

## THE GENUS *CYRTANDRA* IN THE RYUKYU AND CAROLINE ISLANDS

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A RECENT MONOGRAPHIC STUDY of the genus *Cyrtandra* in the South Pacific, covering the territory from the New Hebrides to the Marquesas Islands, includes some 54 species of this very widely dispersed group. However, an additional five species occur north of the equator in the Ryukyu and Caroline Islands, a region with a measure of geographical coherence and some distance from the South Pacific territory of *Cyrtandra*. The purpose of this paper is to present the systematic relationships and expanded descriptions of these five species. A map showing the distribution of *Cyrtandra* and portraying the geographical relationships of the species may be consulted in volume 51 (page 242) of this Journal.

The five species considered here are probably from diverse origins. The most conservative speculation for the evolutionary history of *Cyrtandra yaeyamae* would include long-distance dispersal from northern Luzon. The most probable origins for *C. palawensis* and *C. todaiensis*, on the other hand, would be Mindanao or western New Guinea. These geographical relationships contrast with the eastern New Guinea-Solomon Islands source region for the lineages of *C. kusaimontana* and *C. urvillei*, and for the various lineages that extend across the South Pacific to the Marquesas Islands.

This small group of species includes some remarkable expressions of the genus, including the vining habit (*C. palawensis*), actinomorphic corolla (*C. palawensis* and *C. todaiensis*), valvate corolla lobes (*C. todaiensis*), and stamens numbering 4, 5, and 6 (as opposed to the usual pair of stamens) (*C. todaiensis*). The vining habit has been reported in some New Guinea species. Actinomorphic corollas with 4 or 5 stamens also occur in *Cyrtandra jonesii* of the Marquesas Islands, a species whose evolutionary lineage may be distinct from those of *C. palawensis* and *C. todaiensis* of the western Caroline Islands.

While not having had the advantage of field work in the Caroline and Ryukyu Islands, I have received excellent specimens, including spirit collections and field data, through the kind assistance of Mrs. Sheila Hardy, Mr. Demei Otobed, and Dr. Egbert Walker, to whom appreciation is extended. Thanks are also extended to the curators of the following herbaria who generously loaned specimens in their care:

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A	Arnold Arboretum of Harvard University, Cambridge, Massachusetts.
BISH	Bernice P. Bishop Museum, Honolulu.
E	Royal Botanic Garden, Edinburgh.
K	Royal Botanic Gardens, Kew.
P	Muséum National d'Histoire Naturelle, Paris.
TAI	National Taiwan University, Taipei.
UC	University of California, Berkeley.
US	Smithsonian Institution, Washington.

## SYSTEMATIC TREATMENT

*Cyrtandra* J. R. & G. Forst. Char. Gen. 5. *pl.* 3. 1776.

A description of the genus and its geographical range is presented in Contr. U.S. Natl. Herb. 37(4): 107-159.

## KEY TO SPECIES

Corolla actinomorphic.

Stamens 2; shrubs climbing to 5-6 meters; corolla lobes imbricate; calyx persistent. . . . . 1. *C. palawensis*.

Stamens 4, 5, or 6; erect shrubs 2-3 meters high; corolla lobes valvate; calyx deciduous. . . . . 2. *C. todaiensis*.

Corolla bilabiate.

Inflorescence capitate to subcapitate, the pedicels concealed by the congested flowers and bracts. . . . . 3. *C. yaeyamae*.

Inflorescence an open, branching cyme, not capitate or subcapitate, the pedicels visible, not obscured by the congested flowers and bracts.

Calyx 2.0-2.5 cm. long, pubescent on inner surface; corolla 3 cm. long. . . . . 4. *C. kusaimontana*.

Calyx 1.2-1.4 cm. long, glabrous on inner surface; corolla 1.5-2.0 cm. long. . . . . 5. *C. urvillei*.

# 1. *Cyrtandra palawensis* Schltr. Bot. Jahrb. 56: 577. 1921.

*Climbing shrub* ascending to 5-6 m., the young and mature parts densely to moderately pubescent with brown hairs 20-30 microns in diameter and 0.5-1.5 mm. long; leaves opposite, the petioles 3.5-8 cm. long, the blades elliptic, 4.5-9 cm. broad and 10-24 cm. long, primary veins 9-14 per side, blades equal to unequal and acute at bases, acute to acuminate at apices, entire to faintly serrate with about 1 shallow tooth per cm. at margins; inflorescences densely pubescent, of 3-10 flowers, the axillary peduncles 2 mm. long, terminated by deciduous, densely pubescent bracts 2 mm. broad and 5 mm. long; pedicels 2-5 mm. long; calyx persistent, cylindrical to inflated, pubescent on the outer surface with hairs 40-60 microns in diameter and 0.5-1.0 mm. long, glabrous on the inner surface, the calyx 9-12 mm. long, cleft 2-4 mm. into 5 nearly equal, acute lobes; corolla white, cylindrical, 14 mm. long, cleft 2-3 mm. into 5 equal, imbricate lobes, *the limb actinomorphic*, the outer surface of the corolla glabrous below, glabrate to pubescent above, with non-glandular hairs, the inner surface glabrous; stamens 2, the glabrous filaments 3 mm. long,

adnate to the corolla tube 4 mm. below the throat; staminodes 3, 0.25 mm. long, adnate to the tube 5 mm. below the throat, the center staminode 1 mm. above the laterals, the staminodes and stamens adnate opposite the 5 sinuses of the corolla; cupulate annular disc 1 mm. high, the margin entire; ovary glabrous, 6 mm. long; style glabrous, 7 mm. long; stigma cleft 1 mm. into two applanate lobes; fruit enveloped by the persistent calyx, the fruit 1.5 cm. long, ovoid, tapered at the apex into a beak 3–4 mm. long; seeds 0.5 mm. long, the coats sculptured by vertical striations.

TYPE LOCALITY: Babelthuap Island, Palau, Caroline Islands. Type collected by Ledermann (*Ledermann 14523*), not seen.

LOCAL NAME: "Melkii" (*Hardy & Otobed 83*).

DISTRIBUTION: Upland rain forest, Palau Archipelago. Confirmed localities limited to the island of Babelthuap.

**Palau:** without further locality, *Kanehira 274* (BISH), 1963 (K, P). **Babelthuap:** Aimiliki, *Hosokawa 7251* (BISH, TAI); Garmiscan, *Hosokawa 9139* (BISH, TAI); 2 mi. S. of Ngarekea Village, *Fehlman s.n.* (BISH); Ngetbelebel, Imelik, *Hardy & Otobed 83* (UCR).

This species has the distinction of an actinomorphic corolla, seen also in *C. todaiensis* Kanehira. It is different from the latter species in many characters, including imbricate corolla lobes, two stamens, and a persistent calyx. In the more than 90 species of Pacific *Cyrtandra* I have studied, none bears any close relationship to *C. palawensis*. The nearest relative is probably among the more than 200 species in New Guinea and the Philippines.

## 2. *Cyrtandra todaiensis* Kanehira, Bot. Mag. Tokyo 47: 679. 1933.

*Protocyrtandra todaiensis* (Kanehira) Hosokawa, Trans. Nat. Hist. Soc. Formosa 24(132): 202, 203. 1934.

*Cyrtandra todaiensis* is described and illustrated in vol. 51 (pages 241–246) of this Journal. Further discussion of this species has been advanced by Burtt in Notes Bot. Gard. Edinb. 30(1): 1–10. 1970.

## 3. *Cyrtandra yaeyamae* Ohwi, Jour. Jap. Bot. 13: 339, 340. 1937.

*Cyrtandra iriomotensis* Masam. Not. Syst. (Paris) 6: 38, 39. 1937.

Shrub 2–4 m. high, the young foliage pubescent with indument of hairs 30 microns in diameter and 0.4–0.8 mm. long; stems square in cross-section, thick (2–4 cm.), light gray; leaves opposite, the petioles 3–7 cm. long, connate at bases; blades lanceolate to ovate, 7–17 cm. wide, 10–40 cm. long, tapering to an unequal, acute base and decurrent on the petiole, acute to acuminate at apex, shallowly undulate-dentate at margin, glabrous on both surfaces, much paler beneath, the primary veins about 16 on each side, curved-ascending, not uniting at margin; inflorescences axillary, many flowered, the congested fascicles with involucre-like bracts

at the summit of a peduncle, 5–20 mm. long, the bracts lanceolate to oblanceolate, 2–4 cm. long, entire or shallowly lacerate, glabrous, the inner bracts smaller; calyx about 6 mm. long, glabrous on the outer and inner surfaces, cleft to about 2 mm. from the base into 5 subequal lanceolate lobes; corolla funnelform to campanulate, creamy-white, about 2.5 cm. long, cleft into rounded lobes, glabrous outside, with inner pubescence of very short hairs; stamens 2, the filaments glabrous, 7–10 mm. long, adnate to the corolla tube about 1 cm. above the base, the anthers connate and borne slightly below the throat; staminodes 3, attached at the same level as the stamens, erect, straight, somewhat rigid, 3–4 mm. long, the middle staminode 1 mm. long and borne 1 mm. below the laterals, annular disc conspicuous 1.5–2 mm. high, with undulate margin; ovary 9 mm. long, glabrous; style 11 mm. long, densely pubescent with minute noncapitate hairs, bearing the bifid stigma below the anthers; fruit ellipsoidal, about 15 mm. long, tipped by 5 mm. of the persistent style base; seeds not seen.

TYPE LOCALITY: Iriomote Island, Ryukyu Islands. Type: *Sonohara s.n.* (KYO) not seen.

LOCAL NAME: "Yaeyama-iwa-tabako" (Yaeyama Rocky Tobacco).

DISTRIBUTION: Known only from Iriomote Island.

Iriomote Island: along the Nakara River, *Walker & Tawad 6882* (BISH, US), *ibid.*, *Hatusima 18732* (BISH, US).

This species is closely related to *Cyrtandra cumingii* which occurs in the Philippines and north to Botel Tobago, in the Batan Islands, off the southeast coast of Formosa. The similarity is so great that the latter name has been erroneously applied to the Iriomote collection of Hatusima.

4. *Cyrtandra kusaimontana* Hosokawa, Trans. Nat. Hist. Soc. Formosa 24(132): 203. 1934.

Pubescent shrub almost 1 meter high, the stems, leaves, and inflorescences covered with a woolly to sparse indument of yellowish brown hairs 40–60 microns in diameter and 1.0 to 1.5 mm. long; leaves opposite, the petioles 7.5–13 cm. long, the blades elliptic-ovate, 14–17 cm. broad and 28–53 cm. long, the primary veins 8–9 per side, the blades unequal and attenuate at bases, acuminate at apices, irregularly and shallowly serrate at margins, woolly on the lower surface, the hairs scattered on the upper surface; inflorescences of 3–4 flowers, the cymes borne on axillary, woolly peduncles 1–3 cm. long, terminated by 3–4 woolly pedicels 7–20 mm. long; bracts small; calyx tardily deciduous, densely pubescent on the outer and inner surfaces, cylindrical, 2.0–2.5 cm. long, cleft 10–20 mm. into 5 equal, lanceolate, acuminate lobes; corolla 3 cm. long, glabrous, the posterior lip scarcely apparent, the anterior lip trilobate; stamens 2, the filaments 7 mm. long, the anthers 2 mm. long; staminodes 3, 1–2 mm. long; cupulate annular disc 1.0 mm. high, entire at margin, persistent; ovary glabrous;

style sparsely pilose and shortly bilobed at apex; fruit ovoid, yellowish brown, 2.0–2.5 cm. long, tipped by 2.5 mm. of the style base; seeds 0.4 mm. long, ovoid, the coats coarsely reticulate.

TYPE LOCALITY: Kusaie, Eastern Caroline Islands. Type collected by Hosokawa, cited below.

DISTRIBUTION: Upland rain forest on the island of Kusaie.

Kusaie: "In the *Astronia* thicket situated upon the upper altitude of Mt. Buache (*T. Hosokawa* no. 6288 a! July 29, 1933)." Type collection (not seen). Finkel, 500 ft., *Hosokawa* 9389 (TAI).

The above description was prepared from a study of *Hosokawa* 9389 and from a translation of Hosokawa's original publication. Some difficulties were encountered in the translation. Hosokawa apparently reversed the application of "anterior" and "posterior" as applied to the corolla. I have taken the liberty of using "posterior" to designate the bilobate upper lip and "anterior" for the trilobate lower lip, to be consistent with my usage of the terms. There is no doubt that *Hosokawa* 9389 and the type specimen are of the same species, however. This species is strongly distinct from *C. urvillei*, which also occurs on Kusaie. *Cyrtandra kusaimontana* probably evolved from stock dispersed from New Guinea.

5. *Cyrtandra urvillei* C. B. Clarke, in DC. Monogr. Phan. 5: 251, 252. 1883.

*Cyrtandra ponapensis* Kanehira, Bot. Mag. Tokyo 46(548): 492, 493. 1932.

Shrub to small tree 1.5–5 m. high, the young parts pubescent with an indument of brown hairs 30–40 microns in diameter and 0.3–0.6 mm. long; leaves opposite, the petioles 2–10 cm. long, the blades ovate to elliptic, 4–17 cm. broad and 5–39 cm. long, the primary veins 5–8 per side, the blades equal to unequal and decurrent at bases, obtuse to acute at apices, entire to undulate to serrate with 1–3 teeth per cm. at margins; inflorescences pubescent, bearing 1–15 flowers, the axillary peduncles 1–2.5 cm. long, terminated by lanceolate bracts 5–10 mm. long, subtending 1–4 bracteolate, branched axes 5–8 mm. long; pedicels 5–10 mm. long; calyx 12–14 mm. long, cleft to within 1 mm. of base into 5 equal, linear-lanceolate lobes, pubescent on the outer surface with appressed hairs 30 microns in diameter and 0.2–0.3 mm. long, glabrous on the inner surface; corolla white, 16–19 mm. long, cleft 5–7 mm. into 5 unequal, rounded lobes; glabrous on the outer and inner surfaces except for an inner throat pubescence of capitate glandular hairs 30 microns in diameter and 0.1 mm. long; stamens 2, the glabrous filaments 3 mm. long, adnate to the corolla tube 3 mm. below the throat and opposite the sinuses of the anterior lobe, the anthers coherent at apices, held slightly below the throat; staminodes 3, 1 mm. long, adnate to the tube 3 mm. below the throat opposite the sinuses of the posterior lobes, the center staminode 0.5 mm. long and borne 1 mm. above the laterals; cupulate annular disc persistent,

1.5 mm. high, entire at margin; ovary glabrous, 5 mm. long; style glabrous, 5 mm. long; stigma cleft 0.5 mm. into two thick lobes; fruit ovoid 1.5 cm. long; seeds ovoid-fusiform, 0.4 mm. long, the coats sculptured with longitudinal striations.

**TYPE LOCALITY:** Kusaie Island, Caroline Islands. Type (not seen) collected by Dumont d'Urville.

**DISTRIBUTION:** Kusaie and Ponape Islands, eastern Caroline Islands, in upland rain forest, 100–700 m.

**Kusaie:** without further locality, *Kanehira* 1381 (TAI), *Stone* 1923 (BISH), Finkel, *Hosokawa* 6416, 9416 (TAI), Utwa, 9374 (TAI), Mt. Buache, 6287 (TAI).

**Ponape:** Niinoani-zan, *Kanehira* 831 (BISH, syntype of *Cyrtandra ponapensis* Kanehira); Tortom-zan, *Kanehira* 1550 (K, TAI, syntypes of *C. ponapensis*); Naanaraut-zan, *Kanehira* 1642 (P, syntype of *C. ponapensis*); Mt. Seletenreh, *Glassman* 2743, *Stone* 5390 (BISH); Nanalant Mtn., *Takamatsu* 1090 (BISH); Nawpil, *Hosokawa* 8228 (TAI); Nipit, *Hosokawa* 9502 (TAI); Kuporujō, *Takamatsu* 660, 669, 671 (BISH); Troton, *Hosokawa* 5749 (TAI); Nunioanii, *Hosokawa* 5670 (BISH, TAI), 5687 (TAI), Ponape, without further locality, *Kanehira* 1357 (P); *Ledermann* 13682 (K).

In his "Die Gesneraceen von Mikronesien" (Bot. Jahrb. 56: 576, 577. 1921) Schlechter circumscribed *Cyrtandra urvillei* to include both the Kusaie and the Ponape material, a judgment in which I concur. He cited d'Urville's type from Kusaie and *Ledermann* 13682, from Ponape, cited above. Kanehira published *C. ponapensis* 11 years later, in 1932, and illustrated both *C. urvillei* (Kusaie) and *C. ponapensis* (Ponape) in his "Flora Micronesica" in 1933. An examination of the specimens and of Kanehira's illustrations shows that these are one species, of the *Cyrtandra cymosa* (New Hebrides)–*C. tempestii* (Fiji)–*C. samoensis* (Samoa)–*C. rarotongensis* (Rarotonga) lineage that is so well dispersed in the South Pacific. The occurrence of *C. urvillei* on both Ponape and Kusaie (300 miles southeast of Ponape) is consistent with the remarkably wide dispersal of this lineage. The related *C. samoensis* occurs on Niue Island, 300 miles southeast of its nearest locality in Samoa.

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