



# Expansion of the *Nepenthes alata* group (*Nepenthaceae*), Philippines, and descriptions of three new species

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## Key words

conservation  
IUCN  
mining  
*Nepenthes*  
Philippines  
taxonomy  
ultramafic

**Abstract** Three new species in the *Nepenthes alata* group from the Philippines, *Nepenthes armin*, *N. tболи* and *N. zygon*, are described and assessed as threatened using the IUCN 2012 standard. The group is expanded by the inclusion of *N. truncata* and *N. robcantleyi*, previously included in the *N. regiae* group. A key to the nineteen species of the group is presented.

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## INTRODUCTION

This paper is part of the research towards a World Monograph of *Nepenthes* L., building on a Skeletal Revision of *Nepenthes* (Jebb & Cheek 1997) and the Flora Malesiana account (Cheek & Jebb 2001).

*Nepenthes* is the only genus of *Nepenthaceae* and includes taxa mainly distributed in Malesia (c. 128 species), while c. 12 species occur in Madagascar, Seychelles, Sri Lanka, NE India, Indochina, Solomon Islands, New Caledonia and Australia. Cheek & Jebb (2001) recorded 87 species of *Nepenthes*, but since 2001, 60 new specific names have been published in the genus (see IPNI 2013 continuously updated, acc. 17 Dec. 2013) and others have been resurrected from synonymy. The number of species currently accepted is estimated as 140 and is set to rise further.

Cheek & Jebb (2001) recorded 12 species in the Philippines. New field surveys and herbaria examinations resulted in the discovery of 26 additional species that have been published in the last twelve years (see IPNI 2013 continuously updated, e.g. Heinrich et al. 2009, Cheek 2011), of which 12 were published in 2013 (Cheek & Jebb 2013a–h). Some taxa e.g. *Nepenthes alzapana* Jebb & Cheek (Cheek & Jebb 2013b: 59) and *Nepenthes extincta* Jebb & Cheek (Cheek & Jebb 2013h) were considered possibly extinct since the destruction of original habitat in the Philippines over the last 100 years has been so extensive. Although the Philippines is thought to have remained two-thirds forested as recently as 1925 according to Sohmer & Davis (2007), 75 years after that date Myers et al. (2000) estimated that remaining primary vegetation in the Philippines amounted to only 3 %. Lowland primary forest is very fragmentary or has now all but gone from the Philippines (Sohmer & Davis 2007). They define lowland forest as occurring below 500 m asl. Sohmer & Davis (2007) estimate species extinction levels due to habitat destruction as 9–28 % in one representative, mainly forest genus, *Psychotria* L. (*Rubiaceae*). However, some good lowland forests are reported to survive in the provinces of Aurora, Cagayan, Isabela in Luzon, parts

of Samar, northwest Panay Peninsula and Mindoro. Moderate forest disturbance can favour the growth of some *Nepenthes* species, particularly a small number of widespread lowland SE Asian species such as *N. gracilis* Korth. which can colonise secondary habitats. However, this is not true of the majority of *Nepenthes* species, which are both more localized and which require primary habitat. It also appears to be the case that primary habitat is not just degraded to secondary habitat in the Philippines, but converted to other land uses, such as rice-fields, open cast mines, or pineapple plantations, offering little chance for survival for even those species that can survive secondary habitats.

Many species of *Nepenthes* in the Philippines appear to be confined to submontane forest (above c. 500 m asl) and are confined to individual mountain groups or mountains of one island. Compared with lowland forest, a higher proportion of submontane forest survives, since it is often less suitable for agriculture. While *N. alzapana* may yet survive since some submontane forest habitat in the Sierra Madre Mts can still be found (e.g. viewing with Google Earth), the hopes for *N. extincta* surviving are extremely small, since recent groundtruthing has shown that virtually all vegetation has been removed from its single location to facilitate extraction of nickel ore (Cheek & Jebb 2013h). Since habitat destruction for open cast mining, timber extraction, small-holder, swidden and plantation agriculture continues in the Philippines, it is a race against time to discover, publish, assess and draw attention to the conservation needs of species before they become extinct, if they have not already been lost.

The *Nepenthes alata* group of species was first circumscribed in Cheek & Jebb (2013d) and additional taxa were added by Cheek & Jebb (2013c, f). The group was redelimited with the addition of four species in Cheek & Jebb 2013h. With the addition of three new species described here as well as two species previously placed in the *N. regiae* group, *N. truncata* and *N. robcantleyi*, we now characterise the *N. alata* group as follows:

1. possessing a convex appendage on the basal ridge of the lid (except in *N. armin*) but lacking an apical appendage;
2. a wingless (except in *N. saranganiensis*), terete (rarely angular) stem;

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3. a distinct but winged petiole, the petiole wings wide, decurrent from the blade, sometimes involute giving a cylindrical appearance to the petiole;
4. the peristome finely ridged, the outer edge not, or only slightly lobed;
5. the inner surface lacking conspicuous teeth;
6. the mouth ovate, oblique, without a well-developed column (except *N. kitanglad*); hairs fine and soft, inconspicuous, not bristle-like (except *N. mindanaoensis*).

The three species described here possess all, or almost all, of these characters and we place them into an expanded definition of the *N. alata* group. They were discovered by examining specimens mainly from BRIT, E and L.

The *Nepenthes alata* group (19 species restricted to the Philippine islands excluding Palawan) and the *N. regiae* group (14 species restricted to Borneo, Sulawesi and New Guinea) are similar and appear closely related, as was discussed in Cheek & Jebb 2013h, where a key separating the two groups was presented. Application of this key to the two Philippine species previously ascribed to the *N. regiae* group, namely *N. truncata* Macfarl. and *N. robcantleyi* Cheek places them also in the *N. alata* group, by reason of their winged petioles and ovoid-cylindrical pitchers. A key to the currently recognised taxa in the *N. alata* group is given below. We hypothesise that the divergence of these two species groups from each other is connected with the geographical division between Borneo (centre of species diversity of the *N. regiae* group) and Mindanao Island (centre of diversity of the *N. alata* group) of the Philippines. A molecular phylogenetic study of these two groups with high species sampling might help to test this hypothesis. However, it is also possible that further discoveries of additional species will provide evidence that the two groups are a continuum and should be united.

## MATERIALS AND METHODS

Herbarium specimens (codes for herbaria are according to Thiers 2011 continuously updated) and living plants were examined. In several cases, the mouth and the lid surface are not readily visible in herbarium specimens, so it was necessary to soak the mouth area and lid, or sometimes the entire pitchers, in warm soapy water after requesting permission from the herbarium concerned.

The following characters were measured: stem, leaf and pitcher (using a graduated rule). Hair sizes, and peristome and lower lid details were measured using a binocular microscope with an eyepiece graticule graduated in units of 0.025 mm at ×40 magnification.

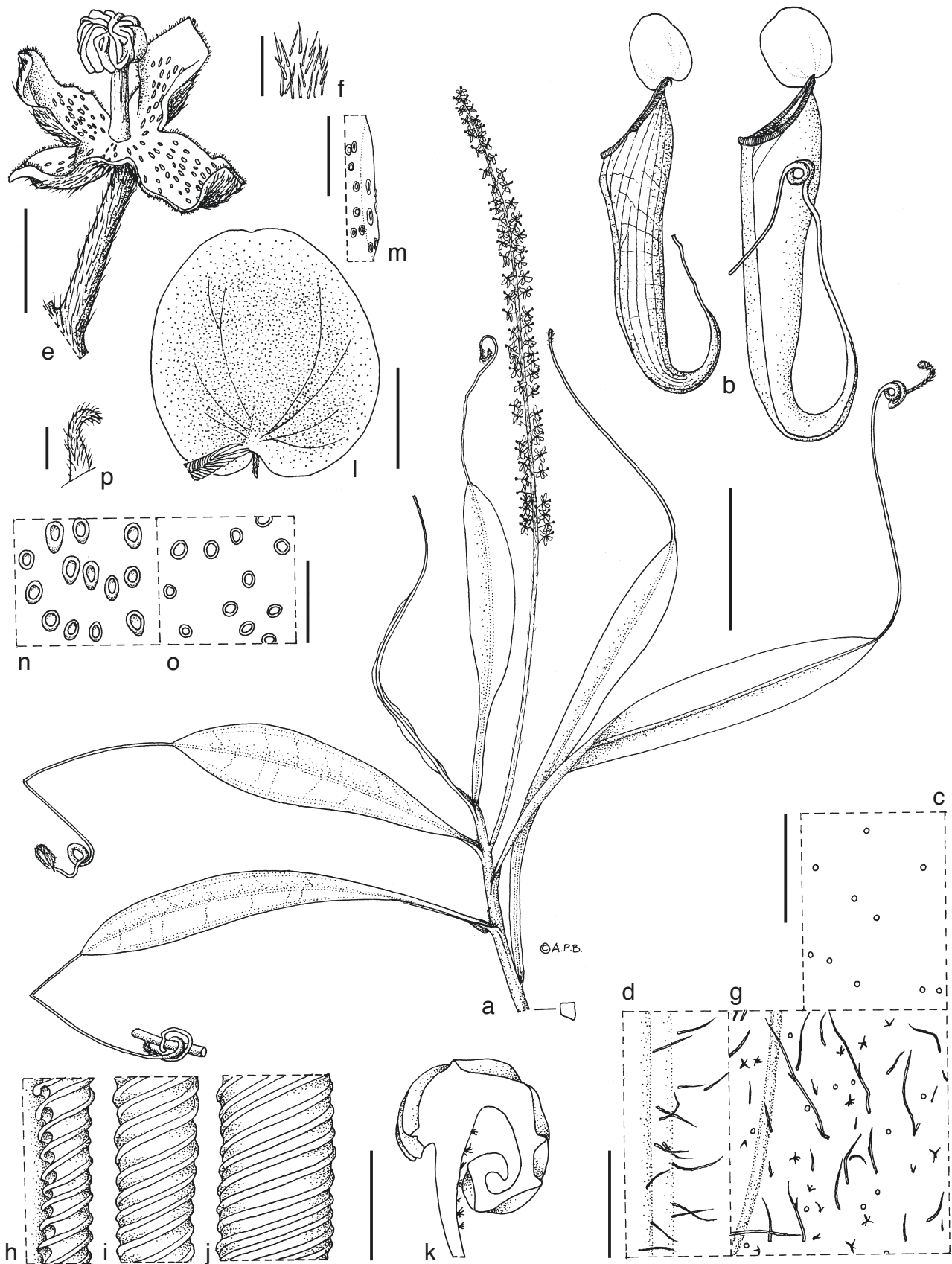
Conservation assessments were made using the categories and criteria of IUCN (2012). IUCN advises that assessments are made if at all possible, even when the data are incomplete, since full data are rarely available for any taxon, and since a threatened taxon may become extinct while waiting for full data to become available. All three of the taxa assessed in this paper were assessed using criterion D, which is based on the numbers of mature individuals that can be evidenced. Data on numbers of mature individuals derives from herbarium specimen data and from the reports of *Nepenthes* enthusiasts, many of which visit the Philippines every year from Germany, USA, Australia and France to seek species of this genus in the wild, and especially taxonomic novelties and rare and poorly known taxa. These same enthusiasts are also a source of information on threats at *Nepenthes* locations, as are a growing number of Philippine observers. A key source of data on threats on the ground is Google Earth. For much of the Philippines high resolution satellite imagery is available through this portal, enabling the encroachment to be viewed of e.g. plantations towards known

*Nepenthes* locations. For the Philippines also, Google Earth also has a large number of photographs embedded within the imagery enabling an assessment to be made of the quality of vegetation on the ground. Searches on Google regarding the locations can also provide additional data on threats on the ground, especially where local conservationists have observed malpractice by commercial land developers or where National Parks have been compromised.

## KEY TO THE SPECIES OF THE NEPENTHES ALATA GROUP

(updated from Cheek & Jebb 2013h)

1. Lower surface of lid, including convex appendage (if developed), densely and evenly covered by uniformly minute, circular nectar glands (0.15–0.2 mm diam) . . . . . 2
1. Lower surface of lid with nectar glands either absent from the appendage (if developed), and/or sparse, large or dimorphic, (larger glands 0.35–0.4 mm diam or larger). — Visayas and Mindanao . . . . . 5
2. Stems angular; convex basal appendage absent from lid; male pedicels 3.5–4.5 mm long. — Sibuyan Island . . . . . *N. armin*
2. Stems terete; convex basal appendage conspicuous from lid; male pedicels > 10 mm long . . . . . 3
3. Stems glabrous, rarely glabrescent; upper pitcher lacking fringed wings; outer surface < 20 % covered with red stellate hairs or lacking them entirely . . . . . 4
3. Stems persistently pubescent; upper pitchers with fringed wings in upper part; outer pitcher surface > 50 % covered with grey stellate hairs. — Northern Luzon . . . . . *N. alata*
4. Upper pitchers subcylindrical, outer surface 10–15 % covered with minute red stellate hairs. — Lowland coastal ultramafic scrub of N and E Luzon . . . . . *N. ultra*
4. Upper pitchers with ellipsoid base constricted abruptly to the narrow, cylindrical upper 2/3; outer pitcher surface lacking stellate hairs. — Lowland to submontane forest or scrub of southern Luzon to Mindanao . . . . . *N. graciliflora*
5. Stems winged from the decurrent petiole bases. — S Mindanao, Sarangani Province . . . . . *N. saranganiensis*
5. Stems terete, or angular, lacking wings . . . . . 6
6. Upper pitchers widest at apex . . . . . 7
6. Upper pitchers subcylindric, widest at base, or equally wide at base and apex . . . . . 8
7. Stems and abaxial surface of midrib moderately densely covered with white appressed hairs 0.5–1.5 mm long; lid of upper pitchers ovate, longer than broad. Volcanic substrate. — Mts Apo and Matutum, Mindanao . . . . . *N. copelandii*
7. Stems and leaf blades glabrous; lid of upper pitcher broader than long. Ultramafic substrate. — Mt Kiamo, Mindanao . . . . . *N. ceciliae*
8. Petioles appearing cylindrical (wings incurved) . . . . . 16
8. Petioles appearing flat, at least distally (wings held flat) . . . . . 9
9. Stems and lower surface of midrib conspicuously long and densely pubescent; lid appendage well-developed, hooked . . . . . 10
9. Stems and upper surface of midrib glabrous or inconspicuously and shortly and sparsely pubescent-puberulent; lid appendage usually only moderately developed, never hooked . . . . . 12
10. Upper pitchers equally wide at base and apex, contracting slightly at the middle, lacking fringed wings. — NE Mindanao . . . . . *N. ramos*
10. Upper pitchers widest at base, contracting slightly above into a narrower cylinder with a short pair of fringed wings near the mouth . . . . . 11



**Fig. 1** *Nepenthes armin* Jebb & Cheek. **a**. Habit, male inflorescence, stem section quadrangular (inset below), and upper pitchers (detached); **b**. upper pitchers; **c**. sessile depressed-globose glands on lower surface of leaf-blade; **d**. hairs on midrib, adaxial surface of leaf; **e**. male flower; **f**. indumentum of lower tepal surface; **g**. indumentum of outer pitcher surface; **h**. peristome showing inner edge (dissected); **i**. peristome, viewed from inside pitcher, teeth not visible; **j**. peristome viewed from above; **k**. peristome, transverse section (outer surface on right); **l**. lower surface of lid; **m**. basal ridge in profile, convex appendage absent, with nectar glands, lower surface of lid; **n**. nectar glands, central area of lid; **o**. nectar glands, from lower surface of lid, lateral area; **p**. spur (all from *Argent & Reynoso 8936*). — Scale bars: **a**, **b** = 5 cm; **c**, **d**, **g**–**k**, **n**–**p** = 1 mm; **e**, **m** = 2 mm; **f** = 0.5 mm; **l** = 1 cm. Drawing by Andrew Brown.



11. Leaf blades long, over 21 cm in length, midrib of lid with numerous more or less circular glands 0.15–0.40 mm diam. — Negros and Biliran Islands . . . . . *N. negros*
11. Leaf blades of climbing stems short, less than 18 cm in length, nectar glands more or less absent from distal half of lid midrib, glands larger 0.5–0.6(–0.7) mm. — NE Mindanao . . . . . *N. zygon*
12. Lid apex with pocket. — S Cotabato, S Mindanao . . . . . *N. tholi*
12. Lid apex lacking pocket or any appendage . . . . . 13
13. Petiole canaliculate proximally (flat distally); blade hairy on upper surface . . . . . 14
13. Petiole flat proximally; blade glabrous on upper surface . . . . . 15
14. Upper pitchers stout, length : breadth ratio 2–2.5 : 1; fringed wings absent. — Mt Hamiguitan, SE Mindanao . . . . . *N. hamiguitanensis*
14. Upper pitchers slender, length : breadth ratio > 3 : 1; fringed wings present below peristome. — NE Mindanao . . . . . *N. zygon*
15. Stems terete; upper pitcher with lid about half as long as mouth; mouth not concave but flat; column absent; lid base truncate. — Mt Malindang, NW Mindanao. . . . . *N. kurata*
15. Stems angular; upper pitcher with lid about as long as mouth; mouth highly concave; column present; lid base cordate. — Kitanglad Mts, Central Mindanao *N. kitanglad*
16. Leaf-blade length : breadth about 1 : 1, apex deeply and broadly notched . . . . . 17
16. Leaf-blade length : breadth about 4 : 1, apex acute or obtuse . . . . . 18
17. Largest pitchers with fringed wings from base to apex; peristome broad and flat at rear; lid nectar glands restricted to a dome-like area around the basal appendage. — E Mindanao. . . . . *N. robcantleyi*
17. Largest pitchers without fringed wings; peristome outer edge rounded at rear; lid nectar glands scattered over lid; dome-like area absent. — NE and Central Mindanao . . . . . *N. truncata*
18. Largest pitchers robust, 18–24 cm long; peristome 7–8 mm wide, curved in section but not cylindric; inner edge of peristome with small teeth visible, outer edge lobed . 19
18. Largest pitchers 12 cm long; peristome 2–3 mm wide, narrowly cylindrical, inner edge lacking visible teeth (unless dissected), outer edge not lobed. — Leyte . . . . . *N. leyte*
19. Largest pitchers without fringed wings; leaf midrib densely, minutely white stellate-hairy; pitcher lid base deeply cordate. — NE Mindanao . . . . . *N. extincta*
19. Largest pitchers with fringed wings; leaf midrib with brown black bristle hairs 1–1.5 mm long; pitcher lid base truncate. — N and NE Mindanao . . . . . *N. mindanaoensis*

***Nepenthes armin* Jebb & Cheek, sp. nov. — Fig. 1**

Differs from *N. graciliflora* Elmer in the pitchers as wide at apex, or wider, than at base (not widest at base); convex lid appendage absent (not present); androecium: tepal length  $\leq 1 : 1$  (not  $2 : 1$ ). — Type: *Argent & Reynoso* 8936 (holotype K; isotypes E, PNH n.v.), Philippines, Sibuyan Island, above Magdiwang on ridge to Mayos Peak, 750 m, male infl. 16 Aug. 1989.

**Etymology.** Named after Armin Rios Marin, Municipal Councilor on Sibuyan and former World Wildlife Fund official who, on 3 October 2007, was shot and killed by a mining company official while leading a protest of his community against the clearance of forest trees to facilitate mining (Goodland & Wickes 2008: 175); [<http://www.piplinks.org/system/files/Mining+or+Food+Case+Study+6.pdf>].

**Terrestrial climber** 5 m tall. **Rosette** and **short stems** unknown. **Climbing stem** rounded-quadrangular (3–)4–5(–5.5) mm diam;

internodes (1.2–)1.8–4.2(–4.9) cm long; axillary buds not seen; indumentum absent apart from dense brown simple hairs in the leaf axils, otherwise only with sessile depressed-globose glands 0.04 mm diam throughout. **Leaves** thinly coriaceous, petiolate narrowly oblong-elliptic to narrowly elliptic-linear, (10–)13.1–15(–17.5) by (1.4–)1.8–2.6(–3.7) cm; apex acute or obtuse-rounded; base gradually decurrent to the petiole; nerves visible on the upper, not the lower, surface; longitudinal nerves 2 pairs, in the outer third of the leaf, the innermost pair arising from the midrib 1/2–1/3 the length of the blade from the petiole; pennate nerves numerous, patent, irregular; indumentum absent except for simple hairs along the upper surface of the midrib, hairs (0.1–)0.4–0.6 mm long, erect, pale brown, covering (5–)20–40 % of the surface, densest in the distal half of the blade, otherwise with sessile glands as the stem, 10–12 glands per mm<sup>2</sup>. **Petiole** (4.2–)4.7–5.6(–7) by (0.2–)0.3–0.4(–0.6) cm, wings patent in life (revolute in herbarium specimens), base clasping the stem by 1/2 its circumference, not decurrent, indumentum absent apart from sessile glands, and with very sparse and inconspicuous simple hairs along the abaxial midrib. **Lower and intermediate pitchers** unknown. **Upper pitchers** (coiled tendril) green, with faint purple mottling, narrowly cylindrical in outline, 10.2–12.9(–16) by 1.9–2.6(–3.2) cm, the lower half narrowly ellipsoid, gradually constricted to 1.3–1.8(–2.2) cm wide at the midpoint, then widening gradually to (1.7–)2.2–2.8(–3.2) cm wide below the peristome; fringed wings absent, reduced to inconspicuous ridges c. 1 mm wide extending from base to apex; indumentum of minutely branched hairs 0.1–1 mm long, 16–20 per mm<sup>2</sup>, the smallest hairs with 2–3 branches at the base, the longer hairs with 1–2 short branches along their length, mixed with sessile depressed-globose glands 10–12 per mm<sup>2</sup>. **Mouth** broadly ovate, 1.8–2.5(–3.8) by 1.8–2.3(–2.4) cm, oblique, slightly concave, column not well-developed; peristome cylindric, 1–2 mm diam,  $\pm$  even in width along its length, ribs 0.25 mm apart, raised 0.04–0.08 mm, inner edge inrolled, teeth and holes visible only when dissected (Fig. 1h), outer edge often with 2–3 shallow lobes; inner surface of pitcher glaucous green with scattered purple mottling. **Lid** orbicular, (1.8–)2.3–2.7 by (1.8–)2.1–2.6(–3.3) cm, apex rounded, or rarely emarginate, base cordate, sinus 3–4 mm deep, 10 mm wide; lower surface brightly mottled purplish red, basal ridge c. 1 mm high 3 mm in length, convex basal appendage absent; nectar glands evenly and densely spread across the lid and ridge surface, (4–)6–8(–10) per mm<sup>2</sup>, monomorphic, directed to lid base (ridges are asymmetric, being highest towards lid apex), orbicular, 0.2 mm diam, with membranous walls projecting vertically, 0.07 mm tall; mixed with sessile depressed-globose glands 0.04 mm diam at the edge of the lid, which are otherwise absent from the larger, central part of the surface. **Spur** recurved, simple, 3.5–5 mm long, tapering to an acute apex, base completely covered in appressed hairs 0.2–0.3 mm long, simple, copper-coloured, distal three-quarters 50 % covered in hairs. **Male inflorescence** 25–28 by 1.2–1.5 cm, indumentum of appressed, simple, copper-coloured hairs 0.3–0.4 mm long covering 40–50 % of the surface, mixed with sessile depressed-globose glands as the stem; peduncle 7–11 by 0.1–0.2 cm; rhachis 17–18 cm long, with 70–95, 1-flowered partial-peduncles; bracts absent; partial-peduncles/pedicels 3.5–4.5 mm long, indumentum covering 80–100 % of the surface; tepals 4, green at anthesis, turning red with age, 2.4 by 1.2–1.6 mm, outer surface completely covered in appressed, simple, copper-coloured hairs 0.2 mm long, papillae absent or inconspicuous, inner surface densely covered in elliptic nectar glands; staminal column 1–1.7 mm long, glabrous; anther-head subglobose, 0.45–0.9 by 1.2 mm. **Female inflorescence** as the male, but c. 30 by 1.2 cm; peduncle c. 16 cm long; rhachis c. 14.5 cm (immature), partial-peduncles/pedicels c. 110, 3.5–6 mm long, tepals narrowly oblong 2.8 by



**Fig. 2** *Nepenthes tболи* Jebb & Cheek. a. Habit, with upper pitchers and infructescence; b. leaf-blade midrib, lower surface, indumentum; c. hairs in axil of leaf with stem; d. hairs, on tendril; e. hairs on outer pitcher surface; f. hairs on outer pitcher wall, profile view; g. lid, lower surface, showing nectar glands (left) and venation (right); h. basal appendage of lower lid surface; i. large nectar glands of the lid midline; j. lid apex showing pocket; k. minute stellate hairs of lid margin, lower surface; l. spur; m. peristome from above; n. peristome, transverse section (outer surface: right) (all from Gaerlan *et al.* PPI 130838). — Scale bars: a = 5 cm; b, h–j, n, m = 2 mm; c–f = 1 mm; g, l = 1 cm; k = 0.1 mm. Drawing by Andrew Brown.

1.2 mm, outer surface densely papillate with hairs sparse, scattered; ovary ellipsoid, 4-lobed, 2.2–3 by 1.1–1.4 mm completely covered in hairs as the pedicels; stigmas glossy black, 4-lobed, 1.25 mm diam. *Infructescence* and *seeds* unknown. Data on colour and posture when live in this description is taken from the field notes of the specimens cited.

**Distribution & Ecology** — Philippines, Sibuyan Island, gallery forest on ultramafic rock; 750 m.

**Additional material.** PHILIPPINES, Sibuyan Island, Mt Giting-Giting, *Madulid* 6927 (A, F, PNH n.v.), female inflor. 20 June 1987; *ibid*, Magdiwang, Barrio Hawasan, Ating River, *Stone et al.* in *PPI* 6724 (BISH, BRIT, K, PNH n.v.) male inflor. 27 May 1992.

**Conservation** — *Nepenthes armin* is known on current evidence from three mature individuals (specimens cited above) which occur at up to three sites on Sibuyan Island (445 km<sup>2</sup>). Clearance of lowland forest trees on Sibuyan to facilitate mining for nickel ore is reported by Goodland & Wickes (2008: 175); [<http://www.piplinks.org/system/files/Mining+or+Food+Case+Study+6.pdf>]. Lowland forest below 750 m altitude on Sibuyan has also been partially cleared for lowland agriculture (Google Earth 2014 imagery, viewed 26 Sept. 2014). The area of occupancy is a maximum of 12 km<sup>2</sup> using the 4 km<sup>2</sup> cells advocated by IUCN (2012), although the actual area occupied is far smaller. Accordingly, *N. armin* is here assessed as Critically Endangered under criterion D (< 50 mature individuals) of the categories and criteria of IUCN (2012). None of the three records of the species indicate its frequency. However, previous extensive botanical collections on Sibuyan by Elmer in the early twentieth century did not reveal this species suggesting that it is not widespread and common on the island and may be as rare and restricted as current evidence suggests. Regular visits by *Nepenthes* enthusiasts to Sibuyan have occurred each year in the last few years but as yet, no additional records for this species have been publicised. However, it is to be hoped that further survey work might yet result in finding numerous additional individuals in secure locations.

**Taxonomic affinities** — The affinities of *N. armin* are clearly with *N. graciliflora*, in the *N. alata* group as defined in Cheek & Jebb (2013d), in fact the two species can be easily confused owing to their superficial gross morphological similarity. It is possible that the two species are sympatric, since both occur in forest below 800 m in Sibuyan. Records of *N. graciliflora* on Sibuyan are: *Elmer* 12465 (BO, E, K, W); *Sohmer* 12400 (A, BISH, K, L) and *Reynoso* 118659 (K, PNH n.v.).

*Nepenthes armin* fits well within the northernmost, Luzon species of the *N. alata* group, namely *N. alata*, *N. graciliflora*, and *N. ultra* Jebb & Cheek (Cheek & Jebb 2013f). In comparison with species from the southern Philippines, these four northern species share relatively smaller upper pitchers 10(–15) cm long, narrowly cylindrical peristomes, lids densely and uniformly covered in steep-walled, small, monomorphic nectar glands, and 1-flowered partial-peduncles. *Nepenthes armin* is easily separated from the remaining northern species due to the slightly lobed outer edge of the peristome, and the angular-terete stems. The absence of a convex basal lid appendage, although unusual in the *N. alata* group, is also seen in *N. kitanglad* Jebb & Cheek. However, in both cases a basal ridge remains. Despite the unremarkable gross morphology of its pitchers, *N. armin* shows several features which are, so far, unique in the *N. alata* group:

- The inflorescences with their very short pedicels and staminal columns, and the dense covering of short, copper-coloured appressed hairs.
- The absence of sessile depressed-globose glands from the centre of the lid.

**Table 1** Diagnostic characters separating *N. graciliflora* from *N. armin*.

	<i>Nepenthes graciliflora</i>	<i>Nepenthes armin</i>
Upper pitcher shape	Basal third much wider than cylindric upper parts, lacking a waist constriction	Basal part as wide as, or narrower than, apex. Constricted slightly in the middle
Convex lid basal appendage	Conspicuous	Absent
Pitcher indumentum	Hairs all simple, sparse, < 1 per mm <sup>2</sup>	Hairs minutely branched, mixed long and subsimple (appearing simple but with one or two very short and inconspicuous branches), with short, substellate, dense, 16–20 per mm <sup>2</sup>
Pedicle length at anthesis	11–14 mm	3.5–4.5 mm
Ratio of length of androecium: tepals	2 : 1	< 1 : 1
Indumentum at centre of male tepals (lower surface)	Mainly papillate, with a few sparse hairs	Completely covered in long appressed hairs, papillae not visible

**Notes** — *Nepenthes armin* is the fourth species of *Nepenthes* known from Sibuyan. All but the widespread *N. graciliflora* (Luzon to Mindanao) are known to be endemic to the ultramafic substrate of the island. The other endemic species are known from low shrubberies on ultramafic at higher altitudes (1300–1400 m altitude), being *N. argentii* Jebb & Cheek and *N. sibuyanensis* Nerz. *Nepenthes armin* is unlikely to be confused with any other species apart from *N. graciliflora*, which is also a climber with petiolate leaves and pitchers which are narrowly cylindrical in outline. They can be separated using Table 1.

The species-richness of *Nepenthes* in Sibuyan, with four species of which three are endemic, equals that of the islands of Luzon, Panay and Masbate combined. Sibuyan measures less than 30 by 20 km, but has a height of 2 058 m. Due to the steep slopes, over 30 % of the island still has intact original forest habitat, unusual in the Philippines, as explained in the introduction above. In the Philippine archipelago, only Mindanao and Palawan island exceed Sibuyan for endemicity and species-richness of the genus *Nepenthes*. This diversity is not due to recent speciation, as has occurred on the Galapagos, for example, but is due to all of the three main Philippine *Nepenthes* lineages (Cheek & Jebb 2013h) having reached Sibuyan, and then having evolved there in isolation to form unusual endemic species, including one of the most distinctive in the entire family *Nepenthaceae*, *N. argentii*. In terms of *Nepenthes*, Sibuyan appears to have the highest species diversity per unit area of any island in the Philippines, which may be an index of diversity for other Philippine plant species. This surprising fact is undoubtedly due to the large quantity of ultramafic substrate (unfortunately a source of metal ores), the broad altitudinal range, and also the long geological isolation of Sibuyan from other islands. The lack of disturbance and high levels of intact original habitat are also explanatory factors.

### *Nepenthes tболи* Jebb & Cheek, *sp. nov.* — Fig. 2

Differs from *N. saranganiensis* Sh. Kurata in the stems terete (not 4-winged); leaf-blade midribs and margins hirsute (not glabrous); pitcher lid apices retuse (not rounded). — Type: *Gaerlan*, *Sagcal* & *Romero* in *PPI* 13083 (holotype BRIT!; isotype L! sh. 0099289), Philippines, Mindanao, South Cotabato Province, T'Boli, Lake Parker, 1463 m alt., male fl. & fr. Aug 1993.

**Etymology.** Named, as a noun in apposition, for the T'boli people and area from whence the type specimen derives.

**Terrestrial shrub** or **climber** to at least 0.5 m tall. **Rosette** and **climbing stems** unknown. **Short stems** terete, 0.4–0.6 cm diam.



Leaves spirally inserted, internodes 1.5–2.6 cm long, epidermis drying black, wrinkled, moderately densely covered in red sessile globose glands 0.05 mm diam; very young stems c. 50 % covered in red-brown, curved-erect, simple or 2(–3)-armed hairs 0.1 mm tall, concentrated in and near leaf axils; older stems with hairs 0.1–0.25 mm long c. 5 % covered and appearing glabrous. *Leaf blades* oblong-elliptic, 11–16 by 2.8–3.5 cm; apex attenuate, base decurrent; longitudinal and pennate nerves not conspicuous, barely visible only on lower surface, longitudinal nerves 5–10 pairs, oblique, arising at intervals along midrib as pennate nerves, arching upwards before running along and adjacent to margin for 0.5–1 cm; indumentum absent from upper surface, except leaf edge which is densely hairy, hairs 2–3-branched from the base or from the main axis, 0.25–0.75 mm long; lower surface with red, sessile, globose glands c. 0.5 mm diam, c. 4 per mm<sup>2</sup>; midrib moderately densely hairy, c. 50 % cover, hairs simple, or basally bi- or trifurcate 0.5–0.7 mm long, mixed with shrubby, multi-armed hairs 0.25 mm diam. *Petioles* with patent wings, 4.5–6 by 0.6–0.9 cm, margin with white, sparsely branched, patent hairs 0.25–0.5 mm long; base clasping the stem for 1/2–2/3 its circumference, shallowly winged, subauriculate. *Lower and intermediate pitchers* unknown. *Upper pitchers* (tendrils coiled) narrowly subcylindrical, 11.5–17.5 by 3.5–4 cm; broadest at base, gradually tapering to 2.5–3 cm wide at the centre, gradually dilating towards apex, to c. 3.5 cm wide below the peristome; fringed wings absent, reduced to ridges; outer surface minutely and sparsely puberulent, c. 5 % covered with erect red hairs, c. 7 per mm<sup>2</sup>, hairs bifurcate at base or apex, or bushy, sessile, 0.15 mm long, or (c. 1 in 20 hairs) 3 mm long, patent, with 2–3 short lateral branches. *Mouth* ovate, 3–5.3 by 3.7–4 cm, oblique; peristome subcylindric, 2–2.5 mm wide, ridges 0.15–0.2 mm high, 0.3 mm apart, outer edge tightly inrolled, not lobed, inner edge slightly incurved, teeth absent, perforated with holes, mostly clearly visible near the weakly developed column. *Lid* ovate or ovate-elliptic; 3–3.8 by 2.4–3.4 cm; apex retuse, sinus 1–2 mm deep, base shallowly and broadly cordate or rounded; lower surface with a forward-directed pocket, 1–2 mm long, 2.5 mm wide, set back 2–3 mm from the midline apex, the pocket sides continued to apex by two ridges; mouth of pocket and marginal 2–3 mm of the lid, minutely stellate-hairy, lacking nectar glands, the hairs c. 0.1 mm diam with (2–)3–4(–5) short, thick arms, covering c. 50 % of the surface at the edge itself, giving it a grey, shaggy appearance; basal appendage conspicuous, semi-circular to oblong, asymmetric, 1.5–2 by 2 mm, arising abruptly from a ridge 6 mm long, 1.25 mm high; nectar glands trimorphic, segregated:

1. Large, elliptic-oblong, thinly bordered nectar glands 1–1.25 by 0.6–1 mm, 15–20 in number, present in a band 6 mm wide, along the midline between basal ridge and apex, sparse; smaller such glands 0.3–0.35 by 0.25 mm sparsely scattered in the distal half outside the midline and in the proximal half inside the margin, throughout the lid mixed with small sessile red globose glands c. 0.05 mm diam, c. 10 per mm<sup>2</sup> (Fig. 2i);
2. small, circular, thickly rimmed (perithecoid) nectar glands, (0.15–)0.25 mm diam, confined to the basal appendage and to two curved elliptic areas on each side of the midline in the proximal half, glands very dense, 13 per mm<sup>2</sup> on the appendage and abutting each other there (Fig. 2h);
3. small, deeply sunk borderless, circular glands 0.1–0.2 mm diam, c. 5 per mm<sup>2</sup> present in a small area at the junction with the peristome.

*Spur* simple, needle-like, tapering to a point, 10 by 0.3 mm, erect; indumentum as outer pitcher surface. *Male inflorescence* known from incomplete portion, rhachis 2.5 mm diam,

**Table 2** The more important diagnostic characters separating *N. saranganiensis* and *N. tболи*.

	<i>Nepenthes saranganiensis</i>	<i>Nepenthes tболи</i>
Stem	Prominently 4-winged	Terete
Indumentum of stem and leaf	Absent	Leaf edge hairy; abaxial leaf midrib and young stem 50 % covered by indumentum
Peristome width (side)	(3.5–)5–9 mm	2–2.5 mm
Lower lid basal ridge with appendage?	Lacking appendage	Well-defined, glandular appendage c. 1.5–2 by 2 mm
Outer pitcher surface	Densely stellate, with sparse long hairs	Sparsely puberulent (c. 5 % cover) with simple, bifurcate and bushy hairs
Largest lid nectar glands of lower surface	0.3–0.5 mm diam, scattered along midline and margin	1–1.25 by 0.6–1 mm, confined to band along midline
Pitcher lid apex	Rounded	Retuse

c. 50 % covered by mainly appressed white, heterogeneous hairs: bristle-like hairs 1–2-armed from base, 0.1–0.2 mm long; vermicular, septate hairs c. 0.2 mm long, and by erect, minute simple hairs 0.05 mm long; partial-peduncles 3 per mm length of rhachis, lacking bracts, 2-flowered, (1–)2 mm long; pedicels divaricate, (8–)9–11 mm long; sepals 'yellow-green', 4, elliptic, c. 0.6 by 0.4 mm, apex obtuse, inner surface densely covered in nectar glands, margin densely felted in rust-red papillae; outer surface c. 40 % covered in white appressed hairs 0.1 mm long; androphore 3 mm long, basal 1/3–2/3 with patent white hairs 0.1 mm long, distal part glabrous; anther-head subglobose, wider than long, 1.5 by 1.75 mm, anther thecae c. 15, uniseriate, dull yellow. *Infructescence* peduncle 25–26 cm long, 0.4–0.6 cm diam at base, very sparsely puberulent; rhachis 12–13 cm long, indumentum as midrib of leaf, c. 60 % of surface covered; partial-peduncles 30–36; 7–10 mm long, 2-flowered; bracts absent; pedicels 8–12 mm long, indumentum as midrib, c. 100 % cover; tepals 4, ovate-oblong 5–6 by 2.5 mm, outer surface with white appressed hairs c. 0.1 mm long, c. 5 % cover, absent from base; inner surface with large elliptic glands. Fruit valves 4, narrowly linear-elliptic, 2.5–3.6 by 0.2–0.3 cm, pale brown, 60 % covered by curved red hairs c. 0.4 mm long. *Seeds* pale brown, filiform, 14 mm long, seed body 1.25 by 0.3–0.4 mm, deeply corrugated.

**Distribution & Ecology** — Philippines, Mindanao, S Cotabato Province, T'boli, Lake Parker, open grassland, 1463 m.

**Conservation** — Here, *N. tболи* is assessed as Critically Endangered under criterion D of IUCN (2012) since it is currently known only from one or two mature individuals at the type locality which is threatened by plantation agriculture and tourism developments (Google Earth data). It is to be hoped that more individuals of the species will be found at other locations, hopefully in the extensive yet botanically poorly known Tiruray Highlands of the T'boli people in southern Mindanao, and that this species will be shown to be more common than present evidence suggests.

**Notes** — *Nepenthes tболи* is morphologically most similar to *N. saranganiensis* Sh.Kurata (2003: 41), but lacks the strongly winged stems of *N. saranganiensis*, a feature unique to this species within the *N. alata* group. *Nepenthes saranganiensis* is nearly sympatric with *N. tболи* and is the only other species of the genus known thus far, from the extreme S of Mindanao. The two species can be differentiated using Table 2.

*Nepenthes tболи* is unusual in the *N. alata* group in possessing a pocket in the lower surface of the lid, at the apex (Fig. 2j). Such lid pockets occur in few other species of the genus, e.g.

*N. albomarginata* Lindl., and are otherwise known in Mindanao species only in *N. robcantleyi* Cheek (2011) and in *N. graciliflora*. The function of such pockets is unknown, but we speculate that they are associated with attraction of prey, possibly by holding nectar.

***Nepenthes zygon* Jebb & Cheek, sp. nov. — Fig. 3**

Differs from *N. mindanaoensis* Sh.Kurata, in having leaf blades narrowly oblong-elliptic (not ovate-lanceolate), petiole with wings patent (not strongly involute, appearing cylindric), basal lid appendage present in upper pitchers, conspicuous, strongly convex or hooked (not inconspicuous or weakly developed). — Type: *Cheek 17059* (holotype K; isotypes L, PNH), Philippines, Mindanao Island, Mt Pasian, seed collected in 1997 by R. Cantley, cultivated at Royal Botanic Gardens, Kew as accession 2004-2413, male infl. Sept. 2013.

Synonymy. *Nepenthes alata* Blanco var. *ecristata* sensu Macfarlane (1927) 137 non Macfarl. (1908) 72, quoad *Elmer 14248*.

*Nepenthes alata* sensu Danser (1928) 261 non Blanco, quoad *Elmer 14248*.

**Etymology.** The epithet *zygon*, here used as a noun in apposition, derives from the Greek, meaning yoked or coupled, to signify the close linkage with *N. mindanaoensis*.

**Terrestrial climber** 2–3 m tall, possibly sometimes rooting on bases of stunted trees in cloud forest. Stem terete, 5.5–9.5 mm diam. **Rosette** and **short stems** not well-developed. **Climbing stems** with internodes (2.8–)5–12 cm long, axillary buds filiform 5(–7) by 0.9 mm long, inserted 6–9 mm above the axil, indumentum of patent brown ‘dagger hairs’ (Kurata 2003) 0.2–0.5(–0.8) mm long, very sparse to 20–30 % surface coverage, denser in leaf axils; sessile red depressed-globose glands 0.05 mm diam, scattered throughout. **Leaves** thinly coriaceous, petiolate. **Rosette leaves** oblanceolate, 14–18 by 4–4.5 cm. **Leaves of climbing stems** narrowly oblong-elliptic, 21–24(–30) by 2.8–5.5(–7) cm; apex acute, not peltate; base decurrent to petiole; longitudinal nerves 1–2 pairs, 2–10 mm from the margin, arising from the midrib of the blade, conspicuous above; pennate nerves numerous, patent, conspicuous above; midrib upper surface 20–30 % covered in a mixture of dark brown simple or ‘dagger hairs’ 0.06–1 mm long and white, (2–)3–6-armed bushy to substellate hairs 0.2–0.25 mm diam, margin densely shortly hairy with same hairs (Fig. 3e), blade otherwise mainly lacking hairs except thinly scattered white hairs; sessile, red depressed-globose glands 0.05 mm diam scattered throughout; lower surface with midrib 10–20 % covered in dark brown ‘dagger hairs’ 0.5–0.6 mm long, mixed with substellate pale brown bushy hairs arising from a dark red base, 4–6-armed, 0.15–0.2 mm diam, extending very sparsely to the blade (i.e. *Elmer 14248*) or moderately densely c. 3 hairs mm<sup>2</sup>; margin densely ciliate with hairs as in upper surface of midrib. **Petiole** winged, broadly U- or V-shaped in section, (6–)7–10 by 0.6–1(–2) cm. **Lower pitchers** (tendrils not coiled) ellipsoid-cylindric, 9–14 by 2.5–5 cm, widest in the ellipsoid lower half, upper half cylindric 1.5–2.5 cm wide; fringed wings present from base to peristome, wings 3–4 mm wide, fringe elements 4–5 mm long, (2–)3–5.5 mm apart; outer surface 30–50 % covered in minute (3–)4-armed stellate hairs 0.1 mm diam, mixed with sparser (c. 5 % cover) hairs 0.75–1.3 mm long superficially simple but bearing 1–2 short side branches from the central axis (Fig. 3j). **Mouth** ovate-elliptic, 2.5–4 by 1.7–2 cm, oblique, not, or only weakly concave, column not present; peristome cylindric 2–4 mm diam, even in width throughout, ribs 0.5–0.6 mm apart, raised 0.4 mm, in life the inner edge appears to be without teeth or holes, which can be found on dissection, outer edge not lobed. **Lid** orbicular-elliptic, 2–2.5 by 1.8–2.9 cm, apex rounded, base slightly cordate; basal ridge and appendage absent in the smaller pitchers (c. 10 cm tall), resembling those of the upper pitchers in the larger (c. 15 cm

tall) pitchers; nectar glands and indumentum resembling those of upper pitchers but sparser. **Spur** triangular c. 2.5 by 1.5 mm, tapering from base to rounded apex; densely covered in brown bushy and ‘dagger hairs’ 0.3–1 mm long. **Upper pitchers** (tendrils coiled) ellipsoid-cylindric (9–)16–25 by (2.6–)4–5.5 cm, widest in the basal ellipsoid, 7–8 cm long portion, above cylindric narrowed to (1.8–)2.5–3(–3.5) cm diam; indumentum as lower pitchers, colour when live with basal, swollen part of pitcher green (drying brown), overlain with white waxy layer, cylindrical part with faint to well-marked longitudinal red-purple stripes and flecks, inner pitcher surface waxy green (drying pale purple), spotted with purple; fringed wings present only immediately below the peristome (0.6–)1.7–3.5 cm long, widest at the peristome where (1–)2.5–7.5 mm wide, fringed elements 3–6 mm long, 1.5–3 mm apart, the uppermost longest and raised above the peristome; mouth ovate, 3.5–5 by 2.5–3.3 cm, oblique, slightly concave, column weakly developed; peristome subcylindric (flattened only before the pitcher is fully opened Fig. 3b) (1.5–)2–3(–5) mm broad, ribs 0.3 mm apart, about 0.01 mm high, outer margin entire, revolute, inner margin without conspicuous teeth, revolute (edge with holes visible only when dissected, (Fig 3q), green or red and green in colour; lid ovate (2.2–)3.3–4.5(–4.9) by 2.5–4(–4.6) cm, apex rounded or slightly retuse, base cordate, the sinus 1–1.5 cm wide, 5 mm deep, lower surface with a basal ridge 1.5 cm long, rising gradually to 0.5–1 mm high, tapering to the extremities, and bearing in the centre a convex or recurved-hooked appendage (Fig. 3n) projecting 3–4 mm from the lid surface, 4–7 mm long; nectar glands are of two types and mostly confined to two approximately lanceolate areas, which are joined at the basal ridge, nectar glands being largely absent from a marginal band 5–8 mm wide and from the distal half of the midline; they are thinly scattered on the basal appendage; type 1: nectar glands (90 % of the total c. 1 per mm<sup>2</sup>) are small, thinly bordered, orbicular or elliptic, 0.1–0.2 mm in length; type 2: nectar glands are similar in appearance, but much sparser and larger 0.5–0.6(–0.7) mm long; sessile red-black depressed-globose glands 0.05 mm diam, c. 3 per mm<sup>2</sup> are scattered over the whole of the lower surface; marginal 2–3 mm 50 % covered in stalked bushy brown hairs 0.1–0.2 mm diam, several occurring towards the centre of the lid, 8–10 mm from the edge; spur simple, filiform, 5–9 mm long, 0.5 mm wide, apex obtuse, densely covered in appressed hairs 0.5–1 mm long. **Male inflorescence** c. 47 by 3.5 cm, indumentum moderately dense, covering 40–50 % of the surface, hairs pale brown, a mixture of ‘dagger hairs’ 0.5–1 mm long, and 2–4-armed bushy hairs 0.2–0.25 mm long; peduncle c. 27 by 0.3 cm; rhachis c. 20 cm long, with partial-peduncles 75–80, 2-flowered (1-flowered at apex); bracts recurved or patent, filamentous, c. 3 mm long, acute, inserted along the length of the partial-peduncles; partial-peduncles 4–6 mm long; pedicels c. 15 mm long, indumentum covering 30–50 % of the surface, hairs bushy, 1–3-armed, erect, 0.2–0.5 mm long; tepals 4, elliptic, 6 by 4 mm, outer surface 50–60 % covered in a mixture of simple, acute hairs 0.15–0.25 mm long, and sessile mucilaginous papillae 0.005 mm diam, inner surface densely covered in elliptic nectar glands; staminal column 5 mm long, moderately densely hairy along its length, hairs 0.1 mm long, more or less patent, red-brown, simple or with a basal branch; anther-head subglobose, 2.5 mm diam. **Female inflorescences, infrutescences and seed** unknown.

**Distribution & Ecology** — Philippines, NE Mindanao, Mts Masay and Pasian, submontane mossy forest along ridges, thought to be non-ultramafic, 1500–1875 m asl.

**Additional material.** PHILIPPINES, Mindanao, Mt Masay (also known as Mt Cabadbaran and Mt Urdaneta), *Elmer 14248* (E, L), “in the summit region at approx. 6250 feet alt., Oct. 1912” (*Elmer 1915*).





**Conservation** — *Nepenthes zygon* is known with certainty from only two individuals at two locations, in a country which has seen loss of most of its natural habitat in the 20th century (Myers et al. 2000, Sohmer & Davis 2007). *Nepenthes zygon* shares its type location, Mt Pasian, with *N. robcantleyi*. The clear-felling of forest there that led to the concern that *N. robcantleyi* might be extinct (Cheek 2011) may also have eliminated *N. zygon* at that location. However at its second location, Mt Masay, no threats are yet known to summit areas where *N. zygon* was collected (Gronemeyer pers. comm. to MC). Recent photographic records of what may be this species (identified as *N. alata* in Gronemeyer 2008: 26, 2009: 7) at Mt Masay suggests that it survives there. A similar image from Mt Hibok-Hibok (Gronemeyer 2008: 25) suggests that *N. zygon* may also be present there, yet all three images do not provide enough detail that identification is certain. Accordingly, *N. zygon* is here assessed as Critically Endangered under IUCN (2012), criterion D based on less than 50 individuals (in fact two) being known from the wild with certainty. It is to be hoped that the species will be verified at the locations named above, found at additional locations and so proved to be not so rare or threatened as existing data suggest. It is fortunate that *N. zygon* is already in cultivation and available commercially from the nursery Borneo Exotics.

**Taxonomic affinities** — Although *N. zygon* has previously been identified as *N. alata* in the broad sense, recent research has shown that the latter species is confined to northern Luzon and differs in a number of characters (see key). *Nepenthes zygon* appears to be closely related to *N. mindanaoensis*, being very similar in overall appearance. Their geographic ranges coincide, but ecologically they are separated by their habitat and altitudinal range, *N. zygon* being restricted to cloud forest on non-ultramafic substances, while *N. mindanaoensis* is restricted to low altitude ultramafic scrub. *Nepenthes zygon* lacks the diagnostic petiole of *N. mindanaoensis* in which the wings are so involute that their margins overlap each other so that the petiole appears cylindrical. *Nepenthes zygon* also has a well-developed basal appendage to the lid (vs being absent), besides differing in the other characters given in Table 3.

*Nepenthes zygon* has several features unusual in the genus, and which are otherwise unknown in the *N. alata* group. These are:

1. the white waxy bloom that coats the lower half of the upper pitchers;
2. the presence of hairs in the centre of the lower surface of the lid of the pitcher; and
3. the dense patent hairs of the androphore (although male inflorescences are not known for all species of the group).

**Table 3** The more important diagnostic characters separating *N. mindanaoensis* and *N. zygon*.

	<i>Nepenthes mindanaoensis</i>	<i>Nepenthes zygon</i>
Leaf-shape	Ovate-lanceolate	Narrowly oblong-elliptic
Petiole	Wings involute, appearing cylindric, 0-shaped in transverse section	Wings ± patent, broadly V-shaped or U-shaped in transverse section
No. and origin of longitudinal nerve pairs	2–3 arising from petiole	1–2 arising from midrib of blade
Length of ‘dagger hairs’ on stem, petiole and midrib	(1–)1.5–2 mm	0.2–0.5(–1) mm
Leaf-blade base	Blade abruptly contracted into petiole	Blade decurrent into petiole
Basal lid appendage	Not well-developed, or absent, inconspicuous	Strongly convex to hooked, conspicuous in upper pitchers, but absent in lower ones
Habitat	Scrub on ultramafic soils	Submontane forest
Altitude range	200–300 m	1500–1875 m

**Variation** — The two collections vary from each other in density of indumentum on the stem and lower surface of the leaf-blade of the climbing stem (very sparse in *Cheek 17059*, moderately dense in *Elmer 14248*) and in the density of the nectar glands on the lower surface of the lid of the upper pitcher, which is much sparser in *Elmer 14248* than in *Cheek 17059*. In all other respects, the two specimens appear more or less identical, e.g. in the unusual trichome complement of the leaf-blade midribs and lower lid surface.

**Notes** — “Three or more distinct terrestrial species” (of *Nepenthes*) were observed “in the summit region or about 5000 feet” by Elmer on Mt Masay (also known as Mt Urdaneta or Mt Cabadbaran) (Elmer 1915). These were all collected by Elmer: *N. surigaoensis* Elmer (*Elmer 12705* in Sept. 1912), *N. petiolata* Danser (1928) which had been collected by Elmer as a mixed gathering with the first species, although Elmer had suspected that it was different when he had collected it (Elmer 1915). Thirdly, newly described here from the same locality (although the altitude given is higher), *N. zygon* (collected in Oct. 1912). From neighbouring peaks “at a lower elevation there is the high epiphytic species *N. truncata* Macf.” (Elmer 1915), which Elmer had collected earlier in Aug. 1912 although he gave it a higher collection number (*Elmer 13483*, BM, Urdaneta).

Macfarlane (1927) in his final paper of Philippine *Nepenthes*, misidentified *Elmer 14248* citing it as *N. alata* var. *ecristata* Macfarl. (1908: 72), the type of which is now raised to species rank as *N. kurata* Jebb & Cheek (2013h). It can be distinguished using the key above. Danser (1928) cited the same specimen simply as *N. alata*, taking a wide view on the delimitation of this species.

In life (*Cheek 17059*), the colour and aspect of the upper pitchers is very different from the herbarium specimens (*Elmer 14248*), but once the former had been dried, these features became identical to the second, although made 101 years later.

*Nepenthes zygon*, although newly described here, is already one of the better-known Mindanao species of the genus, because it has been possible to observe authentic wild-sourced material in cultivation from the juvenile stage to flowering, and so to develop a nearly complete description. This approach is also used in *Araceae* where leaves and inflorescences do not occur on the plant at the same time so that cultivation is the best way to reliably connect the different stages for descriptive purposes.

The basal ridge and appendage that characterise the *N. alata* group, and which are present in the upper pitchers of *N. zygon*, are completely absent from its lower pitchers. Whether this is usual or not throughout the species of the group remains to be determined.

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