

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/322883205>

Nepenthes epiphytica, a new Pitcher Plant from East Kalimantan

Chapter · January 2011

CITATIONS

2

READS

52

3 authors, including:



Alastair Robinson

Royal Botanic Gardens Victoria

19 PUBLICATIONS 82 CITATIONS

[SEE PROFILE](#)



Andreas Wistuba

Wistuba

9 PUBLICATIONS 38 CITATIONS

[SEE PROFILE](#)

Some of the authors of this publication are also working on these related projects:

Project

Notes on *Nepenthes* [View project](#)

Project

Ultramafic endemics [View project](#)

Nepenthes epiphytica, a new pitcher plant from East Kalimantan

Alastair S. Robinson^{1*}, Joachim Nerz² and Andreas Wistuba³.

- 1) Unit 10, The Old Hat Factory, 83-89 Brighton Road, VIC 3184, Australia.
- 2) Jägerstraße 50, 71032 Böblingen, Germany.
- 3) Friedhofweg 4, 88437 Maselheim, Germany.

*Corresponding author. E-mail: arobinson@cantab.net

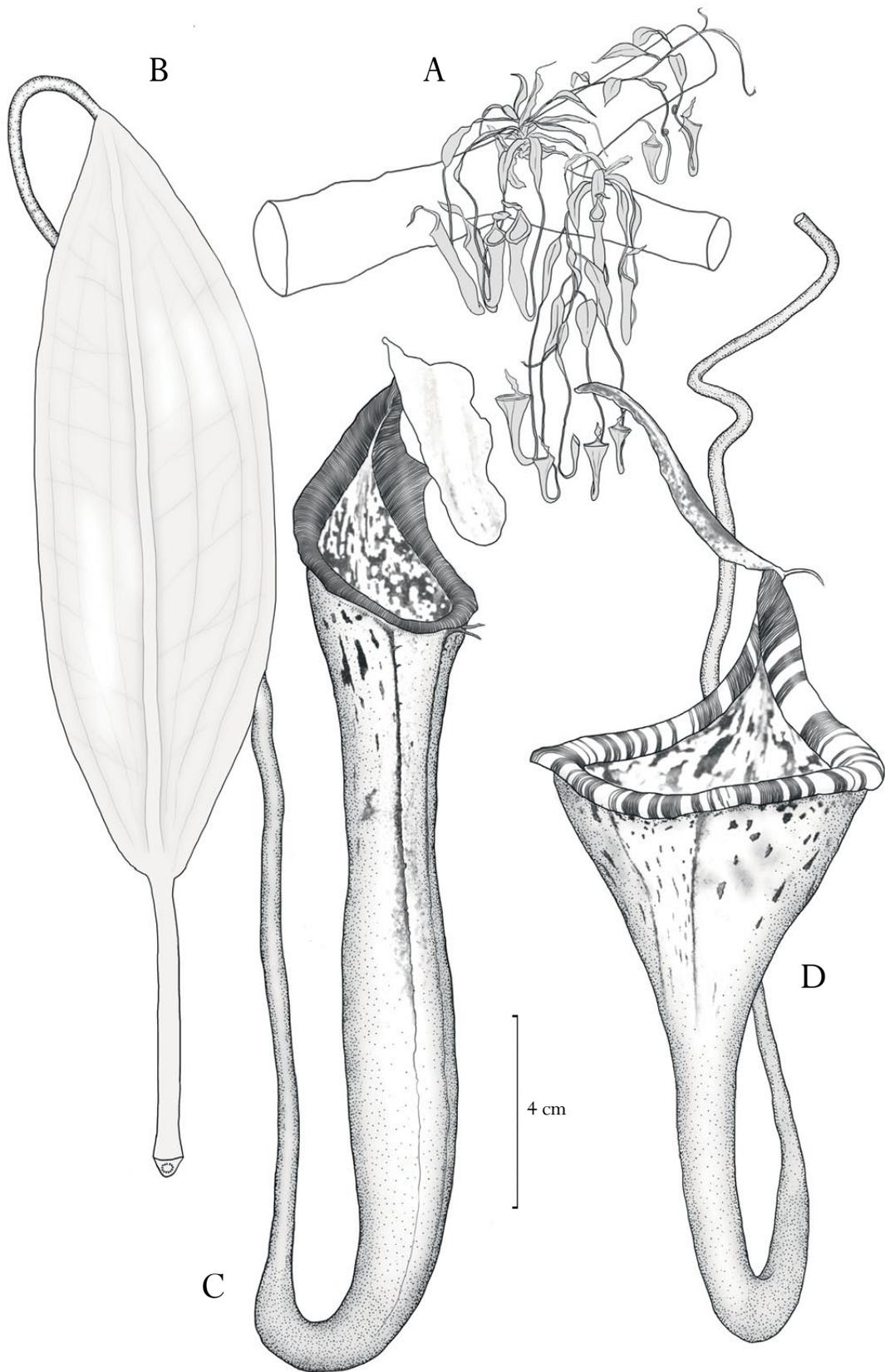
A new species of *Nepenthes* L., *N. epiphytica*, from East Kalimantan, is described and illustrated. This new taxon is restricted to epiphytic montane ridge forest habitats on the scattered limestone mountains of the Berau and East Kutai Regencies of East Kalimantan. *Nepenthes epiphytica* shares some common features with certain members of the *Nepenthes maxima* complex, but can easily be distinguished from these by a number of consistent morphological and ecological differences.

Nepenthes epiphytica A.S.Rob., Nerz & Wistuba, *sp.nov.*

Quoad habitum ad N. fusca Danser accedit, sed ab ea differt essentialiter ascidia inferiora magis anguste cylindricis, alis deminutis ad costis, peristomio latis aequaliter, folia valde petiolata, lamina lanceolata, numquam oblonga, et basi breve angustatus, ascidia superiora mediocria latia et valde tubata, ore lato horizontalis et angulatis, non orbiculatis, peristomio non in collum elongato, operculo anguste ovato-cordato vel subulato numquam ligulato.

TYPE: Indonesia, Borneo, East Kalimantan, Berau Regency, Mount Nyapa (Mount Nyapa, formerly Njapa), along the Kelai River, 1000

Figure 25 (facing page). A botanical illustration of *Nepenthes epiphytica* showing (A) plant growing in typical epiphytic habitat, (B) lamina, (C) lower pitcher and (D) upper pitcher.



m altitude, 25.10.1963, *Kostermans 21495* (holotype; L!) & *Kostermans 21495* Sheets I & II (isotypes; K!).

ETYMOLOGY: The species name *epiphytica* (epiphytic growing) was chosen because all known specimens of this taxon have been observed growing exclusively as epiphytes on trees, an ecological characteristic that is relatively unusual within the genus *Nepenthes*.

DESCRIPTION: Epiphytic climbing, scrambling or pendant branched shrub, to 2 m tall (Figures 25 and 26). *Stems* terete to slightly trigonous, to 5 mm in diameter, internodes 0.5–1.5 cm long in rosettes, 2–5 cm long in climbing stems, often with a waxy bloom. Stems range from green to reddish purple in colour (Figures 27 and 28).

Leaves coriaceous, with a slightly scabrous texture, lamina lanceolate to narrowly elliptic, rosette leaves to 15 cm long and 5 cm wide, leaves of climbing stem to 10 cm long and 4 cm wide, apex acute to slightly acuminate at the very tip, base strongly petiolate, attenuate, semi-amplexicaul, clasping the stem by $1/2$ – $2/3$ its circumference, occasionally decurrent down internode for 2–4 mm; longitudinal veins conspicuous, generally 2 on each side of midrib in outer $1/3$ of lamina, pennate veins numerous, almost indiscernible, perpendicular to midrib; tendrils to 3.5 mm in diameter, to 10 cm long in lower pitchers, occasionally coiling, to 15 cm in upper pitchers, usually coiling.

Lower pitchers narrowly cylindrical, narrowly ventricose in the lower half, dilating slightly towards the mouth (Figure 30), up to 20 cm tall and 3 cm wide excluding lid, originating from tendril at front, side or rear of pitcher; inner surface glandular in the lower half, ventral exterior surface with wings normally reduced to ridges from tendril to mouth, small fringe elements being always present below the peristome; mouth strongly oblique, ovate, slightly concave in profile, rising at the rear to form a short column, triangular in cross-section; peristome cylindrical,

Figure 26 (facing page). Photograph of the *Nepenthes epiphytica* isotype, *Kostermans 21495*, held at Kew Herbarium.



SHEET I

HERBARIUM BOGORIENSE
Bogor, Indonesia

Coll. *Kortemann*
 No. *21495* dd. *25 Oct 1977*
 Fam. _____
 Gen. *Nepenthes* ? *sp. nov.* aff.
 Spec. *N. dubia* Danon
 Det. *D. Schlüter 1977* *but leaves petiolate*
 Vern. _____
 Island *Indon. E. Borneo*
 Loc. *Berau*
 Habitat *Mt. Njapa on Kelai R.*
limestone *6000 m. alt.*
 Notes *fls. brown*



Figure 27 (above). The indumentum of *Nepenthes epiphytica* is most apparent on emerging foliage.



Figure 28 (above). The short internodes of a *Nepenthes epiphytica* rosette; note the waxy bloom present on the stem.



Figure 29 (above). The lower surface of the *Nepenthes epiphytica* lid. Note basal glands and the absence of appendages.

Figure 30 (facing page). A *Nepenthes epiphytica* lower pitcher in cultivation, with its characteristically slender shape and narrow peristome readily apparent.





Figure 31 (above). Large glands are apparent near to the base of the lid.



Figure 32 (above). A *Nepenthes epiphytica* upper pitcher with typical, yellowish colouration.



Figure 33 (above). *Nepenthes epiphytica* upper pitchers hanging from the branches of a tree.

Figure 34 (facing page). Detail of a *Nepenthes epiphytica* upper pitcher with striking, reddish colouration.



slightly flattened, narrow, up to 6 mm wide towards sides and lid, outer margins occasionally sinuate. Lid narrowly ovate, to 3.5 cm long by 2.5 cm wide, no terminal appendages, but a slightly thickened ridge towards base with deep, ovate glands and smaller, shallower, round glands scattered across remainder of the lower surface (Figures 29 and 31); spur simple, 4–8 mm long. Pitcher exterior usually yellow, olive or suffused purplish-red, with sparse, red to black blotches towards mouth; pitcher interior creamy in colour, with liberal red speckling in the upper half; lid as per pitcher exterior; peristome generally red to dark purple.

Upper pitchers narrowly infundibular in the lower half, broadly infundibular above (Figures 32, 33 and 34), up to 15 cm tall and 10 cm wide excluding lid, originating from tendril at rear of pitcher; inner surface entirely glandular, exterior surface with wings reduced to fine ridges or entirely absent; mouth horizontal, rising abruptly at the rear to form short neck; peristome cylindrical to flattened, up to 5 mm wide at front, up to 10 mm wide at sides and up to 7 mm wide at neck, striate with ribs up to 0.4 mm high, terminating on inner margin in fine teeth up to 0.2 mm long, but up to 0.5 mm long on neck. Lid broadly subulate, to 4 cm long by 1.5 cm wide, usually held at 30–40° above horizontal. Pitcher exterior yellowish green to yellow, occasionally with sparse, red flecks towards peristome; pitcher interior similar, but with greater degree of red flecking; lid and peristome generally as per pitcher exterior, but often suffused red, with distinct striping of the peristome.

Inflorescence a racemose panicle. Male inflorescence unknown. Female inflorescence up to 30 cm long, with a peduncle 8–15 cm long and a rachis 12–18 cm long. Flowers borne on predominantly 2-flowered partial peduncles, lacking bracts, with ca. 70–90 flowers per scape. Tepals narrowly elliptic, 3–4 mm long by 1.5–2 mm wide.

Indumentum of golden to dark brown hairs 0.1–0.2 mm long is present on the stem, the adaxial surface of the leaves, the abaxial surface of the midrib, on the tendrils and pitchers. It is shorter on the leaves, giving them a rough texture, and is more obvious on lower pitchers than upper pitchers. Hairs are more dense on juvenile foliage, the spur, and on

the stem and partial peduncles of inflorescences, normally being rusty brown on the latter organs.

DISTRIBUTION: *Nepenthes epiphytica* has a seemingly limited distribution amongst the limestone prominences of East Kalimantan. To this day, the species is known only from those specimens observed at the summit of Mount Tebalar, East Kutai Regency, and the three herbarium specimens that make up the Kostermans collection from Mount Nyapa, Berau Regency. The summit ridges of Mount Tebalar and Mount Nyapa respectively rise to altitudes of ca. 1000 m and ca. 1300 m above sea level.

ECOLOGY: In terms of its known habitat, *Nepenthes epiphytica* appears to grow as an obligate epiphyte; on Mount Tebalar, it grows towards the upper reaches of a limestone mountain of 1000 m altitude. Here, the forest is very open, with trees stunted as a result of the impoverished soils and thin substratum, allowing levels of light sufficient for the growth of *Nepenthes* (Figures 35 and 36). Due to the free-draining nature of the underlying limestone and apparent lack of any water courses, the area is relatively dry. No specimens of *Nepenthes epiphytica* have been observed in a terrestrial situation; all known specimens were found growing from the forks and branches of trees, often forming dense clumps of stems and pendant pitchers.

TAXONOMIC AFFINITIES: *Nepenthes epiphytica* appears to be a member of the *Nepenthes maxima* complex, a casually designated group of species that includes, among others, *N. boschiana* Korth., *N. chaniana* C. Clarke, Chi C. Lee & S. McPherson, *N. eymae* Sh. Kurata, *N. faizaliana* J. H. Adam & Wilcock, *N. fusca*, *N. klossii* Ridl., *N. maxima* Reinw. ex Nees, *N. platyphyla* Chi C. Lee, *N. stenophylla* Mast. and *N. vogelii* Schuit. & de Vogel (Table 4). Morphologically, the climbing parts of *Nepenthes epiphytica* appear most similar to those of *N. eymae* from Sulawesi, with both species producing markedly infundibular upper pitchers that lack wings. Even so, this similarity appears to be superficial, and the lower surface of the lid, which is similar in *N. eymae* and *N. maxima*, lacks the appendages found in those taxa. The pitchers of *N. epiphytica* can be



Figures 35 (above) and 36 (below). Clumps of *Nepenthes epiphytica* growing high in the branches of montane forest trees. These are the only photographs that exist of this plant growing in its natural habitat.



further readily distinguished from those of *N. eymae*; in the latter species the lowermost part of the pitcher is almost entirely tubulose, expanding widely and rather abruptly at the midsection, whereas in *N. epiphytica*, the pitcher lacks such a tubulose base, being instead narrowly infundibular throughout, but flaring broadly below the pitcher mouth. The lower pitchers of *N. epiphytica* are unique in the *Nepenthes maxima* complex, producing narrowly cylindrical, elongate and slightly waisted pitchers with a narrow peristome, in contrast to those of the other maxima complex species, which are generally broader, with a well developed peristome; those of *N. eymae* are invariably ovoid and robust, with rosette-pitchers sporting broad and well developed peristomes. On Borneo, the most closely related taxon in both geographical and morphological terms is *N. fusca*; this species shows marked variation across its range, but the recorded range of continuous variation observed in *N. fusca* does not overlap with the uniform phenotype of *N. epiphytica*. While the lower pitchers of *N. fusca* are generally cylindrical throughout, they are more stout than those of *N. epiphytica* and produce a broader peristome that invariably expands towards the sides and rear, rather than being of uniform width as in *N. epiphytica*. The lower pitchers of *N. fusca* are more typically winged, whereas in *N. epiphytica* the wings are, if present at all, very narrow, being more usually reduced to ribs. The upper pitchers of *N. fusca* are more gracile and less infundibular than those of *N. epiphytica*, which flare widely below the mouth. The pitcher mouth is also slightly rhomboid in the upper pitchers of *N. epiphytica*, versus generally circular in *N. fusca*. In *N. fusca*, the rear part of the peristome in both lower and upper pitchers rises to form an elongated neck that may be inclined forwards, whereas in the lower pitchers of *N. epiphytica*, the mouth is more or less entirely oblique, and in the upper pitchers predominantly horizontal, rising slightly at the rear to form a triangular apex below the lid. The lid of *N. epiphytica*, which lacks appendages, is narrowly ovate to slightly cordate, becoming broadly subulate in the upper pitchers, versus the strap-like appearance of the lid in *N. fusca* that occurs on account of its strongly involute margins. Finally, the mature leaves of *N. epiphytica* are narrower than the variably obovate, oblong or lanceolate leaves of *N. fusca*, being uniformly lanceolate and abruptly attenuated at the base to form a well defined petiole.

Table 4 (below). A comparison of characteristics of *Nepenthes epiphytica* with superficially related species. Observations of *N. eymae* and *N. fusca* based on McPherson (2009).

	<i>Nepenthes fusca</i>	<i>Nepenthes eymae</i>	<i>Nepenthes epiphytica</i>
Lower pitchers	Wholly cylindric, generally stout, usually winged	Wholly ovate, broad and always winged	Narrowly cylindric, slight waist between midsection and mouth, wings commonly reduced to ribs
Upper pitchers	Infundibular throughout, expanding slightly above the midsection to give an ovate appearance	Tubulose to very narrowly infundibular in the lower half, broadly infundibular above	Narrowly infundibular in the lower half, broadly infundibular above
Upper pitcher colour	Green to dusky brown, often blotched with dark reds and browns	Pale green to yellow, rarely flecked with colour	Yellowish green to yellow, sparingly flecked with colour
Peristome	Markedly wider at the sides and rear, rising to form a strongly pronounced neck in both upper and lower pitchers	Very wide at sides and rear, horizontal and more uniform width in upper pitchers, but forming a pronounced neck in both types	Relatively narrow, usually uniform in width and oblique in lower pitchers, horizontal in uppers with a short neck to the rear
Lid	Narrowly ovate in lower pitchers, ligulate (strap-like) in upper pitchers	Ovate in lower pitchers, becoming hastate in upper pitchers	Narrowly ovate in lower pitchers, to broadly subulate in upper pitchers
Leaf	Obovate, oblong or lanceolate, apex rounded to acute, base gradually attenuate	Oblong, usually with a rounded apex, base strongly attenuate	Lanceolate, to narrowly elliptic, apex usually acute, base strongly attenuate
Attachment of leaf base to the stem	Strongly petiolate, winged, semi-amplexicaul	Strongly petiolate, often winged, shortly decurrent	Strongly petiolate, semi-amplexicaul, shortly decurrent
Stem	Branched, up to 7 m, scrambling or climbing	Branched, up to 8 m long, scrambling or climbing	Branched, up to 2 m, climbing, scrambling or pendant from branches
Habitat	Terrestrial or epiphytic, epiphytic especially at lower altitudes	Terrestrial, lithophytic or epiphytic at higher altitudes	Epiphytic

HYBRIDS: There are no known hybrids involving *Nepenthes epiphytica*. Although relatively few populations of this taxon have been identified and studied in the field, the localised occurrence of this species in a rather challenging habitat reduces the likelihood of hybridisation. Although there is a degree of habitat sympatry with other *Nepenthes* taxa, namely *N. mapuluensis* and *N. tentaculata*, these species are rather different in terms of their habitat preferences, possibly reducing the survival fitness of hybrid progeny and thereby precluding their successful maturation.

DISCUSSION: *Nepenthes epiphytica* is remarkable in terms of its distinct morphological characteristics. Even so, being hitherto poorly known and yet seemingly related to allied taxa within the *Nepenthes maxima* complex, it has been generally regarded as an unusual form of *N. fusca* by some authorities (*N. fusca* subsp. *kostermansiana* J.H. Adam & Wilcock ex Jebb & Cheek, 1997; nomen nudum). *Nepenthes epiphytica* certainly shares some important features with its near relatives, with particular regard to the form of the upper pitchers, which are reminiscent of *N. eymae* in particular. As with that taxon, the upper pitchers are both strikingly infundibular and yellow in colour. The colour yellow is commonly recognised as an attractant to flying insects, but particularly nectar feeders (Sutherland *et al.*, 1999; Weinzierl *et al.*, 2005), and as such these features are likely to enhance trapping efficacy, making both species well adapted to the attraction and capture of flying insects.

Nepenthes epiphytica would appear to be further specialised, however; whereas *N. eymae* is generally terrestrial, climbing high into shrubs and small trees on steep ridges to attract flying insects, *N. epiphytica* appears to have left the ground entirely to grow, perhaps exclusively, as an epiphyte on the branches of tall trees. In this manner, the taxon invests relatively little into the production of long vines, instead forming clumps of shorter climbing stems in the canopy, an uncommon characteristic within the genus as a whole, and one that highlights the value of ecological factors as partial determinants of taxonomic rank (C. Clarke, J.A. Moran & C.C. Lee, in press). Indeed, just a few *Nepenthes* taxa are known to grow in this manner, let alone exclusively. *Nepenthes inermis* Danser, from Sumatra, is one such species, with striking, green

to yellow, broadly infundibular pitchers, though this taxon grows as well in the ground as it does in the trees of the montane forests it inhabits. *Nepenthes vogelii*, also grows predominantly on the branches of trees and produces infundibular pitchers, but lacks yellow colouration. Nerz and Wistuba observed another species of the *Nepenthes maxima* complex with close affinities to *N. fusca* in the branches of trees amongst the lower montane forest of Mount Raya (Central Kalimantan); it likewise grew in large clumps, bearing no vines, only multiple rosettes with greenish-yellow rosette-pitchers. In the same area, on the Samba river, a distinct form of *N. veitchii* with bright yellow pitchers was also observed on trees over the river (Nerz & Wistuba; pers. observ., 1992), and in East Kalimantan, bright yellow *N. reinwardtiana* have been observed upon the branches of lowland dipterocarps overhanging the Segah river (Robinson; pers. observ., 2011). Such conspicuous pitcher colouration would appear to be fairly common amongst those *Nepenthes* populations that are adapted to epiphytic growth and, possibly, the capture of flying insects.

Given the scant data gathered thus far for this species, further studies of *Nepenthes epiphytica* would be invaluable. For example, the current distribution of the species is unknown, and the patchiness of suitable habitats makes a reasonable assessment difficult. The limestone formations thus far associated with the taxon are also remote and difficult to negotiate. Moreover, the majority of local limestone prominences are of a lower altitude than is usual for this taxon, with many of the nearby peaks such as Mount Guguang and Mount Gay consisting of sandstone and a somewhat different *Nepenthes* flora (Robinson; pers. observ., 2011). In addition to range data, is also not known with certainty whether or not this taxon is truly an obligate epiphyte, nor have any significant surveys of pitcher contents been carried out in order to assess what types of insects are generally trapped by, or indeed commensal with, this taxon. Such studies, coupled with genetic analyses, would be useful in determining firstly whether the similarities in pitcher structure and colour serve to attract similar insect prey, and secondly, whether these taxa share these similarities as a result of convergent evolution or simply through a shared common ancestry.

Although East Kalimantan and Central Sulawesi, where *N. eymae* occurs, are relatively close, being separated by the ca. 220 kilometres of the Makassar Strait, the most recent data suggests that the two land masses have not been joined by a land bridge since the late Paleocene to early Eocene, approximately 60-50 million years ago (Moss & Wilson, 1998) on account of the sheer depths of the Makassar Basin. This is contrast to the land bridges that are believed to have existed between North Borneo and the islands of Palawan, to the northwest, and Mindanao, to the northeast, during the late Pleistocene, which have been implicated as potential routes of *Nepenthes* migration (Voris, 2000; Robinson *et al.*, 2009). As it stands, a significant amount of evidence suggests that the greatest affinities between the terrestrial biota of Borneo and Sulawesi occur at the generic and higher levels, with a high degree of endemism at species level (Holloway, 1987; Musser, 1987; Moss & Wilson, 1998); a logical interim assumption therefore, when taking into account the respective morphologies of the geographically and phenotypically close *Nepenthes maxima* complex taxa, is that the similarities between *N. epiphytica* and *N. eymae* are the result of convergent evolution.

CONSERVATION STATUS: The sites from which *Nepenthes epiphytica* is known are remote and difficult to access without significant expense and physical effort. The taxon is therefore not directly threatened at this stage, particularly given its epiphytic habit, but the encroachment of logging in surrounding areas and the increased frequency of fires is a major concern. The majority of the limestone peaks that surround its known range are significantly lower in height, and the nearest high mountains are sandstone, both factors that may limit the likelihood of its occurrence at those sites, therefore this species is assumed not to be widespread, but highly localised. Any immediate vulnerability lies in its naturally low population count, but it has not been possible to designate an appropriate IUCN classification at this time owing to lack of data.

ACKNOWLEDGEMENTS: The authors would like to thank Dr. Charles Clarke and François Mey for reviewing this manuscript.