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Synopsis of Sumatran *Nepenthes* (Indonesia)

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Abstract. *Hernawati, Zuhud EA, Prasetyo LB, Soekmadi R. 2022. Synopsis of Sumatran* Nepenthes (Indonesia). *Biodiversitas 23: 4243-4255.* Taxonomic status is a fundamental component in determining the conservation status of a species. Inappropriate taxonomic entities can mislead efforts to protect species, especially endangered ones. Determining the taxonomic status of Sumatran *Nepenthes* is an essential step in conserving these unique species. This study aims to assess the taxonomic status and update the compilation of scientific names and taxon positions related to the Sumatran *Nepenthes*. The morphological characters were collected through observation of herbarium specimens and field research in several locations in Sumatra. The grouping of species is built based on the similarity of morphological characters for each selected species and follows a taxonomic revision process. The results showed that Sumatra had 39 species of *Nepenthes*, which were previously known to occur in only 29 species. The increase in the number of Sumatran *Nepenthes* came from (i) The publication of 9 new *Nepenthes* species from Sumatra. (ii) Restores *N. pectinata* and *N. xiphiodes* as independent species from their original position as synonyms for *N. gymnamphora*. (iii) Positioning *N. gymnamphora* as one of the *Nepenthes* species on the island of Java. (iv) Positioning *N. angasanensis*, *N. longifolia*, *N. talangensis*, and *N. tenuis* as independent species and not synonyms of *N. mikei*, *N. beccariana*, *N. bongso*, and *N. dubia*

Keywords: Morphological characters, Nepenthes, Sumatra, taxonomic status, taxonomic revision

INTRODUCTION

Sumatra is one of the most important distribution centers of *Nepenthes* in the world. Thirty-seven species of *Nepenthes* occur on the island, and more than seventy-five percent are endemic (Clarke 2001; McPherson 2009). In the last two years, the number of *Nepenthes* in Sumatra has increased to thirty-nine with the publication of two new species, *N. putaiguneung* (Metusala et al. 2020) and *N. longiptera* (Victoriano 2021). The publication of these two new species makes Sumatra the island in Indonesia with the second largest number of *Nepenthes* species after Kalimantan.

The Indonesian government has designated *Nepenthes* (Nepenthaceae) as one of the plant groups with high conservation priority through the Minister of Forestry Regulation Number P.57/Menhut-II/2008. However, there is not yet sufficient species data to support the determination of Nepenthaceae as a priority plant group in Indonesia, so there is no determination of conservation priorities at the species level. Specific policy directives for priority plant species of the *Nepenthes* group mandate field research to collect data on the population, distribution, bioecological characteristics, cultivation techniques, and plant breeding of several *Nepenthes* species. The results of field research will be a solid foundation for policymakers (Mardiastuti et al. 2008).

Opinion differences among experts regarding the taxonomic status of several *Nepenthes* species in Sumatra impacted the conservation status of the species concerned. Four Sumatran Endemic *Nepenthes* (*N. angasanensis*, *N. longifolia*, *N. talangensis*, and *N. tenuis*) are not listed in the Permen (2018) regarding protected species of plant and animal because they are considered synonyms of other *Nepenthes*. However, IUCN (2018) categorized the conservation status of *N. talangensis* and *N. tenuis* as endangered (EN). Determining the taxonomic status of a species that does not go through an evaluation of the related taxon leads in the wrong direction if it becomes the basis for determining conservation status. Likewise, all statements relating to geographic distribution, important variables in conservation biology, are partially or completely false if based on incorrect species identification (Dubois 2003).

Taxonomic status is the basis for assessing the risk of species extinction. Taxonomic status defines taxonomic units clearly according to the scientific authority and the applicable nomenclature. The taxonomic status also indicates whether a species is independent or still a complex species. Clarity of taxonomic status is very important in determining the conservation status of a species. Taxonomic status provides an understanding of the critical components of biodiversity for effective conservation and sustainable use. Research on the taxonomic status of Sumatran *Nepenthes* aims to assess its status as well as a synopsis of the species complex, including updating scientific names and taxonomic positions related to all species and their synonyms.

MATERIALS AND METHODS

Data collection and analysis

Morphological characters of Sumatran *Nepenthes* were collected through observations in the herbarium and fieldwork in several locations in Sumatra. Measurement of morphological characters of live plants conducted directly in the field. Data and information recorded from habitats including location site, typical habitat, elevation, associations with other plants, local names, benefits/uses, habit/life form, stems (size, diameter, segment length, color); leaf (length and width of the leaf, shape of the base and tip of the leaf, midrib, condition of the leaf margin, size of the tendril, number of loops on the tendril, other additional organs); Lower pitcher and upper pitcher (pitcher length and diameter, pitcher height, mouth slope, peristome width, peristome shape, height and wingspan, cap shape, cap size, cap base shape, number and length of spurs); inflorescence (flower position, flower stalk length, rachis length, flower branching, flower sex); fruit (length and diameter of fruit).

Data analysis

The grouping of species was built based on the similarity of morphological characters for each selected species. Data collection and analysis followed the taxonomy revision process (Maxted 1992) as described here: (i) Gather data from the literature to delimit the taxon and clarify related taxonomic issues. (ii) Collect representative specimens (herbarium specimens and live plant collections) and record discontinuous characters in the taxon. (iii) Identify the critical characteristics that distinguish between specimens. (iv) Noting patterns of character variation within and between groups. (v) Associating groups of specimens with the geographic or ecological characteristics of each specimen group. (vi) Compile the key to the determination and description of the species. (vii) Write a critical note about the taxon.

RESULTS AND DISCUSSION

An overview of the history of *Nepenthes* Sumatra

Joseph Hooker revised the genus Nepenthes for the first time in 1873. Thirty-three Nepenthes has recorded, most of which came from northern Kalimantan, and there was no record of Nepenthes species originating from Sumatra. Macfarlane revised the entire genus in 1908 and recorded 58 species, of which 14 were found in Sumatera. Danser completed a regional revision of Malesian Nepenthes in 1928, recording 65 Nepenthes and 22 species from Sumatra and Peninsular Malaysia. Tamin and Hotta (1986) revised the Nepenthes of Sumatra, recognizing 17 species. Jebb and Cheek (1997) revised the entire genus, recording 82 species of Nepenthes and 28 species from Sumatra and Peninsular Malaysia. Clarke undertook the most recent revision (2001), which reported 29 species of Nepenthes from Sumatra (Table 1). Twenty-four new species of *Nepenthes* were published from Sumatra from 1908 to 2001. All are endemic: *N. beccariana* (Macfarlane 1908). *N. carunculata*, *N. dubia*, *N. inermis*, *N. pectinata*, *N. spectabilis* (Danser 1928). *N. spathulata* (Danser 1935). *N. densiflora* (Danser 1940). *N. rhombicaulis* (Kurata 1973). *N. adnata*, *N. rosulata*, *N. spinosa* (Tamin and Hotta 1986). *N. carunculata* var. *robusta*, *N. longifolia*, *N. ovata*, *N. talangensis* and *N. tenuis* (Nerz and Wistuba 1994). *N. mikei* and *N. xiphioides* (Salmon and Maulder 1995). *N. lavicola* (Wistuba and Rischer 1996). *N. aristolochioides* and *N. diatas* (Jebb and Cheek 1997). *N. angasanensis* (Salmon and Maulder 1999). *N. jacquelineae* (Clarke 2001).

Table 1 also shows changes in the taxonomic status and scientific names of several *Nepenthes* species. Macfarlane (1908) treated *N. macrostachya* as a synonym of *N. mirabilis*. *N. khorthalsiana* is a synonym of *N. gracilis*. *N. teysmanniana* and *N. tomentella* is a synonyms of *N. gracilis*. Danser (1928) disagreed with Macfarlane (1908) regarding *N. phyllamphora*, *N. melamphora*, *N. eustachya*, *N. treubiana*, and *N. beccariana*. According to Danser *N. phylammphora* is a synonym of *N. mirabilis*. *N. melamphora* is synonym of *N. gymnamphora*. *N. eustachya* is similar to *N. alata* Philippines, so *N. eutachya* is referred to as *N. alata*. *N. treubiana* New Guinea is different from *N. sumatrana*, thus returning *N. sumatrana* as an independent species. *N. beccariana* is a synonym of *N. mirabilis*.

Tamin and Hotta (1986) disagree with Danser (1928) regarding *N. gymnamphora*, *N. carunculata*, *N. pectinata*, *N. spathulata*, and *N. densiflora*. According to Tamin and Hotta (1986), the five species are synonyms of *N. singalana*. Tamin and Hotta (1986) also treated *N. dubia* and *N. inermis* as synonyms of *N. bongso*. Jebb and Cheek (1997) mostly agree with Danser (1928) and do not adopt much of Tamin and Hotta's (1986) opinion. Jebb and Cheek disagree with Danser about *N. trichocarpa* and *N. eustachya*. Jebb and Cheek argued that *N. trichocarpa* is a natural hybrid, and *N. eustachya* has different characters from *N. alata*, thus restoring *N. eustachya* as an independent species. Jebb and Cheek treated *N. rosulata* Tamin & Hotta as synonyms of *N. pectinata* and *N. spinosa* as synonyms of *N. sumatrana*. Jebb and Cheek also changed the taxonomic status of *N. talangensis* and *N. carunculata* var. *robusta* as a synonym of *N. bongso*. *N. tenuis* is a synonym of *N. dubia*, and *N. longifolia* is a synonym of *N. sumatrana*. Jebb and Cheek (1997) also changed the taxonomic status of *N. xiphioides* as a synonym of *N. pectinata*.

Clarke (2001) concurs with Jebb and Cheek (1997) regarding *N. trichocarpa*, *N. eustachya*, and *N. carunculata var. robusta*, but has different opinions about *N. beccariana*, *N. pectinata*, *N. talangensis*, *N. tenuis*, and *N. longifolia*. According to Clarke (2001), *N. beccariana* has similarities in character with *N. longifolia* and is different from *N. mirabilis*, so it does not agree with the opinion of Jebb and Cheek (1997). *N. pectinata* more or less has a growth habit similar to that of *N. gymnamphora*. Rosette pitchers urceolate or ellipsoid, often produced in clusters on greatly small reduced leaves. Both species generally occur in dense lower montane forests. It is difficult to distinguish *N. pectinata* and *N. gymnamphora* in the field if

the lower or upper pitcher is absent. Therefore, Clarke chose to treat *N. pectinata* as a synonym for *N. gymnamphora*. Clarke also wrote that *N. talangensis*, *N. tenuis*, and *N. longifolia* are not synonyms of *N. bongso*, *N. dubia*, and *N. sumatrana*. Clarke also wrote that *N. talangensis*, *N. tenuis*, and *N. longifolia* are not synonyms of *N. bongso*, *N. dubia*, and *N. sumatrana*. These three species of *Nepenthes* are different and are independent species. Clarke (2001) also disagrees with Cheek and Jebb (2001) regarding *N. angasanensis* (Salmon and Maulder 1999). Clarke (2001) places *N. angasanensis* as a separate species, while Cheek and Jebb (2001) state *N. angasanensis* as a synonym for *N. mikei.*

Species complex

A species complex is a group of closely related species that display relatively similar morphological characters so the boundaries between them are often unclear. For example, Sumatran *Nepenthes* has two groups categorized as complex species (Clarke 2001). The first is *N. beccariana* complex, and the second is *N. gymnamphora* complex. *N. beccariana* has similar characteristics to *N. mirabilis* and *N. longifolia*. *N. gymnamphora* is similar *to N. pectinata*, *N. xiphioides*, and *N. rosulata*.

Table 1. Changes in the taxonomic position of several revision to the genus *Nepenthes*

Before 1908	Macfarlane (1908)	Danser (1928)	Tamin & Hotta (1986)	Jebb & Cheek (1997)	Clarke (2001)
N. phyllamphora	*N. phyllamphora*	*N. mirabilis*	*N. mirabilis*	*N. mirabilis*	*N. mirabilis*
N. macrostachya	*N. mirabilis*	*N. mirabilis*			
N. melamphora	*N. melamphora*	*N. gymnamphora*	*N. singalana*	*N. gymnamphora*	*N. gymnamphora*
N. ampullaria	*N. ampullaria*	*N. ampullaria*	*N. ampullaria*	*N. ampullaria*	*N. ampullaria*
N. rafflesiana	*N. rafflesiana*	*N. rafflesiana*	*N. rafflesiana*	*N. rafflesiana*	*N. rafflesiana*
N. bongso	*N. bongso*	*N. bongso*	*N. bongso*	*N. bongso*	*N. bongso*
N. gracilis	*N. gracilis*	*N. gracilis*	*N. gracilis*	*N. gracilis*	*N. gracilis*
N. khortalsiana	*N. gracilis*				
N. hookeriana	*N. hookeriana*	*N. hookeriana*		*N. hookeriana*	*N. hookeriana*
N. albomarginata	*N. albomarginata*	*N. albomarginata*	*N. albomarginata*	*N. albomarginata*	*N. albomarginata*
N. teymanniana	*N. albomarginata*				
N. tomentella	*N. albomarginata*				
N. reinwardtiana	*N. reinwardtiana*	*N. reinwardtiana*	*N. reinwardtiana*	*N. reinwardtiana*	*N. reinwardtiana*
N. trichocarpa	*N. trichocarpa*	*N. trichocarpa*	*N. trichocarpa*	*N. trichocarpa*	*N. trichocarpa*
N. eustachya	*N. eustachya*	*N. alata*	*N. alata*	*N. eustachya*	*N. eustachya*
N. sumatrana	*N. treubiana*	*N. sumatrana*	*N. sumatrana*	*N. sumatrana*	*N. sumatrana*
N. singalana	*N. singalana*	*N. singalana*	*N. singalana*	*N. singalana*	*N. singalana*
	N. beccariana	*N. mirabilis*	*N. mirabilis*	*N. mirabilis*	*N. longifolia*
		N. carunculata	*N. singalana*	*N. bongso*	*N. bongso*
		N. dubia	*N. bongso*	*N. dubia*	*N. dubia*
		N. inermis	*N. bongso*	*N. inermis*	*N. inermis*
		N. pectinata	*N. singalana*	*N. pectinata*	*N. gymnamphora*
		N. spectabilis	*N. spectabilis*	*N. spectabilis*	*N. spectabilis*
		N. tobaica	*N. tobaica*	*N. tobaica*	*N. tobaica*
		N. spathulata	*N. singalana*	*N. spathulata*	*N. spathulata*
		N. densiflora	*N. singalana*	*N. densiflora*	*N. densiflora*
		N. rhombicaulis	*N. rhombicaulis*	*N. rhombicaulis*	*N. rhombicaulis*
			N. adnata	*N. adnata*	*N. adnata*
			N. rosulata	*N. pectinata*	*N. gymnamphora*
			N. spinosa	*N. sumatrana*	*N. sumatrana*
			N. carunculata var. *robusta*	*N. bongso*	*N. bongso*
			N. longifolia	*N. sumatrana*	*N. longifolia*
			N. ovata	*N. ovata*	*N. ovata*
			N. talangensis	*N. bongso*	*N. talangensis*
			N. tenuis	*N. dubia*	*N. tenuis*
			N. xiphioides	*N. pectinata*	*N. gymnamphora*
			N. mikei	*N. mikei*	*N. mikei*
				N. aristolochioides	*N. aristolochioides*
				N. diatas	*N. diatas*
				N. lavicola	*N. lavicola*
				N. angasanensis	*N. angasanensis*
					N. jacquelineae

Nepenthes beccariana *complex*

Macfarlane (1908) described *N. beccariana* based on *Nepenthes* specimens from the Nias Island. Nias Island is located about 120 km off the west coast of Sumatra, with the closest access from Sibolga. Danser (1928) argued that *N. beccariana* is a synonym for *N. mirabilis*, although Danser did not observe any specimens of the type of *N. beccariana*. (Jebb and Cheek (1997) also did not examine the type specimens and followed Danser's opinion. Schlauer and Nepi (2000) studied type specimens of *N. beccariana* from the herbarium specimen of E. Modiagliani from Nias Island and concluded that this plant differed in several diagnostic characters from *N. mirabilis* and separated the Modiaglini's collection as a distinct species. Finally, Clarke (2001) argues that *N. beccariana* has a morphological character similar to that of *N. longifolia*, thus allowing the two species to be synonymous. Figure 2 shows the differentiation of morphological characteristics of *N. beccariana* with *N. mirabilis* and *N. longifolia*.

Table 2 shows the differences in the morphological characters of *N.* beccariana, *N. mirabilis, and N. longifolia.* The leaves and pitcher of *N. mirabilis* were very different from those of *N. beccariana* and *N. longifolia*. Therefore, the justification (Jebb and Cheek 1997; Govaerts et al. 2021) of *N. beccariana* is a synonym for *N. mirabilis* is inaccurate. Instead, it is more suitable to place *N. beccariana* and *N. mirabilis* as separate species, as Schlauer and Nepi (2000) and Clarke (2001) species concepts.

Table 2. Differences in the morphological characters of *N. beccariana*, *N. mirabilis*, and *N. longifolia*

Characters	***N. beccariana***	***N. mirabilis***	***N. longifolia***
Lower pitcher	Ventricose-urceolate in the lower part, cylindrical above	Ovoid in the lower part, cylindrical above	Ventricose-urceolate in the lower part, cylindrical above
Upper pitcher	Cylindrical	Ovoid in the lower and cylindrical above	Infundibular in the lower part cylindrical above
Leaf texture	Coriaceous	Chartaceous with fimbriate margin	Coriaceous

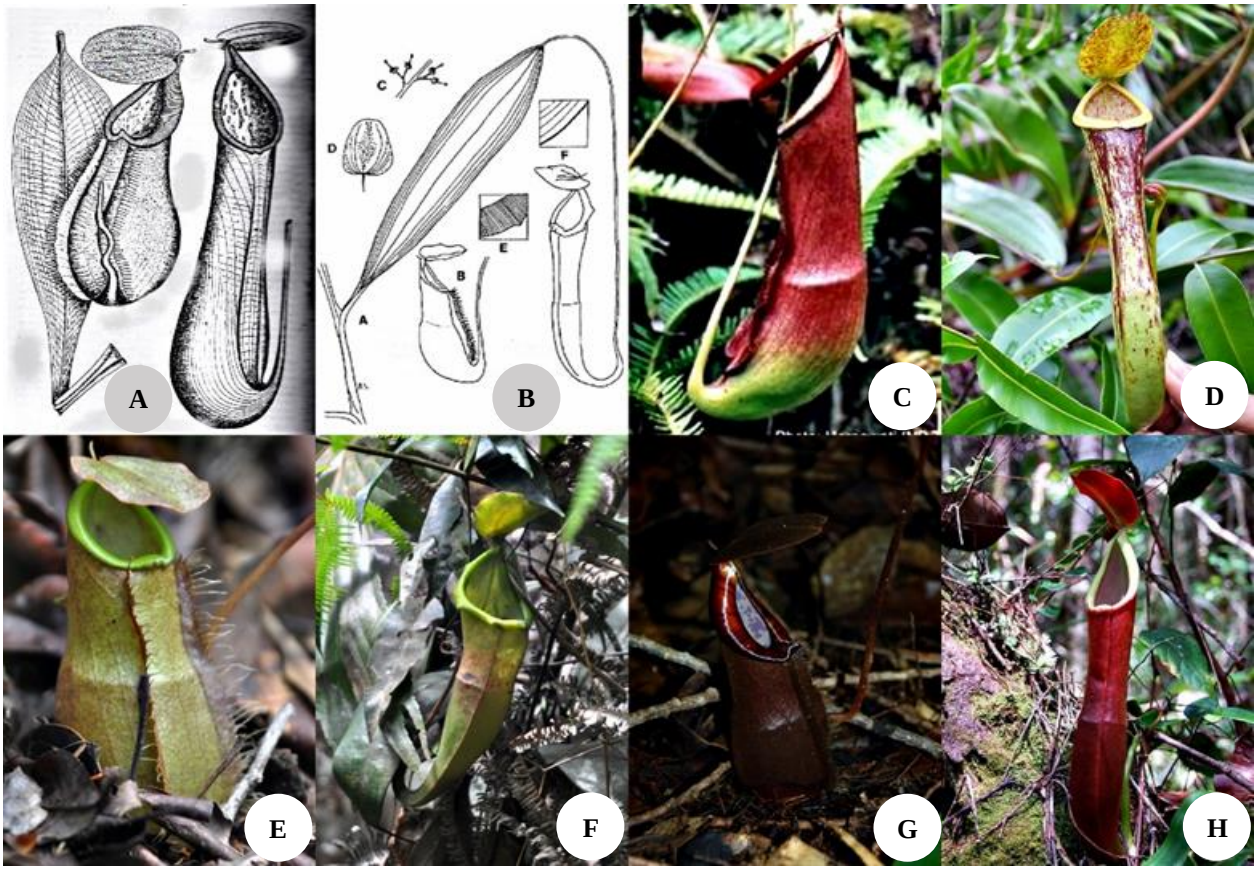

Figure 1. Comparison of morphological characters. A. *N. beccariana* (reproduction from Macfarlane (1908):68). B. *N. longifolia* (reproduction from Nerz and Wistuba (1994):105). C. Lower pitcher of *N. mirabilis*, D. Upper pitcher of *N. mirabilis*. E. Lower pitcher of *N. longifolia*. F. Upper pitcher of *N. longifolia*. G. Lower pitcher of *Nepenthe*s. cf. *beccariana*. H. Upper pitcher of *Nepenthes* cf. *beccariana* (Photo: Mistar Kamsi)

The differences between *N. beccariana* and *N. longifolia* can be seen in tendrils' size, the upper pitcher's shape, and the peristome. The tendrils of *N. beccariana* are shorter than those of *N. longifolia*. The upper pitcher of *N. longifolia* (Figure 1B, F) is infundibular in the lower and cylindrical in the upper part. In contrast, the upper pitcher of *N. beccariana* is cylindrical (Figure 1A, H). Another difference lies in the shape and size of the peristome. The lower pitcher peristome of *N. beccariana* (Figure 1G) is broader than that of *N. longifolia* (Figure 1E). The peristome of the upper pitcher of *N. longifolia* has a high and defined protrusion at the front and has 2-3 lobes on the left and right sides of the mouth (Figure 1F and Figure 1H). Meanwhile, the upper pitcher of *N. beccariana* does not similar with the upper pitcher of *N. longifolia*.

Nerz and Wistuba (1994) collected the type specimens of *N. longifolia* from Bukit Tjampo, Lima Puluh Kota, West Sumatra. In addition to Bukit Tjampo, Clarke (2001) also found a population of *N. longifolia* in the Sibolga-Tarutung of North Sumatra (the closest location to the *N. beccariana* habitat on Nias Island). The discovery of *N. longifolia* in Sibolga-Tarutung led to the assumption that *N. longifolia* in Sibolga-Tarutung might be *N. beccariana*. This assumption arises because of differences in habitat between *N. longifolia* Bukit Tjampo, which is spread in protected forest areas, while N. longifolia Sibolga-Tarutung grows in open habitats. Differences in habitat preferences do not seem to be a strong distinguishing character to distinguish *N. beccariana* and *N. longifolia*. Therefore, future research on the *N. longifolia* Sibolga-Tarutung populations and Batang Toru is needed because these two populations show very similar morphological characters to *N. beccariana*.

Nepenthes gymnamphora *complex*

Nepenthes gymnampora has similar morphological characters to *N. pectinata*, *N. xiphioides*, *N. rosulata,* and species from Mount Sorik Marapi, North Sumatra (Clarke 2001). The publication of *N. pectinata* (Danser 1928) caused controversy because Danser described *N. pectinata* from three collections: The Bunnemeijer collection 700 bis. Bunnemeijer 3897 and Bunnemeijer 763a. Schlauer and Nerz (1994) separated *N. pectinata* into *N. gymnamphora* (Bunnemeijer collection 700 bis) and *N. singalana* (Bunnemeijer collection 3897). Danser (1928), in the image's description on page 351, states that the specimen Bunnemeijer 3897 is the upper pitcher of *N. pectinata*. Schlauer and Nerz (1994) disagreed with Danser's opinion and noted that the Bunnemeijer 3897 specimen was *N. singalana*. Schlauer and Nerz (1994) identified the sample from the Bunnemeijer collection 700 bis from Mount Talamau as the lectotype of *N. pectinata*.

Jebb and Cheek (1997) argued that *N. pectinata* and *N. gymnamphora* differed in several ways: the leaves of *N. gymnamphora* gradually narrowed towards the base, clasping the stem and not decurrent (Figure 2A), while the leaves of *N. pectinata* decurrent (Figure 2D). The lower pitcher of *N. gymnamphora* is rounded in the lower and narrow above (Figure 2B-C), while the lower pitcher of *N. pectinata* is urceolate (Figure 2E-F). *N. gymnamphora* produces an upper pitcher, while *N. pectinata* rarely produces an upper pitcher. Jebb and Cheek (1997) also placed *N. xiphioides* as a synonym for *N. pectinata*.

According to Clarke (2001), the morphological characters of *N. pectinata* (sensu Danser 1928; Jebb and Cheek 1997) were unstable. In addition, there is variation in the population, so separating *N. gymnamphora* and *N. pectinata* in the field is challenging. However, contrary to Clarke's opinion (2001), observations in several mountains in West Sumatra, Jambi, and South Sumatra showed a stable character of the leaves and the lower pitcher shape of *N. pectinata* (Figure 3). This character was also observed from specimens of *N. gymnamphora* at the University of Andalas Herbarium and Herbarium Hortus Botanicus Tjibodensis. Therefore, in this study, *N. gymnamphora* in several mountains in West Sumatra, Jambi, and South Sumatra, is referred to as *N. pectina*ta, following the opinion of Danser (1928) and Jebb and Cheek (1997).

Jebb and Cheek (1997) mention *N. xiphioides* as a synonym for *N. pectinata*, although in the description of *N. xiphioides*, Salmon and Maulder (1995) stated that the leaves of *N. xiphioides* clasping the stem for 2/3 circumference and are not decurrent. The opinion of Jebb and Cheek (1997) regarding *N. xiphioides* is not following the statement that one of the distinguishing characteristics between *N. gymnamphora* and *N. pectinata* is the leaf clasping the stem and decurrent. The leaf attachment of *N. xiphioides* is not similar to that of *N. pectinata*. Therefore, the statement *N. xiphioides* is synonym of *N. pectinata* is inaccurate in this case. Figure 4 also shows that *N. xiphioides* Salmon and Maulder (1995) have a different mouth shape and peristome from *N. pectinata*.

Based on the observations of the morphological character of the *N. gymnamphora* complex (sensu Clarke 2001) in Sumatra, there are five groups of *Nepenthes* species with different morphological characters: 1) *N. pectinata* (sensu Jebb and Cheek 1997). 2) *Nepenthes* group of Bukit Barisan in the North of Bukittinggi and Payakumbuh. 3) *Nepenthes* Group of Gunung Sorik Merapi and Dolok Saut. 4) *Nepenthes* Sipirok Group. 5) *N. xiphioides* (sensu Salmon and Maulder 1995). *N. gymnamphora* Sumatra (sensu Clarke 2001) groups 2, 3, and 4 had different morphological characteristics from *N. pectinata, N. gymnamphora,* and *N. xiphioides*. Further studies are needed to determine whether the three *Nepenthes* groups are independent species or synonyms of other *Nepenthes.* The morphological characters of *N. pectinata* and *N. xiphioides* were relatively stable. These characters are consistent even though these two species are scattered in several locations. The 2019-2020 field survey also shows that the *N. gymnamphora* Sumatra complex did not produce the upper pitchers. In contrast to the Javan *N. gymnamphora*, which almost always has an upper pitcher.

Figure 2. Comparison of morphological characters of *N. gymnamphora* (A-C) West Java with *N. pectinata* (sensu Danser 1928; Jebb and Cheek 1997) Mount Talamau (D-F). A. Leaves. B-C. Rosette pitcher/lower pitcher. D. Leaves. E-F. Rosset pitcher/lower pitcher (Photo: Alponsin & Tengku)

Scientifically unaccepted Sumatran *Nepenthes* species

Five species of Sumatran *Nepenthes* are categorized as not scientifically accepted. Jebb and Cheek (1997), Cheek and Jebb (2001), and (Govaerts et al. 2021) considered five species as synonymies of other *Nepenthes* species. Table 3 shows the Sumatran *Nepenthes* species, characterized as a scientifically unaccepted name.

Nepenthes angasanensis *versus* N. mikei

The taxonomic status of *N. angasanensis* is still a matter of debate. Salmon and Maulder (1995) published *N. mikei* based on specimens from Gunung Pangulubao, North Sumatra, and *N. angasanensis* based on collections from Puncak Angasan, Aceh (Salmon and Maulder 1999). Danser (1940) recognized *Nepenthes* from Puncak Angasan (type locality of *N. angasanensis*) as *N. tobaica*, while Cheek and Jebb (1997) placed it as *N. mikei* by updating the description of *N. mikei*. Salmon and Maulder (1999) disagreed with Jebb and Cheek (1997) and placed *N. mikei* to its original position.

Figure 5 shows some distinctive characters are more easily observed in living plants. The lower pitcher of *N. tobaica* is ovoid in the lower 1/3, cylindrical, and widening towards the peristome (Figure 5A). Lower pitcher of *N. angasanensis* ovoid in lower 1/2, cylindrical in the upper part (Figure 5B-C). The pitcher of *N. mikei* is similar to that of *N. tobaica* but moreslender (Figure 5D-E). The tendrils and the outer surface of the lower pitcher of *N. angasanensis* and *N. mikei* have short-dense hairs, while *N. tobaica* was glabrous.

Apart from pitcher shape, *N. angasanensis* differs from *N. mikei* in several characters. 1) The outer surface of the lower pitcher of *N. angasanensis* is reddish with dark red blotches. In comparison, the outer surface of the lower pitcher of *N. mikei* is pale green with predominantly black or dark brown blotches. 2) The inner surface of *N. angasanensis* is pale green with reddish blotches, while the inner surface of *N. mikei* is pale green without blotches. 3) On the inner surface of the *N. angasanensis* pitcher, there are sometimes two eye-like clear spots, while the *N. mikei* has none. 4) Peristome *N. angasanensis* is cylindrical, narrow in the front, and broader towards the lid, while the peristome of N. mikei is generally rounded and not broader towards the lid. 5) Peristome of *N. angasanensis* is pale green with reddish stripes, while the peristome of *N. mikei* is predominantly black or dark red. The results showed that *N. angasanensis* had different morphological characters from *N. mikei*. Therefore, this study disagrees with Cheek and Jebb (2001) and supports the opinion of Clarke (2001), which places *N. angasanensis* as an independent species.

Figure 3. *N. pectinata* (sensu Danser 1928; Jebb and Cheek 1997). A. Gunung Singgalang. B. Gunung Talang. C. Gunung Kunyit. D. Talang Babungo. E. Gunung Talamau. E. Gunung Sago

Figure 4. *Nepenthes xiphioides*. A. Lower Pitcher. B. Cultivated (A-B reproduction from Salmon and Maulder (1995):80). C. Lower pitcher on Gunung Pangulu Bao (reproduction from Clarke (2001):138). D. Lower pitcher on Gunung Sibuatan

Table 3. List of the unaccepted name of Sumatran *Nepenthes*

Species	Synonym	Source	Author
N. angasanensis	*N. mikei*	Plant of The World Online (POWO)	Cheek & Jebb (2001)
N. beccariana	*N. mirabilis*	Plant of The World Online (POWO)	Govaerts et al. (2021)
N. longifolia	*N. sumatrana*	Plant of The World Online (POWO)	Govaerts et. al (2021)
N. talangensis	*N. bongso*	Plant of The World Online (POWO)	Cheek & Jebb (2001)
N. tenuis	*N. dubia*	Plant of The World Online (POWO)	Cheek & Jebb (2001)

Nepenthes beccariana *versus* N. mirabilis

Danser (1928) states *N. beccariana* is a synonym for *N. mirabilis*. Jebb and Cheek (1997) and Cheek and Jebb (2001) agree with Danser's opinion. Govaerts et al. (2021) refer to the previous authors' opinion and state that *N. beccariana* is a synonym for *N. mirabilis.* The differences in the characters of *N. beccariana* and *N. mirabilis* have been discussed previously in the *N. beccariana* complex section. This study agrees with Schlauer and Nepi's (2000) opinion, which states that *N. beccariana* is not a synonym for *N. mirabilis.*

Nepenthes longifolia *versus* N. sumatrana

Identifying *N. longifolia* and *N. sumatrana* in the field is not difficult because both have a large pitcher with striking colors. *N. longifolia* and *N. sumatrana* have almost the same stem shape, leaf structure, and leaf shape. The main distinguishing character between *N. longifolia* and *N. sumatrana* lies in the pitcher's shape, size, and color. The tendrils of *N. longifolia* are 50-110 cm long, while tendrils of *N. sumatrana* are, on average, 60 cm. The pitcher of *N. longifolia* is ovoid in the lower part, has a hip in the middle, and then cylindrical towards the mouth of the pitcher. The lower pitcher of *N. longifolia* is primarily dark red, sometimes green. The peristome is bright green or green with red lines. The peristome in front of the mouth has a thick protrusion (Figure 6A). The upper pitcher is infundibular in the lower part, has a hip in the middle, and is slightly wider and cylindrical towards the peristome. Generally green or red. The peristome of the upper pitcher is usually pale green or similar to the pitcher's color; it has one protrusion on the front with 2-3 lobes on the left and right sides of the mouth (Figure 6B). The lower pitcher of *N. sumatrana* is a broad ovoid, with the hip close to the peristome (Figure 6C). The upper pitcher is infundibular, and the hip position is adjacent to the peristome. The lower and upper pitcher of *N. sumatrana* is reddish-green with dark red blotches. Peristome dark red with green stripes. The peristome of *N. sumatrana* has two protrusions at the front of the pitcher's mouth. These two projections are high and conspicuous in the upper pitcher of *N. sumatrana* (Figure 6D).

Field observations show that the character of *N. longifolia* is different from that of *N. sumatrana*, so the placement of *N. longifolia* as a synonym for *N. sumatrana* is inaccurate. Therefore, this study agrees with the opinion of Clarke (2001), which states that *N. longifolia* is not a synonym of *N. sumatrana*, and disagrees with Cheek and Jebb (2001) and Govaerts *et al*. (2021), which placed *N. longifolia* as a synonym of *N. sumatrana*.

Nepenthes talangensis *versus* N. bongso

Nerz and Wistuba (1994) published *N. longifolia* based on specimens from Gunung Talang. According to Nerz and Wistuba (1994), the specimens collected by Bunnemeijer 2552 (L), Bunnemeijer 5398 (L), Bunnemeijer 6740 (BO) from Mount Talang were *N. talangensis*. But Danser (1928) placed Bunnemeijer's collection as *N. bongso*. Jebb and Cheek (1997) and Cheek and Jebb (2001) follow Danser's opinion who argues that *N. talangensis* is a synonym for *N. bongso*.

Observation showed that *N. talangensis* had different morphological characters from *N. bongso.* The lower pitcher of *N. talangensis* is infundibular in the lower part and broad ovoid above. The mouth of *N. talangensis* is round, horizontal in the anterior 2/3. The peristome is wide and curved towards the inside of the pitcher (Figure 7A). The upper pitcher of *N. talangensis* is similar to the lower pitcher but longer. The peristome of the upper pitcher is identical to the lower pitcher but is smaller/narrower (Figure 7B). The lower and upper pitchers of *N. bongso* have different shapes and colors. The lower pitcher is ovoid, with the hip in the center or close to the peristome. Peristomes narrow at the front, widening like a collar towards the lid. The peristome has 2-4 lobes on each side of the mouth. The lower pitcher is generally reddish-green or dark red. The peristome is similar to the pitcher, but the color is more intense or darker (Figure 7C). The upper pitcher of *N. bongso* is infundibular, hip below the peristome, and the outer surface of the pitcher is bright green. The peristome of the upper pitcher is narrower and has 2-4 lobes on the left and right sides of the mouth, and the color is green with red stripes (Figure 7D). The pitcher's shape and the peristome of *N. talangensis* are different from *N. bongso*. Observing these two characters is easier on living specimens. In addition, there are several other differences, such as leaf structure, tendril insertion, and appendages on the lower surface of the lid of *N. bongso*. The differences in the two Nepenthes morphological characters support *N. talangensis* as a different species and not a synonym of *N. bongso.* This study differs from Jebb and Cheek (1997) and Cheek and Jebb (2001), who stated that these two species are synonymous and agreed with Clarke's (2001) opinion that treated *N. talangensis* as a separate species.

Figure 5. Morphological characters. A. Lower Pitcher of *N. tobaica* Samosir Island. B. Lower pitcher of *N. angasanensis* Puncak Angasan (reproduction from Clarke (2001):103). C. Lower pitcher of cultivated *N. angasanensis* (Photo: Wibowo Aji). D. Lower pitcher of *N. mikei* Gunung Bandahara (reproduction from Clarke (2001):161). E. Lower pitcher of *N. mikei* Nagan Raya (Photo: Havid Ramadhan)

Figure 6. Morphological characters of *N. longifolia* Bukit Tjampo (A-B) and *N. sumatrana* Sibolga (C-D). A. Bottom pocket. B. Top pocket. C. Bottom pocket. D. Top pocket

Figure 7. Morphological characters of *N. talangensis* Gunung Talang. A. Lower Pitcher. B. Upper pitcher and *N. bongso* Talang Babungo. C. Lower pitcher. D. Upper Pitcher

Figure 8. Morphological character. (A-B) The upper pitcher of *N. tenuis* Taram and (C-D) The upper pitcher of *N. dubia* Gunung Talamau

Nepenthes tenuis *versus* N. dubia

Nerz and Wistuba (1994) published *N. tenuis* based on specimens collected by Meijer in Taram. Meanwhile, Danser (1928) published *N. dubia* based on specimens collected by Bunnemeijer from Gunung Talamau. Jebb and Cheek (1997) and Cheek and Jebb (2001) treated *N. tenuis* as a synonym for *N. dubia*. The pitcher of *N. tenuis* and *N. dubia* is smaller than other Sumatran *Nepenthes*. The upper pitcher of *N. tenuis* was 5 cm high and 3 cm wide, while the pitcher of *N. dubia* was 8 cm high and 4 cm wide. Figure 9A1 and Figure 9A2 show a comparison of the height of the upper pitcher of *N. tenuis* with that of *N. eustachya*. The size of *N. tenuis* is equivalent to ±1/5 the height of the pitcher of *N. eustachya*. Therefore, the pitcher of *N. tenuis* (Figure 8A-B) is very different from that of *N. dubia* (Figure 8C-D).

The differences between *N. tenuis* and *N. dubia* include: 1) The pitcher of *N. tenuis* is broad and infundibular, slightly narrowing in the lower part. In contrast, the pitcher of *N. dubia* is cylindrical in the lower and narrowly infundibular in the upper part. 2) The peristome of *N. tenuis* is wide and flattened, while the peristome of *N. dubia* is flattened but narrower. 3) The lid of *N. tenuis* is elliptical, curved over the Pitcher's mouth. The lid of *N. dubia* is linear-cuneate, curved 180° away from the mouth. The character that distinguishes *N. tenuis* and *N. dubia* is very strong, thus minimizing the possibility of erroneous identification of the two species. Therefore, this study concluded that *N. tenuis* is an independent species and is not a synonym for *N. dubia*. This opinion differs from the opinion of Jebb and Cheek (1997) and Cheek and Jebb (2001), which state that *N. tenuis* is a synonym of *N. dubia* and agrees with Clarke's (2001) opinion that treated *N. tenuis* as not a synonym of *N. dubia*.

Observations and analysis of morphological characters have proven that *N. angasanensis*, *N. longifolia*, *N. talangensis*, and *N. tenuis* are independent species and are not synonyms of other *Nepenthes*. Therefore, these four species deserve the same treatment as other scientifically accepted Sumatran *Nepenthes*. The existence of *N. talangensis* and *N. tenuis* as independent species has been recognized. Cheek *et al.* (2017) stated that interpreting species based on a single specimen often raises doubts. Recent photographs, information, and reports on the living collections of *N. talangensis* and *N. tenuis* have dispelled any doubt about the taxonomic position of *N. talangensis* and *N. tenuis* as independent species. However, Govaerts *et al*. (2021) do not refer to the publications of Cheek *et al*. (2017), so in Plant of the World Online (POWO), *N. talangensis* is still listed as a synonym for *N. bongso* and *N. tenuis* for *N. dubia.* The taxonomic position of *N. beccariana* as a species still requires further research, as previously discussed in the discussion of the *N. beccariana* complex.

The latest list of Sumatran *Nepenthes* species

Table 4 shows the number of Sumatran *Nepenthes* species from the first revision to 2022 (this study). The total number of Sumatran *Nepenthes* currently is 39 species. The increase in species resulted from the restoration of taxonomic status of *N. pectinata* and *N. xiphioides* into independent species. In contrast to Clarke (2001), who put *N. pectinata* and *N. xiphioides* as synonyms of *N. gymnamphora*, this study agrees with the opinion of Jebb and Cheek (1997) and Cheek and Jebb (2001) that placed *N. pectinata* as separate taxon with *N. gymnamphora* Java. This study also restores the position of *N. xiphioides* as a distinct species because the morphological character of *N. xiphioides* is different from that of *N. pectinata*.

The number of Sumatran *Nepenthes* at this time mostly comes from the publication of new species. Nine new species of *Nepenthes* have been published from 2002 to 2022. These are *N. izumiae* (Clarke *et al.* 2003), *N. rigidifolia* (Akhriadi *et al.* 2004), *N. jamban* and *N. lingulata* (Lee *et al*. 2006), *N. flava* (Wistuba *et al*. 2007), *N. naga* (Akhriadi *et al*. 2009), *N. putaiguneung* (Metusala *et al.* 2020), *N. longiptera* (Victoriano 2021) and *N. harauensis* (Hernawati *et al*. 2022). Therefore, apart from the debate about the taxonomic status of Sumatran *Nepenthes*, this study will further refer to the thirty-nine species of Sumatran *Nepenthes* that occur today.

Table 4. List of Sumatran *Nepenthes* species from the first revision to the current condition

Species	Macfarlane (1908)	Danser (1928)	Tamin & Hotta (1986)	Jebb & Cheek (1997)	Clarke (2001)	*Present study* (2022)
N. adnata			Y†	Y	Y	Y
N. albomarginata	Y	Y	Y	Y	Y	Y
N. ampullaria	Y	Y	Y	Y	Y	Y
N. angasanensis				s	Y	Y
N. aristolochioides				Y	Y	Y
N. beccariana	Y	s	s	s	s?	s?
N. bongso	Y	Y	Y	Y	Y	Y
N. densiflora			s?	Y	Y	Y
N. diatas				Y	Y	Y
N. dubia		Y	s?	Y	Y	Y
N. eustachya	Y	s	s	Y	Y	Y
N. flava						Sn
N. gracilis	Y	Y	Y	Y	Y	Y
N. gymnamphora		Y	s	O	Y	O
N. harauensis						Sn
N. inermis		Y	O	Y	Y	Y
N. izumiae						Sn
N. jacquelineae					Y	Y
N. jamban						Sn
N. lavicola					Y	Y
N. lingulata						Sn
N. longifolia				s	Y	Y
N. longiptera						Sn
N. mikei				Y	Y	Y
N. mirabilis		Y	Y	Y	Y	Y
N. naga						Sn
N. ovata				Y	Y	Y
N. pectinata		Y	s	Y	s	Y
N. putaiguneung						Sn
N. rafflesiana	Y	Y	Y	Y	Y	Y
N. reinwardtiana	Y	Y	Y	Y	Y	Y
N. rhombicaulis			Y	Y	Y	Y
N. rigidifolia						Sn
N. singalana	Y	Y	Y	Y	Y	Y
N. spathulata			s	Y	Y	Y
N. spectabilis		Y	Y	Y	Y	Y
N. sumatrana	s	Y	Y	Y	Y	Y
N. talangensis				s	Y	Y
N. tenuis				s	Y	Y
N. tobaica		Y	Y	Y	Y	Y
N. xiphioides				s	s	Y

Note: Y† : invalid publication; Y : species with valid descriptions and publications; O : valid species, not distributed in Sumatra; s : synonym; Sn : Spec.nov (new species); H : hybrid

The determining Keys to the species of Sumatran *Nepenthes*

1a. Pitcher mouth lateral, upper pitcher utriculate ……..…… ……..…….. *N. aristolochioides*
b. Pitcher mouth horizontal or oblique ……..… 2
2a. Pitcher mouth completely horizontal or horizontal on the front 2/3 ……..……..…….. 3
b. Pitcher mouth oblique ……..……..…….. 10
3a. Pitcher mouth horizontal on the front 2/3, curved to a neck toward the lid. Pitcher infundibular and ovoid towards peristome, peristome incurved towards inside of the pitcher ……..……..…….. *N. talangensis*
b. Pitcher mouth horizontal ….……..……..……..…….. 4
4a. Peristome lacking on upper pitcher …… *N. inermis*
b. Peristome present on upper pitcher ….. ……..……..…….. 5
5a. Lid linear, cuneate, reflexed ≥180° away from the mouth ……..……..……..……..……..……..……..……..…….. 6
b. Lid elliptical, ovate or obovate, never reflexed ≥90° away from the mouth ……..……..…….. 7
6a. Pitcher urceolate-globose, peristome broad, incurved towards inside of the pitcher…… *N. ampullaria*
b. Picher tubular in the lower part, infundibular above, peristome cylindrical or slightly flattened ….……..…… *N. dubia*
7a. Peristome flattened, expanding towards outside of the pitcher, outer edge horizontal 8
b. Peristome cylindrical, slightly widened, outer edge curled or folded ……..…….. 9
8a. Peristome expanded and extremely broad (≤3.5 cm), ribs indistinct, lid ovate ….……...…… *N. jacquelineae*
b. Peristome not expanded (≤0.6 cm), ribs distinct, lid obovate ….……...……...……..…… *N. jamban*
9a. The outer edge of the peristome has 4-5 lobes on the left and right of the mouth. Lid ovate, with a glandular crest at the base ……..……..……..……..… *N. flava*

b. The outer edge of the peristome is not lobed. Lid elliptic, without glandular crest ……. *N. tenuis*
10a. Pitcher with a circular white band under the peristome…… ……..…….. *N. albomarginata*
b. Pitcher without a circular white band …… 11
11a. Leaves chartaceous with red fimbriate margins on rosettes/ lower pitchers …….. *N. mirabilis*
b. Leaves coriaceous ……..…… 12
12a. Leaf base adnate ..…….…… *N. adnata*
b. Leaf base not adnate ……..……..…… 13
13a. Two fringed wings with long, sparse hair extend from the mouth to the bottom of the pitchers and continue to the tendril's tip …..…… *N. longiptera*
b. Wings is not like the description above …… 14
14a. Tendril insertion sub-apical (peltate) ……..….. 15
b. Tendril insertion apical ……...…. 18
15a. Lamina thick and stiff coriaceous ……. 16
b. Lamina is not thick and stiff coriaceous …… 17
16a. The petiole is sheath-like, congested on the short shoots, and internodes obscured. Lamina elliptic-oblong or spathulate. Pitcher ovoid in the lower part, cylindrical above, outer surface glabrous ……..... *N. harauensis*
b. Lamina sessile, ovate, or spathulate-oblong. Pitcher broad ovoid, outer surface tomentose ……..…… *N. rigidifolia*
17a. Lamina obovate-spathulate. Upper pitcher infundibular throughout. Lid cordate-orbicular with a simple appendage in the apex …… *N. bongso*
b. Lamina spatulate-ovate. Upper pitcher infundibular in the lower part and cylindrical above. Lid ovate, margin undulate with two appendages beneath. Sharp-like teeth at the base and triangular dichotomous appendages at the apex …… *N. naga*
18a. Leaf base decurrent ……... 19
b. Lead base not decurrent ……..…… 24
19a. Leaf base long decurrent into two ridges running almost to next axil ……..…….. 20
b. Leaf base decurrent like wings at 1/3, 2/3, or along the internodes ……..……..…… 21
20a. Upper pitcher infundibular throughout. Peristome cylindrical, expanding towards the lid with two high projections in the front of the mouth ……..…… *N. sumatrana*
b. Upper pitcher infundibular at the bottom, extending to the hip, and cylindrical above. Peristome cylindrical with a single notched at the front of the mouth ..…… *N. longifolia*
21a. Leaf base decurrent to ≥ 2/3 internodes …… 22
b. Leaf base decurrent to ≤ 2/3 internodes ……..…….. 23
22a. Lower pitcher ovoid in the lower 1/4, narrower at the hip, wider towards the peristome. Wings lacking fringe element. Most pitchers with two clear eye spots on the inner surface … …..……..…… *N. reinwardtiana*
b. Lower pitcher ovoid in the lower ¼-1/3, cylindrical in the upper. With two fringed wings. without two clear eye spots on the inner surface ……. *N. gracilis*
23a. Lower pitcher ellipsoid-urceolate. Mouth strongly oblique. Peristome flattened. Upper pitcher unknown … *N. pectinata*
b. Lower pitcher urceolate-ovoid. Upper pitcher infundibular-ovoid in the lower, cylindrical above. Purple to blackish on the outside, pale green on the inside. Peristome flattened, expanding towards the lid ……..…… *N. lavicola*
24a. Leaves petiolate ……..…… 25
b. Leaves sessile …… 26
25a. Leaf stalks canaliculate. Lower pitcher ovoid, upper pitcher infundibular. Mouth oblique, extending into a very pronounced neck at the back. Peristome cylindrical occasionally expanded at the sides with two raised projections at the front of the mouth. Lid two-keeled, ovate, cordate, and vaulted ……..……..……..… *N. rafflesiana*
b. Leaf stalks not grooved. Pitcher ovoid in the lower part, cylindrical and broader towards the mouth. Peristome flattened and slightly expanded. Lid sub-orbicular ……..…… ……..……..……..... *N. eustachya*
26a. Lid with appendages ……..… 27
b. Lid without appendages ……..……. 31
27a. Lid broadly triangular, cordate the base, appendage filiform, ≥ 2.2 cm …..…… *N. lingulata*
b. Lid orbicular, ovate or ovate-orbicular ……. 28
28a. Lid orbicular, base cordate, appendage hook-shaped, ± 1cm long on the base of lid …….…..…….. *N. izumiae*
b. Lid ovate or ovate-orbicular ……..……. 29
29a. Stem rhomboid stem. Pitcher ovoid-ventricose in the lower, cylindrical towards the peristome. Mouth round and oblique, extending towards the lid. Peristome sub-cylindrical to irregularly expanded sometimes has 2-3 lobes on the left and right sides of the mouth. Lid ovate with a small appendage on the apex ……..……..…. *N. rhombicaulis*
b. Stem cylindrical or cylindrical to angular …..……. 30
30a. Stem cylindrical. Lower pitcher ovoid or infundibular in the lower, broad ovoid in the upper part. Lid ovate, with a hook-shaped appendage near the base. ……..… *N. ovata*
b. Stem cylindrical-quadrangular. Lower pitcher ellipsoid-ovoid in the lower, cylindrical in the upper part. Upper pitcher infundibular-ellipsoid in the lower, cylindrical, then wider towards the peristome. Lid ovate with a slightly cordate base, with appendages in the basal and the tip of the peristome ……...……..….. *N. putaiguneung*
31a. Upper pitcher infundibular ……..…….. *N. densiflora*
b. Upper pitcher infundibular in the lower, cylindrical in the upper part or upper pitcher rarely produced ……..……. 32
32a. Lower pitcher grows in clusters on the ground. Pitcher ellipsoid-ovoid. Peristome cylindrical incurved towards inside of the pitcher ……..….. *N. xiphioides*
b. Lower pitcher does not grow in the cluster …….. 33
33a. Peristome of the lower pitcher narrow at the front, widening toward and extremely broad near the lid, sometimes with 2-4 lobes on the left and right sides of the mouth …… ……..…….. *N. spathulata*
b. Peristome of the lower pitcher not widening toward the lid … ……. 34
34a. Ribs of the peristome raised and pronounced …… 35
b. Ribs of the peristome not pronounced …… 36
35a. Peristome and pitchers rigid, somewhat woody ….. *N. diatas*
b. Peristome and pitchers papery in texture ……..… *N. singalana*
36a. Upper pitcher infundibular in the lower, cylindrical in the upper part. Outer surface of the pitcher is green with purple-blackish blotches. Mouth rounded, oblique. Lid sub-orbicular with cordate base ……. *N. spectabilis*
b. Upper pitcher ovoid in the lower, cylindrical in the upper part ……..……..…… 37
37a. Mature plant glabrous, except on the midrib. Stem angular. Lamina lanceolate or lanceolate-spathulate. Peristome cylindrical or slightly expanded. Lid ovate or sub-orbicular …..…….. *N. tobaica*
b. A few short, filiform hairs persistent on the tendril and pitcher ……...…… 38
38a. Lamina linear-lanceolate. Pitcher reddish with dark red blotches on the outside, pale green inside. Peristome cylindrical, narrow at the front, slightly widening towards the lid ……..... ……..…….. *N. angasanensis*
b. Lamina linear Pitcher pale green with black or dark brown blotches on the outside, pale green inside. Peristome cylindrical not widening towards the lid ……..…… *N. mikei*

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