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**Gesneriaceae of the Old World III. New species and varieties
from Borneo, chiefly from Mt Kinabalu**

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GESNERIACEAE OF THE OLD WORLD
III. New species and varieties from Borneo,
chiefly from Mt Kinabalu

B.L. BURTT

A new variety of *Agalmyla tuberculata* Hook. f. is described; it extends the range of the species from Mt Kinabalu, Sabah, to Mt Murud, N Sarawak. Five new species and four new varieties of *Cyrtandra* are described from Mt Kinabalu; there are also two new species of *Cyrtandra* from Sarawak.

The largest genus of Gesneriaceae on Mt Kinabalu is *Cyrtandra* but, although there are now many collections from the mountain, no one has ever paid particular attention to this genus. Thus there are specimens in herbaria whose distinctiveness is clear, but whose status is uncertain. Some of these are described here at varietal rank.

Where notes on foliar sclereids are given, I am indebted for the information to Professor M.H. Bokhari, Bahauddin Zakariyah University, Multan, Pakistan or to Dr Kit Tan.

Agalmyla tuberculata Hook. fil. var. *ovata* B.L. Burtt, var. nov. a var. *tuberculata* internodiis longioribus, foliis oppositis valde anisophyllis ovatis basi valde inaequilateralibus indumento saepe molliore indutis distinguenda.

Type: Sarawak, Fifth Div., route from Bakelalan to Gunung Murud, above Camp III, c.3°56'N 115°32'E, c.6000ft, creeping in moss forest, 27 ix 1967, *Burt & Martin* B.5249 (holo. E).

SARAWAK. Fourth Div., Gunung Murud, N side, c.3°55'N, 115°31'E, c.7000ft, in dwarf forest, 11 x 1967, *Burt & Martin* B.5459 (E).

SABAH. Mt Kinabalu, Eastern Shoulder, 6°05'N 116°36-40'E, Camp 3, 8000ft, in mossy forest, climber, corolla and filaments scarlet, underside of leaf whitish, 22 vi 1961, *RSNB* 1075 (E, K, L); *ibidem*, 9500 ft, *RSNB* 865 (E, K, L); Kinabalu N.P., 9500ft, *I. Sinclair* 242 (E); Kinabalu trail, between Power Station and first lookout point, 6300ft, *Collenette* 81/79 (E); above Power Station, *Aban Gibot* SAN 78689 (L); right bank of E tributary of Mesilau R., below cave, 1960m, *Collenette* 21581 (L). Crocker Range, Kimanis Road, 1989, *Lamb* s.n. (E).

This plant, which is placed here as a variety of *A. tuberculata*, usually grows at a lower altitude than the typical species. That grows between 9500 and 10,500ft (2896-3200m) if we disregard the altitude (8000ft) given by H. Low for the type specimen which he collected on the first ascent of Kinabalu in 1851. *A. tuberculata* var. *ovata* was collected between 6000 and 7000ft (1800-2100m) on Gunung Murud, whose summit is at c.8000ft (2300m) and between 6300ft and 9500ft (1950-2900m) on Mt Kinabalu. However Gunung Murud is not necessarily too low to carry var. *tuberculata*, for plants such as *Gentiana borneensis*, *Centrolepis*, *Patersonia* are found there at c.7000ft, whereas on Mt Kinabalu they occur above 10,000ft.

= *A. ovata*
(see *Agalmyla* Burtt 2002)

I have deliberately taken the Gunung Murud plant as the type of var. *ovata* as there it grows away from any chance of contamination by var. *tuberculata*. Some of the specimens from Mt Kinabalu show somewhat swollen hair-bases on the leaves and this may indicate that there is no sharp barrier between the varieties in this feature, though leaf-shape remains diagnostic. Although leaves in var. *tuberculata* are usually in whorls of three these are often reduced to two fully formed leaves and the linear rudiment of the third.

It was at first thought that var. *ovata* might be a hybrid between *A. tuberculata* and *A. bracteata* Stapf, which it approaches in leaf shape and indumentum. However, whatever its origin it now seems to be established as an independent entity and will perhaps be eventually raised to full specific rank.

Cyrtandra areolata (Stapf) B.L. Burt var. *grandis* B.L. Burt, var. nov. a var. *areolata* habitu robustiore, foliis multo majoribus (lamina c.25 x 16cm, apice breviter acuminato, basin versus ad 2cm abrupte angustata deinde attenuata, petiolo parte attenuata laminae inclusa 8cm longo), fructibus immaturis c.7cm longis recedit.

Type. Sabah, Mt Kinabalu, Eastern Shoulder, 4000 ft, below ridge (not seen elsewhere), stem 5-7 ft high, erect, unbranched, pallid whitish, corky, leaves large, paired, as if in a terminal rosette, fruit green, 29 viii 1961, RSNB 1541 (holo. E, iso. K).

This has the slender, 7-8mm long, calyx segments of true *Cyrtandra areolata*, but differs sharply in its robust unbranched habit (stem c.9mm diam.) and very large leaves with short internodes near the top of the stem. A specimen with similar unbranched habit and leaves clustered near the top was collected on Gunung Alab (*Nooteboom* 971, L), but its leaves (16 x 6cm) are typical of *C. areolata*. This variety may well be a distinct species, but with only one specimen known, and that without flowers, it seems advisable to retain it within *C. areolata* at present: that is undoubtedly its closest ally. As in var. *areolata*, the leaf has no hypodermis and there are no sclereids in the mesophyll.

Cyrtandra clarkei Stapf in Trans. Linn. Soc. ser. 2, Bot. 4: 213 (1894).

Type: Sabah, Mt Kinabalu, 10,500ft, *Haviland* 1131 (holo. K, iso. SAR).

Cyrtandra clarkei was described by Stapf from a single specimen; in this typical form it is recognized by its solitary stalked flower closely embraced by a pair of partially united bracts that cover the calyx, and by its bright red corolla; bracts and corolla have a dense silkywoolly indumentum, the hairs on the corolla being long and silky. At the time of its description it was very isolated in the genus. There is now a recently described ally, *C. kermesina* B.L. Burt (in *Edinb. J. Bot.* 47: 220, 1990), which differs in having several flowers in the inflorescence and bracts (not seen) that must fall before the flowers are open: this species is included in the key given below, but needs no further consideration here.

Several plants more closely allied to typical *Cyrtandra clarkei* are represented in herbaria. They can be sorted into four distinct entities (including the typical plant) and the differences are too great for them to be included within *C. clarkei* without recognition. It may well be that they will prove to be worthy of specific rank, but all the

specimens have been casual collections; no one has studied the group in the field, so there are no comparative notes. We do not know whether they grow close to one another or whether there is distinct ecological separation; details of habit and habitat are both scanty. Under these circumstances it has seemed best to give each of these entities varietal rank under *C. clarkei*: thus their existence is formally recognized but they are held together under one species and the position is set for critical studies in the field.

Despite the variation in leaf-size between var. *clarkei* and var. *brachycalyx* on the one side and the large-leaved var. *grandis* and var. *longipetiolata* on the other, all these plants have the same pattern of sclereids in the leaves: short broad osteosclereids in the 2-3-layered hypodermis and astrosclereids in the mesophyll. In *Clemens* 33757 (var. *longipetiolata*) it was recorded that the osteosclereids of the hypodermis produced short branches into the mesophyll. *C. kermesina* has the same pattern of sclereids as *C. clarkei*.

I have included in the key a specimen (*Clemens* 32371, L), that almost certainly represents a new species. It differs, according to the collectors' notes, in having a white corolla with purple throat. In other features it seems to be related to *C. clarkei* and its allies, the whole group being endemic to Mt Kinabalu.

var. *clarkei*

Leaves with petioles c.2.5cm long; lamina elliptic, 7-8 x 3-4cm densely sericeous on both surfaces; peduncle 1-2cm; bracts 16-25cm, densely hairy; calyx equalling bracts, lobes 4-5mm; corolla c.3.3cm long, densely sericeous outside.

Type: Sabah, Mt Kinabalu, 10,500ft, *Haviland* 1131 (holo. K, iso. SAR, SING).

SABAH. Mt Kinabalu, 1100ft, 27 viii 1913, *native coll.* 51 (E, SAR); 9000ft, 20 iii 1976, *R. Kiew* 197 (E); between Kamarangan and Paka-paka cave, 8500ft, 12 vi 1957, *Sinclair* 9104 (E); Gurulau spur, S Lobang, 8000ft, *Clemens* 50957 (BM, K); above Limu, 6500ft, 30 v 1932, *Clemens* 30054 (BO, K); near Paka cave, c.9000ft, vii 1964, *Meijer* SAN 46562 (K).

var. *brachycalyx* B.L. Burt, var. nov. a var. *clarkei* indumento tenuiore et calyce bracteis dimidio brevior differt.

Petiole 8-12cm long. Lamina 22-28 x 11-14cm. Peduncle 30-60mm. Bracts 25-34mm. Calyx 7-11mm.

Type. Mt Kinabalu, Mesilau cave, above landslip, 6500ft, on mossy rocks in shady moss forest, many-stemmed juicy herb c.18 inches, brilliant rosy pink flowers, no scent, ix 1979, *Collenette* 87/79 (holo. E).

SABAH. Mt Kinabalu, Mesilau river, 6°N 116°35'E, 2200 m, rather open submontane rain-forest, herb to 50cm, flowers red, 25 ii 1980, *Argent & Lamb* 1369 (E); Marai Parai, 5000ft, jungle stream N of camp under clay banks, flower red, grey and purple labellum, 4 iv 1933, *Clemens* 32573 (BM, L). Gunung Tambuyukon, c.6°12'N 116°36'E, amongst boulders right up to summit c.2600 m, flower red mottled red and white in throat, 12 iii 1980, *Argent & Walpole* 1477 (E).

var. *grandis* B.L. Burt, var. nov. a var. *clarkei* indumento similis, sed foliis multo majoribus (lamina c.12-14 x 8-9cm, nec c.7 x 4cm) petiolis longioribus (3-4cm, nec

2cm longis), calyce majore (20–25mm, nec 16mm), corolla majore (c.45mm, nec 35mm) distinguitur.

Type. Sabah, Mt Kinabalu, Mesilau, in stream valleys, 22 iii 1964, *Chew & Corner* RSNB 5914 (holo. E, iso. K).

The collectors made the following field notes: 'tufted stems, unbranched and erect, 6ft high, stem thick, fleshy, solid; leaves all turned to the illuminated side; corolla rose-carmine with deeper stripes, tube white externally pink spotted, white to fawn silky; anther and stigma cream'.

var. *longipetiolata* B.L. Burtt, var. nov. a var. *grandi* petiolis longioribus (8–11cm, nec ad 5cm tantum longis), laminiis majoribus (minime 20 x 12cm, nec 15 x 8cm) maturitate subglabris, bracteis pubescentibus (nec villosis) distinguitur.

Type. Sabah, Mt Kinabalu, Penibukan, Kinataki river, 4000–5000ft, 16 vi 1933, *Clemens* 31083 (holo. L; iso. BO).

SABAH. Mt Kinabalu, Colombon river basin near base of 2000ft wall and falls, 8000ft, 28 vi 1933, *Clemens* 33757 (BM, BO, L); Marai Parai, 5000ft, iii 1933, *Clemens* 35027 (BM, BO).

This is a very distinct variety of which good herbarium material is needed. The flowers, as in typical *C. clarkei*, are usually solitary in the bracts, but specimens with two or even three flowers also occur.

Key to varieties of *C. clarkei* and to allied species

- 1a. Inflorescence with 3–6 flowers; bracts not seen, presumably caducous before the flowers open _____ *C. kermesina*
- 1b. Flower solitary (rarely 2 together), closely embraced by a pair of bracts united to midway, persistent through flowering, caducous from fruit _____ 2
- 2a. Leaf-blade not exceeding 10cm long and 4cm wide _____ 3
- 2b. Leaf-blade at least 12cm long and 8cm wide _____ 5
- 3a. Whole plant, except outside of corolla, glabrous; 'corolla white with purple throat' _____ *Clemens* 32371
- 3b. Whole plant pubescent to villous _____ 4
- 4a. Corolla densely sericeous-villous with long hairs; calyx nearly as long as the bracts _____ *C. clarkei* var. *clarkei*
- 4b. Corolla more thinly hairy; calyx distinctly shorter than the bracts
C. clarkei var. *brachycalyx*
- 5a. Petiole to 5cm long; leaf-blade c.15 x 8cm _____ *C. clarkei* var. *grandis*
- 5b. Petiole 8–11cm long; leaf-blade more than 20cm long and 12cm broad
C. clarkei var. *longipetiolata*

Cyrtandra corniculata B.L. Burt, species nova *C. radiciflorae* C.B. Clarke affinis sed calyce brevior (c.10mm nec 15mm longo) segmentis obtusis 1mm infra apicem dorso corniculatis (nec acuminatis, sine cornu), corolla brevior (c.17–20mm nec c.30mm longa) facile distinguitur.

Herb to 1m high, aerial stems probably unbranched and decumbent at the base, at first very sparsely and inconspicuously hairy very soon glabrous, internodes 3–4cm long. *Leaves* opposite, those of a pair subequal; petiole 2–4.5cm, at first sparsely pilose soon glabrate; lamina probably up to 20 x 6cm (largest leaves damaged), usually 12–16 x 4–5cm, elliptic, acuminate at apex, narrowed at base, glabrous above, shortly brown-pilose on the veins below, shallowly crenate-serrate on margins, main lateral nerves ascending, about 8 on each side of the midrib, all nerves somewhat prominent below. *Inflorescences* arising in the axils of fallen leaves on the erect stem; about 8 flowers borne on a short peduncle; bracts inconspicuous, linear, c.4 x 0.5mm, with a few brown hairs; pedicels c.10mm, with conspicuous spreading brown bristly hairs. *Calyx* red, caducous in fruit; tube 5–6mm long, narrowly campanulate, with spreading bristly hairs c.0.75–1.25mm long in the lower part, subglabrous above; lobes 4mm long, obtuse, with a short 1mm dorsal horn c.1mm below the apex. *Corolla* white, c.17–20mm long overall, with scattered brown bristly hairs outside; tube c.4mm wide in lowermost 5mm, then somewhat abruptly expanded (to 9mm as pressed); lobes c.5mm long (?), broadly rounded. *Disc* unilateral, enveloping only one side of the ovary, nearly 3mm long, slightly lobed. *Stamens*: fertile filaments arising 7mm above base of corolla, 6mm long, glabrous, retracted by coiling after pollen is shed; anthers joined at their tips, 1.5–2mm long with some short bristly hairs round the edges, thecae parallel; staminodes arising 5mm above base of corolla, 2mm long. *Ovary* 5 x 2mm, covered with subsessile glands, with a brush of fulvous brown ascending hairs c.2.5mm long at junction with style. *Style* 8mm long, villous, hairs in middle 1mm long and becoming shorter upwards; stigma large, bilobed vertically, the lobes 2 x 1mm, rounded. *Fruit* (immature) 10 x 3mm, calyx already fallen.

Type. Sabah, Mt Kinabalu, Pinosuk Plateau, Base Camp, 5000ft, 7 v 1964, *Chai & Ilias* RSNB 6035 (holo. E, iso. K, SING).

SABAH. Mt Kinabalu, Bembangan River, 5000ft, 25 ii 1964, *Chew & Corner* RSNB 4537 (K).

Cyrtandra corniculata is very reminiscent of *C. radiciflora* C.B. Clarke in its vegetative characters but differs sharply in its floral features; the outstanding ones are the presence of a short horn below the tip of the blunt calyx-lobes (the feature that gives the species its epithet) and the much shorter corolla. This has a tube that is narrow at the base but expands rather abruptly upwards so that the whole is distinctly funnel-shaped (only gradually widened towards the mouth in *C. radiciflora*). Also the corolla is described as white: no markings are mentioned: in *C. radiciflora* the corolla as a whole is cream-coloured, but the inside of the lower lip (except the margins of the lobes) is bright scarlet.

The similarity of the leaves of these two species is borne out by the fact that both have a single-layered hypodermis lacking sclereids, but astroscleids are present in the

spongy mesophyll. These species also share an important floral character, the brush of long hairs at junction of ovary and style: this is characteristic of all the species allied to *C. radiflora* so far examined, but may not be exclusive to them.

Cyrtandra dallasensis B.L. Burtt, species nova nulli arcte affinis, petiolis ad 12cm longis, corollae tubo angusto elongato (c.25mm longo), staminodiis duobus ad apices membranaceo-falcatis, fructu cylindrico ad 6cm longo recognoscenda.

Woody herb perhaps up to 1.5m high, but can be only 30cm; stem apparently unbranched, with a few scattered hairs when very young but soon glabrous. *Leaves* opposite; petioles up to 9.5–13cm long, at first with appressed hairs, soon subglabrous; lamina at least up to 22 x 7.5cm, elliptic, acuminate, somewhat unequally narrowed at base, margins bluntly denticulate, lateral nerves c.12 on each side of midrib, all nerves prominent below. *Inflorescence* axillary, bearing about 6–10 flowers on very short pubescent peduncle, not heavily bracteate; pedicels c.5mm long, pubescent, elongating to c.10mm in fruit and then glabrate. *Calyx* divided to base: segments 4–5 x 1.5mm at base, sparsely pubescent outside, glabrous inside, blunt at tips. *Corolla* white, c.30–35mm long, glabrous; tube c.3.5mm wide at base and in lower 20mm, then somewhat widened upwards; lobes? *Disc* tubular, 3mm high, bluntly and very shallowly toothed at tip. *Stamens* rising at top of narrow part of tube; filaments 10mm long, glabrous, recoiling after dehiscence of anthers; anthers 3 x 1.25mm, cohering at tips, thecae parallel. *Staminodes* 2, arising at same level as fertile stamens, 6mm long, the vascular strand with a falcate curve in the upper part and the 'bay' of the curve webbed across by a thin membrane. *Gynoecium* 35mm long; ovary glabrous, narrowly cylindrical, c.15mm long passing imperceptibly into the style; style c.17mm long, sparsely clad with short spreading glandular hairs; stigma bilobed, the lobes spreading horizontally, 2.5mm long, spatulate, blunt, densely papillose on inner faces. *Fruits* cylindrical, tapering near tip, at least 6–9cm long, 4mm wide.

Type. Sabah, Mt Kinabalu, Dallas, 3000ft, flower white, fruit purplish, 7 ix 1931, Clemens 26345 (holo. K, iso. BM, BO, L).

Probably to be placed here:

SABAH. Beaufort distr., Montenor, primary forest, shrub on stony riverside, 5ft high, flowers whitegrey, fruits greenish 2.5 inches, 25 x 1975, DeWol & Abd. Karim SAN 80266 (L).

Cyrtandra dallasensis is a remarkable species and at present it is difficult to suggest a close affinity with any other. Its distinctive features are the long petioles, surprisingly long in view of the large lamina and its thin texture (it has neither hypodermis nor sclereids), and the long narrow corolla-tube of the white flowers. Its really unique character, however, lies in the staminodes: these are 6mm long, the vascular strand is falcate in the upper part and the 'bay' of the curve is webbed across by a delicate membranous tissue. The shape of the corolla mouth and lobes cannot be ascertained from the single flower available, but the white flowers with a long tube suggest moth-pollination and it may be that the staminodes in some way act as a guide for the moth's tongue: this will be an interesting study when the plant is rediscovered.

The specimen from the Beaufort district (south of Kota Kinabalu) is necessarily cited with some hesitancy, as there are no flowers on the specimen seen. Nevertheless vegetative characters and young fruits agree with those of the type: the localities are some 80 km apart.

Cyrtandra dolichopoda B.L. Burt, species nova *C. megalocrateri* Kraenzlin et speciebus affinis proxima, petiolis (c.12cm) et pedunculis (c.4–6cm) multo longioribus facile distinguitur. Flores, in specimine typico tantum visi, stamina fertilia 4 praebent. Unbranched woody glabrous herb; stem 12–35cm high, glabrous. *Leaves* opposite; petioles 8–13cm long, more or less equalling the lamina, glabrous; lamina 8–15 x 3.5–7.5cm broadly elliptic, with a very short acumen at the apex, cuneate at the base, margins obscurely denticulate, lateral nerves in 4–5 pairs, ascending, together with the midrib flat above slightly raised below. *Inflorescence* axillary, pedunculate, cymes much congested and enclosed in two large partly united bracts; peduncle 4.5–6cm long; bracts up to 3 x 2cm, united nearly to the middle, upper part spreading, falling as fruits ripen; flowers in inflorescence c.12; pedicels c.3mm elongating to c.5mm long in fruit. *Calyx* 13–14mm long glabrous; lobes 5–6.5mm long 1.5mm wide at base, linear-lanceolate, thickened at tips. *Corolla* 22mm long; tube 18mm, glabrous within, outside hairy in upper part only; lobes subequal, 4 x 4mm, hairy outside, rounded at apex, overlapping at rounded base. *Stamens* 4 fertile, arising 12mm above corolla base; filaments 4mm, thickish, terete, glabrous; anthers 2 x 1.5mm, thecae parallel, connective thick reaching nearly to tip of anther. *Disc* 2mm high, 5-lobulate. *Gynoecium* 16mm, glabrous; ovary 4mm, narrowly conical, 2mm diam.; style 12mm, 1mm diam. in middle; stigma bent over in bud, densely papillate with median horizontal groove. *Fruit* c.15 x 7–8mm with apiculus 1.5mm long; placentae meeting in middle and stretching across to side walls before recurving, seed-bearing only on recurved parts.

Type. Sabah, Mt Kinabalu, Ulu Liwagu and Ulu Mesilau, c.6°N 116°35'E, 5000ft, 6 ix 1961, *Chew, Corner & Stainton* RSNB 2811 (holo. E, iso. K).

SABAH. Mt Kinabalu, Tenompok, trail to Tomis, 5400ft, 2 v 1932, *Clemens* 30052 (K); Mesilau cave, 6500ft, 15 viii 1963, *Mikil* SAN 36180 (K).

SARAWAK. Fifth div., route from Bakelalan to Gunung Murud, below Camp III, c.3°56'N 115°32'E, c.5400ft, 29 ix 1967, *Burt & Martin* B.5307 (E, SAR).

Flowers of *Cyrtandra dolichopoda* have only been seen on the spirit-preserved material of the type plant. They are remarkable in having four fertile stamens. This is very unusual in *Cyrtandra*; however, the field notes record 'corolla white, but the lobes pale clear yellow on the inside except the 1(–2) upper white lobes'. This suggests that there may also be some irregularity in the lobing of the corolla. One ovary was sectioned that only had a single placenta, but other ovaries and fruits were normal. In any case *C. dolichopoda* is distinct from other species of *Cyrtandra* even if the four fertile stamens do not prove to be a constant character.

The description above is based on the type specimen only. The Sarawak specimen (B.5307) has peduncles only 1.5–3cm long: as it was not in flower there is always the possibility that there may be differences in floral details although I have little doubt that it is correctly placed here.

Cyrtandra leiocrater B.L. Burtt, species nova *C. megalocrateri* affinis sed foliis longius petiolatis (petiolis 5–8cm nec 2–3cm), lamina foliorum longitudine latitudinem duplo (nec triplo) excedente basi subito et inaequaliter angustata (nec attenuata), involucre sessili (nec pedunculo 6–10mm longo suffulto) distinguenda.

Plant up to 1m high; stem unbranched, glabrous even when young, strongly 4-angled, the angles sharp to narrowly winged. *Leaves* opposite, those of a pair subequal, glabrous; petioles 5–13cm; lamina c.12–20 x 5.5–9.5cm broadly elliptic to ovate-elliptic, acuminate at tip, rather abruptly and unequally narrowed at base, margins bluntly denticulate, lateral nerves in 8–10 pairs more widely spaced towards top, slightly raised on both surfaces. *Inflorescence* axillary, sessile to subsessile, strongly involucre; involucre c.3cm long, bracts united, glabrous. *Calyx* glabrous, 10mm long; lobes 2–4mm, with thickened tips. *Corolla* 25mm long; tube narrow in lowermost 15mm, then widening upwards and apparently curved sideways, upper part of tube and lobes thinly hairy on outside; lobes 3 x 3mm, subequal, rounded, overlapping at base. *Stamens* arising 1.5mm above base of corolla; filaments 5mm long; anthers 2.5 x 1.75mm. *Disc* 2mm high, lobulate, somewhat oblique. *Gynoecium* 16mm long, glabrous; ovary 5mm long; style 11mm. Fruit not known.

Type. Sabah, Mt Kinabalu, Kinataki R., 4500ft, 7 iii 1933, Carr SFN 26442 (SING).

SABAH. Kinabalu, Marai Parai spur, 1–4 ii 1915, Clemens 11105 (BO); Sungai Kinataki, along Bahandoi ridge, 4–5000ft, primary montane forest on ultrabasic, 16 ix 1965, Kanis SAN 53978 (E, K); Penibukan, Kinataki, ridge, forest trail, 4–5000ft, red flowers, 10 i 1933, Clemens 30860 (BM).

Cyrtandra leiocrater is apparently endemic to Mt Kinabalu.

Cyrtandra (sect. *Decurrentes*) *multicaulis* B.L. Burtt, species nova a *C. bracheia* B.L. Burtt habitu praecipue differt. *C. multicaulis* habet caules internodiis distinctis, seniores basi prostratos, quasi rhizomata formantes, ex quibus caules juniores oriuntur; etiam a *C. bracheia* involucre pedunculo 1–2cm longo praedito bracteis tenuibus mox ab alabastris crescentibus fractis (nec involucre robusto) distinguitur.

Stems erect, c.30–50cm high, older ones prostrate at the base and giving rise to new erect shoots; young stems at first brown-pilose (the hairs often somewhat curled below the internode, straight and appressed above it), becoming glabrous on older parts; internodes up to 12cm long, usually less. *Leaves*: lowest 2–3 pairs on erect stem small (1.5–5.5cm long) and those subtending inflorescences early caducous (not present in herbarium); upper leaves in about 4 pairs, those of a pair sometimes slightly unequal, 10–17 x c.3.5cm, obovate-elliptic, quite abruptly narrowed at the apex with a short acumen, long-attenuate at base (petiolar region c.1–2.5cm long), the lower margins somewhat membranous and at the base shortly connate across the stem; lamina at first shortly pilose (hairs 1mm long from a bulbous base), eventually glabrescent so that the adult leaf is rough with persistent hair-bases; lower surface pilose chiefly on the nerves and margin, thinly so elsewhere when leaf fully expanded, margins serrate, the teeth with apical tufts of hairs; main veins about 7 pairs, ascending, breaking up near the margin into veinlets that run to individual teeth, intermediate veins weaker and joining up with side branches of main veins. *Inflorescences* axillary to fallen leaves near the

base of the stem; peduncle 1–2cm long; bracts united into an involucre c.1.5–2cm long, pilose on the outside, very thinly hairy or almost glabrous inside, thin, soon breaking up as flower buds enlarge; pedicels c.7mm long, densely sericeous. *Calyx* at least 9mm long with 'horn' 5mm; calyx soon ruptured, lobing uncertain. *Corolla* 4.5cm, densely sericeous on the outside; dorsal lobes 1cm long densely glandular inside, lower lip c.1.5cm. *Stamens*: filaments arising 20mm above base of corolla, total length 20mm with a thickened knee at mid-point, glabrous below except for few long hairs near base, glandular near top; anthers 3.5cm long with parallel thecae, attached to one another at their tips; lateral staminodes 2.5mm long, filiform, median one shorter. *Disc* 4mm high, edge with 5 broad shallow teeth. *Gynoecium* 2.5cm long; ovary 1.8cm long, glabrous below, becoming hairy with ascending hairs at top; placentae T-shaped, the arms recurved at their tips, the opposing flat faces without ovules; style densely hairy with ascending hairs in lower part, glandular with spreading hairs above; stigma transversely oval and flat in bud, becoming deeply bilobed by folding about the vertical axis when mature. *Fruit* 17–20 x 4.5–6mm, greyish, surface covered with close shallow tubercles. *Seeds* brown, broadly ellipsoid, c.0.3mm long.

Type. Sarawak, Bau distr., S end Gunung Doya above Kampong Seromah, forming extensive patches on flat wet areas between limestone outcrops, flowers white spotted red in the tube, 23 v 1975, *Burt* 8183 (holo. E, iso. SAR).

SARAWAK. Kuching, in a wood, 28 i 1954, *Brooke* 8010 (E). Bau distr., Gunung Krian to Seburan mine, 23 v 1962, *Burt & Woods* B.1892 (E); Bukit Krian, in damp hollow at foot of limestone, 10 ix 1967, *Burt* 5154 (E); Bukit Jebong, 200ft, base of limestone hill, 11 iii 1981, *Lehmann* S29416 (E, SAR). Padawan distr., Gunung Manok, clay slopes in forest on limestone, 13 v 1975, *Burt* 8118 (E). Upper Sadong distr., Gunung Selabor, 0°98'N 110°29'E, slopes and flat ground at foot of limestone hill, 29 v 1975, *Burt* 8213 (E).

Cyrtandra multicaulis is apparently limited to the limestone of First Division, where it is found in both the Bau and the Padawan areas as well as on Gunung Selabor in the Upper Sadong district. It usually forms ground cover under a light canopy of trees at the foot of limestone hills. Its habit is the same as that of *C. radiflora* C.B. Clarke (see *Burt* in *Gardens Bull. Singapore* 29: 74, 1976). The lower part of the stems become decumbent and then root and form new stems: thus the ground becomes a tangle of these prostrate stem bases. This habit may have come about simply because the stems became too heavy to continue erect growth and accommodate this by curvature at ground level.

As in *C. radiflora*, flowering takes place near the base of the plant in the axils of fallen leaves. Despite these resemblances, *C. multicaulis* is not closely related. The allies of *C. multicaulis* are the other species of sect. *Decurrentes*; they all have large corollas that are very densely sericeous on the outside. In bud the corolla may seem to be drawn out to a sharp point, but this is formed entirely by the long silky hairs which project as much as 5mm beyond the blunt corolla-lobes.

Cyrtandra papyracea B.L. *Burt*, species nova nulli arcte affinis; inter species fructibus longis praeditas foliis longipetiolatis multinerviis, calyce magno papyraceo, antherarum thecis late divaricatis distinguenda.

Herb; stem 1m high, when living 2.5cm in girth (fide coll.), glabrous, with internodes c.2–3cm long. *Leaves* opposite, those of a pair subequal; petiole up to 15cm long, glabrous; lamina up to 28 x 12cm, rather thin in texture, broadly elliptic, probably shortly acuminate at apex, cuneate at base, glabrous above, when very young minutely papillose and pubescent below, soon glabrous; midrib raised below, main lateral nerves c.22 on each side, intermediate ones and tertiary nerves weak; margins thin and very slightly revolute, entire. *Flowers* borne in few-flowered, rarely 1-flowered, cymes in the axils of the upper leaves; peduncle c.20mm long; primary bracts lanceolate, c.7mm long; primary pedicel c.20mm long; inflorescence glabrous. *Calyx* 20mm long, campanulate, glabrous outside, papillose inside, papery, distinctly veined, lobes c.7mm long, triangular, perhaps unequal. *Corolla* 30mm long, glabrous outside; tube 2–2.5mm wide in basal 12mm, then expanding to c.9mm at mouth, total tube c.25mm; dorsal lobes c.7 x 5mm the central sinus 5mm, anterior lobes c.6 x 6mm (lobe measurements approximate due to fragmentary material), all lobes truncate to rounded the margins ciliate with short gland-tipped hairs; corolla white with a red-blotch of thicker tissue at each sinus and 3 red bands on the floor of the throat, palate with short-stalked glands. *Stamens* arising 14mm above base of corolla; filaments 10mm long, with a well-developed knee midway, glabrous except for a few scattered glands near top; anthers 4.5mm across the widely divaricate thecae, cohering face to face, with a downward blunt projection on lower side. *Staminodes* 2, arising level with the stamens, 4mm long, glabrous. *Disc* annular, 1mm high, thicker at top than below, the upper rim rounded, smooth. *Gynoecium* probably immature; ovary 8 x 1.5mm glabrous; style 10 x 1.5mm beset with short-stalked glands; stigma capitate 3mm diam. *Young fruit* 50 x 2mm, glabrous.

Type. Sarawak, 7th Division, Kapit, Bukit Raya, by rocky stream, 4 x 1965, *Jugah anak Kudi* S23821 (holo. L, iso. SAR).

Cyrtandra papyracea is a remarkably distinct species, and at present I can find no close ally for it. *C. eminens* C.B. Cl. has multinerved leaves, but the flower is only 11mm long and the calyx is divided almost to the base into segments only 2–3mm long, and the disc is unilateral. The anthers of *C. papyracea* with widely divaricate thecae and held face to face are particularly distinctive, as it is more usual in *Cyrtandra* for the thecae to be parallel and the anthers only united at their tips.

Cyrtandra rubricalyx B.L. Burtt, *species nova* *C. splendenti* C.B. Cl. et *C. areolatae* (Stapf) B.L. Burtt affinis, ab ambabus habitu humilior, floribus inter folia axillaribus solitariis, calycis segmentis lanceolatis c.4mm longis breviter pilosis (nec filiformibus c.8mm longis longe pilosis), corollis albis immaculatis.

Dwarf woody herb; stem pilose, c.15mm high; leaves clustered near top of stem which is probably sometimes more or less horizontal from rock crevice or bank with the leaves forming a pendulous fan. *Leaves* up to 25 x 7cm, variable in size on same plant, those of a pair also somewhat unequal, smaller leaves only 11 x 3.5cm; lamina gradually narrowed to the base but without a distinct petiolar region, more or less elliptic (some leaves slightly falcate when part of a fan), shortly acuminate, mamillate and thinly pilose above, invaginated under the mamillae below and more pilose especially on the nerves,

closely crenate-dentate along the margins, main lateral nerves about 7 on each side, well spaced. *Flowers* apparently solitary in the leaf axils. *Pedicels* c.1.5cm, pilose, hairs spreading, rather variable in length, mostly gland-tipped. *Calyx* tube 1mm long; segments 4mm long, 1mm wide at base; tube and lobes verrucose-glandular-pubescent outside, with shorter glandular hairs inside. *Corolla* glandular-pilose outside, c.35mm long, the lowermost 15mm forming a cylindrical tube, then widening to the mouth, lobes short, rounded, broad, scarcely 5mm long. *Disc* 1.5mm high. *Filaments* arising at top of narrow part of tube, 10mm long, somewhat flattened minutely papillose-glandular; anthers 2mm long, joined at tips, thecae parallel. *Staminode* 5mm long, hooked at tip, arising at same level as fertile stamens. *Immature gynoecium* 8mm long; ovary glandular-pubescent 7mm; style 1mm with sessile glands; stigma with horizontal groove. *Fruit* to 50 x 5mm, sometimes cylindric, attenuate at tip, sometimes with persistent style 15mm long.

Type. Sabah, Mt Kinabalu, Eastern Shoulder, 6°05'N 116°36-40'E, Camp I, 2500ft, on rocks in Dipterocarp forest, corolla pure white, calyx red, leaves sometimes red below, 26 vii 1961, *Chew, Corner & Stainton* RNSB 1181 (holo. E, iso. K, L).

SABAH. Ranau distr., road from Lohan to Mamut Copper mine near tank 54, 6°01'N 116°41'E, 1000 m, dipterocarp forest on Trusmadi formation, leaves brickred below, 9 vii 1984, *Beaman* 10650 (US).

Cyrtandra rubricalyx belongs to the growing group of species that appear to cluster round *C. splendens* C.B. Cl. They are characterized by mamillate leaves that lack hypodermis and sclereids, long pedicels, largish flowers with ovaries lacking an apical brush of bristles, and medium length fruits. The allied group centred on *C. radciflora* C.B. Cl. have smooth leaves with hypodermis, astrosclereids in the mesophyll, and an apical brush on the ovary.

A specimen very closely related to *Cyrtandra rubricalyx* was collected by M. Warwick on Gunung Monkobo in the Crocker Range (5°48'S 116°56'E; MW68, E). It may well prove to belong to this species, but there is a marked difference in the much narrower (4.5 x 0.5mm) calyx segments. The floral measurements for *C. rubricalyx* (corolla 35mm long) are taken from flowers in the male phase. On MW68 there is a beautifully pressed flower in the female phase (the stamens being retracted) with corolla 50mm long; however another flower on the same sheet measures only 40mm. Phase of flowering and excellence of drying can obviously affect the floral measurements that are made in the herbarium.

Cyrtandra (sect. *Decurrentes*) *sinclairiana* B.L. Burt, *species nova* *C. multicauli* B.L. Burt, *speciei sarawakensis* supra descriptae, similis sed foliis flores subtendentibus persistentibus, calyce spathaceo cornu carente, corolla brevior (vix 20mm longo, nec c.45mm), fructu brevior (c.10mm, nec 17-20mm longo) distinguitur.

Woody herb to 0.6m high; flowering stems erect, unbranched, the basal part procumbent and rooting and producing additional erect shoots; internodes 3-4cm, lower half of stem bare of leaves. *Leaves* opposite equal, subsessile; blade 12-15 x 3-4cm, oblanceolate-elliptic, pointed at the apex, gradually attenuate at base, sharply toothed on the margins

(the teeth tipped with a tuft of hairs), upper surface pilose when very young soon glabrate but slightly rough with small persistent hair bases, lower surface at first long pilose later hairy chiefly on the veins, eventually subglabrous; lateral nerves about 6 pairs, inconspicuous above, slightly raised beneath. *Inflorescence* axillary, subsessile, congested; primary bracts broadly ovate, c. 13 x 14mm, slightly united at base, softly hairy; pedicels 2–3mm long, shortly hairy; flowers about 6. *Calyx* c. 9mm long, spathaceous, split ventrally to c. 3mm from base, pilose inside and outside. *Corolla* c. 18–20mm long, densely villous outside with long hairs; tube 10–11mm long, 2.5mm wide at base, straight and more or less erect for 4.5mm then sharply bent outwards and widened for 6mm, at the mouth c. 7mm wide; limb bilabiate, median lobe 7 x 4mm, laterals 8 x 5mm, dorsal lip beset with short stalked glands inside, 7mm long, bilobed to 3.5mm, the lobes 3.5mm wide, all lobes rounded. *Disc* 3mm high, with irregular teeth c. 0.25mm, cylindrical but (always?) split dorsally almost to the base. *Filaments* inserted 5mm above base of corolla, 6mm long with a distinct knee 1.5mm above base, glabrous; anthers 2.25 x 1mm, coherent at their tips, thecae parallel. *Ovary* glabrous at base (where covered by disc) densely villous with long hairs above, 10mm long; style 6mm, villous with long ascending hairs near the base these passing gradually into shorter spreading gland-tipped hairs towards the top; stigma c. 1.5mm diam. *Fruits* ovoid-conical, c. 10 x 6.5mm.

Type. Sabah, Mt Kinabalu, Lumulumu, 6100ft, by path in forest, 15 vi 1957, *Sinclair, Kadim & Kapis* 9209 (holo. E; iso. K, L).

SABAH. Mt Kinabalu, 3 vii 1937, *Griswold* 91 (US); trail near Luma, 7000ft, jungle, vi 1932, *Clemens* 29833 (BM, K.); Penibukan, spur S of Kinataki R., 4000–5000ft, 5 ii 1933, *Clemens* s.n. (BM); Kinabalu N.P., dense jungle, 6–7000ft, viii 1981, *Huxley* M26 (E); Bukit Wartrail, 1700–1900 m, 10 xii 1980, *Jermey & Rankin* J15382 (BM); Cascade trail, 1550 m, 11 xii 1980, *Jermey & Rankin* J15472A (BM); continuation of Marai Parai spur, 7500ft, 18 ix 1959, *Collenette* A63 (BM).

The corolla is white with brownish red spots in the throat, the lower lip has two yellow ridges running down into the mouth. Collectors say nothing about the habit of the plant, however its growth pattern seems to be that of *Cyrtandra multicaulis* and *C. radicyflora*: the flowering part of the stem is erect and unbranched, but the lower part is prostrate, rooting freely and giving rise by lateral buds to additional flowering stems. *C. multicaulis* and *C. radicyflora* can both form quite big patches on the forest floor, but there is no indication whether *C. sinclairiana* behaves in the same way.

Cyrtandra sinclairiana bears a superficial resemblance to *C. gracilentia* Kraenzlin, a species originally described as coming from Borneo although there is now good reason to believe it is Sumatran (see Notes RBG Edinb. 36: 166, 1978). This differs in having few, slightly larger flowers (corolla 30mm long), linear calyx segments and glabrous style. It is at present only known from the type collection. *C. sinclairiana* has long osteosclereids in the 3-layered hypodermis and astrosclereids in the spongy mesophyll.

Cyrtandra sinclairiana is named in memory of the late James Sinclair (1913–1968), who was briefly in charge of the herbarium at RBG Edinburgh before making his career at the Botanic Garden, Singapore. He collected extensively on Singapore, the Malay Peninsula and Borneo and his material of this species is taken as its type.