



Research article

***Cyrtandra argentii*, a new species of *Cyrtandra* (Gesneriaceae) from the Philippines, and a review of the *C. villosissima* group**

Jay Edneil C. OLIVAR^{1,*}, Hannah J. ATKINS², Frank HAUENSCHILD^{1,3} &
Alexandra N. MUELLNER-RIEHL^{1,4}

¹Department of Molecular Evolution and Plant Systematics & Herbarium (LZ), Institute of Biology,
Leipzig University, Johannisallee 21–23, 04103 Leipzig, Germany.

²Royal Botanic Garden Edinburgh, 20a Inverleith Row, EH3 5LR, United Kingdom.

³Leipzig University, Centre for Teacher Training and School Research, Prager Str. 38–40,
04317 Leipzig, Germany.

⁴German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig, Leipzig, Germany.

*Corresponding author: jay_edneil.olivar@uni-leipzig.de

²Email: HAtkins@rbge.org.uk

³Email: frank.hauenschild@uni-leipzig.de

⁴Email: muellner-riehl@uni-leipzig.de

Abstract. *Cyrtandra argentii* Olivar, H.J. Atkins & Muellner sp. nov., endemic to the Philippines and named after George Argent, is herein described and illustrated. Collections associated with this new species are often confused with three other species, namely *C. ferruginea* Merr., *C. villosissima* Merr., and *C. hirtigera* H.J. Atkins & Cronk. Distinguishing characters including keys, updated descriptions, distribution maps, and photos of live specimens are provided to aid identification of the four species. Following the International Union for the Conservation of Nature (IUCN) criteria, *C. argentii* sp. nov. is considered to be Near Threatened (NT) due to its distribution in a zone susceptible to anthropogenic pressure and the lack of any formal protection.

Keywords. *Cyrtandra*, *C. argentii* sp. nov., George Argent, IUCN, Philippines.

Olivar J.E.C., Atkins H.J., Hauenschild F. & Muellner-Riehl A.N. 2020. *Cyrtandra argentii*, a new species of *Cyrtandra* (Gesneriaceae) from the Philippines, and a review of the *C. villosissima* group. *European Journal of Taxonomy* 676: 1–15. <https://doi.org/10.5852/ejt.2020.676>

Introduction

Cyrtandra J.R. Forst. & G. Forst. (Forster & Forster 1775) is the largest genus of ca 800 spp. in the family Gesneriaceae Rich. & Juss. (de Candolle 1816). The genus is recognized by possessing two fertile stamens and fruits that are indehiscent, either hard capsules or fleshy berries (Cronk *et al.* 2005; Atkins *et al.* 2013). Members of the genus exhibit diverse growth forms, ranging from herbs and shrubs, to climbers and small trees distributed throughout the Malesian region and across the Pacific (Johnson *et al.* 2017; Kartonegoro *et al.* 2018). Species of *Cyrtandra* are important rainforest elements, thriving in habitats with high humidity, low light intensity, and constant moisture supply (Gillett 1967). Despite a

continuous distributional range, the genus shows high levels of local endemism exhibiting high degrees of ecological specialization, making it an ideal candidate to address hypotheses on speciation, patterns of diversification, and community assembly (Atkins *et al.* 2001; Bramley *et al.* 2004; Clark *et al.* 2009; Johnson *et al.* 2019).

In recent years, several studies (Wagner *et al.* 2001; Bramley *et al.* 2003; Atkins 2004; Bramley 2005; Lorence & Perlman 2007; Bone & Atkins 2013; Johnson 2017; Kartonegoro *et al.* 2018; Atkins *et al.* 2019; Nishii *et al.* 2019) have led to an increase in numbers of species of *Cyrtandra*. These studies emphasized the urgency to document and understand the biodiversity of cyrtandras before they succumb to anthropogenic pressures. However, little is still known about the taxonomy of members in areas which are considered centers of biodiversity for the genus. Atkins *et al.* (2013) estimated a high species richness on Borneo, in the Philippines and on New Guinea. Understanding species boundaries of members from these areas is becoming increasingly important for examining biological trends of adaptation and speciation, and facilitating ecosystem and species conservation assessments.

For the Philippines, a comprehensive account of *Cyrtandra* spp. was published by Merrill (1922) in his *An Enumeration of Philippine Flowering Plants* noting 83 species, of which only *C. oblongifolia* C.B. Clarke (de Candolle & de Candolle 1883) was listed as not endemic. Atkins & Cronk (2001) revised Philippine cyrtandras from the island of Palawan, describing seven new species and indicating that *C. elatostemoides* Elmer (Elmer 1913) is also found on Borneo. Both accounts were considered in an updated checklist of Philippine cyrtandras available through ‘Co’s Digital Flora of the Philippines’ (Pelser *et al.* 2011 onwards). A taxonomic revision of Philippine cyrtandras, however, addressing species boundaries, distributions, and descriptions is yet to be achieved.

Atkins & Cronk (2001) noted the striking vegetative similarities between *C. villosissima* Merr. (Merrill 1906) from the island of Mindanao and a 1922 collection by Merrill from the island of Palawan which he labeled *C. woodii* Merr. ined. with no accompanying publication. Similarities include an erect suffrutescent habit, and large leaves that are slightly falcate and densely hirsute. However, in Merrill’s 1922 *Enumeration of Philippine Plants* the name *C. woodii* did not appear, and the distribution of *C. villosissima* was extended to Palawan, which according to Atkins & Cronk (2001) seems to provide evidence for Merrill’s decision to ‘sink’ his *C. woodii* into *C. villosissima*. Increased sampling in the locality of *C. woodii* led to collections with reproductive structures that show the species’ distinctness from *C. villosissima*. This ultimately led to the description of *C. hirtigera* H.J. Atkins & Cronk (Atkins & Cronk 2001), favoring a new name to prevent confusion with the Bornean *C. woodsii* B.L. Burtt (Burtt 1970). In the course of an ongoing research project, aimed at the taxonomic revision of Philippine cyrtandras, it was found that *C. ferruginea* Merr. (Merrill 1915) and a series of collections from Mindoro and the Aurora Province housed at the Royal Botanic Garden Edinburgh (RBGE) share similar vegetative characters with *C. villosissima*. As a result, identification of several herbarium specimens was found to be intermediate between *C. villosissima* and *C. ferruginea*, without a clear distinction being possible between the two when no additional reproductive characters were present. In this paper, species sharing the character combination of an erect suffrutescent habit and large leaves that are slightly falcate and densely hirsute, are referred to as the *C. villosissima* group. Members of this group are *C. ferruginea*, *C. hirtigera*, *C. villosissima*, and *C. argentii* sp. nov. Our study aims at clarifying the differences between these species through keys and photographs, and provides a description and diagnosis for a new species often misidentified as either *C. ferruginea*, *C. villosissima*, or *C. hirtigera*.

Material and methods

Data for this study were derived from herbarium specimens including their corresponding field notes, photographs, and field observations. Whenever available, living collections housed at the Royal Botanic Garden Edinburgh (RBGE) were consulted and reproductive characters and measurements were

Table 1. Diagnostic characters separating the four studied species.

	<i>C. argentii</i> sp. nov.	<i>C. ferruginea</i>	<i>C. hirtigera</i>	<i>C. villosissima</i>
Distribution	Sierra Madre Mountain Range to Mindoro Island	Catanduanes, Mt Bulusan, Mt Isarog, Mt Mayon	Palawan	Negros Island to Mindanao Island
Indumentum color	White all throughout	Ferruginous	Crimson or pale white	Ferruginous
Leaf symmetry	Subequal	Anisophyllous	Subequal	Subequal
Inflorescence type	Compound cyme	Cyme	Cyme	Cyme
Inflorescence attachment	Pedunculate	Pedunculate	Subsessile	Subsessile
No. of flowers per inflorescence	10–15	1–3	4–many-flowered	4–many-flowered
Calyx hirsuteness	Densely hirsute externally, glabrous internally	Densely hirsute externally, with glandular hairs internally at base of lobes	Densely hirsute externally, with scattered glandular hairs internally and prominent tufts of hairs at the base	Densely hirsute
Calyx lobes shape	Acuminate	Acuminate	Acute or narrowly acuminate	Linear
Corolla color	White	White	Dull reddish orange or yellowish green	Red
Corolla hirsuteness	Glabrous externally and internally	Densely hirsute, with glandular hairs internally	Glandular hairs externally and internally	Densely hirsute
Calyx persistence	Persistent entirely enclosing the fruit	Persistent entirely enclosing the fruit	Not persistent	Persistent
Style persistence	Persistent	Persistent	Not persistent	Persistent

recorded from material preserved in alcohol. All Philippine *Cyrtandra* deposited at AAH, BM, BO, E, GH, K, L, NY, P, PNH, and US were consulted through visits to these herbaria and access to digital images. Herbaria acronyms follow *Index Herbariorum* (Thiers, continuously updated). Descriptions follow schemes of recently published accounts of new species (Atkins & Cronk 2001; Johnson 2017; Kartonegoro *et al.* 2018; Atkins *et al.* 2019). Assessment of Conservation Status was implemented using GeoCAT (Bachman *et al.* 2011), following the IUCN Red List Category criteria (IUCN Standards and Petitions Subcommittee 2017).

Results

Cyrtandra ferruginea, *C. villosissima*, *C. hirtigera*, and the new species described here share the following characteristics: erect suffrutescent habit and large slightly falcate and densely hirsute opposite leaves. There exist minute differences in their vegetative characters and they are presented in the key. Table 1 details more differences between the studied species. The studied species primarily differ, vegetatively, in color of indumentum and leaf symmetry. *Cyrtandra argentii* sp. nov. is distinct among the three species by having a white indumentum, and *C. ferruginea* is distinct by having pronouncedly anisophyllous leaves. Ultimately, the species are distinguishable by calyx and inflorescence type, corolla color and, to some degree, by geographic distribution (Fig. 1). *Cyrtandra hirtigera* is restricted

to the island of Palawan and *C. villosissima* is found in Mindanao extending to Negros Island. Only *C. ferruginea* and *C. argentii* sp. nov. occur on Luzon island.

Class Magnoliopsida Brongn. (Brongniart 1843)
Order Lamiales Bromhead (Bromhead 1838)
Family Gesneriaceae Rich. & Juss. (de Candolle 1816)

Genus *Cyrtandra* J.R.Forst. & G.Forst. (Forster & Forster 1775)

Key to the studied species

1. Mature leaves anisophyllous (i.e., smaller leaves less than half the length of the larger leaves in a pair) *C. ferruginea* Merr.
– Mature leaves subequal 2
2. Indumentum white; inflorescences pendulous and pedunculate
..... *C. argentii* Olivar, H.J. Atkins & Muellner sp. nov.
– Indumentum ferruginous; inflorescences erect and subsessile 3
3. Calyx divided almost to the base; corolla red *C. villosissima* Merr.
– Calyx fused for half or more of its length; corolla yellowish green or dull reddish orange
..... *C. hirtigera* H.J. Atkins & Cronk

Cyrtandra argentii Olivar, H.J. Atkins & Muellner sp. nov.

[urn:lsid:ipni.org:names:77209562-1](https://nomenclature.ipni.org/names/77209562-1)

Figs 1, 2, 3A, 4A

Diagnosis

The species' pendulous compound cymose inflorescences (10–15 flowers) distinguish it from all other members of the genus in the Philippines. The combination of subequal leaves, white woolly indumentum, glabrous corolla, and ovoid fruit separates this species from the rest of the *C. villosissima* group.

Etymology

This species is named after George Argent who was part of the team that collected specimens at the type locality. George's contribution to our knowledge of the Philippine flora is undisputed. His extensive fieldwork in the country has led to the discovery of several new species, recognition of important conservation areas, and promotion of biodiversity studies.

Material examined

Type

PHILIPPINES • Mindoro Island, Oriental Province, Mt Halcon; 600 m; 13 Mar. 1997; *Mendum, M., Argent, C.G.C., Pennington, R.T., Wilkie, P., Reynoso, E.J., Gaerlan, F.* 29053 (holotype: E!; isotype: PNH).

Additional material

PHILIPPINES • Mt Halcon, Mindoro; 12 May 1986; *C.E. Ridsdale* 1762 (K000223279, L.2822762) • *ibid.*; 1 Apr. 1991; *Stone, Reynoso, Sagcal* 504 (K000223280, L.2822797, US00737625) • *ibid.*; 13 Mar. 1997; *Argent, Gaerlan, Reynoso* 20053 (L.3805692) • Sierra Madre Mountains, Baler Aurora; 25 Mar. 1968; *Jacobs, M.* 8002 (L.2822694) • Aurora National Park; 8 Mar. 1993; *Barbon, Garcia, Fernando*

9121 (K000223281, L.3794225) • Llavac, Infanta, Quezon Province; 25 Jun. 1955; *Lagrimas*, M. 521 (L.2822646).

Description

An erect suffrutescent plant up to 3 m in height. *Stems* terete or slightly grooved, with white woolly hairs throughout. *Leaves* opposite, subequal; petioles 4–7 cm long, densely hirsute; blades 13–30 × 7–15 cm, oblong to oblong-elliptic, slightly falcate, apex attenuate, base rounded to oblique, pronouncedly asymmetrical, not decurrent, margins denticulate, 10–12 pairs of lateral veins, curving and uniting at the margins, densely hirsute on both sides. *Inflorescences* compound cymes, axillary, pendulous, pedunculate, with 10–15 flowers; peduncle 5–6 cm, densely hirsute; bracts green, ca 9 × 2 mm, lanceolate, densely hirsute on both surfaces, persistent; bracteoles on every point of branching, lanceolate, green, ca 5 × 2 mm, densely hirsute on both surfaces; pedicels 3–5 cm long, densely hirsute. *Calyx* tubular, pale green, ca 15 mm long, upper lobes ca 4 mm long, lower lobes ca 6 mm long, acuminate, densely hirsute externally, glabrous internally. *Corolla* white, ca 30 mm long, funnel-shaped, lobes suborbicular, upper lobes, 10–12 × 5 mm, lateral lobes 7 × 7 mm, lower lobes 8 × 8 mm, 3–4 × 1–2 mm; glabrous externally and internally, lobes slightly recurved. *Stamens* 2; filaments ca 12 mm long, attached ca 17 mm from base of corolla, glabrous; anthers ca 2.5 mm long, thecae parallel, coherent at apices; staminodes 3, lateral staminodes ca 3 mm long, central staminode ca 0.5 mm long. *Gynoecium* ca 20 mm long overall; disc cupular with entire margin, ca 1.5 mm long, glabrous; ovary ca 6 mm long, glabrous, with some eglandular hairs towards base of style; style ca 14 mm long, with eglandular hairs throughout; stigma

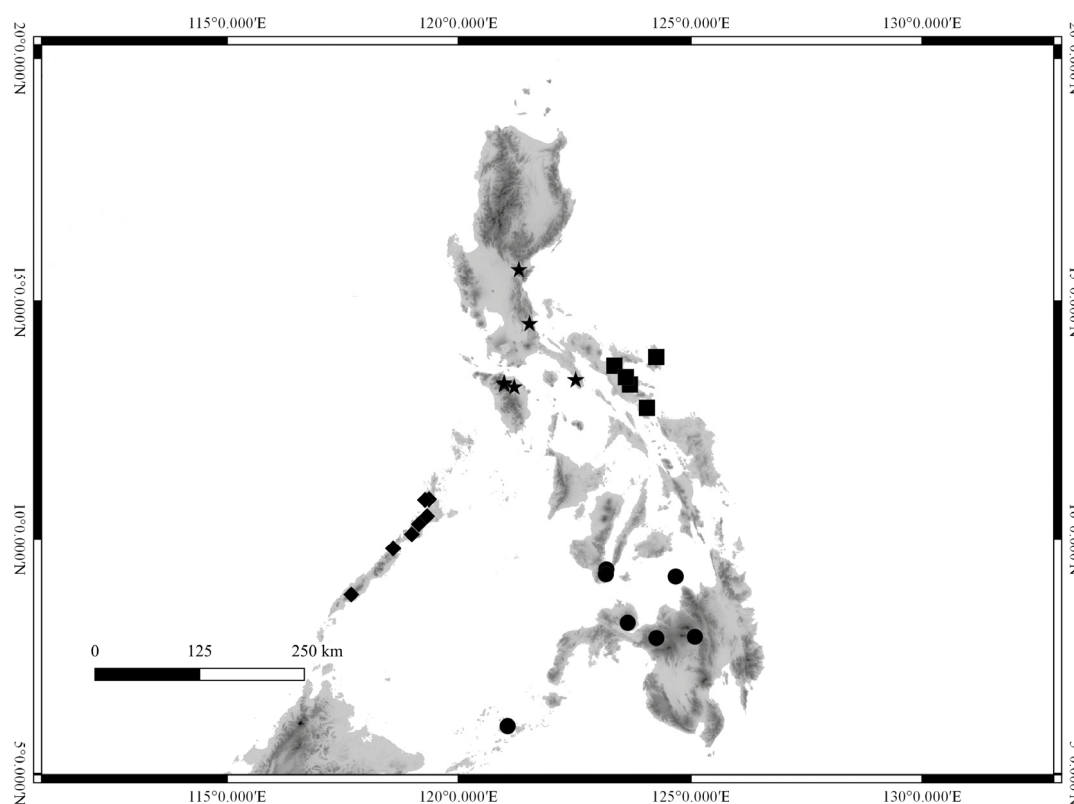


Fig. 1. Map of the Philippines showing known distributions of *Cyrtandra argentii* Olivar, H.J. Atkins & Muellner sp. nov. (★), *C. ferruginea* Merr. (■), *C. hirtigera* H.J. Atkins & Cronk (◆), and *C. villosissima* Merr. (●) based on collection localities. A single point may represent more than one collection.

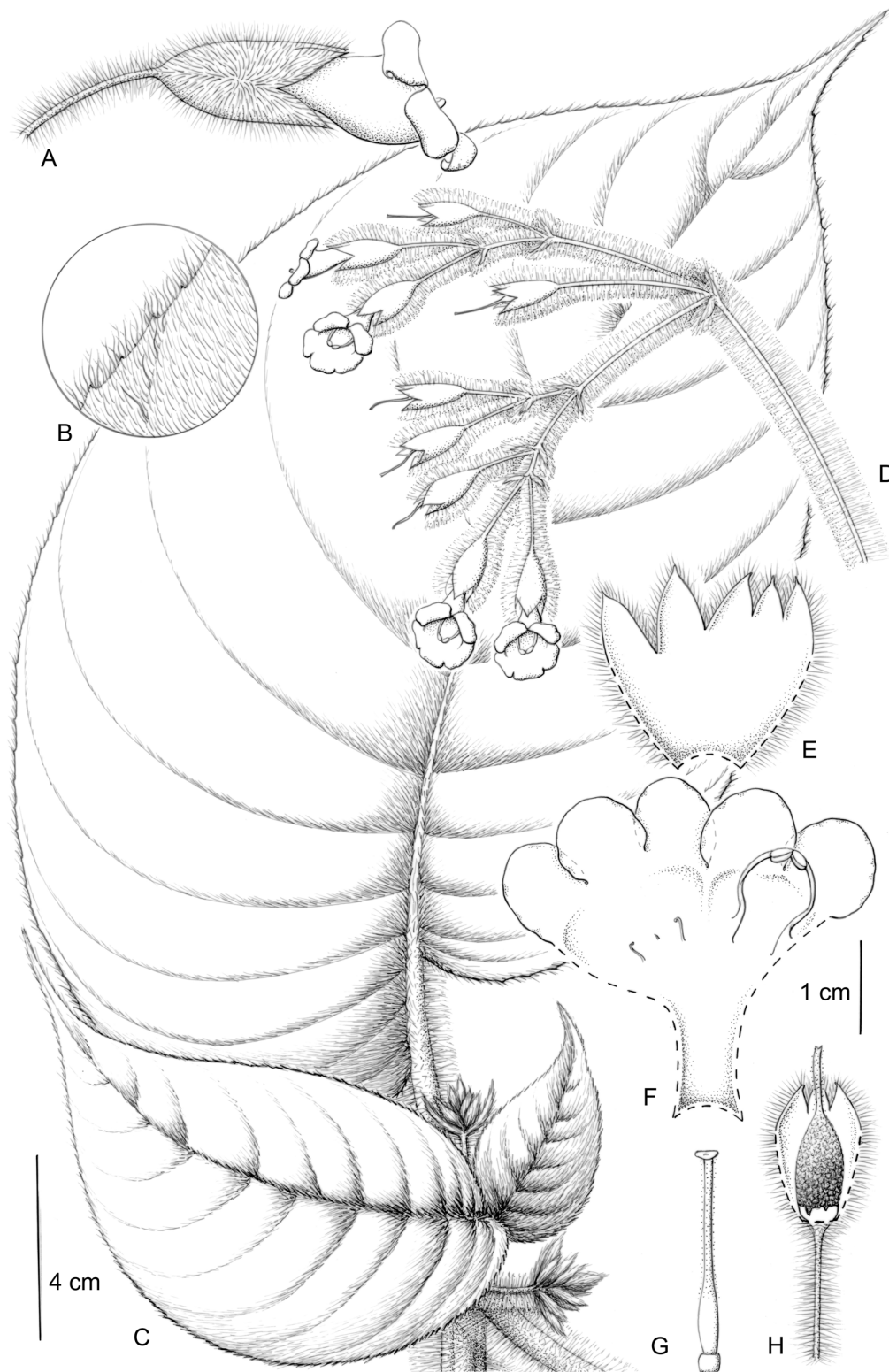


Fig. 2. *Cyrtandra argentii* Olivar, H.J. Atkins & Muellner sp. nov. **A.** Flower, lateral view. **B.** Detail of upper leaf surface. **C.** Habit. **D.** Inflorescence. **E.** Calyx, longitudinal section. **F.** Corolla, longitudinal section. **G.** Gynoecium. **H.** Fruit enclosed by the persistent calyx. Drawn from *Mendum et al. 29053* deposited at E. Habit, inflorescence, fruit and leaf indumentum drawn from dried material. Flower parts all from material preserved in alcohol. Drawing by Claire Banks.

bilobed, ca 2.5 mm across. *Fruits* ovoid, green, glabrous, verrucose, ca 12 × 5 mm, excluding the style; calyx persistent and entirely enclosing the fruit, style persistent.

Distribution and habitat

Cyrtandra argentii sp. nov. is found growing on slopes near streams in primary forests. This species is distributed from the north of Luzon to the island of Mindoro.

Conservation status

Cyrtandra argentii sp. nov. occurs at an elevation of 600–800 m a.s.l. which corresponds to the forest land use zone (Villanueva & Buot Jr 2018). Using the online GeoCAT conservation assessment tool (<http://geocat.kew.org/>), the proposed conservation category based on Extent of Occurrence (EOO) is Near Threatened (NT), and the category based on the estimated Area of Occupancy (AOO) calculated using the default 2 × 2 km grid is Endangered (EN). Here, we consider this species' status as NT due to: i) its occurrence in close proximity to the agroforest land use zone, the latter at approximately 100–400 m a.s.l. (Villanueva & Buot Jr 2018); and ii) the fact that the forest areas wherein the species occurs are not declared protected by law (Biodiversity Management Bureau 2015), making it highly susceptible to population decline through deforestation and other anthropogenic activities.

Notes

Like many species of *Cyrtandra*, filaments of *C. argentii* sp. nov. recoil into the corolla tube after anther dehiscence. This is hypothesized as constituting a mechanism against self-pollination (Bramley *et al.* 2003). The length of the style also varies developmentally, the style can be either exerted or inserted depending on the stage of maturity of the flower.

Cyrtandra ferruginea Merr. (Merrill 1915)

Figs 1, 3B, 4B

Material examined

Type

PHILIPPINES • Luzon, Camarines, Mt Cauayan; 9 Dec. 1913; *Phil. Pl. Ramos 1548* (syntypes: BM!, GH!, NY!, P!, US!).

Additional material

PHILIPPINES • Mt Isarog, Camarines Sur; Aug. 1915; *Ramos 23554* (US00081328) • *ibid.*; 22 Mar. 1997; *Mendum et al. 29182* (E00057041) • *ibid.*; 23 Mar. 1997; *Argent et al. 20182* (L.3805694) • Mt Bulusan, Sorsogon; Dec. 1915; *Elmer 16074* (L.2818244, US00081329, U.1341267, P03884333) • *ibid.*; 19 Jun. 1958; *Sinclair 9624* (E00631523) • Mt Mayon, Albay; 15 Nov. 1991; *Reynoso, Romero & Fuentes 3584* (E00316099) • Catanduanes; 11 Dec. 1917; *Ramos 30288* (US00081330, P03884332) • Mt Malinao, Albay; 29 Oct. 1995; *Reynoso, Sagcal & Fernando 21406* (L.3805666).

Description

An erect suffrutescent plant up to 1 m in height. *Stems* terete with ferruginous hairs all throughout. *Leaves* opposite, anisophyllous; petioles 4–7 cm long, densely hirsute; blades ca 20 × 12 cm, oblong to oblong-elliptic slightly falcate, apex acute or slightly acuminate, base acute or rounded, pronouncedly asymmetrical, not decurrent, margins denticulate, 10 pairs of lateral veins, curving and uniting at the margin, densely hirsute on both sides; blades of smaller leaves of a pair 6.5–9 × 2–2.5 cm, resembling the major leaves in all other respects. *Inflorescences* cymose, axillary, erect, pedunculate, with 1–3 flowers; peduncle 2–3 cm long, densely hirsute; bracts green, ca 10 × 1 mm, linear lanceolate, densely hirsute

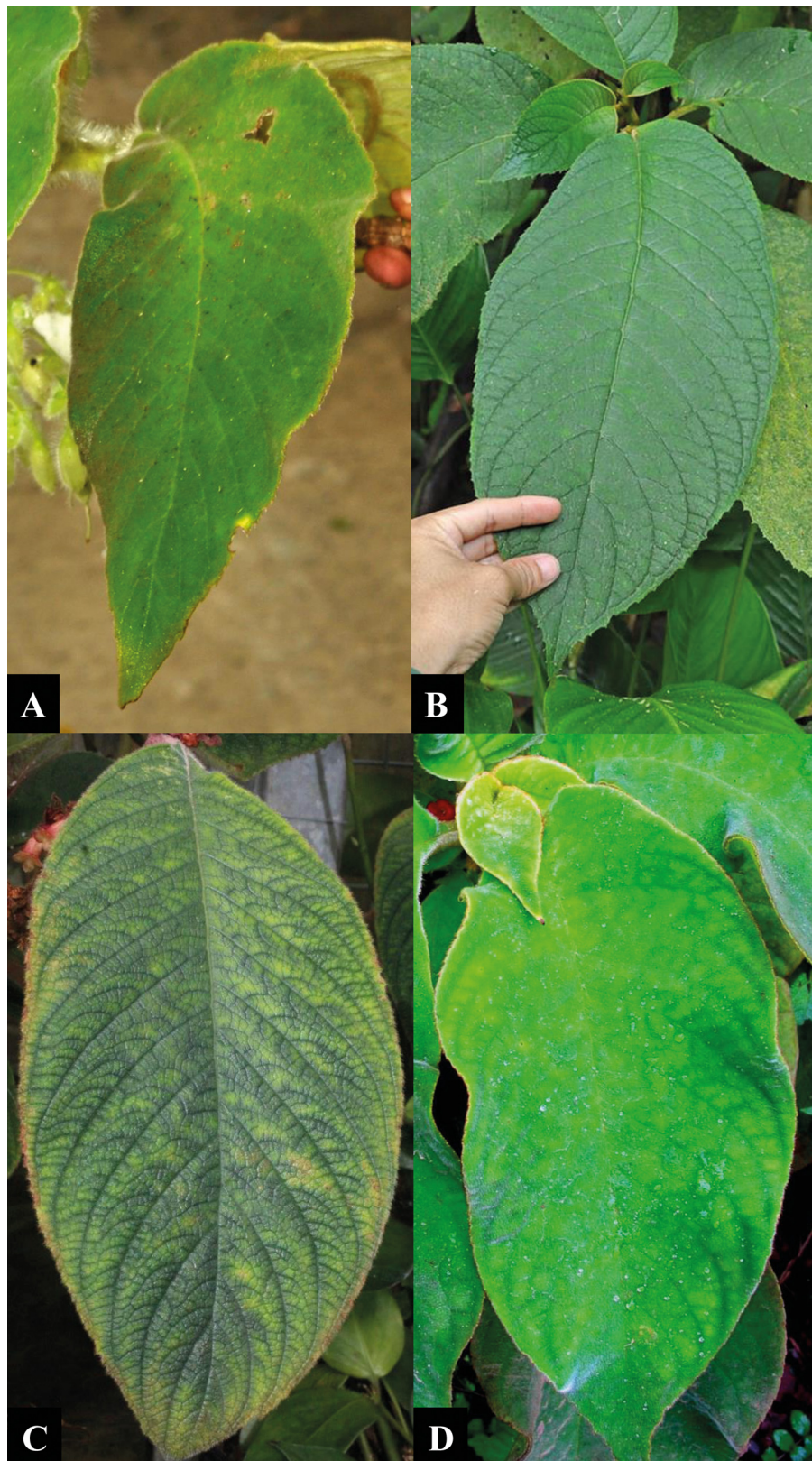


Fig. 3. Leaf similarities. **A.** *C. argentii* Olivar, H.J. Atkins & Muellner sp. nov. **B.** *C. ferruginea* Merr. **C.** *C. hirtigera* H.J. Atkins & Cronk. **D.** *C. villosissima* Merr. Photos taken from *Co's Digital Flora* with permission (Pelser *et al.* 2011 onwards).

on both surfaces, persistent. *Calyx* tubular, pale green, 20–30 mm long, upper lobes ca 3 mm long, lower lobes ca 7 mm long, acuminate, densely hirsute externally, with glandular hairs internally at base of lobes. *Corolla* white, 50–65 mm long, funnel-shaped, upper lobes rounded, ca 8×9 mm, lower and lateral lobes rounded, ca 5×6 mm, densely hirsute, with glandular hairs internally, lobes slightly recurved. *Stamens* 2; filaments ca 10 mm long, attached ca 18 mm from base of corolla, sparsely covered with glandular hairs; anthers ca 1.5 mm long, thecae parallel, coherent at apices; staminodes 3, lateral staminodes ca 4 mm long, central staminode ca 1 mm long. *Gynoecium* ca 25 mm long overall; disc cupular with undulate margin, ca 2 mm long, glabrous; ovary 8–9 mm long, with glandular hairs throughout; style ca 12 mm long, with glandular hairs throughout; stigma bilobed, ca 1 mm across. *Fruits* lanceolate, green, hirsute, verrucose, 30–40×6 mm; calyx persistent and entirely enclosing the fruit, style persistent.

Distribution and habitat

Cyrtandra ferruginea is found growing in damp forests at approximately 500–800 m a.s.l. and can be found on Catanduanes, Mt Isarog, Mt Mayon, Mt Malinao and Mt Bulusan (Fig. 1).

Notes

Cyrtandra ferruginea is morphologically most similar to *C. argentii* sp. nov., but can be separated by the following characters: ferruginous anisophyllous leaves, 1–3 flowered simple cymes, and hirsute corolla.

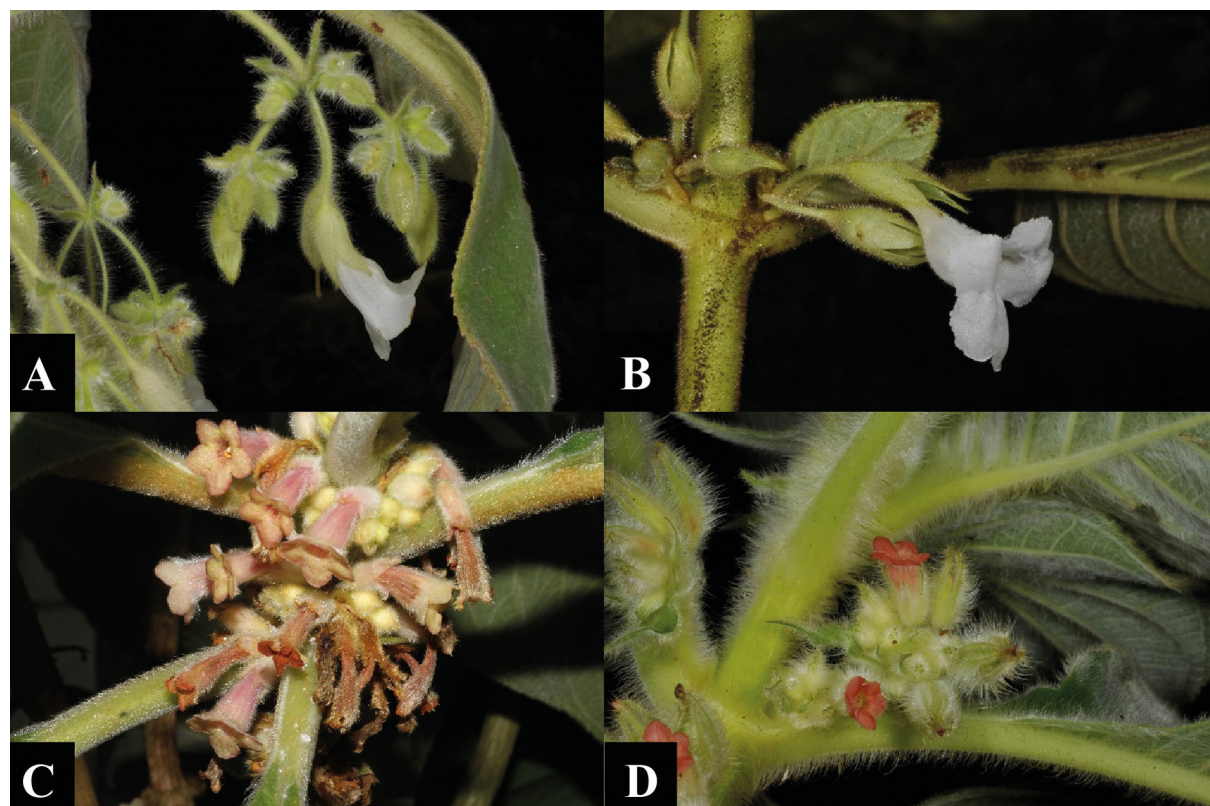


Fig. 4. Inflorescence types. **A.** *C. argentii* Olivar, H.J. Atkins & Muellner sp. nov. **B.** *C. ferruginea* Merr. **C.** *C. hirtigera* H.J. Atkins & Cronk. **D.** *C. villosissima* Merr. A, B & D from *Co's Digital Flora* with permission (Pelser *et al.* 2011 onwards). C from a living collection in RBGE.

Cyrtandra hirtigera H.J. Atkins & Cronk (Atkins & Cronk 2001)
Figs 1, 3C, 4C

Material examined

Type

PHILIPPINES • Palawan, Cleopatra's Needle; 29 Jan. 1998; *Cronk et al.* 25433 (holotype: PNH!; isotypes: E!, K!, L!).

Additional material

PHILIPPINES • San Vicente, Palawan; 4 Aug. 1988; *Soejarto & Madulid* 6353 (L.2818243) • Mt Beaufort, Palawan; 12 Mar. 1984; *Ridsdale SMHI* 23 (L.2818051) • Pagdanan Range, Palawan; 22 Apr. 1984; *Podzorski SMHI* 934 (L.2818049) • Mt Mantalingahan, Palawan; 5 May 1948; *Edaño* 122 (L.2818048) • *ibid.*; 4 Mar. 1992; *Argent & Romero* 9666 (L.3805814) • Malampaya Bay, Palawan; Oct. 1922; *Merrill* 11573 (US00081506) • Mt Capoas, Palawan; Apr. 1913; *Merrill* 9500 (US00081487) • Palawan; Apr. 1906; *Foxworthy* 581 (US00081485, P03899657) • Taytay, Palawan; 31 Jan. 1991; *Stone* 327 (L.2822680).

Description

An erect suffrutescent plant, up to 2–2.5 m in height. *Stems* terete, with crimson or white hairs throughout. *Leaves* opposite, subequal; petioles 5–8 cm long, densely hirsute; blades 22–30 × 15–18 cm, broadly elliptic, slightly falcate, apex acuminate, base cuneate, not decurrent, margins denticulate, 12–14 pairs of lateral veins, curving and uniting at the margins, densely hirsute on both sides. *Inflorescences* cymous, axillary, erect, subsessile, with 4–many flowers; peduncle 4–5 mm, densely hirsute; bracts green, ca 1 cm × 5 mm, lanceolate, densely hirsute on both surfaces, persistent; bracteoles up to 5 mm long, densely hirsute on both surfaces; pedicels ca 5 mm long, densely hirsute. *Calyx* tubular, red or green, ca 1–1.5 cm long, lobes ca 5 mm long, lower lobes ca 6 mm long, acute or narrowly acuminate, densely hirsute externally, with scattered glandular hairs internally and has prominent tufts of hairs at the base. *Corolla* dull reddish orange or yellowish green, ca 2 cm long, funnel-shaped, lobes slightly bilabiate or subequal, upper lobes, 1–1.5 × 2 mm, lateral lobes 1 × 1.5 mm, lower lobes 2 × 1.5 mm; glandular hairs externally and internally. *Stamens* 2; filaments ca 1–1.5 cm long, attached ca 12–13 mm from base of corolla, glabrous; anthers ca 2 mm long, thecae parallel, coherent at apices; staminodes 2, 5–8 mm long. *Gynoecium* ca 20 mm long overall; disc cupular with undulate margin, ca 1.5 mm long, glabrous; ovary ca 4–5 mm long, glabrous; style ca 10 mm long, with eglandular hairs throughout; stigma bilobed, ca 2.5 mm across. *Fruits* ovoid, green, glabrous, ca 1 cm × 5 mm; inflorescence bracts persistent, calyx and style not persistent.

Distribution and habitat

Cyrtandra hirtigera is distributed throughout the island of Palawan and is usually found on slopes near gullies at 30–900 m a.s.l.

Notes

Atkins & Cronk (2001) described two varieties of this species, *C. hirtigera* var. *hirtigera* and *C. hirtigera* var. *chlorina*, distinguishable by color and shape of their calyces and corolla limbs. *Cyrtandra hirtigera* var. *hirtigera* has a crimson indumentum, red calyces with acute lobe apices, and reddish orange corollas with slightly bilabiate limbs. *Cyrtandra hirtigera* var. *chlorina* has pale indumentum, green calyces with acuminate lobe apices, and yellowish green corollas with subequal lobes.

Cyrtandra villosissima Merr. (Merrill 1906)

Figs 1, 3D, 4D

Material examined

Type

PHILIPPINES • Mindanao, Camp Keithley, Lake Lanao; Jan. 1906; *Mrs Clemens 51* (holotype: AAH!; isotypes: F!, US!).

Additional material

PHILIPPINES • Mt Malindang, Misamis Occidental; 16 Mar. 2004; *Opiso et al. 2088* (L.3794253) • *ibid.*; May 1993; *Gaerlan et al. 10925* (K000184579, L.3794112) • Mt Hibok-Hibok, Camiguin; 1999; *RBGE & PNH 48* (E00743749) • Lake Balunsasayao, Negros Oriental; 11 Sep. 1953; *Britton 357* (L.2826671) • Cuernos Mountains, Negros Oriental; 13 May 1948; *Edaño 7393* (AAH00092001) • *ibid.*; Mar. 1908; *Elmer 9511* (L.2826672, US00081486) • Mahilucot River, Bukidnon; Jul. 1920; *Ramos & Edaño 38649* (L.2826670, US00081488) • Mt Daho, Jolo; Sep. 1924; *Ramos & Edaño 43913* (P03899658).

Description

An erect suffrutescent plant up to 7 m in height. *Stems* terete or slightly grooved, with ferruginous woolly hairs throughout. *Leaves* opposite, subequal; petioles 3–5 cm long, densely hirsute; blades 11–20 × 3.5–8 cm, oblong-ovate to ovate-lanceolate, slightly falcate, apex acuminate, base acute or acuminate, pronouncedly asymmetrical, not decurrent, margins denticulate, 12–14 pairs of lateral veins, curving and uniting at the margins, densely hirsute on both sides. *Inflorescences* cymous, axillary, erect, subsessile, with 4–many flowers; peduncle 4–5 mm, densely hirsute; bracts green, ca 1 cm, linear, densely hirsute on both surfaces, persistent; bracteoles up to 5 mm long, densely hirsute on both surfaces; pedicels ca 5 mm long, densely hirsute. *Calyx* tubular, pale green, lobes linear ca 1.5 cm × 1 mm, densely hirsute. *Corolla* red, ca 18 mm long, funnel-shaped, lobes orbicular-ovate ca 4 mm long, densely hirsute. *Stamens* 2; filaments ca 2 mm long; anthers ca 2.5 mm long, thecae parallel, coherent at apices. *Gynoecium* ca 20 mm long overall, densely hirsute; disc cupular, glabrous; style densely hirsute. *Fruits* oblong, green, densely hirsute, ca 1 cm × 4.5 mm; calyx and style persistent.

Distribution and habitat

Cyrtandra villosissima is distributed throughout the island of Mindanao and extends to the island of Negros in the Visayas and is usually found in well-shaded areas near ravines.

Notes

Cyrtandra villosissima is vegetatively similar to *C. hirtigera*. It is distinguishable by its red corolla and green calyces with distinctly linear lobes. Based on available distribution data, *C. hirtigera* appears to be restricted to the island of Palawan while *C. villosissima* can be found from Negros Island to the island of Mindanao.

Discussion

The recognition of *C. argentii* sp. nov. as a new species was here aided by increased availability of collections with reproductive parts and continued alpha-taxonomic work. This highlights the importance of reproductive characters in establishing species boundaries among *Cyrtandra* species. In phylogenetic analyses of the Southeast Asian *Cyrtandra* (Atkins *et al.* 2020), the *C. villosissima* group was not resolved as monophyletic; only *C. villosissima* and *C. hirtigera* belonged to the same subclade, but were not resolved as exclusive sister taxa. The character combination of erect suffrutescent habit with large leaves that are slightly falcate and densely hirsute has evolved at least three times independently (Atkins

et al. 2020). Figure 3 shows this shared character combination and Fig. 4 shows the inflorescence type that ultimately distinguishes the species from each other.

The genus *Cyrtandra* is the most taxonomically challenging in the Gesneriaceae due to its large number and high proportion of poorly known and undescribed species (Burt 2001; Atkins *et al.* 2013; Clark *et al.* 2013). Atkins *et al.* (2013) estimated 800 species of *Cyrtandra*. Since then, several authors (Bone & Atkins 2013; Johnson 2017; Kartonegoro *et al.* 2018; Atkins *et al.* 2019) have described additional species. The number of species is expected to increase further as more alpha-taxonomic work and field collection are carried out.

Large genera can be systematically addressed by following a phylogenetically informed taxonomic approach on a region-by-region basis (Atkins *et al.* 2013; Clark *et al.* 2013). This has been applied effectively by Bramley (2005) in a revision of *Cyrtandra* section *Dissimiles* in Borneo. The approach involves a robustly sampled phylogenetic tree wherein monophyletic clades can be characterized morphologically by one or more salient characters (Atkins *et al.* 2013; Clark *et al.* 2013). Taxa with molecular data can be assigned to the clades while taxa lacking molecular data can be tentatively assigned based on morphological similarities. Upon assignment to a clade, taxonomic assessment can be streamlined by focusing on related taxa identified through both morphological and molecular data, therefore limiting the number of potential conspecifics for comparison. Areas, particularly archipelagos, with high diversity can benefit from this approach since it provides a systematic way of prioritizing areas where additional fieldwork and alpha-taxonomic work are most needed. Clark *et al.* (2013) suggest that phylogenetically defined areas can be addressed taxonomically first, followed by increased sampling in lesser-resolved areas. This strategy is currently being applied to study the genus in the Philippines with the aim of producing a complete revision of *Cyrtandra* in the archipelago (Olivar *et al.*, in preparation).

Acknowledgements

This research received support from the SYNTHESYS Project <http://www.synthesys.info/> which is financed by European Community Research Infrastructure Action under the FP7 ‘Capacities’ Program. Financial support for this study was also provided by the Deutscher Akademischer Austauschdienst (DAAD project no. 91690870) to JECO and ANM-R, and the Federal Ministry of Education and Research (BMBF project no. 16GW0120K) to ANM-R. Mr Danilo Tandang from PNH is acknowledged for his help with the types. Curators of AAH, BM, BO, E, GH, K, L, NY, P, PNH, and US are acknowledged for their assistance during visits, loans, and digital images. Nathan Kelso, Sadie Barber and Stephen Willis are thanked for their excellent care of the Gesneriaceae living collections at RBGE and Claire Banks is thanked for the detailed botanical illustration of the new species.

References

- Atkins H.J. 2004. The Gesneriaceae of Sulawesi II: Seven new species of *Cyrtandra*. *Edinburgh Journal of Botany* 60 (3): 305–321. <https://doi.org/10.1017/s096042860300026x>
- Atkins H.J., Bramley G.L.C. & Clark J.R. 2013. Current knowledge and future directions in the taxonomy of *Cyrtandra* (Gesneriaceae), with a new estimate of species number. *Selbyana* 31 (2): 157–165. Available from <https://www.jstor.org/stable/24894287> [accessed 2 Jun. 2020].
- Atkins H.J., Bramley G.L.C., Johnson M.A., Kartonegoro A., Nishii K., Kokubugata G., Möller M. & Hughes M. 2020. A molecular phylogeny of Southeast Asian *Cyrtandra* (Gesneriaceae) supports an emerging paradigm for Malesian plant biogeography. *Frontiers of Biogeography* 12 (1). <https://doi.org/10.21425/F5FBG44184>
- Atkins H.[J.] & Cronk Q.C.B. 2001. The genus *Cyrtandra* (Gesneriaceae) in Palawan, Philippines. *Edinburgh Journal of Botany* 58 (3): 443–458. <https://doi.org/10.1017/s0960428601000762>

- Atkins H.J., Heatubun C.D., Galloway L. & Bramley G.L.C. 2019. Two new species, *Cyrtandra bungahijau* and *C. vittata*, and notes on *Cyrtandra* (Gesneriaceae) from Yapen Island, Indonesia. *Kew Bulletin* 74 (2): 29. <https://doi.org/10.1007/s12225-019-9817-2>
- Atkins H.J., Preston J. & Cronk Q.C.B. 2001. A molecular test of Huxley's line: *Cyrtandra* (Gesneriaceae) in Borneo and the Philippines. *Biological Journal of the Linnean Society* 72 (1): 143–159. <https://doi.org/10.1111/j.1095-8312.2001.tb01306.x>
- Bachman S., Moat J., Hill A.W., De Torre J. & Scott B. 2011. Supporting Red List threat assessments with GeoCAT: geospatial conservation assessment tool. *ZooKeys* (150): 117–126. <https://doi.org/10.3897/zookeys.150.2109>
- Biodiversity Management Bureau. 2015. *Guidebook to Protected Areas of the Philippines*. Biodiversity Management Bureau, Department of Environment and Natural Resources, Quezon City.
- Bone R.E. & Atkins H.J. 2013. Four new species of *Cyrtandra* (Gesneriaceae) from the Latimojong Mountains, South Sulawesi. *Edinburgh Journal of Botany* 70 (3): 455–468. <https://doi.org/10.1017/s0960428613000152>
- Bramley G.L.C. 2005. Revision of *Cyrtandra* section *Dissimiles* (Gesneriaceae). *Blumea - Biodiversity, Evolution and Biogeography of Plants* 50 (1): 163–189. <https://doi.org/10.3767/000651905x623355>
- Bramley G.L.C., Weber A., Cronk Q.C.B. & Bokhari M.H. 2003. The genus *Cyrtandra* (Gesneriaceae) in Peninsular Malaysia and Singapore. *Edinburgh Journal of Botany* 60 (3): 331–360. <https://doi.org/10.1017/s0960428603000283>
- Bramley G.L.C., Pennington R.T., Zakaria R., Tjitrosoedirdjo S.S. & Cronk Q.C.B. 2004. Assembly of tropical plant diversity on a local scale: *Cyrtandra* (Gesneriaceae) on Mount Kerinci, Sumatra. *Biological Journal of the Linnean Society* 81 (1): 49–62. <https://doi.org/10.1111/j.1095-8312.2004.00283.x>
- Bromhead E.F. 1838. Lamiales. *Magazine of Natural History* 2: 210.
- Brongniart A.T. 1843. Magnoliopsida. *Énumération des Genres de Plantes cultivés au Muséum d'histoire naturelle de Paris* xxvi: 95.
- Burt B.L. 1970. Studies in the Gesneriaceae of the Old World. XXXIII. Some species of *Cyrtandra*, chiefly Bornean. *Notes Royal Botanic Garden Edinburgh* 30: 23–42.
- Burt B.L. 2001. A survey of the genus *Cyrtandra* (Gesneriaceae). *Phytomorphology Golden Jubilee Issue* 51: 393–404.
- Candolle A. de & Candolle C. de 1883. *Monographiae phanerogamarum: Prodromi nunc continuatio, nunc revisio*. Vol. 1–8, G. Masson; vol. 9, Masson & Cie, Paris.
- Candolle A.P. de. 1816. *Essai sur les propriétés médicales des plantes, comparées avec leurs formes extérieures et leur classification naturelle*. Crochard, Paris. <https://doi.org/10.5962/bhl.title.112422>
- Clark J.R., Atkins H.J., Bramley G.L.C., Jolles D.D., Roalson E.H. & Wagner W.L. 2013. Towards a phylogenetically informed taxonomy of *Cyrtandra* (Gesneriaceae) in the Solomon Islands. *Selbyana* 31 (2): 166–183.
- Clark J.R., Wagner W.L. & Roalson E.H. 2009. Patterns of diversification and ancestral range reconstruction in the southeast Asian–Pacific angiosperm lineage *Cyrtandra* (Gesneriaceae). *Molecular Phylogenetics and Evolution* 53 (3): 982–994. <https://doi.org/10.1016/j.ympev.2009.09.002>
- Cronk Q.C., Kiehn M., Wagner W.L. & Smith J.F. 2005. Evolution of *Cyrtandra* (Gesneriaceae) in the Pacific Ocean: the origin of a supertramp clade. *American Journal of Botany* 92 (6): 1017–1024.
- Elmer A.D.E. 1913. Four scores of new plants. *Leaflets of Philippine Botany* V: 1751–1853.

- Forster J.R. & Forster J.G.A. 1775. *Cyrtandra. Characteres Generum Plantarum* 3.
- Gillett G.W. 1967. The genus *Cyrtandra* in Fiji. *Contributions from the United States National Herbarium* 37 (4): 107–159.
- IUCN Standards and Petitions Subcommittee. 2017. *Guidelines for Using the IUCN Red List Categories and Criteria Version 13*. Prepared by the Standards and Petitions Subcommittee. Gland, Switzerland and Cambridge, U.K.
- Johnson M.A. 2017. Four new species of *Cyrtandra* (Gesneriaceae) from the South Pacific Islands of Fiji. *PhytoKeys* 91: 85–104. <https://doi.org/10.3897/phytokeys.91.21623>
- Johnson M.A., Clark J.R., Wagner W.L. & McDade L.A. 2017. A molecular phylogeny of the Pacific clade of *Cyrtandra* (Gesneriaceae) reveals a Fijian origin, recent diversification, and the importance of founder events. *Molecular Phylogenetics and Evolution* 116: 30–48. <https://doi.org/10.1016/j.ympev.2017.07.004>
- Johnson M.A., Pillon Y., Sakishima T., Price D.K. & Stacy E.A. 2019. Multiple colonizations, hybridization and uneven diversification in *Cyrtandra* (Gesneriaceae) lineages on Hawai'i Island. *Journal of Biogeography* 46 (6): 1178–1196. <https://doi.org/10.1111/jbi.13567>
- Kartonegoro A., Bone R. & Atkins H. 2018. Eleven new species of *Cyrtandra* (Gesneriaceae) from Sulawesi, Indonesia. *Edinburgh Journal of Botany* 75 (2): 173–204. <https://doi.org/10.1017/S0960428618000045>
- Lorence D.H. & Perlman S. 2007. A new species of *Cyrtandra* (Gesneriaceae) from Hawai'i, Hawaiian Islands. *Novon: A Journal for Botanical Nomenclature* 17 (3): 357–361. [https://doi.org/10.3417/1055-3177\(2007\)17\[357:ANSOCG\]2.0.CO;2](https://doi.org/10.3417/1055-3177(2007)17[357:ANSOCG]2.0.CO;2)
- Merrill E.D. 1906. New or noteworthy Philippine plants, V. *Philippine Journal of Science* 1 (Supplement): 169–246.
- Merrill E.D. 1915. New or noteworthy Philippine plants, XI. *The Philippine Journal of Science. Section C, Botany* 10: 1–84.
- Merrill E.D. 1922. *An Enumeration of Philippine Flowering Plants*. Bureau of Printing, Manila.
- Nishii K., Kokubugata G., Möller M. & Atkins H.J. 2019. Notes on *Cyrtandra* (Gesneriaceae) from Japan, Taiwan and Batan Island (Philippines). *Edinburgh Journal of Botany* 76 (3): 333–344. <https://doi.org/10.1017/s0960428619000106>
- Pelser P.B., Barcelona J.F. & Nickrent D.L. 2011 onwards. *Co's Digital Flora of the Philippines* [online]. Available from www.philippineplants.org [accessed 2 May 2019].
- Thiers B. continuously updated. *Index Herbariorum* [online]. Available from <http://sweetgum.nybg.org/science/ih/> [accessed 5 May 2019].
- Villanueva E.L.C. & Buot Jr I.E. 2018. Vegetation analysis along the altitudinal gradient of Mt Ilong, Halcon Range, Mindoro Island, Philippines. *Biodiversitas Journal of Biological Diversity* 19 (6): 2163–2174. <https://doi.org/10.13057/biodiv/d190624>
- Wagner W.L., Wood K.R. & Lorence D.H. 2001. A new species of *Cyrtandra* (Gesneriaceae) from Kaua'i, Hawaiian Islands. *Novon* 11 (1): 146–152. <https://doi.org/10.2307/3393224>

Manuscript received: 2 September 2019

Manuscript accepted: 6 January 2020

Published on: 30 June 2020

Topic editor: Frederik Leliaert

Desk editor: Connie Baak

Printed versions of all papers are also deposited in the libraries of the institutes that are members of the *EJT* consortium: Muséum national d'histoire naturelle, Paris, France; Meise Botanic Garden, Belgium; Royal Museum for Central Africa, Tervuren, Belgium; Royal Belgian Institute of Natural Sciences, Brussels, Belgium; Natural History Museum of Denmark, Copenhagen, Denmark; Naturalis Biodiversity Center, Leiden, the Netherlands; Museo Nacional de Ciencias Naturales-CSIC, Madrid, Spain; Real Jardín Botánico de Madrid CSIC, Spain; Zoological Research Museum Alexander Koenig, Bonn, Germany; National Museum, Prague, Czech Republic.

ZOBODAT - www.zobodat.at

Zoologisch-Botanische Datenbank/Zoological-Botanical Database

Digitale Literatur/Digital Literature

Zeitschrift/Journal: [European Journal of Taxonomy](#)

Jahr/Year: 2020

Band/Volume: [0676](#)

Autor(en)/Author(s): Olivar Jay Edneil C., Atkins Hannah J., Hauenschild Frank, Muellner-Riehl Alexandra N.

Artikel/Article: [Cyrtandra argentii, a new species of Cyrtandra \(Gesneriaceae\) from the Philippines, and a review of the C. villosissima group 1-15](#)