backs of the stigmatic lobes. *Stigmatic lobes* 2×1.5mm. *Fruit* c.25×5mm, upper half retaining the now scattered hairs of the coma, pericarp foveolate. *Seeds* c.0.4×0.2mm, testa dark red-brown.

Cyrtandra palimasanica, like many species from Kalimantan, is known only from the type collection made 'on moist rock, acid sandy soil', presumably in rain forest.

This species is one of four allies currently known to us that have peculiar bulbous hairs on the outside of the corolla, each type mostly specific to one species, namely *C. digitaliflora* (Sarawak, Brunei), *C. toreniiflora* (Kalimantan, Sabah), and now *C. palimasanica* (Kalimantan) and *C. tubibractea* (Sabah), newly described here. These species also share the character of a foveolate pericarp. *Cyrtandra quinquenotata* Kraenzl. (Kalimantan) also has very distinctive bulbous hairs but having distinctive sclereids in the hypodermis its affinity is not so close and it is allied, inter alia, to *C. gibbsiae* S.Moore (Sabah, Kalimantan).

Cyrtandra palimasanica is diagnosed against *C. digitaliflora*, to which it bears a striking superficial resemblance in habit, stem and leaves, though they differ markedly in the calyx. In *C. palimasanica* it is more or less tubular and divided about halfway into narrowly triangular acute lobes; in *C. digitaliflora* it is more or less campanulate in shape, but is 2-lipped, the posticous lip minutely 3-toothed, the anticous lip with two similar minute teeth (actually the thickened tips of the main veins, possibly hydathodes). At anthesis, the expanding corolla splits the calyx irregularly.

The hairs on the outside of the corolla in *C. palimasanica* are at most 0.2mm long and 3-celled, composed of a relatively large globular basal cell c.0.1mm in diameter, surmounted by another about half that size and an apical cell about a quarter the size of the basal cell, easily seen under a dissecting microscope. In the specimen seen by us, often only the basal cell, or two cells, are present. Of infrequent occurrence among these 'balloon' cells are minute 3-celled, star-shaped glands. In *C. digitaliflora* similar, but 4-celled, glands occur on the lower, cylindric part of the

tube, and the conspicuous hairs about 0.5mm long are composed of about six superimposed globular cells, the lowermost c.0.1mm in diameter, then progressively smaller upwards.

Cyrtandra parvifructa Hilliard, **sp. nov.** *C. subsphaerocarpae* B.L.Burtt affinis sed foliis valde anisophyllis (nec isophyllis) in pagina inferiore persistenter pilosis (nec glabris), inflorescentia sessili uniflora (nec breviter pedunculata pluriflora) distinguenda.
Type: Kalimantan Tengah [=central], Project Barito Ulu, c.114°06′E, 0°2′S, P.T. Pamanang Logging Concession, logging camp c.km 20, 22 vi 1990, *Ridsdale* PBU590 (holo. E; iso. K, L).

Branched herb; longest stem seen 270mm, 3mm in diam. at base, stems woody, ± decumbent, upper part appressed-pubescent, hairs silky, c.1mm long, ± glabrescent and then bark pale, glossy, longitudinally wrinkled, leafy above, nodes c.20mm apart. *Leaves* opposite, strongly anisophyllous, largest major leaves 85–100 × 22–28mm, elliptic, apex acute, base narrowly cuneate, margins entire, undulate, upper surface clad in fine appressed hairs c.1mm long, soon glabrous, similar hairs on lower surface, dense over midrib, more scattered on blade; petiole 5–14mm long, hairy as midrib; minor leaves 5–40 × 4–18mm, otherwise as major leaves. *Inflorescence* 1-flowered (essentially a 3-flowered cyme, only the apical flower developed, the other two rudimentary), solitary in axils of leaves, sessile. *Bracts* c.15 × 3.5mm, leaf-like, bracteoles similar but smaller. *Pedicels* absent. *Calyx* c.6.5mm long, 5-lobed to c.halfway, posticous lobes c.2.8 × 1.2mm, anticous lobes c.3 × 1.5mm, all narrowly triangular, tip drawn out into a short beak (calyx almost certainly embracing corolla in bud), densely appressed hairy outside, hairs silky. *Corolla* not seen. *Fruit* c.9 × 5mm, subspherical, pericarp pale, very strongly verrucose. *Seeds* c.0.2 × 0.15mm, testa almost black.

Cyrtandra parvifructa (Latin = small fruit) is known only from the type collection, which is in fruit only, but the plant is so distinctive that it warrants a name. Its general affinity appears to lie with *C. subsphaerocarpa*, their fruits being remarkably similar in size, shape, colour, and very warty pericarp. The leaves of the two species are similar in shape and in the immersion of the lateral veins, but those of *C. parvifructa* are anisophyllous and remain hairy on the lower surface, while those of *C. subsphaerocarpa* are isophyllous or nearly so, and glabrous from inception. In *C. parvifructa* the inflorescence is 1-flowered (not several-flowered), the calyx is lobed to about midway (not shortly toothed) and is not sulcate (strongly so in *C. subsphaerocarpa*).

Cyrtandra subsphaerocarpa, which appeared to be without affinity when it was described, is known only from the upper reaches of Sungai Baleh on the Sarawak–Kalimantan border, at c.1°35′N, 114°33′E, while *C. parvifructa* was collected further south in Kalimantan on the upper reaches of Sungai Barito at 0°2′S, 114°06′E. Regrettably, the collector gave no information other than 'herb on streamside rocks, disturbed lightly logged primary forest'.

Prof. M.H. Bokhari examined the leaves and found no sclereids in the 1-layered hypodermis and long-rayed astrosclereids in the spongy mesophyll, as in *C. subsphaerocarpa*. There are crystals in all the mesophyll cells; stomatal turrets are not present.

Cyrtandra sublanea Hilliard & B.L.Burtt, **sp. nov.** a *C. basiflora* C.B.Clarke sens. strict. habitu laxo (nec caulibus rigide erectis), pilis in parte caulis juvenili et in petiolis fere laneis, pallidis (nec strictis neque rufescentibus), foliis maximis 74–110 × 25–32mm (nec 140–230 × 40–57mm), pilis in pagina inferiore pallidis (nec rufescentibus), inflorescentiis semper bifloris (nec c.7-floris), antheris glabris vel basi pilis paucis praeditis (nec dense barbatis) differt.
Type: Brunei, Temburong distr., Kuala Temburong Machang, ridge bounded by the Temburong river, elevation 260m, 18 viii 1990, *Wong* 1952 (holo. K).

Herb; stems c.350–750mm long, c.3mm in diam., stoloniferous, clump-forming, rooting vigorously, very sparingly branched, young parts almost woolly, old parts thinly felted, leafy towards apex, most of stem leafless. *Leaves* opposite, strongly anisophyllous, minor leaf stipule-like, occasionally both leaves of a pair fully developed, largest major leaves 74–110 × 25–32mm, elliptic, apex long-acuminate, base cuneate, margins entire, villous, lateral veins 6–9 looping upwards and terminating at margins, tertiary veins coarsely reticulate, upper surface smooth, glabrous, lower surface almost villous over whole surface and margins, hairs pale, very delicate, to c.1.5mm; petiole 5–20mm long, woolly. *Inflorescence* a 2-flowered cyme borne at the nodes on lower, leafless, part of stem (the stipule-like minor leaves may persist). *Peduncle* 4–6mm long. *Bracts* white or pale green, veins pink; c.21–23 × 7–8mm, elliptic, united for c.3mm at base on abaxial side, free on adaxial side, closely embracing the flowers, outside finely appressed-pubescent, inside also with delicate appressed hairs; bracteoles absent. *Calyx* white, 9–11mm long, ± tubular, at first completely enveloping corolla bud, splitting (as the corolla expands) into 5 lobes 2–4 × 1.5–3mm, strongly ridged from sinus to base or from shortly beaked tip of lobe to base of tube, deep furrows alternating with ridges, outside with closely appressed-pubescent hairs less than 0.5mm long. *Corolla* white, c.53mm long, tube 41mm, lower half narrowly cylindric, upper half funnel-shaped, anticous lip c.12 × 20mm, anticous lobe c.8 × 8mm, posticous lobes c.8 × 8mm, all lobes suborbicular, corolla clad in fine silky hairs c.3mm long outside, glabrous inside. *Stamens* inserted c.26mm above base of tube, filaments c.11mm long, glabrous; anthers 2.2 × 1.5mm, cohering apically by a very small apiculus, base of thecae minutely tailed, glabrous or with very few hairs; lateral staminodes 2mm, posticous staminode not seen. *Disc* 2 × 1.5mm, cupular. *Ovary* c.9 × 1mm, glabrous. *Style* c.27mm, upper 10mm puberulous, glabrous below. *Stigmatic lobes* c.1.5 × 1.5mm. *Fruit* not seen.

BRUNEI. Temburong distr., Amo, Temburong river, mouth of Sungai Tulan, 50m, 15 vii 1993, *S. Atkins* 476 (E). Temburong, subdiv. Amo, catchment of Sibut river headwaters west of Kuala Belalong, 21 iii 1991, *Sands* 5512 (E).

Cyrtandra sublanea (Latin *lana* = wool) is allied to *C. basiflora*, a complex species requiring further investigation. Here, *C. sublanea* is diagnosed against the type collection of *C. basiflora* from Pankalan Ampat, 1°11′N, 110°15′E, in Sarawak. It differs in its lax habit (stems not stiffly upright), hairs on young parts of stems and on the petioles almost woolly (whence the epithet) and pale in colour (not with straight rufous hairs), largest leaves 74–110 × 25–32mm (not 140–230 × 40–57mm), hairs on the undersurface of the leaves pale (not rufous), the inflorescence strictly 2-flowered (not about 7-flowered), the anthers either glabrous or with a few hairs at the base (not densely bearded).

This is a lowland plant, not having been recorded above 260m, which favours forested hill slopes. Sands recorded 'Setap shales. Hill Dipterocarp forest'.

Cyrtandra tubibractea Hilliard & B.L.Burtt, **sp. nov.** a *C. digitaliflora* B.L.Burtt cupula mox caduca, anguste ampulliformi primordia floralia includente (nec bracteis liberis cupulam haud formantibus) et calyce tubulari (nec urceolato) distincta.
Type: Sabah, road from Tambunan to Trus Madi beyond Batu Lapan, c.5°33′N, 116°31′E, in degraded primary forest at 1200–1300m, 23 x 1999, *Davies et al.* SJD 99283 (holo. A, iso. E).

Herb; stem c.150–600mm tall, base decumbent, 5–6mm in diam., rooting, stoloniferous, glabrous, longitudinally striate and black at least when dry, leafy mainly in upper half. *Leaves* opposite, ± isophyllous, largest 100–200 × 20–55mm, elliptic, apex acuminate, base usually cuneate, rarely rounded, margins entire to obscurely serrulate, lateral veins 6–9 each side of midrib, tertiary veins invisible or nearly so, both surfaces glabrous (see discussion), granulate below (sclereids?); petioles 20–60mm long, glabrous, black (at least when dry). *Inflorescence* initially with 2–several floral primordia enclosed within a slender acutely tapering cupule to c.25mm long, quickly splitting and falling as the flowers develop; when cupule shed, flowers appear fascicled in each leaf axil; peduncle 1–2mm long. *Bracts* 2, c.20–25 × 15mm at maturity, fused almost to apex into a bilabiate strongly tapering cupule, ± glabrous at maturity, initially clad in minute hairs to c.0.3mm long. *Pedicels* 8–12mm long at maturity, initially very minutely glandular. *Calyx* 17–22mm long, ± tubular, initially completely enveloping the corolla bud, at maturity 5-toothed, anticous teeth c.3–4 × 1.5mm, posticous teeth smaller, glabrous, except for very minute glands inside and out (see discussion). *Corolla* 'white', leathery, c.32mm long, tube c.25mm, funnel-shaped, curved, limb nearly regular, anticous lip c.7 × 26mm, anticous lobe 6 × 12mm, posticous lobes 5–6mm, all lobes suborbicular; outside, on backs of lobes and short way down tube, with stout hairs of up to 5 large, ± globose cells plus a very small, spike-like, apical cell, lower part of tube with very small 2-celled hairs outside, inside glabrous. *Stamens* inserted c.12mm above base of tube, filaments c.6mm long, glabrous; anthers 3 × 1.5mm, ± triangular in outline, cohering face to face by prominent apiculi, thecae not confluent, glabrous; lateral staminodes 3mm, posticous staminode 1mm. *Disc* 3 × 2.5mm, cupular. *Ovary* 5 × 1mm (young), crowned with a conspicuous coma. *Style* 8mm, densely and coarsely hairy, hair

extending onto backs of stigmatic lobes. *Stigmatic lobes* (young) 2 × 1.5mm. *Fruit* 30–40 × 4–5mm, hairs of the coma persisting on upper half, pericarp foveolate. *Seeds* not fully developed, testa bright red-brown.

SABAH. H.S. Trusmadi, 26 ii 1990, *Magaweil et al.* SAN 128828 (E, K). Gunong Trusmadi, 24 viii 1988, *Fidilis Krispinus* SAN 125583 (K). Pensiangan, logged areas Penontomon [SW of Keningau], 26 ix 1989, *Asik Mantor* SAN 127985 (E), ibid., SAN 128043 (K), Pensiangan Kayu F.R., 28 i 1994, *Fidilis Krispinus* SAN 136942 (K). Penampang, Crocker Range, km 41 on Kota Kinabalu–Tambunan road, 5°51′N, 116°17′E, 1050m, 9 iii 1984, *Beaman* 8817 (GH, K, L).

Cyrtandra tubibractea is easily distinguished from its closest allies, *C. digitaliflora*, *C. toreniiflora* and *C. palimasanica* (described above), by its extraordinary, slender, acutely tapering cupule to c.25mm long that completely encloses the floral primordia. It is quickly shed as the flowers develop. Should the cupules all have been shed, the form of the calyx is another good diagnostic character. In *C. digitaliflora*, it is more or less cupular, distinctly bilabiate, the two limbs scarcely toothed, then splitting irregularly as the corolla expands, very different from the distinctly 5-lobed or 5-toothed calyx seen in the other three species. In *C. toreniiflora* the calyx is c.35mm long, in *C. tubibractea* 17–22mm, in *C. palimasanica* c.14mm.

Cyrtandra tubibractea appears to be confined to the Crocker Range in western Sabah, in forest at c.1000–1300m above sea level, on steep banks or hillslopes. A specimen from Ranau district (Kampong Paus region, *Amin & Alidain* SAN 94672, K, L) needs special mention; although it is similar to typical *C. tubibractea* in most respects, it differs in having the very young leaves pubescent on both surfaces, the hairs later confined to the veins on the lower surface, and the calyx densely pubescent. We accept it as a variant of the typical plant.

Cyrtandra undata Hilliard & B.L.Burtt, **sp. nov.** ex affinitate generali *C. benaraticae* B.L.Burtt sed petiolis anguste alatis, marginibus undulatis (nec petiolis exalatis), bracteis inter se liberis (nec partim conjunctis cupulam formantibus), calyce bilabiato (nec distincte 5-lobo) statim distinguenda.
Type: Sarawak, Bau, 23 iv 1955, *Brooke* 9854 (holo. L).

Stem prostrate at base, 5–10mm in diam., rooting, then ascending for c.15–300mm (plant appears taller because of apical tuft of large erect leaves); young parts clad in strongly appressed brown hairs to c.1mm. *Leaves* opposite, isophyllous, largest 140–230 × 55–95mm, elliptic, apex acute to ± obtuse, base cuneate, decurrent into narrow undulate wings, margins serrulate, pubescent, lateral veins 8–10 each side of midrib, curving upwards and terminating at margin, tertiary veins scalariform, often invisible, upper surface ± glabrous at maturity, finely granulate, eventually coalescing into irregular strings, lower surface initially finely appressed-pubescent, later blade glabrous, veins remaining appressed-pubescent; petiole 75–135mm long, with narrow undulate wings, hairy as blade, base broad, clasping, linked to base of opposite leaf. *Inflorescence* a short very condensed cyme, flowers c.16–20, borne on lower part of stem, often on rooting part, solitary in axils of fallen leaves; peduncle

3–5mm long, very stout. *Bracts* 2, c.12–17 × 4mm, soon caducous, lanceolate, margins minutely toothed, both surfaces minutely appressed-pubescent, bracteoles similar but progressively smaller (especially narrower). *Pedicels* c.4–7mm long, appressed-pubescent. *Calyx* 7–8mm long, initially completely enveloping young corolla, splitting, as corolla expands, into 2 lips, posticous lip, of 3 fused lobes, c.4 × 5mm, anticous lip, of 2 fused lobes, c.2–3 × 4mm, each terminating in a hard beak, calyx sometimes splitting down one side only, outside minutely appressed-pubescent all over. *Corolla* 'white with red spots in throat', 'flowers white, lower lip pale yellow, deeper yellow at base where also red-spotted', 17–19mm long, tube 12.5–14mm, cylindric in lower half, funnel-shaped in upper, anticous lip c.5 × 10–12mm, anticous lobe c.4–5 × 3.5–5mm, posticous lobes c.3–4 × 2.5–4mm, outside sericeous, hairs c.3mm long, inside minutely glandular below posticous sinus. *Stamens* inserted 6–7mm above base of tube, filaments c.3.2mm long, twisted once, thickened in upper half; anthers c.2–2.5 × 0.5mm, almost triangular in outline, cohering face to face by a small ligature; lateral staminodes 2mm, posticous staminode 0.5mm. *Disc* 1.5 × 1.3mm, cylindric. *Ovary* c.2.6 × 1.2mm, glabrous. *Style* c.5mm, puberulous. *Stigmatic lobes* c.1 × 0.8mm. *Fruit* 8–13 × 4–5mm, pericarp initially verrucose, becoming flaky at maturity. *Seeds* c.0.4 × 0.2mm, bright red-brown.

SARAWAK. 1st Division. Bukit Rawan, Tebakang area, 600m, 4 iv 1983, *Awa & Paie* S45269 (E). Sungai Raya, 3 xi 1954, *Brooke* 9332 (L). Gunung Bewan, Padawan distr., 14 v 1975, *Burtt* 8139 (E). Gunung Sikijang, Jln. Padawan, 850m, 26 ix 1987, *Yii & Rantai* S61339 (E). Gunung Lanyang Limestone, Bau, 15 viii 1978, *Rena George* S38990 (E).

All collections of *C. undata* known to us have come from hills west and south-west of Kuching on limestone (always?), in forest. The species is in the general affinity of *C. benaratica*, known to us only from Gunung Mulu National Park in northern Sarawak. The two species are alike in habit, indumentum, leaf blade, and colour and markings of the corolla. The petioles in *C. undata* have narrow undulate wings (whence the epithet *undata*), but those of *C. benaratica* are wingless. They differ further in their bracts, which are free from each other in *C. undata*, but united to form a cupule in *C. benaratica*, and in the calyx: bilabiate in *C. undata* because the three posticous lobes are firmly united as are the two anticous lobes, but with five distinct lobes in *C. benaratica*.

Both species have in their leaves a 1-layered hypodermis with dendrosclereids sending branches down into the mesophyll, where long-armed astrosclereids also occur (M.H. Bokhari).

Cyrtandra warburgiana Lauterb., Bot. Jahrb. 44: 540 (1910); B.L.Burtt, Notes Roy. Bot. Gard. Edinburgh 30: 40 (1970), p.p.
Type: Kalimantan, zwischen Salina hu [c.1°47′S, 115°47′E] und Simpokak [not traced], 15 iv 1908, *Winkler* 2987 (lecto., chosen by B.L. Burtt 1970, WRSL).
Syn.: *C. campanulata* Merr., Univ. Calif. Publ. Bot. 15: 270 (1929) non Reineke (1898). Type: British North Borneo [Sabah], Tawao, x 1922–iii 1923, *Elmer* 20867 (K, L).

Herb to c.400mm tall; base of stem c.5–17mm in diam., decumbent and rooting, upper part of erect stem finely appressed-pubescent, hairs to c.1mm long, brown when dry, purplish (always?) when young, leafy in upper part. *Leaves* opposite, isophyllous, largest 150–255 × 60–135mm, elliptic or sometimes obovate, apex acute, base cuneate, margins serrulate (each tooth a hydathode), lateral veins 7–8 each side of midrib, tertiary veins invisible, or faintly visible and then pinnate, upper surface granulate, eventually joining to form short, knotty strings, glabrous at maturity (midrib with a few hairs in youth), lower surface almost pusticulate, with appressed brown bristles to c.1.5mm on veins and much shorter ones well scattered on blade (dense only in extreme youth); petiole 45–120mm long, hairy as midrib. *Inflorescence* borne low down on bare stem at lowermost nodes, often among the roots, a highly congested many-flowered cyme hidden within a cupule, axis of cyme elongating as fruits mature. *Peduncle* 10–20mm long, hairy. *Bracts* c.40–55 × 25–35mm when mature, fused almost to apex to form a cupule, free margins undulate, outside with appressed brown hairs c.0.8–1.3mm long, most plentiful on veins, glabrescent, inside with a few scattered bristles, both surfaces granulate. *Pedicels* c.2mm long, glabrous, receptacle bristly. *Calyx* 12–16mm long, initially completely enveloping corolla, later splitting into 5 deltoid, beaked lobes 2.5–5 × 2–3mm, glabrous or with well-scattered hairs to 1mm long outside. *Corolla* 'yellowish-green with red stripes', 'pinkish, lobes creamy', 'lobes deep cream flecked peach or purple-pink', 'pale pink to pale yellow at tip', 'pale yellow', c.40mm long, tube c.34mm, lower half narrowly cylindric, upper funnel-shaped; anticous lip c.7 × 15mm, anticous lobe c.6 × 5mm, posticous lobes c.6 × 5mm, all lobes rounded, outside with hairs to 1.5–2mm long, inside with small patch of glandular hairs below posticous sinus. *Stamens* inserted c.23mm above base of tube, filaments c.7mm long, thickened about the middle, twisted once, glabrous; anthers 2 × 1.5mm, cohering face to face by minute apiculi; lateral staminodes 1.2mm, posticous staminode 0.5mm. *Disc* 2 × 1.5mm, cylindric. *Ovary* 7–10 × 1–1.2mm, glabrous. *Style* c.27mm, puberulous near apex. *Stigmatic lobes* c.1–2 × 1–1.5mm. *Fruit* c.12–16 × 5–6mm, pericarp verrucose. *Seeds* c.0.2 × 0.15mm, testa light red-brown.

SABAH. Pitas [6°43′N, 117°04′E], H.S. Paitan [c.6°23′N, 117°22′E], 20 v 1987, *Amin & Pius* SAN 121356 (E). Ulu Dusun [c.5°50′N, 117°45′E], Belukar, Oil Palm Research Station, 21 iii 1977, *Stone & Lamb* 12889 (E). Sukau [5°32′N, 118°17′E] distr., Bod Tai, 14 ix 1996, *Kiew & Lim* RK 4139 (E). Kinabatangan distr., Tabin Wildlife Reserve, northern part near Tabin river, 5°19′N, 118°45′E, 40m, 16 x 2000, *Poulsen* 1657 (E); Tabin Wildlife Reserve, near Core Area, 5°13′N, 118°39′E, c.150m, 17 xi 2000, *Kjeldsen* 302 (E), Tabin Wildlife Reserve near Wildlife Department's headquarters, 5°11′N, 118°30′E, 12 iv 2000, *Kjeldsen* 303 (E). Lahad Datu distr., Malua[r] Forest Reserve [c.5°18′N, 117°37′E], 27 vii 1990, *Sundaling* SAN 129672 (L); Kennedy Bay [4°56′N, 118°33′E], 300ft, 15 xii 1959, *Meijer* 18994 SAN 20112 (SAN). B.S. Toelit [Sungai Tulit 4°16′N, 116°59′E], ix 1912, *Amdjah* 634 (L), ibid., ix 1912, *Amdjah* 630 (L). Gunong Pemblingan [4°N, 117°03′E], 1 viii 1912, *Amdjah* 336 (L).

KALIMANTAN. Kalimantan Selatan, 10km NE of Muara Uja [1°54′S, 115°36′E], Djaro Dam, 150m, 11 xi 1971, *Kuswata Kartawinata* 736 (A).

Lauterbach did not see fully developed flowers of his new species and the measurements he gives for calyx and corolla are misleading; we now provide more accurate data. Plants matching the type of the name *C. warburgiana* (cited above) occur through the lowlands of eastern Borneo from 6°45′N to 1°50′S, spanning both Sabah and Kalimantan below c.150m altitude. The hairs on the stem are appressed, the upper surface of the leaf is granulate, the granules eventually linking up into short 'knotted' strings easily seen with a hand lens at least in dried leaves; the lower surface has scattered appressed hairs on the blade, does not feel velvety to the touch, and there are no tubercles at the base of the cupule. In contrast, plants from western Borneo have patent hairs on the stem, upper leaf surface smooth and very finely pitted, lower surface with plentiful brown patent hairs, velvety to the touch, and tubercles c.1–1.5mm long (often best seen on hydrated material) at the base of the cupule and on the peduncle. It is these plants that were cited by Burtt (1970, reference above). Additional specimens examined are as follows:

SABAH. Mt. Kinabalu, Eastern shoulder, 6°05′N, 116°36–40′E, 3500ft, 18 vi 1961, *Chew et al.* 640 (E). Apin-Apin, 5°35′N, 115°37′E, 350m, 15 vii 2000, *Mendum et al.* MM45 (E). Batu Tinahas [not in gazetteer], 16 v 1997, *Kiew & Anthony* RK 4393 (E). SARAWAK. Maputi [2 days' walk up river from Lawas at 4°51′N, 115°24′E, taken from Miss Brooke's unpublished notes on her collecting localities], 28 vi 1955, *Brooke* 10166 (E). Long Ugong to Long Semadoh, c.4°10′N, 115°35′E, 18 x 1967, *Burtt & Martin* B5564 (E). KALIMANTAN. Meratus Mts., Gunong Besar, 2°40′S, 115°45′E, c.1500m, 20 x 1996, *Argent & Wilkie* s.n. (E).

These plants occur between 350 and 1500m above sea level, so far as one can judge from these records. The two entities otherwise look much alike: in both, there are whitish patches between the veins on young leaves, whitish involucre, and similar floral details. Their precise relationship needs further investigation, particularly in the field.

ACKNOWLEDGEMENTS

We are, as ever, grateful to the following herbaria for the loan of specimens: A, AAU, GH, K, L, MSC, SAN and WRSL, and to Prof. M.H. Bokhari (Multan, Pakistan) for information on leaf anatomy.

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Received 7 December 2004; accepted after minor revision 5 December 2005