


***NEPENTHES CALCICOLA* (NEPENTHACEAE), A NEW PITCHER PLANT FROM GULF PROVINCE, PAPUA NEW GUINEA**

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GARY W. WILSON

Australian Tropical Herbarium, James Cook University, Cairns, PO Box 6811, Queensland, Australia.
Email: gwwilson064@gmail.com  <https://orcid.org/00009-0004-2583-5968>

STEPHANUS VENTER

Australian Tropical Herbarium, James Cook University, Cairns, PO Box 6811, Queensland, Australia.
Email: fanieventer458@gmail.com

KAPIRO Q. DAMAS

Papua New Guinea National Herbarium, Lae, PO Box 314, Papua New Guinea.
Email: kippyson@gmail.com

ABSTRACT

WILSON, G. W., VENTER, S. & DAMAS, Q. K. 2023. *Nepenthes calcicola* (Nepenthaceae), a new pitcher plant from Gulf Province, Papua New Guinea. *Reinwardtia* 22(2): 103–109. — A new species of pitcher plant from rain forest on limestone karst in the Purari River catchment in the Gulf Province of Papua New Guinea is described and illustrated as *Nepenthes calcicola* Gary W. Wilson, S. Venter & Damas. It is distinguished from *N. neoguineensis* on the basis of its distribution, ecology, habitat, and pitcher and inflorescence morphology. The new species is illustrated, and description is here given. The species is assessed as Vulnerable (VU) according to IUCN criteria.

Key words: Karst, Nepenthaceae, Papua New Guinea, pitcher, taxonomy.

ABSTRAK

WILSON, G. W., VENTER, S. & DAMAS, Q. K. 2023. *Nepenthes calcicola* (Nepenthaceae), tanaman kantong semar baru dari Provinsi Teluk, Papua Nugini. *Reinwardtia* 22(2): 103–109. — Sebuah jenis baru kantong semar dari hutan hujan di batugamping di DAS Sungai Purari di Provinsi Teluk Papua Nugini dipertelakan dan diilustrasikan sebagai *Nepenthes calcicola* Gary W. Wilson, S. Venter & Damas. Jenis ini dibedakan dari *N. neoguineensis* berdasarkan distribusi, ekologi, habitat, dan morfologi kantong dan perbungaannya. Pertelaan dan ilustrasi dari jenis baru ini disajikan dalam naskah ini. Status konservasi jenis ini berdasarkan kriteria IUCN adalah jenis rentan (VU).

Kata kunci: Batugamping, kantong, Nepenthaceae, Papua Nugini, taksonomi.

INTRODUCTION

The genus *Nepenthes* L. (1753) comprises approximately 181 species, with the greatest diversity and endemic species in the Philippines, Sumatra and Borneo (Gronemeyer *et al.*, 2014; Cheek, 2015; Murphy *et al.*, 2020).

At a time when so much biodiversity is being lost or is under threat, exploration of the island of New Guinea is providing a wealth of new and often spectacular species of flora and fauna. In particular, targeted Rapid Assessment trips by teams of expert observers to remote and difficult to access locations have revealed many new species. This has included *Nepenthes* pitcher plants, with several taxa recently being found or recognised *e.g.*, *N. monticola* (Robinson *et al.*, 2011; McPherson, 2011), from mountains in West Papua, Indonesia. During fieldwork in Papua New Guinea in November 2011 the second author made two collections of a *Nepenthes* taxon that did not key to any known species. Here we describe *Nepenthes*

calcicola a new species of pitcher plant from the Purari River catchment in the Gulf Province.

MATERIALS AND METHODS

Georeferencing was made using a Garmin GPS-MAP 64sx handheld unit with dual GPS and GLONASS telemetry enabled. Taxonomic descriptions are based on morphometric and qualitative data from dried specimens and from living plants in the field. A total of 15 plants were examined in the wild across two different sites. Plants of the new species were systematically compared with morphologically allied *Nepenthes* species. Specimens of *Nepenthes* were examined in the collections of BRI, CANB, CBG, CNS, K, LAE, and NSW. The type material was deposited in LAE and CNS (herbarium codes follow Thiers, 2022).

Material for prey investigation was sampled from both forest floor pitchers and from intermediate pitchers.

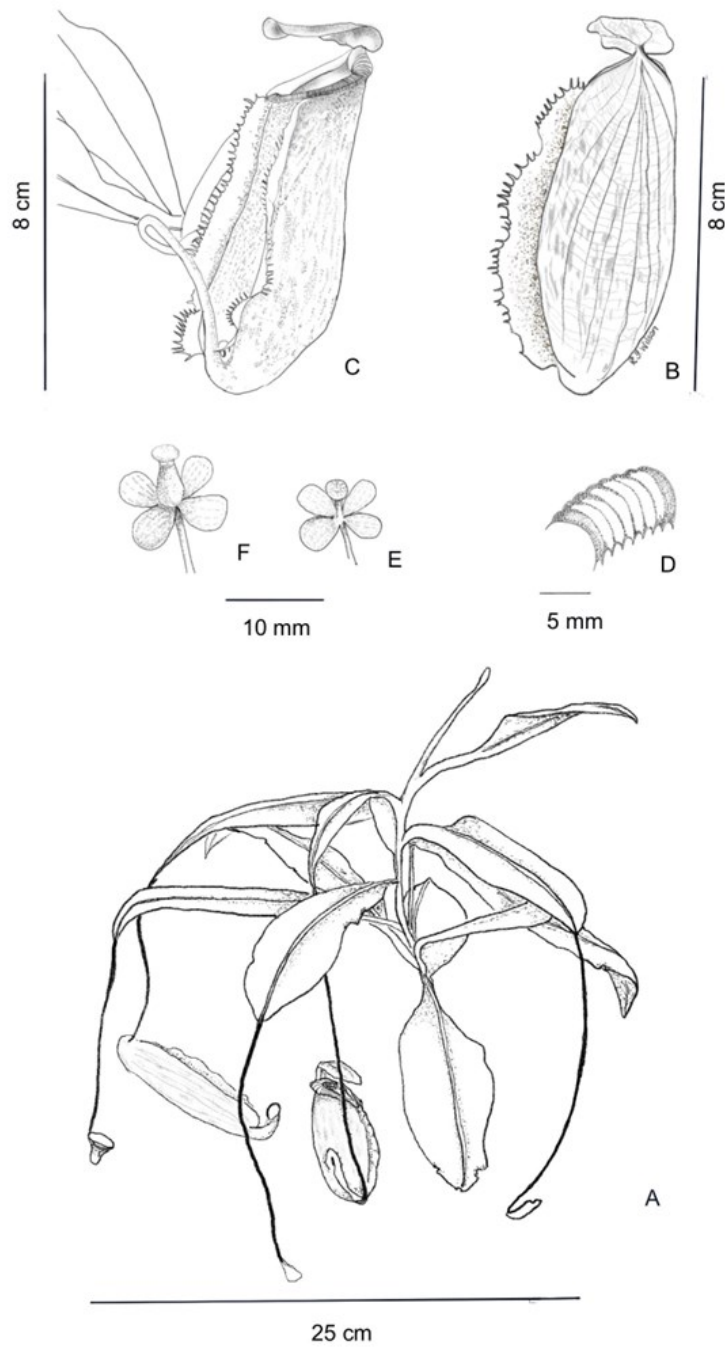


Fig. 1. *Nepenthes calcicola* Gary W. Wilson, S. Venter & Damas. A. Habit with mid-level pitchers. B. Mid-level pitcher showing alae with fimbriae. C. Lower pitcher showing alae with fimbriae. D. Section of peristome showing teeth on inner margin. E. Male flower. F. Female flower. Drawings by R. F. Wilson.

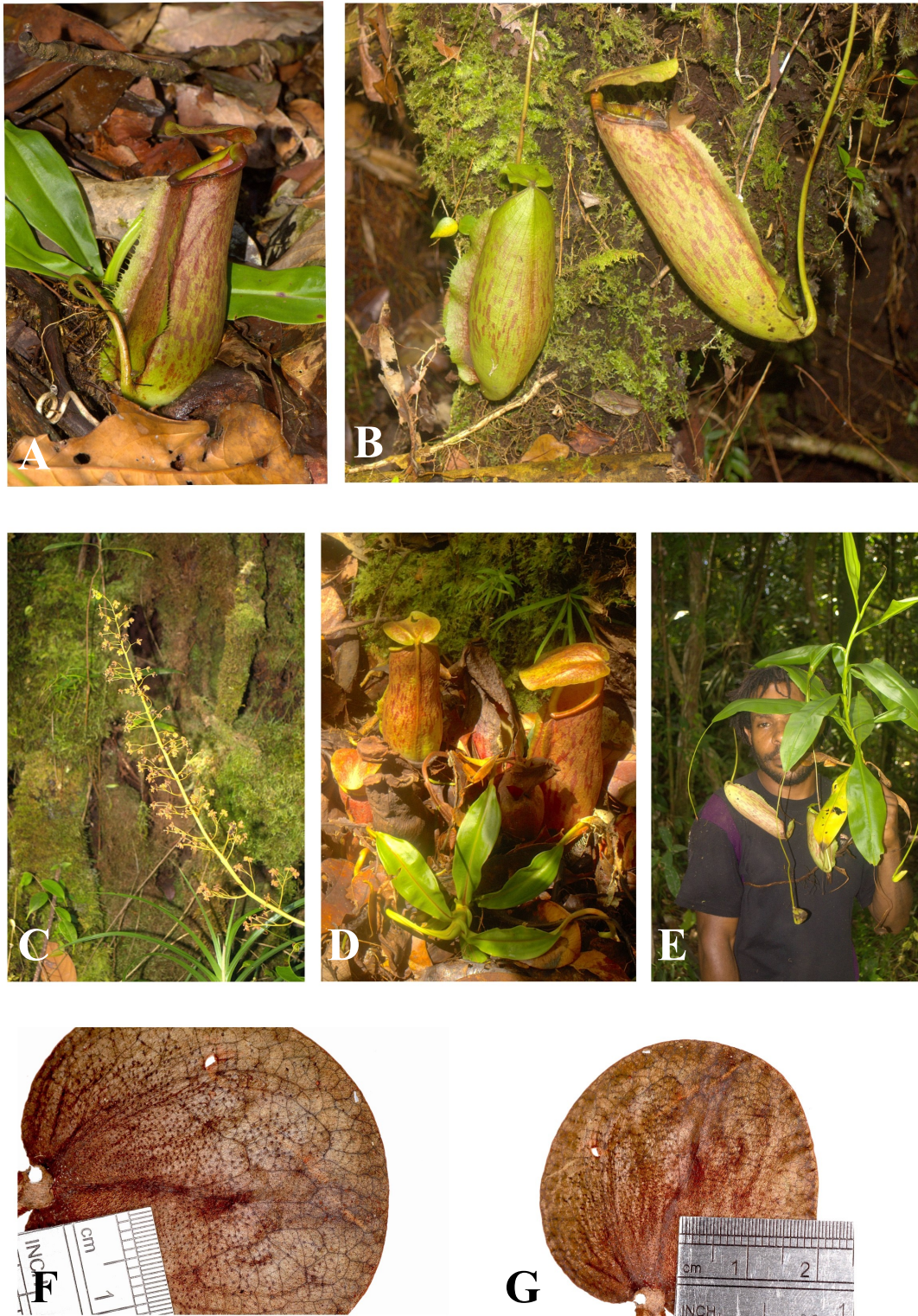


Fig. 2. *Nepenthes calcicola* Gary W. Wilson, S. Venter & Damas. A. Habit with lower pitcher. B. Habit with mid-level pitchers. C. Habit with male inflorescence. D. A rosette of pitchers. E. Field Assistant Siwi with mid-level rosette. F-G. Images of the underside of the lid of mid-level pitcher showing the distribution of the nectar gland. (from the type, Collection S. Venter 14170 lodged at CNS). Photos by S. Venter.

Table 1. Diagnostic morphological characteristics of *N. calcicola* and *N. neoguineensis*

Character	<i>N. calcicola</i>	<i>N. neoguineensis</i>
Habitat	Low light undisturbed Closed Forest	Higher light regime, often disturbed habitats, not known from Closed Forest
Stem	To 20 m long in the canopy	To 10 m long or more
Stems below leaf litter	Present	Absent
Pitcher-bearing leaves	No curl in the tendril	Always a curl in the tendril
Longitudinal nerves on each side of midrib	1–2	3–4
Vestiture of young pitcher	Glabrous	Covered in stellate hairs
Spur shape	Terete and recurved	Dorsiventrally flattened, not recurved
Intermediate pitcher wing width (mm)	7.9–10.0	5.0–8.0
Short stems and rosettes of pitchers	Present	Absent
Male inflorescence peduncle length (mm)	8.0–14.0 × 3.0–5.0	4.0–12.0 × 2.5–4.0
Female inflorescence peduncle length (mm)	160–190 × 3.0–4.0	120–150 × 2.0–2.5
Tepal shape	Obovate to broadly-obovate	Orbicular-elliptic

RESULTS AND DISCUSSION

Nepenthes calcicola Gary W. Wilson, S. Venter & Damas, *spec. nov.* Figs. 1 & 2 — TYPE: PAPUA NEW GUINEA: Gulf Province: limestone karst along Mua River, Purari River Catchment, 16 October 2011. *S. Venter 14170.* (Holotype: LAE!, isotype: CNS!).

Nepenthes calcicola differs from *N. neoguineensis* in having stems that grow beneath the layer of leaf litter (*vs.* stems above leaf litter); short stems and rosettes of pitchers present (*vs.* absent); spur terete and recurved (*vs.* dorsiventrally flattened and not recurved); female inflorescence peduncle 160–190 × 3.0–4.0 mm (*vs.* 120–150 × 2.0–2.5 mm); tepals obovate to broadly-obovate (*vs.* orbicular-elliptic).

Terrestrial climber, reaching to *ca.* 20 m, stems running horizontally underneath leaf litter forming rosettes of leaves with erect pitchers which are sometimes half buried in the litter, before climbing to the canopy. *Stems* 6–8 mm diameter, internodes 20–40 cm on climbing stems, glabrous. *Leaves* sessile, coriaceous, broadly lanceolate-

oblong, 180–320 × 30–75 mm, midrib 1–5 mm wide, cross-section flat, apex acute, margin straight, entire, longitudinal nerves 2–3 on each side of midrib, in outer 1/3 of lamina, obscure or moderately obvious, pennate nerves not obvious, upper surface glossy, glabrous, lower surface matt, glabrous, tendril insertion simple, straight, 150–220 × 1.0–1.5 mm, sometimes greater than the length of the lamina blade, not coiled. *Terrestrial pitchers* growing on the forest floor, 70–100 × 40–50 mm, base flat, ovoid in lower part, constriction above mid-point, wings 3–9 mm wide along the length of the pitcher, simple in cross section, filaments to 1.5 mm long, mouth oblique and ovate, peristome to 3 mm wide, rounded, ribs to 0.15 mm high and 0.2 mm apart, inner edge with teeth to 0.3 mm long; lid ovate-orbicular, 16–30 × 16–30 mm, base cordate, attachment 2.8–3 mm wide; spur simple, straight or curved, vestigial or to 3.0 mm long, nectar glands orbicular occasionally ovate, 0.15–0.2 mm in size, most dense about centre line and base of lid; pitcher exterior and lid most often red in colour and lighter interior but some uniform light green. *Intermediate pitchers* most often in rosettes on elevated portions of the stem, 0.5–2 m above ground and on normally developed leaves

(Fig. 2D), pitchers 75–150 × 35–100 mm, wings 8–10 mm wide along the length of the pitcher, filaments to 3.0 mm long, mouth oblique and ovate, peristome to 6.5 mm wide, rounded, ribs to 0.15 mm high and 0.2 mm apart, inner edge with teeth to 0.35 mm long; lid suborbicular-orbicular, 21–50 × 31–50 mm, base cordate; spur simple, straight or curved, vestigial or to 3.0 mm long, nectar glands sunken, circular or oval, 0.15–0.2 mm in size, surrounded by a light-coloured annulus, most dense, to 150/cm², about centre line and base of lid; pitchers red in colour, darkening with age, mid-age pitchers have lighter and contrasting peristomes, and mature-age pitchers a dark-red peristome. Upper pitchers not produced. *Male inflorescence* with peduncle 8–14 cm long, 3–5 mm diameter, bearing 30–55 partial peduncles, 10–30 mm long, evenly scattered along its length, 3–6 flowered in the basal third, bracts absent, pedicels divergent 10–17 mm long. Tepals 4, obovate to broadly obovate, 3.5–4.0 × 3.0–4.0 mm, lower surface with reddish-brown sub-appressed branched and stellate dense hairs, upper surface with elliptic nectar glands, glabrous, live colour green. Androphore 4.0 × 2.5 mm, glabrous. Anther-head white, globose, 1.3–1.8 mm. *Female inflorescence* peduncle 160–190 × 3.0–4.0 mm, partial-peduncles 10–35 × 0.8–1.0 mm, 2–3 flowered. Bracts absent. Pedicels 8.0–18.0 mm long. Tepals 4, ovoid, 4.4–5.5 × 1.8–2.5 mm, upper surface with elliptic nectar glands, ovary sessile. Fruit valves 4, narrowly elliptic, 18.5–35.0 × 3.5–4.2 mm, outer surface covered in fine reddish-brown hairs.

The *Nepenthes* species most similar to *N. calcicola* is *N. neoguineensis* Macfarl. (1910) (Table 1).

Distribution. *Nepenthes calcicola* is known only from the type locality in limestone karsts along the Mua River, a tributary of the Purari River, Gulf Province, Papua New Guinea. Specific collection locations not revealed to reduce the likelihood of poaching.

Habitat and Ecology. This species grows in Closed Low Lowland Hill Rainforest (Hammermaster & Saunders, 1995; Pajmans, 1976) with *Pometia pinnata* J.R.Forst. & G.Forst. and *Syzygium* P.Br. ex Gaert. spp. as emergents, sensu Shearman *et al.* (2008), on the margins of limestone karsts at elevations of 250–270 m. Epiphytes from many genera, and moss and liverwort species are common. Dominant tree genera are *Aglaia* Lour., *Syzygium* P.Br. ex Gaertn., *Ficus* Tourn., *Myristica* Gron. and *Terminalia* L. No other *Nepenthes* taxon is present in the collection area. The soil is a humus-rich clay loam and varies considerably in depth. The leaf litter layer is well

developed and to 20 cm deep. Most surface rock (limestone) is covered in vegetation. Only a small number of *Nepenthes* species occur on limestone, mostly from Borneo and one Thai species (Cheek, 2015). Both populations of *Nepenthes calcicola* are restricted to limestone. Examination of the contents of terrestrial and intermediate pitchers shows the species traps invertebrate fauna, including ants, cockroaches, snails and slugs, and katyids.

Etymology. The specific epithet describes the calcareous substrate the plants grow in.

Conservation status. Vulnerable (VU) with Criteria D1,2 (IUCN 2012) as *Nepenthes calcicola* is known from only two populations, one kilometre apart, on karst limestone in the Purari River catchment in the Gulf District in Papua New Guinea. The area of occupancy (AOO) is <100 km² and the number of individuals is <1,000.

Notes. This is the first record of a *Nepenthes* species from closed forest habitat on karst limestone in Papua New Guinea (see Jebb, 1991), a habitat type recognised for its distinct biodiversity (Clements *et al.*, 2006). *Nepenthes treubiana* Warb. and *Nepenthes* sp. Misool, described by McPherson (2009) as ‘similar to the extremely variable *N. neoguineensis*’ also grow on limestone sea-stacks and cliffs in West Papua, Indonesia (McPherson, 2009) but in soil-depauperate exposed sites. *Nepenthes* typically occur in high light regime habitats, the notable exception being *N. ampullaria*, which also occurs in forest habitats in New Guinea but derives most of its nitrogen from leaf detritus (Moran *et al.*, 2003), and has not been found at or near the collection site of *N. calcicola*.

The species that *N. calcicola* may be confused with on basis of gross morphology is *N. neoguineensis* (Table 1) which occurs throughout New Guinea and the d’Entrecasteaux Archipelago (Cheek & Jebb, 2001). *Nepenthes neoguineensis* grows in habitats from open grassland at sea level to heath forest on ridge tops at ca. 1400 m (Jebb, 1991; Cheek & Jebb, 2001; McPherson, 2009) but has not been recorded from primary closed forest. In addition, *N. neoguineensis* produces functional aerial pitchers with wings (McPherson, 2009), a morphology typical of terrestrial pitchers of other taxa and of intermediate pitchers in *N. calcicola*. In contrast, *N. calcicola* has a restricted distribution in rain forest on limestone hills below 300 m altitude and despite careful searching aerial pitchers have not been found; suggesting they are restricted to the canopy. Surveys of the *N. calcicola* collection location has not revealed the presence of *N. ampullaria*, the most likely other

A portion of the key of *Nepenthes* in New Guinea & neighbouring islands in Cheek and Jebb (2001) modified to include *N. calcicola* is presented here.

- 4a Leaves decurrent to at least ½ way down the internode 5
- 4b Leaves distinctly petiolate, never decurrent 7
- 5a Stem triangular, peristome >0.8 cm in width 35. *N. insignis*
- 5b Stem rounded, peristome <0.8 cm in width 6
- 6a Inflorescence a raceme; grows on ultramafics at >1000 m altitude 38. *N. lamiii*
- 6b Inflorescence a panicle; grows on limestone at <300 m altitude *N. calcicola*
- 7 Margins of lower leaf blades fimbriate; upper pitchers not winged 49. *N. mirabilis*

species in closed forest habitat, or of *N. neoguineensis*.

Additional specimens examined. PAPUA NEW GUINEA: Gulf Province: limestone karsts along Mua River, Purari River Catchment, 17 October 2011. *S. Venter 14169* (CNS, LAE) and Hill east of Mua Creek, 20 October 2011, *S. Venter 14210* (CNS, LAE).

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