

## A SKELETAL REVISION OF NEPENTHES (NEPENTHACEAE)

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### SUMMARY

A skeletal world revision of the genus is presented to accompany a family account for Flora Malesiana. 82 species are recognised, of which 74 occur in the Malesiana region. Six species are described as new, one species is raised from infraspecific status, and five species are restored from synonymy. Many names are typified for the first time. Three widespread, or locally abundant hybrids are also included. Full descriptions are given for new (6) or recircumscribed (7) species, and emended descriptions of species are given where necessary (9). Critical notes are given for all the species. Little known and excluded species are discussed. An index to all published species names and an index of exsiccatae is given.

### INTRODUCTION

A world revision of *Nepenthes* was last undertaken by Macfarlane (1908), and a regional revision for the Flora Malesiana area (excluding the Philippines) was completed by Danser (1928). The purpose of this paper is to provide a skeletal revision, covering issues relating to *Nepenthes* taxonomy which would be inappropriate in the text of Flora Malesiana. For the majority of species, only the original citation and that in Danser (1928) and later publications is given, since Danser's (1928) work provides a thorough and accurate reference to all earlier literature.

74 species are recognised in the region, and three naturally occurring hybrids are also covered for the Flora account. The hybrids *N. × hookeriana* Lindl. and *N. × trichocarpa* Miq. are found in Sumatra, Peninsular Malaysia and Borneo, although rare within populations, their widespread distribution necessitates their inclusion in the Flora. By and large other hybrids are rare and sporadic, with the exception of *N. × kinabaluensis*, which forms a discrete hybrid swarm on Mt Kinabalu.

Six new species are described: *Nepenthes argentii* from the Philippines, *N. aristolochioides* from Sumatra, *N. danseri* from Waigeo Island (New Guinea), *N. diatas* from Sumatra, *N. lamii* from New Guinea, and *N. murudensis* Culham ex Jebb & Cheek from Sarawak. One new combination is made; *N. macrophylla* (Marabini) Jebb & Cheek, formerly a subspecies of *N. edwardsiana* Low ex Hook. f.

Three species synonymised by Danser (1928): *N. eustachya* Miq., *N. ramispina* Ridl., and *N. sumatrana* (Miq.) Beck, and one synonymised by Macfarlane (1908): *N. hispida* Beck, are restored. *Nepenthes pectinata* Danser is also restored. A number of names are relegated to synonymy, and lectotypifications have been undertaken where necessary.

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Like Danser we recognise no subspecies or varieties. Collections remain few, with 9 species being known from the type collection alone. A further 10 species are restricted to single mountains, or mountain groups, and only 10 of the remaining taxa extend beyond a single island.

Eight species of *Nepenthes* do not occur in the Flora Malesiana region: *Nepenthes madagascariensis* Poir. and *N. masoalensis* Schmid-Hollinger in Madagascar, *N. pervillei* Blume in the Seychelles, and *N. distillatoria* L. in Sri Lanka. In Northern India *N. khasiana* Hook. f. and in Indochina *N. anamensis* Macfarl. and *N. thorelii* Lecomte. *Nepenthes vieillardii* Hook. f. is found in New Caledonia (specimens from New Guinea formerly placed in this species are now placed in the new species *N. lamii*).

#### PREVIOUS REVISIONS

There have been three major monographic revisions of the genus. Firstly Joseph Hooker's 1873 account in De Candolle's *Prodromus*, at which time the genus numbered 33 species. He placed the Seychelles species *N. pervillei* in a monotypic section *Anourosperma*. Macfarlane revised the family for Engler's *Pflanzenreich* (1908), recognising 58 species. Danser's treatment of the genus for the Netherlands Indies treated 51 species found in the former Dutch East Indies and adjoining areas.

Historically, *Nepenthes* taxonomy has both benefited and suffered from the horticultural desirability of these plants, and species often entered herbaria via the greenhouses of Europe. Collectors of type material such as David Burke (1880), Charles Curtis (1878–84) and Frederick Burbidge (1877–78) were also collectors of live plants for Mr. Harry Veitch of Chelsea, one of the foremost growers of *Nepenthes* at that time. Bull Nurseries were also in the trade at the time, and their catalogues list an impressive range of species at outrageous prices. Sir Hugh Low, who was Rajah James Brooke's personal secretary at this time, sent many plants to his father at the Clapton nurseries in London.

Maxwell Masters and Frederick Burbidge appear to have been regular correspondents of Sir Joseph Hooker at Kew, soliciting his opinion on specimens they had growing in nurseries. During this period (1881–1890) a number of species and cultivars were published in the *Gardeners' Chronicle*. This led to uncritical descriptions, as well as unsatisfactory information on provenance (*N. burkei* Mast., *N. curtisii* Mast. and *N. stenophylla* Mast. were all based on cultivated material alone).

Without doubt Danser's masterful treatment in 1928 remains the most thorough, and up to date treatment of the genus. He retained 35 species in the former Dutch East Indies and adjoining areas, adding 17, to give a then world total of 65 species. He made a first attempt at a phylogenetic treatment, with six informal species groups.

#### TAXONOMY SINCE DANSER

Little collecting has occurred since Danser's revision (1928), and it was not until the 1970's and 80's that specialist collectors began publishing new species on an *ad hoc* basis. Horticultural interest in these plants has been the most important factor in stimulating this progress. Since Danser (1928), 36 names of species, subspecies, and

naturally occurring varieties and hybrids have been published (including two further species by Danser); 18 of these are retained here. A number of species names remained invalidly published for a number of years (*N. adnata* Tamin & M. Hotta ex Schlauer, *N. dentata* Sh. Kurata, *N. globamphora* Sh. Kurata & Toyosh. and *N. macrovulgaris* J.R. Turnbull & A.T. Middleton).

In 1984, two sets of competing names were published for three Sulawesi species. On the 6th February, Kurata (1984a) published *N. eymae* and *N. rubromaculata* (a homonym of a nineteenth century hybrid). On the 10th February Turnbull and Middleton (1984) published *N. glabrata* (a valid name for *N. rubromaculata*), *N. hamata* and *N. infundibuliformis* (= *N. eymae*). On the 7th March, Kurata (1984b) published *N. dentata* (= *N. hamata*). The question of dates is complicated by the fact that the first two publications were subtitled with the claim that they were 'preprinted'. The actual dates at which these publications were 'widely' available is difficult to determine, and it is unclear whether the Turnbull and Middleton pre-publication was in fact distributed before either of Kurata's publications.

Several regional revisions have appeared, including Kurata's *Nepenthes* of Mount Kinabalu (1976), Shivas's *Pitcher Plants of Peninsular Malaysia & Singapore* (1984), Tamin & Hotta's *Nepenthes di Sumatera* (1986), Jebb's *Nepenthes in New Guinea* (1991) and Phillipps & Lamb's *Pitcher Plants of Borneo* (1996). Jumaat Adam has revised the Bornean species, but his species descriptions are scattered in the literature, and no review of the entire flora has been undertaken except in the form of an ecological paper (Adam et al., 1992).

#### HORTICULTURE AND HYBRIDS

There are a large number of collectors and growers of *Nepenthes* and many species are now widely cultivated. Several newsletters and an electronic bulletin board (CP, served by Listproc@opus.hpl.hp.com) are dedicated to the cultivation and description of carnivorous plants. A number of new species, as well as numerous cultivars, have been described in these newsletters. *Nepenthes* cultivation last reached a zenith at the end of the 19th century. Pollen and seed exchange is now common practice in both conserving species and developing new hybrids.

The entire genus is listed under Appendix II of the CITES convention, and two species (*N. khasiana* and *N. rajah*) are listed as Appendix I species. *Nepenthes rajah* and *N. clipeata* are the only species known to be directly endangered by specialist collectors.

Over 280 hybrid names have been published, 193 involving more than two parents. 34 species are involved in these crosses, although 75% of the crosses involve *N. rafflesiana* and/or *N. maxima*. Some hybrids have been generated through multiple crosses of up to six species (Schlauer, 1994).

#### ECOLOGY

*Nepenthes* species occur mostly locally, often sporadically, and then often in large numbers. They are found from sea-level to 3,500 m, but most commonly between 1,500 to 2,500 m. They can be found in practically every vegetation type, but espe-

cially on thin or infertile soils (either from chemistry, waterlogging or low nutrient levels), where the canopy is sparse or thin. They occur least commonly in closed forest. They are common on white podsolic soils, wet peaty soils, or heavily leached volcanic soils, but are almost entirely absent from rich alluvial or clay soils. They are commonly encountered along river banks, on abrupt, open, or rocky ridge tops, and in wet mossy forest.

A number of taxa are restricted to ultrabasic, serpentine soils (*N. argentii*, *N. burbidgeae*, *N. danseri*, *N. × kinabaluensis*, *N. macrovulgaris*, *N. rajah* and *N. villosa*), whilst others appear to be restricted to limestone rocks (*N. campanulata*, *N. mapuluensis*, and *N. northiana*).

Some species are found in a wide range of habitats, and appear to thrive best in disturbed habitats (*N. mirabilis* and *N. gracilis*). A few species are capable of surviving in quite dense shade (*N. ampullaria*, *N. macfarlanei*, and *N. mirabilis*). Most species are shrubby scramblers or climbers of open vegetation. A few species regularly grow as epiphytes (*N. inermis*, *N. insignis*, *N. reinwardtiana*, and *N. veitchii*).

#### HABIT

Young *Nepenthes* plants produce their first pitchers while still minute, and the height of these pitchers may be only 2 to 3 mm. As the plant develops, successive pitchers are larger, and begin to acquire their specific characters.

Plants of all species begin life as low rosettes. The stems are highly condensed and produce leaves with straight tendrils and incurving, globose pitchers often with prominent, fringed wings. As the plant grows the stem may begin to climb, producing longer internodes and leaves in which the tendril is coiled and the pitcher now curves outwards from the tendril, becoming more cylindrical or infundibulate, and the wings become much reduced or absent. Side shoots from the main stem reiterate this process, initially forming rosettes bearing pitchers of the lower type, and then pitchers of the upper type once the shoot begins to elongate (Jebb, 1991). These two pitcher types are here referred to as Upper and Lower pitchers. Danser (1928) distinguished pitchers of the rosette, short shoot and climbing stem. We consider that the distinction is not always clear cut. Our descriptions treat apparent intermediates where they have been observed.

*Nepenthes* species can be remarkably polymorphic, both within and between individuals and populations. Variation in pitcher structure and colouration can be striking. Sometimes these differences can be related to soil type (Phillipps & Lamb, 1996), although more usually it is light levels that are most significant. The dimorphy of the pitchers apparently follows the same pattern in all species. Relative to the lower pitchers, the upper pitchers become longer and narrower and bear reduced wings; internally the waxy zone becomes reduced, and the basal glandular zone can reach almost to the level of the peristome; the peristome is narrower, and often not as markedly toothed; the spur near the base of the lid becomes smaller and less branched. This dimorphy often leads to confusion as to how many species are present at a site. Selection of herbarium material may be strongly biased to the most extreme forms. Thus to the inexperienced, young and mature plants may give the appearance of belonging to quite separate species.

A distinctive architecture is found in *N. ampullaria* and *N. pectinata*, where the lower pitchers are almost globose, with much reduced leaf blades, while the upper leaves have large blades, and the upper pitchers are usually not developed, being reduced to a mere swelling at the tendril tip.

#### MORPHOLOGY

Venation indicates that the spur of the pitcher is the true leaf apex, the lid being the only organ to lack a mid-rib (Hooker, 1859). The blade of the leaf may be sessile or petiolate to the main stem. Petioles are often winged, and in some species the leaf base is decurrent or adnate to the stem. The leaves of climbing stems tend to be more petiolate than those of the rosette stems in all species. At fertile nodes, however, the leaves can be quite aberrant, often being sessile or more abruptly truncate at the base than the norm. In some species the leaf blade shows great variation in size on the one plant; either being smaller on the rosette leaves (*N. ampullaria*) or larger there (*N. maxima*). Blade margins are entire, with the exception of *N. mirabilis* in which the leaf blade margin is finely fimbriate, and then only in the lower leaves. Other species may have a dense indumentum below the margin. The relative numbers, distribution and dominance of the longitudinal and pennate nerves is usually characteristic of the species.

Pitchers range from almost globose or urceolate, to cylindrical, and at the opposite extreme to narrowly or broadly infundibulate. The edge of the pitcher mouth bears a finely ribbed structure – the peristome. In transverse section the peristome is more or less T-shaped, with the arms of the T curving downwards and inwards. On the inner edge of the peristome the corrugations may end in sharply pointed teeth, and between each of these teeth lies a nectar gland. The peristome of some species is much reduced, especially so in the upper pitchers. In others the corrugations of the peristome have become vastly enlarged and widely spaced, giving the appearance of flat plates or hooks. In a few species the inner margin of the peristome has become elaborated into a more complex structure (*N. edwardsiana*, *N. rajah* and *N. villosa*).

The shape and glandulation of the lid can be of great diagnostic value. Some species have one or more appendages on the midline of the lower surface of the lid. The lid glands range in size from less than 0.1 mm to 3 mm across, and may be either shallow depressions or have a narrow rim or a prominent swollen lip around their margin.

*Nepenthes* are dioecious, and only begin flowering once upper pitchers are produced. The inflorescence ranges from a raceme of 1- or 2-flowered partial peduncles, to a panicle of 3–10-flowered partial peduncles. The female inflorescence is usually shorter and somewhat more robust than the male, and in the paniculate species the partial peduncles bear somewhat fewer flowers. Towards the apex of the inflorescence in all species, the partial peduncles are invariably fewer-flowered, and many species, even the paniculate ones, may have variants with wholly 1-flowered partial peduncles (racemes). Sometimes inflorescences with partial peduncles entirely 1- and 2-flowered occur on the same plant (*N. spectabilis*). Filiform bracts are present on the partial peduncles of many species, but this feature can again be variable between populations in some species, but in other species provides an important character.

## PHYLOGENETIC CONSIDERATIONS

The natural relations of Nepenthaceae have been much contested in the past. Biochemistry and rbcL gene sequence data (Williams et al., 1994) suggest that *Nepenthes* has a relationship to Polygonaceae/Plumbaginaceae on the one hand, and with Droseraceae on the other. Gene sequence work is currently being conducted at the New York Botanic Garden.

All species of *Nepenthes* investigated to date have a chromosome number of  $n = 40$ ; this is concordant with the apparent lack of breeding barriers to interspecific hybridisation (Lowrey, 1991). A study of thirteen enzyme systems revealed typical isozyme ranges for diploid seed plants, and no duplicated loci were found, which does not support a polyploid origin for the family (Lowrey, 1991).

Danser (1928) proposed six groupings of species, each in turn sub-divided into smaller groups. Whilst there is little evidence to support some of his groupings, others continue to appear wholly natural.

Comparatively few species have paniculate inflorescences, and these appear to form two distinct lineages, with *N. madagascariensis*, *N. masoalensis*, *N. pervillei* and *N. distillatoria*, forming one group in the western range of the genus, and *N. to-moriana*, *N. danseri*, *N. neoguineensis* and *N. paniculata* forming a second eastern group. The remaining two species, *N. ampullaria* and *N. bicalcarata*, show no particular morphological affinities with either of these groups or with any other species for that matter.

*Nepenthes adnata*, *N. murudensis*, *N. reinwardtiana*, *N. tentaculata* and *N. hamata* all show affinities in their leaves (adnate to the stem) and pitchers (narrow peristome, flared or rhomboidal mouth). The last two species appear to be particularly closely related. The little known *N. campanulata* may also be related to this group.

In Sumatra many of the montane species appear to share a common origin, species delimitations are often confined to one or two correlated characters. *Nepenthes aristolochioides*, *N. bongso*, *N. densiflora* and *N. ovata* share infundibuliform pitchers, while *N. diatas*, *N. singalana* and *N. spathulata* share ventricose-tubular pitchers. *Nepenthes gymnamphora* of Java and *N. pectinata* of Sumatra are a further pair of species which appear to be related to this grouping. In contrast the species from Borneo appear to include representatives from diverse evolutionary lineages.

The Peninsular Malaysian montane species *N. gracillima*, *N. macfarlanei*, *N. ramispina*, and *N. sanguinea* appear related to those of Sumatra but pose certain problems. Whilst readily distinguishable in their typical forms, much herbarium material and some wild populations can only be distinguished with difficulty and not without some reservation (Danser, 1928).

Danser's Regiae grouping remains a good morphological unit, including *N. maxima* and its supposed relatives: *N. borneensis*, *N. boschiana*, *N. burbridgeae*, *N. clipeata*, *N. eymae*, *N. fusca*, *N. klossii*, *N. maxima*, *N. pilosa*, *N. rajah*, *N. stenophylla*, *N. truncata*, and *N. veitchii*.

Besides these groups, the species either appear isolated, or fall into morphologically similar pairs or threesomes, some of which suggest geographical vicariant origins: *N. dubia* and *N. inermis*; *N. gymnamphora* and *N. pectinata*; *N. lamii* and *N. vieillardii*; *N. burkei* and *N. ventricosa*; *N. ephippiata* and *N. lowii*; *N. mapulu-*

*ensis* and *N. northiana*; *N. edwardsiana*, *N. macrophylla* and *N. villosa*; *N. hirsuta*, *N. hispida* and *N. macrovulgaris*.

#### BIOGEOGRAPHY

Of the 82 species of *Nepenthes*, only 10 species have distributions greater than a single island or small group of islands. Of these, *N. mirabilis* has the largest range, encompassing the range of all but six other species. Danser was struck by the isolation of the western species in Madagascar, the Seychelles, Sri Lanka and the Khasia Hills, and suggested a Gondwanic origin of the genus to account for their distribution, with a relatively recent expansion into the Malesia region (Danser, 1928).

Besides *N. mirabilis*, two other species have a moderately broad distribution; *N. ampullaria*, found from Sumatra to New Guinea, but mysteriously absent from Sulawesi and the Moluccas; and *N. maxima* from Sulawesi and the Moluccas to New Guinea. *Nepenthes alata* is found throughout the Philippine islands. Four species have a distinct Sunda-shelf distribution, being found in Sumatra, Peninsular Malaysia and Borneo (*N. albomarginata*, *N. gracilis*, *N. reinwardtiana*, and *N. rafflesiana*). *Nepenthes tentaculata* is found in Borneo and Sulawesi, and *N. danseri* is found in Halmahera and Waigeo.

Species richness appears to be well correlated to the historically ever-wet cores recognised in the region (Van Steenis, 1979: fig. 4). The well leached volcanic soils of the central Sumatran mountains support a great diversity of species (25, of which 17 are endemic), and these appear to stem from relatively few ancestral groups, forming a swarm of sometimes hard to distinguish species. Borneo, by comparison, has by far the richest *Nepenthes* flora (31 species, of which 25 are endemic), and the majority of these taxa are morphologically quite isolated from one another. The diversity of soil types may be an important factor in the evolution of the genus in Borneo (ultra-basic, limestone and sandstone soils).

The relatively depauperate *Nepenthes* flora of the northern Philippines, Sulawesi, Moluccas, the eastern Sunda Islands and the eastern end of New Guinea is probably explained by the presence of seasonal droughts in these regions, as well as the presence of active volcanoes in the recent past, and the consequently rich soils which do not favour *Nepenthes*.

#### NOTES ON IDENTIFYING SPECIES

A number of species have unique spot characters, which provide instant recognition. Flowering material may be of benefit in identifying the paniculate species (10), but it is of less use for the majority of species. The branching of the partial peduncles and presence of a bract can be quite variable within a species.

The presence of angular stems, often with acute ridges, and the leaf insertion on the stem (whether petiolate or sessile and combined with amplexicaul or decurrent bases) provide important characters. Leaf shape may be somewhat variable, but the number and distribution of the longitudinal veins is usually characteristic of a species. A number of species have peltate leaf tips (*N. campanulata*, *N. clipeata*, *N. mapulu-*

*ensis*, *N. northiana* and *N. rajah*), although others are somewhat variable in this regard, and may have sub-peltate tips to the leaves (*N. bongso* and *N. eustachya*).

Pitcher shape is not a reliable means of determining identity of a specimen with the exception of a few species. The development of ventral wings on the pitcher can likewise be variable. The peristome provides a number of useful characters, especially in its size and shape, and most importantly the nature of its inner margin, whether entire or toothed. The distribution and size of glands under the lid can be diagnostic of a species.

The indumentum can provide important characters, by its type, density and colour.

#### MATERIALS AND METHODS

A number of important collections have not been available for this study, and we have not been able to see the collections at the following herbaria: B (Warburg), CGE (T. Lobb), FI (Beccari), PENN (Macfarlane), PNH (Philippine material), SAN (recent Sabah material) and the herbarium of the Nippon Dental College, Fujimi, Tokyo (Shigeo Kurata collections). Many other collections remain in private hands, and the holotypes of a number of recently published species (*N. eymae*, *N. glabrata* and *N. hamata*) have not been deposited in the herbaria stated in their protologues. For 12 recently described Indonesian taxa, no type has been deposited at the national herbarium (Bogor).

Many of the early collections from Asia, from which species were described, were not identified by numbers or exact dates or localities, and interpretation of several types (e.g., those collected by Burbidge, Lobb and Low) is complicated by this lack of information. In interpreting these types we have taken care to ensure that the localities and description are compatible with the original protologues, as well as all other clues relating to handwriting or previous interpretations. Several species were described from cultivated material alone and the provenance of these can be very imprecise. Five names are regarded as too imperfectly known to be included as recognised species, and these are placed in a section on Little Known Taxa. Three names are rejected; these are either based on mixed types or derive from horticultural sources of unknown provenance.

The following herbaria have been consulted: BK, BO, DBN, K, KEP, KLU, L, LAE, OXF, P, SAR, SING, SINU, TCD, UPNG, and W.

#### GEOGRAPHICAL KEYS TO THE MALESIAN SPECIES OF NEPENTHES

##### Key to the Sumatran species

- 1a. Lid with a curved, hook-like process near the base ..... 57. *N. ovata*
- b. Lid without a curved, hook-like process near the base, at most a swollen lump 2
- 2a. Pitcher mouth lateral, upper pitchers utriculiform ..... 7. *N. aristolochioides*
- b. Pitcher mouth apical, pitchers urceolate, tubular or infundibuliform ..... 3
- 3a. Pitcher with a prominent rim of white hairs immediately below peristome ..... 3. *N. albomarginata*
- b. Without a rim of white hairs below the peristome ..... 4



- 4a. Lid narrow, at least four times as long as broad ..... 5
- b. Lid broad, less than three times as long as broad ..... 7
- 5a. Pitcher globose, lid without glands below ..... **4. *N. ampullaria***
- b. Pitcher strikingly infundibulate, widening greatly to the mouth, lid with glands  
..... 6
- 6a. Peristome lacking ..... **35. *N. inermis***
- b. Peristome present ..... **21. *N. dubia***
- 7a. Stem triangular and leaf bases decurrent to two of these ..... 8
- b. Stem rounded or angular, but then leaf bases not decurrent ..... 9
- 8a. Peristome inner margin without teeth; lid with numerous minute glands .....  
..... **67. *N. reinwardtiana***
- b. Peristome inner margin with teeth; lid with < 50 large, rimmed glands .....  
..... **28. *N. gracilis***
- 9a. Margin of lower leaves fimbriate ..... **51. *N. mirabilis***
- b. Margin of lower leaves entire ..... 10
- 10a. Leaf bases decurrent or adnate ..... 11
- b. Leaf base amplexicaul or sessile ..... 17
- 11a. Leaf bases not narrowed to a petiole ..... 12
- b. Leaves petiolate ..... 14
- 12a. Lid glands minute (< 0.15 mm), numerous, throughout underside of lid .....  
..... **1. *N. adnata***
- b. Lid glands large (0.3–0.5 mm), few (< 50), near base and midline, or through-  
out ..... 13
- 13a. Lid ovate; glands near base and along midline only ..... **60. *N. pectinata***
- b. Lid elliptic; glands throughout ..... **80. *N. × trichocarpa***
- 14a. Lid oblong-elliptic, apex notched ..... **34. *N. × hookeriana***
- b. Lid rounded or ovate, apex rounded ..... 15
- 15a. Leaf base long decurrent into 2 ridges running almost to next axil .....  
..... **74. *N. sumatrana***
- b. Leaf base shortly decurrent, attenuate wings to 2 cm long at most ..... 16
- 16a. Lid glands numerous, small (< 0.3 mm), throughout centre of lid .....  
..... **72. *N. spectabilis***
- b. Lid glands few, large (0.3–0.5 mm), near midline and base only .....  
..... **60. *N. pectinata***
- 17a. Peristome extended into a flattened neck; lid glands absent from centre of the lid  
..... **64. *N. rafflesiana***
- b. Peristome not extended into a neck; glands less numerous towards margin . 18
- 18a. Stems rounded, slender (< 3 mm); leaves less than 13 × 2 cm ..... 19
- b. Stems rounded or angular (> 3 mm); leaves larger than 13 × 2 cm ..... 20
- 19a. Axils with conspicuous downy indumentum ..... **77. *N. tobaica***
- b. Axils glabrous ..... **50. *N. mikei***
- 20a. Lid oblong-elliptic; apex truncate or notched .....  
..... **34. *N. × hookeriana***
- b. Lid rounded to ovate; apex not notched ..... 21
- 21a. Inner margin of peristome entire or with very short teeth < 0.3 mm long ... 22
- b. Inner margin of peristome with prominent teeth, 0.4–10 mm long ..... 24

- 22a. Stem angular ..... 68. *N. rhombicaulis*  
     b. Stem rounded ..... 23  
 23a. Leaf petiolate ..... 24. *N. eustachya*  
     b. Leaf sessile ..... 50. *N. miki*  
 24a. Stem angular ..... 25  
     b. Stem rounded ..... 26  
 25a. Peristome flattened towards neck and much broader there . 71. *N. spathulata*  
     b. Peristome of more or less even width throughout ..... 70. *N. singalana*  
 26a. Leaf blades of lower pitchers often very small ( $< 8 \times 2$  cm), upper leaves usually much larger ( $20\text{--}25 \times 5$  cm), lanceolate, base tapering ... 60. *N. pectinata*  
     b. Leaf blades of lower pitchers larger ( $> 10 \times 2$  cm), upper leaves similar in size ( $16 \times 4$  cm), obovate, base parallel-sided ..... 27  
 27a. Upper pitchers distinctly ventricose below, tubular above ..... 28  
     b. Upper pitchers infundibuliform or ellipsoid throughout ..... 29  
 28a. Peristome rigid, somewhat woody ..... 19. *N. diatas*  
     b. Peristome papery in texture ..... 7. *N. singalana*  
 29a. Pitcher arising abruptly in a short curve from the tendril tip 18. *N. densiflora*  
     b. Pitcher arising very gradually, and in a broad curve from the tendril tip .....  
         ..... 10. *N. bongso*

### Key to the Peninsular Malaysian species

- 1a. Leaf base distinctly petiolate ..... 2  
     b. Leaf base tapering, decurrent or amplexicaul, but never petiolate ..... 5  
 2a. Lid narrow; lacking glands ..... 4. *N. ampullaria*  
     b. Lid elliptic; with at least some glands ..... 3  
 3a. Lower leaf margins fimbriate ..... 51. *N. mirabilis*  
     b. Lower leaf margins not fimbriate ..... 4  
 4a. Lid with many glands confined to edges ..... 64. *N. rafflesiana*  
     b. Lid with few, scattered, prominently rimmed glands ..... 6  
 5a. Leaf base petiolate; lid ovate, apex rounded ..... 80. *N. \times trichocarpa*  
     b. Leaf base attenuate, not petiolate; lid apex notched .... 34. *N. \times hookeriana*  
 6a. Leaf base decurrent to stem ..... 7  
     b. Leaf base amplexicaul, but not decurrent ..... 8  
 7a. With a white collar below the peristome ..... 3. *N. albomarginata*  
     b. Lacking a white collar below the peristome ..... 28. *N. gracilis*  
 8a. Lid rounded, cordate at base, peristome narrow, rounded, stem rounded .. 9  
     b. Lid ovate, truncate at base, peristome broader, irregular, stem angular .... 10  
 9a. Pitcher spur branched; lid glands numerous, small ( $0.2\text{--}0.3$  mm) .....  
         ..... 66. *N. ramispina*  
     b. Pitcher spur simple; lid glands few, large ( $0.4\text{--}0.5$  mm) .. 29. *N. gracillima*  
 10a. Stem sharply 3-angled, peristome scarcely toothed within, lid without hairs below ..... 69. *N. sanguinea*  
     b. Stem perceptibly 3-angled, peristome teeth large near lid, lid with hairs below .....  
         ..... 42. *N. macfarlanei*

**Key to the Javan species**

- 1a. Lower leaves with fimbriate margin, lid with evenly spread, small (0.1–0.2 mm) glands ..... **51. *N. mirabilis***
- b. Lower leaves without fimbriate margin, lid with large glands (0.2–0.4 mm) most numerous near mid-line ..... **30. *N. gymnamphora***

**Key to the Moluccan and Sulawesi Island species**

- 1a. Lower leaves with fimbriate margin ..... **51. *N. mirabilis***
- b. Lower leaves without fimbriate margin ..... 2
- 2a. Inflorescence a panicle – at least some partial peduncles 3- or more-flowered ..... 3
- b. Inflorescence a raceme – partial peduncles 1- or 2-flowered ..... 4
- 3a. Partial peduncles with a bract, lid glands small, numerous .. **78. *N. tomoriana***
- b. Partial peduncles without a bract, lid glands large, few ..... **17. *N. danseri***
- 4a. Stems triangular, with leaf base decurrent to 2 angles ..... 5
- b. Stems rounded ..... 8
- 5a. Peristome lacking teeth; pitcher with 2 ‘eye-spots’ ..... **67. *N. reinwardtiana***
- b. Peristome with teeth on inner margin; pitcher without ‘eye-spots’ ..... 6
- 6a. Peristome of upper pitchers with large flattened plates and large teeth .....  
..... **31. *N. hamata***
- b. Peristome ribs as high as wide, lacking large plates ..... 7
- 7a. Lid with filiform, hair-like processes, especially near margin .....  
..... **75. *N. tentaculata***
- b. Lid without such filiform processes ..... **28. *N. gracilis***
- 8a. Lid with 1 or no appendages on dorsal surface ..... **27. *N. glabrata***
- b. Lid with 1 or 2 appendages on dorsal surface ..... 9
- 9a. Upper pitchers narrow tubular below, abruptly bowl-shaped above .....  
..... **25. *N. eymae***
- b. Upper pitchers infundibuliform throughout, never abruptly bowl-shaped .....  
..... **48. *N. maxima***

**Key to the Bornean species**

Whole plant with a short dense indumentum of reddish hairs; the leaves lanceolate, sessile with a broad base, and decurrent into 2 gradually attenuate wings, with 0–2 longitudinal veins on each side (pitchers unknown) ... **52. *N. mollis***

- 1a. Pitcher with a dense ring of white hairs below the peristome .....  
..... **3. *N. albomarginata***
- b. Pitcher without a white ring of hairs below the peristome ..... 2
- 2a. Peristome developing two large thorns at apex of peristome, lid reniform .....  
..... **9. *N. bicalcarata***
- b. Peristome not so; lid orbicular, or narrower than long ..... 3
- 3a. Lid more than 3 times as long as wide; lacking glands ..... **4. *N. ampullaria***
- b. Lid less than 3 times as long as wide; with glands ..... 4

- 4a. Underside of lid with long bristles or thick tubercles to several mm in length 5
- b. Underside of lid lacking bristles, rarely with a slight indumentum of short (< 0.8 mm) hairs. . . . . 6
- 5a. Lid bristles fine, tapering; peristome ribs of upper pitchers scarcely developed . . . . . **41. *N. lowii***
- b. Lid bristles thick (1 mm), blunt-tipped; peristome ribs always apparent . . . . . **23. *N. ehippiata***
- 6a. Peristome ribs like flattened plates, 3 mm tall or more . . . . . 7
- b. Peristome ribs not like flattened plates, scarcely 1.5 mm tall . . . . . 10
- 7a. Pitcher ventricose-tubular . . . . . **22. *N. edwardsiana***
- b. Pitcher globose, narrowed near mouth . . . . . 8
- 8a. Lid less than 6 cm across . . . . . **85. *N. villosa***
- b. Lid greater than 6 cm across . . . . . 9
- 9a. Leaf tip acute to acuminate . . . . . **43. *N. macrophylla***
- b. Leaf tip peltate . . . . . **38. *N. × kinabaluensis***
- 10a. Peristome very reduced, only just discernible at ×10 as a row of small teeth . . . . . **15. *N. campanulata***
- b. Peristome not so reduced, a distinct rib always present . . . . . 11
- 11a. Inner margin of peristome lacking teeth; pitcher with 2 eye-spots on dorsal wall . . . . . **67. *N. reinwardtiana***
- b. Inner margin of peristome with teeth; no eye-spots. . . . . 12
- 12a. Leaf apex peltate . . . . . 13
- b. Leaf apex scarcely to not peltate . . . . . 16
- 13a. Leaf orbicular, tendril arising before 2/3rds leaf length . . . . . **16. *N. clipeata***
- b. Leaf elliptic, tendril arising within 2 cm of apex . . . . . 14
- 14a. Lid with a basal appendage . . . . . **65. *N. rajah***
- b. Lid lacking appendage below . . . . . 15
- 15a. Leaf tapering to base, decurrent or forming saddles on stem . . . . . **56. *N. northiana***
- b. Leaf petiolate, amplexicaul to scarcely decurrent . . . . . **46. *N. mapuluensis***
- 16a. Lid with a basal appendage below. . . . . 17
- b. Lid without a basal appendage . . . . . 21
- 17a. Leaf base shortly decurrent or amplexicaul; lid ovate to triangular . . . . . **26. *N. fusca***
- b. Leaf bases sheathing or long decurrent; lid round . . . . . 18
- 18a. Upper pitcher ventricose at base, tubular above . . . . . **12. *N. boschiana***
- b. Upper pitcher infundibuliform or tubular . . . . . 19
- 19a. Stems triangular; pitchers almost glabrous . . . . . **13. *N. burbidgeae***
- b. Stems rounded; pitchers with sparse hairs to 1 mm long . . . . . 20
- 20a. Upper pitcher infundibuliform throughout, pale green or yellow **63. *N. pilosa***
- b. Upper pitcher tubular; green with red marking . . . . . **73. *N. stenophylla***
- 21a. Stem triangular . . . . . 22
- b. Stem rounded . . . . . 24
- 22a. Lid with tentacle-like appendages above, especially near margin . . . . . **75. *N. tentaculata***
- b. Lid without tentacle-like appendages above . . . . . 23

- 23a. Lid with few (< 50) large (> 0.5 mm) glands below ..... 28. *N. gracilis*  
 b. Lid with many (> 200) small (< 0.3 mm) glands below .. 54. *N. murudensis*  
 24a. Stems covered by hairs 1–2 mm long ..... 25  
 b. Stems more or less glabrous ..... 27  
 25a. Leaf base sheathing ..... 82. *N. veitchii*  
 b. Leaf base amplexicaul or sessile ..... 26  
 26a. Leaf petiolate ..... 32. *N. hirsuta*  
 b. Leaf sessile, broadly amplexicaul ..... 33. *N. hispida*  
 27a. Leaf base decurrent ..... 28  
 b. Leaf base sessile to amplexicaul ..... 29  
 28a. Leaf petiolate ..... 11. *N. borneensis*  
 b. Leaf tapering to base ..... 80. *N. × trichocarpa*  
 29a. Leaf sessile, base clasping stem ..... 53. *N. muluensis*  
 b. Leaf petiolate, base at most slightly amplexicaul ..... 30  
 30a. Margin of lower leaves fimbriate ..... 51. *N. mirabilis*  
 b. Margin of lower leaves entire ..... 31  
 31a. Peristome elongated into a long flattened neck ..... 64. *N. rafflesiana*  
 b. Peristome not elongated into a long flattened neck ..... 32  
 32a. Lid slightly notched at apex, glands large (0.5 mm) few .....  
 ..... 34. *N. × hookeriana*  
 b. Lid rounded at apex, glands small (0.1–0.2 mm) numerous .....  
 ..... 44. *N. macrovulgaris*

### Key to the Philippine species

- 1a. Lower leaves with fimbriate margin ..... 51. *N. mirabilis*  
 b. Lower leaves with an entire margin ..... 2  
 2a. Pitchers markedly constricted at their middles ..... 3  
 b. Pitchers not markedly constricted at their middles ..... 4  
 3a. Mouth of pitcher oblique, ovate ..... 14. *N. burkei*  
 b. Mouth of pitcher transverse, elliptic ..... 83. *N. ventricosa*  
 4a. Pitchers globose; wings with numerous branching fringe elements .....  
 ..... 8. *N. bellii*  
 b. Pitchers various, but not globose; wings with few fringe elements ..... 5  
 5a. Lid with a basal appendage below ..... 6  
 b. Lid lacking a basal appendage ..... 7  
 6a. Leaf apex truncate ..... 81. *N. truncata*  
 b. Leaf apex acute ..... 2. *N. alata*  
 7a. Peristome adnate to the lid below, forming a short plate ..... 6. *N. argentei*  
 b. Peristome not adnate to lid ..... 8  
 8a. Peristome ribs prominent, higher than 1 mm, with extended teeth internally to 3  
 mm ..... 62. *N. petiolata*  
 b. Peristome ribs not prominent, as high as wide ..... 9  
 9a. Leaf elliptic, petiolate ..... 2. *N. alata*  
 b. Leaf long attenuate-spathulate, sessile ..... 49. *N. merrilliana*

### Key to the species of New Guinea and neighbouring islands

- 1a. Lower pitchers urceolate; lid narrow, lacking glands . . . . . **4. *N. ampullaria***
- b. Lower pitchers tubular to ovoid; lid orbicular, always with glands. . . . . 2
- 2a. Lid with 2 glandular processes, one at the apex, one near the base; axillary buds spike-like. . . . . 3
- b. Lid flat below; axillary buds never spike-like . . . . . 4
- 3a. Mouth of pitcher oblique, dorsal pitcher surface vertical . . . . . **48. *N. maxima***
- b. Mouth of pitcher hooded, dorsal pitcher surface curving forwards **39. *N. klossii***
- 4a. Leaf blade decurrent to at least half-way down internode . . . . . 5
- b. Leaf blade distinctly petiolate, never decurrent . . . . . 6
- 5a. Stem triangular; peristome over 0.8 cm in width . . . . . **36. *N. insignis***
- b. Stem rounded; peristome less than 0.6 cm in width . . . . . **40. *N. lamii***
- 6a. Margin of lower leaf blades fimbriate; upper pitchers not winged . . . . . **51. *N. mirabilis***
- b. Margin of lower leaves never fimbriate; upper pitchers winged or not . . . . . 7
- 7a. Longitudinal nerves confined to outer 1/3 of leaf blade . . . . . 8
- b. Longitudinal nerves throughout blade . . . . . 9
- 8a. Upper pitchers widest at mouth; partial pedicels not corymbose **58. *N. paniculata***
- b. Upper pitchers narrowing to mouth; partial peduncles corymbose . . . . . **55. *N. neoguineensis***
- 9a. Leaves with 2–4 pairs of longitudinal nerves, some arising from midrib . . . . . **79. *N. treubiana***
- b. Leaves with 5–7 pairs of longitudinal nerves, all arising from base . . . . . 10
- 10a. Lid glands numerous, small (0.1–0.2 mm) . . . . . **59. *N. papuana***
- b. Lid glands very few, large (0.3–0.6 mm) . . . . . **17. *N. danseri***

### SPECIES ACCOUNTS

Only in the case of new species (6) or where circumscriptions have changed from previous literature (9) (i.e. Danser, 1928 or protologues of species published thereafter) have we provided a full description of a species. For 9 species, brief emendations are given for previous descriptions. The Flora Malesiana account will contain full descriptions of the 77 Malesian taxa. All specimens cited have been seen unless otherwise indicated as n.v. (non vide).

Abbreviations used in this paper include: Bt. = Bukit (hill); FR = Forest Reserve; G. = Gunung (mountain); ICBN = International Code of Botanical Nomenclature; Kp. = Kampung (village); NP = National Park; P. = Pulau (island); Sg. = Sungai (river); TL-2 = Taxonomic Literature 2nd Ed. by Stafleu & Cowan, 1976–1988 (see references); †? = presumed destroyed.

#### 1. *Nepenthes adnata* Tamin & M. Hotta ex Schlauer

*Nepenthes adnata* Tamin & M. Hotta ex Schlauer in Schlauer & Nerz, Blumea 39 (1994) 141. — *Nepenthes adnata* Tamin & M. Hotta in M. Hotta, Diversity and dynamics of plant life in Sumatra (1986) 76, f. 1; nom. nud. — Type: *Meijer 6941* (L. holo), West Sumatra, Taram E of Payakumbuh, river Tjampo, 1000 m, 24 Aug 1957.

Distribution — East-Central Sumatra.

Ecology — 100–1000 m altitude.

Notes — 1. Tamin and Hotta (1986) described this species in detail, but did not give a Latin diagnosis. The name was legitimised by Schlauer and Nerz (1994).

2. Differing from *Nepenthes tentaculata* of Borneo and Sulawesi in its smaller size, more rounded mouth and round or cordate (not elliptic or ovate) lid. In Sumatra it resembles *N. tobaica* from which it is told by its adnate leaf base, and the short, unbranched partial peduncles; and *N. miki* from northern Sumatra which has sessile leaf bases and pitcher spurs with 3–7 branches.

Selected collections — SUMATRA. Sumatera Barat, Kelok Sembilan, 20 Sep 1985, *M. Hotta 31301* (Univ. Andalas n.v., KYO n.v.), *R. Tamin 1262, 1623* (BO n.v., Univ. Andalas n.v., KYO n.v.).

## 2. *Nepenthes alata* Blanco

*Nepenthes alata* Blanco, Fl. Filip., ed. 1 (1837) 805; Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 258, excl. syn. *N. eustachya* Miq. — Type: *Blanco s.n.* (not located, PNH †?), Philippines, Luzon, Ilocos, Vintar.

*Nepenthes blancoi* Blume, Mus. Bot. Lugd. Bat. 2 (1852) 10. — Type: *Blanco s.n.* (not located, PNH †?), Philippines, Luzon, Pangasinan, Agoo.

*Nepenthes melamphora* auct. non Blume: Fern.-Vill., Fl. Filip. Nov. App. 3 (1880) 173.

*Nepenthes alata* Blanco var. *ecristata* Macfarl. in Engl., Pflanzenr. 4, 3 (1908) 72. — Type: *Mearns & Hutchinson 4632* (not located, PNH †?), Philippines, Misamis, Mt. Malindang, May 1906.

*Nepenthes alata* var. *biflora* Macfarl. in Engl., Pflanzenr. 4, 3 (1908) 72. — Type: *Whitford 1537* (lecto, designated here, K; iso PNH †?), Philippines, Negros, Mt. Silay.

*Nepenthes philippinensis* Macfarl. in Engl., Pflanzenr. 4, 3 (1908) 43. — Type: *Foxworthy 721* (not located, PNH †?), Philippines, Palawan, Mt. Victoria, 350 m.

*Nepenthes copelandii* Merr. ex Macfarl. in Engl., Pflanzenr. 4, 3 (1908) 51. — Type: *Copeland 1033* (not located, PNH †?), Philippines, Mindanao, Davao, Mt. Apo.

*Nepenthes graciliflora* Elmer, Leafl. 4 (1912) 1494. — Type: *Elmer 12465* (lecto, designated here, K; iso BO, E, PNH †?), Philippines, Sibuyan Is., Mt. Guiting-Guiting, May 1910.

*Nepenthes brachycarpa* Merr., Philipp. J. Sci., Bot. 10 (1915) 306. — Type: *Merrill 9588* (L), Philippines, Palawan, Silanga peak, 250–400 m, 30 May 1913.

Non *Nepenthes alata* sensu Shivas, Pitcher plants of Peninsular Malaysia & Singapore (1984) 23; quae = *N. gracillima* Ridl.

Non *Nepenthes alata* sensu Sh. Kurata, Nepenthes of Mt. Kinabalu, Sabah (1976) 32; quae = *N. stenophylla* Mast.

Non *Nepenthes alata* sensu Tamin & M. Hotta in M. Hotta, Diversity and dynamics of plant life in Sumatra (1986) 78; quae = *N. eustachya* Miq.

Distribution — Philippines.

Ecology — Mossy forest, 800–2400 m altitude.

Notes — 1. We have restored *N. eustachya* Miq., comprising specimens from Sumatra, which Danser reduced to *N. alata* in his revision (1928). The two species differ in a number of minor characters: *N. alata* has a lanceolate-ovate leaf-blade, with an acute or attenuate apex (unlike the obtuse to sub-peltate tip of *N. eustachya*), usually only two longitudinal veins, and the petiole is broadly winged compared to *N. eustachya*; the pitchers are very similar in the two, but those of *N. eustachya* have a more angular, woody base; the spur of the latter is usually branched or fasciculated; the partial peduncles are somewhat shorter in this species; and *N. eustachya* is more or less glabrous throughout.

2. The species is somewhat polymorphic. The ridge on the lower surface of the lid may be developed into a prominent, even slightly hooked appendage, or be more or less absent. Specimens from Luzon tend to have smaller, hairier pitchers, while those from Mindanao have more strikingly ventricose bases to their pitcher and relatively narrow necks. Specimens from Palawan island have somewhat tubular pitchers which taper very gradually to the tendril.

3. A specimen of *N. gracillima* from Peninsular Malaysia (Ridley 16097) was erroneously identified as *N. alata* by Danser (Kiew, 1990). Danser (1928) also identified a collection at Bogor (*Botter s.n.*) from Ambon as a pitcher of *N. alata*, but this specimen is referable to *N. mirabilis*. Kurata (1973) records the species from Borneo, but this again is based on a misidentification of a Clemens collection of *N. stenophylla* from Mt. Kinabalu, by Smythies (1965).

4. We have delayed lectotypifying *N. alata* Blanco until we have completed a survey of the material available. According to TL-2, Merrill stated that nothing was known about a Blanco herbarium, but Philippine plants collected by him are said to be at MA (Lanjouw & Stafleu, 1954).

*Selected collections* — PHILIPPINES. Luzon. Benguet Prov., Trinidad, *R. S. Williams* 1012 (K, NY, n.v.); Baguio, *Elmer* 5854 (K); Pampanga Prov., Pinatubo, *Elmer* 21190 (BO, SING). — Mindanao. Lake Lanao, Camp Keithley, *M. A. Clemens* 923 (K); Culion, *Merrill* 507 (BO, W), 516 (K). — Palawan. Bacuna, Puerto Princesa, *Edaño* 259 (BO, SING).

Hybrids — 1. *Nepenthes mirabilis* × *N. alata*, Sh. Kurata & Toyosh., Gard. Bull. Sing. 26 (1972) 157. — *Kurata 1111a* (Nippon Dental College, n.v.), Philippines, Mindanao, Surigao del Sur, Carrascal bay, 20 m, 9 Aug 1965.

2. *Nepenthes petiolata* × *N. alata*, Sh. Kurata & Toyosh., Gard. Bull. Sing. 26 (1972) 158. — *Kurata 1113a* (Nippon Dental College, n.v.), Philippines, Mindanao, Surigao del Sur, E slope Mt. Legaspi, 270 m, 19 Aug 1965.

Table 1. Comparative table of characters of *Nepenthes alata* and *Nepenthes eustachya*.

<i>Nepenthes alata</i>	<i>Nepenthes eustachya</i>
Leaf blade lanceolate-ovate	Leaf blade lanceolate
Leaf apex acute or attenuate	Leaf apex rounded to sub-peltate
Petiole broadly winged	Petiole scarcely winged.
Pitcher base of similar texture to rest of pitcher, abruptly attenuate to tendril	Pitcher base angular, woody, gradually attenuate to tendril
Spur simple, acutely pointed	Spur simple or bifurcate.
Indumentum of whitish or reddish hairs	More or less glabrous throughout

### 3. *Nepenthes albomarginata* T. Lobb ex Lindl.

*Nepenthes albomarginata* T. Lobb ex Lindl., Gard. Chron. (1849) 580; Macfarl. in Engler, Pflanzenr. 4, 3 (1908) 37, excl. syn. *N. teysmanniana*; Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 262; Shivas, Pitcher plants of Peninsular Malaysia & Singapore (1984) 25; Tamin & M. Hotta in M. Hotta, Diversity and dynamics of plant life in Sumatra (1986) 80; Philipps & A.L. Lamb, Pitcher Plants of Borneo (1996) 65, f. 38. — Type: Gard. Chron. 1849, p. 580, t. 3 (lecto, designated here).



*Nepenthes laevis* C. Morren (non *N. laevis* Lindl. quae = *N. gracilis*), Belg. Hort. 2 (1852) 234. — Type: not indicated.

*Nepenthes tomentella* Miq., Fl. Ned. Ind. 1, 1 (1858) 1075; Sumatra, Seine Pflanzenwelt (1862) 151; Beck, Wien. Ill. Gartenz. (1895) 191 (as a variety of *N. albomarginata*). — Type: *Teijsmann 537*. (BO, U, n.v.), Sumatra, coast at Sibolga, Feb 1856.

*Nepenthes albomarginata* var. *villosa* Hook. f. in A.DC., Prodr. 17 (1873) 103. — Type: *Low s.n.* (not located), Borneo.

*Nepenthes albomarginata* var. *typica* Beck, Wien. Ill. Gartenz. (1895) 191, nom. inval.

*Nepenthes albocincta* Hort. ex Macfarl. in Engler, Pflanzenr. 4, 3 (1908) 38, nomen.

*Nepenthes albomarginata* var. *rubra* Macfarl. in Engler, Pflanzenr. 4, 3 (1908) 38. — *Nepenthes albocincta* var. *rubra* Hort. ex Macfarl. in Engler, Pflanzenr. 4, 3 (1908) 38, nomen. — Type: not located.

Distribution — Sumatra, Peninsular Malaysia (absent from Singapore) and Borneo.

Ecology — Lowland kerengas forest or exposed ridge-tops, on limestone or sandstone; sea level to 1100 m.

Notes — 1. The protologue comprises a brief Latin diagnosis credited to T. Lobb, as a figure legend. The accompanying text is initialled “R.E.” (probably Robert Errington of Sutton Park), and does not refer to the figures or T. Lobb, though it does discuss the genus *Nepenthes*, including a reference to what is probably *N. albomarginata*. The article is somewhat poetic, whimsical and lacking in detail, and although Malacca and Mt. Ophir are both mentioned, we have not been able to trace any T. Lobb material from these localities collected before 1849. However, we have not had access to CGE, where (TL-2) the top set of T. Lobb is held. On balance we have decided to lectotypify using the figure cited in the protologue since this is the only original element and unambiguously represents the species to which this name is usually applied. We have maintained the authority as T. Lobb ex Lindl., since, although Lindley is not credited with authorship of the species name in the text, he was editor of the journal at that time (TL-2), and it seems that he must be responsible for the figures and legend in question. It was often the case in this journal that uncredited pieces would be contributed by the editors. Lindley’s involvement is further confirmed by the fact that he is credited with authorship of the other new species name in the legend, *N. sanguinea*. Macfarlane (1908) cites *N. teysmanniana* Miq. as being synonymous with *N. albomarginata*, and indeed the Utrecht specimen of the type number (*Teijsmann 530*) does belong to this species, but the Bogor specimen under this number, and the description clearly indicate *N. gracilis*.

2. This species is sometimes confused with *Nepenthes gracilis* but immediately distinguished from this and all other species by the bright white, narrow band of densely packed silky hairs just below the peristome; the pitcher is often covered by short white hairs. The lower surface of the leaf usually bears coppery-red, simple hairs 1–1.5 mm long. In some specimens the white peristome hairs can dry dark however, particularly when collected into alcohol. Populations from Sumatra and Borneo (e.g. Bako National Park) often have very narrow cylindrical, almost pencil-thin pitchers, whilst in other populations, especially from Peninsular Malaysia (e.g. G. Jerai, G. Ophir), the pitchers are infundibuliform with broader peristomes, more ovate lids and large lid glands.

3. In Peninsular Malaysia the species is absent from the central mountain ranges, but is found from sea level to over 1000 m in outlying mountains such as G. Jerai

and G. Ophir. It is possible that this distribution reflects competitive exclusion from the central mountain ranges, by the diversity of montane species found there. It is also, surprisingly, absent from Singapore.

*Selected collections* — MALAY PENINSULA. Kedah, G. Jerai, *Y. C. Chan, FRI 021778* (KEP, K); Kedah Peak, *Kochummen FRI 18074* (KEP, K). — SUMATRA. N of Pajakumbuh, Lubuh Bangku, *W. Meijer 5276* (Univ. Andalas, n.v., K); N Sumatra, Karo Highlands, Bundar Baru, *W. Meijer 15010* (K). — BORNEO. Sarawak. Bako NP, *Tan 28811* (SAR, SING); Batang Kayan, Sampadi FR, G. Meroyong, *Sinclair & Kadim bin Tassim S 10408* (E, n.v., K, L, SAR, SING); Bau Dist., Bt. Jebong, *Anderson & Chai S 29923* (K, L, SAR, SING). — Sabah. Beaufort, Wiston, G. Batu Batu, *Gibot SAN 66636* (K, L, SAN n.v.). — Kalimantan. Lepung, Semangit-Selimbau, *Afriastini 995* (BO, K, L). — Brunei. Temburong, Batu Apoi, Bt. Gelagas, *Simpson 2319* (BRUN n.v., K).

#### 4. *Nepenthes ampullaria* Jack

*Nepenthes ampullaria* Jack, Comp. Bot. Mag. (1835) 271; Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 265; Sh. Kurata, Gard. Bull. Sing. 26 (1973) 227; *Nepenthes* of Mt. Kinabalu, Sabah (1976) 34; Shivas, Pitcher plants of Peninsular Malaysia & Singapore (1984) 27; Tamin & M. Hotta in M. Hotta, Diversity and dynamics of plant life in Sumatra (1986) 81; Jebb, Science in New Guinea 17, 2 (1991) 21, f. 4 & 8; Phillipps & A. L. Lamb, Pitcher Plants of Borneo (1996) 67, f. 40. — Type: *Jack s.n.* (lecto, designated here, SING), Singapore.

*Nepenthes ampullaceae* Low, Sarawak 69 (1848), nomen.

*Nepenthes ampullaria* var. *guttata* D. Moore, Gard. Chron. (1872) 360. — Type: not located.

*Nepenthes ampullaria* var. *vittatamajor* Mast., Gard. Chron. (1872) 542; André, Ill. Hort. 24 (1877) 45. — Type: not located.

*Nepenthes ampullaria* var. *vittata* André, Ill. Hort. 24 (1877) 272; Beck, Wien. Ill. Gartenz. (1895) 150. — Type: not located.

*Nepenthes ampullaria* var. *geelvinkiana* Becc., Malesia 3 (1886) 8. — Type: *Beccari s.n.* (FI n.v.), New Guinea, Mios Num.

*Nepenthes ampullaria* var. *longicarpa* Becc., Malesia 3 (1886) 8. — Type: *Beccari s.n.* (FI n.v.), New Guinea, Ramoi.

*Nepenthes ampullaria* var. *microsepala* Macfarl., Nova Guinea 8 (1910) 340. — Type: *Versteeg 1229* (lecto, designated here, K; iso BO, L), New Guinea, Noord River, near Sabang, 30 m, 14 June 1907.

*Nepenthes ampullaria* var. *racemosa* J. H. Adam & Wilcock, Mal. Nat. J. 44 (1991) 29. — Type: *Bamber 372* (holo K), Borneo, Labuan Is.

Non *Nepenthes ampullaria* sensu Jeann., Nouv. Cal. Agric. (1894) 92; quae = *N. vieillardii* Hook. f.

Distribution — Thailand; Malesia: Sumatra, Peninsular Malaysia, Borneo, New Guinea.

Ecology — Damp, shady forest, in Borneo swamp forests, in New Guinea *Araucaria* forests, also in secondary forests, open microphyllous vegetation, or swamp grassland; from sea level to 2100 m.

Notes — 1. The habit of this species is characteristic, with numerous rosettes sunken in the leaf litter or moss of the forest floor, and tall climbing stems which lack upper pitchers, though lower pitchers may be borne in rosettes to 2 m from the ground. Recently a few isolated cases of plants bearing upper pitchers have been reported in Brunei and Peninsular Malaysia. These are small, infundibuliform pitchers no more than 2 cm in height, but are not common.

2. The published varieties are based on minor inflorescence characters, and there seems to be no correlation with habitat or geography.

3. The species is apparently absent from the Moluccas and Sulawesi, but the eastern (New Guinea) and western (Thailand to Borneo) populations are morphologically indistinguishable.

4. Hybrids between this species and *N. gracilis* (*N. × trichocarpa*) and *N. rafflesi-ana* (*N. × hookeriana*) are widespread though scarce, and are treated in this account.

Selected collections — THAILAND. Ban Kaluli, Toh Moh, *Lakshnakara* 766 (BK, K). — MALAY PENINSULA. Sungei Paka, Trengganu, *Symington FRI* 26873 (K, KEP, SING n.v., L n.v., BO n.v.). — SINGAPORE. *Jack s. n.* (SING lecto, photo K). — SUMATRA. N Sumatra, *Lörzing* 11530 (BO, K, L). — BORNEO. Sarawak, 1st Div., Lundu Rd, Kp. Rasau, path to G. Besi, *Ilias Paie S* 46073 (K, L, KEP, SAN). — Sabah. Ranau, Kg. Miruru Mohd, Gan logging area, *Dewol & Petrus SAN* 89584 (K, L, SAN). — Kalimantan. Bulungan, Sg. Sebakis Region, *Kostermans* 9268 (A n.v., BO, K, L, SING). — Brunei. Tutong Dist., Telamba Bridge, road Brunei-Kuala Balait, *Jacobs* 5686 (BRUN n.v., K, L). — NEW GUINEA. Irian Jaya, SE, Ingembit to Opka, *Soengeng Reksodihardjo* 388 (BO, K, L). — Papua New Guinea. Western District, Kiunga Subdistrict, Kiunga, *Streimann & Lelean NGF* 34149 (A n.v., BRI n.v., CANB n.v., K, L, LAE).

## 5. *Nepenthes anamensis* Macfarl.

*Nepenthes anamensis* Macfarl. in Engl., *Pflanzenr.* 36 (1908) 39. — *Nepenthes micholitzii* Hort. ex Bonst. Parey Blumeng. 1 (1931) 663. — Type: *Micholitz s. n.* (lecto, designated here, K; iso K × 2), Vietnam, Anam, Lang Bean.

*Nepenthes geoffrayi* Lecomte, *Not. Syst.* 1 (1909) 62. — Syntypes: *Geoffray* 84-88, 91-93 (all P), Cambodia, Kampot, 14 Sep 1903.

*Nepenthes kampotiana* Lecomte, *Not. Syst.* 1 (1909) 62. — Syntypes: *Geoffray* 89 (P, photo K), 90 (P, photo K), 191 (P), Cambodia, Kampot.

Distribution — Peninsular Thailand and Cambodia to Vietnam.

Ecology — Moist montane woodland, 1500 m altitude.

Notes — 1. The collection selected as lectotype is the only one cited in the protologue, and the sheet chosen of the three available is that annotated by Macfarlane.

2. The type material of *N. geoffrayi* comprises lower pitchers, and rather slender, short inflorescences. The material of *N. kampotiana* on the other hand is of upper pitchers and somewhat more robust and with much elongated inflorescences. We have not lectotyped this material, since it comprises somewhat fragmented collections, and no inflorescence is actually attached to leaf or stem material. These species remain poorly known and more studies are needed. In particular the relationship between *N. anamensis* and the other endemic Indochinese species, *N. thorelii*.

Selected collections — THAILAND. Kanchanadit, Surat, *Kerr* 13141 (K); Loei, Phu Kradung, *Chantaranothai, Parnell & Simpson* 90/158 (K, TCD). — CAMBODIA. *Gougaud s. n.* (P n.v., photo K). — VIETNAM. Talmy (P); Anam, Lang Bean, *Micholitz s. n.* (Type).

## 6. *Nepenthes argentii* Jebb & Cheek, *spec. nov.* — Fig. 1

*Nepenthes bellii* Kondo similis sed non scandens foliis subpetiolatis oblanceolatis apice truncatis (non foliis sessilibus loratis apice acutis distinguenda). — Typus: *Argent & Reynoso* 89119 (holo K; iso E, PNH n.v.), Philippines, Sibuyan Island, above Magdiwang on ridge leading to Mayos Peak, 1400 m, 27 Aug 1989.

Terrestrial, monopodial shrub c. 30 cm tall. Stem erect, terete, 2–4 mm wide, 22 cm apparently buried in leaf litter, 4 cm above ground, with leaves congested (4 per cm

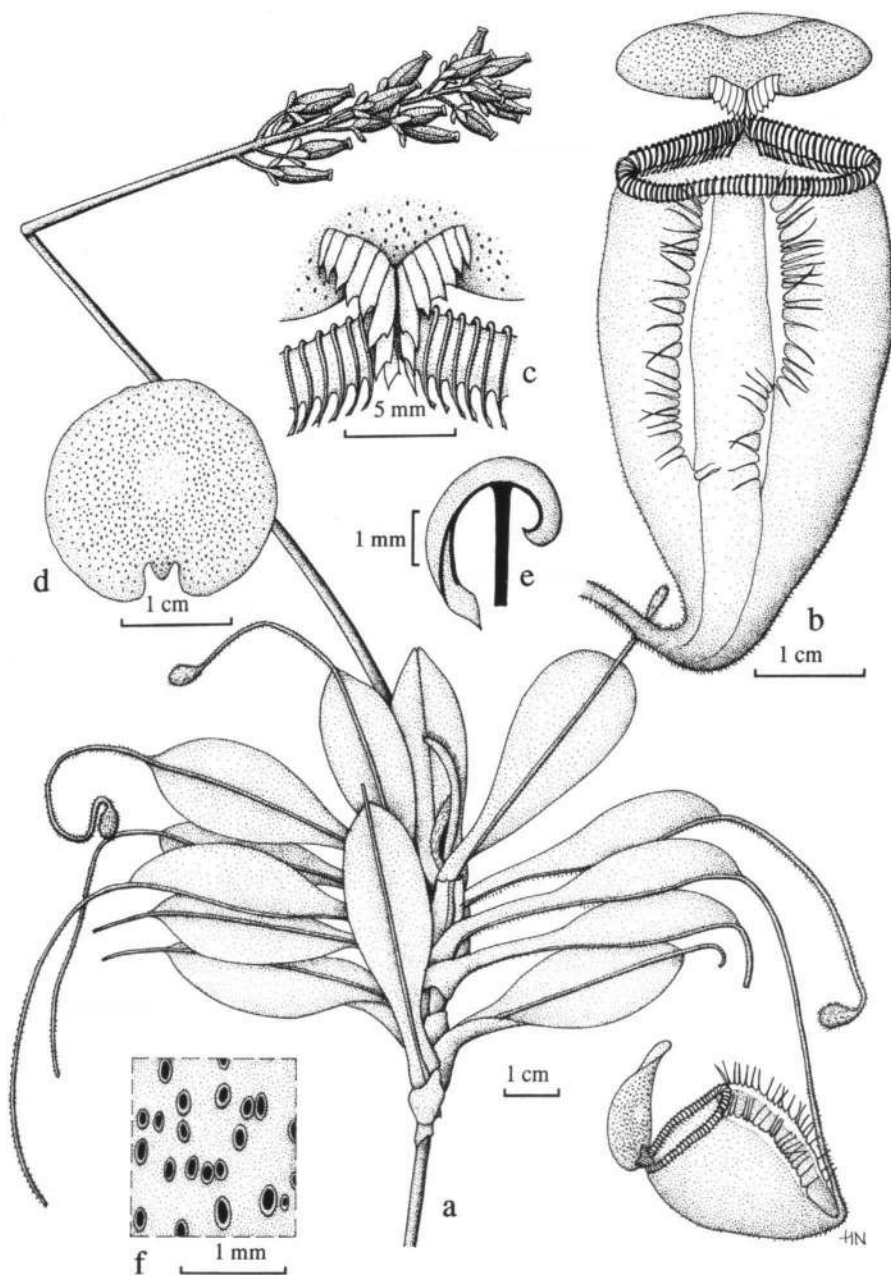


Fig. 1. *Nepenthes argentii* Jebb & Cheek. a. Habit, with female inflorescence; b. pitcher; c. detail of peristome junction with lid; d. underside of lid; e. section through peristome; f. detail of glands on lower lid surface (Argent & Reynoso 89119).

of stem), internodes obscured. *Leaves*  $\pm$  petiolate; blade obovate-oblongate, 3.5–4  $\times$  1.4–2.2 cm, apex obtuse to truncate, base cuneate-decurrent, thickly coriaceous; petiole 1–1.8 cm long, sheath-like, clasping the stem for about half its circumference, not auriculate or decurrent. Longitudinal nerves 1 or 2 on each side of the midrib in the marginal half, mostly inconspicuous. Pennate nerves inconspicuous. Lower pitchers infundibuliform-shortly cylindrical, 40–47  $\times$  22–24 mm, with two fringed wings 1.5–2 mm wide, fringed elements 3 mm long, often grouped and webbed together in clusters of 2–4, elements or groups of elements 1–2 mm apart; mouth sub-circular, almost flat, abruptly rising in the rear to provide a stout column 5 mm high, 2.5 mm wide, for the lid; peristome rounded, c. 1 mm wide, ridges laterally flattened, highly pronounced, 0.1–2 mm high, 5 mm apart, inner surface with stout, incurved teeth, up to 1 mm long near the column, outer surface never sinuate, adnate to underside of lid, forming a short transverse wall c. 7 mm long, 2–3 mm high, with triangular teeth below; lid suborbicular, to 13 mm long, 18 mm wide, apex rounded, base cordate, lower surface lacking appendages, glands very dense, pit-like, near the centre elliptic, 0.2  $\times$  0.3 mm, near the edge orbicular, 0.15 mm across; spur stout, rounded c. 1–1.5 mm long. Upper pitchers apparently not formed. Inflorescence/infructescence 21.5 cm long, 2 mm wide at base, peduncle 15.5 cm long, partial-peduncles absent; lower pedicels 6–7 mm long, upper pedicels 4 mm long; sepals oblong to slightly spatulate, 3.5–4.5  $\times$  1 mm; male flowers unknown; old female flower/young fruits obclavate, 10–11 mm long, 2.5–4 mm at widest point, stigmatic head black, 2 mm wide. Ripe fruit unknown. Seed unknown. Indumentum absent from stem and upper surface of leaves; lower surface of leaf and tendril densely invested with persistent patent red hairs c. 2 mm long, simple or with a short inconspicuous branch, remainder of blade with red sessile glands only. Pitcher outer surface and lid densely invested with minute reddish stellate hairs 0.1–0.2 mm across, with 3–5 erect arms, and with sparser appressed, twisted, sub-simple hairs 2–3 mm long bearing up to 5 or 6 short branches, giving a slightly matted appearance and felty texture. Inflorescence axis with whitish hairs c. 0.6 mm long, particularly at base and apex; sepals glabrescent; carpels densely hairy with appressed reddish hairs. Colour of pitchers buff mottled red, peristome dark purple, lid spotted red underneath, mostly mottled red on top. Young fruit brown.

Distribution — Philippines (Sibuyan, Romblon Province). Type only.

Ecology — Subalpine shrubbery with smooth wind-clipped canopy 30 cm tall on ultrabasic ridge; 1400 m altitude. Fruiting Aug 1989.

Notes — 1. *Nepenthes argentii* commemorates one of the collectors of the only specimen, George Argent, a botanist of the Royal Botanic Gardens, Edinburgh well known for his fieldwork in Borneo, Philippines and New Guinea, and for his research on the species of *Musa* and of *Rhododendron*.

2. This species is unusual in that it has a long, vertical, subterranean rhizome. It seems that the stem may grow slowly upwards, keeping pace with the accumulation of organic matter on the surface which continually buries the lower portion of the stem as with *Drosera rotundifolia* in a *Sphagnum* bog. More field studies are needed to verify this hypothesis. The diminutive stature, lack of upper pitchers and lack of climbing habit are also unusual in the genus and this species must contend as the smallest at maturity of all. Argent (pers. comm.) reports that the plants he collected

were completely concealed below the low (c. 30 cm high), wind-clipped shrubbery and that the pitchers were buried in the substrate amongst grasses or sedges. Plants were only detected by the inflorescences emerging above the shrub canopy. Several other species of *Nepenthes* known from ultrabasic soils (e.g. *N. rajah*, *N. burbidgeae* and *N. macrovulgaris*, all from Sabah and unrelated) are entirely restricted, as far as is known, to such soils and this may be the case with *N. argentii*.

3. *Nepenthes bellii* of Surigao Prov., Mindanao is the only other Philippine species with subglobose lower pitchers, and with upper pitchers absent or rare and with grouped fringed elements of the pitcher wings. *Nepenthes argentii* differs from *N. bellii* in the lack of climbing habit and the subpetiolate, oblanceolate leaves with truncate apices.

## 7. *Nepenthes aristolochioides* Jebb & Cheek, *spec. nov.* — Fig. 2

*A. N. bongso* Danser et ceteris speciebus Malesiae occidentalis in ascidiis inferioribus utriculariformibus ore non apicali distat. — Typus: *Meijer 6542* (holo L; iso BO), Sumatra, Mt. Kerinci, Gunung Tudjuh, 2000 m, 5 Aug 1956.

Climber, height unknown. Stem terete 0.2–0.4 cm thick, internodes 5.5–13 cm long; axillary buds conspicuous, 0.15–0.7 cm above axil. Leaves sessile; lower leaf-blade narrowly lanceolate to lanceolate-spathulate, to 15 × 2.5 cm; apex acute, rarely sub-peltate; base more or less parallel-sided, ultimately with rounded auricles; upper leaf-blade 7.5–15 × 1–3 cm, as the lowers, but lacking auricles, the base clasping the stem for 1/3–1/2 its circumference, rarely decurrent. Longitudinal veins indistinct in dried leaves, 2 or 3, in outer 1/3 of blade, arising from base, and sometimes along the midrib. Pennate nerves few, indistinct, arising obliquely and curving towards the apex. Upper pitchers utriculate, basally infundibuliform, obovoid above; to 9 × 3.5 cm; wings lacking; mouth almost vertical, lateral, not apical, ovate, to 2 cm across; peristome externally rounded, to 1.5 mm across, internally flattened, to 8 mm, broadening within, ribs 0.5–0.8 mm apart, inner margin entire, with large glands between ribs; spur simple, to 9 mm, apically with 2–4 minute acute points; lid rounded, to 2.7 × 2.1 cm, apex rounded to emarginate, base slightly cordate, with evenly scattered rimmed glands, somewhat larger and denser on mid-line, the rims distinctly asymmetric, being highest toward lid apex. Inflorescence unknown. Indumentum inconspicuous, of short, irregularly branching or simple, appressed white hairs to 0.2 mm long, in leaf axils, on midrib and on pitcher particularly around the peristome, and on the lid; the lower leaf-blade with sessile glands. Colour of pitchers green with brown-red flecks, becoming denser towards mouth, conspicuous in dried specimens; peristome dark red-brown.

Distribution — Sumatra (Mt. Kerinci).

Ecology — Mossy forest, 2000–2200 m altitude.

Notes — 1. The lower pitchers of this species are remarkable, and unique, in their bladder-shaped structure and lateral mouth. Resembling *N. bongso* in leaf shape, the pitchers of *N. aristolochioides* however, are unmistakable, and the hooded nature of the lid glands is also characteristic.

2. The specific epithet signifies the resemblance of the pitchers, in their shape and coloration, to the flowers of *Aristolochia*.

Collections — SUMATRA. Gunung Tudjuh, Mt. Kerinci, *Meijer 6542* (Type), 7426 (L); Mt. Kerinci, *Robinson & Kloss s.n.* (K).

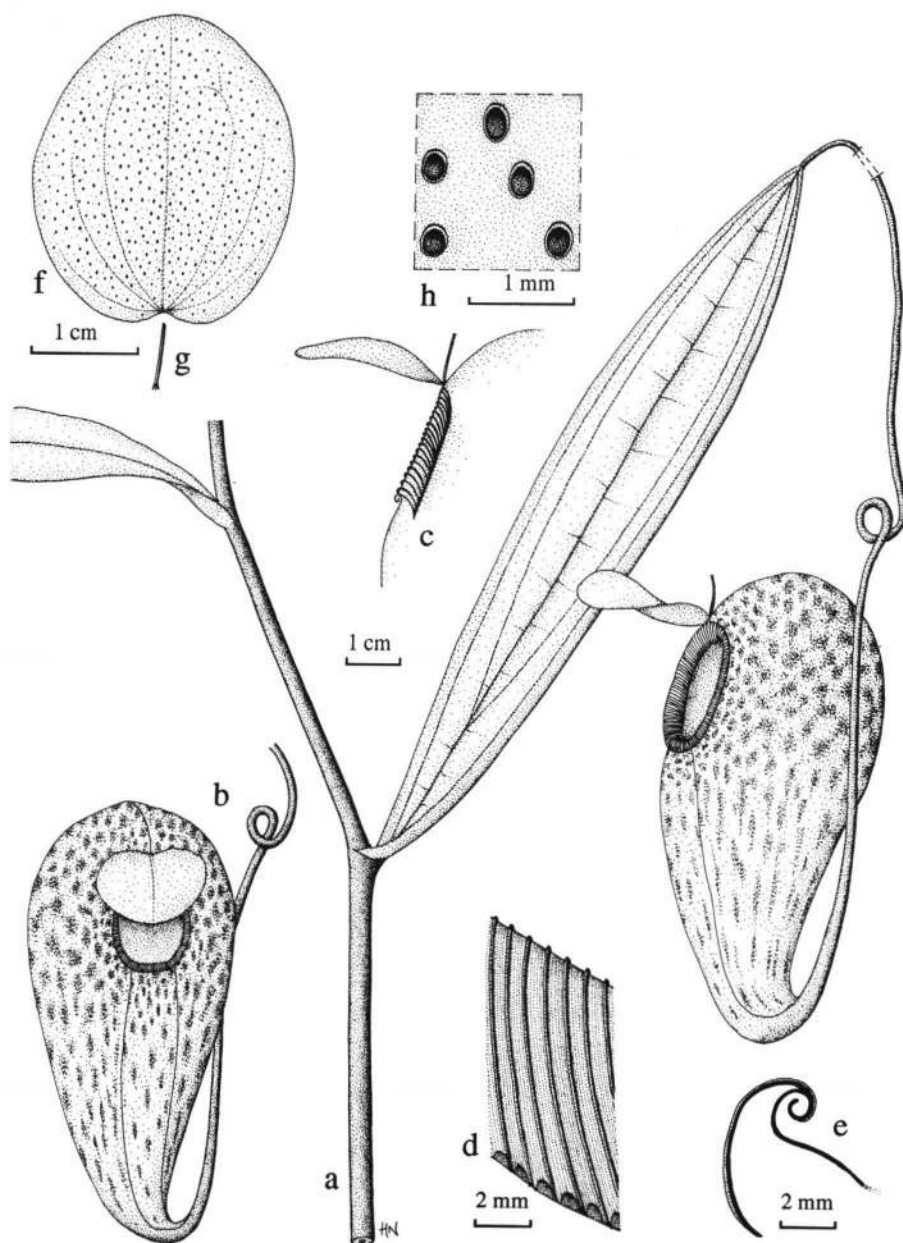


Fig. 2. *Nepenthes aristolochioides* Jebb & Cheek. a. Stem with upper pitcher; b. pitcher, frontal view; c. vertical section through mouth of pitcher; d. detail of peristome, internal view; e. section through peristome; f. underside of lid; g. spur; h. detail of glands on lower lid surface (Meijer 6542).

## 8. *Nepenthes bellii* K. Kondo

*Nepenthes bellii* K. Kondo, Bull. Torr. Bot. Club 96 (1969) 653, f. 1. — Type: *Kondo 11514* (holo NCU; iso KC. Nagoya n.v.), Philippines, Mindanao, Surigao, between Hayangobon and Carrascar, 800 m, 14 Apr 1968.

*Nepenthes globamphora* Sh. Kurata & Toyosh., Gard. Bull. Sing. 26 (1972) 155, t. 1, f. 1; J. Insect. Pl. Soc. 36 (1966) 15, nomen. — Type: *Kurata & Toyoshima 1128* (Nippon Dental College n.v.), Philippines, Mindanao, Surigao del Sur, Mt. Legaspi, 270 m, 22 Aug 1965.

Distribution — Philippines (Mindanao, Surigao Prov.). Known from the two type collections cited above.

Ecology — 250–800 m altitude.

Notes — 1. *Nepenthes globamphora* was not formally described for 6 years after the name first appeared, and meantime *N. bellii* was legitimately published.

2. Distinct in the subglobular pitchers, with very densely fringed wings, the fringed elements c. 1 mm apart (cilia trifid) on tendrils up to twice as long as the blades. Not easily confused with any other species besides *N. argentii*, where the specific differences are listed.

## 9. *Nepenthes bicalcarata* Hook. f.

*Nepenthes bicalcarata* Hook. f. in A.DC., Prodr. 17 (1873) 97; Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 270; Sh. Kurata, *Nepenthes* of Mt. Kinabalu, Sabah (1976) 37, t. 8; Phillipps & A.L. Lamb, *Pitcher Plants of Borneo* (1996) 70, f. 41. — Type: *Low s.n.* (lecto, designated here, K; iso K), Borneo, Sarawak, Lawas River.

*Nepenthes dyak* S. Moore, J. Bot. 18 (1880) 1, t. 206.; Burb., Gard. Chron. 1 (1882) 56; Becc., Malesia 3 (1886) 1. — Type: *Teijsmann 10962* (lecto, designated here, K; iso K), Borneo, West Kalimantan, Kapuas River near Sintang.

Distribution — Northwestern Kalimantan, Sarawak, Brunei and SW Sabah.

Ecology — Common in peat-swamp forest dominated by *Shorea albida*; also occasionally in heath forest on white sand soils. From sea level to 950 m.

Notes — 1. Of the two syntypes available for lectotypification, *Low s.n.* from Lawas River is chosen because it is annotated by Hooker, at Kew. The second syntype, also from Sarawak, *Beccari s.n.* from Batan Lupar, is presumably at FI, but has not been seen.

2. The huge peristome thorns, the reniform lid which is broader than long, and the ant-hollowed tendrils and stems, are unique features of this species. The paniculate inflorescence has scorpioid partial peduncles similar to those of *N. madagascariensis* and *N. masoalensis*.

3. The tendril of the pitcher is nearly always hollowed out and occupied by a golden-coloured ant of the genus *Camponotus*. The ants are said to recover prey items from the pitcher fluid (Clarke & Kitching, 1993). Numerous nectar glands are found scattered on the stem, upper midribs and tendrils, and the spur is likewise often densely glandular. The long attenuation of the peristome to the lid, and the recurved thorns may represent a specialised method of ant capture, rather than the fanciful protective role suggested by Burbidge (Gard. Chron. 28/2/1880).

4. The upper pitchers of this species are often surprisingly small relative to the large leaf-blades. This may be an adaptation to the somewhat shady sites that this species favours.



## 10. *Nepenthes bongso* Korth.

*Nepenthes bongso* Korth., Kruidkunde, in C.J. Temminck, Verh. Nat. Gesch. (1840) 19, t. 14; Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 272; Sh. Kurata, Gard. Bull. Sing. 26 (1973) 227. — Type: *Korthals s.n.* (lecto, designated here, K; iso BO†?, n.v., L†? n.v., W), Sumatra, G. Merapi, 2500 m.

*Nepenthes carunculata* Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 277, f. 1; Sh. Kurata, Gard. Bull. Sing. 26 (1973) 227. — Type: *Bünnemeijer 5747* p.p. (lecto, designated here, BO), Sumatra, Bt. Gombak, 2330 m, 16 Nov 1918.

*Nepenthes carunculata* var. *robusta* Nerz & Wistuba, Carnivorous Plant Newsl. 23 (1995) 111, f. 5. — Type: *Nerz 2401* (holo L), Sumatra, G. Gadut, 1800 m, 6 Mar 1989.

*Nepenthes talangensis* Nerz & Wistuba, Carnivorous Plant Newsl. 23 (1995) 101, f. 1. — Type: *Nerz 2501* (L), Sumatra, G. Talang, 2200 m, 6 Sep 1986.

Non *Nepenthes bongso* sensu Ridl., J. Linn. Soc., Bot. 38 (1908) 320 = *N. gracillima* Ridl.

Non *Nepenthes bongso* sensu Guill., Ann. Mus. Col. Mars. II, 9 (1911) 211, *quae* = *N. vieillardii* Hook. f.

Non *Nepenthes bongso* sensu Tamin & M. Hotta in M. Hotta, Diversity and dynamics of plant life in Sumatra (1986) 83, f. 2, *quae pro parte* = *N. bongso* Korth., *N. dubia* Danser et *N. inermis* Danser.

Short climber, to several metres; internodes to  $8 \times 0.4$  cm, rounded to angular. Leaf blade obovate-spathulate, margins more or less parallel near base;  $7\text{--}20 \times 2.5\text{--}4.5$  cm; apex rounded-acute, rarely emarginate, peltate or not; base abruptly truncate to stem; longitudinal nerves 2–4, throughout blade; pennate nerves scattered, irregular, arising perpendicular to midrib, or obliquely ascending. Lower pitchers ellipsoid; to  $20 \times 6$  cm; with 2 narrow, sparsely fringed wings. Upper pitchers infundibulate, narrowed at mouth, often with a broad curve near base;  $8\text{--}16(\text{--}21) \times 2.5\text{--}4(\text{--}6)$  cm; wings lacking; mouth horizontal at front, oblique and sometimes attenuate to lid; peristome rounded, to 5 mm across; spur simple, 2 to 7 mm long; lid rounded to triangular or cordate,  $2.5 \times 2.5\text{--}5 \times 4$  cm, with or without a thickened boss near the apex, glands numerous, 0.2–0.3 mm across, most dense towards centre, often with a few, large (0.8–1 mm) glands towards the apex. Male inflorescence 10–22 cm; partial peduncles 4–12 mm, often with a long filiform bract to 10 mm in length; more robust inflorescences (*Bünnemeijer 9696*) with 2-flowered partial peduncles to 15 mm overall, again with a basal bract; sepals elliptic,  $2 \times 1\text{--}4 \times 2$  mm, glands not dense; column 2–4 mm, anthers to 1 mm across; female inflorescence unknown. Indumentum sparse, on inflorescence and pitcher surface, glabrous with age. Colour of pitchers green, peristome with red lines, and mottled red within; flowers creamy-green to red; indumentum white to rufous brown.

Distribution — Central Sumatra (G. Singgalang, G. Talang).

Ecology — Forest, 1000–2700 m altitude.

Notes — 1. The Korthals specimens were not located at either BO or L (sheet 908.155-867 according to Danser, 1928), and we have therefore lectotypified using the extant K specimen, which appears to be annotated “*N. bongso* Korthals” in his own hand. The only locality data given on this sheet is Sumatra. Korthals (1840) records the locality as close to the summit of G. Merapi (2500 m).

2. This is one of a Sumatran group of apparently closely related species (the others are: *N. aristolochioides*, *N. diatas*, *N. densiflora*, *N. ovata*, *N. singalana* and *N. spathulata*). The wholly infundibulate upper pitchers, which are narrowed immedi-

ately below the mouth are characteristic of this species, *N. densiflora* and *N. ovata*. *Nepenthes ovata* is distinguished by the hook-like appendage on the underside of its lid, while *N. densiflora* has more gradually attenuate and narrower leaves (not obovate-spathulate) with an acute or acuminate apex (not sub-peltate), and the abrupt (not gradual) origin of the pitcher from the end of the tendril.

3. Tamin and Hotta (1986) reduced both *N. dubia* and *N. inermis* to synonyms of this species, and used material of *N. inermis* to illustrate their concept of *N. bongso*. The illustration in Korthals (1840) and the type specimen at Kew bear no similarity to these latter two species.

4. Danser distinguished *N. carunculata* from *N. bongso* by the presence of an apical appendage on the lid, and the 2-flowered partial peduncles. Recent collections, however, combine one or other of these characters with one or other of those of *N. bongso* (e.g. *de Vogel* 2826 has a lid appendage and 1-flowered partial peduncles), and it seems sensible at this stage to reduce *N. carunculata* to synonymy until such time as field observations can confirm the presence of two species. The type specimen of *N. carunculata* at Bogor is a mixed collection, the second sheet bearing a specimen of *N. pectinata*, which can be identified by its larger laminas with more numerous, and evenly spaced longitudinal veins. Collections from Mt. Talang have somewhat acute leaf apices, and have recently been distinguished as *N. talangensis*; in all other respects they match specimens of *N. bongso*.

*Selected collections* — SUMATRA. Padang, Mt. Singgalang, *Beccari* 222 (K), 183 (K), 268 (K); W Sumatra, above Padang, Barisan Range, Air Sirah, *de Vogel* 2826 (K, L)

## 11. *Nepenthes borneensis* J.H. Adam & Wilcock

*Nepenthes borneensis* J.H. Adam & Wilcock, Gard. Bull. Sing. 42 (1990) 26, t. 1, f. 1. — Type: *Murata, Kato & Moge* 3455 (holo L; iso BO), Borneo, southern Kalimantan, Muratus Mts, G. Besar, 1300–1880 m, 18 Feb 1979.

**Emended description:** Climber, height unknown. Stem angular, c. 0.7 cm thick, internodes c. 3 cm long. Lower leaves and pitchers unknown. Upper leaf-blade petiolate, lanceolate, 20 × 5 cm; apex acute to sub-peltate; base attenuate to the winged petiole; longitudinal veins 4 on each side of the midrib, in the outer half of the lamina; pennate nerves numerous, oblique, parallel. Petiole 3–5 cm long; winged, to 1 cm broad; base amplexicaul to c. 1/2 the circumference of the stem, decurrent. Upper pitchers infundibuliform, and very slightly narrowed towards middle; 16 × 3.5 cm; lacking fringed wings, but with prominent ribs; mouth oblique; peristome rounded-expanded, irregular, to 1.7 cm near lid, ribs c. 0.5 mm apart; spur simple, to 6 mm; lid round, densely glandular, the glands larger and less numerous along the midline. Inflorescence a raceme, 2-flowered near base, but otherwise 1-flowered. Indumentum reddish.

**Distribution** — Southern Kalimantan. Type only.

**Ecology** — 'Evergreen mossy forest'. Collected between 1300 and 1880 m.

**Notes** — 1. This species appears to be closely related to another little known species, *N. boschiana*, also known only from its type, and from the same mountain range in southern Borneo. *Nepenthes borneensis* differs in its more infundibuliform pitchers and smaller size.

2. *Nepenthes borneensis* was described from the Leiden specimen alone, the extra descriptive data above is taken from the Bogor isotype.

## 12. *Nepenthes boschiana* Korth.

*Nepenthes boschiana* Korth., Kruidkunde, in C.J. Temminck, Verh. Nat. Gesch. (1840) 25, t. 2, 4: 39–54; Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 275. — Type: *Korthals s.n.* (lecto, designated here, L; iso L × 6, K × 2, W × 3), Borneo, southern Kalimantan, G. Sakoembang, 950 m, 1836.

*Nepenthes maxima* auct. non Reinw. ex Nees: Becc., Malesia 1 (1878) 214, *ibid.* 3 (1886) 3 & 9 p.p.

Non *Nepenthes boschiana* sensu Hook. f. in A.DC., Prodr. 17 (1873) 98, quae pro parte = *N. stenophylla* Mast.

Non *Nepenthes boschiana* sensu Macfarl., in Engl., Pflanzenr. 4, 3 (1908) 71, p.p. = *N. stenophylla* Mast.

Non *Nepenthes boschiana* var. *sumatrana* Miq., Fl. Ned. Ind. 1, 1 (1858) 1074, quae = *N. sumatrana* (Miq.) Beck.

Non *Nepenthes boschiana* var. *lowii* Hook. f. in A.DC., Prodr. 17 (1873) 98, quae = *N. stenophylla* Mast.

Emended description: Leaves petiolate; blade oblong-lanceolate, to 25 × 8 cm, apex acute, base cuneate, petiole to 8 cm, somewhat expanded and amplexicaul at base; longitudinal veins 3 on each side, in outer 1/3–1/2 of blade, pennate nerves numerous, oblique. Lower pitcher only known by very small specimen 4 × 1 cm; ovoid below, tubular in upper half, with narrow fringed wings (ex Korthals t. 2). Upper pitchers tubular in upper 1/2–2/3, ventricose below; to 30 × 4 cm (2.5 cm above); wings lacking; mouth oblique; peristome expanded, irregularly recurved, 1.1–2.8 cm across, ribs c. 1 mm apart; spur unknown; lid round, apex rounded, base cordate, with a rounded crest near the base, densely glandular, these large on the crest and near midline, otherwise small. Female inflorescence 85 cm overall, peduncle 55 cm; partial peduncles 2-flowered, without a bract, to 2.8 cm; male partial peduncles shorter, to 1 cm; ripe fruit valves to 25 × 2.5 mm.

Distribution — Southern Kalimantan (Mt. Sakoembang). Only known by the type.  
Ecology — Altitude 950 m.

Notes — 1. The species, as recognised by Korthals, has rarely been treated correctly. Miquel described the variety *sumatrana*, which was later elevated to specific rank by Beck. Beccari included *N. maxima* in the species, whilst Macfarlane and Hooker both confused *N. stenophylla* with this species. Danser (1928) reinstated *N. boschiana* as comprising the type alone.

2. It differs from related species by its large tubular upper pitchers with a ventricose base, and the wavy, somewhat expanded peristome. *Nepenthes borneensis* comes from the same southern massif in Borneo, and is likewise known only by its holotype. It differs in its entirely infundibulate upper pitchers, which internally are glandular throughout.

## 13. *Nepenthes burbidgeae* Hook. f. ex Burb.

*Nepenthes burbidgeae* Hook. f. ex Burb., Gard. Chron. 1 (1882) 56; Macfarl. in Engl., Pflanzenr. 4, 3 (1908) 70; Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 276; *ibid.* 13 (1935) 467; Sh. Kurata, *Nepenthes* of Mt. Kinabalu, Sabah (1976) 40, t. 9 & 10; Philipps & A.L. Lamb, *Nature*

Malaysiana 13, 4 (1988) 22, 23; Pitcher Plants of Borneo (1996) 75, f. 43. — Type: *Burbidge s.n.* (lecto, designated here, K; iso K  $\times$  2), Borneo, Sabah, Mt. Kinabalu.  
*Nepenthes phyllamphora* auct. non Willd.: Stapf, Trans. Linn. Soc. II, Bot. 4 (1894) 217.

Distribution — Borneo (Mt. Kinabalu).

Ecology — Restricted to ultrabasic soils; 1200–2250 m.

Notes — 1. This species was inadvertently described by Burbidge himself. One sheet at Kew bears the following label: “This I believe an undescribed sp. It was first discd [sic] by Mr Low – Pitchers pure white with pink blotching – Flowers?? May it be called Nep. Burbidgeae [sic]. FWB” (F.W. Burbidge). This specimen is selected as the lectotype. Popular history has it that the plant was to be named after his wife, although it is not clear from this note to Hooker that this was the intention. Obituaries indicate that Burbidge was devoted to his wife Mary (he died shortly after her). It seems unnecessary to make the change to the orthography since we cannot be certain of Burbidge’s intentions when he published the name.

2. In common with a number of other Hooker manuscript names the species was never published by Hooker himself, and it was not until Macfarlane’s 1908 publication that the species was fully described.

*Selected collections* — BORNEO. Sabah. Mt. Kinabalu, Pig Hill, 2250 m, *Chew & Corner* in *RSNB 4514* (K); Mamut copper prospect, 1500 m, *Collenette 1053* (K); Marai Parai spur, *Bailes & Cribb 883* (K).

Hybrids — A hybrid with *N. rajah* has been named: *Nepenthes*  $\times$  *alisaputrana* J.H. Adam & Wilcock, *Reinwardtia* 11 (1992) 37 (as *alisaputraiana*). — *Nepenthes burbidgeae*  $\times$  *N. rajah*, Phillipps & A.L. Lamb, *Nature Malaysiana* 13, 4 (1988) 10; Pitcher Plants of Borneo (1996) 153, f. 81. — Type: *Jumaat Adam et al. 2442-4* (holo not designated, UKMS; iso UKMS, ABD, BO, K, L, SAN, SAR, Sabah National Parks Herbarium), Borneo, Sabah, Mt. Kinabalu, 1900 m, 2 Feb 1988.

Specimens of this hybrid share the triangular stem, the smaller lid with glandular crest, and pitcher coloration of *N. burbidgeae*, while with *N. rajah* they share the peltate leaf-tip and the expanded peristome with an undulate outer edge.

Note — Four duplicates (at UKMS) are cited as the holotype in the protologue, of these one (sheet 4) appears to be the only sheet annotated with “Type Specimen”, although clearly all duplicates were used in the description by the authors. As sheet 4 comprises a pitcher alone, sheet 3 which includes leaf-blades and stem material would probably be a better lectotype. Without having seen the material we have deferred lectotypifying any particular element. As with other wild hybrids, the parentage is assumed rather than known. *Nepenthes burbidgeae* is a rare species, as is *N. rajah* and this hybrid is correspondingly a great deal rarer.

#### 14. *Nepenthes burkei* Mast.

*Nepenthes burkei* Mast., *Gard. Chron.* (1889) 492, f. 69, and 566; Sh. Kurata & Toyosh., *Gard. Bull. Sing.* 26 (1972) 155. — Type: *J. Veitch & Sons s.n.* (K, lecto), cultivated from material collected by David Burke from Mindoro, Philippines.

*Nepenthes burkei* var. *prolifera* Mast., *Gard. Chron.* III, 8 (1890) 184. — Type: *J. Veitch & Sons s.n.* (K, lecto), cultivated.

*Nepenthes burkei* var. *excellens* Veitch, *J. Roy. Hort. Soc.* 21 (1897) 233. — Type: not located.

Distribution — Philippines (Mindoro and Panay Islands).

Ecology — Not recorded; 1300–1600 m altitude.

Notes — 1. *Nepenthes burkei* was first exhibited by Veitch nurseries at a Royal Horticultural Society meeting under the name *Nepenthes burkeii*. This name was then formalised by Masters in the Gardeners Chronicle. In the original description it was stated that this species originated from Borneo, but this was corrected in a later issue of the Chronicle (1889: 566) to the Philippines. The type chosen is a cultivated specimen at K with a reference to the protologue and inscribed “*Nepenthes burkei*, Mast. , Hort. J. Veitch & Sons Jan 16, 1890.” Presumably the date is that upon which it was presented to Kew, not the date on which the specimen was made, otherwise we should have lectotypified the plate cited in the protologue instead, this being the only other original element. A specimen probably contemporary with the original wild collection of the species: “David Burke 1670, Isla Mindoro” was presented to Kew in 1884, but was not mentioned in the protologue and there is no evidence that Masters studied it.

2. We here lectotypify *N. burkei* var. *prolifera* Mast., which seems to be no more than an extinct cultivar, on a specimen in the Kew herbarium apparently labelled in Masters’ hand “*Nepenthes Burkei* var. *prolifera* Mast.! in the Gardeners’ Chronicle 1890 vol. 8, p. 184. Type specimen! Borneo. From J. Veitch & Sons Nursery. Presented by Dr M.J. Masters Aug. 1890.”

3. *Nepenthes burkei* is closely related to *N. ventricosa* of Luzon. The present species can be distinguished by the less strongly waisted, green-blotched purple pitchers with lid as large as mouth and with 6 or 7 pairs of nerves. In *N. ventricosa* the pitchers are more narrowly waisted, glossy yellowish white, with lids much smaller than the mouth and with only 3–4 pairs of longitudinal veins in the leaf-blade.

## 15. *Nepenthes campanulata* Sh. Kurata

*Nepenthes campanulata* Sh. Kurata, Gard. Bull. Sing. 26 (1973) 227, t. 1 & 2; The Heredity 26, 10 (1972) 44 & 50, nomen; Phillipps & A.L. Lamb, Pitcher Plants of Borneo (1996) 78, f. 44. — Type: *Kostermans 13764* (holo SING; iso A, n.v., BM, BO, CANB n.v., K, KEP n.v., L, NY n.v.), Borneo, East Kalimantan, Sankulirang, Ilas Bungaun, upriver from Sangkulirang, 300 m, 9 Sep 1957.

Emended description: Short climber to 30 cm long (but upper pitchers and inflorescence not known); internodes to 0.4 cm thick. Only lower pitchers and leaves known. Leaf blade obovate; 5–9 × 1.2–2.5 cm; apex rounded, peltate by 0.1–0.4 cm; base attenuate, sides ± parallel; longitudinal veins 3 on each side, arising from base of midrib, throughout blade, confluent and irregular near apex, pennate nerves obscure; margin regularly crinkled and wavy, coriaceous; tendril to 4 cm, curving abruptly to base of pitcher, but not coiled. Lower pitchers campanulate, ventricose near base, narrowed to middle, and broadening at mouth; to 8 × 4 cm; wings absent, but with a pair of ribs; mouth circular, horizontal, to 4 cm across; peristome very reduced, with short, conical recurved teeth to 0.3 mm on inner edge, 0.25–0.4 mm apart, the margin scarcely thickened between these teeth; inner surface glandular in lower 1/4 only; spur simple, flattened, to 1.5 mm long; lid elliptic-oblong to ovate, 1.5–2 × 1.2–1.5 cm, junction with pitcher broad, 3–4 mm across, glands deeply sunken, 0.1–0.2

mm across, scarcely rimmed, dense near base and along midline, becoming sparse towards margin. Inflorescence unknown. Indumentum sparse, dense below peristome and around spur, brown, < 0.1 mm long. Colour yellowish green.

Distribution — Borneo: East Kalimantan (Ilas Bungan). Type collection only.

Ecology — On sheer limestone walls, 300 m.

Notes — 1. The thick leaves with their wavy margins, and the reported yellowish coloration of the plants are probably a reflection of its harsh life on limestone rock surfaces.

2. In other species with strongly infundibuliform pitchers such as *N. dubia*, *N. eymae* and *N. inermis* the lid is very narrow, and before opening the pitcher is laterally flattened along its length. *Nepenthes campanulata* on the other hand has a relatively small, elliptic lid. Thus after opening, the mouth of these pitchers must expand far more than is the norm in the genus. In this respect they are similar to the pitchers of *N. reinwardtiana* which has a broad infundibuliform pitcher with a wide mouth, but a relatively small lid and a very reduced peristome.

3. This species was reported to be absent from the type locality in 1987, the whole area having been burnt over during the drought of 1982. It is possible that the species is now extinct at this location.

4. The list of herbaria at which isotypes are placed is derived from the labels on the duplicates seen.

## 16. *Nepenthes clipeata* Danser

*Nepenthes clipeata* Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 281, f. 2; Philipps & A.L. Lamb, Pitcher Plants of Borneo (1996) 80, f. 45. — Type: *Hallier B 2344* (lecto, designated here, BO sheet no. 1711-04; iso BO × 8, K × 2), Borneo, W Kalimantan, G. Kelam, Feb 1894.

Distribution — Eastern Borneo (Mt. Kelam). Known only from the type gathering.

Ecology — Reportedly growing on the sheer granite walls of Mt. Kelam, otherwise unknown.

Notes — 1. This species is unmistakable, with its orbicular leaf with the tendril arising from near the centre of the blade. Kurata (1976) and Adam et al. (1991) claim that the species is a limestone endemic, but this is not in agreement with either the collection notes or the type locality (granitic).

2. It seems that a number of horticultural collectors have visited the site regularly, and the species is now said to be scarce.

## 17. *Nepenthes danseri* Jebb & Cheek, *spec. nov.* — Fig. 3

*Nepenthes* sp. in Jebb, Science in New Guinea 17 (1991) 47, f. 29.

*A. N. tomoriana* Danser (et ceteris speciebus inflorescentiis paniculatis gaudentibus) pedunculis partialibus bracteis non gerentibus, glandulis operculi paucis c. 3 mm diametro medio operculi restrictis (non numerosis minus quam 2 mm diametro et passim distributis). — Typus: *Jebb 989* (holo K; iso BO, BRI, CANB, L, LAE, MAN), New Guinea, Waigeo Island, Go village, 100 m, 8 Sep 1992.

Shrub or climber 0.3–4 m tall. Stem terete, 0.3–0.9 cm thick. Leaves petiolate, leaf-blade broadly to narrowly elliptic; 6–11.5 × 2–4.3 cm; rosette leaf-blade sometimes

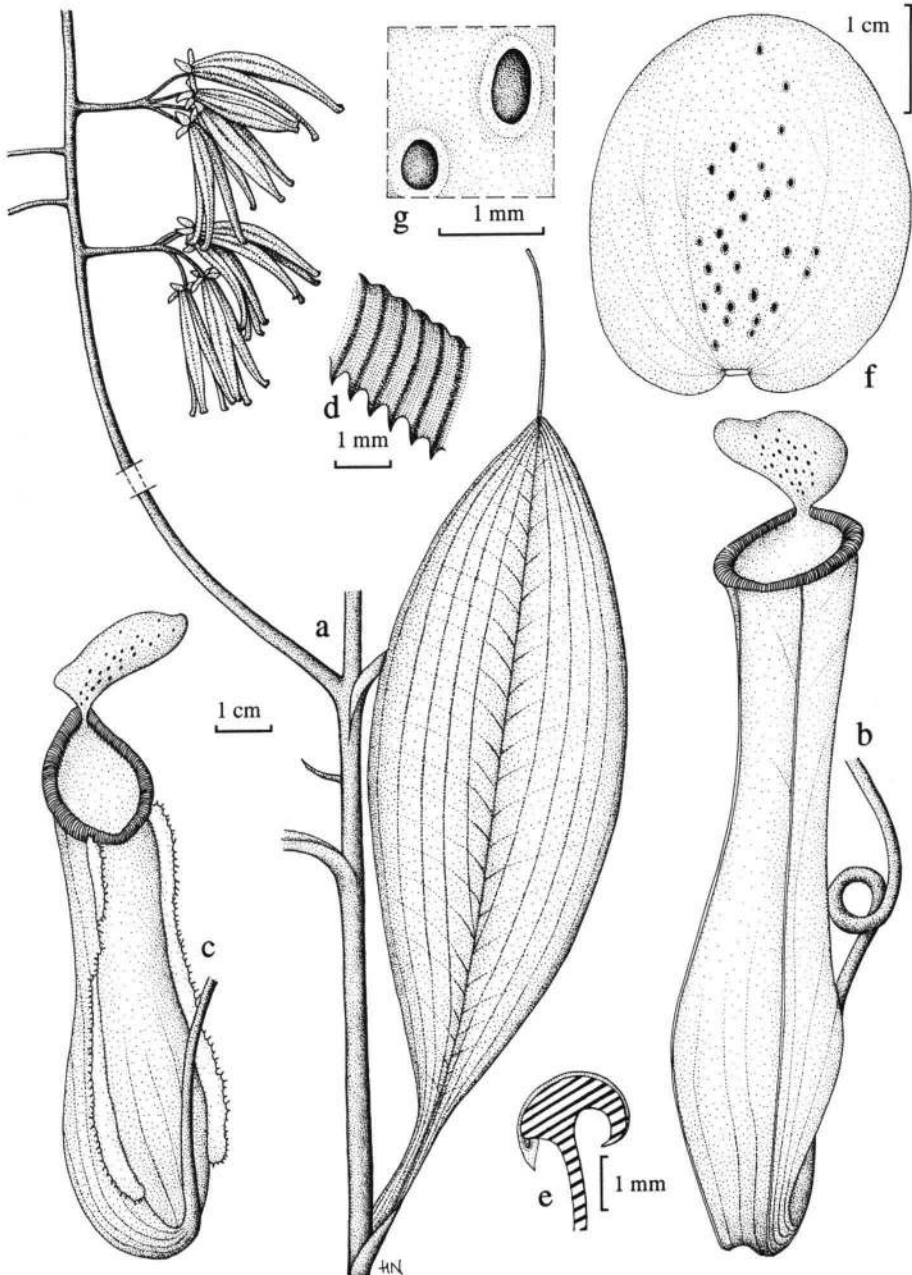


Fig. 3. *Nepenthes danseri* Jebb & Cheek. a. Stem with part of female inflorescence; b. upper pitcher; c. lower pitcher; d. detail of peristome, internal view; e. section through peristome; f. underside of lid; g. detail of glands on lower lid surface (Jebb 989).

very reduced; apex acute to rounded, base tapering to a winged petiole; petiole 1.5–4 cm long; amplexicaul, clasping the stem by half its diameter, or rarely decurrent to 1.5 cm below the node, with the two margins becoming united on the opposite side of the stem. Leaves of short stems with blades narrowly lanceolate, 1.5–9.5 × 0.5–2.5 cm; petioles 0.5–2 cm, sheathing. Longitudinal veins 4–8 on each side of the midrib, mostly arising from base, but sometimes 1 or 2 arising from midrib, spread throughout width of the leaf-blade. Pennate nerves numerous, arising obliquely and curving towards the margin, less distinct than the longitudinal veins. Lower pitchers ovoid in lower 2/3, cylindrical towards mouth, and broadening there; 4.5–10 × 1.8–2.7 cm; with 2 fringed wings to 0.5 cm broad with fringed elements 0.5–1.5 mm long, c. 0.5 mm apart; mouth oblique; peristome rounded, 0.5–2 mm across, ribs c. 0.3 mm apart, barely perceptible, internally with triangular teeth to 0.5 mm long; spur 1–1.5 mm long, stout, apex rounded. Lid elliptic to orbicular; 2–3.5 × 2.1–3 cm; apex rounded, base truncate to cordate; with 15–50 rimmed glands 0.2–0.7 mm across, most numerous towards midline of lid. Upper pitchers ovoid in lower half, narrowing towards mouth, but widening again at c. 2/3 its length, then infundibuliform and broadest at the mouth; to 9–13.5 × 2.2–3.2 cm; with 2 prominent ventral ridges, lacking fringed elements; mouth oblique; peristome thickened, rounded, 1–3 mm across, ribs 0.3–0.5 mm apart, 0.1–0.3 mm high; spur stout to 2 mm long; lid as in lower pitcher. Female inflorescence 25 × 0.2 cm; partial peduncles 0.7–1.8 cm, 2–5-flowered, rarely with a short bract; pedicels to 0.9 cm long; tepals ellipsoid, 2 × 1.5 mm. Male inflorescence 18 × 0.2 cm; peduncle 10 cm; partial peduncles 0.4–1.6 cm long, 1–5-flowered; pedicels 0.3–0.7; tepals elliptic, 2 × 1.5 mm; staminal column c. 1.5 mm long; anther-head sub-globular, 0.5 mm long, 1 mm wide. Fruit with valves 14–28 × 2.5–4 mm. Seeds fusiform, 11.5 × 0.5 mm. Indumentum sparse and inconspicuous, of appressed, simple, bronze hairs c. 0.4 mm long on new parts, lower pitchers, near spur only of upper pitchers, dense on inflorescences, and midribs of new leaves. Colour of stems reddish; leaves yellowish green, occasionally the lower leaves maroon; midrib and tendrils red; lower pitchers green with khaki to brown marbling; upper pitchers greenish-yellow to pale green; underside of the lid with red streaks; sepals green, red in fruit; fruit olive yellow; indumentum golden-orange.

Distribution — Apparently restricted to ultrabasic rocks in Halmahera (Moluccas), and on the north coast of Waigeo Island (New Guinea).

Ecology — Most commonly in open scrub or on bare soils on ultrabasic rock, also in forest, but then not bearing pitchers; sea level to 300 m.

Notes — 1. This species was outlined in Jebb (1991); at that time insufficient material was available for a complete description. It is a gracile species with a yellowish coloration overall. Another unusual feature of this species are the very small blades of the rosette leaves, and the ability of the plants to grow in shade, where they fail to produce pitchers.

2. *Nepenthes tomoriana* Danser from Sulawesi is the only paniculate species with which *N. danseri* is likely to be confused. *Nepenthes danseri* is told apart by the lack of a bract on the partial-peduncles, and the fewer, larger glands on the lid. The rosette and lower pitchers of *N. tomoriana* are ellipsoid and much more inflated, 3.5–4 cm wide (not 1.8–2.5 cm), the fringe elements 5–10 mm long (not 0.5–1.5 mm) and grouped in clusters (not evenly spaced); the peristomes are 4 mm deep on the inner



face (not to 2 mm) with teeth to 7 mm long (not 0.5 mm) and with prominent, ridge-like (not barely perceptible) ribs.

3. The species is named in honour of Benedictus Danser (1891–1943), whose taxonomic studies of this genus are without parallel.

*Collections* — MOLUCCAS. Halmahera, Nucifera, Weda Dist., *de Haan 1718* (BO, L). — NEW GUINEA. Waigeo Island, Go village, *Jebb 989* (Type); path from Poean to Tofal Bay, Go Isthmus, *van Royen 5541* (K, L, LAE); path from Poean to Fofak Bay, *van Royen 5563* (L); Kambele hills, SE of Kabare, *van Royen 5417* (L), *5423* (BO, K, L).

## 18. *Nepenthes densiflora* Danser

*Nepenthes densiflora* Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1940) 268; Schlauer & Nerz, Blumea 39 (1994) 140. — *Nepenthes bongso* × *N. pectinata* Danser in Bull. Jard. Bot. Buitenzorg III, 16 (1928) 274; Steenis, Tijd. Kon. Aardrijksk. Genootsch. 55 (1938) 750–785, ic. 7. — Type: *van Steenis 8331* (lecto, designated here, BO; iso L, SING), Sumatra, Aceh, Gajo Land, Poetjoek Angasan, biv. I to biv. II, 2400 m, 28 Jan 1937.

Distribution — Northern Sumatra (Aceh province).

Ecology — Montane scrub, 1700–3000 m.

Note — Among the Sumatran species, *N. densiflora* can only be confused with *N. bongso*, in its infundibuliform upper pitchers, which are constricted below the mouth. From *N. bongso* it differs by the more abrupt origin of the pitcher from the tendril (in the latter the curve of the lower pitcher is broad, and broadens gradually), the clasping, non-auriculate leaf bases, and the larger lid glands. *Nepenthes diatas*, which occurs in the same region, is distinguished by its ventricose-tubular pitcher and stiff, almost woody peristome.

*Selected collections* — SUMATRA. Aceh, *van Steenis 9081* (BO, L); Aceh, top Goh Lemboeh, 3000 m, *van Steenis 9130* (BO, L); G. Losir, 2700–2800 m, *van Steenis 8491* (BO, L).

## 19. *Nepenthes diatas* Jebb & Cheek, *spec. nov.* — Fig. 4

A *N. densiflora* Danser ascidiis superioribus medio constrictis basi inflatis (non infundibuliformibus), laminis foliorum basi auriculatis (non decurrentibus) a *N. singalana* Becc. peristomium lignosis (non chartaceus) differt. — Typus: *de Wilde & de Wilde-Duyffes 14927* (holo L; iso K), Sumatra, Aceh province, G. Bandahara, 10 km NE of Seldok, 25 km N of Kutacane.

Subscandent shrub, to 2.5 m in length. Stem base woody; stem 0.4–0.8 cm thick, quadrangular, angles being most marked below the petiole base; internodes 1–3.5 cm. Upper leaf-blade lanceolate, 9.5–17 × 2.5–3.5 cm; apex acute, base attenuate, subparallel-sided, to 1.6 cm across, ultimately abruptly clasping 1/2 stem, occasionally auriculate; longitudinal veins 3 or 4, in outer half of blade; pennate nerves numerous, oblique and parallel, inconspicuous. Lower pitchers not known. Upper pitchers ventricose in lower 1/3, cylindrical in upper 2/3, and gradually broadening towards mouth; 14–22 × 3–4.5 cm; with prominent ridges, and rarely with very short fringed wings immediately below peristome to 1 cm broad including fringed elements; mouth oblique and slightly concave; peristome woody, 0.5–1.5 cm across, rounded at front, flattened towards lid, inner edge toothed, teeth to 2.5 mm long, outer edge

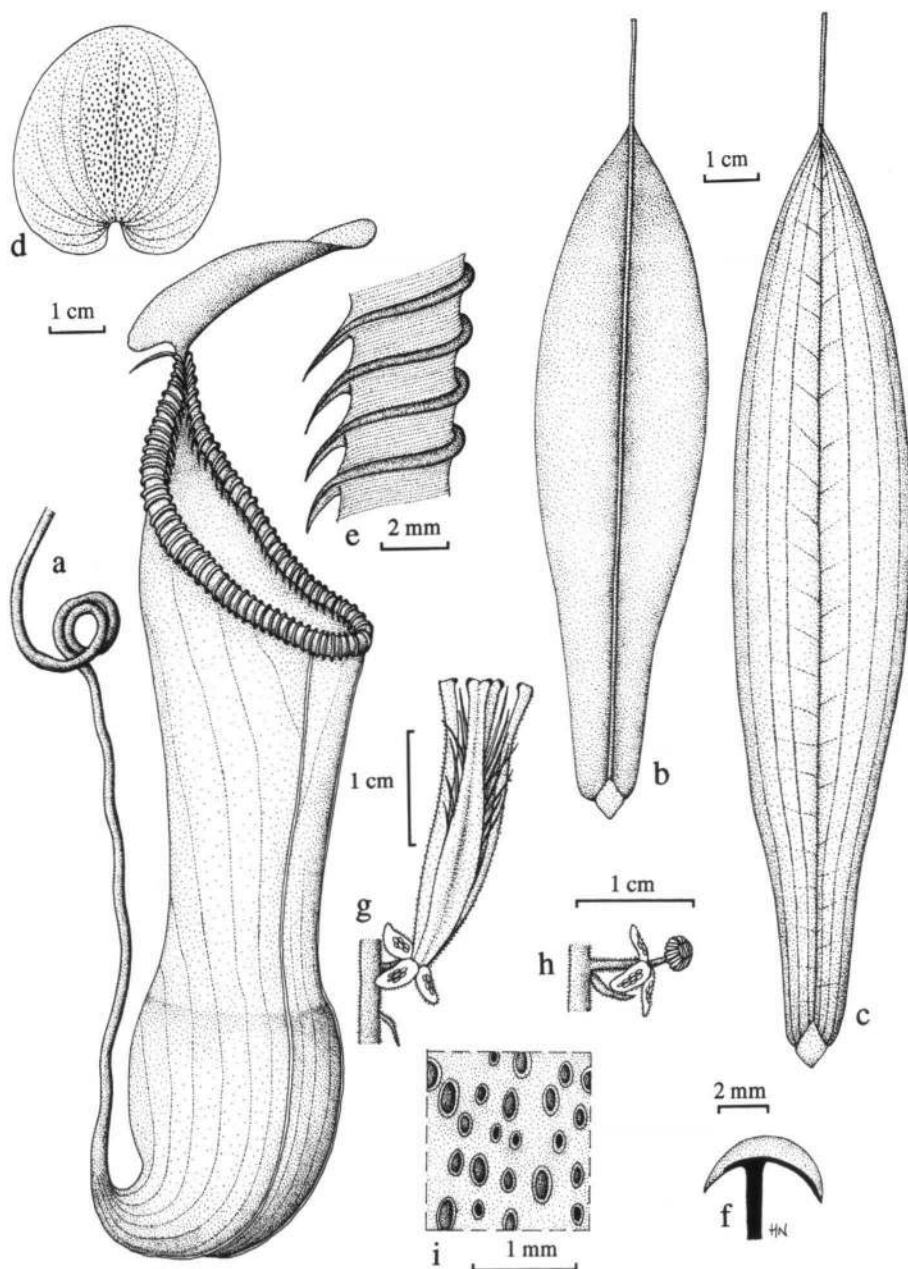


Fig. 4. *Nepenthes diatas* Jebb & Cheek. a. Upper pitcher; b. lower leaf surface; c. upper leaf surface; d. underside of lid; e. detail of peristome, internal view; f. section through peristome; g. fruit; h. male flower; i. detail of glands on lower lid surface (a–g, i: de Wilde & de Wilde-Duyffes 13172; h: de Wilde & de Wilde-Duyffes 15285).

recurved, and extending further than inner edge, ribs 1–2.5 mm apart, to 1.5 mm high; spur simple to 12 mm long; lid round, diameter 3.2–6.5 cm, apex rounded to truncate, base cordate, thickened on midline, glands circular, 0.15 mm across, very numerous, on midline elliptic, 0.6 mm long. Inflorescence a raceme, 26–38 cm long, flowers clustered and dense in topmost 1/3–1/4. Partial peduncles 1-flowered, rarely 2-flowered, 0.5–1 cm long, with a flattened bract to 6 mm in length at the base of the partial peduncle, or even somewhat below on the peduncle; sepals ovate 4–6 × 2–3 mm, glands small, to 0.2 mm, confined to the middle of the adaxial surface of the tepal, being absent near base and apex; staminal column 2–4 mm long, anther head to 2 mm long, and 2.5 mm across. Fruit valves 27–32 × 3–4 mm. Seeds unknown. Indumentum of erect reddish brown hairs c. 0.5 mm long, more or less dense throughout, absent from upper leaf-blade, soon glabrescent, but persistent on tendril and in leaf axils, and dense on inflorescence, including staminal column and valve. Colour of pitchers reddish brown; flowers brownish or purple-brown, or tepals rusty, purple inside; anthers pale yellow; fruits rusty brown.

Distribution — Northern Sumatra.

Ecology — Montane scrub and mossy forest; 2400–2600 m.

Notes — 1. *Nepenthes diatas* is part of the Sumatran *singalana*-group. In its ventricose-tubular upper pitchers and attenuate, subparallel-sided leaf bases it resembles *N. singalana* and *N. spathulata*, but differs from both in the woody, rather than papery, peristome. It is probably derived from *N. singalana*, representing a far more robust version of that species.

2. *Diatas* is a Bahasa Indonesian word for ‘on top’: the species is found both on the top of mountains, and in Aceh, the most northerly, or ‘topmost’, region of Indonesia.

3. Collections of lower and rosette pitchers are needed to complete our knowledge of *N. diatas*.

Collections — SUMATRA. Aceh province, G. Bandahara, 10 km NE of Seldok, 25 km N of Kutacane, *de Wilde & de Wilde-Duyffes 14927* (Type); G. Bandahara, 25 km NNW of Kutacane, *de Wilde & de Wilde-Duyffes 13172* (BO, K, L); G. Bandahara, 12 km NE of Seldok, 25 km N of Kutacane, *de Wilde & de Wilde-Duyffes 15285* (L).

## 20. *Nepenthes distillatoria* L.

*Nepenthes distillatoria* L., Sp. Pl. (1753) 955; Burm., Fl. Indica (1768) 190; Gaertn., Fruct. 2 (1791) 18, t. 83, f. 6; Willd., Sp. Pl. ed. 4, 2 (1805) 873; Aiton, Hort. Kew. 5 (1813) 420, p.p.; Jack, Comp. Bot. Mag. (1835) 271; Thwaites, Enum. Pl. Zeyl. (1861) 290, n.v.; Hook. f. in A.D.C., Prodr. 17 (1873) 93; Hook. f., Fl. Brit. India 5 (1886) 68. — Type: not located, probably a Hermann collection at BM.

*Bandura zeylanica* Burm., Thes. Zeyl. (1737) 42, t. 17, n.v.; Burm. ex Brongn., Ann. Sci. Nat. 1 (1824) 43, n.v. — *Nepenthes zeylanica* (Burm.) Raf., Fl. Tellur. 4 (1836) 101. — Type: not located.

*Nepenthes indica* Poir. in Lam., Encycl. Meth. Bot. 4 (1798) 458; Link, Handbuch (1829) 369; Raf., Fl. Tellur. 4 (1836) 101. — Type: not located.

*Nepenthes hirsuta* var. *glabrescens* Smith, Gard. Chron. 1 (1882) 398, f. 59. — *Nepenthes smithii* Beck, Wien. III. Gartenz. 20 (1895) 188. — Type: not located.

*Nepenthes rubra* G. Nicholson [non *N. rubra* Hort. ex Rafarin, Rev. Hort. (1869) 270], Ill. Dict. Gard. 4 (1886) 439. — *Nepenthes zeylanica* var. *rubra* Beck, Wien. III. Gartenz. (1895) 226. — *Nepenthes distillatoria* var. *rubra* (G. Nicholson) Macfarl. in Engl., Pflanzenr. 4, 3 (1908) 87. — Type: not located.

*Nepenthes speciosa* Hort. ex Beck, Wien. Ill. Gartenz. 20 (1895) 226, in synon.

*Nepenthes zeylanica* auct. non (Burm.) Raf.: Chapman, Ceylon J. Sci. Sect. A, Bot. 12 (1947) 221, n.v. — *Nepenthes chapmanii* N.P. Balakr., J. Bombay. Nat. Hist. Soc. 67 (1970) 65. — Type: not located.

Non *Nepenthes distillatoria* sensu R. Grah., Edinb. New Phil. J. (1827) 371 = *N. khasiana* Hook. f., n.v.; nec sensu Jack, Comp. Bot. Mag. 1 (1835) 271 = ?*N. gracilis*; nec sensu Raf., Fl. Tellur. 4 (1836) 101 = *N. khasiana* Hook. f.; nec sensu Steud., Nom. ed. 2, 2 (1841) 190 = *N. mirabilis* (Lour.) Druce; nec sensu Brion, Belg. Hortic. 5 (1855) 196 = *N. madagascariensis* Poir.; nec sensu Jeanneney, Nouv. Caléd. Agric. (1894) 92 = *N. vieillardii* Hook. f.

Distribution — Sri Lanka.

Ecology — Waterlogged open scrub, road embankments and other cleared areas, also in forest; from sea level to 700 m.

Notes — 1. The only species of *Nepenthes* from Sri Lanka. It appears to survive well following clearance of forest.

2. The name has been used once in the Flora Malesiana region, by Jack, probably in reference to *N. gracilis*.

*Selected collections* — SRI LANKA. Sabaragamuwa Prov., Ratnapura Dist., Kalawana, Clayton 5703 (K); Malwalakelle on Kalawana-Pedikanda Rd, R.B. & A.J. Faden 76/445 (K); Western Province, Kalutara Dist., Nagoda, Cramer 5201 (K).

## 21. *Nepenthes dubia* Danser

*Nepenthes dubia* Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 285, f. 4. — Type: *Bünnemeijer* 938 (lecto, designated here, BO; iso BO), Sumatra, Mt. Talakmau (Ophir), 1900 m, 29 May 1917.

*Nepenthes bongso* auct. non Korth.: Tamin & M. Hotta in M. Hotta, Diversity and dynamics of plant life in Sumatra (1986) 83, partim.

*Nepenthes tenuis* Nerz & Wistuba, Carnivorous Plant Newsl. (1995) 104, f. 2. — Type: *Meijer* 6949 (holo L), Sumatra, Taram, river Tjampo, 1000 m, 24 Aug 1957.

Emended description: Female inflorescence a raceme to 12 cm overall, peduncle 7 cm; pedicels to 6 mm, with a single bract 1–2 mm long, slightly above the middle (*Nagamasu* 4254).

Distribution — Central Sumatra.

Ecology — Not recorded; 1000–2500 m altitude.

Notes — 1. Prior to Danser's work, Backer had intended to name this species 'linguifer', and proposed to include it with specimens of *N. inermis*. *Nepenthes inermis* shares a similar shaped pitcher, lid and leaf-blade shape. The only differences are that *N. dubia* has fewer longitudinal veins, a slightly broader lid (5 mm vs. 3 mm) with more numerous, but much smaller glands, and bears a peristome, which *N. inermis* completely lacks. *Nepenthes dubia* was reduced to *N. bongso*, along with *N. inermis* by Tamin & Hotta (1986).

2. Previously only known from Mt. Talakmau, this species is possibly a hybrid between *N. inermis* and *N. bongso* (Danser, 1928). *Nepenthes tenuis* is included here with some hesitation, the pitcher is somewhat broader in its lower half, but in all other respects matches the current species; the collecting locality (1000 m) is considerably lower than the remaining collections.

*Collections* — SUMATRA. NW slope of G. Talakmau (G. Ophir), *Bünnemeijer 938* (Type), 4/8/1989, *Nagamasu et al.* 4254 (BO); Taram, river Tjampo, *Meijer 6949* (Type of *N. tenuis*); G. Talang, 2/4/72, *Kurata s.n.* (SING).

## 22. *Nepenthes edwardsiana* Low ex Hook. f.

*Nepenthes edwardsiana* Low ex Hook. f., Trans. Linn. Soc. 22 (1859) 420, t. 70; Sh. Kurata, *Nepenthes of Mt. Kinabalu, Sabah* (1976) 44; Philipps & A. L. Lamb, *Nature Malaysiana* 13, 4 (1988) 21; *Pitcher Plants of Borneo* (1996) 82, f. 46. — Type: *Low s.n.* (K), Borneo, Sabah, Mt. Kinabalu, N side, 6000–8000 ft, 1877–78.

*Nepenthes edgeworthii* Rchb. f. ex Beck, Wien. III. Gartenz. (1895) 183, in synonym. *Herb. Reichenbach s.n.* (n.v.).

*Nepenthes villosa* auct. non Hook. f.: Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 397, partim.

Non *Nepenthes edwardsiana* Hook. f. subsp. *macrophylla* Marabini, Mitt. Bot. Staatssamml. Münch. 23 (1987) 427, quae = *N. macrophylla* (Marabini) Cheek & Jebb (see species 43).

Distribution — Borneo (Mt. Kinabalu and Mt. Tamboyukon).

Ecology — Large climber, occasionally epiphytic in mossy forest, 1500–2700 m.

Notes — 1. The sheet selected as lectotype from amongst the three at K, of the only collection cited in the protologue, is that bearing the collecting notes of Low in his hand.

2. Danser reduced this species to *N. villosa*, while Harms resurrected it. Marabini described a subspecies from Mt. Trus Madi in Sabah: *Nepenthes edwardsiana* subsp. *macrophylla* Marabini. In view of the very different facies of this latter taxon, we have decided to change the status to that of a species.

3. Closely related and sometimes confused with *Nepenthes villosa* and *N. macrophylla*. This species is a climber, the tendrils are exceptionally long, and the pitchers ventricose below, tubular above. *Nepenthes villosa* is a prostrate scrambler with short urceolate pitchers. The pitchers of *N. edwardsiana* differ from those of the closely related *N. macrophylla* in being more papery, narrowly subcylindrical, at least 4 times as long as broad (vs. woody, broadly cylindrical and less than 3 times as long as broad in *N. macrophylla*), the lower 1/3–1/4 of the pitcher is slightly swollen, the upper part narrower and cylindrical (vs. pitcher with a shallow central constriction in *N. macrophylla*). The leaf-blade of *N. edwardsiana* never exceeds 20 cm, while that of *N. macrophylla* frequently reaches 35 cm. An important difference not hitherto appreciated between *N. edwardsiana* and *N. villosa* is in the structure of the internal peristome. In *N. edwardsiana* the flattened peristome teeth bear a narrow-mouthed gland on the abaxial surface (i.e. away from the lid), and below each peristome tooth there is a distinct, elliptic pocket. In *N. villosa* the gland has a toothed opening, and the pockets are so deepened as to form a series of rectangular partitions between the front peristome, and a second series of irregular teeth which lies close to the pitcher wall. In *N. rajah* the inner peristome wall is elaborated to form three layers, each interconnected with cross walls.

*Selected collections* — BORNEO. Sabah, Mt. Kinabalu, Marai Parai spur, *Holtum s.n.* (SING), *Bailes & Cribb 843* (K); *J. & M.S. Clemens 10871* (BO), 30959 (K).

Hybrid — *Nepenthes edwardsiana* × *N. villosa*; *N.* × *harryana* Burb., Gard. Chron. 1 (1882) 56; Macfarl. in Engl., *Pflanzenr.* 4, 3 (1908) 54; Sh. Kurata, *Nepenthes of Mt. Kinabalu, Sabah* (1976) 45, t. 12. — Type: not located.

### 23. *Nepenthes ehippiata* Danser

*Nepenthes ehippiata* Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 286, f. 5; *ibid.*: 426, f. 36; Philipps & A.L. Lamb, Pitcher Plants of Borneo (1996) 85, f. 47. — Type: *Amdjah* 497 (lecto, designated here, BO sheet #1711-60; iso BO sheet 1711-61), Borneo, Kalimantan, Bt. Batoe Lesong, 28 Jan 1899.

As *Nepenthes lowii* but upper leaf with petiole base continued down stem in a prominent, recurved ridge. Longitudinal veins entirely absent, rarely 1. Pennate nerves oblique, branching once or twice before reaching edge of leaf, conspicuous. Upper pitchers only very slightly constricted at midpoint, the peristome somewhat more developed, the inner glands larger, the lid relatively broader and larger than *N. lowii*, towards the base with thick processes 2–3 mm long and 1 mm thick, amongst these 1 mm wide lipped glands with a narrow central opening < 0.1 mm wide, these glands more numerous toward the lid margin, where the processes are absent.

Distribution — Borneo: mountains of central Kalimantan; Bt. Raya, Bt. Lesong (type locality).

Ecology — Forest (?); 1000–1900 m altitude.

Notes — 1. The drawing of *N. ehippiata* in Danser (1928) is not accurate in that in this species the lid bristles are far less numerous, concentrated towards the base of the lid and are both shorter and stouter than those shown. Danser did not appreciate how similar this species was to *N. lowii*. The upper pitchers of *N. ehippiata* differ from those of *N. lowii* in their less constricted middle, their more developed peristome, and their relatively large lids. Both *N. ehippiata* and *N. lowii* have more or less cylindrical lower pitchers with a well developed peristome: it is only in the upper pitchers that the extreme, and characteristic shape is developed. The large saddle-like leaf bases of *N. ehippiata*, from which the species derives its name, are very similar to those of some *N. northiana* collections.

2. *Nepenthes ehippiata* appears to replace *N. lowii* in the central mountains of Kalimantan, the latter being abundant in Sarawak, Brunei and Sabah.

Collections — BORNEO. Kalimantan Barat, Bt. Raya, Winkler 1023 (BO), Nooteboom 4617 (BO); Kalimantan Timur, Bt. Lesong, *Amdjah* 497 (Type).

### 24. *Nepenthes eustachya* Miq.

*Nepenthes eustachya* Miq., Fl. Ned. Ind. 1, 1 (1858) 1074, suppl. 151; Ill. de la flore de l'Arch. ind. 1 (1870) 3, pl. 3; Hook. f. in A.DC., Prodr. 17 (1873) 99; Beck, Wien. Ill. Gartenz. (1895) 217; Macfarl. in Engl., Pflanzenr. 4, 3 (1908) 51. — Type: *Teijsmann* 529 (lecto, designated here, BO; iso BO × 2), Sumatra, Sibolga, on the coast, February 1856.

Terrestrial climber to 5 m tall; stem terete, 0.3–0.7 cm thick. Leaf petiolate, blade obovate to oblong-lanceolate; 14–19.5 × 2.9–5 cm; apex rounded, sub-peltate, or slightly emarginate; base tapering to winged; longitudinal veins 2 or 3 (or 4) on each side of the midrib, some arising from midrib, confined to outer 1/2–1/3 of lamina; pennate nerves arising obliquely from the midrib at an angle of c. 30° Petiole to 5 cm long, 0.7 cm wide, broadening at very base, and clasping 1/2 stem, not decurrent. Lower pitchers not seen. Upper pitchers ventricose-tubular, widening abruptly from

base, and somewhat woody and angular there, becoming obovoid, then narrowing and gradually enlarging towards the mouth;  $11\text{--}24.5 \times 2.5\text{--}4.5$  cm; normally lacking wings, but rarely with fringed wings to 0.3 cm, the fringe elements to 0.4 cm; mouth oblique, attenuate to lid; peristome rounded to slightly flattened in cross section,  $0.2\text{--}0.5(-0.7)$  cm across, ribs c. 0.3–0.4 mm apart, inner margin with no apparent teeth; spur 2–4 mm long, usually bifid, occasionally with ancillary hair-like appendages arising from near base, or rarely simple, flattened to 10 mm long; lid obovate to rounded, rarely somewhat broader than long, base rounded to scarcely cordate,  $3\text{--}6.5 \times 2.5\text{--}6.7$  cm, lacking a crest below, glands not prominently lipped,  $0.1\text{--}0.15$  mm across, scattered, densest near base. Inflorescence a raceme to 50 cm overall; partial peduncles forked near base of inflorescence, simple above, to 23 mm long; tepals lanceolate, to  $4 \times 2$  mm. Fruits to  $17 \times 2.3$  mm. Indumentum sparse on new shoots, evanescent.

Distribution — Sumatra, from Lake Toba in the north to the Padang region in the south

Ecology — Forest margins, sea level to 1600 m.

Notes — 1. No Teijsmann material has been seen from Leiden or Utrecht. There are three sheets at Bogor which appear to represent *Teijsmann 529*. On two of these a 'Herb. Hort. Bot. Bog.' label has the name *Nepenthes eustachya* Miq. written in Miquel's handwriting. The sheet with a single complete pitcher is selected here as the lectotype.

2. Danser united *N. eustachya* with *N. alata*; however, in our opinion the two differ sufficiently in morphology to support the reinstatement of Miquel's species. The two species differ as described under *N. alata*.

3. Danser (1928: 261) included Peninsular Malaysia in the range of *Nepenthes alata* (which also included *N. eustachya*) on the basis of a single, misidentified specimen of *N. gracillima* (Ridley 16097) from Mt. Tahan (Kiew, 1990).

*Selected collections* — SUMATRA. Lake Toba, *Lörzing 11603* (BO); Sibolga, *Alston 14421* (BO); Bt. Tinggi, *Bünnemeijer 3054* (BO); Air Putih, E of Pajakumbuh, *Alston 14384* (BO); Panorama Selat Malaka, 40 km N of Pajakumbuh, *Hotta & Okada* (BO).

## 25. *Nepenthes eymae* Sh. Kurata

*Nepenthes eymae* Sh. Kurata, J. Insectivorous Plant Soc. (Japan) 35, 2 (6th Feb 1984) 41 (as *eymai*). — Type: Kurata, Atsumi & Komatsu 102-a (Not located, probably Nippon Dental College, plate in Sh. Kurata, l.c. p. 44), Sulawesi, G. Lumut, 1850 m, 5 Nov 1983.

*Nepenthes infundibuliformis* J.R. Turnbull & A.T. Middleton, Reinwardtia, 10, 2 (10th Feb 1984) 110. — Type: Turnbull & Middleton 83148a (BO n.v.), Sulawesi, G. Lumut Kecil,  $121^{\circ} 41' \text{ E } 1^{\circ} 03' \text{ S}$ , 1500 m, 20 Sep 1983.

Emended description: Lower pitchers cylindrical, slightly constricted below mouth;  $10\text{--}18 \times 2\text{--}6$  cm; with narrow (2 mm) fringed (3 mm) wings in upper 2/3; mouth oblique; peristome rounded in transverse section,  $0.2\text{--}0.5$  cm across at front, expanded, and sinuate towards lid, then to 2.5 cm across; lid subtriangular, to  $4.5 \times 2$  cm, apex acuminate, base truncate to auriculate, with broad, rounded lobes midline strikingly thickened below, basal appendage hooked, apical appendage filiform, mid-

line and appendages with large, elliptic, rimmed glands to  $2 \times 1$  mm, the lid blade with numerous small glands, margin irregular, sinuous. Upper pitchers gradually originating from tendril, with a wide tubular curve which expands rapidly at  $1/2$  to  $3/4$  overall height to form a broad bowl, which is shortly contracted immediately below the peristome; to  $11 \times 8$  cm overall; ventral ridges parallel in lower curve, divergent above; mouth horizontal, peristome forming a 1–3 cm long, vertical, acuminate neck to lid, which overhangs the mouth; peristome in cross section flattened above, sharply curved at outer edge, broadest on inner surface, 0.4–0.8 cm broad, and often sinuate immediately adjacent to this neck; the spur inserted 1 cm from lid, bifurcate at tip. Lid hastate, to 8 cm long, 1 cm broad in middle, 2.5 cm broad at base, the basal lobes rounded, apex obtuse to abruptly rounded, margin sinuate; the basal crest hook-shaped, to 0.8 cm long, apical appendage filiform, to 1.2 cm long; glandulation as in lids of lower pitchers. Unopened pitchers laterally compressed, with a prominent bulge at the dorsal end with spur upright and bifurcation closed. Indumentum on all surfaces, including the underside of lid and leaf-blade surfaces, short tufted hairs to 0.05 mm long, especially dense on tendril, midrib, lid and spur. Colour of leaves dark green, tendrils reddish, pitcher yellowish green below becoming blotched with red above, generally more darkly pigmented within, peristome with numerous narrow streaks of red and green, lid green above, with red blotches below, indumentum maroon.

Distribution — The eastern arm of central Sulawesi.

Ecology — Narrow mossy ridges, 1500–1800 m.

Notes — 1. Along with two other species (*N. hamata* and *N. glabrata*) the nomenclatural history of *N. eymae* involved almost simultaneous publication of two competing names. Kurata's (1984) publication of *N. eymae* preceded Turnbull & Middleton's (1984) *N. infundibuliformis* by a month. Unfortunately the location of the proposed holotype (Kurata 102a), and series of paratypes (Kurata 103, 104 & 105) was not stated (although the name is nonetheless valid under article 37 of the ICBN), and none of this material appears to have been deposited in a public institution, although the holotype is illustrated in the original publication. Similarly, the types proposed by Turnbull and Middleton have not been found at Bogor (though they are cited here). The name *Eyma* is feminine, even though the collector was male, and the correct ending is therefore *eymae*.

2. Closely related to *N. maxima*, but with upper pitchers differing in the narrowly hastate lid and in that the upper pitchers are broadly infundibuliform in the upper half, with a narrow cylindrical basal half.

3. The remarkable pitcher appears to be a specialised trap, its relatively horizontal sides would probably make the capture of much of its prey difficult. The pitcher fluid is extremely viscous in cultivated specimens at Kew. Interestingly this feature is also reported in *N. inermis*, a species with equally infundibulate upper pitchers from Sumatra (see discussion under *N. inermis*).

Collections — SULAWESI. Sulawesi Tengah, Mt. Lumut, Kurata, Atsumi & Komatsu 102a (Type of *N. eymae*, n.v.), 103, 104, 105 (all n.v.); Mt. Lumut, North spur, *Eyma* 3571 (BO), Mt. Lumut Kecil, 20/9/83, Turnbull & Middleton 83148 (Type of *N. infundibuliformis*, n.v.), 83142–47 (undistributed?); Mt. Tomongkobae, 9/10/38, *Eyma* 3968 (BO).



## 26. *Nepenthes fusca* Danser

*Nepenthes fusca* Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 288, f. 6; Sh. Kurata, *Nepenthes* of Mt. Kinabalu, Sabah (1976) 48, t. 13; Phillipps & A.L. Lamb, *Nature Malaysiana* 13, 4 (1988) 24; *Pitcher Plants of Borneo* (1996) 87, f. 48. — Type: *Endert 3955* (lecto, designated here, BO, fertile sheet; iso BO), Borneo, East Kalimantan, G. Kemoel (= G. Kongkemul), 1500 m, 12 Nov 1925.

*Nepenthes maxima* auct. non Reinw. ex Nees: Kondo & Kondo, *Carn. Pl. of the World in Colour* (1983) 110.

*Nepenthes fusca* subsp. *kostermansiana* J.H. Adam & Wilcock, ined. — Type: *Kostermans 21495* (holo L; iso K), Borneo, East Kalimantan, Berau, Mt. Njapa, Kelai River, 1000 m, 25 Oct 1963.

Non *Nepenthes fusca* subsp. *apoensis* J.H. Adam & Wilcock, ined., quae = *N. stenophylla* Mast.

Distribution — Borneo.

Ecology — Mossy forest, ridge tops; 1200–2500 m.

Notes — 1. Of two duplicates of the type at Bogor, the sheet with a male inflorescence is selected as the lectotype. *Nepenthes fusca* is characterised by the narrowly triangular lids with revolute margins. In lower pitchers the lid is more ovate, and often flat, and it is only in the upper pitchers that the characteristic shape is developed. Danser described *N. fusca* from the type specimen alone, and although upper pitchers are present on the two duplicates, none have lids. In his original description the lids are said to be like those of the lower pitchers. It is our interpretation that the plate may have been constructed using the lids of the lower pitchers to complete the upper pitchers. The surviving lids on the specimen are on intermediate upper/lower type pitchers, and consequently the lids do not exhibit the characteristic, narrowly triangular shape of the upper pitchers.

2. The glandular crest at the base of the lid is always present in this species, and an apical appendage may or may not be developed, and then only in upper pitchers. Whilst other workers have argued that the presence of an apical appendage signifies *N. maxima*, we view this species as a closely related taxon, and as in *N. eymae* of Sulawesi, character intergrades occur. *Nepenthes maxima* appears to be entirely replaced in northern Borneo by *N. fusca*. The inflorescence of *N. fusca* is much smaller and more delicate than that of *N. maxima* or *N. stenophylla*.

3. *Nepenthes fusca* subsp. *apoensis*, based on *Chai 35939*, belongs in *N. stenophylla* by virtue of its sheathing leaf bases, rounded lids and reddish indumentum.

*Selected collections* — BORNEO. Sarawak. Kuching, N slopes Mt. Penrissen, 1000 m, *Jacobs 5115* (K, L, SAR); G. Berumpit, near Kuching, *Smythies 12645* (K, L, SING), *Anderson 218* (BO); Carapa Pila, Balleh, 3rd Div, *Ashton 19609* (K, L). — Sabah. Beluran, Bt. Liminintang, NW of Telupid, *Aban & Dewol 91185* (K, KEP, L, SAR, SING); Mt. Kinabalu, *Lantoh 82759* (K, KEP, L, SAR). — Kalimantan Timur. Mt. Kemoel, 1500 m, *Endert 3955* (Type); G. Beratus, near Balikpapan, *Kostermans 7497* (BO, L).

## 27. *Nepenthes glabrata* J.R. Turnbull & A.T. Middleton

*Nepenthes glabrata* J.R. Turnbull & A.T. Middleton, *Reinwardtia* 10 (10th Feb 1984) 107 (as *glabratus*). — Type: *Turnbull & Middleton 83113a* (holo, BO n.v.), Central Sulawesi, 120° 55' E 13° 03' S, Tri Tunggal Eboni Corp. logging concession, 1666 m, 31 Aug 1983.

*Nepenthes rubromaculata* Sh. Kurata (non *N. × rubromaculata* J. Veitch & Sons ex 'G.F. Wilson', Gard. Chron. II, 8 (1877) 441; J. Ins. Pl. Soc. (Japan) 35 (6th Feb 1984) 42. — Type: *Kurata, Atsumi & Komatsu 149a* (holo, not indicated, probably Nippon Dental College, plate in Sh. Kurata l.c.: 44), Central Sulawesi, route from Malei to Kajoga, 9 Nov. 1983.

Distribution — Central Sulawesi.

Ecology — In open, high forest, 1600–2000 m.

Notes — 1. Kurata's *N. rubromaculata* is a later homonym of a horticultural hybrid name published in 1877. The type repository is not stated, but is presumably the herbarium of the Nippon Dental College. The holotype is illustrated in the original publication on page 44.

2. Turnbull & Middleton's material, including types, was not found at Bogor in 1995 or 1996, and may never have been distributed.

3. The red-streaked pitcher of this species is characteristic. It is a distinctive species with no obvious relatives. Turnbull and Middleton (1984) describe a number of features not apparent from the scant material available: young plants are said to have extremely narrow leaves with small globose pitchers, and rosette leaves of mature plants are said to have blades greatly reduced or even absent.

Collections — SULAWESI. Sulawesi Tengah, 120° 55' E 1° 33' S, Tri Tunggal Eboni Corp. logging concession, *Turnbull & Middleton 83113a* (Type of *N. glabrata*, n.v.); *83114* (n.v.); G. Towako, *Turnbull & Middleton 83080–93* (n.v., undistributed?); North spur of Mt. Lumut, 3/9/1938, *Eyma 3585* (BO); Boro-Poena, 10/8/1937, *Eyma 1604* (BO); 121° 25' E 1° 45' S, Mt. Tambusisi, 30/3/1980, *Lack & Grimes 1785* (K); route from Malei to G. Kajoga, *Kurata, Atsumi & Komatsu 149a* (type of *N. rubromaculata* Sh. Kurata, n.v.).

## 28. *Nepenthes gracilis* Korth.

*Nepenthes gracilis* Korth., Kruidkunde, in C.J. Temminck, Verh. Nat. Gesch. (1840) 22, t. 1 & 4; Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 290; Sh. Kurata, Gard. Bull. Sing. 26 (1973) 229; Shivas, Pitcher plants of Peninsular Malaysia & Singapore (1984) 29; Tamin & M. Hotta in M. Hotta, Diversity and dynamics of plant life in Sumatra (1986) 86; Phillipps & A.L. Lamb, Pitcher Plants of Borneo (1996) 89, f. 49. — Type: *Korthals s.n.* (lecto, designated here, L; iso K), Borneo, G. Pamatton, 325 m.

*Nepenthes distillatoria* auct. non L.: Jack, Comp. Bot. Mag. 1 (1835) 271.

*Nepenthes laevis* Lindl. (non *Nepenthes laevis* C. Morr., quae = *Nepenthes albomarginata*), Gard. Chron. (1848) 655. — Type: not located.

*Nepenthes gracilis* var. *elongata* Blume, Mus. Bot. Lugd. Bat. 2 (1852) 10. — Type: *Wallich 2244* p.p. (K-Wall), Singapore.

*Nepenthes teysmanniana* Miq., Fl. Ned. Ind. 1, 1 (1858) 1073. — *Nepenthes gracilis* var. *teysmanniana* (Miq.) Beck, Wien. Ill. Gartenz. 20 (1895) 190. — *Nepenthes tupmanniana* Bonst., Parey Blumeng. I (1931) 663, sphalm. — Type: *Teijsmann 530* p.p. (BO), Sumatra, Sibolga by the coast, Feb 1856.

*Nepenthes korthalsiana* Miq., Fl. Ned. Ind. 1, 1 (1858) 1071. — Type: *Teijsmann 538* p.p. (U n.v., L), Sumatra, Sibolga.

*Nepenthes laevis* Korth. ex Hook. f. in A.DC., Prodr. 17 (1873) 104, in synon.

*Nepenthes angustifolia* Mast., Gard. Chron. 2 (1881) 524. — Type: *Burbidge s.n.* (K), N Borneo, 1877/78.

*Nepenthes gracilis* var. *longinodis* Beck, Wien. Ill. Gartenz. (1895) 190, as *N. longinodis*. — Type: *Lobb s.n.* (K), Borneo.

*Nepenthes gracilis* var. *arenaria* Ridl. ex Macfarl. in Engl., Pflanzenr. 4, 3 (1908) 59. — Type: *Ridley 1473* (K), Singapore, Praman.

Distribution — Thailand, Sumatra, Peninsular Malaysia, Singapore, Borneo, Sulawesi.

Ecology — Lowland peat-swamp forest or disturbed areas on poor soils, podsol heath scrub, swamp edges, on sandstone or ultrabasic soils; sea level to 800 m.

Notes — 1. Korthals gives the altitude of the type as 325 m (1840: 22); he also collected this species at Sibolga, Sumatra.

2. Blume cites both Jack's misapplication of the name *N. distillatoria* and Wallich's Cat. No. 2244 under his variety *elongata*. It is not possible to identify the former with certainty. As to the latter the Wallich herbarium at K includes at least five sheets of *N. gracilis*, two of these specimens of *N. albomarginata*. Five further sheets of this number bear specimens of *N. khasiana*.

3. Teijsmann's Sibolga collections (Feb 1856) were examined by Miquel (1858), who described *N. korthalsiana* and *N. teysmanniana* from them. Some of the duplicates sent to Utrecht have been confused, and different species are represented under the same numbers at the two herbaria (BO, U). Macfarlane (1908) listed *N. teysmanniana* as a synonym of *N. albomarginata*, but Danser indicated that this error was due to the labels of the Utrecht specimens being muddled (1928) and that the material described is in fact *N. gracilis*.

4. *Nepenthes albomarginata* and particularly *N. reinwardtiana* are often confused with this species. The triangular stems and the decurrent leaf bases, which run down two of the stem ridges, the slender gracile pitchers, the shortly-toothed peristome and the few-glanded lid help to identify this species fairly readily.

5. *Nepenthes neglecta* Macfarl. is discussed in relation to *N. gracilis* in the section on Little Known Taxa.

*Selected collections* — SUMATRA. Sibolga, *Teijsmann 530* p.p. (BO); E coast, Asahan, Loemban Ria, *Rahmat si Boeea 7806* (SING); Anambas Is., G. Ajur Moeroe, *van Steenis 1480* (BO, SING); Bangka Is., *Kostermans & Anta 372* (BO, SING). — THAILAND. Narathiwat, Takbai, *Sakol 4191* (BK). — PENINSULAR MALAYSIA. Perak, Larut, *King's Coll. 4084* (BO), *4025* (SING); Pahang, Tasek, Berau, *Henderson 24039* (BO, SING); Johore, Kota Tinggi, *Vethevelu 25256* (KEP, SING). — SINGAPORE. Woodlands rd, *Burkill 316* (BO, SING). — BORNEO. Sarawak. Bako NP, *Ching 42173* (KEP), *Garrick & Enoch 8* (SING); Baram, *Anderson 2027* (SING). — Brunei. Labi rd, Belait, *Forman 852* (K, SING). — Sabah. Kimanis FR, *Keith 48915* (KEP). — Kalimantan Barat. G. Kelam, *Hallier 2235* (B); Kalimantan Timur, W Kutei, nr Melan, *Kostermans 9604* (SING); Kalimantan Selatan, G. Pamatton, *Korthals s.n.* (Type). — SULAWESI. Enrekang, Kp. Rapang, *Noerkas 338* (BO, L).

Hybrids — A number of naturally occurring hybrids have been proposed: *Nepenthes* × *ghazallyana* J.H. Adam, Wilcock & Swaine, J. Trop. Forest Sci. 5 (1992) 22, nomen, is a hybrid with *N. mirabilis* from Telupid, Borneo. — *Nepenthes* × *trichocarpa* Miq., a naturally occurring hybrid with *N. ampullaria*, is rare but widespread in Sumatra, Peninsular Malaysia, Singapore and Borneo (taxon 80 in this paper).

## 29. *Nepenthes gracillima* Ridl.

*Nepenthes gracillima* Ridl., J. Linn. Soc. 38 (1908) 320; Macfarl. in Engl., Pflanz. 4, 3 (1908) 38; J. As. Soc. Beng. 75, 3 (1914) 282; Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 296, excl. syn. *N. ramispina*; Shivas, Pitcher plants of Peninsular Malaysia & Singapore (1984) 31 partim; Kiew, J. Wildlife and National Parks 10 (1990) 36. — Type: *Wray & Robinson 5309* (lecto, designated here, SING; iso BO), Peninsular Malaysia, Pahang, G. Tahan, 990 m, 29 May 1905.

*Nepenthes alba* Ridl., Fl. Mal. Pen. 3 (1924) 22. — *Nepenthes singalana* auct. non Becc.: Macfarl. in Engl., Pflanzenr. 4, 3 (1908) 47 partim; J. As. Soc. Beng. 75, 3 (1914) 282. — *Nepenthes bongso* auct. non Korth.: Ridl., J. Linn. Soc. Bot. 38 (1908) 320. — Type: Wray & Robinson 5411 (lecto, designated here, SING; iso BO), Peninsular Malaysia, Pahang, G. Tahan, 1500 m, 3 June 1905.

Terrestrial climber, 1–5 m tall. Stems terete to sub-angular; 0.2–0.5 cm thick. Leaves sessile, lanceolate; 5–10(–16) × 1–1.5 cm; apex acute; base cuneate, amplexicaul; longitudinal veins 0–3 on each side of midrib, in outer half of blade; pennate nerves irregular. Lower pitchers infundibuliform below, cylindrical above; to 5–10 × 1–3.5 cm; wings to 2 mm broad, fringed elements to 3 mm long. Upper pitchers infundibuliform below, abruptly narrowing at 1/2 to 3/4 height and then cylindrical, but gradually broadening to mouth; 6–15 × 0.9–2.8 cm; wings absent; peristome 1.5–3 mm across, slightly flattened in cross section; lid orbicular to broadly ovate, 1.2–2.3 × 1.2–2 cm; glands lipped, 0.4–0.5(–0.7) mm across, more or less even-sized, sometimes interspersed with smaller lipped glands 0.15–0.2 mm across; spur 2–3 mm long, flattened, unbranched, slightly curved. Indumentum very short, < 0.05 mm, sparse or absent on stems, axils sparsely pubescent, pitcher and lid likewise. Colour of lower pitchers deep-purple to blackish green; upper pitchers pale green in lower part, becoming pale yellow to ivory-white above, with rose coloured markings throughout.

Distribution — Peninsular Malaysia: the eastern mountain ranges, Banjaran Timur; G. Tahan and G. Tapis.

Ecology — Open areas or amongst scrub, on quartzitic soils or heavily weathered rock; 1300–2100 m altitude.

Notes — 1. Ridley described *N. gracillima* from Mt. Tahan collections in 1908. At the same time he identified other specimens collected on the same expedition as *N. bongso* Korth. In 1924 he corrected this identification, and described the latter specimens as a new species: *N. alba*, and at the same time described *N. ramispina* from Mt. Semangka in the Genting Highlands. Danser (1928) reduced all these names to *N. gracillima*, but we have reinstated *N. ramispina*. Danser's illustration (1928: f. 7) is of *N. ramispina*.

2. *Nepenthes gracillima* can be distinguished from *N. ramispina* by its smaller size. The pitcher is not as attenuated, the spur is usually simple, the lid glands are larger, fewer and more uniform in size, and the whole plant is somewhat glabrescent. The coloration of the upper pitchers of *N. gracillima* is particularly striking: they are green in their lower part, becoming pale yellow to ivory white in their upper parts, with rose coloured markings throughout. Kiew (1990) discussed the species on G. Tahan in some detail.

3. Danser identified a specimen of *N. gracillima* (Ridley 16097) as belonging to *N. alata* (see there).

4. There has been confusion about the *Nepenthes* of upland Peninsular Malaysia: *N. gracillima*, *N. macfarlanei*, *N. ramispina* and *N. sanguinea*. Danser (1928) reduced *N. ramispina* to a synonym of *N. gracillima*, but regarded the delimitation of the remaining three species as confused by hybrids. Amongst herbarium specimens, hybrids seem to be common; this may be an artifact of collector selection of unusually large or different individuals. The ecology of the three species is distinct (Kiew, 1990).

*Nepenthes gracillima* and *N. ramispina* are no doubt a closely related pair, but a distinct morphological disjunction correlates with the western and eastern mountain ranges of Peninsular Malaysia. Whilst we acknowledge that hybrids are to be found, nonetheless it is possible to key the majority of highland Peninsular Malaysia specimens as follows:

- 1a. Stem cylindrical or sub-angular; lid rounded; peristome narrow (< 3 mm) . . . 2
- b. Stem angular; lid ovate; peristome broader (> 6 mm) . . . . . 3
- 2a. Pitcher spur branched; lid glands numerous, small (0.2–0.3 mm) *N. ramispina*
- b. Pitcher spur simple; lid glands few, large (0.4–0.5 mm) . . . . . *N. gracillima*
- 3a. Stem sharply 3-angled, glabrous; peristome scarcely toothed; lid without hairs . . . . . *N. sanguinea*
- b. Stem perceptibly 3-angled, pubescent; peristome toothed, flattened near lid; lid with many bristle-like hairs below . . . . . *N. macfarlanei*

*Collections* — PENINSULAR MALAYSIA. Pahang, G. Tahan, *Haniff* 7890 (BO, SING), 7891 (BO); *Holtum* 20644 (BO), 20666 (BO, SING); *Ng* 1448 (FRIM), 1478 (FRIM, SING), 20915 (FRIM), 20954 (FRIM); *Ridley* 13704, 16097, 16098 (all at SING); *Wong & Wyatt-Smith* 58, 61, 62, 63 (all at FRIM); *Wray & Robinson* 5309 (Type of *N. gracillima*), 5411 (Type of *N. alba*); *Strugnell* 42878 (FRIM); G. Tahan, Padang Luas, 1500 m, *Kloss* 12211, 12212, 12227, 12297 (all at BO); Pahang, G. Tapis, 1400 m, *Symington & Kiah* 28877 (BO, FRIM); *Cockburn* 11021 (FRIM).

### 30. *Nepenthes gymnamphora* Nees

*Nepenthes gymnamphora* Nees, Ann. Sc. Nat. 3 (1824) 366, t. 19 & 20, f. 1; Blume, Enum. Pl. Javae (1827) 85; Korth., Verh. Nat. Gesch. (1840) 32, t. 3 & 4: 55–70; Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 300 partim. — *Nepenthes melamphora* Reinw. ex Blume, Cat. Gew. Buitenzorg (1823) 111, nomen; Blume, Mus. Bot. Lugd. Bat. 2 (1852) 8. — Type: Nees, l.c., t. 19 (lecto, designated here).

*Nepenthes melamphora* sensu Fern.-Vill., Fl. Filip. Nov. App. (1880) 173, quae = *N. alata* Blanco.

*Nepenthes gymnamphora* var. *haematamphora* Miq., Pl. Jungh. 1 (1852) 169; Beck, Wien. Ill. Gartenz. (1895) 186; Macfarl. in Engl., Pflanzenr. 4, 3 (1908) 57. — *Nepenthes melamphora* var. *haematamphora* (Miq.) Miq., Fl. Ned. Ind. 1, 1 (1858) 1073. — Type: *Junghuhn s.n.* (n.v.), Java, Mts Patuha & Merapi.

*Nepenthes phyllamphora* auct. non Willd.: Reinw. ex Miq., Fl. Ned. Ind. 1, 1 (1858) 1073.

*Nepenthes rafflesiana* auct. non Jack: Haberl., Bot. Tropenr. (1893) 227.

*Nepenthes melamphora* var. *pubescens* Kuntze, Rev. Gen. Pl. 2 (1891) 562. — Type: (not located) Java, Gede.

?[*Nepenthes melamphora* var. *lucida* Blume, Mus. Bot. Lugd. Bat. 2 (1852) 8; Becc., Malesia 3 (1886) 5; Beck, Wien. Ill. Gartenz. (1895) 186. — Type: *Muller s.n.* (L), Borneo.]

Non *Nepenthes melamphora* var. *tomentella* Becc., Malesia 3 (1886) 13, quae = *N. pectinata* Danser.

**Distribution** — Western and Central Java (one record from Borneo, see note 3 below).

**Ecology** — Forest, 1000–2750 m altitude.

**Notes** — 1. Blume's 1823 publication of the name *Nepenthes melamphora* was in reference to a Reinwardt description which, in the event, was never published. Nees (1824) published his description of *N. gymnamphora* based on material which he decided was more complete than that for *N. melamphora*, and he therefore decided to substitute the new name (with Reinwardt as the author) so as to avoid confusion with

Blume's name. Since Reinwardt is not the author of this latter name however, authorship can only be attributed to Nees. At Leiden there are a number of specimens that have been annotated as 'Type' material for *N. melamphora*. The various Korthals sheets (male plants) are clearly not correct, since they have been collected after publication of the names [Korthals reached Java in 1831 (Van Steenis-Kruseman, 1950)]. Danser (1928) cites a sterile Reinwardt collection made in 1817, and distinguished by the sheet number H.L.B. 908,156-109, but this specimen was not present at Leiden in 1993. However, since this specimen was said to be sterile (Danser, 1928), it is not likely to be the material on which *N. gymnamphora* is based. Another sheet at Leiden, 908,155-1069 comprises a female plant, as do two other sheets: 988,205-430 and 988,205-448. The first of these is probably a Korthals collection, which again excludes it as original material. The latter sheets, on the other hand, may comprise original material of *N. melamphora*. Nees von Esenbeck was dismissed from Breslau University in 1851 for 'moral turpitude' and his herbarium was split up and sold (TL-2). The whereabouts of the *N. gymnamphora* material (the collection having been sold to several herbaria) is unknown to us. In the meantime we have decided not to lectotypify this species on a specimen, and plate 19 in Nees' original publication (1824) is selected to serve as the lectotype (stem, leaves and inflorescence), and plate 20, f. 1 in the same work as the paratype (lower pitchers).

2. Beccari (1886) described the variety *tomentella* to include Sumatran specimens of what was then regarded as a widespread species. The Sumatran variant has continued to be segregated: in 1928 Danser described *N. pectinata*, although this was based on mixed types, as resolved by Schlauer & Nerz (1994); Tamin & Hotta (1986) published the invalid name *N. rosulata*; and lastly Salmon & Maulder (1995) published *N. xiphioides*. Schlauer & Nerz (1994) lectotypified *N. pectinata*, rejecting the inclusion of specimens of *N. singalana*. *Nepenthes pectinata* is distinguished by several characters; in overall architecture it differs in that the upper leaves rarely produce pitchers; the upper leaves are more gradually attenuated to their bases, with broadly winged and scarcely discernible petioles and are decurrent on the stem, unlike the shortly amplexicaul base of the present species; the pitchers have a more rounded, urceolate form, with a narrow mouth, and the peristome drawn out into a neck; *N. pectinata* usually has a denser indumentum, and the inner peristome margin has larger teeth.

3. The variety *lucida* described by Blume is discussed in the section of Little Known Taxa at the end of this paper.

*Selected collections* — JAVA. Batavia, Kirawang, *de Monchy* 125 (BO); Preangar, G. Pangerango, *van Steenis* 17624 (BO, K, L); G. Gede, *Forman* 94 (K, L), *Meijer* 2870 (BO), *Schiffner* 1999 (SING); Banjoemas, G. Slamet, *Backer* 420 (BO); Kediri, G. Dorowati, 24/5/1920, *Coert s.n.* (BO).

### 31. *Nepenthes hamata* J.R. Turnbull & A.T. Middleton

*Nepenthes hamata* J.R. Turnbull & A.T. Middleton, Reinwardtia 10 (10 Feb 1984) 108 (as *hamatus*). — Type: *Turnbull & Middleton* 83121a (BO n.v.), Central Sulawesi, G. Lumut W ridge, 1850–1900 m, 19 Sep 1983.

*Nepenthes dentata* Sh. Kurata, *Nepenthes* of Mt. Kinabalu, Sabah (1976) 11, nom. nud.; Gard. Bull. Sing. 36 (7 Mar 1984) 197, t. 1, f. 1. — Type: *Eyma* 3572 (lecto, designated here, BO; iso BO), Central Sulawesi, G. Lumut, between bivouac II and III on N spur, 3 Sep 1938.

Distribution — Sulawesi.

Ecology — On open ridge-tops, rooted in moss and climbing into trees, 1400–2500 m altitude.

Notes — 1. This species was first mentioned in a listing by Kurata (1976) under the name *N. dentata*, although he did not validate this name until 1984. The description appears in volume 36 of the Gardens Bulletin of Singapore, although the effective publication date is 7th March 1984. The description of *N. hamata* appeared in a preprinting of the appropriate pages of volume 10 of Reinwardtia, with an effective publication date of 10th February 1984, gaining priority by 28 days. The effective publication date of these two names is open to debate. Whether the 'preprinting' was widely available before the Kurata paper is hard to determine. It was certainly not deposited at either Kew or Edinburgh prior to the accession of volume 36 of the Gardens Bulletin of Singapore which arrived at both libraries in June 1984. The appropriate volume of Reinwardtia arrived over a year later, in August 1985 (K) and November 1985 (E) respectively.

2. The Turnbull and Middleton Sulawesi collections, from which they describe three species (*N. glabrata*, *N. hamata* and *N. infundibuliformis*), were not found at Bogor, nor at any other herbaria examined.

3. This species is related to *N. tentaculata*; amongst the most notable similarities are the presence of hair-like appendages on the lid, the spur is branched, and surrounded by other branching appendages, the lids of the lower pitchers often lack glands, and the upper pitchers may or may not bear fringed wings. The features which distinguish this species are the striking peristome, with plate-like teeth, but this only develops in the upper pitchers and is variable in the degree of development. Some specimens appear to be wholly like *N. tentaculata*. At present the seven or so collections form something of a continuum. Kurata's description and selected type represent an extreme in form (as illustrated in his figure), whilst the material selected by Turnbull and Middleton has not been located, but the description suggests somewhat of an intermediate between *N. hamata* and *N. tentaculata*. It is possible that the two species may hybridise, and some collections represent hybrids.

*Collections* — SULAWESI. Central Sulawesi, West ridge of G. Lumut, Turnbull & Middleton 83121a, 19/9/83 (BO n.v.), 83122–32 (?n.v.); Biv. II–III, north ridge of G. Lumut, Poso S.D., 3/9/38, Eyma 3573 (BO, K); 5/9/38, Eyma 3643 (BO); Mt. Tambusisi, 30/3/80, Lack & Grimes 1783 (K), 1784 (K); G. Sojol (G. Ogoomas), 27/10/83, Turnbull & Middleton 83166–78, (?n.v.), 83185–97 (?n.v.); Mt. Roroda Timbu summit, van Balgooy 3335, 14/5/79 (BO); Tomongkobae Mts, 9/10/38, Eyma 3969, 3969a, 3970 (all BO); G. Poka Pindjang, Kjellberg 1492, 28/5/29 (BO).

### 32. *Nepenthes hirsuta* Hook. f.

*Nepenthes hirsuta* Hook. f. in A.DC., Prodr. 17 (1873) 99; Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 306, f. 8; Philipps & A.L. Lamb, Nature Malaysiana 13, 4 (1988) 16; Pitcher Plants of Borneo (1996) 92, f. 50. — Type: *Low s.n.* (holo K), Borneo, Lawas River.

*Nepenthes hirsuta* var. *typica* Macfarl. in Engl., Pflanzenr. 4, 3 (1908) 50, nom. inval.

*Nepenthes hirsuta* var. *glabrata* Macfarl. in Engl., Pflanzenr. 4, 3 (1908) 50. — Type: *Lobb* 92 (holo K), Borneo, Sarawak.

*Nepenthes leptochila* Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 319, f. 13; Philipps & A.L. Lamb, Pitcher Plants of Borneo (1996) 97, f. 52. — Type: *Amdjah* 730 (lecto, designated here, BO, sheet 1711-26; iso BO, K), Borneo, E Kalimantan, G. Djempanga, Sep 1912.

Distribution — Northern Borneo: Sarawak, Brunei, Sabah, Kalimantan.

Ecology — Thick peat on sandstone soils, ridgetops; 600–1000 m altitude.

Notes — 1. *Nepenthes hirsuta* has a characteristic inner margin of the peristome, which is entire, or only very slightly toothed, but with large nectary-openings between the ribs. It varies from long-hairy to short-hairy. *Nepenthes leptochila* is reduced here as a near hairless form. Young shoots on the type indicate that the hairs are lost. The variety *typica* is invalid from a nomenclatural point of view, since it includes the type of the species.

2. *Nepenthes hirsuta* is widespread in northern Borneo, but two apparent close relatives, have more restricted distributions: *N. macrovulgaris* which is more or less confined to ultrabasic soils in Sabah, and *N. hispida* which occurs in Sarawak, near the border with Brunei and Sabah.

*Selected collections* — BORNEO. Sarawak, near Kuching, 8/1912, *Anderson s.n.* (SING); G. Serapi, *Smythies 12640* (SING); 7th Division, Ulu Sg. Kayan, Dulit range, *Awa & Yai 46831* (KEP). – Sabah. Sandakan, Ruku Telupid, *Gambio Loloh SAN 60107* (KEP); Tambulanan, Keningau, *Patrick & Kumin SAN 68879* (KEP). – Kalimantan. Kalimantan Barat, G. Damoes, *Hallier 642* (BO); Kalimantan Timur, Tarakan Oilfields, Sesarip, *Meijer 2480* (BO), *2550* (SING).

### 33. *Nepenthes hispida* Beck — Fig. 5.

*Nepenthes hispida* Beck, Wien. Ill. Gartenz. (1895) 187. — Type: *Burbidge s.n.* (W, sheet no. 55649, lecto designated here; iso W x 2, K), Sarawak, Lawas River, 2000–3000 ft.

*Nepenthes hirsuta* auct. non Hook. f.: Macfarl. in Engl., Pflanzenr. 4, 3 (1908) 59, partim; M. Hotta, Acta Phytotax. Geobot. 22 (1966) 7, partim.

Climber, height 50 m. Stem terete, 2–4 mm thick, internodes of climbing shoots 2–4 cm long; internodes of short shoots 0.25–0.75 cm long. Leaves sessile, blade oblanceolate to oblong, sometimes narrowly so; leaves of short stems 7–12 × 1.6–2.8 cm; leaves of climbing shoots 7.5–28 × 1.8–3.3 cm, apex shortly acuminate to obtuse, often unequal, not peltate, base decurrent-amplexicaul, extending down the stem by 0.5–1 cm, and clasping it by 9/10 its diameter, the wings short, but 4–6 mm broad, and almost meeting opposite the axil, coriaceous. Longitudinal nerves 3, on each side of the midrib in the outer half, from the leaf base. Pennate nerves inconspicuous, apparently few, running almost normal to the midrib. Above each inflorescence, the first leaf of the replacement shoot has an ovate blade, 2.5–4 × 0.7–1.3 cm, with an acute to obtuse apex, and lacking a tendril. Lower pitchers ovoid-ellipsoid in the lower half, the upper half subcylindrical, tapering slightly to the mouth, 5–8.5 cm long, 1.5–3 cm wide at the base, 1–1.8 cm wide at the mouth, with two fringed wings, 1–3 mm wide, fringed elements 1–2 mm long, 1–2 mm apart; mouth ovate, oblique, slightly concave; peristome rounded, 0.5–1.2 mm wide, not sinuate, ribs 0.25 mm apart, the inner margin with teeth 0.5–1 mm long; lid ovate-elliptic, 1.4–2.7 × 0.9–2 cm, apex rounded, base truncate to slightly cordate, lower surface with numerous circular, crater-like glands 0.1–0.15 mm across, those on the midline, larger, elliptic, to 0.35 mm long; spur c. 5 mm long, entire. Upper pitcher as the lower, but more cylindrical; to 7–11.5 × 1.2–2.7 cm; wings sparsely fringed near mouth and to 2 mm broad, or lacking fringed elements, 0.4–0.5 mm broad; mouth peristome, lid and spur as in lower pitchers. Male inflorescence 9–13 cm long, 1.5 cm wide; stalk 2.5–4 cm long; partial-peduncles 2-flowered near base, but mostly



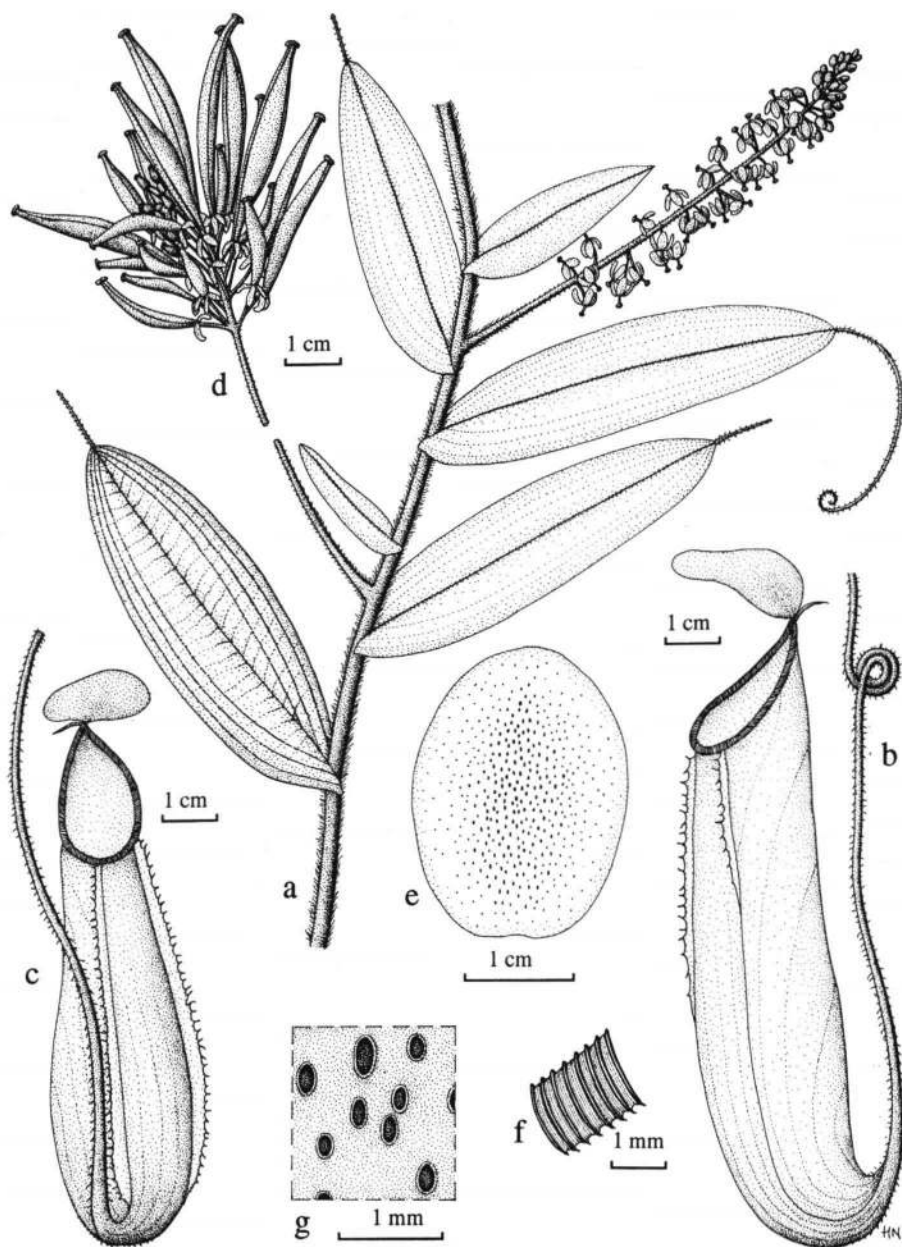


Fig. 5. *Nepenthes hispida* Beck. a. Stem with male inflorescence; b. upper pitcher; c. lower pitcher; d. female inflorescence; e. underside of lid; f. detail of peristome, internal view; g. detail of glands on lower lid surface. (a, b, d–g: Morshidi 24068; c: Burbidge s.n.).

1-flowered, 0.5–3 mm long, bracts absent; tepals elliptic, c.  $3.5 \times 2$  mm; staminal column 1.5–2 mm, anther-head with anthers in a single whorl, subglobular, 1–1.25 mm diam. Female inflorescence to 13 cm overall; stalk 5 cm; partial peduncles nearly all 2-flowered, to 7 mm overall, branched near base; tepals elliptic-oblong, 3–5  $\times$  2 mm long, the upper surface entirely covered with elliptic glands 0.2–0.5 mm across; fruit valves 35–47  $\times$  3–4 mm. Indumentum as *N. hirsuta*, but denser and longer, of erect, slightly forward pointing, mostly simple, dark coppery, bristle-like hairs 1.5–4 mm long, persistent and highly conspicuous on the stem, tendril and peduncle, sparser on lower leaf-blade, and shorter and denser on inflorescence, including axis, lower tepal surface and staminal column. Upper leaf-blade, midrib, upper tepal surface and fruit, glabrous. Colour of stems (when dried) purplish grey; pitchers glaucous green, flecked red, especially inside, peristome red or greenish; flowers red.

Distribution — Borneo, NE Sarawak and Brunei.

Ecology — Heath forest; 100–800 m altitude.

Notes — 1. This species has been long overlooked, partly because of difficulties with its typification. Beck cites the type as “Am Lawas River bei 2000 bis 3000 Fuss (Low)!”. Low and Burbidge collected together in this area and some specimens bear the name of neither collector. At Kew there is a collection with a printed label of F.W. Burbidge attached; however, there is also a larger, handwritten label: “*N. species*, Lawas River, 2000 to 3000 feet no flowering or seeding specimens seen.” At Vienna (W) there is a duplicate of this sheet with details presumably transcribed from the Kew label. Beck probably saw the Kew material as well, and he has no doubt interpreted the handwriting as Low’s. The specimens accord exactly to Beck’s description in both dimensions and appearance. Macfarlane (1908) placed *N. hispida* as a synonym of *N. hirsuta*, in the var. *typica* which he described. Under this variety he cites 3 collections: “Low!, Beccari!, Burbidge!”, since the former specimen is most likely the type of *N. hirsuta*, the varietal name is superfluous and illegitimate. The last named specimen however, is in all likelihood the specimen we interpret here as Beck’s ‘Low’ specimen. Danser (1928) was skeptical of Macfarlane’s treatment of *N. hispida*, but did not see the type.

2. This species is closely related to *N. hirsuta*, but distinct in the amplexicaul-decurrent leaf base, and also in the pilose character of the indumentum, with dense bristle-like hairs 1.5–4 mm long (1–2 mm long in *N. hirsuta*) on purplish grey stems (brown in *N. hirsuta*). The male flowers have a staminal column only 1.5–2 mm long at anthesis (3.5–6 mm long in *N. hirsuta*). *Nepenthes hispida* appears to be common in the region surrounding the Lambir Hills of northern Sarawak, with one collection being known from nearby Brunei and the type from the Lawas River.

Collections — BORNEO. Brunei, Bt. Teraja, Terajah FR, Seria, 21/12/63, *Hotta 12881* (SAR); Brunei Tembrong, Bt. Subok to Bt. Batu-Api, 21/1/64, *Hotta 13518* (L). — Sarawak. Miri Dist., Lambir NP, 29/9/78, *Burt* in *B. 11672* (SAR), 1/3/66, *Awang Morshidi S 24068* (K, L, SAR, SING, SAN n.v.); Lambir Hills, *Burt & Woods 2380* (SAR); Lawas River, *Burbidge s.n.* (Type).

### 34. *Nepenthes* $\times$ *hookeriana* Lindl.

*Nepenthes*  $\times$  *hookeriana* Lindl., Gard. Chron. (1848) 87 nomen; Mast., Gard. Chron. 2 (1881) 812, f. 157; G. Nicholson, III. Dict. Gard. 4 (1886) 436; Gard. Chron. (1892) 561, ic. 557; Boerl., Handl. Fl. Ned. Indië 3 (1900) 54; Burb., Flora & Sylva II, 12 (1904) 111; Macfarl. in Engl.,

- Pflanzenr. 4, 3 (1908) 34; Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 309, f. 9; Shivas, Pitcher plants of Peninsular Malaysia & Singapore (1984) 33; Philipps & A.L. Lamb, Pitcher Plants of Borneo (1996) 94, f. 7. — Type: *Low s.n.* (not located), Borneo, Sarawak.
- Nepenthes rafflesiana* auct. non Jack: Low, Sarawak (1848) 68. nomen.
- Nepenthes loddigesii* W. Baxter, Loud. Hort. Brit. Suppl. 3 (1850) 593; Beck, Wien. Ill. Gartenz. (1895) 227. — Type: Not located.
- Nepenthes hookeri* Alphand ex Hook. f. in A.DC., Prodr. 17 (1873) 96 (in synonym. *N. rafflesiana*); Alphand, Prom. de Paris, cum ic. (n.v.).
- Nepenthes rafflesiana* var. *hookeriana* (Lindl.) Beck, Wien. Ill. Gartenz. (1895) 147.
- Non *Nepenthes hookeriana* sensu Low, Sarawak (1848) 68, quae = *N. rafflesiana* Jack.

Distribution — Widespread but scarce: Sumatra, Peninsular Malaysia, Singapore, Borneo.

Ecology — Open, usually disturbed habitats, and then only found near populations of the parent species *N. ampullaria* and *N. rafflesiana*; sea level to 1000 m altitude.

Notes — 1. *Nepenthes* × *hookeriana* Lindl. was first published as a name in a listing of species in the Gardeners' Chronicle of 1848, in reference to the name in Low's book. Hugh Low, however, accidentally, or otherwise, treated *N. rafflesiana* as *N. hookeriana* and vice versa in his book (1848). Masters was the first author to note this confusion in the Gardeners' Chronicle (1881, vol. 2: 818 & f. 157), where he gives the first full description and illustration of *N. × hookeriana*. However, until Macfarlane's revision the taxon still remained dubious taxonomically, even though its facies were well understood in horticultural circles. Macfarlane (1908) cites several specimens, among them a Low collection from Sarawak, which would seem the most appropriate choice for a lectotype, but we have not been able to locate this specimen. *Nepenthes loddigesii* is included on the authority of Macfarlane (1908), but no type material has been located.

2. *Nepenthes* × *hookeriana* is a naturally occurring hybrid between *N. ampullaria* and *N. rafflesiana* (Macfarlane, 1908). In morphology it is intermediate between the parental species. The leaf-blade exhibits the venation typical of *N. ampullaria*, with the longitudinal veins in the outer 1/2 of the blade only, and a shortly petiolate base. The lower pitchers are urceolate with broad pitcher wings and a broad, rounded peristome, but this is not developed into the long apical neck seen in *N. rafflesiana*. The lid is oblong to oblong-ovate, with a blunt or notched apex, and two prominent lateral veins, the lid glands are distributed throughout, unlike those of *N. rafflesiana*, which are densest near the margins.

3. Along with another naturally occurring hybrid, *N. × trichocarpa*, this taxon is widespread, albeit scarce. The numbers of plants present in a given population is often small and they tend to be very localised. It is possible that hybrids can only survive in marginal or disturbed habitats, since the ecologies of the two parental species are not identical. Other hybrids, such as *Nepenthes* × *kinabaluensis* and *Nepenthes* × *trusmiensis*, though locally frequent, are restricted in their distribution, and their identification is not problematic on a Malaysian scale.

*Selected collections* — SUMATRA. Beccari 48 (K); East coast, Yates 1394 (BO). — MALAY PENINSULA. Johore, G. Pulai FR, Chan 17515 p.p. (KEP). — SINGAPORE. Jurong, Green s.n. (SING). — BORNEO. Sarawak. Matang rd, Kuching, Collenette 707 (K); G. Gadang, Lubuk Sika-ping, van Borssum Waalkes 1985 (K, L). — Sabah. Sook, Hobbs 13 (K); Sook Tulit rd, Comber 4167 (K). — Kalimantan. Kalimantan Barat, Pontianak, Mampawah, Enoch 362 (K).

### 35. *Nepenthes inermis* Danser

*Nepenthes inermis* Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 312, f. 10. — Type: *Bünnemeijer 9695* (lecto, designated here, BO), Sumatra, G. Kerinci, 1800 m, 26 Apr 1920.

*Nepenthes bongso* auct. non Korth.: Tamin & M. Hotta in M. Hotta, Diversity and dynamics of plant life in Sumatra (1986) 83 partim, f. 2 toto.

Distribution — Sumatra.

Ecology — This is one of the few species only known to grow epiphytically in mossy forest (Hopkins et al., 1990); 2300–2590 m altitude.

Notes — 1. A typographical error in Danser (1928) led to the omission of the specimen number (*Bünnemeijer 9695*) for the Kerinci locality, although it is mentioned in the figure legend. We have selected this material as the lectotype, since the fertile material is badly damaged, and the pitcher presents the primary characters of this species.

2. This species remains poorly known, and as yet the lower pitchers have never been collected. The remarkable upper pitchers lack a peristome and have a very narrow lid. The tendrils may or may not be coiled, an unusual habit – in the majority of species they are always coiled in upper pitchers. The pitcher fluid is said to be extremely viscous, forming long stringy droplets when the pitcher is upset (Hopkins et al., 1990). An unrelated species, *N. eymae*, shares the same combination of infundibulate pitcher, narrow lid and viscous pitcher fluid. It has been suggested, and demonstrated in greenhouse grown plants, that the infundibuliform pitcher and the highly viscous pitcher fluid allows rainwater to be shed from the pitcher without diluting or washing away the partly-digested contents (Wistuba, 1994). The weight of excess rainwater causes the pitcher to overbalance, shedding the water from the broad mouth, whilst the narrow shape of the lower part of the pitcher, and the viscosity of the fluid, prevents mixing of the column with rainwater (Wistuba, 1994). A survey of 22 pitchers (under the name *N. bongso*) suggests that this species traps a very high proportion of dipterans (flies) compared to other Sumatran species (Kato et al., 1993).

Collections — SUMATRA. Sumatera Barat, Bt. Gombak, *Bünnemeijer 5747* (BO), *5749* (BO, L); Bt. Gadang, Bancah, Talang Babungu, *Okada & Rudsdi 40* (BO); G. Talang, *Bünnemeijer 5522* (BO); G. Kerinci, *Bünnemeijer 9695* (Type).

### 36. *Nepenthes insignis* Danser

*Nepenthes insignis* Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 314, f. 11; Jebb, Science in New Guinea 17 (1991) 24, f. 10.; H. Rischer, Carnivorous Plant Newsl. 2 (1995) 75. — Type: *Pulle 277* (lecto, designated here, BO; iso BO × 3, 1 in alcohol), New Guinea, Irian Jaya, Beaufort River, 80 m, 9 Nov 1912.

Emended description: Short epiphyte to 80 cm. Pitchers to 30 cm overall, dark green below, yellow above with deep red spots, peristome reddish brown (Rischer, 1995).

Distribution — New Guinea: Irian Jaya, including Biak Island.

Ecology — Epiphytic, rooted in thick moss layer, particularly on trees overhanging rivers, more occasionally growing in sediment bars along rivers at 800 m; 80–800 m altitude.

Notes — 1. Of the three duplicates of *Pulle* 277 at Bogor, the sheet with the large, complete inflorescence has been annotated 'Type!' by Danser, and is selected as the lectotype here.

2. The decurrent leaf base, large peristome with toothed inner margin, and 2-flowered partial peduncles separate this species from all others.

*Collections* — NEW GUINEA. Irian Jaya. Biak Is., nr Bavieri, *Kostermans & Soengeng* 936 (BO, L); Idenburg River, 4 km S of Bernhard camp, *Brass* 13379 (A n.v., BO); 2 km SW of Bernhard camp, *Brass* 13669 (A n.v., BO); Rouffaer River, border of affluent 'C', *Docters van Leeuwen* 10258 p.p. (BO, K, L); Merauke, Beaufort River, *Pulle* 277 (Type).

### 37. *Nepenthes khasiana* Hook. f.

*Nepenthes khasiana* Hook. f. in A.DC., Prodr. 17 (1873) 102; Anon., Gard. Chron. 16 (1872) 542; Hook. f., Fl. Brit. India 5 (1886) 70; Beck, Wien. Ill. Gartenz. (1895) 189; Macfarl. in Engl., Pflanzenr. 4, 3 (1908) 59. — Type: *Wallich* 2244 (lecto, designated here, K-W; iso K-W  $\times$  4), India, Jyntea Mts.

*Nepenthes phyllamphora* auct. non Willd.: Sims, Bot. Mag. 53 (1826) t. 2629; Hook. f. & Thomson, Herb. Ind. Or. ex Hook. f. in A.DC., Prodr. 17 (1873) 102; Regel, Gartenfl. (1881) 371, ic. 374 (n.v.).

*Nepenthes distillatoria* auct. non L.: Graham, Edinb. Nepenthes Phil. J. July–Sept 3 (1827) 371; in Curtis's Bot. Mag. 55 (1828) t. 2798.

*Nepenthes melamphora* auct. non Reinw. ex Blume: Hook. f., Trans. Linn. Soc. 22 (1859) 423, p.p. *Nepenthes rubra* Hort. ex Rafarin, Rev. Hortic. (1869) 270.

Distribution — India, Bengal: Jyntea and Khasia Mts.

Ecology — Forest margins; 1000 m altitude.

Notes — 1. The Wallich collection at Kew contains 8 sheets of No. 2244. Three of these consist of *N. gracilis*, of which 2 have mixtures of *N. albomarginata*, while 5 comprise *N. khasiana* from the Jyntea mountains. One of these latter has been annotated as the lectotype for the species.

2. This species is remarkable for its geographical remoteness from the remainder of the genus.

*Selected collections* — INDIA. East Bengal, Khasia Mts, *Hooker & Thompson s.n.* (K, SING); Jyntea Mts, *Wallich* 2244 (Type); Jarain, Jyntea Mts, *Clarke* 3500 (n.v.).

### 38. *Nepenthes* $\times$ *kinabaluensis* Sh. Kurata

*Nepenthes*  $\times$  *kinabaluensis* Sh. Kurata, *Nepenthes* of Mt. Kinabalu (1976) 64, pl. 21; nomen. — *Nepenthes* sp., Macfarl., J. Linn. Soc., Bot., 42 (1914) 127. — *Nepenthes rajah*  $\times$  *Nepenthes villosa*, Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 363; Philipps & A.L. Lamb, *Nature Malaysiana* 13, 4 (1988) 23; *Pitcher Plants of Borneo* (1996) 95, f. 51.

Intermediate between *N. rajah* Hook. f. and *N. villosa* Hook. f.; whole plant covered by villose hairs; leaf peltate tipped; lid large, round; peristome broad wavy, with expanded teeth.

Distribution — Borneo: western slopes of Mt. Kinabalu.

Ecology — *Leptospermum/Dacrydium* forest on ultrabasic soils; 2420–3030 m altitude.

Notes — 1. Kurata's description (1976) is invalid and we have seen no herbarium material, so this hybrid name is yet to be validated.

2. Although long recognised as a hybrid, it has only recently been confirmed that this taxon forms large, self-sustaining, and apparently true-breeding populations (A. Phillipps, pers. comm.). In the case of *N. × hookeriana* and *N. × trichocarpa*, although recorded from many sites, and nearly always to be found where the parental species occur together, the plants tend to be isolated individuals.

3. Adam & Wilcock (1992) report that the much rarer hybrid between *N. burbidgeae* and *N. rajah* produces largely sterile pollen. No information is available on the pollen of *N. × kinabaluensis*.

Collection — BORNEO. Sabah. Mt. Kinabalu above Kamburangau, Gibbs 4300 (BM n.v.).

### 39. *Nepenthes klossii* Ridl.

*Nepenthes klossii* Ridl., Trans. Linn. Soc. II, Bot., 9 (1916) 140; Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 317, f. 12; Jebb, Science in New Guinea 17 (1991) 26, f. 12. — Type: *Boden Kloss s.n.* (lecto, designated here, SING), Irian Jaya, Utakwa expedition to Mt. Carstenz, Camp VIb, 26 Jan 1913.

Distribution — New Guinea: Irian Jaya.

Ecology — Habitat unknown, probably grassland between 1000 and 2000 m altitude, where it is apparently sympatric with *N. maxima*.

Note — The distinctive hooded appearance of the pitcher mouth (Jebb, 1991) is similar to that seen in *N. aristolochioides*. It was inaccurately portrayed in Danser (1928, f. 12).

Collections — NEW GUINEA. Irian Jaya. Camp VIa, Wollaston expedition, *Boden Kloss s.n.* (K), Camp VIb, *Boden Kloss s.n.* (Type); Enarotali, Lake Tigi, *Eyma 4893* (BO, K, SING).

### 40. *Nepenthes lamii* Jebb & Check, *spec. nov.*

*Nepenthes vieillardii* auct. non Hook.f.: Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 393 partim, f. 26; toto; Jebb, Science in New Guinea 17 (1991) 45, f. 27.

A *Nepenthes vieillardii* Hook. f. cirrus et costus glandulis plurimus c. 1.5 mm diametro, glandulis operculi denso c. 2–3 mm diametro toto, cum labio manifeste (non paucis 0.15–0.5 mm diametro) peristomio plus grossus, costis 0.3–0.4 mm distantibus, dentibus 0.15 mm longus (non 0.2–0.3 mm distantibus, dentibus nullo), indumentum nullo (non pubescento) differt. — Typus: *Lam 1637* (holo BO; iso BO), New Guinea, Irian Jaya, Doorman Top, 3200 m, 17 Oct 1920.

Shrub or climber. Stem rounded or slightly angular, often greatly contracted, 0.1–0.6 mm thick. Leaf-blade lanceolate; 5–14 × 1.2–2.8 cm; apex acute; base decurrent to 2 cm down stem; longitudinal veins 3 or 4 (0–5) running in outer 1/3 to 1/4 of the lamina; pennate nerves distinct or indistinct, running obliquely from midrib and forming an irregular network in the outer 1/2 of the blade. Tendrils with numerous glands with thickened rims, 1.5–3 mm across. Lower pitchers obovoid throughout, or somewhat cylindric above; to 11 × 4 cm; with 2 fringed wings up to 8 mm broad, the fringe segments to 4 mm long, or these reduced to 2 ridges; peristome 0.1–0.5

cm broad, ribs 0.3–0.5 mm apart, teeth on inner margin to 0.3 mm. Lid circular, flat; 2.5–4 cm across; apex rounded, base rounded to cordate; glands on lower surface dense, either with large thickened rims, and to 3 mm in diameter overall, 1.5 mm within lipped margin, or much smaller (0.1 mm) and very numerous (1500–2000/sq. cm). Spur simple, sometimes flattened, 1–5 mm long. Upper pitchers obovoid throughout, or more usually cylindrical, slightly constricted in the upper 1/2; 4–14 × 1–3 cm; lacking fringed wings, otherwise as the lower pitcher. Inflorescence a raceme, 8.5–14 cm long, often much contracted; partial peduncles 1-flowered, to 10 mm long, without a bract. Indumentum very sparse, on new innovations, but becoming glabrous throughout. Colour of pitchers green, the peristome red, interior of pitcher pale green, sometimes suffused with red.

Distribution — New Guinea: Irian Jaya (Mts. Doorman and Erica).

Ecology — Epiphyte in mossy forest, or amongst scrub and grass above tree-line; 1460–3520 m altitude.

Notes — 1. Formerly treated as an outlier of *N. vieillardii* Hook. f., but all the New Guinea material differs in its almost glabrous nature (vs. sparse to dense white hairs c. 1 mm long in *N. vieillardii*). Rather a variable species – the collections are somewhat sharply disparate; further collections are necessary to elucidate the pattern of variation. The type specimen has exceptionally glandular tendrils, and the lid glands are dense, very large and prominently lipped. Other specimens (*Brass 12189*) have much smaller glands, but these are exceptionally dense, with 1500–2000 glands/sq. cm (vs. 75–100 glands/sq. cm in *N. vieillardii*). The peristome of *N. lamii* has somewhat more widely spaced ribs (0.3–0.4 mm vs. 0.2–0.3 mm in *N. vieillardii*). At high altitudes it becomes dwarfed and stunted (*Lam 1637, 1654*). Some of the collections from the Hellwig Mts. (*Pulle 803, von Römer 1037*) are very small, delicate plants.

2. The illustrations of '*N. vieillardii*' in both Danser (1928) and Jebb (1991) are of *N. lamii*.

3. The species is named after Professor Herman Lam who made the first collections of this plant during the Van Overeem expedition to Mt. Doorman in 1920.

*Collections*— NEW GUINEA. Irian Jaya. Nassau Mts, 2600 m, Oct 1926, *Docters van Leeuwen 10834* (BO, U); Mt. Doorman, 128° 25' E 3° 28' S, 3250 m, 17 Oct 1920, *Lam 1637* (Type), Doorman Top, 3520 m, *Lam 1654* (BO); Idenburg River, 18 km SW of Bernhard Camp, 2100 m, Jan 1939, *Brass 12189*; Hellwig Mts, Erica summit, 1460 m, Nov 1909, *von Römer 1037, 1038, 1052* (all BO); Erica summit, 1520 m, Dec 1912, *Pulle 802, 803* (both BO), Hellwig Mts, 1900 m, *Pulle 843* (BO).

#### 41. *Nepenthes lowii* Hook. f.

*Nepenthes lowii* Hook. f., Trans. Linn. Soc. 22 (1859) 420, t. 71; Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 321; Sh. Kurata, *Nepenthes of Mt. Kinabalu, Sabah* (1976) 53; Philipps & A.L. Lamb, *Nature Malaysiana* 13, 4 (1988) 19, 20; *Pitcher Plants of Borneo* (1996) 98, f. 53.  
— Type: *Low s. n.* (lecto, designated here, K; iso K × 3), Borneo, Sabah, Kinabalu.

Emended description: Lowermost pitchers ovoid, ventricose below, narrowing, and sometimes shortly tubular towards mouth, and somewhat constricted below peristome; with 2 fringed wings running from mouth to 2/3–3/4 the height of pitcher;

peristome rounded, toothed within; lid with numerous bristles to 6 mm long and covering most of the lower lid surface; lid glands exude a characteristic white fluid.

Distribution — Borneo: Sabah (Mts. Kinabalu, Trus Madi) and Sarawak (Hose Mts., G. Buli, Tama Abu range, Bario, Mt. Murud, Mt. Mulu).

Ecology — Mossy forest, ridge tops; 1600–2600 m altitude.

Notes — 1. A distinctive species in the semi-woody, laterally twisted upper pitchers which lack a proper peristome and are extremely constricted at their mid-point. The lower pitchers, however, are ovoid and bear a well developed peristome. The upper pitcher is green outside and a deep maroon red inside. The lid is relatively small, reflexed backwards and has many long, tapering bristles to 6 mm in length. In life, these bristles may occasionally support a mass of white gelatinous exudate. The composition and purpose is unknown (Phillipps & Lamb, 1996). Wistuba (1994) suggested that the unique pitcher shape may be an adaptation to preventing rainwater from diluting or leaching the pitcher contents below the narrow 'waist'.

2. The related *N. ephippiata* is distinguished by its relatively large lid, with short stout processes ( $3 \times 2$  mm tapering to a blunt 1 mm apex) relative to the longer, slender bristles ( $6-7 \times 0.5$  mm tapering to a point) in *N. lowii*. The more strongly developed peristome in the upper pitchers, and the less constricted 'waist' of *N. ephippiata* are also distinctive.

3. The species can be remarkably common in undisturbed areas but suffers greatly from curious humans (Phillipps & Lamb, 1996). Some collectors have remarked on the tendency of these pitchers to trap leaf litter — a 'vegetarian' pitcher plant (Ed de Vogel, pers. comm.). The tree shrew *Tupaia montana* has often been reported by collectors as 'licking', or 'hunting for snails' on the underside of the lids (Smythies, 1965).

Collections — BORNEO. Sarawak. Lawas, Bakelalan, G. Murud, *Paie* 26511 (SAR), 26512 (SAR, SING); Murud NP, *Yii Puan Chin* S 44420 (SAR); Murud to Bakelalan ridge, camp IV, *Burt & Martin* 5418 (SAR); Kalabit highlands, Mt. Murud east path to ridge, *Nooteboom & Chai* 1962 (SAR); Miri Div., Marudi Dist., Mulu NP, *Bulcher & Jawa* S 57910 (SAR); G. Mulu, *Anderson* S 15085 (SAR), *Lee* 38829 (KEP, SAR), *Burt & Woods* 2144 (E, SAR); G. Mulu, G. Api,  $4^{\circ} 07' S$   $114^{\circ} 53' E$ , *Argent & Jermy* 1012 (KEP, SAR); Mulu NP, Ulu Sg. Tutoh, *Chai* 36461 (SAR); Mulu NP, Ulu Sg. Melinau, *James et al.* 36561 (SAR); G. Bt. Buli, *Awa & Lee* 50990 (SAR); Tama Abu Range, Bario, *Awa & Lee* 51149 (SAR); Hose Mts, Bt. Temedo, *Banying & Nyudengo* S 19023 (SAR). — Brunei. Temburong Dist., N of Bt. Retak, *Wong* 453 (KEP, SAR, SING). — Sabah. Mt. Kinabalu, *Anderson* 25600 (SAR), *Smythies* 14422 (SAR), *Haviland* 1659 (SAR), *Holtum s.n.* (SING), *Collenette* 755 (SING), *Sinclair* 9043 (SING); G. Alab range, W of Trus Madi, *Tambunan* 60341 (KEP); Bt. Mankobo, Beluran, *Aban G. SAN* 95220 (KEP, SAR). — Kalimantan. East Kalimantan, G. Lunjut, Pujungan River, *McDonald & Ismail* 3578 (BO); East Kalimantan, G. Buduk Pakik, N of Long Bawan, Krayan,  $4^{\circ} 03' 115^{\circ} 47'$ , *Kato et al.* 11053 (BO).

Hybrids — Two hybrids involving this species have been described:

1. *Nepenthes lowii*  $\times$  *Nepenthes macrophylla* — *Nepenthes*  $\times$  *trusmadiensis* Marabini, Mitt. Bot. Staatss. Munch. 19 (1983) 449; Phillipps & A.L. Lamb, Nature Malaysiana 13, 4 (1988) 21, 22; Pitcher Plants of Borneo (1996) 142, f. 76.

Description — Upper pitchers with the form of *N. lowii*, with constricted middle, and a broadening mouth, but with a large peristome, and a very large lid lacking bristles below. As in *N. lowii* the outer surface is predominantly green, and the inner surface deep red.



Distribution — Borneo: Sabah (Mt. Trus Madi).

Note — This natural hybrid between *N. macrophylla* and *N. lowii* was said to be frequent on the summit of Mt. Trus Madi in Sabah. However, recent visitors suggest that the plant may be a solitary, rather large individual (Martin Sands, pers. comm.). It is of note that no equivalent hybrids have been found on Mt Kinabalu, where *N. edwardsiana* (closely related to *N. macrophylla*) is to be found growing with *N. lowii*.

2. *Nepenthes lowii* × *Nepenthes stenophylla* Phillipps & A.L. Lamb, *Nature Malaysiana* 13, 4 (1988) 10; *Pitcher Plants of Borneo* (1996) 154, f. 82. — *Nepenthes* × *bruneiensis* A. Culham, *Carnivorous Plant Society* 21; nomen;

Description — Pitchers tubular, but constricted towards the middle, with a large, rounded peristome, and a lid with bristles and white exudate.

Distribution — Borneo: Sabah (Mt. Mentapok); Brunei (Bukit Pagon).

Note — Found rarely as individuals in mixed populations of *N. lowii* and *N. stenophylla* (Phillipps & Lamb, 1996). Mossy forest above 1500 m altitude.

#### 42. *Nepenthes macfarlanei* Hemsl.

*Nepenthes macfarlanei* Hemsl., *Proc. Linn. Soc.* 6/4/1905 (1905) 12; Hook. f., *Icon.* (1906) 29, t. 2814 & 2815; Danser, *Bull. Jard. Bot. Buitenzorg* III, 9 (1928) 323; Shivas, *Pitcher plants of Peninsular Malaysia & Singapore* (1984) 35. — Type: *King's Coll. 7421* (lecto, designated here, K; iso K × 3), Perak, nearly on top of G. Bubu, 4800–5300 ft, 1885.

Distribution — Peninsular Malaysia.

Ecology — Mountain ridges, but usually in shady sites on mossy banks; 1000–2150 m altitude (Kiew, 1990).

Notes — 1. At Kew there are four sheets collected by Dr. King's collectors. On one of these sheets '*N. macfarlanei* Hemsley' has been written, followed by the initials W.B.H., and we presume that this annotation has been done by Hemsley himself. These collections were probably in the Calcutta herbarium, and received at Kew in 1905.

2. This species is characterised by the bristles on the underside of the lid. The pitchers are characteristic in the way they are abruptly contracted at the mouth. The peristome is flattened, and developed into a short neck at the apex, on its inner margin it is markedly toothed. The lower pitchers may be borne on tendrils up to 90 cm in length.

3. Danser (1928) pointed out that some collections appear intermediate between *N. ramispina* or *N. sanguinea*. The bristles below the lid and the toothed peristome are usually diagnostic of *N. macfarlanei*. *Nepenthes sanguinea* has a sharply-angled stem, those of *N. macfarlanei* are more rounded-angular, while *N. gracillima* and *N. ramispina* have cylindrical stems. (See *N. gracillima* for further differential characters between these four species.)

*Selected collections* — MALAY PENINSULA. Perak. G. Batu Puteh, *Wray 339* (SING); G. Bubu, *Symington 30848* (KEP), *King's coll. 7395* (BO, SING). — Selangor. G. Ulu Kali, *Shah & Ali 2961* (KEP, SING), *Soepadmo 9021* (KLU); Bt. Tunggai, *Wyatt-Smith 94569* (KEP). — Kelantan. G. Storig, *Symington 37699* (KEP). — Terengganu. G. Sembilu, *7/1952, Hislop s.n.* (SING). — Pahang. Cameron Highlands, *Holttum 23404* (BO, SING); G. Tahan, *Ng 20961* (KEP). — Malaka. *Alvins s.n.* (SING).

#### 43. *Nepenthes macrophylla* (Marabini) Jebb & Cheek, *stat. nov.*

*Nepenthes edwardsiana* Hook. f. subsp. *macrophylla* Marabini, Mitt. Bot. Staatss. Munch. 23 (1987) 427; Philipps & A.L. Lamb, Nature Malaysiana 13, 4 (1988) 21 as *Nepenthes edwardsiana*; Philipps & A.L. Lamb, Pitcher Plants of Borneo (1996) 101, f. 54. — Type: *Marabini 2167/48* (holo ER n.v.; M n.v.), Borneo, Sabah, Mt. Trus Madi, 2500 m, 1983.

Description: As for *N. edwardsiana*, but leaf-blade larger, to 35(–60) × 12(–20) cm. Pitchers semi-woody, shortly cylindrical, slightly constricted at the mid-point; 22–28 × 6.5–8.5 cm at base and apex, 6–7 cm wide at midpoint; peristome with ridges much shallower, 1(–3) mm high at side of mouth, 5–8 mm apart; lid larger, 9–12 × 9–10.5 cm. Inflorescence 38–78 cm long; peduncle 15–23 × 0.4 cm; pedicels ± 250, 15–16 mm long; bracts 1–2 mm long, 1–5 mm from main axis; tepals ellipsoid 5–6 × 3 mm; staminal column 3–4 mm long; anther-head 1.5–2 × 2–2.5 mm. Colour of pitcher suffused dull red, peristome darker, inner pale green, lid red above, green below, inflorescence dull reddish brown and green.

Distribution — Borneo: Sabah (Mt. Trus Madi); type collection only.

Ecology — Moss forest, ridge-tops; 2000–2600 m altitude.

Note — The leaves of *N. edwardsiana* reach a maximum size of about 20 × 6 cm, whilst the smaller blades of *N. macrophylla* start at 35 × 12 cm. The pitcher is distinct from that of *N. edwardsiana*, by its shorter, more ventricose pitcher, which is narrowed in its upper 1/3, and its relatively large lid.

Hybrids — A hybrid with *N. lowii* (see there) has been named *Nepenthes* × *trus-madiensis* Marabini.

#### 44. *Nepenthes macrovulgaris* J.R. Turnbull & A.T. Middleton

*Nepenthes macrovulgaris* J.R. Turnbull & A.T. Middleton, Bot. J. Linn. Soc. 96 (1988) 352, f. 1 & 2; Lowrie, Carnivorous Plant Newsl. 12 (1983) 88, nomen; Philipps & A.L. Lamb, Pitcher Plants of Borneo (1996) 103, f. 55. — Type: *Turnbull & Middleton 81166j* (lecto, designated here, K; iso BO, K, L, US), Borneo, Sabah, Mt. Silam, 4° 58' N 118° 10' E, 550 m, 1 June 1981. *Nepenthes* sp., Sh. Kurata, *Nepenthes* of Mt. Kinabalu, Sabah (1976) 76, f. 27.

Distribution — Borneo: Sabah.

Ecology — Shrubberies, landslides or cliffs only on ultrabasic soils; 300–1200 m.

Notes — 1. Five sheets at Kew are cited as the holotype, but this is incompatible with ICBN rules. One sheet (*Turnbull & Middleton 81166j*) has been illustrated (fig. 1) in the original publication and this is here selected as the lectotype. The specific name is an irregular combination of Greek and Latin.

2. Most closely related to *N. hirsuta* and *N. hispida*, this species can be distinguished by being confined to ultrabasic soils, its toothless peristome margin, and its total lack of hairs. The lower pitchers have a constriction immediately below the peristome, not unlike that of *N. macfarlanei*.

3. Specimens of this species collected over the last two decades have often been incorrectly labelled '*N. hybrida*'.

Collections — BORNEO. Sabah. Mt. Silam, *Beaman 11633* (SAR), *Turnbull & Middleton 81161* (Type); Mt. Tribulation, Sq. Segama, *Cockburn 84881* (K, KLU, L, SAR); Tongod Dist., Bt. Tinker, Keramuak, *Dewol 96682* (K, L, SAR, SING); Telupid, Bt. Tawai FR, *Dewol 108799* (KEP, SAR, SING); Mt. Meliau, Kiabau-Labuk, *Meijer 51564* (SAR).

**45. *Nepenthes madagascariensis* Poir.**

*Nepenthes madagascariensis* Poir. in Lam., *Encycl. Méth. Bot.* 4 (1796) 459; Willd., *Spec. IV*, 2 (1805) 873; Brongn., *Ann. Sci. Nat.* 1 (1824) 45, t. 5, f. 2; Raf., *Fl. Tellur.* 4 (1836) 101; Korth., *Verh. Nat. Gesch.* (1840) 41; Blume, *Mus. Bot. Lugd.-Bat.* 2 (1852) 9; Hook. f. in A. DC., *Prodr.* 17 (1873) 92; Becc., *Malesia* 3 (1886) 2; Nicholson, III, *Dict. Gardening* 4 (1886) 438; Scott-Elliott, *Ann. Bot.* 5 (1891) 376; Beck, *Wien. Ill. Gartenz.* (1895) 226; Burbidge, *Flora & Sylva II*, 12 (1904) 112; Dubard, *Bull. Mus. d'Hist. Nat.* 12 (1906) 62; Macfarl. in Engl., *Pflanzenr.* 4, 3 (1908) 31; Schmid-Hollinger, *Bot. Jahrb. Syst.* 100 (1979) 385, t. 8–14; Flore de Madag. fam. 86 (1982) 44, t. 12–13. — Type: *Commerson s.n.* (P-LA), Madagascar.

*Nepenthes cristata* Brongn., *Ann. Sci. Nat.* 1 (1824) 48, partim (see Excluded species).

*Nepenthes distillatoria* auct. non L.: Brion, Belg. *Hortic.* 5 (1855) 196.

*Nepenthes madagascariensis* var. *cylindrica* Dubard, *Bull. Mus. d'Hist. Nat.* 12 (1906) 63. — Type: *Humblot 400* (P n.v.), Madagascar.

*Nepenthes madagascariensis* var. *macrocarpa* Scott-Elliott, *Ann. Bot.* 5 (1891) 376. — Type: *Scott-Elliott 2302* (n.v.), Madagascar, near Fort Dauphin.

**Distribution** — Madagascar, east coast as far north as Masoala peninsula, commonest in south around Fort Dauphin.

**Ecology** — Along the edges of swamps and in peaty/sandy soils; low altitudes.

**Note** — There are two species of *Nepenthes* in Madagascar. The second species, *N. masoalensis*, occurs immediately beyond the northernmost locality of the present species. *Nepenthes madagascariensis* is characterised by its wholly infundibuliform upper pitchers (vs. ventricose-tubular in *N. masoalensis*). Other differences are cited under *N. masoalensis*.

**Selected collections** — MADAGASCAR. Belavenoke, 1/10/32, *Decary 10731* (K, P); Fort Dauphin, 26/6/26, *Decary 3983* (K, P); Tamatave, 20/7/1882 *Humblot s.n.*, (K, P); Tamatave Tampina FR, 21/12/38, *Lam & Meeuse 6032* (K); Andovoranto, near Antanifotsy, 45 km S of Tamatave, *Viguiet & Humbert 2004* (P).

**46. *Nepenthes mapuluensis* J.H. Adam & Wilcock**

*Nepenthes mapuluensis* J.H. Adam & Wilcock, *Blumea* 35 (1990) 265. — Type: *Kostermans 14017* (lecto, designated here, L; iso BO, L), Borneo, East Kalimantan, Berouw, Mt. Ilas Mapulu, 800 m, 23 Sep 1957.

**Emended description:** Stem angular to rounded, nodes bent in lower part of stem, giving zig-zag appearance. Leaves lanceolate-obovate, sessile or petiolate; 13–26 × 2–5.5 cm; apex acute to rounded, sub-peltate; base tapering, parallel-sided and somewhat dilated and amplexicaul at the very base; longitudinal veins 4–5, in outer 2/3 to 3/4 of blade, arising from base, or some from lower part of midrib, pennate nerves arising obliquely, curving towards margin; petiole absent or broadly winged to 6 cm long. Lower pitcher ellipsoid throughout, and narrowest at mouth, or somewhat tubular in upper 1/2; 12–22 × 3.5–8 cm; fringed wings 2–8 mm broad, with fringe elements to 3 mm, 2–4 mm apart; mouth oblique; peristome rounded at front, somewhat broadened near apex, 0.3–2.2 cm across, internally with teeth to 1.5 mm, externally margin undulate; lid ovate, 4.5–9.2 × 3–5 cm, apex rounded, base abruptly attenuate to scarcely cordate, with a prominent central ridge, glands dense near base and along ridge, rimmed, 1 mm across, remaining surface glandless; tendril to over

45 cm long. Upper pitcher ellipsoid in lower 1/2, constricted above and widening to mouth; to 19 × 5 cm; mouth ovate; peristome 0.4 cm across, rounded at front, expanded near lid to 1.2 cm across, ribs 0.3–0.5 mm apart, teeth on inner margin to 2 mm long; fringed wings as in lower pitcher, but near mouth only. (Climbing pitchers of BO specimen ellipsoid below, tubular in upper 1/2; to 12 × 2 cm; peristome 1–2 mm across, rounded, not expanded; wings absent.) Leaves dry a characteristic grey-green above, and reddish brown below. In life the pitcher varies from light green with black-purple markings to dark purple with greenish purple spots; peristome brown; wings black.

Distribution — Borneo: East Kalimantan (Sambaliung range).

Ecology — Limestone; 700–800 m altitude.

Notes — 1. Adam and Wilcock (1990) only cited the holotype in their original publication. Two other collections at Leiden and Bogor provide for a fuller description of the species. In the original publication two duplicates of the type number are given as the holotype. Of these the sheet with the male inflorescence (from which their fig. 1 was prepared) is chosen as the lectotype.

2. The majority of the isotype material at Bogor exhibits very different upper pitchers from the remaining material, but the leaves match the remaining specimens, and we may presume that the species either shows a somewhat extreme dimorphism in pitcher shape, or that the material is a mixed collection of *M. mapuluensis* and a further unknown species.

3. This species has a striking similarity to *N. northiana*; the ellipsoid lower pitchers with large oblique mouth, the expanded peristome with an undulate outer edge, the ovate lid with glands confined towards the midline, and the sub-peltate leaf tips. It differs in many other features, particularly the smaller leaf, non decurrent leaf base and smaller inflorescence. Like *N. northiana* it has only been collected from limestone. One collection comes from the type locality of *N. campanulata* Sh. Kurata.

Collections — BORNEO. Kalimantan Timur, G. Buntung, 1° 50' N 117° 15' E, 700 m, 28 Aug 1981, *Geesink 9314* (L); Berouw, Mt. Ilas Bungaan, 700 m, 12 Sep 1957 *Kostermans 13821* (L), Mt. Ilas Mapulu, 800 m, 23 Sep 1957, *Kostermans 14017* (Type).

#### 47. *Nepenthes masoalensis* Schmid-Hollinger

*Nepenthes masoalensis* Schmid-Hollinger, Bot. Jahrb. Syst. 97 (1977) 576, t. 1–4. — Type: *Zaka-hosy 1949* (P), Madagascar, Antanampanihy prov., Antalaha district, Serv. d'Agric. d'Antalaha, Ambato.

Distribution — Madagascar: Masoala peninsula, and Mt. Ambato region.

Ecology — *Pandanus* and *Sphagnum* swamp, mountain ridgetops, xerophytic vegetation; 30–400 m altitude (Schmid-Hollinger, 1977).

Notes — 1. This species is confined to the Masoala peninsula in northeastern Madagascar, while *N. madagascariensis* is found to the south.

2. Closely related to *N. madagascariensis*, it differs in its upper pitchers being cylindrical or ventricose-tubular, not wholly infundibulate; the lid is rounded and never emarginate or broader than long; the leaves are scarcely petiolate, and the venation of this species is distinct in the way the pennate nerves are more distinct, and curve to an almost perpendicular arrangement, unlike those of *N. madagascariensis*, which

are scarcely separable from the longitudinal nerves, in that they tend to curve towards the apex.

**Collections** — MADAGASCAR. Amboato, *Schmid-Hollinger 100.1–100.7* (Z, n.v.); Antalaha Dist., Antanampanihy Prov., *Zakahosy 1949*, Serv. d'Agric. d'Antalaha (Type); Antalaha, Res. Nat. II, *Duran 2253* (P); d'Ambato sur Onive, *Roberson s.n.*, 27/3/49 (P); Masoala, Maroantsetra, *SF 5546* (P); Sinda, S of Onive, *Schmid-Hollinger 101.1–102.21* (Z) sans vide; Miandralanitra, S of Onive, *Schmid-Hollinger 102.1–102.23* (Z) sans vide.

#### 48. *Nepenthes maxima* Reinw. ex Nees

*Nepenthes maxima* Reinw. ex Nees, Ann. Sc. Nat. 3 (1824) 369, t. 20, f. 2; Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 325, partim; Jebb, Science in New Guinea 17 (1991) 29, f. 14, 15. — Type: ? *Reinwardt 1537* (L x 3), Sulawesi, Manado, G. Roemengan, 1821.

*Nepenthes celebica* Hook. f. in A.D.C., Prodr. 17 (1873) 100. — Type: *Meyer s.n.* (lecto, designated here, K), Sulawesi, Gorontalo.

*Nepenthes boschiana* auct. non Korth.: Becc., Malesia 1 (1878) 214; 3 (1886) 3, f. 3 & 9.

*Nepenthes curtisii* Mast., Gard. Chron. 2 (1887) 681, t. 133. — Type: *Curtis s.n.* (K), cultivated ex Borneo.

*Nepenthes curtisii* var. *superba* Hort. Veitch ex Marshall, Gard. Chron. III, 14 (1893) 756. — *Nepenthes maxima* var. *superba* (Hort. Veitch ex Marshall) Veitch, J. Roy. Hort. Soc. 21 (1897) 238; Mast., Gard. Chron. III, 38 (1905) 379. — Type: not located.

*Nepenthes oblanceolata* Ridl., Trans. Linn. Soc. II, Bot., 9 (1916) 140; Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1940) 344. — Type: *Kloss s.n.*, Wollaston Expd. (lecto, designated here, K), New Guinea, Carstenz Mts., camp VIa, 930 m.

*Nepenthes maxima* var. *minor* Macfarl. in Gibbs, Contr. Phytogeogr. & Flora Arfak Mountains (1917) 141. — Type: *Gibbs s.n.* (BM n.v.), New Guinea, Arfak Mts.

Non *Nepenthes maxima* var. *lowii* Becc., Malesia 3 (1886) 3, quae = *N. stenophylla* Mast.

Non *Nepenthes maxima* var. *sumatrana* (Miq.) Becc., Malesia 3 (1886) 3, quae = *N. sumatrana* (Miq.) Beck.

**Distribution** — Sulawesi, Moluccas, New Guinea.

**Ecology** — Epiphytic in mossy forest, or terrestrial in swamp grassland, or on ridge tops; usually 600–2500 m, but occasionally at lower altitudes (40 m, Milne Bay, Papua New Guinea).

**Notes** — 1. Reinwardt's collection at Leiden (*No. 1537*) is annotated as the type of *N. maxima*. The original publication certainly cites a Reinwardt specimen from Sulawesi, but it also includes a drawing of a male flower and a fruit, which are not present on the Leiden material. Nees von Esenbeck's herbarium was split up and sold (see notes under *N. gymnamphora*). It is possible that further duplicates of Reinwardt's material exist elsewhere. Whilst not disputing that the Leiden sheets (3) are original material, we consider it probable that Nees used further material for his description. A lectotype is therefore not nominated for the present.

2. Hooker did not see the Korthals material of *N. maxima*, and he left the species as not satisfactorily known, describing *N. celebica* from the Meyer material at Kew.

3. *Nepenthes curtisii* was grown from seed at Veitch's nurseries, and was said to have been collected by Charles Curtis in Borneo. To our knowledge no equivalent material has ever been collected in Borneo, and it is possible that the seed was collected in Sulawesi, where Charles Curtis travelled (1881) after Borneo (1880).

4. *Nepenthes maxima* is a widespread and very variable species. The upper pitchers range greatly in form, from narrowly cylindrical to strongly infundibulate. In some populations the upper pitchers are winged along their entire length, resembling the rosette pitchers. In others the lower pitchers are ovoid throughout while the upper pitchers vary from slender and cylindrical to markedly infundibulate. There has been confusion with *N. fusca* in Borneo because some authors, including Danser, have used the presence of an apical lid appendage as a diagnostic character for *N. maxima*. Although some individuals of *N. fusca* in Sarawak do have broad, ovate lids with apical appendages, these are usually on lower or intermediate pitchers. The narrow lid which we consider the main diagnostic character of *N. fusca* is usually only evident in upper pitchers. *Nepenthes eymae* is another close relative, and is said to merge with *N. maxima* in Sulawesi, although we have seen no herbarium material to support this view.

*Selected collections* — SULAWESI. Menado, G. Roemengan, *Reinwardt* 1537 (L), Kanba-Taripa, *Eyma* 4019 (BO); Minahasa, Tomohai, G. Lokon, *Foreman* 368 (BO); G. Malabo, *Rachmat* 514 (BO); Kabaena, G. Sabampolulu, *McDonald & Ismail* 4170 (BO). — MOLUCCAS. Morotai, *Kostermans* 1202 (BO). Halmahera, Tillare, *Lam* 3745 (BO); W. Tobelor, *Begu* 2313 (BO). Batjan, G. Sibela, *Roepke* 11 (BO). Obi Is., G. Jikodolang, *de Vogel* 4286 (BO). Buru, *Toxopeus* 143 (BO). Seram, G. Binaia, *Argent* 87169 (BO); G. Selagor, *Buwalda* 5780 (BO). Ambon, *Boerlage* 463 (BO), *Buwalda* 6216 (BO). — NEW GUINEA. Irian Jaya. Sorong, path from Sudjak village to Mt. Kusemun, Ije River valley, *Van Royen & Sleumer* 7719 (BO, K, L); Angi Gita lake, *Kostermans* 2165 (BO, K); Enarotali, *Eyma* 4819 (BO, K); Cycloops Mts, *van Royen & Sleumer* 5928 (BO, K); Balim valley, *Burley & Ismail* 4507 (KEP, SING); Balim valley above Wellesey, *Kostermans & Soegeng* 610 (BO, K). — Papua New Guinea. Telefomin, *Lisowski* 53164 (K); Morobe, Headwaters of Buhem River, Mt. Rawlinson, *Hoogland* 9299 (BO, K, LAE); Normanby I., Mt. Pabinama, *Brass* 25663 (K, LAE).

#### 49. *Nepenthes merrilliana* Macfarl.

*Nepenthes merrilliana* Macfarl., Trans. & Proc. Bot. Soc. Pennsylv. 3, 3 (1911) 208, t. 1; Sh. Kurata & Toyosh., Gard. Bull. Sing. 26 (1972) 157. — Type: *Hutchinson* 7545 (MAN n.v.), Philippines, Mindanao, Surigao Prov., Dinagat Island, 20 m, 1907.

*Nepenthes merrillii* Elmer, Leaflet. Philipp. Bot. 8 (1915) 2787, sphalm.

*Nepenthes surigaoensis* Elmer, Leaflet. Philipp. Bot. 8 (1915) 2785. — Type: *Elmer* 13705, p.p. (PNH †?), Philippines, Mindanao, Agusan Prov., Mt. Urdaneta, 1700 m, Sep 1912.

Distribution — Philippines: Mindanao (Surigao Province, including Dinagat Is.).

Ecology — Forest, steep slopes near coast, 20–1700 m altitude. Although reported by Macfarlane (1911) as being epiphytic, this is probably an error, and is based on a note added to the specimen at Kew by Merrill.

Notes — 1. The type of *N. surigaoensis* was erroneously recorded as 12705 by Elmer, the true number being 13705. This collection is a mixture, and the other species was described by Danser as *N. petiolata*.

2. From other Philippine species it can be distinguished by its long, narrow spatulate leaves, 20–60 × 5–7 cm with an obtuse or somewhat emarginate apex, with 5–7 longitudinal nerves on each side of the midrib in the outer 2/3 of the blade, the pitcher is ellipsoid to obovoid, with a broad sinuous peristome.

3. Danser identified a specimen (*Riedel s.n.*, BO) from Gorontalo, Sulawesi as belonging to this species. However, it seems to us that the acute leaf apex, narrowed

mouth and long peristome teeth do not suggest that they are conspecific. Further material is needed from northern Sulawesi to elucidate the placement of this material.

4. Three Philippine endemics are confined to the Surigao province of Mindanao Island: *N. bellii*, *N. merrilliana* and *N. petiolata*.

*Selected collections* — PHILIPPINES. Mindanao, Surigao Prov., Dinagat I., *Hutchinson 7545* (Type); Surigao Prov., *Ramos 34503* (BO, SING); Agusan Prov., Mt. Urdaneta, *Elmer 13705* p.p. (Type of *N. surigaoensis*).

## 50. *Nepenthes mikei* B. Salmon & Maulder

*Nepenthes mikei* B. Salmon & Maulder, Carnivorous Plant Newsl. 24 (1995) 82, f. 3 & 4. — *Nepenthes* sp., Hopkins, Salmon & Maulder, Carnivorous Plant Newsl. 19 (1990) 23, 25. — Type: *Salmon & Maulder 221719* (AK n.v.), cultivated, Sumatra, Riau Prov., Mt. Pangulubau, 1900 m, 17 Feb 1995.

**Emended description:** Stems rounded to angular. Leaves linear-obovate; to  $15 \times 2$  cm. Lower pitchers to  $11.5 \times 2$  cm. Upper pitchers  $5\text{--}13 \times 0.8\text{--}2$  cm; mouth acuminate to lid. Lids to  $3.8 \times 2.1$  cm. Male inflorescence  $7\text{--}15$  cm long, upper  $1/2$  to  $2/3$  bearing from  $20\text{--}45$  flowers.

**Distribution** — Sumatra: Aceh, Gajo and Leuser Mts.; Riau, G. Pangulubau.

**Ecology** — Mossy forest, montane scrub;  $1100\text{--}2400$  m altitude.

**Notes** — 1. The type material was cultivated from specimens collected on Mt. Pangulubau. Other herbarium material was overlooked by the authors at the time of publication. The species was named for Mike Hopkins, who published the first description of the species.

2. *Nepenthes mikei* resembles *N. tobaica* from which it differs by its small *N. ramispina*-like pitchers, with fasciculated multiple spurs at the apex of the pitcher, and 1-flowered partial peduncles. It also differs in having auriculate leaf bases and a short inflorescence of pedicelled flowers.

**Collections** — SUMATRA. Aceh Prov., G. Leuser Nature Reserve, G. Bandahara, 2400 m, 22 June 1972, *de Wilde & de Wilde-Duyffes 13190* (BO); *13103* (L); Takengon, Bui ni Telong, 16/6/1930, *Frey-Wyssling 18* (BO); Ravijn van Passoebaea, Habinsaran, 27/12/30, *Frey-Wyssling 24* (BO); Losir Massif, 2250–2750 m, 30 Jan 1937, *van Steenis 8488, 8488a* (BO); Leuser, Go Lemboeh, Feb 1937, *van Steenis 8976, 9170* (BO); Losir, Paja, K. Kapi & K. Aoenan, *van Steenis 9968* (BO).

## 51. *Nepenthes mirabilis* (Lour.) Druce

*Nepenthes mirabilis* (Lour.) Druce, Rep. Exch. Cl. Br. Isl. (1916) 637; Merr., Interpr. (1917) 242; Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 330; Sh. Kurata, *Nepenthes* of Mt. Kinabalu, Sabah (1976) 56; Tamin & M. Hotta in M. Hotta, *Diversity and dynamics of plant life in Sumatra* (1986) 88; Jebb, *Science in New Guinea* 17 (1991) 32, f. 16; J.H. Adam & Wilcock, *Mal. Nature J.* 46 (1992) 76; Philipps & A.L. Lamb, *Pitcher Plants of Borneo* (1996) 109, f. 57. — *Phyllamphora mirabilis* Lour., Fl. Cochinch. 2 (1790) 606. — *Nepenthes phyllamphora* Willd., Sp. Pl. IV, 2 (1805) 874. — Type: *Loureiro s.n.* (P n.v.), Vietnam, near Hue.

*Cantharifera* Rumph., Amb. 5 (1750) 121, t. 59, f. 2.

*Nepenthes distillatoria* auct. non L.: Steud., Nom. ed. 2, 2 (1841) 190.

*Nepenthes moluccensis* Oken, Allg. Naturgesch. 3, 2 (1841) 1368, n.v.

*Nepenthes phyllamphora* var. *platyphylla* Blume, Mus. Bot. Lugd.-Bat. 2 (1852) 7. — Type: *Blume s.n.* (L n.v.), Java, Bantam; not located.

- Nepenthes macrostachya* Blume, Mus. Bot. Lugd.-Bat. 2 (1852) 7. — Type: Sumatra, Bencoolen; not located.
- Nepenthes fimbriata* Blume, Mus. Bot. Lugd.-Bat. 2 (1852) 7. — Type: *Korthals s.n.* (L n.v.), Borneo, Pulau Lampei.
- Nepenthes fimbriata* var. *leptostachya* Blume, Mus. Bot. Lugd.-Bat. 2 (1852) 8. — Type: *Blume s.n.* (L n.v.), Borneo.
- Nepenthes kennedyana* F. Muell., Fragm. 5, part 37 (1866) 154. — *Nepenthes kennedyi* Benth., Fl. Austr. 6 (1873) 40, sphalm. — Type: *Jardine s.n.* (MEL n.v.), Australia, Queensland, Cape York, near Somerset.
- Nepenthes echinostoma* Hook. f. in A.DC. Prodr. 17 (1873) 95; Macfarl. in Engl., Pflanzenr. 4, 3 (1908) 70. — *Nepenthes mirabilis* var. *echinostoma* (Hook. f.) J.H. Adam & Wilcock, Mal. Nature J. 46 (1992) 81, f. 2; Philipps & A.L. Lamb, Pitcher Plants of Borneo (1996) 110. — Type: *Beccari 121* (K, FI n.v.), Borneo, Sarawak, Kuching.
- Nepenthes phyllamphora* var. *macrantha* Hook. f. in A.DC. Prodr. 17 (1873) 97. — Type: *Beccari s.n.* (FI n.v.), Borneo, Sarawak.
- Nepenthes bernaysii* F.M. Bailey, Proc. Linn. Soc. N.S.W. 5 (1881) 185. — Type: *Haskett s.n.* or *Beddome s.n.* (BRI n.v.), Australia, Queensland, Cape York at Bowden Park.
- Nepenthes obrieniana* Linden & Rodrigas, L'Illustration Hort. 38 (1890) 109, t. 66 (as *o'brieniana*). — Type: not located, ?Borneo.
- Nepenthes jardinei* F.M. Bailey, Qld. Agric. J. 1 (1897) 230, t. s.n. — Type: *Jardine s.n.* (BRI n.v.), Australia, Queensland, Somerset.
- Nepenthes rowanae* F.M. Bailey, Qld. Agric. J. 1 (1897) 231, t. s.n. — Type: *Jardine s.n.* (BRI n.v.), Australia, Queensland, Somerset.
- Nepenthes albolineata* F.M. Bailey, Qld. Agric. J. 3 (1898) 355, t. 58 (as *albo-lineata*). — Type: *Jardine s.n.* (BRI n.v.), Australia, Queensland, Somerset.
- Nepenthes moorei* F.M. Bailey, Qld. Agric. J. 3 (1898) 355. — Type: *Jardine s.n.* (BRI n.v.), Australia, Queensland, Somerset.
- Nepenthes alicae* F.M. Bailey, Qld. Agric. J. 3 (1898) 356. — Type: *Jardine s.n.* (BRI n.v.), Australia, Queensland, Somerset.
- Nepenthes cholmondeleyi* F.M. Bailey, Qld. Agric. J. 7 (1900) 441, t. 59. — Type: *Cholmondeley Jardine s.n.* (BRI n.v.), Australia, Queensland, 5 miles S Jardine River.
- Nepenthes pascoensis* F.M. Bailey, Qld. Agric. J. 16 (1905) 190, t. 2. — Type: *Garraway s.n.* (BRI n.v.), Australia, Queensland, Head of Pascoe River.
- Nepenthes armbrustae* F.M. Bailey, Qld. Agric. J. 16 (1905) 191, t. 3. — Type: *Armbrust s.n.* (BRI n.v.), Australia, Queensland, Coen.
- Nepenthes garrawayae* F.M. Bailey, Qld. Agric. J. 16 (1905) 191, t. 4. — Type: *Garraway s.n.* (BRI n.v.), Australia, Queensland, between York Downs & Weipa.
- Nepenthes tubulosa* Macfarl. in Engl., Pflanzenr. 4, 3 (1908) 60. — Type: *Teijsmann 6759* (BO), Moluccas, P. Gebe, Aug 1871.
- Nepenthes beccariana* Macfarl. in Engl., Pflanzenr. 4, 3 (1908) 67, f. 17. — Type: *Modigliani s.n.* (FI n.v.), Sumatra, Nias Is.
- Nepenthes phyllamphora* var. *pediculata* Lecomte, Fl. Gén. Indoch. 5 (1910) 52. — Type: *Harmand 47* (P), Laos, Champasak prov., Sé-moun basin.
- Nepenthes mirabilis* var. *biflora* J.H. Adam & Wilcock, Mal. Nature J. 46 (1992) 80, f. 1. — Type: *Jumaat Adam 1065* (UKMS), Sarawak, 7th Division, Kp. Bawang, 10 m, 6 Feb 1987.
- Non *Nepenthes phyllamphora* sensu Sims, Bot. Mag. (1826) t. 2629 = *N. khasiana* Hook. f.
- Non *Nepenthes phyllamphora* sensu Regel, Gartenfl. (1881) 371, t. 372 = p.p. *N. khasiana* Hook. f.
- Non *Nepenthes phyllamphora* sensu Stapf, Trans. Linn. Soc. II, 4 (1894) 217 = *N. burbridgeae* Hook. f. ex Burb.

Distribution — Indochina to Micronesia (Palau) and Australia. In Malesia: throughout except northern Philippines (Luzon) the eastern Nusa Tenggara (East Java, Bali to Lombok).



Ecology — Found in a remarkable range of habitats, but usually most abundant in disturbed, swampy or grassland situations. Usually at low altitude up to 200 m, but up to 1000 m, and more rarely to 1500 m (New Guinea).

Notes — 1. This species was long known under the name *N. phyllamphora* due to Willdenow's incorrect combination of Loureiro's *Phyllamphora mirabilis*. In 1916, both Druce and Merrill made the correct combination, although the former has priority by a few months.

2. The peristome of western populations is usually flattened and extends well beyond the pitcher wall; in eastern populations it is more rounded (Beccari, 1885).

3. The variety *echinostoma* is one of the most striking aberrations, with long hook-like teeth developing from the inner peristome. Large populations of this variety are said to exist in Sarawak, but herbarium material is very scanty.

*Selected collections* — CHINA. Macao, *Ford s.n.* (K); Louitsion, *Delavay s.n.* (K). — VIETNAM. Thu Duc, 6/1867, *Pierre s.n.* (BO); Din Bonia, 3/1867, *Pierre s.n.* (BO); Hue and vicinity, *Squires 401* (BO). — THAILAND. Bau Son, *Haniff 4236* (SING); Hat Yai, *Kingdon Ward 37512* (BO, SING); Pattani, Yala, *Kerr 7265* (BK). — PENINSULAR MALAYSIA. Langkawi I., 9/1900 *Haniff s.n.* (SING); Pinang, Tasek Glugor, 4/1902, *Curtis s.n.* (SING); Pahang, Telok Bahang reserve, *Ahmad 9822* (KEP, SING); Selangor, Rawang–Kuala Lumpur rd, *Yap 253* (KLU); Johore, Segamat, *Holtum 38286* (SING). — SUMATRA. Siberut I., *Iboet 55* (BO, SING); Aceh, Takugan, *van Steenis 6046* (BO, SING); Benkoelen, Lebang, *de Voogd 1140* (BO); East coast, Asahan, Goeroeh Batoe, *Yates 1628* (BO); S Sumatra, Baturadjah, *Sun 9926* (BO); Bangka I., *Bünnemeijer 2116* (BO). — JAVA. Rawa Tembaga, *van Steenis 12560* (BO); Danau Moeras, *van Steenis 10543* (BO, SING). — BORNEO. Sarawak. Kuching, *Ridley s.n.* (SING); 2nd Div., Lubok Antu, Wang Pandak, *Awa & Paie 44138* (KEP); 3rd Div., Dalat-Oya rd, *Jenang 58080* (KEP). – Sabah. Sapaayau FR, *Amin SAN 113630* (KEP); Sg. Kapis, Kertan, *Dewol SAN 55957* (KEP). – Kalimantan. Pontianak, Mampawah, *Enoh 424b* (BO); G. Klam, *Hallier 2234* (BO); Sg. Wain, N of Balikpapan, *Kostermans 4150* (BO); Tarakan, Linghas, *Wiriadinata 97* (BO). — PHILIPPINES. Mindanao, Camp Kiethley, Lake Lanao, *Clemens s.n.* (BO). — SULAWESI. Menado, Oaafdi Poso, *Eyma 3459* (BO); Malili, *Kjellberg 2003* (BO); Matano Lake, Soroako, *Meijer 11074a* (BO). — MOLUCCAS. Halmahera, Ekor, G. Panjang, *de Vogel 3203* (BO); Obi I., Jikodolong, *de Vogel 4335* (BO); Ambon, Mangga dua, *Kuswata & Soepadmo 305* (BO, SING). Palau I., *Volkens 69* (BO). — NEW GUINEA. Irian Jaya. Sorong, *Stellman 15* (BO); Kebar valley, Netoti, opposite Andjai, *van Royen & Sleumer 6767* (BO, K); Cycloop Mts, *Gjellerup 493* (BO), *Iwanggin BW 5225* (LAE, S), *Meijer Drees 136* (BO, K). – Aru Is., P. Tringan, Kp. Ngaibor, *Buwalda 5341* (BO, SING). – Papua New Guinea. Manus, Mt. Dremsel, Lorengau sub-province, *Kerenga LAE 77541* (LAE); West Sepik, Yambi, *Hinson 46* (K, LAE); Western Highlands, Nondugl, *Mason 79* (K); Western Prov., 1 mile S of Moorhead Patrol Post, *Pullen 7156* (K, LAE); Markham Point, *Ridsdale & Frodin NGF 30352* (K, LAE); Central Prov., Varirata plateau, *Frodin UPNG 4378* (UPNG); Fergusson I., Aimelele, *Brass 25997* (K, LAE); Rossel I., Abaleti, *Brass 28365* (LAE). — AUSTRALIA. Cape York, *Jardine s.n.* (BRI); Pascoe River, *Garraway s.n.* (BRI).

## 52. *Nepenthes mollis* Danser

*Nepenthes mollis* Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 338, f. 14; Philipps & A.L. Lamb, Pitcher Plants of Borneo (1996) 113, f. 60. — Type: *Endert 4282* (holo BO), Borneo, East Kalimantan, Kemoel (= G. Kongkemul), 1500 m, 12 Nov 1925.

Distribution — Borneo; only known from the type, a single sheet.

Ecology — Unknown; 1500 m altitude.

Note — The lanceolate leaves with decurrent bases, a dense reddish indumentum of simple red hairs, the virtual absence of longitudinal veins except for their develop-

ment from the pennate nerves, and the 2-flowered partial peduncles distinguish it from all other species. It is possible that the specimen is a hybrid. Also collected from the same locality was the type of *N. fusca*.

### 53. *Nepenthes muluensis* M. Hotta

*Nepenthes muluensis* M. Hotta, Acta Phytotax. Geobot. 22 (1966) 7, f. 2.; Phillipps & A.L. Lamb, Pitcher Plants of Borneo (1996) 115, f. 61, 62. — Type: *Hotta 14791a* (KYO holo; iso L), Borneo, Sarawak, Mt. Mulu, western ridge, 1900–2400 m, 18 Mar 1964.

Distribution — Borneo: Sarawak (Mt. Mulu).

Ecology — Shrub vegetation; 1900–2400 m altitude.

Note — This distinct gracile species is not easily confused with the only other small highland species in Borneo *N. tentaculata*. It differs in its cuneate based, sessile leaves, short triangular spur and rounded lid. The lid and peristome are usually a delicate whitish green or white in colour, contrasting strikingly with the predominantly purple-coloured pitcher.

Collections — BORNEO. Sarawak, 4th Div., Bario, Tama Abu Range, Awa & Lee 51169 (K, KEP, L, SAN n.v.); G. Mulu, *Hotta 14791* (Type), *Anderson 4542* (K, L), *Lewis 354* (K), 1930 m, *Martin 37103* (K, KEP, L), 2040 m, *Lee 38825* (K, KEP, L, SAN n.v.), 2060 m, *Martin 38763* (L), 2370 m, *Nielsen 851* (SAR).

### 54. *Nepenthes murudensis* Culham ex Jebb & Cheek, *spec. nov.* — Fig. 6

*Nepenthes reinwardtiana* × *N. tentaculata*?, Phillipps & A.L. Lamb, Nature Malaysiana 13, 4 (1988) 9. — *Nepenthes murudensis* Culham ined., Phillipps & A.L. Lamb, Pitcher Plants of Borneo (1996) 117, f. 63, nomen.

*Nepenthes tentaculata* Hook. f. arcte affinis sed indumento denso velutino (non glabra), caulibus robustis 4–5 mm diametro (non 2–3 mm), ascidiis superioribus magnis 20 cm longis 4–5 cm diametro (raro 5–9 × 1.5–2 cm), pagina superiore operculi glabra (non pilis 2–6 mm longis multicelluribus simplicibus vel ramosis obsita), operculo obovato (non ovato) differt. — Typus: *Yii Puan Ching S 44623* (holo K; iso SAR), Borneo, Sarawak, G. Murud National Park, between first and second summits, 2200 m, 13 Sep 1982.

Terrestrial climber. Stem erect, strongly triangular, 4–5 mm wide, length unknown, internodes 7–8 cm with rounded axillary buds projecting less than 1 mm from the stem c. 4 mm above the node; indumentum dense, velutinous. Leaves not petiolate, adnate; blade oblong-elliptic, 4.5–8.6 × 1.5–3 cm, apex rounded to obtuse, base decurrent to 2 cm, thickly coriaceous. Longitudinal nerves 4 or 5 on each side of the midrib, densest near the margin, conspicuous above and below. Pennate nerves obscured. Lower pitchers unknown. Upper pitchers subcylindrical; 12–25 × 2–5 cm; the basal 1/5 swollen, ellipsoid, in the larger pitchers to 4–5 cm wide, the mouth about the same diameter, both tapering gradually to 2–2.5 cm at the centre of the pitcher; with two ridges to 0.1 cm broad lacking fringed elements; the inner pitcher surface glaucous; the mouth ovate, oblique; peristome not sinuate, cylindrical to slightly flattened in section, 1.5–2 mm wide, with very low ribs 0.1–0.2 mm high, 0.4–0.5 mm apart, the inner edge appearing entire; lid ovate to obovate, c. 2.7–5.5 × 2–4 cm, apex rounded, base rounded-truncate, without appendages, lower surface

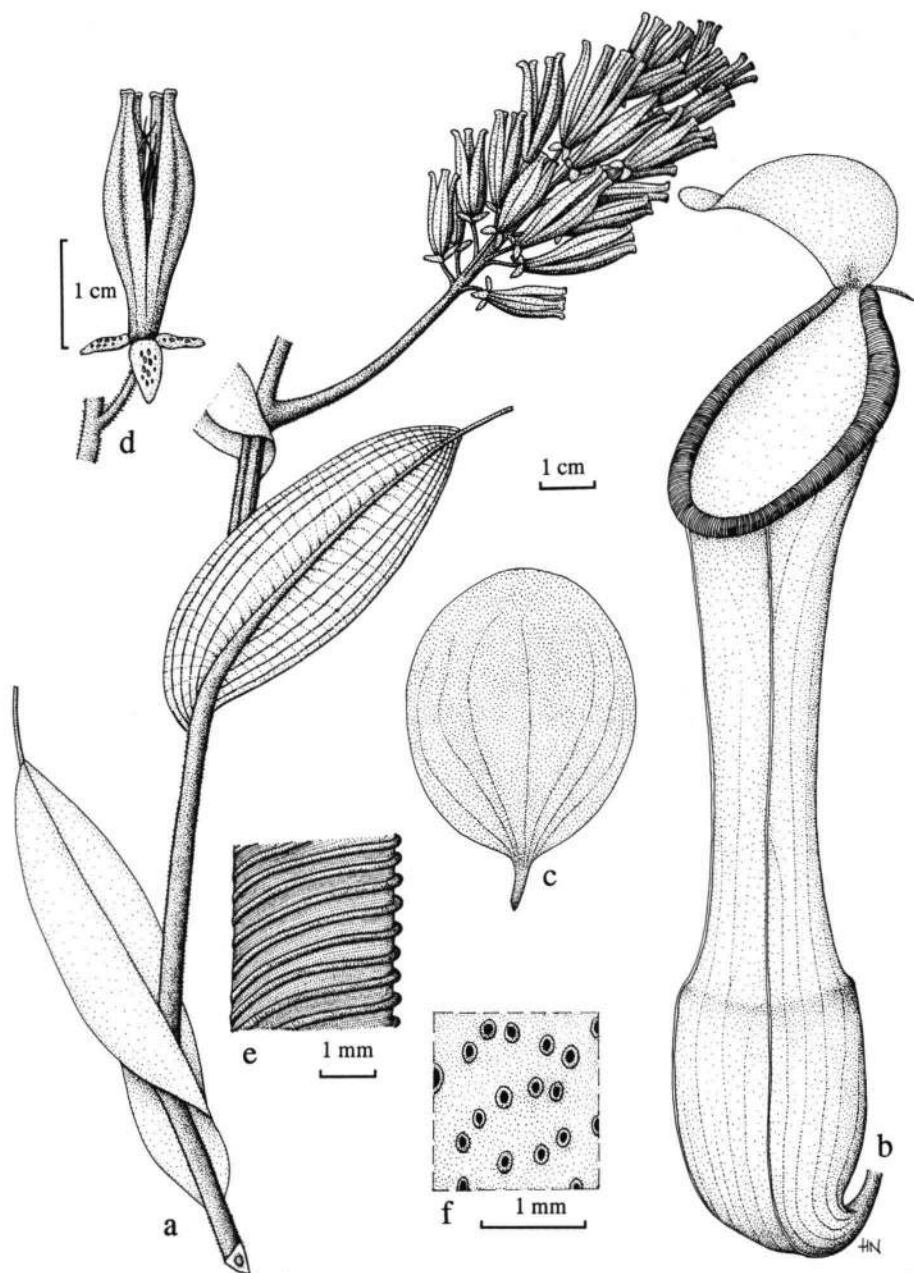


Fig. 6. *Nepenthes murudensis* Culham ex Jebb & Cheek. a. Stem with female inflorescence; b. upper pitcher; c. upper surface of lid and spur; d. ripe fruit; e. detail of peristome viewed from above; f. detail of glands on lower lid surface (*Yii Puan Ching 44623*).

with crater-like glands small, rounded, with lumina c. 0.15 mm diam., 320–440 per sq. cm; spur simple, stout, blunt and slightly flattened, to  $9 \times 1.5$  mm, or filiform with numerous branches, to 9 mm long, puberulent. Male inflorescence a raceme, to 9 cm long; stalk to 2.3 cm long; pedicels 0.4–0.7 mm long, staminal column to 2 mm, anther-head to 0.9 mm across; bracts absent. Infructescence a raceme c. 11 cm long; stalk 5 cm long; pedicels 0.4–0.7 cm. Sepals oblong,  $4\text{--}4.5 \times 1$  mm, inner surface with raised elliptic glands. Fruits with valves  $14\text{--}22 \times 3\text{--}4$  mm. Seeds  $10 \times 1$  mm. Indumentum of short, dense, pale, brown, velvety, erect 3–5-branched hairs c. 0.25–0.5 mm long; persisting on stems, midrib and inflorescence axis; leaf-blade glabrous; pitcher inconspicuously hairy with scattered appressed, simple white hairs 0.1–0.3 mm long; lid subglabrous; fruit valves with strongly appressed white or brown hairs c. 0.5 mm long. Colour of stem and midribs black; pitchers green with black streaks on the back side; inner surface pale green, glaucous; peristome green; fruits brown.

Distribution — Borneo: Sarawak, known only from Gunung Murud (also known as Mt. Murut).

Ecology — Stunted scrub-forest, or moss forest on sandstone; 2200–2500 m altitude.

Notes — 1. The specific epithet commemorates the mountain to which this species appears to be endemic and was coined by Alastair Culham who explored Sarawak and Brunei for *Nepenthes* in the mid 1980s.

2. *Nepenthes murudensis* has been confused with the lower altitude *N. reinwardtiana* which it resembles in the shape of the upper pitchers, but differs in lacking the pitcher eye-spots and visibly perforate inner peristome margin. The stem, leaf-shape and aspects of the pitcher morphology and the small inflorescence are those of the variable and widespread *N. tentaculata* with which *N. murudensis* has also been confused. *Nepenthes tentaculata* differs from *N. murudensis* in being a much more gracile species with multicellular hairs on an ovate lid. Both *N. reinwardtiana* and *N. tentaculata* have glabrous stems unlike the densely velvety hairy stem of *N. murudensis*.

3. As first indicated by Phillipps and Lamb, this species is somewhat intermediate between *N. reinwardtiana* and *N. tentaculata*. With the former it shares a pitcher with a ventricose base, a narrow waist and flared mouth. With the latter it shares a broad adnate leaf, and a fasciculated spur with tentacle-like appendages. The relatively large pitchers combined with the small oblong leaves which clasp the stem distinguish the species from others.

Collections studied — BORNEO. Sarawak, 4th Div., Mt. Murud, *Ilias Paie S 26513* (SAR), 2400 m, *Nooteboom & Chai 2035* (KEP, SAR), 2200 m, *Yii Puan Chang S 44623* (K, SAR).

## 55. *Nepenthes neoguineensis* Macfarl.

*Nepenthes neoguineensis* Macfarl., Nova Guinea 8 (1910) 340, t. 67; Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 341; Jebb, Science in New Guinea 17 (1991) 36, f. 19. — Type: *Versteeg 1746* (BO, K), New Guinea, Lorentz River, Sabang, 25 Sep 1907.

Non *Nepenthes neoguineensis* sensu Ridley, Trans. Linn. Soc. II, Bot., 9 (1916) 139, quae = *N. papuana* Danser.

Distribution — New Guinea mainland and d'Entrecasteaux archipelago.

Ecology — River edge and river gravel bars, ridge crests, rarely open grassland or disturbed forest. From sea level to 900(–1400) m altitude.

Notes — 1. We are not certain that we have seen all the duplicates examined by Macfarlane, since the sheets at Bogor and Kew do not indicate they were used directly in the production of the plate in Nova Guinea. We have therefore delayed lectotypifying.

2. The fringed wings of the upper and lower pitchers are long decurrent to the tendril, and in combination with the corymbiform partial peduncles these characters are diagnostic. It has not been collected from many highland areas of New Guinea, nor in Madang Province. The type specimen has rather poorly developed inflorescences in which the partial peduncles are mostly 2-flowered, and 3-flowered near the base. The bract on the partial peduncles is not always well developed. The upper pitchers may be strongly infundibulate (i.e. Cycloops Mts. near Jayapura), approaching in appearance those of *N. paniculata*. This latter species may be distinguished by its wholly infundibuliform upper pitchers (which are neither narrowed nor cylindrical towards the mouth) and the much reduced wings.

*Selected collections* — NEW GUINEA. Irian Jaya. Near Jayapura, *Meijer Drees* 228 (BO, K), Jayapura, *Brass* 8808 (BO); Merauke, first *Nepenthes* hill nr. Sabang, *Versteeg* 1746 (BO, K). — Papua New Guinea. Sepik, near Wantipi village on Bliri R. Aitape, *Darbyshire & Hoogland* 8357 (K, LAE), Prospect creek near Frieda River, Telefomin sub-district, *Henty & Foreman* NGF 42582 (LAE); Southern Highlands, Lake Kutubu, Sorotage, *LAE* 69103 (BULOLO, LAE); Morobe, SE of Lae on the coast opposite Lasanga I., *Jacobs* 9658 (LAE), 10 miles east of Garaina, Wau sub-district, *Womersley* NGF 46416 (K, LAE); Northern Prov., Arumu River S of Botue village, *Hoogland* 3968 (LAE); Fergusson I., mountains between Angimoia and Ailululai, *Brass* 27194 (LAE).

## 56. *Nepenthes northiana* Hook. f.

*Nepenthes northiana* Hook. f., Gard. Chron. 2 (1881) 717, t. 144 & 724 & 725; Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 342; Philipps & A.L. Lamb, Pitcher Plants of Borneo (1996) 119, f. 64. — Type: *Curtis s.n.* (K), Borneo, Sarawak, Jambusan.

*Nepenthes spuria* Beck, Wien. Ill. Gartenz. (1895) 187. — Type: not located.

*Nepenthes nordiana* Boerl., Handl. 3, 1 (1900) 54.

*Nepenthes northiana* var. *pulchra* Hort. ex Macfarl., Bail. Std. Cycl. Hort. 4 (1922) 2129.

*Nepenthes decurrens* Macfarl., Kew Bull. (1925) 35; Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 282, f. 3. — Type: *Hewitt* 100 (lecto, designated here, K (pitcher & stem); iso K (infl.), BO), Borneo, Sarawak, Baram.

Distribution — Borneo: Sarawak (near Bau).

Ecology — Apparently confined to limestone cliff faces with permanent water seepages; 300 m altitude.

Notes — 1. This species first came to the attention of botanists through a painting by Marianne North. Harry Veitch saw the painting and arranged for his collector Charles Curtis to obtain the plant.

2. *Nepenthes decurrens* is certainly this species but the locality from where it was said to have been collected must be open to question. *Nepenthes northiana* is only known from the Bau region near Kuching, whereas *N. decurrens* was said to have been collected at Baram. If the Baram referred to is the Baram River, some 500 km

to the northeast, it seems astonishing the species has not been recollected there since or found in other limestone areas. Hewitt's numbering system provides no clue, but it is of note that a specimen of *Trevesia burckii* Boerl. (Araliaceae) at K also bears the number *Hewitt 100*, and was collected on Mt. Poi near Kuching. A duplicate of the type at Bogor is probably the specimen that Danser (1928) cites as the Sarawak Museum specimen.

3. Beck based his *N. spuria* on Masters' original publication; he regarded the English text and fig. 144 to represent another species. There seems no justification for such a division however.

4. The very large leaves and pitchers, and the remarkably long-pedicelled (up to 12.5 cm long) flowers are diagnostic. On elongated stems the leaf base is long decurrent, while on shortened stems, the base may form saddle-like bases, with the wing of the petiole being continuous about the base of the petiole, reminiscent of those of *N. ephippiata*. Lower pitchers are often suspended on remarkably long tendrils, and rest in a recumbent position, with the hooded lid held close to the pitcher mouth. The ovate lid bears many small, rimmed glands, which are most dense near the base, and to each side of the centre line which itself is virtually free of glands.

5. The species is a limestone specialist, and like *N. campanulata* and *N. mapulensis* has not been collected on any other rock type. The species has been over-collected and exterminated in many areas around Bau (Phillipps & Lamb, 1996).

*Selected collections* — BORNEO. Sarawak. Bau Dist., Seburan, *Anderson 9094* (K, SAR, SING), *15476* (K, SAR); Bt. Numpang, TaiTon, *Cahi & Seng S 22862* (K, SAR); Bidi Cave, *Clemens 20650* (K); Bt. Kapor, Bau Dist., *Smythies 15244* (K, L, SING, SAR), *Collenette 833* (K, SAR).

## 57. *Nepenthes ovata* Nerz & Wistuba

*Nepenthes ovata* Nerz & Wistuba, *Carnivorous Plant Newsl.* 23 (1994) 108, f. 4. — Type: *Nerz 1601* (L holotype), Sumatra, Sumatera Utara, Prapat, G. Pangulubao, 1800 m, 16 Mar 1989.

*Nepenthes* sp., Hopkins, Maulder & Salmon, *Carnivorous Plant Newsl.* 19 (1990) 21, 25.

Distribution — Sumatra: Mt. Pangulubao.

Ecology — Climber or epiphyte in open, wet mossy forest at 1800 m altitude.

Note — A close relative of *N. bongso*, this species is distinguished by its larger, often more irregular peristome, and the large glandular crest at the base of the lid. *Nepenthes bongso* is only known from the mountains around Padang, further to the south.

*Collections* — SUMATRA. Sumatera Utara, Prapat, G. Pangulubao, 1800 m, *Nerz 1601* (Type), *1602* (L n.v.), *1603* (L n.v.).

## 58. *Nepenthes paniculata* Danser

*Nepenthes paniculata* Danser, *Bull. Jard. Bot. Buitenzorg III*, 9 (1928) 344, f. 15; Jebb, *Science in New Guinea* 17 (1991) 38, f. 20. — Type: *Lam 1569* (lecto, designated here, BO; iso BO, U n.v.), New Guinea, Irian Jaya, Doorman Top, 1460 m, 9 Oct 1920.

Distribution — New Guinea: Irian Jaya (Doorman Top); only the type collection.

Ecology — Mossy forest on ridge top at 1460 m altitude.

Notes — 1. Of the two sheets at Bogor, the fertile sheet is selected as a lectotype.

2. This species is closely related to *N. neoguineensis* and the means of distinguishing them are slight: the partial panicles of the inflorescence are not corymbiform; the upper pitchers are wholly infundibulate, and not narrowed at the mouth, and have much reduced wings; the peristome is larger, more rounded, and has more widely spaced ribs (0.6–1 mm vs. 0.25–0.35 mm); the numerous, large (0.5 mm), lipped glands on the upper surface of the leaf sheaths, and scattered along the upper surface of the midrib (absent in *N. neoguineensis*).

### 59. *Nepenthes papuana* Danser

*Nepenthes papuana* Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 346, f. 16; Jebb, Science in New Guinea 17 (1991) 40, f. 22. — Type: *Docters van Leeuwen 10341* (lecto, designated here, BO; iso BO, L), New Guinea, Irian Jaya, affluent C of the Rouffaer River, 300 m, Sep 1926. *Nepenthes neoguineensis* auct. non Macfarl.: Ridl., Trans. Linn. Soc. II, 9 (1916) 139.

Distribution — New Guinea: southern Irian Jaya (Fakfak to Balim valley).

Ecology — Forest edges, forest on white sand soils; 250–900 m altitude.

Notes — 1. Ridley identified the first material of this species, collected on the Wollaston expedition, as *N. neoguineensis* Macfarl. Danser (1928) does not nominate a type. However, one sheet of *Docters van Leeuwen 10341* has been annotated 'female type' and the single sheet of *Docters van Leeuwen 10340* has been annotated 'male type', by Danser in August 1927. The former specimen is designated as the lectotype, the second sheet, also at Bogor bears the rosette pitcher form of the species.

2. The species has tubulose pitchers with a somewhat narrow peristome, and while resembling *N. mirabilis* in general appearance, it can be told by its more leathery leaf-blades with somewhat indistinct pennate nerves, the blades of lower rosette pitchers lack the fimbriate margin of this latter species, while the upper pitchers have blades with a pubescent margin below. The valves of the fruit have a distinctly bifid apex, with sharply pointed apices. Specimens of this species dry a characteristic reddish brown colour.

Collections — NEW GUINEA. Mimika, Fakfak, road to Tembaga Pura, *Widjaya 2199* (BO); Rouffaer River, affluent 'C', *Docters van Leeuwen 10258* p.p. (BO), *10340* (BO), *10341* (Type); Merauke, Camp VIa, 5/1/1913, *Kloss s.n.* (SING); Noord River, *von Römer 454, 900* (both BO).

### 60. *Nepenthes pectinata* Danser

*Nepenthes pectinata* Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 350, f. 17a, b, d. — Type: *Bünnemeijer 700* [L lecto (Schlauer & Nerz, 1994); BO iso], Sumatra, Sumatera Barat, G. Takmau, 1850 m, 13 May 1917.

*Nepenthes gymnamphora* auct. non Nees: Miq., Pl. Jungh. 2 (1852) 169. — *Nepenthes melamphora* var. *tomentella* Becc., Malesia 3 (1886) 13. — Type: *Beccari 48* (L, K), Sumatra, Sumatera Barat, Mt. Singgalang, 6–7/1878.

*Nepenthes rosulata* Tamin & M. Hotta in M. Hotta, Diversity and dynamics of plant life in Sumatra (1986) 95, f. 4, nom. nud.

*Nepenthes xiphioides* B. Salmon & Maulder, Carnivorous Plant Newsl. 24 (1995) 78, f. 1 & 2. — Type: *Salmon & Maulder 221720* (AK n.v.), Sumatra, Sumatera Utara, G. Pangulubao, 1900 m, 17 Feb 1995.

Short climber to 4 m. Stems terete to 1 cm. Leaves elliptic-spathulate to oblong; 15–27 × 3–6 cm; apex acute to acuminate; base cuneate or broadly winged, decurrent for 1–3 cm; longitudinal veins 3 or 4, throughout lamina, innermost arising from midrib; pennate nerves numerous, arising obtusely and forming a net-like pattern with the longitudinal veins. Leaves of short-shoots and rosettes sometimes as small as 3 × 0.7 cm, triangular in outline, dilated at the base, and clasping the stem, sometimes forming a sheath, with penninervous venation only, the larger ones with a beginning of longitudinal veins. Lower pitchers ellipsoid-urceolate narrowing towards the mouth; 6–16 × 2–6.5 cm; with 2 fringed wings 2–5 mm wide, with numerous fringe elements 2–4 mm long; mouth oblique, acute to acuminate towards lid, and sometimes forward pointing there; peristome rounded at front, expanded towards sides and narrowing towards lid, 2–12 mm across, with prominent, thin ribs 0.5–1.5 mm high and 0.8–2 mm apart, inner margin with teeth 2–4 mm long, papery; spur filiform or flattened, rarely many-branched, 1–4 mm long. Lid ovate; 2–7.3 × 1.5–5.3 cm; base truncate to cordate; glands few, prominently lipped, 0.1–0.5 mm across, near midline and towards base of lid only, absent from margin. Upper pitchers apparently only produced rarely, or (?) only in some populations (G. Malintang), somewhat ventricose in lower half, tubular above; 7–22 × 1.5–4.5 cm; with two fringed wings to 0.5 cm, with fringe elements to 0.6 cm; peristome expanded towards lid, to 2.5 cm across, including teeth to 1 cm or more. Lid broadly ovate; base cordate; glands numerous near midline, largest in centre of lid, to 0.8 mm across. Inflorescence a raceme to 50 cm overall, partial peduncles 2-flowered near base, 1-flowered above, with a filiform bract near base, or rarely wholly 1-flowered; ovary to 35 × 6 mm. Indumentum dense on young pitchers, stellate, c. 0.1 mm across; margin often with dense brown indumentum below; inflorescence axis and pedicels densely pubescent. lower pitchers green, densely blotched with maroon.

Distribution — Central Sumatra.

Ecology — Undisturbed dense forest, hill dipterocarp forest, wet mossy forest on ridge tops; 950–2750 m altitude.

Notes — 1. Authors prior to Danser usually included the present species with the Javanese *N. gymnamphora*. Although Danser described *N. pectinata*, he did so from mixed material, and his original description is based on a combination of *N. pectinata* and *N. singalana*. Tamin & Hotta (1986) did not recognise the presence of *N. gymnamphora* in Sumatra, reducing the majority of collections to *N. singalana*, and coining the invalid name *N. rosulata* for specimens of *N. pectinata* from Gunung Gadut and G. Talang. Schlauer & Nerz (1994) were the first authors to recognise that *N. pectinata* was based on mixed collections involving *N. singalana*; they lectotypified the species with a specimen of what they recognised as *N. gymnamphora*.

2. This species differs from *N. gymnamphora* in a number of ways. The leaves are more gradually attenuate to the base, and decurrent to the stem, the margin of the blade is usually densely pubescent below, and the whole plant is more tomentose. Upper pitchers are not always produced (G. Malintang), whereas they are regularly produced in *N. gymnamphora*. The lower pitchers are distinctly urceolate, with a slightly narrowed mouth with a broad peristome which has long, papery teeth internally. In the upper pitchers these teeth may be over 1 cm long. The variation in leaf-



blade size is akin to that seen in *N. ampullaria*, and material collected from the same plant can have very different facies.

3. *Nepenthes pectinata* can be told from *N. bongso* and *N. singalana* by its large upper leaf-blades which are decurrent to the stem. *Nepenthes spathulata* can be distinguished by its narrowed leaf bases, and square stem.

**Collections** — SUMATRA. Sumatera Barat. Bt. Waaen, *de Voogd 1385* (BO); Bt. Kapanasan, Simarasap, *Arbain 329* (BO, L); Rimbo Merapi, *Arbain DA 364* (BO, L); G. Ophir (Talakmau), *Bünnemeijer 700* (Type), 747 (BO), 763a (BO, L), 854 (BO, L), 938 (BO); G. Singgalang, *Schiffner 1990* (Vienna, L, BO?); G. Merapi, *Schiffner 1991* (Vienna, L); G. Malintang, *Bünnemeijer 3897, 3898, 4113* (all BO), 4114 (BO, L), 4115, 4179 (all BO); G. Sago, Pajakumbuh, *Meijer 3111, 5932, 7523* (all L), *Bünnemeijer 4027, 4399, 4400* (all BO), *Des & Tamin 508* (BO); Puncak Pato, 32 km N of Batusangkar, *Tamin 2304* (BO); G. Gadut, near Solok, *Hotta & Tamin 35, 60* (all BO); G. Talang, *Bünnemeijer 5272* (BO); Bt. Gombak, *Bünnemeijer 5748, 5488* (BO); Talang Butyo, Bt. Gadang, 16 km S of Alahan Panjang, *Tamin 506* (B), 1265 (BO); Air Sirah, Barisan range, Padang, *de Vogel 2860* (BO), *de Vogel & Vermeulen 7340* (L); Simmur Wasos, Battak, *Junghuhn s.n.* (L).

## 61. *Nepenthes pervillei* Blume

*Nepenthes pervillei* Blume, Mus. Bot. Lugd.-Bat. 2 (1852) 10; Hook. f. in A.DC., Prodr. 17 (1873) 92; Baker, Fl. Mauritius & Seychelles (1877) 299; Macfarl. in Engl., Pflanzenr. 4, 3 (1908) 30; Robertson, Fl. Plants of Seychelles (1989) 192. — Type: *Perville 98* (L), Seychelles, Mahé. *Anurosperma pervillei* (Blume) Hallier f., Bot. Centralbl. 39, Abt. 2, 1 (1921) 162. — *Anurosperma* Hook. f., in A.DC., Prodr. 17 (1873) 91, as section of genus. *Nepenthes wardii* Wright, Trans. Roy. Irish Acad. 24 (1869) 576, t. 29, 30. — Type: *Wright s.n.* (BM), Seychelles, Silhouette, Trois Frères Mts., July 1867.

**Distribution** — Seychelles; recorded from Mahé and Silhouette.

**Ecology** — Rocky areas near granitic mountain summits; 350–500 m altitude.

**Notes** — 1. This species has several unique characters, which led Hooker to place it in the monotypic section *Anurosperma* (1873). The fruits are obconic in shape, and usually have only three valves. The seeds are short and truncate at one end, not slender and filiform as in other species. The male flowers are 4-petalled, and the anthers are borne on a somewhat short column.

2. The habit of this species is unusual in that the tendril of the upper pitchers does not form a tightly twining region, but instead is short, and bends abruptly at its tip, bringing the base of the pitcher into an upright position. Nor is there any marked separation of pitcher types between rosette and climbing growth forms, although the form of the pitcher shows considerable variation (Schmid-Hollinger, 1979). Long-tendriled lower pitchers and short, bent-tendriled upper pitchers can both occur in rosettes. In climbing stems, only the short-tendriled upper pitchers are produced, although it seems that the latter are confined to aerial rosettes as opposed to the terrestrial rosettes. Inflorescences only appear from rosettes bearing upper pitchers, and these appear to only be produced one at a time.

3. The scorpioid partial peduncles, which bear up to 16 flowers, are similar to those of *N. bicalcarata*, *N. madagascariensis* and *N. masoalensis*. With these latter species, and with *N. distillatoria* of Sri Lanka, the species shares a similar reticulated

venation, with the numerous longitudinal veins being produced from the lower part of the midrib, and forming a network with the equally prominent pennate nerves.

*Selected collections* — SEYCHELLES. Mahe, Mahe Peak near Morne, 8/9/60, *Archer 137* (K); Delanos, 20/3/37, *Vesey-Fitzgerald 5516A* (K); Mt. Coton, above Le Niol, 19/1/70, *Fosberg & Mason 51998* (K); Trois Frères, 22/12/61, *Jeffrey 559* (K). — Silhouette. 4/11/73, *Bernardi 14677* (K, Gen); Seychellois ridge, 11/9/1908, *Gardiner 107* (K).

## 62. *Nepenthes petiolata* Danser

*Nepenthes petiolata* Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 353, f. 18; Sh. Kurata & Toyosh., Gard. Bull. Sing. 26 (1972) 158. — Type: *Elmer 13705* p.p. (holo BO, iso E), Philippines, Mindanao, Agusan Prov., Mt. Urdaneta, 1700 m, Sep 1912.

Distribution — Philippines: Mindanao; Agusan & Surigao.

Ecology — Montane forest including *Agathis* and Oak, 1500 m altitude.

Notes — 1. The type of *N. surigaoensis* (a synonym of *N. merrilliana*) was distributed as a mixed collection by Merrill (and erroneously published as *12705*), and Danser described the specimen sent to Bogor.

2. Characterised by its thin, deeply flanged peristome ridges, with long flattened teeth, similar to some of the Sumatran species (i.e. *N. singalana*).

*Collections* — In addition to the type, one other collection is cited by Kurata (1972), which has not been seen.

Hybrids — 1. *Nepenthes petiolata* × *N. alata* Sh. Kurata & Toyosh., Gard. Bull. Sing. 26 (1972) 158. — *Kurata 1113a* (Nippon Dental College n.v.), Philippines, Mindanao, Surigao del Sur, E slope Mt. Legaspi, 270 m, 19 Aug 1965.

2. *Nepenthes petiolata* × *N. truncata* Sh. Kurata & Toyosh., Gard. Bull. Sing. 26 (1972) 158. — *Kurata 1109a* (Nippon Dental College n.v.), Philippines, Mindanao, Surigao del Sur, E slope Mt. Legaspi, 270 m, 19 Aug 1965.

Note — We have seen neither of these specimens, but the description appears to place them intermediate between the parental species which were reportedly present at the site.

## 63. *Nepenthes pilosa* Danser

*Nepenthes pilosa* Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 355, f. 19; Phillips & A.L. Lamb, Nature Malaysiana 13, 4 (1988) 25; Pitcher Plants of Borneo (1996) 121, f. 65. — Type: *Amdjah 491* (holo BO), Borneo, East Kalimantan, G. Lesung, 28 Jan 1899.

Distribution — Borneo: Kalimantan, Sabah and Sarawak.

Ecology — Ridge top forest; 1000–1800 m altitude.

Notes — 1. The pitcher of the type specimen at BO is badly damaged, and the lid has lost the apex of the basal crest. The illustration in Danser (1928) indicates that the pitcher was somewhat anomalous in this collection. Usually the pitcher is more conical-tubular, and up to 28 cm long.

2. The species is closely related to *N. stenophylla* by its sheathing leaf bases, long indumentum, rounded lid with basal crest and its pattern of glandulation, and the inner margin of the peristome which is likewise scarcely toothed, with prominent glands

lying between the ridges. It is distinguished by its large, rectangular-shaped leaf, its conical-tubular upper pitchers which gradually broaden towards the mouth, rather than being tubular there, in colour the pitchers differ in being pale green throughout, without any noticeable red coloration other than on the peristome, the indumentum of this species is also usually longer (5 mm vs. 3 mm) and is a pale golden brown (vs. reddish brown) in colour.

*Collections* — BORNEO. Sarawak. 4th Div., route to Bt. Law Borio, 1630 m, 24 Aug 1985, Awa & Lee S 50980 (K, SAR), 1000 m, Ashton S 21114 (K, L, SING, SAR). — Sabah. Mt. Alab, Phillipps & Lamb 1996. — Kalimantan. East Kalimantan, G. Lesung, Amdjah 491 (Type), 499 (BO); G. Tibang, Mjöberg 46 (BO).

#### 64. *Nepenthes rafflesiana* Jack

*Nepenthes rafflesiana* Jack, Mal. Misc. ex Hook. f., Comp. Bot. Mag. 1 (1835) 270; Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 357; Shivas, Pitcher plants of Peninsular Malaysia & Singapore (1984) 39; Phillipps & A.L. Lamb, Nature Malaysiana 13, 4 (1988) 14; Tamin & M. Hotta in M. Hotta, Diversity and dynamics of plant life in Sumatra (1986) 90; Phillipps & A.L. Lamb, Pitcher Plants of Borneo (1996) 123, f. 66, 67, 68. — Type: *Jack s.n.* (lecto, designated here, SING), Singapore.

*Nepenthes hookeriana* auct. non Lindl.: Low, Sarawak (1848) 68. — *Nepenthes rafflesiana* var. *hookeriana* Beck, Wien. Ill. Gartenz. 20 (1895) 147.

*Nepenthes rafflesiana* var. *rafflesiana* Hort., Rev. Hortic. (1869) 130.

*Nepenthes rafflesiana* var. *nivea* Hook. f. in A.DC., Prodr. 17 (1873) 97. — Type: Singapore and Borneo, not located.

*Nepenthes rafflesiana* var. *glaberrima* Hook. f. in A.DC., Prodr. 17 (1873) 97. — Type: Singapore, Borneo and Sumatra, not located.

*Nepenthes rafflesiana* var. *insignis* Mast., Gard. Chron. II, 18 (1882) 424, f. 69. — Type: Borneo, not located.

*Nepenthes rafflesiana* var. *nigro-purpurea* Mast., Gard. Chron. II, 18 (1882) 424, f. 70 (as *N. nigro-purpurea*, sphalm.). — Type: Borneo, not located.

*Nepenthes hookeriana* Low ex Becc., Malesia 3 (1886) 3.

*Nepenthes rafflesiana* var. *minor* Becc., Malesia 3 (1886) 3, 11, t. 1: 2. — Type: *Teijsmann 10910* (not located), Borneo, Pontianak, Sintang.

*Nepenthes rafflesiana* var. *typica* Beck, Wien. Ill. Gartenz. 20 (1895) 146.

*Nepenthes rafflesiana* var. *ambigua* Beck, Wien. Ill. Gartenz. 20 (1895) 147. — Type: *Low s.n.* (not located), Borneo, Labuan Is.

*Nepenthes rafflesiana* var. *elongata* Hort., Kew Bull. (1897) 405. — Type: not located.

*Nepenthes hemsleyana* Macfarl. in Engl., Pflanzenr. 4, 3 (1908) 61. — Type: *Burbidge s.n.* (K), Borneo, Sarawak, Lawas River.

*Nepenthes rafflesiana* var. *alata* J.H. Adam & Wilcock, Malayan Nat. J. 44 (1990) 32, t. 2; Phillipps & A.L. Lamb, Pitcher Plants of Borneo (1996) f. 68. — Type: *Meijer SAN 35792* (holo SAN), Borneo, Sabah, Sandakan, Mt. Walker FR, 13 Apr 1963.

Non *Nepenthes rafflesiana* sensu Low, Sarawak (1848) 68, quae = *N. hookeriana* Lindl.

Non *Nepenthes rafflesiana* var. *excelsior* Beck, Wien. Ill. Gartenz. 20 (1895) 147. — *Nepenthes* × *excelsior* Williams, Garden Lond. 28 (1885) 463; quae = *N. hookeriana* Lindl.

Non *Nepenthes rafflesiana* var. *longicirrhosa* Tamin & M. Hotta in M. Hotta, Diversity and dynamics of plant life in Sumatra (1986) 93, f. 3; quae = *N. sumatrana* Beck.

**Distribution** — Sumatra, Peninsular Malaysia and Borneo.

**Ecology** — A common lowland species in Borneo, rare in Sumatra and Peninsular Malaysia. Open areas to shady forest; sea level to 1000 m.

Notes — 1. Low created confusion by transposing the names of *N. rafflesiana* and *N. hookeriana* in his book (1848). This confusion was cleared up by Masters writing in the Gardener's Chronicle (1881: 812).

2. This widespread species is often abundant in weedy regrowth at the sides of roads. It can be recognised by its petiolate leaves and the manner in which the peristome rises into an extended, and flattened neck, becoming broadest immediately below the lid. The lid is often notched or blunt at its apex, and the glands are confined towards the edge, and virtually absent from the centre. The indumentum on the inflorescence, petioles and midribs is of a silvery-grey colour.

3. *Nepenthes rafflesiana* is rather rare in mainland Sumatra and Peninsular Malaysia, but abundant on offshore islands such as the Riau archipelago and Singapore. In northern Borneo it is one of the most abundant species, where a number of striking variants have been described (Phillipps & Lamb, 1996). It has been erroneously reported from New Guinea (Adam et al., 1992).

*Selected collections* — SUMATRA. Sumatera Utara, G. Dolok, near Tappiannoeli, *van der Meer Mohr s.n.* (BO). Lingga, Pulau Singkep, Kp. Raja, *Bünnemeijer 7097* (BO). — PENINSULAR MALAYSIA. Pahang, Rompin, G. Lesong, *Shah 3105* (KLU); Selangor, Sungei Tinggi, *Ahmad 1126* (SING); Terengganu, Sungei Paka, *Symington 26803* (KEP); Johore, G. Panti, *Jumali & Kuswata 74* (BO). — SINGAPORE. MacRitchie reservoir, *Turner et al. 268* (SINU). — BORNEO. Sarawak. Bako, *Purseglove 4904* (K, L); Baram, *Anderson 4180* (SING). — Brunei. Berakas, *Sinclair 10543* (BM, E, K, L, SAR, SING). — Sabah. Sandakan, Labuk road, *Talip SAN 83700* (KEP). — Kalimantan. Kalimantan Barat, G. Kelam, *Hallier 2378* (BO); Kalimantan Tengah, Sampit, *Buwalda 7782* (BO); Kalimantan Timur, Sebulu, N of Samarinda, *Nuhanara 18* (BO).

## 65. *Nepenthes rajah* Hook. f.

*Nepenthes rajah* Hook. f., Trans. Linn. Soc. 22 (1859) 421, t. 72; Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 361; Sh. Kurata, *Nepenthes* of Mt. Kinabalu, Sabah (1976) 61, t. 19 & 20; Phillipps & A.L. Lamb, *Pitcher Plants of Borneo* (1996) 129, f. 69, 70. — Type: *Low s.n.* (holo K), Borneo, Sabah, Mt. Kinabalu, 1500 m.

Distribution — Borneo: Sabah (Mt. Kinabalu and Mt. Tamboyukon).

Ecology — Open sites in mossy forest, on ridges or landslips, restricted to serpentine soils, 1500–2650 m altitude.

Notes — 1. Renowned as the largest pitcher of all pitcher plants (though less well known species such as *N. merrilliana* and *N. truncata* may bear equally voluminous pitchers). The peltate leaf-blade tip, oversized and vaulted lid, as well as its overall large size, makes this a very distinct species.

2. The inner peristome wall is elaborated to form three layers; these are interconnected by a series of staggered cross-walls, creating two rows of box-like compartments when viewed from below.

*Selected collections* — SABAH. Mt. Kinabalu, *Collenette 21608* (A, G, K, L, SAR), Pig Hill, *Chew & Corner 4516* (K, SING).

Hybrids — 1. *Nepenthes rajah* × *N. villosa*. — *Nepenthes* × *kinabaluensis* Sh. Kurata. See *N. × kinabaluensis*.

2. *Nepenthes rajah* × *N. burbidgeae*. — *Nepenthes* × *alisaputrana* J.H. Adam & Wilcock. See under *N. burbidgeae*.

**66. *Nepenthes ramispina* Ridl.**

*Nepenthes ramispina* Ridl., J. Fed. Mal. St. Mus. 4 (1909) 59; Fl. Malay Penins. 3 (1924) 22. — Type: *Ridley 12064* (lecto, designated here, SING; iso SING  $\times$  2), Peninsular Malaysia, Selangor, top of Ulu Semangka, Aug 1904.

*Nepenthes gracillima* var. *major* Ridl., Fl. Malay Penins. 3 (1924) 22. — Type: *Ridley s.n.* (SING), Peninsular Malaysia, Pahang, G.Telom.

*Nepenthes gracillima* auct. non Ridl.: Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 296 partim, f. 7 toto.

Climber to 5 m. Stem terete, 0.3–0.6 cm thick. Leaves obovate-oblong, to  $16 \times 3.1$  cm; apex acute to rounded; base clasping at least half stem, auriculate; longitudinal veins (0–)1–3(–4), in outer half of blade; pennate nerves irregular; midrib pubescent above and below. Lower pitchers short cylindric,  $5\text{--}10 \times 1\text{--}2.5$  cm; slightly ventricose in the lower half, cylindric and somewhat narrowed in the upper half; wings throughout, 0.3 cm across, with fringe segments to 0.5 cm. Upper pitchers long-cylindric, to  $18\text{--}(24) \times 2.5$  cm; base gradually infundibulate to about  $1/2$  height, then gradually narrowing above and broadening again at the mouth, and usually broadest there; wings usually absent, or very much reduced; lid rounded to cordate, to  $3.2 \times 3.8$  cm, glands unlipped, most numerous near centre of underside, to 0.4 mm there, becoming smaller towards margin, 0.1–0.3 mm; spur 3–10 mm, somewhat flattened at base, with 3–7 branches above. Indumentum on stems and upper side of midrib, branched, 0.3–0.5 mm; other parts sub-glabrous. Colour of lower pitchers maroon-green to deep blackish green, inner surface glaucous pale green; upper pitchers either purple-green throughout, peristome deep red or pale green, or pale green throughout, inner surface of pitcher glaucous pale green.

Distribution — Peninsular Malaysia: the western mountain ranges, Banjaran Titiwangsa.

Ecology — Forest edges, ridgetops; 900–2000 m altitude.

Notes — 1. There are two duplicates at Singapore of *Ridley 12064* and a third sheet which Danser has annotated as ‘probably’ of this number also. Of these, the sheet with a male inflorescence is selected as the lectotype. This species was synonymised with *N. gracillima* Ridl. by Danser, and is reinstated here. The illustration of *N. gracillima* in Danser (1928) is wholly of this species.

2. From *N. gracillima* it can be told by its larger size, the broader, oblong-obovate leaves, the slender and longer upper pitchers with long, fasciculated spurs (vs. simple and  $< 3$  mm), the glands on the underside of the lid which are numerous, unlipped, and range from 0.1 mm near the margin to 0.4 mm across near the middle (vs. lipped and evenly sized from 0.4–0.6 mm), and the pubescence of the stem and midrib (vs. glabrous to sparsely pubescent). *Nepenthes gracillima* is confined to the eastern mountain ranges of Peninsular Malaysia (G. Tahan & G. Tapis), while *N. ramispina* is restricted to the western ranges, from Perak to Negri Sembilan.

3. From the other Peninsular Malaysian species it can be told by its cylindrical stem, narrow pitchers, lack of bristles on the underside of the lid, scarcely toothed peristome and branched spur.

Collections — PENINSULAR MALAYSIA. Perak: Cameron Highlands, 11/1939, *Batten Pool s.n.* (SING), Castle rock, *Wyatt-Smith 63672* (KEP); G. Stong, *Nur 12219* (SING), Tanah Rata, *Abdullah 57* (KLU). — Selangor: Kuala Woh, G. Batu Putih, *Chua 39049* (KEP); Pine tree hill, Bt.

Fraser, *Strugnell* 11130, 12871, 20175 (all KEP), *MEDP* 1391 (KLU), *UM* 4782 (KLU), *Yap* 255 (KLU), *Keng* 57 (SINU), *Addison* 37377 (SING), *Nur* 11057 (SING), 12/1950, *Allen s.n.* (SING), 6/1933, *Banfield s.n.* (SING), *Purseglove* 4195 (SING), *Chin* 1220 (KLU); G. Ulu Kali, Ulu Gombak FR, *Shah & Ali* 2958 (KEP, SING), 2959 (KEP, KLU, S), *Soepadmo* 9020 (KLU), *Stone* 8436 (KLU), *Rao* 9578 p.p. (SINU), *Tan* 6 (SING); Ulu Gombak, *Shah* 3080 (SING); Lebar, *Robinson* 1/1913 (SING); G. Nuang, Ulu Langat, *Symington* 51798, 51814 (both KEP); G. Bunga Buah, *Wyatt-Smith* 77684, 77685, 77686 (all KEP), *Burkill* 4339 (SING); Ulu Semangko, *Ridley* 12064 (Type), 15563 (SING), 2/1904, *Bunn Merdock s.n.* (SING); G. Purum, *Chua* 34906, 34907, 34909 (all KEP); G. Ulu Bakar to G. Rajah, *Chua* 40515 (KEP); Taman sedia, Ulu Telom, *Jaamat* 27665 (KEP); G. Rabang, Ulu Kelantan, *Shah* 2523 (SING). — Pahang: G. Paking, *Shah* 1445 (KEP). — Negri Sembilan: Ladang Gadis, Bahau, *Carrick* 670 (KLU).

## 67. *Nepenthes reinwardtiana* Miq.

*Nepenthes reinwardtiana* Miq., Pl. Jungh. (1852) 168; Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 363; Sh. Kurata, *Nepenthes* of Mt. Kinabalu, Sabah (1976) 65, t. 22; Tamin & M. Hotta in M. Hotta, Diversity and dynamics of plant life in Sumatra (1986) 93; J.H. Adam & Wilcock, Edinb. J. Bot. 50 (1993) 99; Phillipps & A.L. Lamb, Pitcher Plants of Borneo (1996) 132, f. 71. — Syntypes: *Junghuhn s.n.* (sh. 00274, U n.v.), Sumatra, Batak region, Pagerutang, 600 m, Sep 1840. Or *Junghuhn s.n.* (sh. 00273, U n.v.), Sumatra, Batak region, Simurwasos, 1350 m.

*Nepenthes reinwardtii* Hook. f., Trans. Linn. Soc. 22 (1859) 422, sphalm..

*Nepenthes reinwardtiana* var. *samarindaiensis* J.H. Adam & Wilcock, Edinb. J. Bot. 50 (1993) 103. — Type: *Meijer* 1047 (holo L; iso BO, K), Borneo, East Kalimantan, Samarinda, S.Titan Complex, 20 m, 3 Aug 1952.

Distribution — Sumatra and Borneo.

Ecology — Lowland peat-swamp forest or high altitude ridges (sandstone or limestone) or more rarely moss forest, occasionally on ultrabasic soils; 0–1450 m altitude. Often growing epiphytically.

Notes — 1. We have seen neither of the syntypes mentioned by Miquel, and have therefore not lectotyped the species.

2. Adam and Wilcock base their variety *samarindaiensis* on specimens with rounded stems and non-decurrent leaf bases found in East Kalimantan.

3. This species is unique in the glabrous ‘eye-spots’, which contrast strongly against the back of the glaucous inner pitcher wall. In some populations there may be pitchers with one, three or no eye-spots (Phillipps & Lamb, 1996). This species is sometimes confused with *N. gracilis*, with which it shares sharply triangular stems and decurrent, sessile leaf bases. *Nepenthes reinwardtiana* can be distinguished by its leaves with 1–3 (vs. 4–6) veins, the peristome which is exceptionally finely striate, and lacks teeth, but has a prominent row of glandular pits, the base of the lid is truncate, not cordate, and has many small glands, unlike the large, prominently-lipped glands of *N. gracilis*, and the partial peduncles are 2-flowered (vs. 1-flowered). Phillipps and Lamb (1996) report that red pitchers seem to be found only on plants growing on ultrabasic, sandy heath or podsolic soils.

4. As indicated by Adam & Wilcock (1993), reports of this species in Peninsular Malaysia are based on the misidentification of specimens or misinterpretation of localities from collecting notes. A number of other species otherwise widespread in Borneo and Sumatra are also surprisingly rare in Peninsular Malaysia; *N. rafflesiana* which is coastal, and *N. albomarginata*, which is only found on isolated peaks in the lowlands, and never in the central ranges.

*Selected collections* — SUMATRA. Siberut Island, *Iboet 53* (BO); Sumatera Barat. Pajakumbuh, *Teijsmann 539* (BO); Sumatera Selatan, Ranau, G. Rajau, *van Steenis 3530* (BO); Bangka Island, Bt. Tampang, *Bünnemeijer 1724* (BO). — BORNEO. Sarawak. Bako NP, *Tan S 28830* (SAR, SING); Hose Mts., *Asah 21201* (L, SAR); Mt. Dulit, *Synge 528* (SING). — Sabah. Sandakan, Sepilok FR, *Kadir 172754* (KEP, L); Ulu Sg. Lokan, Lamag, SE of Telupid, *Aban & Petrus 90659* (K, KEP, SAN, SAR). — Kalimantan. Kalimantan Barat, G. Kelam, *Hallier 2299* (BO); Kalimantan Tengah, Sampit, *Kostermans 7992* (BO, L); Kalimantan Timur, Samarinda, *Meijer 1035* (BO).

## 68. *Nepenthes rhombicaulis* Sh. Kurata

*Nepenthes rhombicaulis* Sh. Kurata, Gard. Bull. Sing. 26 (1973) 229, f. 1; The Heredity, 26 (10) (1972) 44, nomen. — Type: *Kurata 4300* (Nippon Dental College n.v., SING), Sumatra, near Prapat, G. Pangulubao, 1700–1900 m, 29 Mar 1972.

Emended description: Stem glabrous, with prominent sunken glands/lenticels. Leaf-blade apex sub-peltate to emarginate; longitudinal veins running in the outer 1/4 of the blade, innermost vein arising from 1/3 to 1/2 way along midrib; pennate nerves numerous, oblique. Peristome ribs c. 0.5 mm apart. Lid broadly ovate, 2.5 × 2.1 cm; base truncate; glands rimmed, c. 0.15 mm across, evenly scattered throughout. Spur bifid, fused near base.

Distribution — North Sumatra: G. Pangulubao.

Ecology — Unknown.

Notes — 1. We have been unable to view the type material at the Nippon Dental College, and we hesitate to nominate a lectotype from the Singapore material which is not in full agreement with the type description (see emended description above). Two types are cited in the original publication, *Kurata 4300* (male) and *Kurata 4301* (female); duplicates of both are deposited at the Singapore herbarium.

2. Although reported by the original author as being ‘common’ on the mountains surrounding Lake Toba we have seen no other herbarium material, other than the type. The material at Singapore does not exhibit the apical appendage on the underside of the lid mentioned by Kurata (1973). Other authors have reported on this species (Hopkins et al., 1990; Schmid-Hollinger, 1994) but there are no voucher specimens, and their descriptions and photographs do not appear to match the known herbarium material. Although the type is distinct from other Sumatran species, this species remains poorly known.

## 69. *Nepenthes sanguinea* Lindl.

*Nepenthes sanguinea* Lindl., Gard. Chron. (1849) 580 cum icon.; Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 366, f. 20; Shivas, Pitcher plants of Peninsular Malaysia & Singapore (1984) 43. — Type: *Griffith 4411* (lecto, designated here, K), Peninsular Malaysia, G. Ledang. *Nepenthes pumila* Griff., Post. Papers 4 (1854) 349.

Distribution — Peninsular Malaysia, Thailand.

Ecology — Mountain ridges amongst scrub of *Dacrydium* and *Rhododendron*; 900–1800 m altitude.

Notes — 1. As discussed under *N. albomarginata*, the protologue comprises a figure legend, and does not cite material, although an accompanying satirical piece mentions Mr. Lobb’s name in connection with Mt. Ophir. There is a Lobb specimen at

Kew from Malacca, but this lacks a date, and the Lobb material at CGE has not been seen by us. It appears that Lobb probably did not visit Mt. Ophir until 1854, whilst Griffith did in 1842 (Van Steenis-Kruseman, 1950). At Kew, *Griffith 4411* would seem to be the most likely material seen by Lindley, even though it does not come from Mt. Ophir.

2. Distinguished from *N. macfarlanei* by its sharply 3-angled, glabrous stems, the lower lid surface either lacking or possessing very few hairs, but then the pitchers not abruptly contracted below the peristome, and the inner peristome margin lacking teeth.

3. Four collections from the northeast of Peninsular Malaysia [*Shah & Shukor 3168* (KEP, KLU) and *Stone & Chin 15238* (KLU), both from Bt. Baka, Machang, Kelantan; and *Shah et al. 3274* (KEP) & *3283* (KLU), from G. Tebu, Jabi, Trengganu] have larger leaves, with narrowed, almost petiolate bases, which are decurrent down the stem for some distance. These collections also dry to a paler, straw colour compared to other *N. sanguinea* collections. They may represent an undescribed species.

*Selected collections* — THAILAND. Peninsular, Yala Prov., G. Ina, 20 km E of Betong, *Kerr 7548* (TCD). — PENINSULAR MALAYSIA. Perak. G. Hijam, *Henderson 11816* (BO); Bt. Larut, *Chua 40471* (KEP). — Pahang. Cameron Highlands, Foster's Hill, *Henderson 17841* (BO, SING), Robinson Falls, *Henderson 17752* (BO, SING); G. Tapis, *Cockburn 11035* (KEP); G. Tahan, *Holtum 20643* (BO, SING). — Selangor. Fraser's Hill, 8/1966, *Keng s.n.* (SING), *Hose 65* (SING). — Terengganu. G. Sembilu, 7/1952, *Hislop s.n.* (SING). — Johore. G. Ophir, *Derry 644* (SING), 6/1892, *Ridley s.n.* (SING).

## 70. *Nepenthes singalana* Becc.

*Nepenthes singalana* Becc., *Malesia* 3 (1886) 4 & 12, t. 3; Danser, *Bull. Jard. Bot. Buitenzorg* III, 9 (1928) 371; Sh. Kurata, *Gard. Bull. Sing.* 26 (1973) 231; Tamin & M. Hotta in M. Hotta, *Diversity and dynamics of plant life in Sumatra* (1986) 98, excl. syn., non f. 5 & 6. — Type: *Beccari 187* (FI, K, L), Sumatra, near Padang, Mt. Singgalang, 2880 m.

*Nepenthes sanguinea* auct. non Lindl.: Beck, *Wien. Ill. Gartenz.* (1895) 185 partim.

*Nepenthes junghuhnii* Macfarl. ex Ridl., *J. Fed. Mal. St. Mus.* 8, 4 (1917) 79. — Type: *Robinson & Kloss s.n.* (BM, BO), Sumatra, G. Kerinci, 2600 m, 27/4/1914.

Non *Nepenthes singalana* sensu Macfarl. in Engl., *Pflanzenr.* 4, 3 (1908) 47; quae, pro parte = *N. gracillima*; nec Macfarl., *J. As. Soc. Beng.* 75, 2 (1914) 282; quae = *N. gracillima* Ridl.

Distribution — Sumatra.

Ecology — Montane forest; 2000–2900 m altitude.

Notes — 1. The Beccari herbarium has not been viewed in relation to lectotypification, although it seems more than certain that material deposited there would be most suitable unless deficient in any respect. As noted by Danser (1928) the orthography of the species name is confusing, since the type locality is Mount Singgalang, whereas the name *singalana* implies 'from Singala' (i.e. Sri Lanka, Singala being its old name), the correct etymology would have been *singgalangana*. There is no necessity under the code to correct the name, however.

2. This species has been variously misunderstood. Macfarlane (1908, 1914) included specimens of *N. gracillima* which Ridley (1908) had misidentified as *N. bongso* Korth. Tamin and Hotta (1986) reduced *N. carunculata*, *N. pectinata* and *N. spatulata* to this species, but overlooked the name *N. densiflora*.



3. Ridley described '*N. junghuhnii* Macfarl.' in relation to collections made on Mt. Kerinci by Robinson & Kloss. The Junghuhn specimens, which Macfarlane had intended to use as types for the name in *Plantae Junghuhnianae* (Danser, 1928: 371), were made in the Batak region of northern Sumatra, probably near Tapanoeli. As Ridley's description is the only legitimate publication, the identity of *N. junghuhnii* is confused, since Macfarlane's name is attached to specimens of *N. singalana* (see Little Known Taxa at end of this paper).

4. In its typical form, on mountains around Padang, the species has papery pitchers with only slightly expanded peristomes and ventricose-tubular pitchers, the leaf apex is acute, the lid is ovate with numerous lipped glands of 0.1–0.4 mm across throughout the lower surface. Specimens of *N. diatas*, *N. pectinata* and *N. spathulata* can be readily confused with this species. *Nepenthes diatas* has characteristically rigid pitchers, the upper part of the ventricose-tubular pitchers broadens towards the mouth, rather than being somewhat constricted there as in the present species. *Nepenthes pectinata* has a large lanceolate leaf with a decurrent base, and the lid glands are usually somewhat sparse and restricted to the basal part of the midline. *Nepenthes spathulata* has sharply 4-angled stems in the climbing phase, the peristome is greatly expanded at the sides, and the lid has glands restricted to the midline of the lid.

**Collections** — SUMATRA. Sumatera Barat. G. Singgalang, 6-7/1879, *Beccari* 187 (Type), 1883, *Boerlage s.n.* (L), 28/5/18, 2600 m, *Bünnemeijer* 2692 (BO), 2693 (BO), 1990, *Schittner s.n.* (BO), *Meijer* 3841, 3829, 5202 (all L), *Ichlas* 155 (L), Danau Gadang, *Meijer* 3867 (L); G. Sago, 26/7/18, 2000 m, *Bünnemeijer* 4028 (BO), *Des & Tamin* 529 (BO), *Meijer* 3590, 3598, 5158, 5159, 5160 (all L); G. Merapi, *van Borssum Waalkes* 2251 (BO), *Meijer* 3464 (L), *Arbain* 377 (BO, L), 9/1983, *Arbain s.n.* (BO, L); G. Kerinci, 4/5/20, 2600 m, *Bünnemeijer* 9997 (BO), 7/5/20, 2200 m, *Bünnemeijer* 10270 (BO), 10271 (BO, SING), 27/4/1914, *Robinson & Kloss s.n.* (SING), *Holtum* 26101 (BO), 28101, 28102 (BO, SING), *Frey-Wyssling* 107 (BO). — Sumatera Selatan. G. Dempo, *Jacobson* 491 (BO). — Bengkulu. G. Belirang, *Rappard* 66, 67 (BO).

## 71. *Nepenthes spathulata* Danser

*Nepenthes spathulata* Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1935) 465. — Type: *Liefinck 11* (lecto, designated here, L; iso BO), Sumatra, Lampongs, Mt. Tanggamus, 2000 m, Jan 1935.

**Distribution** — Southern Sumatra.

**Ecology** — Forest to mountain top; 1500–2100 m altitude.

**Notes** — 1. Danser described this species some years after completing his monograph. The most complete collection is probably that of *Liefinck 11*, of which the sheet with a female inflorescence at Leiden is selected as the lectotype.

2. Although closely related to *N. singalana*, this species can be distinguished by the combination of more sharply angular stems (although collections of *N. singalana* overlap in this character), the greatly expanded peristome, in which the ribs are not as tall and papery, the lid is ovate (vs. orbicular cordate in *N. singalana*), and the lid glands are fewer, and densest and largest near the midline of the lid (vs. evenly distributed) in a manner similar to those of *N. gymnamphora* and *N. pectinata*. Danser considered these latter two species as the most closely allied species to *N. spathulata*.

3. The lower leaf-blades are strikingly large and spatulate with a winged petiole and sheathing base.

*Collections* — SUMATRA. Lampung. *Forbes s.n.* (K), Kaiser's Peak, *Forbes s.n.* (K); *van Steenis 3751* (BO, L), *Toxopeus 17* (L), 18 (BO); Gunung Tanggamus, *Lieftinck 7*, 8 (BO), 9, 10 (L), 11 (Type), *Jacobs 8212*, 8261 (K, L).

## 72. *Nepenthes spectabilis* Danser

*Nepenthes spectabilis* Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 373, f. 21; Tamin & M. Hotta in M. Hotta, Diversity and dynamics of plant life in Sumatra (1986) 103. — Type: *Lörzing 7308* (lecto, designated here, BO; iso BO × 2, L), Sumatra, Sibolangit, Sibajak, 1800 m, 5 June 1920.

Distribution — North Sumatra: Aceh to Lake Toba.

Ecology — Sub-alpine shrubberies; 1450–2000 m altitude.

Notes — 1. There are three duplicates of *Lörzing 7308* at Bogor, of which the sheet with a male inflorescence is chosen as a lectotype.

2. Recent collections greatly extend the range of this species since Danser (1928). The species is not easily confused with any other. The lanceolate leaf has a winged, petiolate base and prominently hairy axils; the upper pitchers are long and slender, with much reduced wings that may be fimbriate immediately below the peristome, the mouth of the pitcher is elongated into an acuminate neck, and the peristome becomes flattened and broad near the lid; the spur is long (1.2–2.5 cm), undivided and densely pubescent; the lid is ovate-cordate, with glands more or less confined to the centre and absent from the margins; the indumentum of reddish brown hairs to 0.6 mm in length, is prominent on stems, particularly in the axils of the leaves, on the underside of the midrib, and on the pitcher spur and inflorescence, but sparse elsewhere.

*Selected collections* — SUMATRA. Aceh. G. Kemiri, 2000 m, *van Steenis 9726* (BO, L); Boer ni Telong, 2000 m, *van Steenis 6367*, 6368 (BO); G. Ketambe, 8–15 km SW from mouth of Lau Ketambe, 40 km NW Kutacane, *de Wilde & de Wilde-Duyffes 13694* (BO); G. Bandahara, 2000 m, *de Wilde & de Wilde-Duyffes 13103* (BO). — Sumatera Utara. Sibajak, *Lörzing 7308* (Type), 15772 (BO); G. Pinto, *Lörzing 8260* (BO); Penghulu Bau, 1800 m, *Frey-Wyssling 40* (BO); Bandar Baru, Sungai Tepi, *Meijer 15840* (BO).

## 73. *Nepenthes stenophylla* Mast.

*Nepenthes stenophylla* Mast., Gard. Chron. III, 8 (1890) 240; III, 11 (1892) 402, f. 58; Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 376, f. 22; Sh. Kurata, *Nepenthes* of Mt. Kinabalu, Sabah (1976) 68, f. 23; Philipps & A.L. Lamb, *Pitcher Plants of Borneo* (1996) 136, f. 73. — Type: *Veitch & Son s.n.* (lecto, designated here, K), Borneo.

*Nepenthes boschiana* var. *lowii* Hook. f. in A.DC., Prodr. 17 (1873) 98. — *Nepenthes maxima* var. *lowii* (Hook. f.) Becc., Malesia 3 (1886) 3, 10. — Type: *Low s.n.* (K), Sarawak.

*Nepenthes fallax* Beck, Wien. Ill. Gartenz. 20 (1895) 191. — Type: *Low s.n.* (W), Borneo.

*Nepenthes boschiana* auct. non Korth.: Macfarl. in Engl., Pflanzenr. 4, 3 (1908) 71.

*Nepenthes faizaliana* J.H. Adam & Wilcock, Blumea 36 (1991) 123. — Type: *Lai & Jugah S 44163* (L), Borneo, Sarawak, G. Mulu park, Bt. Panjang, 10 Nov 1981.

*Nepenthes fusca* var. *apoensis* J.H. Adam & Wilcock, Kew Bull. ined. — Type: *Chai S 35939* (holo K), Borneo, Sarawak, Baram dist., Kelabit highlands, Apo Dari, 1550 m, 17 Nov 1974.

*Nepenthes sandakanensis* J.H. Adam & Wilcock, in sched.

*Nepenthes sandakanensis* var. *eglandulosa* J.H. Adam & Wilcock, in sched.

*Nepenthes sandakanensis* var. *ferruginea* J.H. Adam & Wilcock, in sched.

Distribution — Northern Borneo: Sarawak, Brunei, Sabah, Kalimantan.

Ecology — Wet sandy soils, abundant in open areas or on ridge tops; 1000–2600 m altitude.

Notes — 1. The type is a specimen from a cultivated plant, donated to Kew by Veitch & Son and annotated in Masters' handwriting "*N. stenophylla* Masters Type specimen! Presented 1890." This specimen is somewhat atypical of the species, and some workers are of the opinion that the specimen represents what we interpret as *N. fusca* Danser. The leaf is more or less glabrous, lacking the typical reddish hairs of *N. stenophylla*. Unfortunately the petiole base and stem insertion, important characters, have not been preserved. However, the lid is cordate at the base, with scattered glands, and unlike the ovate lid of *N. fusca*. Unfortunately, the type material lacks any discernible crest. The plant was clearly young, and two years later an illustration based on a photograph by H.J. Veitch was published in the *Gardeners' Chronicle* that clearly shows the sheathing leaf bases and rounded lids typical of *N. stenophylla*.

2. The type of *N. faizaliana* differs from *N. stenophylla* in its 1-flowered pedicels, but in all other respects the specimen matches other material of this species from G. Mulu.

3. The species is characterised by its sheathing leaf bases, and the hairiness (rarely absent) of the stems and leaf margins. The lid is more or less orbicular, with a cordate base, and with a more or less prominent crest near the base, which varies somewhat in size and glandulation. The majority of the lid glands are small (0.1–0.15 mm) and dispersed throughout the lid underside, scattered among these are fewer, larger (0.2–0.4 mm), prominently lipped glands, which are present near the margin and on the basal crest, and often in a small aggregation near the apex. The peristome lacks teeth along its inner margin, although a conspicuous gland is present between each rib.

4. *Nepenthes pilosa* is apparently closely related to *N. stenophylla* (for differences see there).

*Selected collections* — BORNEO. Sarawak. 4° 07' S 114° 53' E, Mt. Api, Mt. Mulu NP, *Argent & Jermy* 998 (KEP, L); Bt. Pajang, Mt. Mulu NP, *Lai & Jugah* S 44163, 10/11/81 (K, L, SAR); Baram, Mt. Dulit, *Haviland & Hose* 3304, 3/1894 (BO, SAR, L); Ulu, Sg. Masia in Kota FR, Lawas, 5th Div., *Tong & Jugah* S 33055, 13/3/73 (BO, L). — Brunei. Mt. Retak, N face of N ridge, Temburong Dist., *Wong WKM* 900, 30/1/89 (K). — Sabah. 5° 33' S 117° 05' E, G.Tawai, Sandakan, *Vermeulen & Lamb* 712, 11/1986 (L); Bembanyan River, Kinabalu, *Chew & Corner RSNB* 4552 (L); Mt. Kinabalu, *Rickards* 101 (K); Trus Madi FR, near Sinua, *Leopold SAN* 71915 (L). — Kalimantan. Amai Ambit, *Hallier B* 3390 (BO, L); Bt. Batoe Ajoh, 4/1897, *Jaheri* 1662 (BO); 3° 52' S 115° 42' E, between Long Bawan & Panado, 23/7/81, *Geesink* 9203 (L).

Hybrids — A hybrid with *Nepenthes lowii* (see there) has been reported from Sabah and Brunei.

#### 74. *Nepenthes sumatrana* (Miq.) Beck

*Nepenthes sumatrana* (Miq.) Beck, Wien. Ill. Gartenz. (1895) 149; Tamin & M. Hotta in M. Hotta, Diversity and dynamics of plant life in Sumatra (1986) 103. — *Nepenthes boschiana* var. *sumatrana* Miq., Fl. Ned. Ind. 6 (1858) 1074; Ill. Fl. l'Arch. Ind. (1870) 7; Hook. f. in A.DC., Prodr. 17 (1873) 98. — *Nepenthes maxima* var. *sumatrana* (Miq.) Becc., Malesia 3 (1886) 3. — Type: *Teijsmann* 535 (BO × 3, L, U), Sumatra, Sibolga, Feb 1856.

*Nepenthes boschiana* auct. non Korth.: Miq., Fl. Ned. Ind. Suppl. (1860) 151.

*Nepenthes treubiana* auct. non Warb.: Macfarl. in Engl., Pflanzenr. 4, 3 (1908) 69; Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 387, partim, f. 25 toto.

*Nepenthes rafflesiana* var. *longicirrhusa* Tamin & M. Hotta in M. Hotta, Diversity and dynamics of plant life in Sumatra (1986) 93; nom. nud.

*Nepenthes spinosa* Tamin & M. Hotta in M. Hotta, Diversity and dynamics of plant life in Sumatra (1986) 103, f. 7, 8; nom. nud.

*Nepenthes longifolia* Nerz & Wistuba, Carnivorous Plant Newsl. (1995) 23 (1994) 105, f. 3. — Type: *Nerz 2801* (holo L), Sumatra, West Sumatera, Taram, Tjampo Mts., 1000 m, 25 Sep 1992.

Climber to several metres; internodes to  $16 \times 0.8$  cm, with a pair of prominent ridges or decurrent leaf margins, the stem more or less D-shaped in section. Leaf blade petiolate, lanceolate to obovate-lanceolate;  $39\text{--}54 \times 5\text{--}9$  cm; the apex acute to rounded-emarginate; base attenuate to the winged petiole; longitudinal veins 6–8, in outer 3/5 of blade; pennate nerves numerous, more or less parallel, running at  $60\text{--}70^\circ$  to margin; petiole 5–9 cm; amplexicaul to 1/2 of stem, the winged margins long decurrent, almost to previous node. Lower pitchers globose throughout, or ventricose in lower half, tubular above and narrowing to mouth; up to  $23 \times 6$  cm; with fimbriate wings to 4 cm broad, with fringe elements to 6 mm; mouth oblique. Upper pitchers wholly infundibulate, or tubular, scarcely ventricose below;  $18\text{--}30 \times 4\text{--}6$  cm; without wings; the mouth oblique, and often raised at front; peristome rounded at front, to 1.2 cm across, flattened towards lid, or flattened and irregular throughout, then 0.5–1.5 cm across, inner margin without teeth, but with conspicuous glands between the ribs; spur simple, 0.8–1.4 cm; lid circular to elliptic,  $6\text{--}9.5 \times 3.5\text{--}7.5$ , apex rounded, base cordate, densely glandular throughout, glands largest towards midline (0.4–0.9 mm), smaller towards the sides (0.2–0.4 mm). Inflorescence to 28 cm, a raceme of 2-flowered partial peduncles; partial peduncles 1 to 1.6 cm, branching at midpoint, upper partial peduncles often simple, and then rarely with simple bract; sepals 5–6  $\times$  3 mm, glandular throughout; male similar; capsule valves  $44\text{--}56 \times 3.5$  mm, seeds  $26 \times 0.75$  mm. Indumentum of simple and branched hairs 0.1–0.2 mm long, brown; on all parts, especially on stems, in leaf axils and tendrils; dense below leaf margin and on all new parts; sparse with age. Colour of lower pitchers brownish red, peristome green or red-streaked, pitchers of the climbing stem pale green throughout.

Distribution — Sumatra.

Ecology — Forest(?), sea level to 1000 m.

Notes — 1. We have not lectotypified this species, since the original material used by Miquel for his description is probably deposited at Utrecht, which we have not seen.

2. Both Macfarlane (1908) and Danser (1928) were prepared to admit the most astonishing distribution for *N. treubiana*, by including Teijsmann's collection from Sumatra with this latter species. Beck (1895) followed Beccari (1886) in placing Miquel's var. *sumatrana* of *N. boschiana* under *N. maxima*; however, whether by design or omission, he published this as *N. sumatrana* Miq. To the present the species has not been properly circumscribed. Tamin and Hotta's *N. rafflesiana* var. *longicirrhusa* n.n. and *N. spinosa* n.n. probably match this species also, although we have seen no authentic material.

3. The decurrent leaf base of this species is virtually identical to that of *N. burbidgeae* of Borneo, which differs markedly in pitcher appearance. *Nepenthes rafflesiana*, the only Sumatran species with which it can be confused, never has the decurrent leaf base, its leaf glandulation is quite different, and the peristome is prominently toothed on its inner margin.

**Collections** — SUMATRA. Sumatera Utara. Sibolga, *Teijsmann* 535 (Type of *N. sumatrana*), *Surbeck* 288 (K); Sibolga to Taroetoeng, 21 Apr 1930, *van der Meer Mohr* s.n. (BO). — Sumatera Barat. Taram, E of Pajakumbuh, 24 Aug 1957, *Meijer* 6913 (K); Taram, Tjampo Mts., *Nerz* 2801 (Type of *N. longifolia*); Air Putih, E of Pajakumbuh, 22 Feb 1954, *Alston* 13831 (BO, K); G. Singalang, 1878, *Beccari* s.n. (K); G. Gadang, E of Lubuk Sikapiang, 17 June 1953, *van Borssum Waalkes* 1985 (BO).

### 75. *Nepenthes tentaculata* Hook. f.

*Nepenthes tentaculata* Hook. f. in A.DC., *Prodr.* 17 (1873) 101; Danser, *Bull. Jard. Bot. Buitenzorg* III, 9 (1928) 379; Sh. Kurata, *Nepenthes* of Mt. Kinabalu, Sabah (1976) 69; Philipps & A.L. Lamb, *Pitcher Plants of Borneo* (1996) 138, f. 74. — Type: *Lobb* 83 (lecto, designated here, K; iso W), Borneo, Sarawak, 2500–3000 ft, 1857.

*Nepenthes tentaculata* var. *imberbis* Becc., *Malesia* 3 (1886) 13. — Type: *Beccari* 2930 (Fl n.v.), Borneo, Sarawak, Kuching, Mt. Matang.

*Nepenthes tentaculata* var. *tomentosa* Macfarl. in Engl., *Pflanzenr.* 4, 3 (1908) 43. — Type: *Burbidge* s.n. (K), Borneo, Sabah, Kinabalu.

**Distribution** — Borneo, Sulawesi.

**Ecology** — Peaty soils of mossy forest; 1200–2550 m altitude.

**Notes** — 1. Hooker's protologue cites a Lobb and a Beccari specimen from Sarawak. *Lobb* 83 was collected at 2700 ft in Sarawak; this matches the altitude given by Hooker (2500–3000 ft) and is selected here as the lectotype.

2. The Sulawesi specimens have longer, more lanceolate leaves; in addition the lids tend to be less frequently tentaculate, and the inflorescence is longer (17.5 cm vs. 13 cm).

**Selected collections** — BORNEO. Sarawak. Bako NP, Telok Asam, *Purseglove* 5063 (K, SAR); 4th Div., Bario, Bt. Lawi, *Awa & Lee* 50880 (KEP); summit of G. Mulu, *Martin* S 38784 (K, L, SAR, SAN). — Sabah. S slope of Kinabalu, *Collenette* 21562, 5/9/63 (A, BO, K, L, G, CANB, SAR, US). — Kalimantan. Kalimantan Tengah, Bukit Raya, 10 km NNW of Tumbang Tosah, Upper Katingan, *Mogea & de Wilde* 3958 (BO, K, L); Kalimantan Timur, G. Njapa, Krubung, Berau, *Kato et al.* 6001 (BO); W. Kutei, *Endert* 3954 (BO). — SULAWESI. B. Waroe Meoesa, *Kjellberg* 2314 (BO); G. Sinadji, *Rachmat* 900 (BO); G. Lokai-Taboenan, Loewoek S/D, Manado, *Eyma* 3778 (BO, K, SING); Soroako, *Hennipman* 5759 (K, KEP, L).

### 76. *Nepenthes thorelii* Lecomte

*Nepenthes thorelii* Lecomte, *Not. Syst.* 1, 2 (1909) 63. — Type: *Thorel* 1032 (lecto, designated here, P; iso P, BO), Vietnam, Guia-Toan, Lo-thieu, Ti-tinh.

Terrestrial shrub with large perennial rootstock producing annual shoots in the wet season. Rootstock irregularly branched to 2 cm thick. Stem erect, to 40 cm high, terete, 0.4–0.8 cm in diameter. Leaves linear lanceolate to narrowly obovate; 12–26 × 1.8–3 cm; apex acute to acuminate; base amplexicaul inserted at an acute angle, and

decurrent to stem for 1–2.5 cm, ultimately rounded, these basal wings almost meeting on opposite side of stem; longitudinal veins 2–4 on each side of midrib, arising from along the midrib; pennate nerves numerous curving towards the apex. Lower pitchers ovoid; to 11.5 × 4.5 cm; wings broad, 5–8 mm, with fringe elements 2–5 mm, c. 2 mm apart; the mouth ovate-triangular, oblique, concave; peristome rounded at front, 2–4 mm across, towards lid to 7 mm across, ribs 0.25–0.4 mm apart, the inner margin with rounded teeth 0.2–0.5 mm long; spur simple, 2–4 mm; lid ovate to rounded, 2–3.5 × 2–2.8 cm, the glands prominently lipped, dense and numerous near base of midline, 0.3–0.7 mm across there, c. 0.15 mm across towards margin and not so dense. Upper pitcher borne on uncoiled tendril; obovate, narrowed towards mouth; to 12.5 × 4.5 cm; wings narrow, 1–1.5 mm broad, with very sparse (3–7 mm apart) acuminate fringe elements 1–1.5 mm long; mouth oblique, concave; peristome rounded, 3–5 mm across, outer margin regularly sinuate; lid as in lower pitcher. Inflorescence a raceme; 8–18 cm long; borne on a tall erect rhachis 50–70 cm long; partial peduncles 1-flowered pedicels 3–6 mm long, with or without a short bract. Indumentum of simple or branched hairs 0.3–0.4 mm long. Colour of pitchers light green with reddish markings, lid reddish, indumentum white.

Distribution — Vietnam.

Ecology — Seasonally dry savannah grassland; sea level to 200 m.

Notes — 1. The male specimen at Paris, with lower pitchers, is selected as the lectotype. The Paris isotype is a female plant with upper pitchers.

2. There are problems with the delimitation of this species, *N. anamensis* and *N. smilesii* (see Little Known Taxa). All three species share narrow linear leaves with clasping leaf bases. The limits of variation of these two species is not yet understood, and *N. anamensis* may occupy similar habitats to *N. thorelii*. *Nepenthes thorelii* appears to be a plant of seasonally dry grassland, surviving as a dormant rootstock during the dry season when fires burn out the above ground vegetation. Besides its perennating habit, *N. thorelii* is characterised by the non-coiling tendrils of the upper pitchers, and its tall inflorescence, which rises over a metre above the ground.

Collection — VIETNAM. Guia-Toan, Lo-thieu, Ti-tinh, *Thorel 1032* (Type).

## 77. *Nepenthes tobaica* Danser

*Nepenthes tobaica* Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 382, f. 23; Sh. Kurata in Gard. Bull. Sing. 26 (1973) 232; Tamin & M. Hotta in M. Hotta, Diversity and dynamics of plant life in Sumatra (1986) 107. — Type: *Lörzing 6573* (lecto, designated here, BO; iso BO × 3, L), Sumatra, Habinsaran plateau, ESE of Lake Toba, 1200–1300 m, 11 May 1919.

Distribution — Northern Sumatra.

Ecology — Forest edges, with *Leptospermum/Rhodomyrtus*. Scrub of old clearings; 950–2750 m altitude.

Notes — 1. Of the three dried duplicates of *Lörzing 6573*, the sheet with both male and female inflorescences is selected as the lectotype. The *Lörzing* number '6802' in Danser (1928: 384) is an error for 8602, as on fig. 23.

2. This species is chiefly to be found in the Lake Toba area of Sumatra. It can be distinguished from *N. reinwardtiana* by the absence of pitcher 'eye-spots', the presence of tufts of white hairs in the leaf-axils, and the rounded stem with non-decurrent

leaf bases. *Nepenthes miki* can be distinguished by its fasciculated spurs on the pitcher, the larger peristome (2.5 mm vs. 0.5–1 mm) and the short inflorescence (7–15 cm vs. 15–35 cm) with 1-flowered partial peduncles.

*Selected collections* — SUMATRA. Aceh. G. Kemiri, *van Steenis* 9727 (BO); Lemboeh, *van Steenis* 9170 (BO); Poetjoek Angasan, Penosa, *van Steenis* 8271 (BO). — Sumatera Utara. Habin-saran, *Lörzing* 15454 (BO); Toba, *Lörzing* 16733 (BO); Tapiannoeli, *van der Meer Mohr* 126 (BO, SING); Sidulang, Balige, N. Tapiannoeli, *Yoshida* 2063 (BO); Toba, SE of Prapat, *Iwatsuki* 151 (BO); G. Pangulubas, 2/4/1972, *Kurata s.n.* (SING).

### 78. *Nepenthes tomoriana* Danser

*Nepenthes tomoriana* Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 384, f. 24. — Type: *Rachmat* 645 (lecto, designated here, BO; iso BO, L), Sulawesi, Gulf of Tomori, G. Kolonodale, Sep 1913.

Distribution — Central Sulawesi.

Ecology — Open scrub-land, in mangrove swamps and on ultrabasic soils; sea level to 400 m.

Notes — 1. A duplicate of the type is kept in alcohol at Bogor, the herbarium sheet at Bogor is selected as the lectotype.

2. The only paniculate species known from Sulawesi. Distinguished from the similar *N. danseri* (see there), by the more numerous and smaller lid glands, and the presence of a bract on the partial peduncle, which is absent in the latter species.

*Collections* — SULAWESI. 2° 15' S 121° 30' E, Lake Matano, Soroako, 10/6/79, *van Balgooy* 3643 (K, L); 2° 27' S 121° 22' E, N shore of Lake Mata, *de Vogel* 5811 (BO, L); 2° 35' S 121° 20' E, Matano Lake, NE of Malili, near Soroako, *Meijer* 11074a (L), 11200 (BO); 2° 45' S 121° 33' E, Lake Towuti, Luha Is., 18/7/79, *de Vogel* 6370 (BO, K, L); Malili S/D, near Doongi, 9/8/38, *Eyma* 3327 (BO, K); 1° 50' S 121° 30' E, Morowali Prov., Mangroves at mouth of Ranu River, 16/2/80, *Grimes* 1176 (K); Gulf of Tomori, G. Kolonodale, *Rachmat* 645 (Type); Lampea, Malili, *Kjellberg* 2056 (BO); Waroe Waroe, *Kjellberg* 2421 (BO); Noeha, *Kjellberg* 2795 (BO).

### 79. *Nepenthes treubiana* Warb.

*Nepenthes treubiana* Warb. in Engl., Bot. Jahrb. 13 (1891) 318; Boerl., Handl. 3, 1 (1900) 54; Jebb, Science in New Guinea 17 (1991) 43, f. 25. — Type: *Warburg* 20581 (B n.v.), New Guinea, McCluer Gulf, Sigar, 1889.

Non *Nepenthes treubiana* sensu Macfarl. in Engl., Pflanzenr. 4, 3 (1908) 69; nec Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 387, f. 25, quae pro parte = *N. sumatrana* (Miq.) Beck.

Stem climbing, angular to 1.3 cm in diameter. Leaf blade lanceolate, to 35 × 7 cm; apex acute; gradually attenuate to base, petiole short, or to 7 cm, winged, these wings running down stem, to 0.3 cm broad. Longitudinal veins 3 to 7, some arising from midrib, running in outer 2/3 of blade. Pennate nerves numerous, running obliquely towards margin, reticulate in outer part of blade. Lower pitchers urceolate-globose, to 20 × 10 cm, with fringed wings to 1 cm broad, with very numerous, short fringing elements (0.3–0.5 cm); peristome rounded to 1.5 cm; lid orbicular, to 8 cm, slightly cordate; spur simple. Upper pitchers not known. Inflorescence a dense raceme to 40 cm long, 0.7 cm thick, partial peduncles nearly all 2-flowered, to 2.5 cm long. Indumentum generally sparse, but dense beneath the blade margin. Colour not known.

Distribution — West New Guinea (Sorong, Misool Is.).

Ecology — Forest edge.

Notes — 1. The original type material at Berlin is still extant (Rischer, 1995) but we have not seen it.

2. Macfarlane and Danser united *N. sumatrana* with this species. They share large urceolate pitchers, and 2-flowered partial peduncles, but their geographical disjunction makes such a union highly improbable. *Nepenthes treubiana* has short teeth on the inner margin of the peristome (vs. absent in *N. sumatrana*), the leaf margin is densely hairy (vs. glabrous), the lid glands are uniform, 0.2 to 0.4 mm across (vs. 0.2–0.7 mm), evenly spread throughout the lid surface and slightly rimmed (vs. largest along midline and smaller elsewhere). The wings of the lower pitchers have much shorter and more numerous fringe elements than those illustrated in Jebb (1991).

*Collections* — IRIAN JAYA. Misool Is., *Pleyte* 813 (BO, K), 976 (BO); Sigar, McCluer Gulf, *Warburg* 20581 (B).

## 80. *Nepenthes* × *trichocarpa* Miq.

*Nepenthes* × *trichocarpa* Miq., Fl. Ned. Ind. 1, 1 (1858) 1072; J. Bot. Neerl. 1, 3 (1862) 275, t. 1; Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 389; Tamin & M. Hotta in M. Hotta, Diversity and dynamics of plant life in Sumatra (1986) 108; Phillipps & A.L. Lamb, Pitcher Plants of Borneo (1996) 140, f. 75. — Type: *Teijsmann* 532 p.p. (BO, L n.v., U n.v.), Sumatra, Sibolga, Feb 1856.

*Nepenthes trichocarpa* var. *erythrosticta* Miq., J. Bot. Neerl. 1, 3 (1862) 276. — Type: *Teijsmann* 533 p.p. (BO, L n.v., U n.v.), Sumatra, Sibolga, Feb 1856.

Distribution — Sumatra, Peninsular Malaysia, Borneo.

Ecology — Widespread but rare; nearly always in mixed populations of *N. ampullaria* and *N. gracilis*, its putative parents; sea level to 800 m.

Notes — 1. At Bogor several duplicates of Teijsmann's Sibolga collections exist; of these one duplicate of 532 represents *N. × trichocarpa*, the remaining two sheets are *N. gracilis*. Of 533, one fragmented sheet may be *N. gracilis*, while the two other sheets are annotated *N. trichocarpa* var. *erythrosticta*, characterised by its larger size. Danser (1928) states that the number 532 represents authentic specimens of the var. *erythrosticta* however. Without viewing the Utrecht specimens it is impossible to be certain of Miquel's designation, since Teijsmann's collections at Utrecht have become muddled (Danser, 1928), and Miquel refers to no numbers.

2. Holtum was the first to suggest that this species was a hybrid between *N. ampullaria* and *N. gracilis*. As with *N. hookeriana* this supposition is based upon its apparent rarity but widespread distribution, and the fact that it only occurs sporadically in mixed populations of the parent species.

3. This hybrid has sessile leaves which exhibit *N. ampullaria*-like venation, texture and hairiness, whilst the angular stem, with sub-decurrent leaf bases and the lid with its few, large-lipped glands are similar to those of *N. gracilis*; the pitchers are characteristically barrel-shaped, and somewhat constricted at the mouth.

*Selected collections* — SUMATRA. Sibolga, 2/1856, *Teijsmann* 532 (Type), 533 (BO, U); Danau Padang, Kerinci, Jambi 23/8/72, *Morley & Karadin* 517 (BO, HULL, K); Hitean Haloban, Laboehan Batoe, Bila 17–24/5/33, *Rahmat si Boeea* 4311 (L, MICH). — PENINSULAR MALAYSIA.



Selangor, Sepang, 21/6/39, *Fugh 36551* (L, SING). — SINGAPORE. The Gap 16/7/39 *Holttum 36983* (L, SING); Changi, 25/11/1889, *Goodenough 1603* (SING). — BORNEO. Sarawak. Kuching, Quarry Hill, *Brooke 8040, 8064* (L). — Kalimantan Barat. Koelor, Singkawag, *Coomans de Ruiter 9* (BO). — Sabah. Phillipps & Lamb (1996).

### 81. *Nepenthes truncata* Macfarl.

*Nepenthes truncata* Macfarl., Trans. & Proc. Bot. Soc. Pennsylv. 3 (1911) 209, t. 2. — Type: *Allen 191* (?PENN n.v.), Philippines, Mindanao, Surigao prov., near Samsolang, 600 m, 1907.

Distribution — Philippines: Mindanao (Surigao & Agusan Prov.).

Ecology — Open mountainside, 230–600 m altitude.

Notes — 1. Macfarlane cites two collections in the protologue, one (*Bolster 270*) comprising a small, juvenile leaf, the other (*Allen 191*), which is illustrated, a large mature leaf. While we have not been able to see the Pennsylvania material, this latter specimen seems the most appropriate for lectotypification.

2. The strikingly truncate, to deeply notched, leaf apex, large size and lid with a basal glandular crest distinguish this species from all others. The species appears to be very restricted in distribution, a pattern matched by other species endemic to the northeastern corner of Mindanao (*N. bellii*, *N. merrilliana* and *N. petiolata*). This species shows close affinities to *N. maxima* both in the texture and venation of the leaf blade, and in its lid.

Collections — PHILIPPINES. Mindanao. Surigao Prov., near Cansuram, *Bolster 270* (?PENN n.v.); Camp David, *Kurata 1105, 1106, 1107* (?Nippon Dental College n.v.); *Ramos 34541* (BO); Agusan Prov., Mt. Urdanetta, *Elmer 13483* (BO, W).

### 82. *Nepenthes veitchii* Hook. f.

*Nepenthes veitchii* Hook. f., Trans. Linn. Soc. 22 (1859) 421; Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 391; Phillipps & A.L. Lamb, Pitcher Plants of Borneo (1996) 144, f. 77, 78. — Type: *Lobb s.n.* (lecto, designated here, K), Borneo.

*Nepenthes lanata* Hort. ex Linden, Illustr. Hortic. 23 (1876) 192, t. 261; Mast., Gard. Chron. (1872) 542, nomen. — Type: not located.

*Nepenthes villosa* auct. non Hook. f.: Hook., Bot. Mag. (1858) t. 5080.

*Nepenthes sanguinea* auct. non Macfarl.: Mast., Gard. Chron. 2 (1882) 808, f. 143.

*Nepenthes veitchii* var. *striata* Veitch, Gard. Chron. III, 12 (1892) 561, nomen.

Distribution — Borneo: Central Sarawak, Brunei, Sabah, rare in Kalimantan.

Ecology — Lowland Dipterocarp forest especially near rivers, ridgetops in mossy forest; rarely epiphytic; 55–1200 m altitude.

Notes — 1. William Hooker published what he took to be a more complete collection of *N. villosa* Hook. f., which had been published by his son 6 years previously, when no pitchers had been available. William Hooker cites a Thomas Lobb collection from Sarawak. The following year Joseph Hooker applied a new name to this taxon, citing a Lobb specimen from 1000 ft and a Low specimen from G. Mulu at 3000 ft. The former specimen, at Kew, was previously identified as *N. villosa* in pencil, and this has been rubbed out. This specimen is selected as the lectotype. *Nepenthes lanata* was a horticultural name and placed as a synonym of the species at the time of publication.

2. Immediately recognisable by the broad, flattened peristome, the sheathing leaf bases, and the dense, hispid hairs. There appear to be two distinct forms of this species: one, a lowland form, with long, narrow, spatulate leaves, a narrow lid, and a golden yellow peristome, which is often found near streams or rivers, and a highland form, with abruptly rectangular-elliptic blades, rounded lid, and green and red streaked peristome, which is commonly found on ridgetops. Both climb by means of distichous clasping leaf-blades (Burbidge, 1882, Phillipps & Lamb, 1988).

*Selected collections* — BORNEO. Sarawak. Kuching, G. Santibong, *Hewitt 458* (SAR); 2° 06' N 113° 42' E, Hose Mts., above Ulu Melinau falls, *Burt & Martin 4990* (SAR); 4th Div., G. Mulu NP, G. Api, *Yii Puan Ching 55956* (K, L, SAR); Ulu Sg. Masia, Kota FR, Lawas, *Tang & Jugah 33081* (KEP). — Sabah. Telupid, Heluran, Sg. Meliau, *Rahim 95000* (KEP, SAR); Long Samado, *de Vogel 8470* (KEP, L). — Kalimantan. Kalimantan Timur. W. Kutei, Belajan River, Mt. Palimasan, near Tabang, *Kostermans 12972* (BO, KEP). Kalimantan Tengah. Bt. Raya, *Nooteboom 4083* (BO, KEP).

### 83. *Nepenthes ventricosa* Blanco

*Nepenthes ventricosa* Blanco, Fl. Filip., ed. 1 (1837) 807; Blume, Mus. Bot. Lugd.-Bat. 2 (1852) 10; Hook. f. in A.DC., Prodr. 17 (1873) 100; Becc., Malesia 3 (1886) 4; Beck, Wien. III. Gartenz. (1895) 149; Burbidge, Flora & Sylva II, 12 (1904) 114; Macfarl. in Engl., Pflanzenr. 4, 3 (1908) 54. — Type: Not located; *Blanco s.n.* (PNH †?), Philippines, Luzon, Ilocos Province, Piddig.

Distribution — Philippines: Luzon.

Ecology — Low mossy oak forest, 1200–1500 m altitude.

Notes — 1. Blanco's types are presumed destroyed at PNH, but duplicates may exist elsewhere (see notes under *N. alata*).

2. Closely related to *N. burkei* Mast. of Mindoro q.v. This pair of species both have strongly waisted pitchers, which lack fringed wings at any stage.

*Selected collections* — PHILIPPINES. Luzon. Quezon Prov., Lucban, Tayabas, *Elmer 7441* (BO); Rizal Prov., *Loher 14055* (KEP), *14058* (BO).

### 84. *Nepenthes vieillardii* Hook. f.

*Nepenthes vieillardii* Hook. f. in A.DC., Prodr. 17 (1873) 104; Becc., Malesia 3 (1886) 5; Beck, Wien. III. Gartenz. (1895) 190; Burbidge, Flora & Sylva 2 (12) (1904) 114 (as *veillardii*); Macfarl. in Engl., Pflanzenr. 4, 3 (1908) 48; Guillaumin, Ann. Mus. Col. Mars. II, 9 (1911) 211; Moore, J. Linn. Soc. 45 (1920) 380. — Type: *Vieillard 1121* (lecto, designated here K; iso P n.v., TCD, W), New Caledonia.

*Nepenthes neocaledonica* Mull. ex Heckel, Ann. Fac. Sc. Mars. (1892) 9.

*Nepenthes ampullaria* auct. non Jack: Jeanneney, Nouv. Caléd. Agric. (1894) 92.

*Nepenthes distillatoria* auct. non L.: Jeanneney, Nouv. Caléd. Agric. (1894) 92.

*Nepenthes vieillardii* var. *deplanchei* Dubard, Bull. Mus. Hist. Nat. 12 (1906) 66. — Type: *Herb. Deplanche 100* (P), New Caledonia.

*Nepenthes montrouzierii* Dubard, Bull. Mus. Hist. Nat. 12 (1906) 66. — *Nepenthes vieillardii* var. *montrouzieri* (Dubard) Macfarl. in Engl., Pflanzenr. 4, 3 (1908) 49. — Type: *Pancher 423* (P n.v.), New Caledonia, Isle of Pines, 1858.

*Nepenthes bongso* auct. non Korth.: Guillaumin, Ann. Mus. Col. Mars. II, 9 (1911) 211.

*Nepenthes humilis* S. Moore, J. Linn. Soc., Bot. 45 (1921) 380. — *Nepenthes vieillardii* var. *humilis* (S. Moore) Guillaumin, Mem. Mus. Nat. Hist. Nat. N.S. Sér. B, 15 (1964) 24. — Type: not located, Mont Mou.

*Nepenthes vieillardii* var. *minima* Guillaumin, Mem. Mus. Nat. Hist. N.S. Sér. B, 4 (1953) 61.

Non *Nepenthes vieillardii* sensu Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 393, f. 26; nec Jebb, Science in New Guinea 17 (1991) 45, f. 27, quae pro parte = *N. lamii* Jebb & Cheek partim.

Distribution — New Caledonia.

Ecology — Scrub, forest by streams; 30–800 m altitude.

Notes — 1. The Kew specimen of *Vieillard 1121* is lectotypified, being the sheet on which Hooker is most likely to have worked.

2. *Nepenthes lamii*, described as new in this paper, was formerly included in *N. vieillardii* by Danser (1927) and Jebb (1991). The present species is characterised by the prominent indumentum of white hairs on all parts, with the exception of the leaf-blades, where it is somewhat sparse (vs. almost glabrous in *N. lamii*). The leaf-blade of the present species is somewhat spatulate at its base, being narrowed into a more or less parallel-sided base, which is abruptly amplexicaul to the stem (vs. broadly attenuate and decurrent). The lid glands are sparse, scattered throughout the underside of the lid, and large (0.25–0.4 mm) with prominent rims, which may be somewhat thickened [in *N. lamii* they are somewhat variable (0.1–3 mm) but dense].

*Selected collections* — NEW CALEDONIA. Prony, *Franc 19* (SING), 1909 (BO, SING); *Germain s.n.* (BO). — ISLE DES PINS. *Macgillivray s.n.* (K), *Milne s.n.* (K, TCD).

## 85. *Nepenthes villosa* Hook. f.

*Nepenthes villosa* Hook. f. in Hook., Ic. (1852) t. 888; Beck, Wien. Ill. Gartenz. (1895) 183, p.p., excl. *N. edwardsiana*; Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 396, p.p., excl. *N. edwardsiana*; Sh. Kurata, *Nepenthes of Mt. Kinabalu, Sabah* (1976) 73, t. 25 & 26; Philipps & A.L. Lamb, *Pitcher Plants of Borneo* (1996) 149, f. 79. — Type: *Low s.n.* (K), Borneo, Sabah, Mt. Kinabalu.

Non *Nepenthes villosa* auct. Hook., Bot. Mag. (1858) t. 5080, quae = *N. veitchii*.

Distribution — Borneo: Mt. Kinabalu only.

Ecology — Mossy forest with *Dacrydium* and *Leptospermum*, or amongst boulders, shrubs and grass in open conditions, on ultrabasic soils only; 2400–3200 m altitude.

Notes — 1. *Nepenthes edwardsiana* and *Nepenthes villosa* were first united by Beck (1895), and this was followed by Danser (1928). Macfarlane maintained them separately (1908).

2. Closely related to *N. edwardsiana* and *N. macrophylla*. With the former species it overlaps at the lower end of its altitudinal range. Intermediate taxa can be ascribed to the hybrid *N. × harryana*. *Nepenthes villosa* differs from both these species in its emarginate leaf-blade, long villose tendril, and its ellipsoid villose pitcher which lacks any narrowing at its middle. The peristome has a double inner layer, linked by cross walls, and forming a series of rectangular partitions between the front peristome and an inner layer which lies close to the pitcher wall.

*Selected collections* — BORNEO. Sabah. Mt. Kinabalu, *Anderson 27100* (SAR), *Clemens 29340* (BO), *Holtum 25516* (SING), *Low s.n.* (Type), *Poore 303* (KLU).

Hybrids — 1. *Nepenthes villosa* × *N. edwardsiana* = *N. × harryana* Burb. (see under *N. edwardsiana*).

2. *Nepenthes villosa* × *N. rajah* = *N. × kinabaluensis* Sh. Kurata (see *N. × kinabaluensis*).

#### LITTLE KNOWN TAXA

1. *Nepenthes deaniana* Macfarl. in Engl., Pflanzenr. 4, 3 (1908) 57. — Type: *Curran 3891* (PNH †), Philippines, Palawan, Mt. Pulgar.

Note — The Manila type is presumed destroyed with the Philippine herbarium during World War II. Duplicates of the type may be extant elsewhere, although Macfarlane (1908) mentions Manila alone. The description suggests that the species may be a form of *N. alata*.

2. *Nepenthes junghuhnii* sensu Macfarl. in sched. — ?*Nepenthes sanguinea* × *N. singalana* Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 371.

Non *Nepenthes junghuhnii* Macfarl. ex Ridl., J. Fed. Mal. St. Mus. 8, 4 (1917) 79, quae = *N. singalana* Becc.

Note — Macfarlane determined sheets of *Junghuhn 275* collected in the Batak region of Sumatra (?Tapanoelli) at Kew as '*N. Junghuhnii* Macfarl.'; however, he never published the name. Ridley cites the collections made by Robinson & Boden Kloss on Mt. Kerinci as belonging to this species, and thus inadvertently described the species using specimens we include in *N. singalana* Becc. (see there). The specimens originally determined by Macfarlane are not readily assigned to a taxon. They have narrow lanceolate and petiolate leaves with decurrent bases and large ellipsoid pitchers with an expanded peristome. The pitchers are somewhat intermediate between upper and lower forms and the specimens could belong to *N. bongso* Korth.

3. *Nepenthes melamphora* var. *lucida* Blume, Mus. Bot. Lugd.-Bat. 2 (1852) 8; Becc., Malesia 3 (1886) 5; Beck, Wien. Ill. Gartenz. (1895) 186. — Type: *Muller s.n.* (L), Borneo, E of Bandjermasin.

Note — Blume describes the specimen as having very shiny leaves; however, this is not apparent from the specimens. From typical *N. gymnamphora*, this variety differs in its narrowly ovate lid (3.5 × 2.3 cm), but in other features it falls within the variation shown by the species in Java. The Muratus mountains of southern Borneo are poorly collected. Two species, known only from their types, have been collected there: *N. borneensis* and *N. boschiana*. With no other collections available from S Borneo, this specimen stands alone.

4. *Nepenthes neglecta* Macfarl. (ex Icon. Beccarii) in Engl., Pflanzenr. 4, 3 (1908) 58; Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 29. — Syntypes: Icon. Beccarii (not located); *Low s.n.* (not located), *Burbidge s.n.* (not located), Borneo, Sabah, Labuan Island.

Note — Macfarlane based the name on a drawing by Beccari, and on two specimens, one of Low, the other of Burbidge, both from Labuan Island. It has not been possible to identify these latter two specimens. One specimen at Kew (*Burbidge s.n.* from Labuan, a specimen of *N. hirsuta*) has long been annotated as the type of *N. neglecta*, and a note in Macfarlane's handwriting states: "this is the only fertile material of this species that I have seen." In his original publication, Macfarlane (1908) ends his description thus "... Flores et fructus ignoti." Probably the herbarium note has been written after publication of the species and the specimen cannot be considered original material. Without material, and there being no populations of *Nepenthes* remaining on Labuan (Anthea Phillipps, pers. comm.), the description is the sole reference. There are several important characters in the description: "caulis ... trigonus, anguli a marginibus folii superioris continui, ...", and the lid being "... glandulis paucis magnis irregulariter dispersis, ..."; these characters are matched by *N. gracilis* and quite unlike the stems or glandulation of *N. hirsuta*. The drawing of Beccari's, which we have not seen, may shed further light on this species.

5. *Nepenthes smilesii* Hemsl., Kew Bull. (1895) 116. — Type: *Smiles s.n.* (K), Thailand, Baw Saw, Nam Kawng.

Note — Danser (1928) synonymised this species with *N. mirabilis*. Whilst the margin of the specimen at Kew does have a sparsely fimbriate margin, the venation is very atypical for *N. mirabilis*. In some characters this specimen demonstrates links to *N. anamensis* and *N. thorelii*, and without further material its inclusion with *N. mirabilis* seems premature.

#### EXCLUDED SPECIES

1. *Nepenthes cincta* Mast., Gard. Chron. 21 (1884) 576. — Type: *J. Veitch & Sons s.n.* (K), cultivated from material collected by David Burke in Borneo.

Note — Described from material grown from seed collected by David Burke in Sarawak, a collector for J. Veitch and Co. As Masters states in the original description, it is in all likelihood a natural hybrid between *N. albomarginata* and *N. northiana*.

2. *Nepenthes cristata* Brongn., Ann. Sci. Nat. 1 (1824) 48. — Type: *Commerson s.n.* (lecto, nominated here, P n.v.), Madagascar.

Note — Based on mixed types, comprising *N. alata* [Nöe *s.n.* (P n.v.), Philip-pines, Mauban] and *N. madagascariensis* (*Commerson s.n.*); this name pre-dates *N. alata* Blanco. By lectotypifying the Madagascan element, the name can be excluded from use in the case of *N. alata*.

3. *Nepenthes lindleyana* Low ex W. Baxt. Loudon, Hort. Brit. Suppl. 3 (1850) 593. — Type: not located.

Note — We have been unable to identify this taxon.

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Only specimens with an identifiable collector and collection number are listed. The bracketed number refers to the species number as used in this paper and listed as follows:

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| 2. <i>alata</i> Blanco                        | 11. <i>borneensis</i> J.H. Adam & Wilcock |
| 3. <i>albomarginata</i> T. Lobb ex Lindl.     | 12. <i>boschiana</i> Korth.               |
| 4. <i>ampullaria</i> Jack                     | 13. <i>burbidgeae</i> Hook. f. ex Burb.   |
| 5. <i>anamensis</i> Macfarl.                  | 14. <i>burkei</i> Mast.                   |
| 6. <i>argentei</i> Jebb & Cheek               | 15. <i>campanulata</i> Sh. Kurata         |
| 7. <i>aristolochioides</i> Jebb & Cheek       | 16. <i>clipeata</i> Danser                |
| 8. <i>bellii</i> K. Kondo                     | 17. <i>danseri</i> Jebb & Cheek           |
| 9. <i>bicalcarata</i> Hook. f.                | 18. <i>densiflora</i> Danser              |

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| 22. <i>edwardsiana</i> Low ex Hook. f.                     | 55. <i>neoguineensis</i> Macfarl.            |
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| 37. <i>hasiana</i> Hook. f.                                | 70. <i>singalana</i> Becc.                   |
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- (64) — Gibbs 4300 (38), 5502, 5937 (48) — Gibot SAN 64372 (4) — Gillison NGF 25260 (51) — Gillison & Kairo NGF 25723, 25724 (51) — Gillison & Seruvatu NGF 25742 (55) — Giuilianetti & English 25 (4) — Gjellerup 122 (55), 172, 493 (51), 1130 (48) — Goodenough 406 (28), 1601 (34), 1603 (80), 4692 (64) — Grashoff 9/1914 (4) — Green 9/1962 (34), 11/1963 (64 + 28) — Griffith 4439/2 (4) — Grimes 1176 (78) — Gutierrez PNH 117527 (2).  
 Haan 21 (64) — de Haan 7 (4), 9 (30), 21 (28), 21a (4), 79 (64), 1718 (17) — Hagen s.n. (24) — Hain 1734, 1776 (51) — Hallier 239 (64), 606 (75), 642, 644, 713 (32), 1275, 1320 (51), 1453 (28), 1454 (4), 1455 (3), 1457, 1458, 1459, 1596 (64), 1716 (26), 1893 (30), 2142 (64), 2234 (51), 2298 (64), 2299 (67), 2300 (3), 2344 (16), 2378 (64), 2438 (9), 2709, 2710 (32), 3389 (75), 3390 (73) — Hamel & Rahmat si Boeca 733 (67) — Hamid 1848 (51) — Hancock 299 (30) — Handial 544 (4) — Haniff 611 (3), 1269, 4236 (51), 7890, 7891 (29), 8306 (42), 8310 (69), 13126 (28), 17890 (29) — Hansen 1134 (75) — Hansen & Smitinand 11877 (51) — Hanzah 10/1989 (48) — Hardial 686 (28) — Hardy 2864 (45) — Harno 595A (61) — Hartley 9757, 10608 (51) — Hasseveld 3132 (30) — Haviland 1253 (22), 1352 (65), 1659 (41) — Haviland & Hose 3304, 3638 (73) — Hayes Palmer s.n. (28) — HB 529 (24) — Helford & Cox 338 (75) — Henderson 2938 (51), 10050, 10347 (28), 10984 (42 + 69), 11070 (42), 11217 (69), 11356 (42), 11816, 17752, 17841 (69), 17874, 17878 (42), 20311, 20379 (67), 20440 (4), 20457 (64), 23282 (69), 23329 (42), 24039 (28), 36624 (4) — Hennipman 5759 (75) — Henty NGF 27010 (51) — Henty & Foreman NGF 42582 (55), 49409 (51) — Henty & Katik NGF 38672 (51) — Herb. Drake 64 (4) — Herb. Hooker 302 (4) — Herb. Wight 2508 (20) — Hewitt 7, 50 (75), 100 (56), 396 (75), 458 (82), 751 (75), 752 (82) — Hildebrand 234 (30) — Hinson 46 (51) — Hirano & Hotta 995 (82) — Hobbs 10 (4), 15, 21a (75), 27, 28, 30 (4), 38 (75), 44 (4), 83 (75) — Hochreutiner 2059, 2067 (30) — Holstvoogd 282 (30) — Holtum 3655 (80), 10731 (4 + 64), 10733 (4), 15102 (64), 17373 (28), 18063, 19860 (64), 19940 (4), 20643 (69), 20644 (42 + gracillima), 20644a (42), 20666 (29), 21546 (29 X 69), 21554 (42), 23151 (75), 23404 (42), 24939 (4), 24987 (69), 25446 (75), 25516 (85), 26101, 28101, 28102 (70), 28107 (60), 28122 (24), 31274, 31275 (42), 36510 (69), 36511, 36512 (42), 36983 (80), 38286 (51) — Hoogland 3968 (55), 9299 (48) — Hoogland & Craven 10550 (4) — Hooker & Thompson s.n. (37) — Horne 546, 575, 576 (61) — Horsfield 136 (4) — Hose 65 (69) — Hotta 12881, 13518 (33), 14610, 15070 (73), 31301 (1) — Hotta & Okada 1670 (24), 1676 (67) — Hotta & Tamin 35 (60), 42 (10), 60 (60), 110 (10) — How 73008 (51) — Howcroft LAE 64024, 64052 (4) — Huitema 50 (28), 113, 114 (77) — Hullett 354 (75), 874 (64), 5693 (28) — Humbolt 400 (45) — Hutton NGF 49980 (48) — Hyn 173 (48).  
 Ibalı UPNG 3 (51) — Iboet 53 (67), 55 (51) — Ingemann 10 (48) — Iwanggin BW 5225 (51) — Iwatsuki 151, 213 (77), 243 (4), 244 (77), 247 (4).  
 Jaamat 25948, 27026 (42), 27665 (66) — Jacobs 915 (48), 5686 (4 + 9), 7664 (2), 8212, 8261 (71), 8964 (4), 9651, 9658 (55) — Jacobson 4 (3), 147 (4), 203 (30), 491 (70), 2135, 2136 (3), 2415 (28), 2805 (67) — Jaheri 1662 (73) — James 36561 (41) — Janowsky 43 (4) — Jayasuriya & Kostermans 2335 (26) — Jebb 238 (48), 391, 404 (51), 414 (48), 421, 434 (55), 783 (4), 784 (55), 989 (17) — Jeffrey 463, 559 (61) — Jenang 58080 (51) — Jensen s.n. (4) — Jermy 13363 (4), 13364 (9), 13980 (75) — Jochens 23 (67) — Jochim 3369 (67) — JSWS 127 (4) — Jumali 115 (28), 712 (3), 4320 (64), 4322, 4324, 6324 (4) — Jumali & Kuswata 74 (64), 115 (28) — Junghuhn 1157 (30) — JWŁ 71132 (28).  
 Kadim & Noor K 279, 289 (4), 370 (64) — Kadir 172754 (67) — Kairo NGF 27565 (51) — Kairo & Streimann NGF 30714 (51) — Kalkman BW 3568, 4019 (4), 5323 (48) — Kanehira & Hatu-sima 12174, 12175 (4), 13011 (51), 13736 (48) — Kang & Wyatt-Smith 59 (69) — Kanis 1348 (51) — Karim SAN 80309 (4) — Kartawinata 1153, 1473a (67) — Kasim 543 (69) — Kassim 198 (51), 448 (3) — Kato, Okamoto & Walujo 5987, 6001 (75), 9424, 9434 (73), 10973 (82), 10975 (75), 11373 (73) — Keers 22 (24) — Keith 6716 (64), 48915 (28) — Kelsall 1/1891 (69) — Keng 7 (69), 39 (3), 51 (28), 57 (66), 868 (64), 3979 (30), 8057, 8237 (69), KEP 77952, 79325 (4) — Kerenga LAE 76421, 77541 (51) — Kerenga & Croft LAE 77366 (51) — Kerenga & Lelian LAE 73971 (4) — Kerkhoven 19 (30) — Khaleue 41 (4) — Khoo 73 (69) — Kiah 37 (41), 45 (85), 46 (75), 66 (64), 68 (28), 402 (3), 7801 (4) — King's colls. 1941 (28),

- 1943 (4), 1948 (28), 3316 (69), 4026, 4084 (28), 4087, 4089, 4148, 6222 (4), 7395 (42), 10631 (51) — Kingdon Ward 37512 (51) — Kjellberg 1483, 1484 (48), 1492 (31), 2314 (75), 2003, 2794 (51) — Kleinhoonte 476, 517 (24), 666 (67) — Kloss 12122 (42 + 69), 12134 (29 + 42), 12211, 12212, 12227 (29), 12258, 12259 (42), 12286 (51), 12288 (67), 12297 (29) — KLU 22 (3) — Kochummen 18074 (3), 18395 (42), 18409 (28), 19070, 93132, 93136, 93137 (69), 94887 (64) — Kodoh SAN 87501 (4) — Koers 120 (30) — Kokawa & Hotta 1152, 5272, 5821 (73) — Kondo 11514 (8) — Koorders 274 (10), 18330, 18331, 18332, 18333, 18334 (48), 22358, 22359 (28), 22360, 22361, 22362, 22363 (4), 26014, 26077, 26077b, 26622, 26758, 26800, 27875, 27876, 31662, 35861, 36714 (30) — Koppel 18a (77) — Kornasi 1176 (51) — Kostermans 272 (30), 351 (4), 355 (34), 361 (4), 372 (28), 472, 766 (67), 1202 (48), 1261 (28), 1271 (4), 2123, 2165, 2178, 2295, 2345, 2383 (48), 4150, BW 4313 (51), 7603 (26), 7923, 7925 (64), 7992, 9006 (67), 9254 (64), 9268 (4), 9277, 9280, 9288 (64), 9604 (28), 10751 (64), 12961 (75 + 82), 12972 (82), 13099 (32), 13450 (67), 13764 (15), 13821, 14017 (46), 14056 (67), 24747, 25378, 25515 (20) — Kostermans & Anta 355 (4 + 64), 372 (28), 766 (67), 1271 (4) — Kostermans & Soegeng 133 (55), 610, 781 (48), 936 (36) — Kreke 3/1927 (30) — Kudi & Sangat S 32714 (4) — Kunstler 1236 (4), 1720 (3), 4019 (28), 4025 (28) — Kurata 4002 (2), 4300, 4301 (68) — Kurata & Toyoshima 1128 (8) — Kurz 1460 (4) — Kuswata & Soepadmo 305 (51) — Kwapena WLL 169 (51).
- Lack & Grimes 1783 (31), 1785 (27) — Lai & Jugah S 44163 (73) — Lak Shnakara 766 (4) — Lam 80, 152, 1518 (30), 1569 (58), 1637, 1654 (40), 2156, 3745 (48) — Lam & Meeuse 6032 (45) — Lamb ACSAR 212 (75) — Lamin 153 (30) — Lan s.n. (28) — Landow 45159 (42) — Lantoh 82759 (26) — Latif 12 (24) — L.B. 14677 (61) — Ledermann 6869 (51) — Lee 38825 (53), 38829 (41), 44290, 45355 (82) — de Leeuw 20 (28), 21 (4), 22 (67), 1927 (4 + 64) — Lelean & Streimann LAE 52526 (51) — Leopold SAN 71915 (73) — Lief tinck 11, 78 (71) — Liew 281, 333 (28) — Lisowski 53164 (48) — Lo & Mahmud 6, 47, 72, 73, 76 (3) — Loher 1906, 5466, 5467, 13988 (2), 14055, 14058 (83) — Longuet s.n. (28) — Lörzing 189, 1172, 1416 (30), 2840, 2840 (51), 6342 (4), 6343 (28), 6573 (77), 7308 (72), 7612 (77), 8260, 8297 (72), 8602, 9443 (77), 9590 (4), 9889 (77), 11443 (51), 11507 (67), 11530 (4), 11603 (24), 13874 (72), 14183 (28), 15137, 15454 (77), 15772 (72), 15991, 16085 (77), 16233 (72), 16428 (28), 16633 (4), 16733 (77), 16897 (34), 16898 (28), 16998 (67), 17103 (72) — Low KEP 98414 (4) — Lowrey s.n. (69) — Luang S 22692 (73).
- Macrae s.n. (20) — Mad 1459 (28) — Madani 89205 (67) — Madani & Ismail SAN 111459 (75) — Madius SAN 50092 (4) — Main 1784 (9) — Maingay 1322, 1326 (4) — Mann NGF 43351 (51) — Mannit 32704 (51) — Mansus 117478 (67) — Mantor 121850 (28) — Map 26045 (80) — Marabini 2167/48 (43) — Marshall 23160, 25891 (3) — Martan s.n. (4) — Martin 37103 (53), 38784 (75) — Maskuri 351 (77) — Mason 79 (51) — Maxwell 967, 968 (20) — Mayr 10, 58, 268, 518 (48) — McDonald & Ismail 3578 (41), 4166, 4170 (48) — McGregor 32313 (not ?) — MEDP 1303, 1780 (28), 1384 (51), 1391, 1392, 1393, 1394, 1395, 1398 (66), 1399 (42), 1400, 1402, 1437, 1479 (51), 8101, 8103 (42) — van der Meer Mohr 2 (30), 5 (51), 110, 126, 139, 5054 (77) — Meerdonck 338 (4) — Mees Kooke s.n. (3) — Meeter 89 (51) — Meijer 2486a, 2489a (32), 2870a (30), 617 (64), 909 (26), 1034, 1035, 1047 (67), 2480 (32), 2535 (4), 2550 (32), 2560 (4), 2603 (64), 3111 (60), 4571, 5145 (10), 5932 (60), 6542 (7), 6913 (74), 6941 (1), 6949 (21), 7246 (7), 7523 (60), 9840 (48), 11074a (51), 11200 (78), 15840 (72), 33509, 41210 (9), 51564 (44), 122317 (9) — Meijer Drees 136 (51), 228 (55), 503 (4) — Merrill 259 (2), Sp. Bl. 507 (2) — Metcalfe 43 (64) — Micholitz s.n. (5) — Millar NGF 9721, 22690, 23005 (51) — Mjöberg 46 (63), 49 (75) — Mochtar 47185 (3) — Mogeia & de Wilde 3958 (75) — Moi & Inu NGF 25984 (51) — Molengraaff 3466 (75) — de Monchy s.n. (30) — Mondri 190 (3), 244, 245 (9), 246 (4), 247 (64) — Monod de Froideville 117 (75) — Morley & Karadin 517 (80) — Morshidi 24068 (33) — Moudi 189 (28) — Moulton 118 (73), 192 (75), 356 (41), 512 (82) — Moxon s.n. (64) — Muller s.n. (30?) — Murata 1754 (32) — Murata, Kato & Mogeia 3455 (11) — Murdoch 2/1904 (42).
- Nagamasu 3454, 3460 (10), 4254 (21) — Nauen 35821 (28) — Neethius (67) — Nerz 1602 (57), 2801 (74) — Ng 1448, 1478 (29), FRI 5709 (4), 5869 (28), 5981 (69), 10009 (4), 20915, 20954

- (29), 20961 (42), 27099 (3), 27476 (4), 27477 (28), 27478, 118167 (64) — Ngadiman SING 36624 (4), 36631 (64), 36624 (4) — Nielsen 851 (53) — Ninick Rahayu 240, 241, 242 (4) — Nitta 15187 (30) — Noerkas 505 (48) — Noor 1015a (4), 1017a (34), 1016 (28) — Nooteboom 4083 (82), 4593 (75), 4617 (23) — Nooteboom & Chai 1962 (41), 2035 (54) — Nordin Abas 85812 (64) — Nuhanara 18 (64), 19 (64) — Nur 7342 (72), 11057, 12219 (66), 12221 (42), 18937, 20036 (4) — Nyawa 2101 (67).
- Ogata 110297 (69) — Okada 13 (60) — Okada & Rusdi 40 (35) — Ooster 38 (30) — Oppenhout 11/1929 (18) — Orolfo 3819, 3820 (64) — Othman & Munting 54400 (51) — Ouwehand 79 (77) — Oxford Univ. Exp. 537 (32), 538 (64).
- Paie S 8482 (4), 16393 (75), 19865 (82), 26511, 26512 (41), 26513 (54), 33028 (73), 40704 (75), 42749 (4 + 32), 46073 (4), 47030 (64) — Pajmans 1436 (4) — Palmer 1159 (30) — Percival (61) — Pickles 2905 (82) — van der Pijl 707A (48), 718 (51) — Pleyte 813, 976 (79) — Podzorski 2114 (2) — Polak 112 (77), 125, 126, 127, 128 (4), 129 (28), 138 (51), 164, 168, 204, 213, 216 (64), 217 (3), 243 (34), 282 (64), 283 (67), 471 (51), 605 (4), 617 (64), 632 (51) — Poli s.n. (20) — Poore 303 (85), 752, 758, 1300 (42), 1301, 1302, 1303 (69), 1304, 1305 (42), 1404 (3), 5105 (64), 5106 (4) — Posthumous 391, 1815, 1834, 1861, 1867 (30), 24526 (48), 2146 (67) — Powell UPNG 2448 (48) — Prasa-Angian 3993 (28) — Pringgo Atmodjo 94 (51), 176 (18) — Puasa-Angian 36771 (28) — Pulle 277 (36), 659, 710 (48), 802, 803 (40), 843 (40 + 48), 1137 (48) — Pullen 1491 (55), 3464, 5920, 7156 (51), 7256 (4) — Purseglove 4121 (69), 4195 (66), 4225 (766 + 69), 4384 (4), 4441 (28), 4504 (4), 4733 (32), 4852 (51), 4903 (28), 4904 (64), 4905 (3), 4941, 5035 (64), 5063 (67), 5092, 5093, 5094 (64), 5611 (4) — Purseglove & Shah P 4504 (4).
- Raap 590 (28) — Rachmat 80 (28), 513, 514 (48), 645 (78), 900 (75), 936 (48) — Raefs 545, 622 (67) — Rahayu 239 (64), 240, 242 (4) — Rahim SAN 93291 (4), 95000 (82) — Rahmat si Boeca 30 (4 + 51), 337, 2134 (4), 4306, 4311 (80), 7491, 7806 (28), 7945 (4), 7946 (64) — Rajab 541 (69) — Ramlanto 132, 134, 194 (51) — Ramos 5372, 14650 (2), 34503 (49), 34541 (81), 41301 (2) — Rant 67, 293, 293, 729 (51), 730 (48) — Rao 15 (41), 18 (28), 121 (41), 138 (75), 143 (4), 4600 (75), 4611, 4638 (85), 4673, 4679, 4685 (75), 9193 (3), 9578 (66 + 42), 9580 (42) — Rappard 58 (51), 66, 67 (70), 82 (4), 120 (51), 210 (67) — Rau 571 (55) — Rayab 666 (69) — Reksodihardjo 26 (51), 83 (30), 388 (4) — Richards 2491 (75), 2655 (9) — Rickards 15 (75), 99 (75), 101 (73), 107 (85), 150 (75) — Ridley 79 (4), 873 (69), 1068, 1372 (64), 1473, 1617 (28), 2869 (4), 3041 (28), 3371 (64), 3380 (28), 9790 (69), 11023, 11026 (28), 11668, 11672 (51), 12064 (66), 12286 (51), 13235 (4), 13704 (29), 15562 (42), 15563 (66), 16096 (42), 16097, 16098 (29), 16174 (42 + 69) — Ridsdale 74, NGF 31726 (4), 33567 (51) — Ridsdale & Frodin NGF 30352 (51) — Ridsdale & Galore NGF 31757 (4) — Ridsdale & Henty NGF 33105 (48) — Riedel s.n. (49?) — Rifai 6533, 6705 (48) — Rijkebüsch 3 (48) — van Rijckevorsel 9, 46 (30) — Robinson 1/1913 (66) — Robinson 1903 (48) — Robinson & Kloss 5969 (28), 6050 (4), s.n. (7) — Roepke 11 (48) — van Romburgh 1898 (51) — von Römer 46, 47, 449 (4), 454, 900 (59), 1037, 1038, 1052 (40), 1156, 1192 (48) — Rooney UPNG 29 (51) — Rostado 2/1905 (28) — Rouppert 8/1926 (30) — van Royen 3809 (51), 3864 (48), 3968, 3968, 4515, 4897 (51), 5417, 5423, 5541, 5563 (17), NGF 11480 (48), 20082 (51) — van Royen & Sleumer 5644 (51), 5928 (48), 6461 (4), 6493 (55), 6767 (51), 6887, 7719, 7934, 7952, 8027, 8234, 8235 (48) — Ruffner 188 (4) — Rutgers 1 (77) — Rutter 2041, 2218 (48) — Ruttner 188 (4), 189 (28), 190, 191 (51), 192 (77), 271 (67).
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