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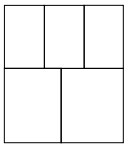

Cover images: Top left: *Cyrtandra pendula* Blume. Top middle: *C. rosea* Ridl. Top right: *C. rubriflora* P.E.Sm. & H.J.Atkins. Below left: *Cyrtandra* sp. Below right: *C. pauciflora* Ridl. Photos by S. Barber (*C. pendula* Blume, *C. rosea* Ridl., *C. pauciflora* Ridl.), P. Wilkie (*C. rubriflora* P.E.Sm. & H.J.Atkins), M. Hughes (*Cyrtandra* sp.).

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TWO NEW RECORDS OF *ATHYRIUM* FOR BALI

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ABSTRACT
WARDANI, W., ADJIE, B., YULITA, K. S. & SALAMAH, A. 2022. Two new records of *Athyrium* for Bali. *Reinwardtia* 21(2): 43–47. — Here we reported two species of *Athyrium* from Bali for the first time based on herbarium study and field work. We provided morphological description, voucher specimens, and taxonomic note for both species. A key to all the four known species of *Athyrium s.l.* in Bali was also provided.

Key words: Athyriaceae, *Athyrium*, new record.

ABSTRAK
WARDANI, W., ADJIE, B., YULITA, K. S. & SALAMAH, A. 2022. Dua rekaman baru *Athyrium* untuk Bali. *Reinwardtia* 21(2): 43–47. — Dua jenis *Athyrium* dilaporkan untuk pertama kalinya dari Pulau Bali berdasarkan studi herbarium dan pengamatan di lapangan. Pertelaan morfologi, daftar spesimen dan catatan-catatan taksonomi untuk keduanya diuraikan di dalam tulisan ini. Selain itu, kunci identifikasi menuju keempat jenis *Athyrium s.l.* yang telah diketahui dari Pulau Bali disajikan.

Kata kunci: Athyriaceae, *Athyrium*, rekaman baru.

INTRODUCTION

Athyrium is a terrestrial fern genus in Athyriaceae that in the broad sense would include *Cornopteris*, *Anisocampium* (Wei *et al*., 2018) and the recently published genus *Ephemeropteris* (Moran *et al*., 2019). This group distributes mostly in the northern Asia that extended southward to the Paleotropics areas and some species are known to the neotropics (Hassler, 2004–2022). In the Malesian region, based on published literatures and initial examination of specimens, there are more than 20 recognized species of *Athyrium s.s.*(Wardani & Adjie, 2018; Hassler, 2004–2022), one *Anisocampium* (Liu *et al*., 2011) and five *Cornopteris* (Kato, 1979 & 1986). There has no *Athyrium s.s.* been recorded in Bali so far. Although there are three species known to the nearby Lesser Sunda Islands *i.e*., *A. puncticaule* from Lombok, *A. erythropodum* from Flores, and *A. nigripes* from Timor, and eight species known to Java (Wardani & Adjie, 2018).

During a trip to Mount Batukaru, Bali, we found two populations of Athyriaceae along a trail on the southeast slope at around 1,800 m asl. Subsequent herbarium study revealed that these two populations belong to two *Athyrium s.s.* species. The detail results are presented here.

Fig. 1. A. *Athyrium erythropodum*. B. *A. nigripes* found in Mt. Batukaru, Bali. Photos by Wita Wardani.

MATERIALS AND METHODS

Herbarium specimen of *Athyrum s.l.* stored in BO and photographs from L, K, and BM were gathered for observation and sorted based on their morphological characters. Two specimens (Fig. 1) were obtained in a short trip to Mount Batukaru, Bali, at 8°20'22.2" S 115°5'49.2" E. Detail examination were carried using Olympus stereo microscope SZ61 equipped with long arm, calibrated eyepiece and camera. In addition, photograph of specimen housed in PE and TAIF that available online, as well as photographs of specimen provided by various herbaria accessible through JSTOR Global Plant are also consulted for comparison.

RESULTS

TAXONOMIC TREATMENT

1. ATHYRIUM ERYTHROPODUM Hayata – Icon. Pl. Formosan. 4:233, t.163. (1914).

Stipes stramineous ± 20 cm long, basal part dark, covered with dark scales with pale margin, scales 4–5 mm long 0.3–0.6 mm wide. *Fronds* to 30 cm long, apex sometimes long acuminate, rachises partly purplish, especially on the upper part, covered with short hairs (Fig. 2). *Pinnae* opposite or sub-opposite at basal, alternate upward; second or third basal pinnae the longest, 10–11 cm long 2.4–2.5 cm wide, acuminate; pinnae rachises purplish, fleshy projections present on pinnae rachises (Fig. 3). *Pinnules* largest at basal pinnae, about 1.5 cm long and 0.75 cm wide, anadromous, cuneate-truncate at base, auricled, rounded to acute apex, margin serrate, shallowly lobed except at basal acroscopic part that sometimes incised almost to the costae. Only basal pinnules of basal pinnae are distinctly stalked. No spine on the midrib. *Sori* elongates, close to the midrib, 1.4–1.7 mm long, indusium fimbriate.

Distribution. Taiwan, Philippine, Java, Lesser Sunda Islands (Bali, Flores). In Bali only known from south east slope of Mt. Batukaru as reported here.

Habitat. In the forest at high altitude, 1,800 m asl.

Note. This species was thought to be Taiwan endemic until Liu *et al.* (2008) who recorded the species from the Philippines and provided a detail

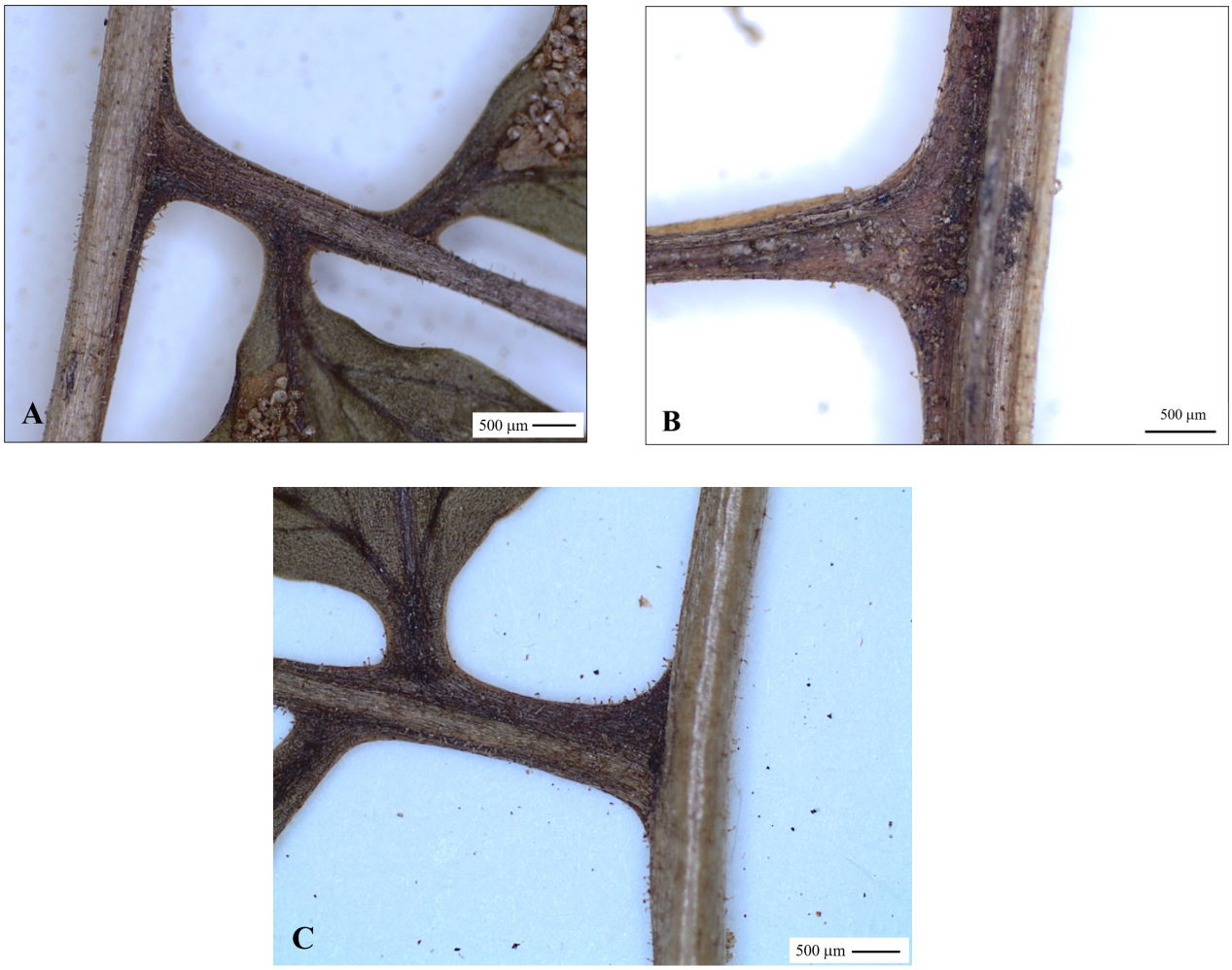

Fig. 2. Comparison of rachis of the two specimens from Bali. A. *Athyrium erythropodum*, *WT 1404b*, with short hair. B. *A. nigripes*, *WT 1404a*, glabrous. As reference. C. *A. erythropodum M.A. Donk P25* from Java. Photos by Wita Wardani.

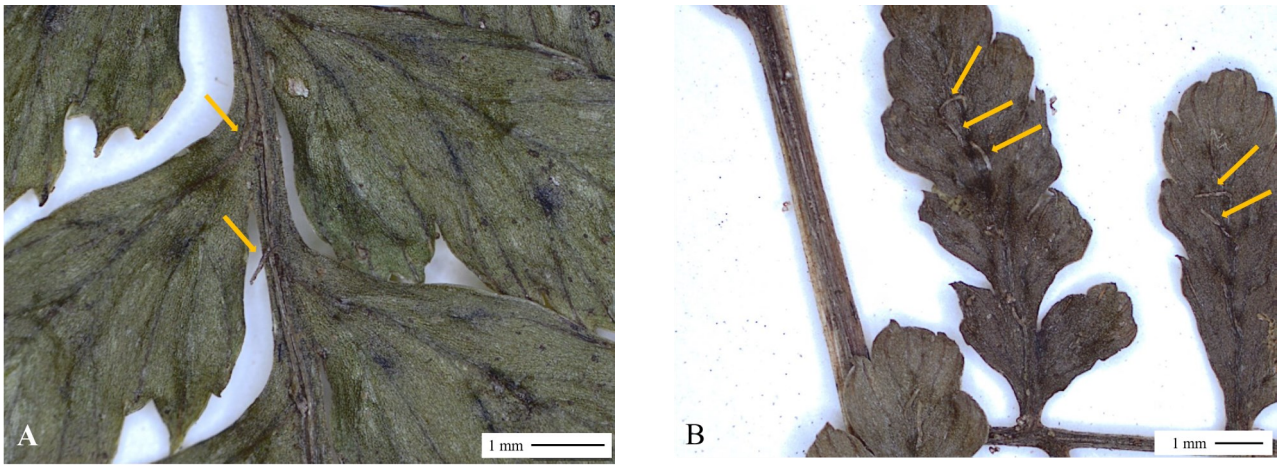

Fig. 3. Fleshy projection and "spine" in A. *Athyrium erythropodum,* the projection on pinnae rachis is more prominent toward apex. B. *A. nigripes* distinctly has long spine on the midrib. Photos by Wita Wardani.

Identification key to *Athyrium s.l.* in Bali

1. a. Lamina pinnate without fleshy projections (spines) on the ridge of costae groove, lowland species ….. ……..……..... *Anisocampium cumingianum*
   b. Lamina pinnate to bipinate with fleshy projection (spine) on the ridge of pinnae rachis, costae or midrib groove, high altitude species …..……..……..…..... 2
2. a. Sori exindusiate, lamina bipinatifid (except basal lamina that partly pinnate), equilateral pinnae base .. ….……..……..……..... *Cornopteris opaca*
   b. Sori indusiate, lamina bipinnate, inequilateral pinnae base ……..……. 3
3. a. Scales on stipes dark, some with pale margin, axis with short hairs, pinnules with strongly serrate margin, no spine on the midrib .....… *A. erythropodum*
   b. Scales on stipes pale, axis glabrous, pinnules margin crenate, long spine on the midrib …. *A. nigripes*

comparison between *A. erythropodum* and similar species. In 2014, Y.C. Liu visited Bogor Herbarium and reidentified several *Athyrium* specimens from Java as *A. erythropodum*, and these specimens were served as our reference in identification.

Specimens examined. INDONESIA, Bali, Mt. Batukaru, 22 March 2022, *WT1404b* (BO). Flores, o. helling G. Mandasawoe, 17 November 1932, *Posthumus 3364* (BO). Java, West Java, Tjibodas, 1915, *Sapiin 2768* (BO); Tjibeureum-Tjibodas, 12 April 1941, *M.A. Donk P25* (BO); Gede, Tjibodas, no date, *T. Nakai s.n.* (BO); G. Patoeha, 25 September 1941, *M.A. Donk P695bis* (BO); East Java, z. helling G. Anjasmoro, 19 July 1936, *Posthumus 3968* (BO); w. helling G. Welirang, 31 July 1933, *Posthumus 3611* (BO).

2. ATHYRIUM NIGRIPES (Blume) T.Moore – Index. Fil. 49 (1857).

Stipes stramineous, 15–17 cm long, clothed with pale scales 6–7 mm long, 0.3–0.5 wide, darker toward basal and rhizome. *Fronds* 25–30 cm long, apex acuminate, upper part of rachis dark, glabrous (Fig. 2). *Pinnae* alternate, second basal is the longest, 8–9 cm long, 2.2–2.6 cm wide, basal pinnae distinctly wider and ovate compare to the next, pinnae rachis dark. Only basal pinnule at basal pinnae have stalk. *Pinnules* longest at basal pinnae, 1.5–2 cm long, 0.5 cm wide, with rounded apex, cuneate base, auricled, deeply lobed that gradually less incised toward apex, distance between pinnules 0.5–0.7 mm long, anadromous. Spine present on abaxial part of the midrib (Fig. 3). *Sori* indusiate, short elongate, 0.9–1.3 mm long.

Distribution. Java, Lesser Sunda Islands (Bali, Timor). In Bali only known from south east slope of Mt. Batukaru as reported here.

Habitat. In the forest at high altitude, 1,800 m asl.

Note. This species has a complicated taxonomy. It is often misreported from India, Sri Lanka, China and neighbouring area and confused with *A. setiferum* C.Chr. as explained in Fraser-Jenkins *et al*. (2018). In 2016, the first author visited K and examined Blume's type specimen collected from Java under microscope and documented the photographs. Our specimen conforms to Blume's type specimen in the long spines on the midrib, serrate margin, glabrous rachis, and pale scales at the base of stipes.

Specimens examined. INDONESIA, Bali, Mt. Batukaru, 22 March 2022, *WT1404a* (BO). Timor, Mutis, 15 November 1935, *de Voog 2345* (BO). Java, West Java, G. Gede, 19 September 1911, *C.A. Backer 3326* (BO); G. Gedeh boven Tjibodas, 27 May 1914, *C.A. Backer 13602* (BO); w. helling G. Patoeha, 26 March 1914, *C.A. Backer 12654* (BO); Pangerango, no date, *Raciborski s.n.* (BO); Kandang Badak, no date, *Raciborski s.n.* (BO); Pangerango, 20 March 1925, *Posthumus 176* (BO); Tjibodas, path from Tjibeureum to Kandang Badak, 12 September 1950, *A.G.H. Adelbert 165* (BO); Gede-Pangrango, Lebak Saat, November 1939, *M.A. Donk P345* (BO); G. Patoeha, 25 September 1941, *M.A. Donk P735* (BO); G. Patoeha, north slope above Tjimanggoe, 25 September 1941, *M.A. Donk P699* (BO); G. Papandajan, 30 March 1930, *C.G.G.H. van Steenis 4307* (BO); Mt. Gedeh, Tjibodas Nature Reserve, Air Panas, 21 June 1953, *W. Meijer 1518* (BO). East Java, G. Tengger, no date, *Mousset 1152* (BO); Tjemoro Kandang, G Kawi, 17 April 1929, *Docters van Leeuwen-Reijnvaan 12345* (BO); G. Tjemoro Kandang, 9 September 1936, *Posthumus 3991* (BO). Central Java, z.o. Prahoe, 8 July 1912, *Lorzing 531* (BO); No information on location, no date, *Blume s.n.* (type) (K). Photo: West Java, Burangrang, no date, *Blume s.n.* (syntype) (L).

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REFERENCES

FRASER-JENKINS, C. R., GANDHI, K. N. & KHOLIA, B. S. 2018. *An Annotated Checklist of Indian Pteridophytes Part-2 (Woodsiaceae to Dryopteridaceae).* Bishen Singh Mahendra Pal Singh. Dehra Dun (India).

HASSLER, M. 2004–2022. *World Plants. Synonymic Checklist and Distribution of The World Flora. V13.0;* last update May 29th, 2022. www.worldplants.de. (Accessed 31 May 2022).

KATO, M. 1979. Taxonomic study of the genus *Cornopteris* (Athyriaceae). *Acta Phytotaxonomica et Geobotanica* 30(4–6): 101–118.

KATO, M. 1986. Two species of *Cornopteris* (Athyriaceae) in Seram and the reduction of *Neoathyrium* Ching et Wang. *Journal of Japanese Botany* 61(8): 229–237.

LIU, Y. C., FRASER-JENKINS, C. R., AMAROSO, V. B., CHIOU, W. L. 2008. *Athyrium erythropodum* (Woodsiaceae, Pteridophyta) a new Philippine record. *Blumea* 53: 447–451.

LIU, Y. C., CHIOU, W. L. & KATO, M. 2011. Molecular phylogeny and taxonomy of the fern genus *Anisocampium* (Athyriaceae). *Taxon* 60: 824–830.

MORAN, R. C., HANKS, J. F. & SUNDUE, M. 2019. Phylogenetic relationship of Neotropical lady ferns (Athyriaceae) with a description of *Ephemeropteris*, gen. nov. *Taxon* 68(3): 425–441.

WARDANI, W. & ADJIE, B. 2018. The genus *Athyrium* Roth in Malesia: a checklist with working names and distributions. *Sibbaldia* 16: 39–48.

WEI, R., EBIHARA, A., ZHU, Y. M., ZHAO, C. F., HENNEQUIN, S. & ZHANG, X. C. 2018. A total-evidence phylogeny of the lady fern genus *Athyrium* Roth. (Athyriaceae), with a new infrageneric classification. *Molecular Phylogenetics and Evolution* 119: 25–36.

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UPDATE ON *ALOCASIA CUPREA* K.KOCH DISTRIBUTION IN NORTH KALIMANTAN

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ABSTRACT
ASIH, N. P. S. & LESTARI, D. 2022. Update on *Alocasia cuprea* K.Koch distribution in North Kalimantan. *Reinwardtia* 21(2): 49–53. — Hitherto Malaysian Bornean *Alocasia cuprea* K.Koch is a newly recorded species for North Kalimantan, taking *Alocasia* in Kalimantan to 10 species. An identification key and photos of *A. cuprea* are presented.

Key words: Araceae, Borneo, distribution, diversity, Krayan.

ABSTRAK
ASIH, N. P. S. & LESTARI, D. 2022. Kebaruan sebaran *Alocasia cuprea* K.Koch di Kalimantan Utara. *Reinwardtia* 21(2): 49–53. — *Alocasia cuprea* K.Koch sebelumnya ditemukan di Sabah dan Serawak, Malaysia, namun sekarang ditemukan di Krayan, Kalimantan Utara, Indonesia. Temuan ini menegaskan bahwa *Alocasia* di Kalimantan sekarang terdiri atas 10 jenis. Kunci identifikasi jenis dan foto tersaji dalam tulisan ini.

Kata kunci: Araceae, Borneo, distribusi, keragaman, Krayan.

INTRODUCTION

The last revision of *Alocasia* in West Malesia and Sulawesi was conducted by Hay (1998), yielding 31 *Alocasia* species. Since then, several new species have been described, six of which are from Borneo (Boyce, 2007; Hay, 2000; Kurniawan & Boyce, 2011; Wong & Boyce, 2016; Wong & Boyce, 2020) and two species are from Sulawesi (Yuzammi & Hay, 1998; 2002). These new species bring the total of *Alocasia* in West Malesia and Sulawesi to 39 species, with 26 species officially recognized as originating from Borneo.

Borneo, a center of *Alocasia* diversity (Wong & Boyce, 2016), is estimated to have 50 *Alocasia* species, the majority of which are endemic (Kurniawan & Boyce, 2011). Kalimantan is a large area in Borneo that is less well known (Kurniawan & Boyce, 2011). According to Hay (1998) and Kurniawan & Boyce (2011), it has acknowledged that there are only ten known *Alocasia* species in Kalimantan. However, the *Alocasia reginae* specimen with collection number *Burley et al.* 527 deposited in Harvard University's Gray Herbarium, is misidentified. *Alocasia reginae* is restricted in Mulu National Park's karst area (P.C. Boyce 2021, pers. comm., 13 November 2021). As a result, there are only nine species of *Alocasia* in Kalimantan. This number is only 35% of the total number of *Alocasia* in Borneo. This resulted to a great opportunity for fieldwork and a more intensive study of *Alocasia* in Kalimantan.

During fieldwork in 2016 in Kayan Mentarang National Park (KMNP), Krayan, North Kalimantan, many species of Araceae, including *Alocasia*, were collected. Some species have not been formally described. *Alocasia cuprea* K.Koch was known to be distributed in Sabah (Hay, 1998) and Serawak (Boyce, 2004), was also found in KMNP (Fig. 1). This first report on the distribution of *A. cuprea* in Kalimantan brings the number of *Alocasia* in Kalimantan to 10 species.

MATERIALS AND METHODS

Plant material was obtained from fieldwork in KMNP in May 2016. The material was cultivated in Eka Karya Bali Botanic Garden (EKBBG), Candikuning, Baturiti, Tabanan, Bali. The morphological characters were described based on this living collection. The habitat was recorded during the fieldwork in Pa' Pulid forest, near to Pa' Api

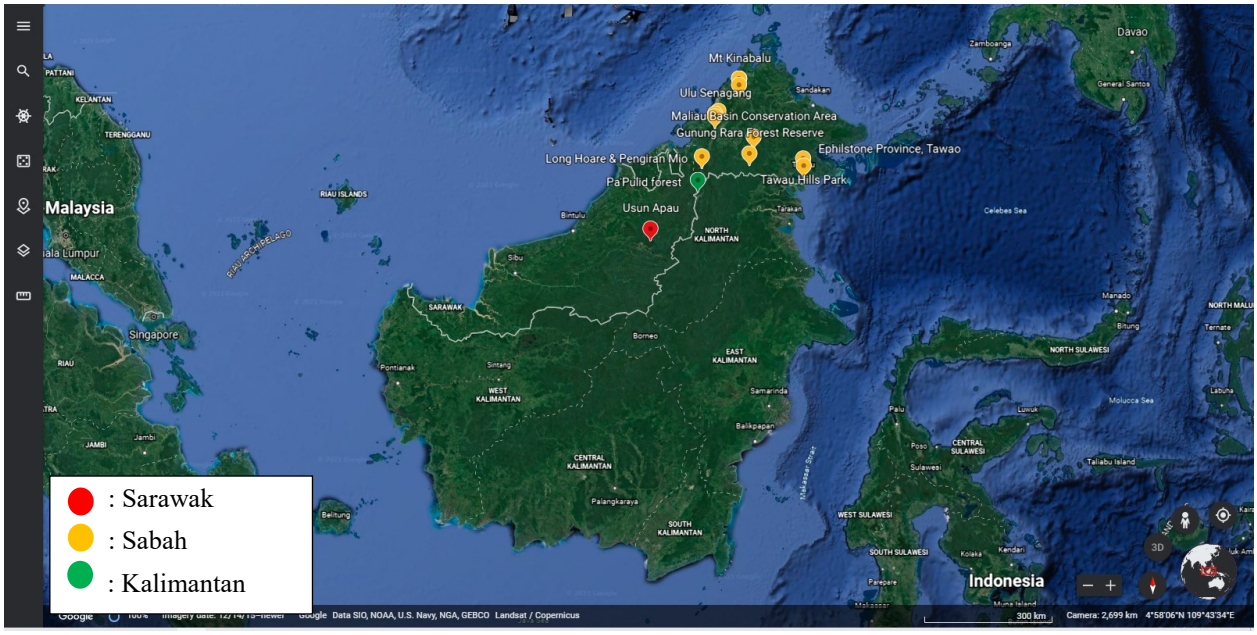

Fig. 1. Distribution of *A. cuprea* in Sabah (Boyce *et al.*, 2002; Sulaiman & Shunmugam, 2010; Wong & Joling, 2021), Sarawak (P.C. Boyce 2021, pers. comm., 13 November), and Krayan (North Kalimantan) (Google earth and modified by Ni Putu Sri Asih (unpublished data)).

village, Krayan, Nunukan, North Kalimantan. The identification key to *Alocasia* species was made based on Hay (1998).

RESULTS

TAXONOMIC TREATMENT

ALOCASIA CUPREA K.Koch
Alocasia cuprea (C.Koch & Bouché) C.Koch, Wochenschr. Vereines Befoerd. Gartenbanes Koenigl. Preuss. Staaten 4 (1861) 141; Engl. in A. & C. DC., Monogr. Phan. 2 (1879) 509; Ridl., J. Straits Br. Roy. Asiat. Soc. 44 (1905) 179; Engl. & K. Krause, Pflanzenr. 71 (IV.23E) (1920) 110; Merr., Bibliogr. Enum. Bornean Pl. (1921) 104; Merr., Pl. Elmer. Born. (1929) 26; Burnett, Aroideana 7 (1984) 76, figs 2 & 3. -*Caladium cupreum* C. Koch & Bouché, Ind. Sem. Hort. Berol., Appendix (1854) 6. Type: Not located, presumed destroyed at B. Neotype: Cult. RBG Kew ex Borneo, *N.E. Brown s.n.,* May 11th 1876 (K; lecto; selected by Hay, 1998).

[*Gonatanthus cupreus* C.Koch, Wochenschr. Vereines Befoerd. Gartenbanes Koenigl. Preuss. Staaten 4 (1861) 141 - nom. in synon.].

[? *Caladium metallicum* Ed. Otto, Hamburger Garten-Blumenzeitung (1853) 517, nom. subnud.; Koch, Berlinen. Allg. Gartenzeitung. 1 (1857) 135].

[*Colocasia cuprea* Engl., Araceae Exsiccatae et Illustratae No. 253 [date not ascertained, see Hay *et al.* (1995: 174)]. -? sphalm. pro *Alocasia cuprea*].

[*Alocasia metallica* Schott, Oesterr. Bot. Wochenbl. 4 (1854) 410, nom. nud.; Schott, Syn. Aroid. (1856) 46 (nom. superfl. pro *Caladium cupreum);* Hook., Bot. Mag. 86 (1860) t. 5190; Lemaire, Ill. Hort. 8 (1861) pl. 283; van Routte, Fl. des Serres & Jardins 21 (1875) t. 2208-9].

Herb to *ca.* 49.5 cm tall; *rhizome* erect; *leaves* 3–4 together; *petiole* to *ca.* 46 cm long, each subtended by cataphyll, green-green yellowish at the tip than gradually green and ivory reddish at the base, adaxially faintly mottled greenish, abaxially not mottled and paler color, sheathing in the lower ¼—⅓, green reddish at the margin; *blades* leathery, peltate, ovate, bullate between the main veins, adaxially glossy silver-green, green darker near the primary veins and midrib, abaxially deep purple, with a hyaline colorless margin *ca.* 1.5 mm wide; *anterior lobe* with the tip cuspidate and mucronate 4 mm; anterior costa with 4–5 primary lateral veins on each side, proximal ones diverging at *ca.* 125° then arching forward and outward to join a submarginal vein, distal primary veins diverging at *ca.* 55°; all primary veins with very conspicuous axillary glands abaxially; secondary veins forming well-defined undulating inter-primary collective veins; *posterior lobes* completely united except for

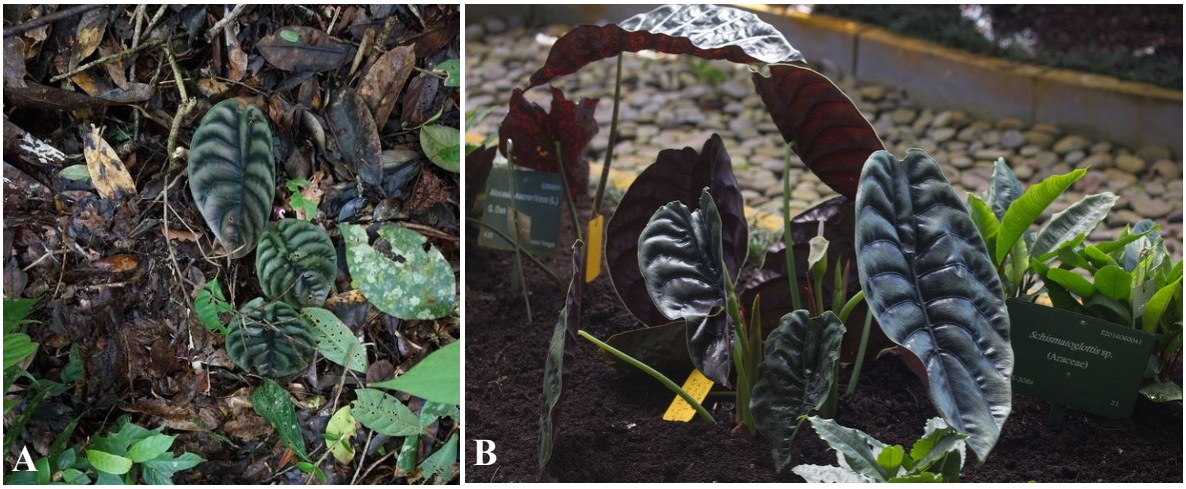

Fig. 2. Habitat of *A. cuprea.* A. *A. cuprea* in KMNP. B. *A. cuprea* cultivated in Bali Botanic Gardens. Photos by A. Dewi Lestari, B. Ni Putu Sri Asih.

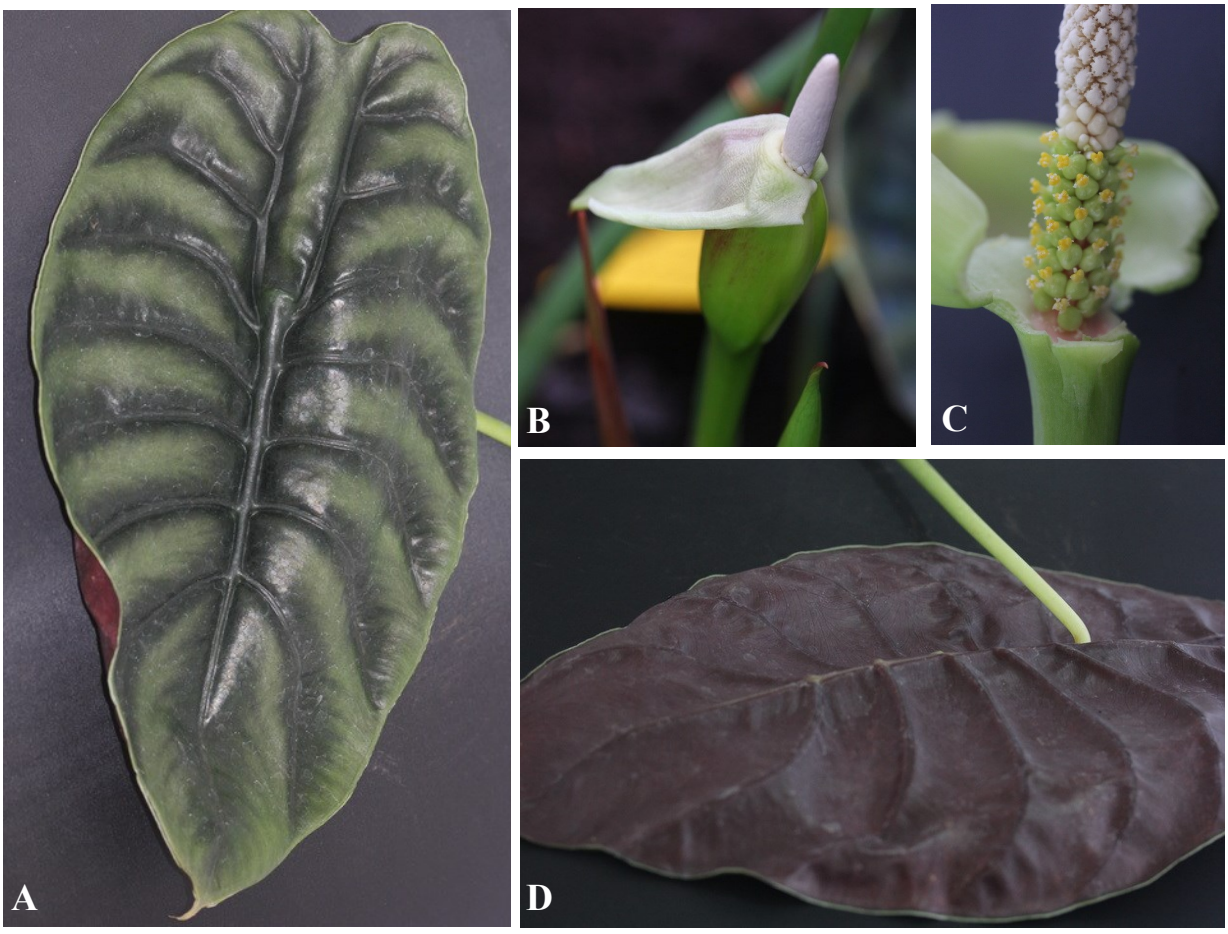

Fig. 3. Habitus of *A. cuprea.* A. The adaxial leaf. B. Flower which almost all male flower within lower spathe. C. Flower with artificial opened. D. The abaxial leaf. Photos by Ni Putu Sri Asih.

TAXONOMY

Identification key to *Alocasia* species in Kalimantan

1a. Leaf blades not peltate in adult plants 2

1b. Leaf blades shallowly to completely peltate in adult plants 7

2a. Leaf abaxially with prominent venation, interprimary vein well defined and leaf blade abaxially pubescent ..... *A. sarawakensis*

2b. Leaf abaxially with no prominent venation, interprimary vein not well defined and leaf blade abaxially glabrous 3

3a. Leaf abaxially glaucous ..... *A. robusta*

3b. Leaf abaxially not glaucous 4

4a. Male zone wholly exerted from the lower spathe chamber ..... *A. macrorrhizos*

4b. Male zone half or completely within the lower spathe chamber 5

5a. Petiole about equaling length of leaf blade, blade very thickly leathery to almost succulent, ovato-sagittate to broadly ovato-sagittate ..... *A. scabriuscula s.l.*

5b. Petiole much exceeding the leaf of leaf blade, blade thinly leathery to leathery but not succulent, narrowly triangular 6

6a. Leaf blades dark green and leathery, peduncle relatively short, male zone about half enclosed within the lower spathe chamber ..... *A. princeps*

6b. Leaf blades grey-green and thinly leathery, peduncle relatively long, and male zone fully enclosed with in the lower spathe chamber ..... *A. principiculus*

7a. Leaf slightly peltate to deeply peltate, membranous or occasionally thinly leathery, plants often unifoliar, stigma stellate ..... *A. longiloba*

7b. Leaf strongly to almost completely peltate, thickly coriaceus, leaves several, the main venation and lamina border not white to pale grey-green adaxially, stigma rounded 8

8a. Leaf bullate among the main veins, inflorescence paired 9

8b. Leaf not bullate among the main vein, inflorescence solitary ..... *A. peltata*

9a. Leaf stiffly and thickly coriaceous, raised areas pale grey against a darker blade, abaxially pale green with the primary and margin veins purplish-brownish red, male zone ⅓–½ enclosed within lower spathe chamber ..... *A. baginda*

9b. Leaf leathery, the bullate glossy bronze-green, abaxially the leaf and venation deep purple, male zone ⅔ within lower spathe chamber ..... *A. cuprea*

a shallow retuse notch, rounded; posterior costae diverging at *ca.* 30°; *inflorescences* 2 paired, subtended by green brown reddish cataphylls; peduncle to *ca.* 20 cm long, pale green reddish at the base and green light reddish-green at the tip, not mottled; *spathe* green to greenish maroon, *ca.* 11.6 cm long; lower spathe oblong ovoid, *ca.* 5.5 cm long *ca.* 2.4 cm diam; limb about equal to the lower spathe, at first erect and cucullate, then sharply deflexed, separated from the lower spathe by an abrupt constriction at the top of male flowers; *spadix* considerably shorter than the spathe *ca.* 8 cm long, very shortly stipitate, 1.5–5 mm, the color is pale red, cylindric except appendix; *female zone* narrowly cylindric, *ca.* 2 cm long, *ca.* 1.2 cm wide; ovaries subglobose, longitudinally 3–4-ribbed; stigma raised on a slender style *ca.* 1 mm, conspicuously 2–(–4) lobed, yellow at female flower anthesis; *sterile interstice* not attenuate, isodiametric or slightly narrower than male, *ca.* 2 whorls of rhomboid synandrodia; *male zone* cylindric, ⅔ or all within the lower spathe, 2.7 cm long; synandria rhomboid, with the synconnective raised above but not overlapping the thecae; thecae opening by apical pores; *appendix* white, gradually tapering to the tip, blunt, faintly irregularly channeled, *ca.* 2.6 cm long; *fruit* unknown.

Distribution. Borneo: Sabah, Sarawak and North Kalimantan

Habitat. Terrestrial, riverbank to cliff of montane forest, sandy soil texture to leaf litter-covered brown humus soil, and open to moderate shade at 1,005 m asl. The soil where this species found in Kalimantan has 6.7 pH, and soil moisture 50%.

Notes. In Kalimantan, *A. cuprea* is currently found in Pa' Pulid forest, mountainous forest, that located in Pa' Api village, Krayan Distric. It is found in two small populations of three to seven individuals. This species found in Kalimantan differ from the former species in blade colour and number of primary veins. The blade colour of Kalimantan species is glossy silver-green adaxially with 4–5 primary vein, while the colour blade of the former species is glossy bronze-green adaxially with 8–11 primary vein. These variations, how ever, are common in *Alocasia* species.

The habitat of this species in Sarawak and Sabah is kerangas or heath forest (P. C. Boyce, 2021, pers. comm., 13 November). Kerangas forest has strongly acidic soil (Katagiri *et al.*, 1991; Suratman *et al.*, 2011). This condition differs with the soil in Pa' Pulid forest, where the soil tends to neutral pH. These different habitat findings indicate that this species is quite tolerant. Hay (1998) said this species appear to be unaffected by substrate, occurring on ultramafic, limestone and sandstone areas.

Specimen examined. INDONESIA, North Kalimantan, Nunukan, TN Kayan Mentarang, SPTN I Long Bawan, Krayan, Pa' Pulid, 20 May 2016, *Dewi Lestari 122/HK 1668* (Bali Botanic Gardens Accession E2016060025, THBB! BO!)

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AUTHOR CONTRIBUTORS

NPSA and DL are the principal author of this manuscript. Both authors analyzed the data and wrote the manuscript.

REFERENCES

BOYCE, P. C. 2004. The Aroids of Borneo. *Gardenwise* 23: 11–13.

BOYCE, P. C. 2007. Studies on the *Alocasia* Schott (Araceae-Colocasieae) of Borneo I: Two new species from Sarawak, Malaysian Borneo. *Gardens' Bulletin Singapore* 58(2): 141–154.

BOYCE, P. C., SULAIMAN, B. & LINTONG, J. 2002. Araceae of the Crocker Range National Park Sabah: a preliminary survey, checklist and generic key. *ASEAN Review of Biodiversity and Environmental Conservation (ARBEC)*: 1–7.

HAY, A. 1998. The genus *Alocasia* (Araceae-Colocasieae) in West Malesia & Sulawesi. *Gardens' Bulletin Singapore* 50(2): 221–334.

HAY, A. 2000. *Alocasia nebula. Curtis's Botanical Magazine* 17(1): 14–18, plate 381.

KATAGIRI, S., YAMAKURA, T. & LEE, S. H. 1991. Properties of soils in kerangas forest on sandstone at Bako National Park, Sarawak, East Malaysia. *Southeast Asian Studies* 29(1): 35–48.

KURNIAWAN, A. & BOYCE, P. C. 2011. Studies on the *Alocasia* Schott (Araceae-Colocasieae) of Borneo II: *Alocasia baginda*, a new species from Eastern Kalimantan, Indonesian Borneo. *Acta Phytotaxonomica et Geobotanica* 60(3): 123–126.

SULAIMAN, B. & SHUNMUGAM, V. 2010. A preliminary survey of Aroids (Family Araceae) in Maliau Basin, Sabah, Malaysia. *Journal of Tropical Biology and Conservation* 6: 35–37.

SURATMAN, M. N., HAMID, N. H. A., DAIM, M. S., MALIM, I. M. S. & SABRI, M. D. M. 2011. Forest types and tree communities of Imbak Canyon, Sabah, Malaysia. *IEEE Symposium on Business, Engineering and Industrial Applications (ISBEIA)*: 71–75.

WONG, K. M. & BOYCE, P. C. 2016. Novitates Bruneienses, 6. *Alocasia azlanii* (Araceae), a new species from Brunei. *Acta Phytotaxonomica et Geobotanica* 67(3): 185–189.

WONG, S. Y. & BOYCE, P. C. 2020. Studies on the *Alocasia* Schott (Araceae) of Borneo III : *Alocasia puncakborneensis*, a new species belonging to the Princeps Complex. *Webbia Journal of Plant Taxonomy and Geography* 75(1): 111–115.

WONG, S. Y. & JOLING, J. 2021. Checklist of aroids (Alismatales, Araceae) from Sabah (Malaysian Borneo). *Check List* 17(3): 931–974.

YUZAMMI & HAY, A. 1998. *Alocasia suhirmaniana* (Araceae-Colocasiae) a spectacular new aroid from Sulawesi, Indonesia. *Telopea* 7(4): 303–306.

YUZAMMI & HAY, A. 2002. A new species of *Alocasia* (Araceae) from Sulawesi. *Aroideana* 25: 70–75.

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NUTRIENT CONCENTRATIONS IN THREE *NEPENTHES* SPECIES (NEPENTHACEAE) FROM NORTH SUMATRA

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ABSTRACT
MANSUR, M., SALAMAH, A., MIRMANTO, E. & BREARLEY, F. Q. 2022. Nutrient concentrations in three *Nepenthes* species (Nepenthaceae) from North Sumatra. *Reinwardtia* 21(2): 55–62. — *Nepenthes* is a genus of carnivorous plants that are unique ornamental plants, but their nutrient concentration relationships have not been studied much, especially in endemic species on the island of Sumatra. So far, the analysis of the nutrient concentration in *Nepenthes* is mostly limited to leaves. There are few reports of nutrient concentrations in the pitcher fluid and the soil around where it grows. Leaves, pitcher fluid, and soil around the growth sites of each species *i.e.*, *Nepenthes sumatrana*, *N. spectabilis,* and *N. tobaica*, from North Sumatra province were collected for nutrient analyses (N, P, K, Ca, Mg, and Na). The results showed that the nutrient concentrations in the leaves and pitcher fluid in the three *Nepenthes* species were generally low with those in the leaves greater than in the pitcher fluid. The concentration of nutrients in the leaves of *N. sumatrana* (lowland species) was least (except for N and Na) when compared to *N. spectabilis* and *N. tobaica* (highland species), likely reflecting the poorly fertile soil. In contrast, the nutrient concentration in the pitcher fluid of *N. sumatrana* was greater than *N. spectabilis* and *N. tobaica.* When compared across an extensive data set, we show that leaf N does not change with elevation, whereas P declines and the N:P ratio increases with elevation, suggesting that *Nepenthes* plants are obtaining sufficient N from prey at higher elevations.

Key words: *Nepenthes*, North Sumatra, nutrient concentration.

ABSTRAK
MANSUR, M., SALAMAH, A., MIRMANTO, E. & BREARLEY, F. Q. 2022. Konsentrasi nutrien pada tiga jenis *Nepenthes* (Nepenthaceae) dari Sumatra Utara. *Reinwardtia* 21(2): 55–62. — *Nepenthes* digolongkan ke dalam tumbuhan karnivora yang saat ini berfungsi sebagai tanaman hias unik, namun hubungan konsentrasi nutriennya belum banyak dipelajari khususnya pada jenis-jenis endemik pulau Sumatra. Sejauh ini, konsentrasi nutrien yang dianalisis baru terbatas pada daun, belum ada yang melaporkan konsentrasi nutrien yang ada di cairan kantong dan tanah tempat tumbuhnya. Sampel daun, cairan kantong, dan tanah di sekitar tempat tumbuh tiga jenis tanaman yaitu *Nepenthes sumatrana*, *N. spectabilis,* dan *N. tobaica*, dikoleksi dari provinsi Sumatra Utara untuk dipelajari kandungan unsur haranya. Hasil menunjukkan bahwa konsentrasi unsur hara pada daun dan cairan kantong pada ketiga jenis *Nepenthes* yang diteliti pada umumnya adalah rendah. Konsentrasi unsur hara pada daun *N. sumatrana* (jenis dataran rendah) adalah lebih rendah (kecuali unsur nitrogen dan natrium) jika dibandingkan dengan *N. spectabilis* dan *N. tobaica* (jenis dataran tinggi). Sebaliknya konsentrasi unsur hara pada cairan kantong *N. sumatrana* lebih tinggi dibandingkan dengan *N. spectabilis* dan *N. tobaica.* Untuk sampel daun, jika dibandingkan dengan seluruh kumpulan data yang luas, N daun tidak berubah dengan elevasi, sedangkan P menurun dan rasio N:P meningkat dengan elevasi, menunjukkan bahwa tumbuhan *Nepenthes* memperoleh N yang cukup dari mangsa di elevasi yang lebih tinggi.

Kata kunci: Konsentrasi unsur hara, *Nepenthes*, Sumatra Utara.

INTRODUCTION

Nepenthes (Nepenthaceae) is a genus of dioecious climbing plants with the unusual yet fascinating habit of being carnivorous; they also function as a unique ornamental plant (Mansur, 2006). The Indonesian archipelago has the greatest number of *Nepenthes* species with diversity concentrated on the islands of Borneo (Kalimantan) and Sumatra. The Bukit Barisan Mountains, which stretch from South Sumatra to Aceh, are the largest contributor to the high biodiversity in Sumatra (Malik *et al*., 2020), including of *Nepenthes* species (Lee *et al*., 2006). Until now, 22 species of *Nepenthes* have been reported from North Sumatra province with 16 of them endemic to Sumatra (Mansur *et al*., *in press.*).

Nepenthes often grow in marginal soils that are poor in nutrients, especially nitrogen (Clarke, 1997; Clarke, 2001; Moran & Clarke, 2010). Nitrogen, phosphorus and potassium often (co-) limit the growth of carnivorous plants (Ellison, 2006). For example, Brearley & Mansur (2012) reported that the foliar nitrogen concentrations of *N. ampullaria*, *N. gracilis*, *N. rafflesiana,* and *N. x hookeriana* were low in peat swamp forest (Sebangau National Park, Central Kalimantan). *Nepenthes* species occupy a broad elevation range from sea level to over 3,000 m elevation (*N. lamii* in New Guinea is the species found at the highest elevation) and so we might expect changes in foliar nutrient concentrations along such a broad gradient as has been seen in other tropical plant taxa (Tanner *et al*., 1998; Bauters *et al*., 2017). In addition to macronutrient elements, *Nepenthes* plants are also able to absorb metallic elements such as lead, as found in *N. macfarlanei* which grows in the montane forests of the Genting Highlands in Malaysia (Brearley, 2021).

The function of the pitchers of *Nepenthes* is to passively capture prey (Phillipps & Lamb, 1996), via nectar secreted by glands under the lid (Kurata & Kurata, 2009), through a slippery peristome (Bauer *et al*., 2009) and through the aroma released (Clarke & Lee, 2004). These can all attract the prey that falls into the pitcher fluid (Bonhomme *et al*., 2011) that may be highly viscoelastic (Gaume & Forterre, 2007). Once the prey is trapped, it will be broken down by the broad range of enzymes found in the pitcher fluid (Takeuchi *et al*., 2011; Rottloff *et al*., 2016), and the nutrients are absorbed through glands in the absorption zone in the pitcher walls (Clarke & Lee, 2004; Moran *et al*., 2010).

The relationship between the nutrient concentrations in the genus of *Nepenthes* and its habitat has not been studied much, especially in species from Sumatra. The objective of this study was to determine nutrient concentrations in *N. sumatrana* (lowland species), *N. spectabilis,* and *N. tobaica* (both highland species) (Fig. 1) that are protected by Indonesia's law (Permen LHK No. 20 of 2018). Based on the Red List issued by the IUCN, the conservation status of *N. sumatrana* is Critically Endangered (CR) and *N. spectabilis* is Vulnerable (VU), whereas *N. tobaica* is of Least Concern (LC). With this paper we hope to contribute to our understanding of nutrient relationships in *Nepenthes* and make a comparison between lowland and highland species using data from Sumatra as well as an extensive data comparison across the geographical range of *Nepenthes* species.

MATERIALS AND METHODS

Study site

Sampling was carried out in November 2019 in Aek Nabobar Village, Sidikalang, Central Tapanuli Regency (N: 01'35'41; E: 098'53'43; altitude 75 m asl) for *N. sumatrana* and in Lae Pondom Protected Forest, Gunung Sibuatan, Karo Regency (N: 02'53'38; E: 098'29'27; altitude 1,750 m asl) for *N. spectabilis* and *N. tobaica,* both in North Sumatra Province. In Aek Nabobar village, *N. sumatrana* grows in the lowlands at an altitude between 20 to 75 m above sea level (asl) in open areas with shrubby habitats. In general, the habitat of *N. sumatrana* has high air temperature, soil pH, and light intensity, but low air humidity and soil moisture. On the other hand, the habitat of *N. spectabilis* and *N. tobaica* is in the Lae Pondom Protected Forest, Gunung Sibuatan, Karo Regency at an altitude of around 1,750 m asl that has lower air temperature, light intensity and soil pH, but higher air humidity and soil moisture. Nutrient analysis was carried out at the Research Center for Ecology and Ethnobiology, National Research and Innovation Agency (BRIN), Indonesia.

Sampling design

Following the approach of Brearley & Mansur (2012), Brearley (2021), and Mansur *et al*. (2021), three plant samples from each species of *Nepenthes* (*N. sumatrana*, *N. spectabilis,* and *N. tobaica*) were collected for their leaves, namely the second leaf from the tip of the stem (estimated to be six months old), pitcher fluid (10 to 40 ml depending on the pitcher sampled) and the soil (*ca.* 100 g from 10 to 20 cm depth) from the rooting zone where they grew. Morphological parameters of each plant sampled were also recorded (*e.g.* stem, leaf, and pitcher length and width) along with leaf chlorophyll concentration on the leaf sampled for nutrient concentrations using a Konica

Fig. 1. A. *Nepenthes sumatrana* (Miq.) Beck ex Tamin & M.Hotta. B. *Nepenthes spectabilis* Danser. C. *Nepenthes tobaica* Danser; from North Sumatra Province, Indonesia. Photos by M. Mansur.

Minolta SPAD-502 meter with the value used being the mean of three measurements per leaf.

Experimental procedures

Leaf and soil samples were dried at 50°C for 5 days, then ground. The nutrient concentrations of soil and leaf nitrogen (N) were analyzed using a Yanako JM1000CN macro corder with a JMA 1000 autosampler. For other nutrients, leaves and soil were digested in a mixture of acids (H_2SO_4, $HClO_4$, and HNO_3) for 24 hours at 170°C, the concentrations of potassium (K), calcium (Ca), magnesium (Mg), and sodium (Na) were analyzed using an atomic absorption spectrophotometer (Shimadzu AA-6200) while the concentration of phosphorus (P) used a spectrophotometer (Shimadzu UV Mini-1240) with the vanadomolybdate colorimetric method. Pitcher liquid was filtered and analysed using atomic absorption spectrophotometry (as above) or with the Nessler and vanadomolybdate colorimetric methods for N and P, respectively.

Data comparison across an extensive elevational dataset

Data of the nutrient concentration of three species of *Nepenthes* were compared between leaves, pitcher fluid, and soils using one-way ANOVAs with post-hoc Duncan tests. Leaf nutrient concentration data were compiled from the literature (see Mansur *et al*., 2021), to which were added additional data on leaf N and P from other studies (Moran & Moran, 1998; Clarke *et al*., 2009; Moran *et al*., 2001, 2003; Graefe *et al*., 2011; Bazile *et al*., 2012). The elevation of each location was sourced from the appropriate paper, and linear regressions were calculated between elevation and the relevant leaf nutrient or the N:P ratio.

RESULTS

Morphology

The morphology of the three species studied differed, *N. sumatrana* growing in the lowlands and open areas, had shorter stems, but greater stem diameter, pitcher size and tendril length than *N. spectabilis* and *N. tobaica*. The pitcher of *N. sumatrana* is trumpet-shaped, while those of *N. spectabilis* and *N. tobaica* are cylindrical (Fig. 1). The leaf chlorophyll concentration (SPAD meter readings) of *N. sumatrana* was greater than *N. spectabilis*, but lower than *N. tobaica* (Table 1).

Soil nutrient concentrations

Soil is not only a place for plants to grow but also a source of nutrients for the plants themselves (Turner, 2001). The concentration of nutrients contained in it determines its fertility and therefore populations of plants. The concentrations of N, P, Ca, and Na in the soil in the habitat of *N. sumatrana* (lowland) were lower and significantly different (Table 2) when compared to those in the habitat of *N. spectabilis* and *N. tobaica* (highland); in contrast the concentrations of K and Mg in the *N. sumatrana* habitat were greater than of *N. spectabilis* and *N. tobaica* and statistically significantly different (Table 2).

Table 1. Morphology of three *Nepenthes* species as measured from three samples in their natural habitat in North Sumatra province, Indonesia. Values are mean ± standard error.

Parameter		*Nepenthes*		
		sumatrana	*spectabilis*	*tobaica*
Stem	Length (cm)	136 ± 41	215 ± 28	207 ± 23
	Diameter (mm)	10.4 ± 1.2	5.3 ± 0.3	3.3 ± 0.3
	Internode length (cm)	3.3 ± 0.8	5.3 ± 0.9	5.2 ± 1.0
Leaves	Length (cm)	33.7 ± 2.1	21.4 ± 1.6	11.9 ± 0.2
	Width (cm)	6.0 ± 0.7	4.0 ± 0.4	2.0 ± 0.1
	Thickness (mm)	0.45 ± 0.01	0.60 ± 0.03	0.41 ± 0.00
	Chlorophyll (SPAD meter units)	46.8 ± 2.1	37.6 ± 2.6	51.3 ± 3.5
Pitchers	Length (cm)	18.0 ± 1.6	18.5 ± 1.9	10.3 ± 0.2
	Bottom girth (cm)	12.5 ± 1.0	6.6 ± 0.8	8.6 ± 0.1
	Top girth (cm)	15.9 ± 0.1	7.4 ± 0.8	6.6 ± 0.1
	Tendril length (cm)	38.0 ± 8.2	23.1 ± 4.2	12.2 ± 0.2

Leaf nutrient concentrations

Leaves, apart from being a place for photosynthesis to occur, are also a store of nutrients (Turner, 2001). Results showed that the leaves of *N. sumatrana* contained the greatest concentration of N and significantly more than *N. spectabilis*, but not significantly different to *N. tobaica* (Table 2). On the other hand, the concentration of P in the leaves of *N. sumatrana* was lower and significantly less than *N. spectabilis*, but not significantly different from *N. tobaica*, while the concentration of K in the leaves of *N. sumatrana* was lower and different from *N. spectabilis* and *N. tobaica* (Table 2). Calcium and Mg in *N. sumatrana* leaves were lower and significantly different when compared to *N. spectablis* and *N. tobaica*, whereas on the other hand the concentration of Na in the leaves of *N. sumatrana* was greater than in the leaves of *N. spectabilis*, but not significantly different from *N. tobaica* (Table 2).

Pitcher fluid concentrations

The function of fluid in the pitcher of *Nepenthes* is as a nutrient solvent (Moran & Moran, 1998; Clarke, 2001), which helps in the process of breaking down trapped insects (Clarke *et al*., 2009) and is carried out by enzymes secreted in the pitcher (Wang, 2009; Takeuchi *et al*., 2011), so that the presence of this fluid is very important for the fulfillment of *Nepenthes* plant nutrition. Nutrient concentrations were lower in the pitcher fluid compared to the leaves or soil (when all data were considered as percentages). Potassium was the most abundant nutrient in the pitcher fluid followed by Na and then Ca; other nutrients were at low concentrations. Concentrations of N, P, and K in the pitcher fluid of *N. sumatrana* were greater (although not always significantly) than in the pitcher fluid of *N. spectabilis* and *N. tobaica.* Likewise, *N. sumatrana* contained concentrations of micronutrients Mg, Ca, and Na in the pitcher fluid that were greater than *N. spectabilis* and *N. tobaica* (Table 2).

Foliar nutrients in an extensive elevational dataset

Foliar N concentrations across our extensive elevational dataset were very variable (0.21 to 1.75 % N) but we found that there was no change in *Nepenthes* foliar N concentrations with elevation (r^2 = 0.04, p = 0.23). Phosphorus concentrations were less variable (0.06 to 0.26 % P) and showed a significant decline with elevation (r^2 = 0.17, p = 0.023); consequently there was an increase in the N:P ratio with elevation (r^2 = 0.23, p = 0.007) (Fig. 2).

Table 2. Concentrations of nutrients (% dry weight for leaves and soil, mg l^{-1} for pitcher fluid) in three species of *Nepenthes* at the study site, North Sumatra province, Indonesia. Values are mean ± standard error with letters indicating differences with a Duncan's test. BDL = Below detection limits.

	Species	Nutrient						
		N	P	N:P	K	Ca	Mg	Na
Leaves	*sumatrana*	0.87 ± 0.10 (b)	0.10 ± 0.001 (a)	8.43 ± 1.12 (b)	1.67 ± 0.01 (a)	0.12 ± <0.01 (a)	0.07 ± <0.01 (a)	0.42 ± 0.01 (b)
	spectabilis	0.21 ± 0.06 (a)	0.11 ± 0.001 (b)	1.90 ± 0.54 (a)	1.75 ± 0.01 (b)	0.29 ± <0.01 (c)	0.11 ± <0.01 (c)	0.33 ± 0.01 (a)
	tobaica	0.58 ± 0.10 (ab)	0.11 ± 0.001 (ab)	5.37 ± 0.90 (ab)	1.77 ± 0.01 (b)	0.23 ± <0.01 (b)	0.11 ± <0.01 (b)	0.40 ± 0.01 (b)
Fluid	*sumatrana*	2.08 ± 0.13 (b)	8.30 ± 0.29 (b)	0.25 ± 0.01 (b)	1740 ± 49 (a)	396 ± 15 (b)	12.0 ± 1.18 (b)	1056 ± 42 (b)
	spectabilis	1.51 ± 0.14 (ab)	6.30 ± 0.29 (a)	0.24 ± 0.01 (b)	1640 ± 45 (a)	293 ± 14 (a)	5.5 ± 0.78 (a)	765 ± 42 (a)
	tobaica	1.13 ± 0.13 (a)	7.26 ± 0.34 (ab)	0.15 ± 0.01 (a)	1590 ± 30 (a)	304 ± 15 (a)	6.4 ± 1.15 (a)	873 ± 42 (a)
Soil	*sumatrana*	BDL	0.019 ± 0.001 (a)	NA	1.74 ± 0.01 (b)	1.02 ± <0.01 (a)	1.09 ± <0.01 (c)	0.47 ± 0.02 (a)
	spectabilis	1.17 ± 0.17 (b)	0.025 ± 0.001 (b)	46.9 ± 5.16 (a)	1.67 ± 0.01 (a)	1.30 ± 0.01 (b)	0.50 ± <0.01 (a)	0.63 ± 0.02 (b)
	tobaica	1.17 ± 0.17 (b)	0.024 ± 0.001 (b)	48.0 ± 5.36 (a)	1.68 ± 0.01 (a)	1.55 ± 0.01 (c)	0.76 ± <0.01 (b)	0.59 ± 0.02 (b)

DISCUSSION

Nepenthes sumatrana grows in lowland areas (20 to 75 m asl) in open habitats with limestone soil and is often found overgrown with shrubs and ferns – at the study site, the vegetation and soil was quite degraded and prone to fire (Mansur *et al*., in press.). In contrast, *N. spectabilis* and *N. tobaica* grow in a different habitat in highland secondary forests (1,750 m asl) with a mineral soil type overlain by an organic humus layer and under large trees that provide shaded canopy cover. The two habitats have different microclimates and soil properties, in particular, the organic carbon content of the soils differed markedly and was around 25% in the highland forest but less than 0.5% in the lowland location (M.M., unpublished data). The concentration of soil nutrients in the *N. spectabilis* and *N. tobaica* habitat is generally greater than the soil where *N. sumatrana* grows (N, P, Na, and Ca), although the concentration of K and Mg in *N. sumatrana* habitat is greater than in the habitat of *N. spectabilis* and *N. tobaica.* However, this broad pattern was not reflected in the foliar nutrient concentrations as, in general, it was found that the nutrient concentration in the leaves and pitcher fluid in *N. sumatrana* had a higher concentration than the other two species indicating that soil nutrients are not always good predictors of foliar nutrients and that neither of them may be related to pitcher fluid nutrient concentrations. However, a measure of available soil nutrients would be more appropriate in future studies rather than the total nutrient concentrations as measured here. Broadly, the foliar nutrient concentrations in all three species were typical for *Nepenthes* as they were found in the centre of a PCA diagram presented by Mansur *et al*. (2021).

We know remarkably little about the determinants of pitcher fluid composition but this is im-

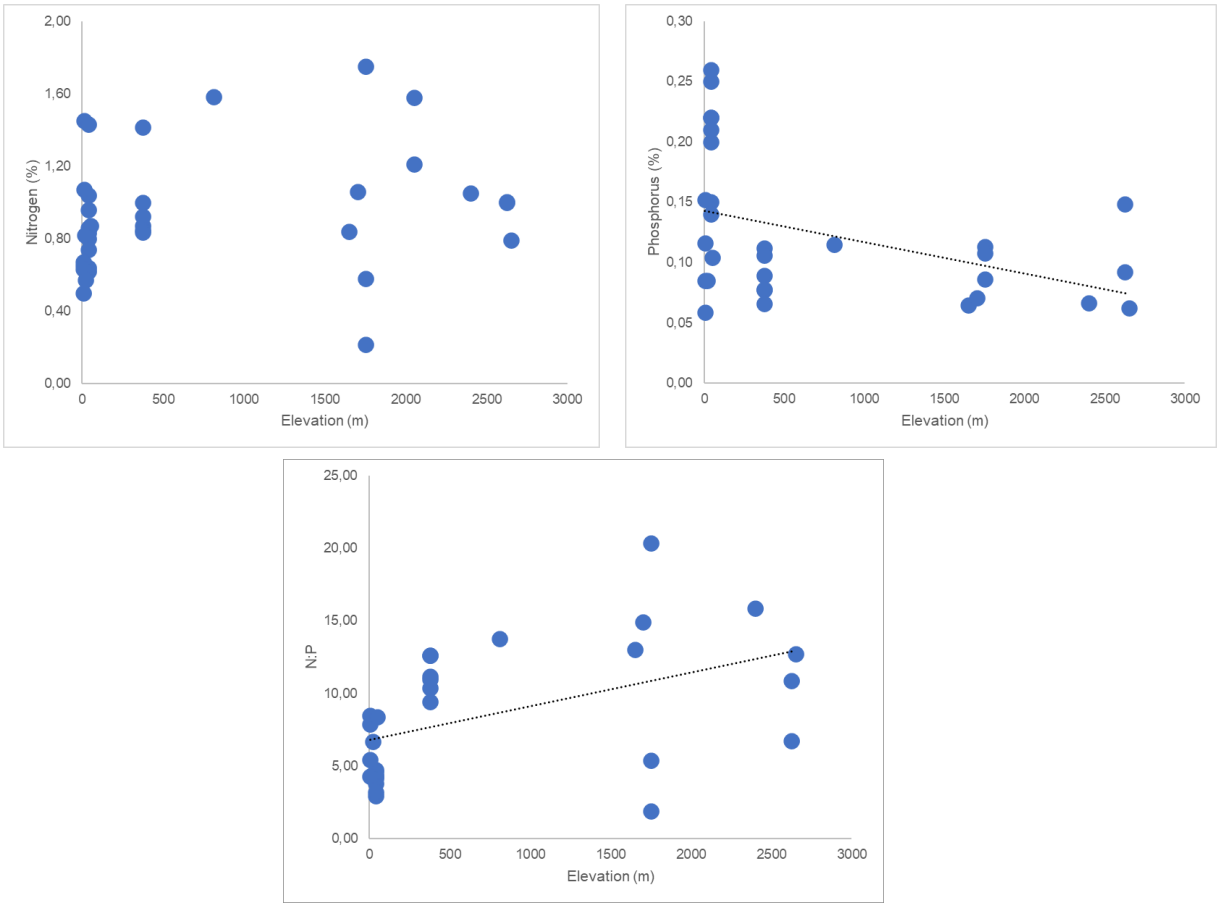

Fig. 2. Relationship between the concentration of foliar nitrogen (N), phosphorus (P), and the N:P ratio in a range of *Nepenthes* species across their geographical range. Each point represents the mean of each species sampled at each location.

portant due to the role of the pitcher fluid in influencing the microbial composition therein (Gilbert *et al*., 2020) and its role in aiding in prey digestion through the production of a range of enzymes. Similar to other studies, K and Na were the dominant ions in the pitcher fluid (Buch *et al*., 2013; Mansur *et al*., 2021). Buch *et al*. (2013) found that N and P were at very low concentrations in the pitcher fluid they studied but these were under artificial experimental conditions so, in natural habitats, we would expect the pitcher fluid nutrient concentrations to be greater due to the addition of insect carcasses and other organic debris. The pitcher of *Nepenthes* has an important role in supplying nutrients that are not available in the soil and the greater concentrations of nutrients in the pitcher fluid of *N. sumatrana* may be because it has a larger pitcher size and is thus able to catch more insects than *N. spectabilis* and *N. tobaica.* This statement is also supported by the results of a study by Moran & Moran (1998) who reported that *N. rafflesiana* which lacks N (from prey sources) in its leaves can lead to decreased photosynthetic activity and reduced number of pitchers of smaller sizes than control plants. It is not known if pitcher fluid has greater nutrient concentrations in species in more nutrient-rich habitats or if faster-growing species have lower nutrient concentrations due to more rapid uptake from the pitchers but this could be the focus of future research. Additionally, it would be informative to relate the pitcher and leaf nutrient concentrations to the composition and biomass of insects and other organic material collected in pitchers over a given time frame.

Across our extensive elevational dataset, we found that there was no change in foliar N with elevation – this suggests that *Nepenthes* species may obtain sufficient N from their prey with changing environmental conditions, or that there may be alterations to the stoichiometric ratio of their prey (*i.e.* changes in the N:P ratio) as elevation increases. As insects become less abundant at higher elevation, the importance of animal faeces may increase (Chin *et al*., 2010) or *Nepenthes* may be able to increase soil N uptake via roots or even through recently-described underground pitchers to trap soil animals (Dančák

et al., 2022). In contrast, foliar P concentrations did decrease with elevation and the N:P ratio increased indicating increasing phosphorus limitation of *Nepenthes* pitcher plants with elevation. This might more reasonably be considered to be a reduction in N limitation as the N:P ratios were very low overall with a median of 8.1 across our dataset. Declining P with elevation could be due to the presence of ultramafic sites at higher elevations in the dataset although this is unlikely as we would also expect declining K and Ca and increasing Mg (Proctor, 2003) which we did not see – additional data on nutrient concentrations of *Nepenthes* growing in ultramafic substrates would also help test this further.

CONCLUSION

Nutrient concentrations in leaves and pitcher fluid in the three *Nepenthes* species studied (*N. sumatrana, N. spectabilis,* and *N. tobaica*) were generally low. The concentration of soil nutrients in the habitat of *N. sumatrana* in the lowland were generally lower than in the habitat of *N. spectabilis* and *N. tobaica* in the highland but nutrient concentrations in the leaves and pitcher fluid of *N. sumatrana* (lowland species) were often greater than *N. spectabilis* and *N. tobaica* (highland species). Further consideration of environmental controls over foliar nutrient concentrations and their linkages with pitcher fluid nutrients and how this is important for nutrient uptake processes are strongly warranted in additional *Nepenthes* species.

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REFERENCES

BAUER, U., BOHN, H. F. & FEDERLE, W. 2009. Biomechanics and ecology of prey capture in *Nepenthes* pitcher plants. In: LEE, C. C. & CLARKE, C. (Eds.). *Proceedings of the 2007 Sarawak Nepenthes Summit*. Sarawak Forestry Corporation, Kuching, Sarawak, Malaysia. Pp. 48–59.

BAUTERS, M., VERBEECK, H., DEMOL, M., BRUNEEL, S., TAVEIRNE, C., VAN DER HEYDEN, D., CIZUNGU, L. & BOECKX, P. 2017. Parallel functional and stoichiometric trait shifts in South American and African forest communities with elevation. *Biogeosciences* 14(23): 5313–5321.

BAZILE, V., MORAN, J. A., LE MOGUÉDEC, G., MARSHALL, D. J. & GAUME, L. 2012. A carnivorous plant fed by its ant symbiont: a unique multi-faceted nutritional mutualism. *PloS ONE* 7(5): e36179.

BONHOMME, V., PELLOUX-PRAYER, H., JOUSSELIN, E., FORTERRE, Y., LABAT, J. J. & GAUME, L. 2011. Slippery or sticky? Functional diversity in the trapping strategy of *Nepenthes* carnivorous plants. *New Phytologist* 191(2): 545–554.

BREARLEY, F. Q. & MANSUR, M. 2012. Nutrient stoichiometry of *Nepenthes* species from a Bornean peat swamp forest. *Carnivorous Plant Newsletter* 41(3): 105–108.

BREARLEY, F. Q. 2021. Nutrient and metal concentrations in *Nepenthes macfarlanei* Hemsl. (Nepenthaceae) from a Malaysian montane forest. *Notulae Scientia Biologicae* 13 (2): 10976.

BUCH, F., ROTT, M., ROTTLOFF, S., PAETZ, C., HILLKE, I., RAESSLER, M. & MITHÖFER, A. 2013. Secreted pitfall-trap fluid of carnivorous *Nepenthes* plants is unsuitable for microbial growth. *Annals of Botany* 111(3): 375–383.

CHIN, L., MORAN, J. A. & CLARKE, C. 2010. Trap geometry in three giant montane pitcher plant species from Borneo is a function of tree shrew body size. *New Phytologist* 186(2): 461–470.

CLARKE, C. 1997. *Nepenthes of Borneo*. Natural History Publications, Kota Kinabalu.

CLARKE, C. 2001. *Nepenthes of Sumatra and Peninsular Malaysia*. Natural History Publications, Kota Kinabalu.

CLARKE, C. & LEE, C. 2004. *Pitcher Plants of Sarawak*. A Pocket Guide Book. Natural History Publications (Borneo), Kota Kinabalu.

CLARKE, C., BAUER, U., LEE, C. C., TUEN, A. A., REMBOLD, K. & MORAN, J. A. 2009. Tree shrew lavatories: a novel nitrogen sequestration strategy in a tropical pitcher plant. *Biology Letters* 5(5): 632–635.

DANČÁK, M., MAJESKÝ, L., ČERMÁK, V., GOLOS, M. R., PŁACHNO, B. J. & TJIASMANTO, W. 2022. First record of functional underground traps in a pitcher plant: *Nepenthes pudica* (Nepenthaceae), a new species from North Kalimantan, Borneo. *PhytoKeys* 201: 77–97.

ELLISON, A. M. 2008. Nutrient limitation and stoichiometry of carnivorous plants. *Plants Biology* 8(6): 740–747.

GAUME, L. & FORTERRE, Y. 2007. A viscoelastic deadly fluid in carnivorous pitcher plants. *PloS ONE* 2(11): e1185.

GILBERT, K. J., BITTLESTON, L. S., TONG, W. & PIERCE, N. E. 2020. Tropical pitcher plants (*Nepenthes*) act as ecological filters by altering properties of their fluid microenvironments. *Scientific Reports* 10(1): 4431.

GRAFE, T. U., SCHÖNER, C. R., KERTH, G., JUNAIDI, A. & SCHÖNER, M. G. 2011. A novel resource-service mutualism between bats and pitcher plants. *Biology Letters* 7(3): 436–439.

KURATA, K. & KURATA, S. 2009. Variation of pitcher morphology within *Nepenthes vieillardii* in New Caledonia. In: LEE, C. C. & CLARKE, C. (Eds.). *Proceedings of the 2007 Sarawak Nepenthes Summit* (Sarawak Forestry Corporation, Kuching, Sarawak, Malaysia. Pp: 59–71.

LEE, C., HERNAWATI & AKHRIADI, P. 2006. Two new species of *Nepenthes* (Nepenthaceae) from North Sumatra. *Blumea* 51(3): 561–568.

MALIK, A. A., PRAYUDHA, J., ANGGREANY, R., WULAN SARI, M. & WALID, A. 2020. Keanekaragaman hayati flora dan fauna di kawasan Taman Nasional Bukit Barisan Selatan (TNBBS) resort Merpas Bintuhan Kabupaten Kaur. *Jurnal Ilmiah Pendidikan Sains* 1(1): 35–42.

MANSUR, M. 2006. *Nepenthes: Kantong Semar yang Unik*. Penebar Swadaya Publisher, Jakarta.

MANSUR, M., BREARLEY, F. Q., RODE-MARGONO, E. J., ESSEEN, P. J. & TARIGAN, M. R. M. 2021. Ecology of *Nepenthes clipeata* on Gunung Kelam, Indonesian Borneo. *Plant Ecology and Diversity* 14(3−4): 195−203.

MANSUR, M., SALAMAH, A. & MIRMANTO, E. 2022. Diversity of *Nepenthes* species in North Sumatra Province. *Berita Biologi*. (*in press*).

MORAN, J. A. & MORAN, A. J. 1998. Foliar reflectance and vector analysis reveal nutrient stress in prey–deprived pitcher plants (*Nepenthes rafflesiana*). *International Journal of Plant Sciences* 159(6): 996–1001.

MORAN, J. A., MERBACH, M. A., LIVINGSTON, N. J., CLARKE, C. M. & BOOTH, W. E. 2001. Termite prey specialization in the pitcher plant *Nepenthes albomarginata*–evidence from stable isotope analysis. *Annals of Botany* 88(2): 307–311.

MORAN, J. A., CLARKE, C. M. & HAWKINS, B. J. 2003. From carnivore to detritivore? Isotopic evidence for leaf litter utilization by the tropical pitcher plant *Nepenthes ampullaria*. *International Journal of Plant Sciences* 164(4): 635–639.

MORAN, J. A. & CLARKE, C. M. 2010. The carnivorous syndrome in Nepenthes pitcher plants: current state of knowledge and potential future directions. *Plant Signaling and Behavior* 5(6): 644−648.

MORAN, J. A., HAWKINS, B. J., GOWEN, B. E. & ROBBINS, S. L. 2010. Ion fluxes across the pitcher walls of three Bornean *Nepenthes* pitcher plant species: flux rates and gland distribution patterns reflect nitrogen sequestration strategies. *Journal of Experimental Botany* 61(5): 1365−1374.

PHILLIPPS, A. & LAMB, A. 1996. *Pitcher Plants of Borneo*. Natural History Publications (Borneo) Sdn. Bhd, Kota Kinabalu.

PERMEN LHK No. 20 of 2018. 2018. Peraturan Menteri Lingkungan Hidup dan Kehutanan Republik Indonesia, Nomor P.20/Menlhk/Setjen/Kum.1/6/2018, tentang jenis tumbuhan dan satwa yang dilindungi. Jakarta, Indonesia, 29 Juni 2018.

PROCTOR, J. 2003. Vegetation and soil and plant chemistry on ultramafic rocks in the tropical Far East. *Perspectives in Plant Ecology, Evolution and Systematics* 6(1–2): 105−124.

ROTTLOFF, S., MIGUEL, S., BITEAU, F., NISSE, E., HAMMANN, P., KUHN, L., CHICHER, J., BAZILE, V., GAUME, L., MIGNARD, B., HEHN, A. & BOURGAUD, F. 2016. Proteome analysis of digestive fluids in *Nepenthes* pitchers. *Annals of Botany* 117(3): 479–495.

TAKEUCHI, Y., SALCHER, M. M., USHIO, M., SHIMIZU-INATSUGI, R., KOBAYASHI, M. J., DIWAY, B., VON MERING, C., PERNTHALER, J. & SHIMIZU, K. K. 2011. *In situ* enzyme activity in the dissolved and particulate fraction of the fluid from four pitcher plant species of the Genus *Nepenthes*. *PloS ONE* 6(9): e25144.

TANNER, E. V. J., VITOUSEK, P. M. & CUEVAS, E. 1998. Experimental investigation of nutrient limitation of forest growth on wet tropical mountains. *Ecology* 79(1):10–22.

TURNER, I. M. 2001. *The Ecology of Trees in the Tropical Rain Forest*. Cambridge University Press, Cambridge.

WANG, C. W. 2009. *Nepenthes* enzymes. In: LEE, C. C. & CLARKE, C. (Eds.). *Proceedings of the 2007 Sarawak Nepenthes Summit*. Sarawak Forestry Corporation, Kuching, Sarawak, Malaysia. pp. 40−46.

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ANNOTATED CHECKLIST OF *CYRTANDRA* (GESNERIACEAE) OF SUMATRA, INDONESIA

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ABSTRACT
WANG, Q. W., BRAMLEY, G. L. C., ATKINS, H. J. & KARTONEGORO, A. 2022. Annotated checklist of *Cyrtandra* (Gesneriaceae) of Sumatra, Indonesia. *Reinwardtia* 21(2): 63–80. — There are 53 species and three varieties of Sumatran *Cyrtandra* (Gesneriaceae) included in the checklist. Thirty-three lectotypes and four neotypes have been assigned, including for two excluded species. Two species are designated as *incertae sedis* due to a lack of type material or any associated specimens. A new name of *C. jackii* is proposed here to replace the illegitimate *C. glabra* Jack. Most of the species included in the checklist are endemic to Sumatra, with some species distributed in neighboring islands in Malesia. The next step for *Cyrtandra* in Sumatra is to carry out a full taxonomic revision to better understand distribution patterns and species limits and also to assign appropriate neotypes for those species still missing original material.

Key words: *Cyrtandra*, endemic, Southeast Asia, Sumatra, typification.

ABSTRAK
WANG, Q. W., BRAMLEY, G. L. C., ATKINS, H. J. & KARTONEGORO, A. 2022. Catatan *Cyrtandra* (Gesneriaceae) dari Sumatra, Indonesia. *Reinwardtia* 21(2): 63–80. — Terdapat 53 jenis dan tiga varietas *Cyrtandra* (Gesneriaceae) dari Sumatra termasuk dalam daftar periksa. Tiga puluh tiga jenis telah ditetapkan lektotipenya dan empat jenis ditetapkan neotipenya dalam studi ini, termasuk dua jenis yang dikeluarkan. Dua jenis ditetapkan sebagai tidak pasti karena tidak adanya tipe atau spesimen lain yang berkaitan. Nama baru *C. jackii* diajukan untuk menggantikan *C. glabra* Jack yang tidak sah. Sebagian besar jenis dalam daftar periksa merupakan jenis-jenis endemik untuk Sumatra, dan beberapa jenis juga tersebar luas di beberapa pulau sekitar di Malesia. Langkah selanjutnya untuk studi *Cyrtandra* di Sumatra adalah melakukan revisi taksonomi secara utuh untuk mengetahui pola distribusi dan batasan jenis dan juga untuk menetapkan neotipe yang tepat untuk beberapa jenis yang material aslinya masih belum ditemukan .

Kata kunci: Asia Tenggara, *Cyrtandra*, endemik, Sumatra, tipifikasi.

INTRODUCTION

Cyrtandra J.R.Forst. & G.Forst. is the largest genus in the Gesneriaceae with *ca.* 800 species (Atkins *et al.*, 2013). It is distributed throughout Southeast Asia and across the islands of the Pacific to Hawaii. Its high species number, tendency to restricted endemism and widespread distribution make it an excellent model genus for biogeographic and ecological studies (Atkins *et al.*, 2013; 2020). However, for this potential to be realised basic taxonomic work is required, particularly on the biodiverse islands of Southeast Asia, such as Sumatra.

The first account of *Cyrtandra* from Sumatra was provided by William Jack in 1823 based on his own collections (Jack, 1823). He described 11 species, mostly from the area around Bengkulu Province. Three years later, Blume proposed 12 *Cyrtandra* species mostly from Java, some of which were subsequently found to occur in Sumatra (Blume, 1826; Clarke, 1883; Bakhuizen van den Brink, 1950; Backer & Bakhuizen van den Brink, 1965). This was followed shortly afterwards

by three species from Sumatra described by Miquel (1858). Clarke (1883) was the first botanist to attempt a monograph of the genus across its distribution, and in that account, he also described a further thirteen species from Sumatra. Ridley (1917, 1923, 1926) then described a further eight species and Moore (1925) added five new species and two varieties from the island. Subsequently, Bramley & Cronk (2003) carried out a revision of the genus on Mount Kerinci on the border between West Sumatra and Jambi Province where they described three new species. Since then, there has been one new species described in 2020 (Smith *et al.*, 2020) and one new name for a later homonym for a Sumatran species (Olivar *et al.*, 2022).

No systematic review of *Cyrtandra* across the island has ever been undertaken. This comprehensive annotated checklist of the genus in Sumatra is an important step towards a full taxonomic account and a significant contribution to our overall knowledge of *Cyrtandra.*

MATERIALS AND METHODS

A provisional set of *Cyrtandra* names from Sumatra was assembled from the Gesneriaceae Resource Centre (GRC, 2022). All protologues were subsequently checked; the type status was confirmed and if appropriate, a lectotype was chosen from the original material if no holotype had been specified. Further discussion on type designation is given below: in general, where a lectotype was selected, it was checked against the protologue to ensure it matched the author's description of the species; decision making related to particular authors is set out in detail. Information on taxonomic status was taken from floras and other publications (Jack, 1823; Blume, 1826; De Candolle, 1845; Miquel, 1858; Clarke, 1883; Bakhuizen van den Brink, 1950; Bramley & Cronk, 2003; Bramley *et al.*, 2004; Atkins & Kartonegoro, 2021; GRC, 2022; POWO, 2022; Olivar *et al.*, 2022) and no additional taxonomic decision-making was undertaken at this time, although where there is some uncertainty about status this has been indicated in the discussion following the name entry. The checklist entry for each name follows the standard abbreviations for authors (IPNI, 2022) and journals and books (TL2, 2022). Most of the research for this paper was carried out during the restrictions of the Covid-19 pandemic using online resources from the following herbaria (A, BM, FI, G, L, M, MEL, SING, US, WU, abbreviations following Thiers, 2021) and online resources such as JSTOR plants (JSTOR, 2021). Physical collections were checked in herbaria of the home institutions of the authors (BO, E, K) and at the Natural History Museum, London (BM).

Wherever they are available the most recent 2D barcodes in the form L.2821876 on the sheets held at L are cited in preference to the older barcodes in the form L0538544 although some specimens, *e.g.* L0003263 (type of *C. longepetiolata*), only have the older ones. Where there are differences, locality details and spelling in type citations are taken from the specimen labels and not from the protologues. The original spelling of names is followed in the checklist except for those exceptions, detailed in Art. 60 of the Code (Turland *et al.*, 2018), where corrections are allowed such as for the removal of a hyphen (Art. 60.11) – *e.g. C. longepetiolata*.

RESULTS AND DISCUSSION

Sumatran *Cyrtandra* species

There are 53 species and three variety names which are considered to be accepted at the current time. Of these, 39 species and three varieties are known to be endemic to Sumatra and 15 species are also distributed on neighbouring islands. Of the 15 non-endemic species, 13 have a distribution that includes Java, with a few also known from Peninsular Malaysia (3), Southern Thailand (1), Borneo (1), Sulawesi (2) or the Lesser Sunda Islands (3) (Atkins & Kartonegoro, 2021; Bakhuizen van den Brink, 1950; Bramley *et al.*, 2004; Girmansyah *et al.*, 2013; Olivar *et al.*, 2022; GRC, 2022). See Appendix for distribution information. Some of the endemic species in Sumatra are distributed widely on the island. However, there are also some species known only in restricted areas such as the Kerinci Range, Leuser Mountains, Mentawai Islands, and North Sumatra (Ridley, 1917, 1926; Bramley & Cronk 2003; Smith *et al.*, 2020). Some of the species are based only on type specimens and two species are of uncertain status due to lack of types or any associated specimens.

Type designation of Sumatran Cyrtandra

To avoid repetition in the text, here we discuss the major collectors and authors of Sumatran *Cyrtandra* and outline our decision-making regarding typification.

Jack (1823) did not cite specimens when he described his species but sometimes gave information about locality. Almost all of Jack's collections and some of his manuscripts were burned in a ship fire in 1824 (Ridley, 1917; Merrill, 1952; Hughes & Girmansyah, 2011). A small number of his Sumatran collections are, however, in the Delessert Herbarium at Geneva (G) and also at the Natural Biodiversity Center in Leiden (L) from the Hasskarl private herbarium (Merrill, 1952). When it has been possible to locate Jack collections and link them unambigu-

Fig. 1. Some *Cyrtandra* species from Sumatra. A. *C. pendula* Blume. B. *C. rosea* Ridl. C. *C. rubriflora* P.E.Sm. & H.J.Atkins. D. *Cyrtandra* sp. E. *C. pauciflora* Ridl. Photos by S. Barber (A, B, E), P. Wilkie (C), M. Hughes (D).

ously with the names, these have been lectotypified here. Following Hughes & Girmansyah (2011) it is necessary to neotypify the names where it has not been possible to locate Jack's own collections. This is done in this study when possible or will be carried out as part of a planned full revision of Sumatran *Cyrtandra* and may require fieldwork to the collecting localities of the type material.

Blume (1826) did not cite types for his proposed *Cyrtandra* taxa from Java, so it has been necessary to choose lectotypes for these names and, whenever possible, we have selected Blume's own collections. Blume was the first Director of the Rijksherbarium in Leiden (L) which was founded in 1830 (Veldkamp, 1980), and the top set of his collections are held there, now the Naturalis Biodiversity Center, with some duplicates elsewhere. When there were no Blume collections associated with the species, the lectotype was chosen from specimens collected by Reinwardt, Kuhl or Van Hasselt where the type is held in the Naturalis Biodiversity Center Herbarium (L). When Blume left Java, he took the herbaria of Reinwardt, Kuhl, and van Hasselt with him (Van Steenis-Kruseman, 2022).

All of the Sumatran *Cyrtandra* species described by De Vriese (1856) were based on the collections of C.G.C. Reinwardt which were sent to De Vriese to study in Amsterdam (Veldkamp, 1980). De Vriese usually gave details of a collection when the species was described but cited no herbarium. Reinwardt's herbarium was later bequeathed to the Rijksherbarium Leiden now the Naturalis Biodiversity Center (Van Steenis-Kruseman, 2022). Reinwardt's collections in L which link to these names have either been treated as holotypes if there is no ambiguity or have been lectotypified here where clarification is helpful.

Miquel (1858) cited specimens when describing his species but did not specify a herbarium so it has been necessary to select a lectotype for his names. All Miquel's Sumatran *Cyrtandra* species are based on the collections of J.E. Teijsmann

which he worked on in Utrecht (Van Steenis-Kruseman, 2022) and are all now incorporated into the herbarium of the Naturalis Biodiversity Center, with some duplicates stored in Herbarium Bogoriense (BO).

Clarke (1883) usually listed multiple specimens for his Sumatran *Cyrtandra* species as he was attempting to provide a comprehensive list of all of the material available at that time from the thirteen herbaria that he consulted for his monograph (Clarke, 1883). For all but two of his species, *C. anisophylla* and *C. integrifolia,* where a single collection from a named herbarium was listed, it has been necessary to select a lectotype from the list of specimens provided by Clarke. Clarke cites a lot of material collected by O. Beccari which he describes as being 'beautifully collected' and supplying 'far more novelties than any other collection'. These are listed as being 'in h. propr.' *i.e.* 'in Beccari's own herbarium', which is in the Museum of Natural History in Florence (FI) (Cecchi *et al.*, 2021).

Ridley (1917; 1923; 1926) usually cited localities when he described species but did not give collection numbers or herbaria. Turner (2012) observed that 'a high proportion of Ridley's taxa need lectotypification because he rarely designated types from among the various specimens he cited when publishing taxa. He was also inconsistent in annotating the specimens he saw'. Thus, following Turner (2012), the choice of lectotype chosen here has been the specimen of highest quality from among candidate syntypes for Ridley's names.

Moore cited a collection when he described a new species but did not specify a herbarium (Moore, 1925). All of his names are based on the collections of H.O. Forbes's expeditions to Java and Sumatra (Rendle, 1925). According to Ridley (1917), the 'type set' of Forbes's collections are held at the Natural History Museum (BM), and thus these specimens are considered here to be the holotypes and any duplicates to be isotypes.

Type designations included in more recent works (Bramley & Cronk, 2003; Smith *et al.*, 2020; Olivar *et al.*, 2022) have usually been retained but a small number of errors relating to species from Mount Kerinci have been corrected here.

Checklist

There are 53 species and three varieties accepted in the checklist and the names are listed alphabetically since there is currently no effective infrageneric classification for *Cyrtandra* (Atkins *et al.*, 2021). Where a specimen (or its high resolution digital image) has not been seen, *n.v.* (indicating not seen) is noted after the specimen. Where possible, lectotypes and neotypes have been designated or we have indicated where further neotypification based on further research will be necessary.

1. CYRTANDRA ANISOPHYLLA C.B.Clarke

Cyrtandra anisophylla C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1) (1883) 249. — Type: INDONESIA. In Sumatra occidentale [West Sumatra Prov.] nel "Padangsche bovenlanden" sul Monte Singalan [Mount Singgalang], 1,700 m, 6 Jul 1878, *O. Beccari s.n.* (holotype: FI [FI013134, image seen]; isotype: K [K000831535!]).

Distribution. Endemic to Sumatra (Clarke, 1883; Bramley & Cronk, 2003; Bramley, 2005).

2. CYRTANDRA AUREA Jack

Cyrtandra aurea Jack, Trans. Linn. Soc. London 14(1) (1823) 29. — Type: INDONESIA. Sumatra, interior of Bencoolen [Bengkulu Prov.], at the foot of Gunong Bunko [Mt. Bungkuk], *W. Jack s.n.* (not found). Sumatra, Tapanuli, between Si-dikalang and Pongkolan, 18 KM South of Si-dikalang, 1,200 m, 27 Mar 1954, *A.H.G. Alston 14832* (neotype: BO [BO-1870315!], designated here).

Cyrtandra cordifolia de Vriese, Pl. Ind. Bat. Orient. (1856) 16, non Gaudich. (1829). – *Rhynchocarpus cordifolius* Reinw. ex Blume, Cat. Gew. Buitenzorg (1823) 84, *nom. nud.* — Type: INDONESIA. Java, *C.G.C. Reinwardt 516* (holotype: L).

Distribution. Sumatra (Jack, 1823); Sumatra and Java (Clarke, 1883; Bakhuizen van den Brink, 1950; Backer & Bakhuizen van den Brink, 1965).

Notes. We have managed to find a number of Jack's Sumatran *Cyrtandra* collections at G and L but none that link to this species. Here we select a new type for the species collected from Tapanuli, North Sumatra (*Alston 14832*, BO) which is a good match with Jack's original description of this species.

Cyrtandra cordifolia de Vriese is considered to be a synonym of *C. aurea* by Clarke (1883) and also by Bakhuizen van den Brink (1950). De Vriese (1856) cites a Reinwardt collection with the description of *Cyrtandra cordifolia* as 'Herb Reinw. no 516 sub nomine: *Rhynchocarpi cordifolii'* and a specimen matching these details is considered to be the holotype.

3. CYRTANDRA AUREOTINCTA Bramley & Cronk

Cyrtandra aureotincta Bramley & Cronk, Harvard Pap. Bot. 7(2) (2003) 419. — Type: INDONESIA. Sumatra, Mount Kerinci, trail to peak from Kersik Tua, 2,000–2,500 m, 28 Jul 2000, *Radhiah & Q.C.B. Cronk 129* (holotype: E [E00121282!]; isotypes: BIOT!, BO!).

Distribution. Endemic to Sumatra [Kerinci Range] (Bramley & Cronk, 2003).

4. CYRTANDRA BECCARII C.B.Clarke
Cyrtandra beccarii C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1) (1883) 249. — Type: INDONESIA. In Sumatra occidentale [West Sumatra Prov.] nel "Padangsche bovenlanden" sul Monte Singalan [Mount Singgalang], 1,700 m, 6 Jul 1878, *O. Beccari PS 327* (lectotype: K [K000831536!], designated here; isolectotypes: FI [FI013136, image seen], L [L0278249, image seen]).

Distribution. Endemic to Sumatra (Clarke, 1883; Bramley, 2005).

Notes. In the protologue of this species, Clarke (1883) cited one specimen with the description of the species, which is *Beccari 327* from Sumatra and cited two herbaria, K and Beccari's own herbarium which is now in Florence. The specimen in K has Clarke's writing on it and is selected here as the lectotype.

5. CYRTANDRA BICOLOR Jack
Cyrtandra bicolor Jack, Trans. Linn. Soc. London 14(1) (1823) 27. — Type: INDONESIA. Sumatra, *W. Jack s.n.* (lectotype: G [G00365349, image seen], designated here).

Distribution. Sumatra (Jack, 1823); Peninsular Malaysia, Sumatra (Clarke, 1883).

Notes. The only specimen found of *C. bicolor* collected by Jack is selected here as the lectotype. Clarke (1883) expands the range of this species to include Peninsular Malaysia although further work is required to clarify the distribution of this species and species limits as it is similar to *C. pendula* Blume.

6. CYRTANDRA BREVICAULIS Ridl.
Cyrtandra brevicaulis Ridl., J. Fed. Malay States Mus. 8(4) (1917) 70. — Type: INDONESIA. [West Sumatra Prov.], Tapan, Barong Baru, 4,000 ft., 7 Jun 1914, *H.C. Robinson & C.B. Kloss s.n.* (lectotype: BM [BM000600363!], designated here; isolectotype: K [K000831553]!).

Distribution. Endemic to Sumatra [West Sumatra] (Ridley, 1917).

Notes. Ridley (1917) states that this species is collected at 'Barong Bharu, on the west side Barisan Range', at 4,000 ft. There are two specimens of *Robinson & Kloss s.n.* from the Korinchi expedition one each at K and BM which are marked as Types and have both *C. brevicaulis* and Barong Bharu written on them. The specimen at BM, which is the most complete, is designated here as the lectotype.

7. CYRTANDRA CARNOSA Jack
Cyrtandra carnosa Jack, Trans. Linn. Soc. London 14(1) (1823) 30. – *Whitia carnosa* (Jack) Blume, Bijdr. Fl. Ned. Ind. 14 (1826) 775. — Type: INDONESIA. Sumatra, *W. Jack s.n.* (lectotype: G [G00365351, image seen], designated here).

Distribution. Endemic to Sumatra (Jack, 1823).

Notes. The only specimen found of *C. carnosa* collected by Jack is selected here as the lectotype. *Cyrtandra carnosa* was moved into the genus *Whitia* Blume in 1826 (Blume, 1826), with a location in Java 'in sylvis montium Seribu' given but no specimen cited. *Cyrtandra carnosa* was listed as a synonym, although strictly this is the basionym as this is a recombination.

Bakhuizen van den Brink (1950) later contended that, in fact, *C, carnosa* and *Whitia carnosa* (Jack) Blume are different species and he provided another name in *Cyrtandra, C. rufa* Bakh.f., to accommodate his understanding of *Whitia carnosa.* Bakhuizen van den Brink (1950) stated that he could not find Blume's original specimen from Mount Seribu but that Blume's description 'and the Javanese specimen doubtless cover each other'. Bakhuizen van den Brink also stated that *C. carnosa* differs by its unilateral disc. He listed Reinwardt's collection from Mount Moenara as the type of this species and the lectotype of *Whitia carnosa* and also cited a *Kuhl & van Hasselt* specimen from Mount Pangrango.

As *Whitia carnosa* is a recombination of *Cyrtandra carnosa,* however, these species should share the same type, which we believe is a Jack collection now in the herbarium in G. It was, therefore, not correct, under the Code (Article 7.3 (Turland *et al.*, 2018)), for Bakhuizen van den Brink (1950) to treat *Whitia carnosa* and *Cyrtandra carnosa* as different taxa and designate a Reinwardt (or Blume) collection as a lectotype for *Whitia carnosa.* We therefore treat *Whitia carnosa* as a synonym of *Cyrtandra carnosa* here and *Cyrtandra rufa* as an unrelated species with the Reinwardt collection from Java as its type. Whether *C. rufa*, based on the Javan material, is present in Sumatra, remains to be confirmed through fieldwork and revisionary work.

8. CYRTANDRA DISPAR DC.
Cyrtandra dispar DC., Prodr. 9 (1845) 282. – *Cyrtandra frutescens* Wall., Numer. List [Wallich] (1829) n. 807, *nom. nud.* — Type: MALAYSIA. Penang, 1829, *N. Wallich Cat. 807* (lectotype: K [K000831502!], designated by Bramley *et al.* (2004); isolectotypes: BM [BM000755533!,

BM000755534!], E [E00062408!, E00062409!, E00062410!], K [K000831500!, K000831501!], L, S [S11-10989, image seen], SING).
Cyrtandra squamulata Korth. *nom.nud.*: C.B.Clarke, in A.DC. & C.DC., Monogr. Phan. 5 (1) (1883) 203. *nom. nud.*

Distribution. Peninsular Malaysia (De Candolle, 1845); Peninsular Malaysia and Sumatra (Clarke, 1883); Southern Thailand, Peninsular Malaysia, Sumatra (Bramley *et al.*, 2004).

Notes. In the protologue, de Candolle cited one specimen from the East India Company herbarium, *Wall. Cat. 807*, which had the name *C. frutescens* Wall. associated with it, which is a later homonym of *C. frutescens* Jack from which it is very distinct. Bramley selected the K-Wallich specimen as lectotype (Bramley *et al.*, 2004). Clarke (1883) cited many specimens with the description of the species and expanded the distribution to include Sumatra. *Cyrtandra squamulata* is an unpublished manuscript name of Korthals that was listed as a synonym of this species by Clarke (1883).

9. CYRTANDRA DISSIMILIS C.B.Clarke
Cyrtandra dissimilis C.B.Clarke, in A.DC. & C.DC., Monogr. Phan. 5(1) (1883) 207. — Type: INDONESIA. Provincia di Padang in Sumatra occidentale [West Sumatra Prov.], Ayer Mancior [Air Mancur], 360 m, Aug 1878, *O. Beccari PS 731* (lectotype: FI [FI013139, image seen], designated here; isolectotype: K [K000831512!]).

Distribution. Sumatra and Java (Clarke, 1883).

Notes. Clarke (1883) cited four specimens with the description of *C. dissimilis*: two from Java and two from Sumatra. Specimens of *Beccari 731* from K and FI and *Korthals 189* from L, both from Sumatra, have been traced. The most complete of the Beccari collections from Florence has been selected here as the lectotype.

10. CYRTANDRA FENESTRATA C.B.Clarke
Cyrtandra fenestrata C.B.Clarke, in A.DC. & C.DC., Monogr. Phan. 5(1) (1883) 233. — Type: INDONESIA. In Sumatra occidentale [West Sumatra Prov.] nel "Padangsche bovenlanden" sul Monte Singalan [Mount Singgalang], 1,700 m, Jul 1878, *O. Beccari PS 253* (lectotype: FI [FI013153, FI013154, image seen] designated here; isolectotypes: BM [BM000600334!], K [K000831528!], [L.2818236, image seen]).

Distribution. Endemic to Sumatra (Clarke, 1883; Bramley & Cronk, 2003).

Notes. In the protologue of *C. fenestrata*, Clarke listed three *Beccari* collections: 65 (in K and FI), and 150 and 253 (in FI). The most complete of these, *Beccari* 253, with both fruits and flowers, in FI is selected as the lectotype here. Duplicates of this collection have also been found at BM, K, and L and these are designated as isolectotypes here.

11. CYRTANDRA FLABELLIFOLIA S.Moore
Cyrtandra flabellifolia S.Moore, J. Bot. 63[Suppl.] (1925) 75. — Type: INDONESIA. Resident Palembang [South Sumatra Prov.], Mt. Dempo, 5,500 ft, 1881, *H.O. Forbes 2258* (holotype: BM [BM000600340!]; isotype: L [L0003300, image seen]).

11a. CYRTANDRA FLABELLIFOLIA var. FLABELLIFOLIA

Distribution. Endemic to Sumatra [Mount Dempo] (Moore, 1925).

11b. CYRTANDRA FLABELLIFOLIA var. CORDATA S.Moore
Cyrtandra flabellifolia var. *cordata* S.Moore, J. Bot. 63[Suppl.] (1925) 75. — Type: INDONESIA. Resident Palembang [South Sumatra Prov.], Mt. Dempo, 5,500 ft, 1881, *H.O. Forbes 2423c* (holotype: BM [BM000600343!]).

Distribution. Endemic to Sumatra [Mount Dempo] (Moore, 1925).

12. CYRTANDRA FLABELLIGERA Ridl.
Cyrtandra flabelligera Ridl., J. Fed. Malay States Mus. 8(4) (1917) 69. — Type: INDONESIA. Sumatra, [Jambi Prov.], Korinchi, Siolak Daras, 16 Mar 1914, *H.C. Robinson & C.B. Kloss s.n.* (lectotype: K [K000831511!], designated here; isolectotypes: A [A00102939, image seen], US [US00126250, US00080844, images seen]).

Distribution. Endemic to Sumatra [Kerinci Range] (Ridley, 1917; Bramley & Cronk, 2003).

Notes. In the protologue, Ridley gave the locality for the species as Siolak Daras at 4,400 ft in Sumatra but did not cite any specimens. A holotype and isotype were listed by Bramley & Cronk (2003), although these specimens have the collection details of 'Sungai Kumbang' which does not match the locality given in the protologue. Specimens of *C. flabelligera* collected by Robinson and Kloss were found at A, K, and US with the collecting details 'Siolak Daras' which match the protologue. The most complete of these held at Kew is designated here as the lectotype. Ridley (1917) thought that this species is allied to *C. oblongifolia*, Benth., but 'with large fan-shaped bracts and a rather long peduncle'. Whether this

species is truly distinct from *C. oblongifolia* requires further study as part of a full taxonomic revision.

13. CYRTANDRA FRUTESCENS Jack
Cyrtandra frutescens Jack, Trans. Linn. Soc. London 14(1) (1823) 31. — Type: INDONESIA. Sumatra, *W. Jack s.n.* (lectotype: G [G00365352, image seen], designated here).

Distribution. Endemic to Sumatra (Jack, 1823).

Notes. The only specimen found of *C. frutescens* collected by Jack is selected here as the lectotype.

14. CYRTANDRA GRACILENTA Kraenzl.
Cyrtandra gracilenta Kraenzl., J. Linn. Soc., Bot. 37 (1906) 278. — Type: INDONESIA. Sumatra, near Datar [Tanah Datar], 1897, *C. Curtis 455* (holotype: K [K000831566!]).

Distribution. Endemic to Sumatra [West Sumatra] (Burtt, 1970, 1978).

Notes. Kraenzlin (1906) cited one specimen with the description of *C. gracilenta*, which was *Curtis s.n.* from near 'Datar (Dater?)' as written by Kraenzlin), which he assumed to be in Borneo. As noted by Burtt (1970, 1978), and also handwritten on the sheet at E on which a photograph of the K specimen is mounted, the correct spelling of the collecting locality has been a cause of confusion but that it is a place in Sumatra, not Borneo, and that Kraenzlin (1906) was incorrect about the locality. We give our interpretation of the locality name as written on the specimen label.

15. CYRTANDRA GRANDIS Blume var. AMPLA (C.B.Clarke) Bakh.f.
Cyrtandra grandis var. *ampla* (C.B.Clarke) Bakh.f., Blumea 6 (1950) 397. – *Cyrtandra ampla* C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5 (1) (1883) 259. — Type: INDONESIA. In Sumatra occidentale [West Sumatra Prov.] nel "Padangsche bovenlanden" sul Monte Singalan [Mount Singgalang], Jun 1878, *O. Beccari PS 173* (lectotype: K [K000831541!], designated here; isolectotypes: BM [BM000600333!], F [FI013132, image seen], L [L0003307, image seen]).

Distribution. Sumatra (Clarke, 1883); Sumatra, Java (Bakhuizen van den Brink, 1950; Backer & Bakhuizen van den Brink, 1965).

Notes. Clarke (1883) cited two specimens with the description of *C. ampla.* One was *Beccari 173* from Sumatra and the other was *Horsfield 18* from Java. Specimens of *Beccari 173* have been seen from K, L, BM, and FI but no specimens of *Horsfield 18* have been traced, although Clarke records that part of this specimen is at BM (Clarke, 1883). The specimen of *C. ampla* at K is selected here as the lectotype as it has the name in Clarke's handwriting on it.

16. CYRTANDRA HIRSUTA Jack
Cyrtandra hirsuta Jack, Trans. Linn. Soc. London 14(1) (1823) 27. — Type: INDONESIA. Sumatra, *W. Jack s.n* (lectotype: G [G00370808, image seen], designated here).

Distribution. Endemic to Sumatra (Jack, 1823).

Note. The only specimen found of *C. hirsuta* collected by Jack is selected here as the lectotype.

17. CYRTANDRA HOLODASYS Miq.
Cyrtandra holodasys Miq., Fl. Ned. Ind. 2 (1858) 747. — Type: INDONESIA. [West Sumatra Prov.], Palembajan, *J.E. Teijsmann HB 11912* (lectotype: K [K000831517!], designated here; isolectotypes: BO [BO-1978094!, BO-1978095!], L [L0003242, image seen]).

Distribution. Endemic to Sumatra [West Sumatra] (Miquel, 1858; Clarke 1883).

Note. In the protologue for *C. holodasys*, Miquel (1858) cited one specimen with the description of the species, which was a *Teijsmann* specimen from Palembayan in Sumatra, although no herbarium was cited. There are specimens matching this description in BO, K and L. The most complete specimen matching these details in K is selected here as the lectotype.

18. CYRTANDRA IMPRESSIVENIA C.B.Clarke
Cyrtandra impressivenia C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1) (1883) 212. — Type: INDONESIA. In Sumatra occidentale [West Sumatra Prov.] nel "Padangsche bovenlanden" sul Monte Singalan [Mount Singgalang], 1,700 m, Jun–Jul 1878, *O. Beccari PS 177* (lectotype: FI [FI013157, image seen], designated here; isolectotype: K [K000831521!]).

Distribution. Endemic to Sumatra [West Sumatra] (Clarke, 1883).

Notes. In the protologue, Clarke (1883) cited one specimen with the description of the species, which was *Beccari 177* from Sumatra, but listed collections from both K and FI. The specimen at FI is selected here as the lectotype, as it is the most complete specimen.

19. CYRTANDRA INCOMPTA Jack
Cyrtandra incompta Jack, Trans. Linn. Soc. London 14(1) (1823) 29. — Type: INDONESIA.

Sumatra, *W. Jack s.n.* (not found). West Sumatra, Gunung Sago, from Puncak Pato, 1,200 m, 9–12 Mar 1989, *Mulyati 06* (neotype: BO [BO-1871010!], designated here; isoneotypes ANDA, BO [BO-1871009!, BO-1871011!]).

Distribution. Endemic to Sumatra (Jack, 1823).

Notes. It has not been possible to find any Jack collections of this species, including at G and L (Clarke, 1883; Merrill, 1952). Thus, following Art 9.8 of the Code (Turland *et al.*, 2018) a neotype is selected from BO which matches Jack's description for the species. No locality is given in the protologue but some of Jack's collections are from West Sumatra.

20. CYRTANDRA INSULARIS Ridl.
Cyrtandra insularis Ridl., Bull. Misc. Inform. Kew 1926(2) (1926) 75. — Type: INDONESIA. Sumatra, Mentawai Islands, Island of Siberut, 11 Sep 1924, *C.B. Kloss SFN 13075* (holotype: K [K000831569!]; isotypes: BO [BO-1731157!, BO -1731159!], SING [SING0050764]).

Distribution. Endemic to Sumatra [Mentawai Islands] (Ridley, 1926).

Notes. This species was described in a paper on the Flora of the Mentawai Islands based on Cecil Boden-Kloss collections (Ridley, 1926). *Kloss 13075* is cited as the type; there are duplicates of this gathering at BO, K and SING. Ridley was at Kew from 1913 (Turner, 2012), so we assume his description was based on the K specimen which we list as the holotype. The specimens had been collected under Singapore Field Numbers and presumably distributed from there, with one set remaining at Singapore and unseen by Ridley. The fact that the SING duplicate has fruits rather than flowers, yet Ridley's description does not include fruit characters, supports this hypothesis.

21. CYRTANDRA INTEGRIFOLIA C.B.Clarke
Cyrtandra integrifolia C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1) (1883) 248. — Type: INDONESIA. Provincia di Padang in Sumatra occidentale [West Sumatra Prov.], Ayer Mancior [Air Mancur], 360 m, Aug 1878, *O. Beccari PS 770* (holotype: K [K000831534!]; isotype MEL [MEL2492168, image seen]).

Distribution. Endemic to Sumatra [West Sumatra] (Clarke, 1883).

22. **Cyrtandra jackii** Q.W.Wang & Karton., ***nom. nov.***
Cyrtandra glabra Jack, Trans. Linn. Soc. London 14 (1823) 28, nom. illeg. non *Cyrtandra glabra* Banks ex C.F.Gaertn. (1807). — Type: INDONESIA. Sumatra, Bencoolen, *W. Jack s.n.* (not found). INDONESIA. Sumatra, Resident Bengkoelen [Bengkulu Prov.], Kaba, 1,000 m, 18 Mar 1932, *C.N.A. de Voogd 1318* (neotype: BO [BO-1731105!], designated here; isoneotypes: BO [BO-1731106!], L [L.2818083, image seen]).

Distribution. Sumatra (Jack, 1823); Sumatra, Java (Bakhuizen van den Brink, 1950).

Notes. *Cyrtandra glabra* Jack was published illegitimately because it is a later homonym of *Cyrtandra glabra* Banks ex C.F.Gaertn. from the Pacific (Gaertner, 1807). In the protologue, Jack (1823) cites the location as being 'inland from Bencoolen'. However, no specimen is cited and it has not been possible to trace any of his collections of this species (Clarke, 1883; Merrill, 1952). A new name, *C. jackii* is proposed here to legitimise the species and a new type specimen is designated collected from close to the locality given by Jack and is a good match to the original description.

23. CYRTANDRA LOCUPLES S.Moore
Cyrtandra locuples S.Moore, J. Bot. 63[Suppl.] (1925) 75. — Type: INDONESIA. Resident Palembang [South Sumatra Prov.], Mt. Dempo, 5,500 ft, 1881, *H.O. Forbes 2264* (holotype: BM [BM000600342!]; isotype: WU [WU-0046015, image seen]).

Distribution. Endemic to Sumatra [South Sumatra] (Moore, 1925).

24. CYRTANDRA MACROPHYLLA Jack
Cyrtandra macrophylla Jack, Trans. Linn. Soc. London 14(1) (1823) 25, t. 2. — Type: INDONESIA. Sumatra, *W. Jack 87* (lectotype: [G00365262, image seen], designated here).

Distribution. Endemic to Sumatra (Jack, 1823).

Notes. The only specimen found of *C. macrophylla* collected by Jack is selected here as the lectotype.

25. CYRTANDRA MEMBRANACEA Ridl.
Cyrtandra membranacea Ridl., J. Fed. Malay States Mus. 8(4) (1917) 71. — Type: INDONESIA. Sumatra, [Jambi Prov.], Korinchi, Siolak Daras, 4,400 ft., 16 Mar 1914, *H.C. Robinson & C.B. Kloss s.n* (lectotype: BM [BM000600362!], designated here).

Distribution. Endemic to Sumatra [Kerinci Range] (Ridley, 1917).

Notes. Ridley (1917) cited three collecting localities for *C. membranacea* (Barong Bharu, Barisan Range at 4,000 ft; Sungei Kumbang at

4,500 ft; Siolak Daras at 3,000 ft) Herbarium specimens with matching details have been found at BM, K and US. As Ridley did not explicitly designate a type or a herbarium, following Article 9.11 of the Code (Turland *et al.*, 2018), it is necessary to select a lectotype from this original material. The choice is further complicated because some sheets have multiple pieces of plant with multiple labels (*e.g.* K000831574, K000831575). After careful consideration, we choose to select the specimen at the BM [BM000600362] from Siolak Daras (in Ridley's handwriting) as lectotype here. Bramley & Cronk (2003) incorrectly listed this specimen as the holotype and that is corrected here.

26. CYRTANDRA MINOR S.Moore
Cyrtandra minor S.Moore, J. Bot. 63[Suppl.] (1925) 75. — Type: INDONESIA. Res. Palembang [South Sumatra Prov.], Mt. Siminoeng [Seminung], 3,900 ft, 1880, *H.O. Forbes 2146* (holotype: BM [BM000600339!]; isotypes: L [L0003255, L0003254, images seen]).

Distribution. Endemic to Sumatra [South Sumatra] (Moore, 1925).

27. CYRTANDRA NAVICELLATA Zipp. ex C.B.Clarke
Cyrtandra navicellata Zipp. ex C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1) (1883) 240. — Type: INDONESIA. Sumatra, 1882, *P.W. Korthals 255* (lectotype: K [K000831532!], designated here; isolectotype: L [L0278284, image seen]).

Distribution. Endemic to Sumatra (West Sumatra) (Clarke, 1883).

Notes. This species was published in 1883 based on an unpublished Zippelius name (Clarke, 1883). In the protologue, Clarke cited two specimens with the description of the species, which were *Korthals 173* and *255* from Sumatra. There is a single sheet with specimens of both *Korthals 173* and *255* mounted on it at Kew. Leiden also has sheets of *Korthals 173* and *255*. *Korthals* 255 at Kew is the most complete specimen and is selected as the lectotype and the specimen in Leiden becomes the isolectotype.

28. CYRTANDRA NEMOROSA Blume
Cyrtandra nemorosa Blume, Bijdr. Fl. Ned. Ind. 14 (1826) 771. — Type: INDONESIA. Java, *C.G.C. Reinwardt s.n.* (lectotype: L [L0003256, image seen], designated here).
Cyrtandra reticosa C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1) (1883) 212. — Type: INDONESIA. Java, *P.W. Korthals 254* (lectotype: L [L2825676, image seen], designated here).

Distribution. Java (Blume, 1826; Clarke, 1883); Sumatra, Java (Bakhuizen van den Brink, 1950).

Notes. Reinwardt's collection from Java labeled *C. nemorosa* is selected as lectotype because there were none of Blume's own collections found for the species. Bakhuizen van den Brink (1950) placed *C. reticosa* in synonymy and automatically added Sumatra to the distribution of this species.

29. CYRTANDRA OBLONGIFOLIA (Blume) Benth. & Hook.f. ex C.B.Clarke
Cyrtandra oblongifolia (Blume) Benth. & Hook.f. ex C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1) (1883) 206. – *Whitia oblongifolia* Blume, Cat. Gew. Buitenzorg (1823) 17. – *Whitia longifolia* Blume, Cat. Gew. Buitenzorg (1823) 86, *nom. nud.* — Type: INDONESIA. Java, *C.L. Blume s.n.* (lectotype: L [L.2825707, image seen], designated here).
Whitia pilosa Zipp., *nom nud.*: C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1) (1883) 206.

Distribution. Java (Blume, 1823); Sumatra, Java, Borneo, Philippines (Clarke, 1883; Merrill, 1923); Sumatra, Java, Borneo (Burtt, 1970)

Notes. This species was first described in the genus *Whitia* by Blume (1823). Bentham & Hooker (1876) later questioned the distinctiveness of *Whitia* in their large work on genera, although the species was only formally moved into *Cyrtandra* by Clarke (1883).

Blume (1823, 1826) did not cite any specimens or a location but states that the species grows 'in sylvis montanis'. Here, we choose one of Blume's own specimens (L.2825707) from among several specimens labeled as *Whitia oblongifolia* in the Naturalis Biodiversity Center (L) and New York Botanical Garden (NY), and this is selected here as the lectotype.

30. CYRTANDRA OLIGANTHA Korth. ex C.B.Clarke
Cyrtandra oligantha Korth. ex C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1) (1883) 241. — Type: INDONESIA. Sumatra, *P.W. Korthals 1036 (109)* (lectotype: L [L.2826139, image seen], designated here; isolectotype: L [L.2826140, image seen]).

Distribution. Endemic to Sumatra (Clarke, 1883; Moore, 1925).

Notes. This species was published in 1883 (Clarke, 1883), based on an unpublished Korthals's name. In the protologue, Clarke cited '*Korthals*, *n. 1036* in h. Mus. Lugd. *n. 109*'. There are two sheets in the herbarium in Leiden which

have 'Korthals' and both of these collection numbers (*109* and *1036*) written on them. One of the sheets (L.2826139) has Korthals's writing on it and is selected here as the lectotype with the second becoming the isolectotype.

31. CYRTANDRA PANDURATA Ridl.
Cyrtandra pandurata Ridl., J. Malay. Branch Roy. Asiat. Soc. 1 (1923) 81. — Type: INDONESIA. [North Sumatra Prov.], Berastagi, 10 Feb 1921, *H.N. Ridley s.n.* (lectotype: K [K000831582!], designated here).

Distribution. Endemic to Sumatra [North Sumatra] (Ridley, 1923).

Notes. Ridley (1923) did not cite a type but he gave the locality of the species as Berastagi. There is one specimen of this species in the herbarium at Kew which was collected by Ridley in 1921 from Berastagi. As no other collections have been found, this is designated here as the lectotype.

32. CYRTANDRA PATENTISERRATA Bramley & Cronk
Cyrtandra patentiserrata Bramley & Cronk, Harvard Pap. Bot. 7(2) (2003) 420. — Type: INDONESIA. Sumatra West Kust [West Sumatra Prov.], G. Koerintji [Mt. Kerinci], 1,400 m, 7 May 1920, *H.A.B. Bünnemeijer 8551* (holotype: L [L0278438, image seen]; isotype: BO!).

Distribution. Endemic to Sumatra [Kerinci Range] (Bramley & Cronk, 2003).

33. CYRTANDRA PAUCIFLORA Ridl. [Fig. 1e]
Cyrtandra pauciflora Ridl., J. Malay. Branch Roy. Asiat. Soc. 1 (1923) 81. — Type: INDONESIA. [North Sumatra Prov.], Berastagi, wooded ravine, 15 Feb 1921, *H.N. Ridley s.n* (lectotype: K [K000831585!], designated here).

Distribution. Endemic to Sumatra (North Sumatra) (Ridley, 1923).

Notes. There was no type specimen recorded in the protologue for this species but the location details are given as 'in a wooded ravine, Berastagi'. There are four specimens in the Kew herbarium collected by Ridley, without collection numbers, from Sumatra. One of these (K000831585) has exactly the same location details as in the protologue, and has flowers and fruits. It is selected here as the lectotype.

34. CYRTANDRA PELTATA Jack
Cyrtandra peltata Jack, Trans. Linn. Soc. London 14(1) (1823) 30, *non* Wawra (1872). — Type: INDONESIA. Sumatra, *W. Jack s.n.* (not found). Sumatra, Bengkulu Prov., Ketahun, Sungai Gembung, c. 150 m, 12 Oct 1993, *J.J. Afriastini 2643* (neotype: BO [BO-1350518!], designated here; isoneotype: L [L.3794481, image seen]).

Distribution. Endemic to Sumatra (Jack, 1823).

Notes. No Jack collections of this species have been found in any herbaria consulted, and thus a neotype has been selected from all Sumatran collections in BO. *Afriastini 2643* is chosen as neotype for the species here as the collection was made very close to Jack's collecting site in Bengkulu, Sumatra and its appearance closely matches Jack's description. The rest of Sumatran species were collected from West Sumatra.

35. CYRTANDRA PENDULA Blume [Fig. 1a]
Cyrtandra pendula Blume, Bijdr. Fl. Ned. Ind. 14 (1826) 768. — Type: INDONESIA. Java, *C.L. Blume 2038c* (lectotype: L [L.2826033, image seen], designated here).
Cyrtandra rotundifolia Ridl., J. Straits Branch Roy. Asiat. Soc. 57 (1911) 76. — Type: MALAYSIA. State of Perak, Temengoh, 1909, *H.N. Ridley 14445* (lectotype: SING [SING0043670!], designated here; isolectotypes: K [K000831503!], BM).

Distribution. Java (Blume, 1826); Sumatra and Java (Clarke, 1883); Peninsular Malaysia, Sumatra, Java (Bramley *et al.*, 2004).

Notes. Blume (1826) did not cite any specimens or a location when he described *C. pendula* but stated that the species grows 'in humidis montanis'. A flowering specimen collected by Blume, *Blume 2038c*, and incorrectly listed in Bramley *et al.* (2004) as the holotype rather than being proposed as the lectotype, is formally designated here.

Cyrtandra rotundifolia Ridl. was described from Peninsular Malaysia (Ridley, 1911). This was considered a synonym of *C. pendula* by Bramley *et al.* (2004). Ridley (1911) did not cite any specimens but gave the locality as 'Temengoh'. The most complete specimen at SING, and marked as a type, is selected as the lectotype and the specimens at K and BM become the isolectotypes.

36. CYRTANDRA PERPLEXA S.Moore
Cyrtandra perplexa S.Moore, J. Bot. 63[Suppl.] (1925) 74. — Type: INDONESIA. Res. Palembang [South Sumatra Prov.], Mt. Dempo, 6,500 ft., 1880, *H.O. Forbes 2493a* (holotype: BM [BM000600347!]; isotype: L [L0003261, image seen]).

Distribution. Endemic to Sumatra [South Sumatra] (Moore, 1925).

37. CYRTANDRA PICTA Blume
Cyrtandra picta Blume, Bijdr. Fl. Ned. Ind. 14 (1826) 769. — Type: INDONESIA. Java, *C.L. Blume s.n.* (lectotype: L [L.2826547, image seen], designated here).
Cyrtandra longepetiolata de Vriese, Pl. Ind. Bat. Orient. (1856) 12. — Type: INDONESIA. Java, Bantam, *C.G.C. Reinwardt. s.n* (lectotype: L [L0003263, image seen], designated here).
Cyrtandra repens var. *monantha* C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1) (1883) 248. — Type: INDONESIA. Java, *H. Kuhl & J.C. van Hasselt 87* (holotype: L).

Distribution. Java (Blume, 1826); Sumatra, Java (Clarke, 1883; Bakhuizen van den Brink, 1950).

Notes. The lectotype for *Cyrtandra picta* was taken from Blume's own collections at L with his handwriting on the label. For *C. longepetiolata* described by de Vriese, one of Reinwardt's collections, annotated with the manuscript name '*Rhynchocarpus glaber* Rwdt' mentioned in the protologue, has been selected as De Vriese was working on Reinwardt's herbarium (Van Steenis-Kruseman, 2022).

Bakhuizen van den Brink (1950) considered *C. longepetiolata* to be a synonym of *C. picta*. Bramley & Cronk (2003) stated that *C. longepetiolata* may be distinct from *C. picta* but it is placed back in synonymy here.

38. CYRTANDRA PILOSA Blume
Cyrtandra pilosa Blume, Bijdr. Fl. Ned. Ind. 14 (1826) 770. — Type: INDONESIA. Java, *C.L. Blume 2038b* (lectotype: L [L0003264, image seen], designated here).
Cyrtandra pallescens Jack, *nom. nud.*: C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1) (1883) 231.

Distribution. Java (Blume, 1826); Sumatra, Java (Clarke, 1883).

Notes. Blume's own collection from Java in L with his handwriting on the label, is chosen as lectotype. This name has been applied to specimens across a wide distributional range from Java, Sumatra, Singapore, Myanmar and Peninsular Malaysia (Clarke, 1883; Burtt, 1978). Although, the Peninsular Malaysian specimens are now considered to be *C. wallichii* (C.B.Clarke) B.L.Burtt (Burtt, 1978; Bramley *et al.*, 2004). Further work is required across the distribution to determine how widely distributed this species is and to confirm its presence in Sumatra.

39. CYRTANDRA POPULIFOLIA Miq.
Cyrtandra populifolia Miq., Fl. Ned. Ind. 2 (1858) 741. — Type: INDONESIA. [West Sumatra Prov.], in de kloof van den Singalang [Mt. Singgalang], *J.E. Teijsmann HB 1197* (lectotype: U [U0002253, image seen], designated here; isolectotypes: BO [BO-1886854!, BO-1886855!], L [L0003267, image seen]).

Distribution. Sumatra (Miquel, 1858); Sumatra, Java (Clarke, 1883; Bakhuizen van den Brink, 1950).

Notes. In the protologue for *C. populifolia*, Miquel cited a Teijsmann specimen from Mount Singgalang with the description of the species. A Teijsmann collection of this species from U, where Miquel was based (Van Steenis-Kruseman, 2022) and marked as 'Typus', is designated here as the Lectotype. A duplicate at L, marked as 'Typ. Dupl' and less complete, is designated here as the isolectotype along with two sheets in BO.

40. CYRTANDRA RHYNCANTHERA C.B.Clarke
Cyrtandra rhyncanthera C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1) (1883) 233. — Type: INDONESIA. Sumatra West Coast, Mount Singgalang, *C. Curtis 77* (lectotype: K [K000831525!], designated by Bramley & Cronk (2003).

Distribution. Endemic to Sumatra (Clarke, 1883; Bramley & Cronk, 2003).

41. CYRTANDRA ROSEA Ridl. [Fig. 1b]
Cyrtandra rosea Ridl., J. Fed. Malay States Mus. 8(4) (1917) 70. — Type: INDONESIA. [Jambi Prov.], Korinchi, Siolak Daras, 3,000 ft., 17 Mar 1914, *H.C. Robinson & C.B. Kloss s.n.* (lectotype: BM [BM000600367!], designated here; isolectotype: K [K000831592!]).

Distribution. Endemic to Sumatra [Kerinci Range] (Ridley, 1917).

Notes. Ridley (1917) gave details of two localities in the protologue of this species. One was Siolak Daras, at 3,000 ft.; the other was Korinchi Peak, 7,300 ft. A *Robinson* & *Kloss* collection from Siolak Daras specimen was incorrectly listed as the holotype by Bramley & Cronk (2003), rather than being proposed as a lectotype. Here, we formally designate it as lectotype.

42. CYRTANDRA ROSTRATA Blume
Cyrtandra rostrata Blume, Bijdr. Fl. Ned. Ind. 14 (1826) 771. — Type: INDONESIA. Java, *C.L. Blume s.n.* (lectotype: L [L0003272, image seen], designated here).

42a. CYRTANDRA ROSTRATA var. ROSTRATA

Distribution. Java (Blume, 1826); Sumatra,

Java (Clarke, 1883; Moore, 1925); Sumatra, Java, Lesser Sunda Islands (Girmansyah *et al.* 2013).

Notes. This species was described from Java but its distribution was later extended to include Sumatra (Clarke, 1883; Moore, 1925) and the Lesser Sunda Islands (Girmansyah *et al.*, 2013). One of Blume's own collections marked as *Cyrtandra rostrata* in his handwriting is selected as the lectotype.

42b. CYRTANDRA ROSTRATA var. SUBSESSILIS S.Moore
Cyrtandra rostrata var. *subsessilis* S.Moore, J. Bot. 63[Suppl.] (1925) 74. — Type: INDONESIA. Sumatra, Lampongs [Lampung Prov.], Kotta Djawa, 285 ft., 1880, *H.O. Forbes 1382* (holotype: BM [BM014127659!]; isotypes: WU [WU0046017, image seen]).

Distribution. Endemic to Sumatra [Lampung] (Moore, 1925).

Notes. The specimens at BM and WU both have the number *1382* written on a label that is marked as 'SOUTH EAST JAVA'. The protologue states, however, that the specimen was collected in 'Kotta Djawa, Lampong' in Sumatra.

43. CYRTANDRA RUBRIFLORA P.E.Sm. & H.J.Atkins [Fig. 1c]
Cyrtandra rubriflora P.E.Sm. & H.J.Atkins, Rheedea 30 (2020) 159. — Type: INDONESIA. Sumatra, Aceh Province, Gunung Leuser National Park, Ketambe Research Station, 8 Mar 2008, *P. Wilkie, M. Hughes, A. Sumadijaya, Rasnovi, Marlan & Rabusin PW630* (holotype: E [E00416358!]; isotype: BO [BO-1880564!]).

Distribution. Endemic to Sumatra [Leuser Mts.] (Smith *et al.*, 2020).

44. CYRTANDRA SANDEI de Vriese
Cyrtandra sandei de Vriese, Pl. Ind. Bat. Orient. (1856) 14. — Type: INDONESIA. Celebes [Sulawesi], Lontar, *C.G.C. Reinwardt s.n.* (lectotype: L [L0003193!], designated by Atkins & Kartonegoro (2021)).

Distribution. Sulawesi (De Vriese, 1856); Sumatra and Java (Clarke, 1883); Sumatra, Java, Lesser Sunda Islands, Sulawesi (Atkins & Kartonegoro, 2021).

45. CYRTANDRA SCUTATA S.Moore
Cyrtandra scutata S.Moore, J. Bot. 63[Suppl.] (1925) 76. — Type: INDONESIA. Resident Palembang [South Sumatra Prov.], Mt. Dempo, 4,000 ft., 1880, *H.O. Forbes 2437bis* (holotype: BM [BM000600346!]).

Distribution. Endemic to Sumatra [Mt. Dempo] (Moore, 1925).

46. CYRTANDRA SIPORENSIS Olivar
Cyrtandra siporensis Olivar, Taxon 71(5) (2022) 1104. – C*yrtandra chiritoides* Ridl., Bull. Misc. Inform. Kew 1926 (1926) 75, *nom. illeg.*, *non* C*yrtandra chiritoides* Kraenzl. (1913) — Type: INDONESIA. Sumatra, Mentawai Islands, Island of Sipora, 9 Oct 1924, *C.B. Kloss 14651* (holotype: K [K000831554!]; isotypes: BO [BO-1735386!], SING [SING0050766!]).

Distribution. Endemic to Sumatra [Mentawai Islands] (Ridley, 1926; Olivar *et al.*, 2022).

47. CYRTANDRA STENOPTERA Bramley & Cronk
Cyrtandra stenoptera Bramley & Cronk, Harvard Pap. Bot. 7(2) (2003) 417. — Type: INDONESIA. Sumatra, Mt. Kerinci, 1,800–2,000 m, 27 Jul 2000, *Radhiah & Q.C.B. Cronk 110* (holotype: E [E00121291!]; isotypes: BIOT!, BO!).

Distribution. Endemic to Sumatra [Kerinci Range] (Bramley & Cronk, 2003).

48. CYRTANDRA SULCATA Blume
Cyrtandra sulcata Blume, Bijdr. Fl. Ned. Ind. 14 (1826) 770. — Type: INDONESIA. [West Java Prov.], Megamendung, *C.L. Blume 221* (lectotype: L [L2826829, image seen], designated by Atkins & Kartonegoro (2021)).

Distribution. Java (Blume, 1826; Clarke, 1883); Sumatra, Java, Sulawesi (Atkins & Kartonegoro, 2021).

49. CYRTANDRA TEYSMANNII Miq.
Cyrtandra teysmannii Miq., Fl. Ned. Ind. 2 (1858) 741. — Type: INDONESIA. Sumatra, in de kloof van den Singalang [Mt. Singgalang], *J.E. Teijsmann HB 1198* (lectotype: BO [BO-1877508!], designated here; isolectotype U [U0002254, image seen]).

Distribution. Endemic to Sumatra [West Sumatra] (Miquel, 1858; Clarke, 1883).

Note. In the protologue for *C. teysmannii*, Miquel (1858) cited a Teijsmann specimen from Singgalang with the description of the species but no herbarium. A Teijsmann collection of this species from BO, which matches the location details in the protologue, is designated here as the lectotype and a duplicate at U is designated as the isolectotype.

50. CYRTANDRA TRICHODON Ridl.
Cyrtandra trichodon Ridl., J. Fed. Malay States Mus. 8 (1917) 70. — Type: INDONESIA. Suma-

tra, Korinchi Peak, 6 May 1914, *H.C. Robinson & C.B. Kloss, s.n.* (lectotype: BM [BM000600356!], designated here; isolectotype K [K000831595!]).

Distribution. Endemic to Sumatra [Kerinci Range] (Ridley, 1917; Bramley & Cronk, 2003).

Notes. Ridley (1917) did not cite any specimens in the protologue but gave a location of 'Korinchi Peak, 7,300 ft' for this species. There are two duplicates of a *Robinson & Kloss s.n.* collection with these locality details: one at the BM and one at K. As Ridley did not explicitly designate a type or a herbarium and because we cannot be sure that Ridley was not working closely with both sheets (his handwriting is on the labels of both), following Article 9.11 of the Code (Turland *et al.*, 2018), it is necessary to select a lectotype. Bramley & Cronk (2003) incorrectly cited the BM duplicate as the holotype and the Kew duplicate as the isotype. We correct that here by formally designating the BM specimen as the lectotype and the Kew specimen as the isolectotype.

51. CYRTANDRA VIRIDESCENS C.B.Clarke
Cyrtandra viridescens C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1) (1883) 247. — Type: INDONESIA. In Sumatra occidentale [West Sumatra Prov.] nel "Padangsche bovenlanden" sul Monte Singalan [Mount Singgalang], 1,600 m, Jun -Jul 1878, *O. Beccari PS 25* (lectotype: FI [FI013180, image seen] designated here; isolectotype: K [K000831533!]).

Distribution. Endemic to Sumatra (Clarke, 1883).

Notes. Clarke (1883) listed *Beccari 25* for this species deposited in FI and K. The collection from FI is selected as the lectotype here as it has flowers.

UNCERTAIN SPECIES

Two names described by Jack (1823) have been placed here. It was not possible to locate any collections made by Jack linked to these names or identify any material appropriate for neotypification. Further research will be carried out as part of a full revision of Sumatran *Cyrtandra* and may require fieldwork to the collecting localities of the type material.

52. CYRTANDRA MACULATA Jack
Cyrtandra maculata Jack, Trans. Linn. Soc. London 14 (1823) 26. — Type: INDONESIA. Sumatra, *W. Jack s.n.* (not found).

Distribution. Endemic to Sumatra (Jack, 1823).

53. CYRTANDRA RUBIGINOSA Jack
Cyrtandra rubiginosa Jack, Trans. Linn. Soc. London 14 (1823) 32. — Type: INDONESIA. Sumatra, *Jack s.n.* (not found).

Distribution. Endemic to Sumatra (Jack, 1823).

EXCLUDED SPECIES

1. CYRTANDRA HORSFIELDII Miq.
Cyrtandra horsfieldii Miq., Fl. Ned. Ind. 2 (1858) 738. — Type: INDONESIA. Sumatra, Bangka, *T. Horsfield s.n.* (lectotype: K [K000854725!], designated here). = ***Pentaphragma horsfieldii*** (Miq.) Airy Shaw, Kew Bull. 8(2) (1953) 249 (Pentaphragmataceae).

Notes. *Cyrtandra horsfieldii* was transferred to *Pentaphragma* in the account for the genus in Malesia (Airy Shaw, 1953).

2. CYRTANDRA DECURRENS de Vriese
Cyrtandra decurrens de Vriese, Pl. Ind. Bat. Orient. (1856) 14. — Type: INDONESIA. [Maluku Prov.], Amboina insula prope Hilam, Jul 1821, *C.G.C. Reinwardt 1266 (205)* (holotype: L [L.2818363, image seen]).
Cyrtandra elongata Korth., *nom. nud.*: C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1) (1883) 232.

Notes. This species was described by De Vriese (1856) from a specimen from the Moluccas, *Reinwardt 1266* at Reinwardt's herbarium, now Naturalis Biodiversity Center (L). A Reinwardt collection from Ambon (Ambonia) at the herbarium in Leiden is considered to be the lectotype. In 1883, Clarke expanded the distribution of the species to include Sumatra and also described three varieties: one from Peninsular Malaysia, one from Borneo and Papua and one from Sulawesi. The varieties from Sulawesi and Peninsular Malaysia have subsequently been raised to species-level as *C. polyneura* (C.B.Clarke) B.L.Burtt (Burtt, 1990) and *C. wallichii* (C.B.Clarke) B.L.Burtt (Burtt, 1978) respectively. The specimens listed by Clarke (1883) as *C. decurrens* when he expanded the distribution of the species to include Sumatra (*Korthals 119 & 128*) are now considered to be *C. pandurata*, and *C. decurrens* is not thought to be present in Sumatra.

AUTHOR CONTRIBUTIONS

QWW, GLCB, HJA, and AK set the ideas for this research and all authors contributed equally as main authors to the manuscript.

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REFERENCES

AIRY SHAW, H. K. 1953. New Malaysian species of *Pentaphragma. Kew Bulletin* 8(2): 241–249.

ATKINS, H. J., BRAMLEY, G. L. C., & CLARK, J. R. 2013. Current knowledge and future directions in the taxonomy of C*yrtandra* (Gesneriaceae), with a new estimate of species number. *Selbyana* 31(2): 157–165.

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): e44814. DOI:10.21425/F5FBG44814.

ATKINS, H. J. & KARTONEGORO, A. 2021. A taxonomic revision of *Cyrtandra* (Gesneriaceae) in Sulawesi, Indonesia. *Edinburgh Journal of Botany* 78, Article 364: 1–122. DOI: 10.24823/EJB.2021.364.

ATKINS, H. J., BRAMLEY, G. L. C., NISHII, K., MÖLLER, M., OLIVAR, J. E. C., KARTONEGORO, A. & HUGHES, M. 2021. Sectional polyphyly and morphological homoplasy in Southeast Asian *Cyrtandra* (Gesneriaceae): consequences for the ta xonomy of a mega-diverse genus. *Plant Systematics and Evolution* 307: Article 60. DOI: 10.1007/s00606-021-01784-x.

BACKER, C. A. & BAKHUIZEN VAN DEN BRINK, R. C. 1965. *Flora of Java.* Volume 2. N.V.P. Noordhoff, Groningen.

BAKHUIZEN VAN DEN BRINK, R. C. 1950. Notes on the Flora of Java. VI. *Blumea* 6: 363–406.

BENTHAM, G. & HOOKER, J. D. 1876. Genera Plantarum. 2(2). *Sistens Dicotyledonum Gamopetalarum Ordines XXXIX*. Lovell Reeve & Co, Williams & Norgate, London.

BLUME, C. L. 1823. *Catalogus van eenige der merkwaardigste zoo in- als uit-heemsche gewassen te vinden in 's Lands Plantentuin te Buitenzorg.* Lands Drukkerij, Batavia [Jakarta].

BLUME, C. L. 1826. *Bijdragen tot de flora van Nederlandsch Indië.* Volume 14. Lands Drukkerij, Batavia [Jakarta].

BRAMLEY, G. L. C. 2005. Revision of *Cyrtandra* section *Dissimiles* (Gesneriaceae). *Blumea* 50: 163–189. DOI: 10.3767/000651905X623355.

BRAMLEY, G. L. C. & CRONK, Q. C. B. 2003. The *Cyrtandra* (Gesneriaceae) species of Mount Kerinci, Sumatra. *Harvard Papers in Botany* 7 (2): 407–421.

BRAMLEY, G. L. C., WEBER, A., CRONK, Q. C. B., & BOKHARI, M. H. 2004. The Genus *Cyrtandra* (Gesneriaceae) in Peninsular Malaysia and Singapore. *Edinburgh Journal of Botany* 60(3): 331–360. DOI: 10.1017/S0960428603000283.

BURTT, B. L. 1970. Studies on the Gesneriaceae of the Old World XXXIII: some species of *Cyrtandra,* chiefly Bornean. *Notes from the Royal Botanic Garden, Edinburgh* 30: 23–42.

BURTT, B. L. 1978. Studies in the Gesneriaceae of the Old World XLIV: new and little-known species of *Cyrtandra*, chiefly from Sarawak. *Notes from the Royal Botanic Garden, Edinburgh* 36(1): 157–179.

BURTT, B. L. 1990. Gesneriaceae of the Old World I. New and little-known species of *Cyrtandra* from Malesia. *Edinburgh Jornal of Botany* 47: 201–233.

CECCHI, L., LASTRUCCI, L., RAFFAELLI, M., DELL'OLMO, L., DONATELLI, A., VICIANI, D. & NEPI, C. 2021. Odoardo Beccari's Malesian herbarium in Florence: the disclosure of a hidden treasure. 1. Zingiberales. *Plant Biosystems* (online). DOI: 10.1080/11263504.2021.1918786

CLARKE, C. B. 1883. *Cyrtandreae* (Gesneraceae arum tribus). In: DE CANDOLLE, A. & DE CANDOLLE, C. *Monographiae Phanerogamarum* 5(1). Sumptibus G. Masson, Paris, pp. 1–303.

DE CANDOLLE, A. P. 1845. Cyrtandraceae. *Prodromus Systematis Naturalis Regni Vegetabilis. Volume 9*. Treuttel et Wurtz, Paris.

DE VRIESE, W. H. 1856. *Plantae Indiae Batavae Orientalis*. E. J. Brill, Leiden.

GAERTNER, C. F. 1807. *Supplementum carpologicae*. C. F. E. Richter, Leipzig.

GIRMANSYAH, D., SANTIKA, Y., RETNOWATI, A., WARDANI, W., HAERIDA, I., WIDJAJA, E. A. & VAN BALGOOY, M. M. J. (Eds.). 2013. *Flora of Bali: An annotated checklist*. Yayasan Obor Indonesia, Jakarta.

GRC. 2022. *Gesneriaceae Resource Centre*. Published on the internet. https://

padme.rbge.org.uk/GRC. Royal Botanic Garden Edinburgh. (Accessed 7 July 2022).

HUGHES, M. & GIRMANSYAH, D. 2011. Searching for Sumatran *Begonia* described by William Jack: following in the footsteps of a 19th century Scottish botanist. *Gardens' Bulletin Singapore* 63(1&2): 83–96.

IPNI. 2022. *International Plant Names Index*. Published on the internet: http://www.ipni.org, The Royal Botanic Gardens, Kew, Harvard University Herbaria & Libraries and Australian National Botanic Gardens. (Accessed 7 July 2022).

JACK, W. 1823. On Cyrtandrace, a new natural order of plants. *Transaction of the Linnean Society of London* 14: 23–45.

JSTOR. 2022. *Global plants on JSTOR*. Published on http://plants.jstor.org. (Accessed 7 July 2022).

KRAENZLIN, F. 1906. Cyrtandraceae Malaye insularis novae. *The Journal of the Linnean Society* 37: 275–285.

MERRILL, E.D. 1923. *An enumeration of Philippine flowering plants*. Volume 3. Bureau of Printing, Manila.

MERRILL, E. D. 1952. William Jack's genera and species of Malaysian plants. *Journal of the Arnold Arboretum* 33(3): 199–251.

MIQUEL, F. A. W. 1858. *Flora van Nederlandsch Indie. Volume 2.* C. G. van der Post, Amsterdam.

MOORE, S. 1925. Gamopetalae. In: Dr H.O. Forbes's Malayan Plants. *Journal of Botany* 63 (Suppl.): 46–80.

NATURALIS BIODIVERSITY CENTER. 2022. *Bioportal: Browse Dutch Natural History Collections*. Published on the internet: http://bioportal.naturalis.nl/. (Accessed 15 July 2022).

OLIVAR, J. E. C., ATKINS, H. J., BRAMLEY, G. L. C., PELSER, P. B., HAUENSCHILD, F. & MUELLNER-RIEHL, A. N. 2022. A synopsis of Philippine *Cyrtandra* (Gesneriaceae). *Taxon* 71(5): 1084–1106. DOI: 10.1002/tax.12725.

POWO. 2022. '*Plants of the World Online*'. Facilitated by the Royal Botanic Gardens, Kew. Published on the internet: http://www.plantsoftheworldonline.org/. (Accessed 7 July 2022).

RENDLE, A. B. 1925. Introductory note. In: Dr H. O. Forbes's Malayan Plants. *Journal of Botany* 63(Suppl.): 46–80.

RIDLEY, H. N. 1911. A scientific expedition to Temengoh, upper Perak. *Journal of the Straits Branch of the Royal Asiatic Society* 57: 5–122.

RIDLEY, H. N. 1917. Results of an expedition to Korinchi Peak, Sumatra. *Journal of the Federated Malay States Museums* 8: 1–136.

RIDLEY, H.N. 1923. A botanical excursion to northern Sumatra. *Journal of Malaysian Branch of the Royal Asiatic Soc*iety 1: 46–113.

RIDLEY, H. N. 1926. The flora of the Mentawi Islands. In: KLOSS, C. B. Spolia Mentawiensia. *Bulletin of Miscellaneous Information (Royal Botanic Garden, Kew)* 1926(2): 56–94.

SMITH, P. E., BRAMLEY, G. L. C., KARTONEGORO, A. & ATKINS, H. J. 2020. A new species of *Cyrtandra* (Gesneriaceae) from Aceh, Sumatra. *Rheedea* 30(1): 159–164. DOI:10.22244/rheedea.2020.30.01.10.

THIERS, B. 2022-continuously updated. *Index Herbariorum: A Global Directory of Public Herbaria and Associated Staff*. New York Botanical Garden's Virtual Herbarium. http://sweetgum.nybg.org/ih/. (Accessed 7 July 2021).

TL2. 2022. *Taxonomic Literature II online*. Published on the internet: https://www.sil.si.edu/DigitalCollections/tl-2/index.cfm. (Accessed 7 July 2021).

TURLAND, N. J., WIERSEMA, J. H., BARRIE, F. R., GREUTER, W., HAWKSWORTH, D. L., HERENDEEN, P. S., KNAPP, S., KUSBER, W. H., LI, D. Z., MARHOLD, K., MAY, T. W., MCNEILL, J., MONRO, A. M., PRADO, J., PRICE, M. J. & SMITH, G. F. (Eds.). 2018. International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code) adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017. Glashütten: Koeltz Botanical Books. DOI: 10.12705/Code.2018.

TURNER, I. M. 2012. The plant taxa of H. N. Ridley, 4. The primitive angiosperms (Austrobaileyales, Canellales, Chloranthales, Laurales, Magnoliales, Nymphaeales and Piperales). *Gardens' Bulletin of Singapore* 64 (1): 221–256.

VAN STEENIS KRUSEMAN, M. J. 2022. *Cyclopedia of Collectors*. Published on the internet: http://www.nationaalherbarium.nl/FMCollectors/. (Accessed 7 July 2022).

VELDKAMP, J. F. 1980. The Rijksherbarium at 150. *Taxon* 29(1): 101–104.

Appendix. List of all Sumatran *Cyrtandra* names with status, distribution, and types and their status and deposition (accepted name in bold).

Name	Accepted name	Distribution	Type and status
Cyrtandra ampla C.B.Clarke	***Cyrtandra grandis*** var. ***ampla*** (C.B.Clarke) Bakh.f.		
Cyrtandra anisophylla C.B.Clarke	=	Sumatra	Holo FI; iso K
Cyrtandra aurea Jack		Sumatra, Java	Neo BO, designated here
Cyrtandra aureotincta Bramley & Cronk		Sumatra (Kerinci Range)	Holo E; iso BIOT, BO
Cyrtandra beccarii C.B.Clarke		Sumatra	Lecto K, designated here; isolecto FI, L
Cyrtandra bicolor Jack		Peninsular Malaysia, Sumatra	Lecto G, designated here
Cyrtandra brevicaulis Ridl.		Sumatra (West)	Lecto BM, designated here; isolecto K
Cyrtandra carnosa Jack		Sumatra	Lecto G, designated here
Cyrtandra chiritoides Ridl.	***Cyrtandra siporensis*** Olivar		
Cyrtandra cordifolia de Vriese	***Cyrtandra aurea*** Jack		Holo L, *n.v.*
Cyrtandra decurrens de Vriese		Moluccas	Holo L
Cyrtandra dispar DC.		Thailand, Peninsular Malaysia, Sumatra	Lecto K; isolecto BM, E, K, L, S, SING
Cyrtandra dissimilis C.B.Clarke		Sumatra, Java	Lecto FI, designated here; isolecto K
Cyrtandra elongata Korth.	***Cyrtandra decurrens*** de Vriese		*nomen nudum*
Cyrtandra fenestrata C.B.Clarke		Sumatra	Lecto FI designated here; isolecto BM, Fl, K, L
Cyrtandra flabellifolia S.Moore		Sumatra (Mt. Dempo)	Holo BM; iso L
Cyrtandra flabellifolia var. ***cordata*** S.Moore		Sumatra (Mt. Dempo)	Holo BM
Cyrtandra flabelligera Ridl.		Sumatra (Kerinci Range)	Lecto K, designated here; isolecto A, US
Cyrtandra frutescens Jack		Sumatra	Lecto G, designated here
Cyrtandra frutescens Wall.	***Cyrtandra dispar*** DC.		*nomen nudum*
Cyrtandra glabra Jack	***Cyrtandra jackii*** Q.W.Wang & Karton.		
Cyrtandra gracilenta Kraenzl.		Sumatra (West)	Holo K
Cyrtandra grandis *var.* ***ampla*** (C.B.Clarke) Bakh.f		Sumatra, Java	Lecto K, designated here; isolecto BM, FI, L
Cyrtandra hirsuta Jack		Sumatra	Lecto G, designated here

Cyrtandra holodasys Miq.		Sumatra	Lecto K, designated here; isolecto BO, L
Cyrtandra horsfieldii Miq.	***Pentaphragma horsfieldii*** (Miq.) Airy Shaw		Lecto K, designated here
Cyrtandra impressivenia C.B.Clarke		Sumatra (West)	Lecto FI, designated here; isolecto K
Cyrtandra incompta Jack		Sumatra	Neo BO, designated here; isoneo ANDA, BO
Cyrtandra insularis Ridl.		Sumatra (Mentawai Islands)	Holo K; iso BO, SING
Cyrtandra integrifolia C.B.Clarke		Sumatra (West)	Holo K; iso MEL
Cyrtandra jackii Q.W.Wang & Karton.		Sumatra, Java	Neo BO, designated here; isoneo BO, L
Cyrtandra locuples S.Moore		Sumatra (South)	Holo BM; iso WU
Cyrtandra longepetiolata de Vriese	***Cyrtandra picta*** Blume		Lecto L, designated here
Cyrtandra macrophylla Jack		Sumatra	Lecto G, designated here
Cyrtandra maculata Jack		Sumatra	Neotype required
Cyrtandra membranacea Ridl.		Sumatra (Kerinci Range)	Lecto BM, designated here
Cyrtandra minor S.Moore		Sumatra (South)	holo BM; iso L
Cyrtandra navicellata Zipp. ex C.B.Clarke		Sumatra (West)	Lecto K, designated here; isolecto L
Cyrtandra nemorosa Blume		Sumatra, Java	Lecto L, designated here
Cyrtandra oblongifolia Benth. & Hook.f. ex C.B.Clarke		Sumatra, Java, Borneo	Lecto L, designated here
Cyrtandra oligantha Korth. ex C.B.Clarke		Sumatra	Lecto L, designated here; isolecto L
Cyrtandra pallescens Jack	***Cyrtandra pilosa*** Blume		*nomen nudum*
Cyrtandra pandurata Ridl.		Sumatra (North)	Lecto K, designated here
Cyrtandra patentiserrata Bramley & Cronk		Sumatra (Kerinci Range)	Holo L; iso BO
Cyrtandra pauciflora Ridl.		Sumatra (North)	Lecto K, designated here
Cyrtandra peltata Jack		Sumatra	Neo BO, designated here; isoneo L
Cyrtandra pendula Blume		Peninsular Malaysia, Sumatra, Java	Lecto L, designated here
Cyrtandra perplexa S.Moore		Sumatra (South)	Holo BM; iso L
Cyrtandra picta Blume		Sumatra, Java	Lecto L, designated here

Cyrtandra pilosa Blume		Sumatra, Java	Lecto L, designated here
Cyrtandra populifolia Miq.		Sumatra, Java	Lecto U, designated here; isolecto BO, L
Cyrtandra repens var. *monantha* C.B.Clarke	***Cyrtandra picta*** Blume		Holo L, *n.v.*
Cyrtandra reticosa C.B.Clarke	***Cyrtandra nemorosa*** Blume		Lecto L, designated here
Cyrtandra rhyncanthera C.B.Clarke		Sumatra	Lecto K
Cyrtandra rosea Ridl.		Sumatra (Kerinci Range)	Lecto BM, designated here; isolecto K
Cyrtandra rostrata Blume		Sumatra, Java, Lesser Sunda Islands	Lecto L, designated here
Cyrtandra rostrata var. ***subsessilis*** S.Moore		Sumatra (Lampung)	Holo BM.; iso WU
Cyrtandra rotundifolia Ridl.	***Cyrtandra pendula*** Blume		Lecto SING, designated here; isolecto K
Cyrtandra rubiginosa Jack		Sumatra	Neotype required
Cyrtandra rubriflora P.E.Sm. & H.J.Atkins		Sumatra (Mt. Leuser)	Holo E; iso BO
Cyrtandra sandei de Vriese		Sumatra, Java, Lesser Sunda, Sulawesi	Lecto L
Cyrtandra scutata S.Moore		Sumatra (Mt. Dempo)	Holo BM
Cyrtandra siporensis Olivar		Sumatra (Mentawai Islands)	holo K; iso BO, SING
Cyrtandra squamulata Korth.	***Cyrtandra dispar*** DC.		*nomen nudum*
Cyrtandra stenoptera Bramley & Cronk		Sumatra (Kerinci Range)	Holo E; iso BIOT, BO
Cyrtandra sulcata Blume		Sumatra, Java, Lesser Sunda, Sulawesi	Lecto L
Cyrtandra teysmannii Miq.		Sumatra (West)	Lecto BO, designated here; isolecto U
Cyrtandra trichodon Ridl.		Sumatra (Kerinci Range)	Lecto BM, designated here; isolecto K
Cyrtandra viridescens C.B.Clarke		Sumatra	Lecto FI, designated here; isolecto K
Rhynchocarpus cordifolius Reinw. ex Blume	***Cyrtandra aurea*** Jack		*nomen nudum*
Whitia carnosa (Jack) Blume	***Cyrtandra carnosa*** Jack		
Whitia longifolia Blume	***Cyrtandra oblongifolia*** (Blume) Benth. & Hook. ex C.B.Clarke		*nomen nudum*
Whitia oblongifolia Blume	***Cyrtandra oblongifolia*** (Blume) Benth. & Hook. ex C.B.Clarke		
Whitia pilosa Zipp.	***Cyrtandra oblongifolia*** (Blume) Benth. & Hook. ex C.B.Clarke		*nomen nudum*

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CORRECTING A MINOR ERROR: A NEW NAME FOR A MARANTACEAE SPECIES FROM NEW GUINEA

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ABSTRACT
TURNER, I. M. 2022. Correcting a minor error: a new name for a Marantaceae species from New Guinea. *Reinwardtia* 21(2): 81–82. — The new name, *Phrynium cominsia* I.M.Turner, and lectotype are published for *Cominsia minor* Valeton (Marantaceae).

Key words: *Cominsia,* Indonesia, lectotype, nomen novum, *Phrynium*.

ABSTRAK
TURNER, I. M. 2022. Perbaikan kesalahan kecil: nama baru jenis Marantaceae dari Papua Nugini. *Reinwardtia* 21 (2): 81–82. — Nama baru tersebut adalah *Phrynum cominsia* I.M.Turner, dan diterbitkan sebagai tipe pengganti *Cominsia minor* Valeton (Marantaceae).

Kata kunci: *Cominsia*, Indonesia, nama baru, *Phrynium,* tipe pengganti.

INTRODUCTION

In their revision of the generic organisation of Asian Marantaceae, Suksathan *et al.* (2009) reduced the genus *Cominsia* to *Phrynium*. Among the new combinations at species rank that were made to accompany this realignment, *Cominsia minor* Valeton was transferred to *Phrynium*, as 'Phrynium minor'. The Latin term *minor* is a comparative adjective derived from *parvus* meaning small, so *minor* means smaller. Latin adjectives typically decline according to the gender of the noun that they are describing, or in plant nomenclature when used as a specific (or infraspecific) epithet with the gender of the generic name with which they form the name (ICN (Turland *et al.,* 2018) Art. 23.5). For masculine and feminine genders, *minor* is the correct declension, for genera with a neuter gender the epithet is correctly *minus*. Therefore, 'Phrynium minor' is correctible to *Phrynium minus*. But this name has been used before by Schumann (1902) for what is now known as *Stachyphrynium repens* (Körn.) Suksathan. & Borchs. The new combination in *Phrynium* for *Cominsia minor* is therefore an illegitimate later homonym, and cannot be the correct name for the species. As there appear to be no heterotypic synonyms available, a replacement name is proposed here, using the old generic name as the specific epithet.

Cominsia minor was described by Valeton from plants growing in the Bogor Botanic Garden, that were originally introduced from South-West New Guinea. The protologue included a detailed plate, presumably drawn from living material. Valeton made no reference to herbarium material and no likely type material was located in Herbarium Bogoriense (H. Rustiami *pers. comm.*). Therefore, Valeton's plate is here selected as lectotype of the name *Cominsia minor.*

Phrynium cominsia I.M.Turner, *nom. nov.*

Replaced synonym: *Cominsia minor* Valeton, Bull. Jard. Bot. Buitenzorg, ser. III, 2 (1920) 351, t. II. – *Phrynium minus* Suksathan & Borchs., Bot. J. Linn. Soc. 159 (2009) 394, as 'minor', *nom. illegit*., non *P. minus* K.Schum. (1902). Lectotype: [published illustration] Valeton, Bull. Jard. Bot Buitenzorg, ser. III, 2 (1920) t. II (designated here).

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Dr. Himmah Rustiami very kindly checked Herbarium Bogoriense for type material of *Cominsia minor*.

REFERENCES

SCHUMANN, K. 1902. Marantaceae. In: Engler, A. *Das Pflanzenreich* 4: 1–184.

SUKSATHAN, P., GUSTAFSSON, M. H. & BORCHSENIUS, F. 2009. Phylogeny and generic delimitation of Asian Marantaceae. *Botanical Journal of the Linnean Society* 159: 381 –395.

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Scope. *Reinwardtia* is a scientific regular journal on plant taxonomy, plant ecology and ethnobotany published in June and December. Manuscript intended for a publication should be written in English.

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References. Bibliography, list of literature cited or references follow the Harvard system as the following examples.

Journal : KRAENZLIN, F. 1913. *Cyrtandraceae* novae Philippinenses I. *Philippine Journal of Science* 8: 163–179.

MAYER, V., MOLLER, M., PERRET, M. & WEBER, A. 2003. Phylogenetic position and generic differentiation of *Epithemateae* (Gesneriaceae) inferred from plastid DNA sequence data. *American Journal of Botany* 90: 321–329.

Proceedings : TEMU, S. T. 1995. Peranan tumbuhan dan ternak dalam upacara adat "Djoka Dju" pada suku Lio, Ende, Flores, Nusa Tenggara Timur. In: NASUTION, E. (Ed.). Prosiding Seminar dan Lokakarya Nasional Etnobotani II. LIPI & Perpustakaan Nasional. Pp. 263–268. (In Indonesian).

SIMBOLON, H. & MIRMANTO, E. 2000. Checklist of plant species in the peat swamp forests of Central Kalimantan, Indonesia. In: IWAKUMA, T., INOUE, T., KOHYAMA, T., OSAKI, M., SIMBOLON, H., TACHIBANA, H., TAKAHASHI, H., TANAKA, N. & YABE, K. (Eds.). Proceedings of the International Symposium on: Tropical Peatlands. Pp. 179 – 190.

Book : RIDLEY, H. N. 1923. *Flora of the Malay Peninsula 2*. L. Reeve & Co. Ltd, London.

Part of Book : BENTHAM, G. 1876. *Gesneriaceae*. In: BENTHAM, G. & HOOKER, J. D. (Eds.). *Genera Plantarum 2*. Lovell Reeve & Co., London. Pp. 990–1025.

Thesis : BAIRD, L. 2002. *A Grammar of Kéo: An Austronesian Language of East Nusantara*. Australian National University, Canberra. [PhD. Thesis].

Website : http://www.nationaalherbarium.nl/fmcollectors/k/KostermansAJGH.html. (Accessed 15 February 2012).

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REINWARDTIA
Vol. 21. No. 2. 2022
CONTENTS

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