Nepenthes nebularum, a new species from Mindanao, Philippines

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Abstract: The discovery of *Nepenthes nebularum* sp. nov. is here reported and thereby described as a new addition to the Philippine *Nepenthes* flora. This new species is closely related to both *N. truncata* and *N. robcantleyi*, differing mainly in the smaller stature of the plants, the more pronounced peristome teeth, and the bronzy, rather dense, and woolly indumentum found on the petiole wings, tendrils and traps. Further distinguishing traits are discussed in the description proper. With the description of this new species, the number of Nepenthes species in the archipelago now stands at over 53.

Key words: *Nepenthes*, south-eastern Mindanao, Philippines

Introduction

In September 2011 participants on a trip to a remote mountain on south-eastern Mindanao, with well-known geographer, traveller, and author Stewart McPherson, sighted epiphytically growing black *Nepenthes truncata*-like plants and photos were taken from a distance; it was stated by some of the participants on this same trip that this was evidence of the then newly described *N. robcantleyi* in habitat. However, due to the distance and foggy surroundings, no real distinguishing features could be observed in the photo except for superficial similarities to both *N. truncata* (Macfarlane 1911) and *N. robcantleyi* (Cheek 2011). On seeing the photo and noticing differences between these plants and *N. robcantleyi*, Exotica Plants organized several trips to the mountain in 2012 in hope of obtaining more details of the plants. These were undertaken by Philippine botanist and *Nepenthes*/orchid taxonomist, Wally Suarez. The mountain is very foggy, as mentioned above, and leeches as well as spiny rattans are abundant, which made the ascent difficult. After three attempts he successfully located a colony of these plants and a set of photographs were obtained which clearly distinguished these plants as different from both *N. robcantleyi* and *N. truncata* (Fig. 1).

The most notable distinguishing features of these plants are the pitchers and tendrils that are covered with a pubescence of soft bronzy hairs resembling wool, the smaller stature of the plants, their epiphytic preference, the lack of the lid dome ("boss") (Cheek 2011), and the lack of bracts on the partial peduncles of the male and female flowers. Unfortunately, no specimens were collected on this trip.

After more discussions with Stewart McPherson and Alastair Robinson, a further trip was incorporated as a leg of one of their Philippine excursions. In July 2013, a group climbed the same mountain. The route taken for this trip was different from the one used on the earlier trip by Wally Suarez organized by Exotica Plants and a different colony of these plants was located on the mountain top. Upon examining these photos and the discovery of this additional colony on the same mountain and noting the apparent introgression, more research was done.

From further photos and reports of sightings of the dark *N. truncata*-like plants on another mountain, also on south-eastern Mindanao, a fourth trip was organized. This second mountain was climbed and explored in April 2015 as a part of a Philippine excursion led by Stewart McPherson

Figure 1: *Nepenthes nebularum*. Two pitchers from different plants from Mt. Mayo, Mindanao. Photos by W. Suarez.

and Alastair Robinson. In the limited time available, a colony of dark *N. truncata*-like plants was located and no other *Nepenthes* species were seen. Photographs of the plants were taken in detail (Fig. 2 & Front Cover) and it could be seen that these plants did not represent *N. robcantleyi* or *N. truncata* and were nearly identical to the plants found by Wally Suarez on an earlier expedition. It should be duly noted that as previously observed, mature plants were also about one half the size of both *N. robcantleyi* and *N. truncata*. In the opinion of the authors, these new "black" *N. truncata*-like plants clearly represent a new species and are described here as *N. nebularum* sp. nov.

In July 2016, another trip, organized by Exotica Plants, was undertaken to this second mountain—its location also withheld to dissuade possible poaching—and other colonies of *N. nebularum* sp. nov. were observed in detail. Plants that fall within the range of *N. copelandii* were also observed on the ascent trail. Plants resembling, if not the same as, *N. cornuta* were also found by Wally Suarez on the 2012 trip, but on lower altitudes where *N. nebularum* grows.

Taxonomy

Nepenthes nebularum Mansell and Suarez sp. nov. (Fig. 3).

Type: From Mindanao, Philippines, sub-adult pitcher and leaf from specimen grown from seed at Exotica Plants. Collected on 1 July 2016. *Mansell* NEB14, *ex cult.* (Holotype: BRI AQ522212).

Description: A short stemmed rosette to 60 cm diameter and up to 1.0 m long in low light, usually much shorter. Stems terete and up to 1.5 cm in diameter. Leaves of mature plants to 16.5 cm long by 15 cm wide, broadly truncate, apices cordate-truncate, tips decurrent to tendril, with subobtuse and cordate bases tapering down to the petiole. Longitudinal nerves conspicuous 4-6 on each side of midrib, not equidistant, closer together the further away they are from the midrib. Outermost veins not full length. Pennate nerves numerous web like, inconspicuous. Petioles shallowly cana-

Figure 2: *Nepenthes nebularum,* Mindanao. Photo by A.Bianchi.

liculate, from 12-15 cm long × 0.6-0.8 cm in diameter near stem. Bases clasping the stem tightly, the wings rolling evenly and tightly, one over the other, over the adaxial canal immediately after leaving the stem, continuing smoothly and tapering slightly to the leaf blade, where they adjoin together. Tendrils 'D' shaped in cross-section. At first glance, the tendril appears terete but on closer examination, there are two raised ribs that run from the decurrent leaf tip and increase in size with the tendril thickness as they near the pitcher, where these continue and form the pitcher wings. Pitchers on mature plants are from 25-29 cm long × 7.5 cm at widest point, pubescent to villous with two distinct types/lengths of ferruginous to golden hairs. Pitcher cylindrical in most part, wider in the upper half slightly constricted in the middle, becoming elliptical in the lower part as it tapers to the tendril attachment, with two prominent fringed wings running +/-parallel up the front of the pitcher and terminating just below the peristome edge. Wings ca. 1.5-1.7 cm with fringe elements from 1.2-1.5 cm long. Mouth horizontal at the front angling gradually up at about 30° and then steeply forming a narrow neck on the pitcher. Hip on pitcher rear at the back of the mouth. Peristome 6-7 cm wide approximately midway around mouth. Flatly rounded down following the rim of the mouth at the front with a pronounced raised triangular fold at the front of the mouth. Rest of peristome flattened and flared, gently curving on the outer edge between several undulations forming sharp folds. Coarse ribs – sharp inverted 'V' in section, ca. 2 mm high at 3 mm spacing on the outside edge of the peristome, closer together as they enter the mouth, terminating in sharp tooth like projections extending into the mouth several millimeters. Lid ca.7.5 × 5.5 cm, held approximately horizontal, deltoid-ovate. Front rounded, base cordate. Margins slightly undulate. Top surface covered in short, golden/ferruginous hairs. Noticeably, 2 prominent rows start together from the lid attachment point, curving outwards each side of the indent created from the keel below, and curve back in, nearly

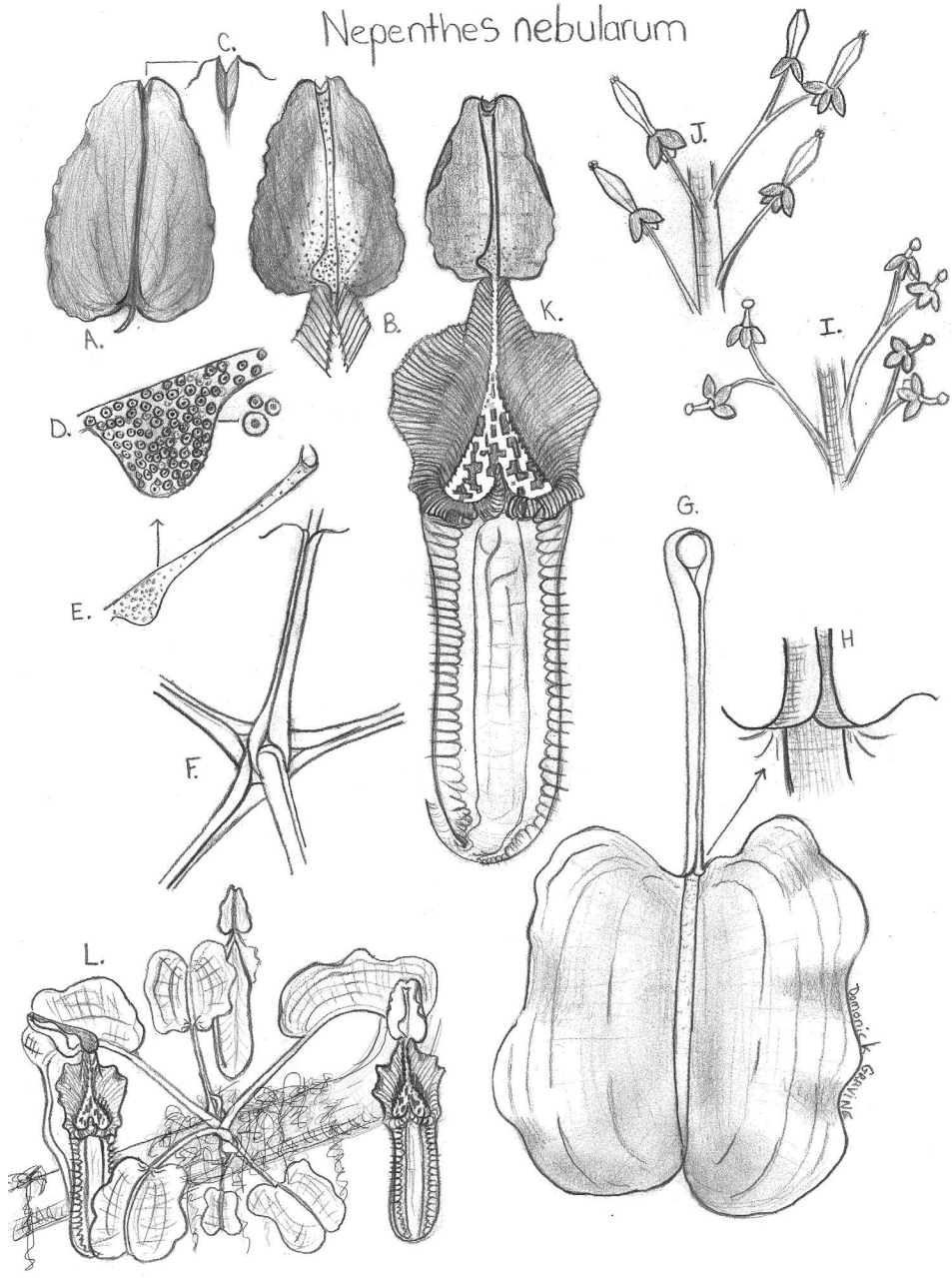

Figure 3: *Nepenthes nebularum.* (A) lid upper surface, (B) lid lower surface, (C) lid pleated tip detail, (D) basal appendage gland detail, (E) Keel, basal and apical appendages detail, (F) top view of petiole to stem attachment, (G) top view of an entire leaf, petiole and stem attachment, (H) detail of petiole finish at leaf blade, (I) section of male inflorescence, (J) section of lower part of female inflorescence showing single flowered to two flowered change, (K) pitcher, (L) mature epiphytic plant. Drawn from herbarium specimens and habitat photos by Domonick Gravine.

meeting, at the front of the lid. There is a slight domed portion near the rear of the lid over the basal appendage below. The lid lower surface has a raised keel running longitudinally. It has a raised vertically flattened, rounded appendage at the rear which is in the domed portion. From about half way along the lid length the keel widens and flattens and the front part forks into a raised, partially hollowed, semi-cone like appendage and tapers down to a stop several millimeters from the front of the lid. The lid is folded down between this apical appendage and creates a pleated recess which can also be seen on the top of the lid as an elongated V-shaped depression. Small, rimmed nectar glands present and numerous on basal appendage and around its base in the recessed area. Slightly larger similar glands sparse around appendage base and continuing sparsely along the keel to the apex of the lid. Lid also covered, +/- evenly spaced, and with minute recessed glands. These do not seem to be nectar glands. Keel, basal appendage recess, and apical appendage all cream/yellow colored, the rest of the lid underside purple/maroon. Spur simple sometimes bifurcating at tip, 2-3 cm long. Female inflorescence up to 120 cm long, 1-flowered in the lower part and then the rest is 2-flowered, no bracts. Peduncles ca. 50 per inflorescence. Male inflorescence ca. 80 cm long, two-flowered, no bracts. Indumentum: Ferruginous dendritic hairs dense on pitcher and tendril ca. 0.25-0.5 mm. Tendril, pitcher lower part, pitcher bud, midrib under leaf and petiole wings densely covered also in tufted (caespitose) ferruginous hairs, sparse on rest of pitcher, ca. 2-3 mm long. Although these hairs are tufted the longest one(s) extend to this length others in tuft are shorter. Short ferruginous/golden hairs are present in a row ca. 3-4 mm running along the inside edge of the lid lower surface, possibly dendritic in shape, 0.1 mm. Leaf upper surface has simple white hairs ca. 3 mm on entire surface. Sparse underneath blade. Leaf margin is edged with ferruginous hairs ca. 1-2 mm.

1. Ecology: Mainly epiphytic on tall trees in sub-montane forests at altitudes to 1,800 m asl on two mountains in south-eastern Mindanao, but suspected to occur further north, where the seed parent of *N. robcantleyi* was located (see Discussion below). Sometimes lithophytic on cliff faces. They grow sympatrically, on at least one site, with lowland *N. truncata* and *N.* cfr. *cornuta*, but both occur at much lower elevations than those preferred by the new species. However, a few plants of highland *N. truncata* were noted growing in the same altitude as *N. nebularum*, which allows the possibility that the two species may hybridize on some occasions (again, please refer to the Discussion below).
2. Etymology: The name originates from the Latin word *nebula*, meaning clouds. Inflected in the case genitive, *nebularum* means “cloud loving” and “coming from the clouds”. This is in reference to the habitat in which the plants are growing that is frequently covered in fog.
3. Discussion: *Nepenthes nebularum* sp. nov. is a member of Benedictus Danser’s putative *Regiae* group, and is most closely related to *N. truncata*, the differences of which are summarized in Table 1. The authors are of the position that *N. alata* and its associated species represent a group of its own, and does not include *N. truncata* and related taxa. While the readers may be inclined to think that this new species is the same as *N. robcantleyi*, we believe otherwise. While we prefer not to discuss it in length here, it is worth noting that all plants observed in the wild never approached the sizes obtained by *N. robcantleyi*. As a matter of fact, we are of the conviction that *N. robcantleyi* represents a lineage rooted from a hybridogenic event involving *N. truncata* and *N. nebularum*. On this conviction it should be duly noted that the progeny of the *N. robcantleyi* cultivars was not taken into consideration as they are a further hybridization and certainly do not all fit the description of *N. robcantleyi*. It is also for this reason that we are not in favour of plans to reintroduce *N. robcantleyi* in the wild, and for such purposes, *N. nebularum* is the logical and more preferable candidate. A separate paper on this matter is in preparation.

Table 1. Differences between *N. nebularum*, *N. robcantleyi*, and *N. truncata*.

Specific characters	*N. nebularum*[1]	*N. robcantleyi*[2]	*N. truncata*[3]
Plant size and growth habit	30 cm long × 60 cm dia. Stem 1.5 cm dia. Epiphytic.	1.0 m long × ca. 1.0 m dia. Stem 2 cm dia. Terrestrial.	3.0 m long × ca. 1.4 m dia. Stem 3 cm dia. Terrestrial, sometimes epiphytic.
Leaf outline	Broadly truncate, widest at apex. Apex truncate with leaf blade extending down tendril, acuminate. Leaf blade ca. 16.5 × 15 cm.	Oblong-elliptic. Apex truncate with acumen, base cordate. Leaf blade 25.0-28.55 × 23.0-26.5 cm.	Sub-rectangular, widest at apex. Apex emarginate. Leaf blade 45 × 22 cm.
Leaf venation	4-6 each side of midrib, not equidistant. Outermost veins not full length of blade. Pennate nerves numerous, web like, inconspicuous.	2-4 on each side of midrib. Pennate nerves inconspicuous.	5 each side of midrib, +/- equidistant. Pennate nerves numerous, conspicuous.
Petiole	Appearing terete as wings are folded tightly over adaxial canal. Actually shallow canaliculate, winged. ca. 12-15 cm long × 0.6-0.8 cm near stem. Clasping stem tightly. Wings folding tightly and evenly, one over the other over the adaxial canal, immediately after leaving stem. Continuing smoothly to the leaf blade, finishing together.	Pseudo-terete, canaliculate, winged. 22-23 cm long × 2.0 cm near stem. Clasping stem loosely. Wings start off spread, as in *N. truncata* and then roll tightly, as in *N. nebularum*, up to the leaf blade usually finishing unevenly from each other.	Pseudo-terete, shallowly canaliculate, winged. 27 cm long × 1.8 cm at base. Clasping stem loosely. Wings start off spread then roll tighter as in *N. nebularum*, up to the leaf blade usually finishing unevenly from each other.
Tendril	D-shaped in section due to two raised ribs running from the leaf tip decurrency along the tendril increasing in size forming the pitcher wings. Villous/shaggy with 2 sorts of hair. New pitcher bud the same.	Cylindrical in section. Glabrous. New pitcher bud has dense red-brown dendritic hairs.	Cylindrical in section with a slightly flattened edge. New pitcher buds pubescent with short ferruginous hairs.
Pitchers	ca. 27 × 7.5 cm at widest point at mouth. Villous with two types and lengths of ferruginous to golden hairs. Mostly cylindrical, wider in the upper half, slightly constricted at middle, elliptical in lower half tapering to tendril. Hip on rear +/- level with mouth.	ca. 33 × 9.5 cm widest at the base. Appear glabrous but are minutely puberulent. Broadly cylindrical narrowest below peristome.	Up to 48 × 11.7 cm. Wholly cylindrical or slightly ovate in the bottom third, narrowing slightly in the middle and widening towards the mouth.
Pitcher wings	Prominent, +/- parallel, 1.5-1.7 cm wide, fringe hairs 1.2-1.5 cm, terminating just below the peristome.	Not parallel. ca. 1.0 cm wide, fringe elements 1.0-1.2 cm long. Terminating underneath the peristome.	Rudimentary wings run the length of the pitcher, not parallel, wider at the pitcher base, narrowing towards the mouth.
Peristome	6-7 cm wide approx. midway around mouth. Flatly rounded down following the rim of the mouth at front with a pronounced triangular upward fold at front of mouth. Rest of peristome flattened and flared, gently curving on the outer edge between several (4-5) undulations forming sharp folds. Coarse ribs - sharp inverted 'V' in section, ca. 2 mm high at 3 mm spacing on the outside edge of the peristome, closer together as they enter the mouth, terminating in sharp tooth like projections extending downwards into the mouth several mm.	6-9 cm wide below the column. Gently curved in section, horizontal in front, center rising by 1(-3) cm, outer edge of peristome slightly undulate. The ribs ca 1.5 mm apart, 1.0-1.5 mm deep, inner edge with teeth 3-4 mm long, those along the central seam ca 2 mm long.	Peristome up to 6 cm wide and sometimes the front protruding in a triangle upwards, broad and flared but can sometimes roll back, depending on populations. Coarse ribs 1-2 mm apart, 1-2 mm high, outer edge sinuate, inner surface dentate but not generally in defined teeth.

Table 1. Continued.

Specific characters	*N. nebularum*[1]	*N. robcantleyi*[2]	*N. truncata*[3]
Lid	ca. 7.5 × 5.5 cm, deltoid-ovate, front rounded base cordate, margin slightly undulate. Top surface covered in short ferruginous/gold hairs. 2 prominent rows run from lid attachment together separating each side of keel below, curving back in at front. There is a slight dome over the basal appendage below. Lower surface has a raised keel running longitudinally with a raised, vertically flattened, rounded appendage at the rear which is in the domed portion. About half way along the lid length the keel widens and flattens and the front part forks into a raised, partially hollowed, semi-cone like appendage and tapers down to a stop several millimeters from the front of the lid. Lid pleated down above this appendage. Short ferruginous/ golden hairs present in a row ca. 3-4 mm running along the inside edge of the lid lower surface. Small, rimmed nectar glands present and numerous on basal appendage and around its base in recessed area. Slightly larger similar glands sparse around appendage base and continuing sparsely along the keel to the apex of the lid. Lid also covered, +/- evenly spaced, with minute recessed glands. These do not seem to be nectar glands. Keel, basal appendage recess, and apical appendage all cream/ yellow colored, the rest of the lid underside purple/maroon. Spur simple sometimes bifurcating at tip, ca. 2-3 cm long.	ca. 9.5 × 9.5 cm, broadly ovate to suborbicular apex rounded, base shallowly, then abruptly cordate, upper surface with ovate boss ca. 4 × 3 cm, raised 1 cm, immediately above the basal appendage on the lower surface; lower surface with a laterally flattened more or less semicircular basal appendage ca. 4 mm high, 13 mm long, arising from a keel 3-5 mm high, ca. 2.5 cm long, continuing towards the apex as a raised midrib terminating in a small cylindrical terminal appendage ca. 3 mm wide, projecting from the surface ca. 2 mm, placed 7 mm from the apex; lid nectar glands restricted to the ovate boss (concave) area ca. 4 × 3 cm around the basal appendage; glands dense, orbicular, dome-volcano-like 0.15 mm in diameter. Within a 5 mm radius of the base of the appendage, otherwise transversely elliptic 0.3-0.5 mm wide; remainder of lid with minute thinly scattered red depressed globose glands ca. 0.05 mm diameter; spur entire, stout, ca. 12 × 1.5 mm, apex truncate-concave.	14.5 × 12.5 cm. at widest point. Lid cordate to ovate with a cordate base. Top surface has two distinct raised ribs starting together from the attachment point and running each side of the indentation caused by a keel on the lower surface and nearly joining again at the front of the lid. There is a raised dome in the rear centre of lid which varies in height in different populations, above a basal appendage. Lower surface has a raised rounded basal appendage inserted in the dome part of the lid and as part of a keel or remnants of one, which runs the length of the lid. In specimens where the rib is more pronounced it splits at the apex and terminates in two small protrusions. Large crater like nectar glands numerous, prominent, concentrated under lid dome and on basal appendage, sparsely scattered around the rest of the surface under the lid combined with other minute glands. Spur simple av. 2.5 cm long.
Inflorescence	Female: up to 120 cm long, 1 flowered in the lower part and then the rest is 2 flowered, no bracts. Peduncles ca. 50 per inflorescence. Male: ca. 80 cm long. Two-flowered, no bracts.	Female: 140 cm long, peduncle 97 cm long; partial-peduncles ca. 35 per inflorescence, two-flowered, bracts filiform-linear. Male: 2.13 m long; peduncle 97 cm long; partial-peduncles 100-130, two-flowered, lacking bracts.	Female: to 1.8 m long, peduncle 80 cm, partial peduncles ca 150 per inflorescence, two flowered, small or no bracts on partial peduncles. Male: to 1.2 m long, peduncle 80 cm, partial peduncles ca 200, two flowered. No bracts
Indumentum	Ferruginous dendritic hairs dense on pitcher and tendril ca. 0.25-0.5 mm. Tendril, pitcher lower part, pitcher bud, midrib under leaf and petiole wings densely covered also in tufted ferruginous hairs, sparse on rest of pitcher, ca. 2-3 mm long. Although these hairs are tufted the longest one(s) extend to this length others in tuft are shorter. Leaf upper surface has simple white hairs ca. 3 mm on entire surface. Sparse underneath blade. Leaf margin is edged with ferruginous hairs ca. 1-2 mm.	Red-brown dendritic hairs ca 0.5 mm long, dense on leaf-buds, sparse on lower surface of blade, upper part of pitcher.	Leaf margin fringed in dendritic red hairs ca. 0.8 mm long. Pitcher ferruginously villose. (Macf). Actually ferruginously pubescent with dendritic hairs ca. 0.1 mm, denser near tendril attachment, tendril and leaf buds.

[1] Most measurements of *N. nebularum* sp. nov. were taken in habitat by Andrea Bianchi and Ryan B. Rizalda.
[2] The plant of *N. robcantleyi* owned by Shinya Yamada of Japan is from the original collection and is a sibling of *N. robcantleyi* 'Queen of Hearts', (according to Cheek 2011). It is male and has very well developed partial peduncle bracts ca. 1 cm long.
[3] The *N. truncata* data are based on the description (Macfarlane 1911, as revised by Cheek and Jebb 2001) and observations over 30 + years of growing wild collected material and many thousands of cultivated plants of *N. truncata*.

4. Conservation Notes: *Nepenthes nebularum* is presently known from two disjunct mountains in south-eastern Mindanao, but there are indications that it is much more widespread on the island, their detection limited due to the paucity of research undertaken because of uncertainties on securities, and their preference for growing on tall trees in high-altitude, remote areas. On the two aforementioned mountains, human disturbance is limited on the lowermost slopes, and traces of neither clearing nor logging were observed on the upper elevations. Even mountaineering activities are extra-limital. However, such may not be the case on other areas where *N. nebularum* is suspected to be found. Indeed, if our supposition is correct that *N. robcantleyi* is a natural hybrid involving *N. truncata* and *N. nebularum*, then the population of the latter should be already extinct on the site where the seed parent of *N. robcantleyi* was found (Rob Cantley, email correspondence with Wally Suarez). Awaiting a thorough population determination of the new species on the entire island, we propose that *N. nebularum* be classified as 'Data Deficient' under IUCN.

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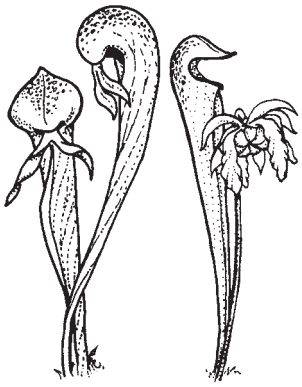

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Front Cover: *Nepenthes nebularum*, Mindanao, Philippines. Photo by A. Bianchi. **Article on page 132.**

Back Cover: *Pinguicula* 'Red Starfish' summer rosette and flower (inset). This newly named cultivar was created by Dr. Miloslav Studnicka in 1994. Photo by Miroslav Srba. **Article on page 158.**

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