

POLYRHACHIS (MYRMOTHRINAX) NEPENTHICOLA, A NEW SPECIES OF THE THRINAX-GROUP INHABITING PITCHER PLANTS (HYMENOPTERA: FORMICIDAE: FORMICINAE)

RUDOLF J. KOHOUT

Biodiversity Program, Queensland Museum, PO Box 3300, South Brisbane, Qld 4101

(Email: rudolf.kohout@qm.qld.gov.au)

Abstract

Polyrhachis (Myrmothrinax) nepenthicola, a new species of the *thrinax* species-group, is described from Sarawak, Borneo. The characters distinguishing it from similar species of the *thrinax*-group are provided and the species is illustrated. A preliminary note on its unusual nesting habit is included.

Introduction

The subgenus *Myrmothrinax* was established by Forel (1915) as a subgenus of *Polyrhachis* Fr. Smith, 1857, with *Polyrhachis thrinax* Roger, 1863 as the type species. The first description was given by Emery (1925), who included 27 species and subspecific forms as its constituents. Both Emery (1925) and, more recently, Dorow (1995) considered *Myrmothrinax* to be a relatively small and homogenous group and did not subdivide it into species-groups. However, as discovery of numerous new, mainly Southeast Asian species is increasing, Kohout (2008) proposed two species-groups, based on the relative length of the petiolar spines.

The *aequalis*-group includes species with the petiolar spines more-or-less subequal or with the middle spine shorter than the lateral pair. The *thrinax*-group includes species with the middle petiolar spine distinctly elongated. Distribution of the subgenus *Myrmothrinax* extends from India, Sri Lanka and Myanmar across Southeast Asia to the Philippines and Vietnam, and southwards throughout Indonesia to Papua New Guinea, Solomon Islands and northern Australia. The *Myrmothrinax* species are typical arboreal nesters, with their nesting habit almost identical to the closely similar species of the subgenus *Myrmatopa* Forel. They build their polydomous nests of silk and vegetation debris between the leaves of trees and shrubs (Robson and Kohout 2005, 2007) and in some localities ants of both subgenera were found nesting together side by side (Kohout 1999). However, as the employment of modern collecting methods, such as insecticidal fogging, has resulted in the discovery of many new species, it also became apparent that, while the *Myrmatopa* species seemingly prefer the rainforest canopy for their nesting sites, the *Myrmothrinax* species are predominantly confined to the lower arboreal zone.

While ant association with various plants is widely known, their interaction with pitcher plants (Nepenthaceae) has been recorded on only a few occasions. Many species of ants visit pitcher plants regularly to feed on the extrafloral nectar; however, they also risk being digested in the pitfall traps.

Only one species of ant, *Camponotus (Colobopsis) schmitzi* Starcke, is so far known to find a shelter and nesting space within the swollen and hollow tendrils of *Nepenthes bicalcarata* (Clarke and Kitching 1995, Thornham *et al.* 2012). At the same time, these ants are able not only to move across the slippery surface of the pitcher without being trapped, but also to swim in the pitcher fluid, where they hunt and retrieve food from the pitcher (Clarke and Kitching 1995). However, the nesting behaviour of *Polyrhachis nepenthicola* sp. n., described below, is the only recorded case of an ant actually building its nest within a pitcher of a *Nepenthes* plant (Grafe and Kohout in press).

Methods and abbreviations

Photographs of the ant specimens were taken with a digital camera attached to a stereomicroscope and processed using Auto-Montage (Syncroscopy, Division of Synoptics Ltd, USA) and Adobe Photoshop CS2 (Adobe Systems Inc., USA). Images depicting the holotype were photographed by Dr Steve O. Shattuck (ANIC). Photographs of living specimens, including their nest and the pitcher plant *Nepenthes stenophylla* in their natural environment, were taken by Dr T. Ulmar Grafe (UBDG).

Standard measurements and indices follow Kohout (2008): TL = Total length (the necessarily composite measurement of the outstretched length of the entire ant measured in profile); HL = Head length (the maximum measurable length of the head in perfect full face view, measured from the anterior-most point of the clypeal border or teeth to the posterior-most point of the occipital margin); HW = Head width (width of the head in perfect full face view, measured immediately in front of the eyes); CI = Cephalic index ($HW \times 100/HL$); SL = Scape length (length of the antennal scape, excluding the condyle); SI = Scape index ($SL \times 100/HW$); PW = Pronotal width (greatest width of the pronotal dorsum, measured behind the pronotal teeth); MTL = Metathoracic tibial length (maximum measurable length of the tibia of the hind leg). All measurements are in millimetres (mm) and were taken using a Zeiss (Oberkochen) SR stereomicroscope at 20x and 32x magnifications with an eyepiece graticule calibrated against a stage micrometer.

Institutions (with names of cooperating curators): ANIC – Australian National Insect Collection, CSIRO Entomology, Canberra, ACT, Australia (Dr S.O. Shattuck); BMNH – The Natural History Museum, London, UK (S. Ryder); MCZC – Museum of Comparative Zoology, Harvard University, Cambridge, MA, USA (Dr S.P. Cover); SMKS – Sarawak Museum, Kuching, Sarawak; QMBA – Queensland Museum, Brisbane, QLD, Australia (Dr C.J. Burwell); UBDG – University Brunei Darussalam, Gadong.

Systematics

Genus *Polyrhachis* Fr. Smith, 1857

Polyrhachis Fr. Smith, 1857: 58. Type species: *Formica bihamata* Drury, 1773, by original designation.

Subgenus *Myrmothrinax* Forel, 1915

Myrmothrinax Forel, 1915: 107 (as subgenus of *Polyrhachis* Fr. Smith). Type species: *Polyrhachis thrinax* Roger, 1863, by original designation.

Myrmothrinax Forel; Emery, 1925: 182 (diagnosis of the subgenus).

***Polyrhachis nepenthicola* sp. n.**

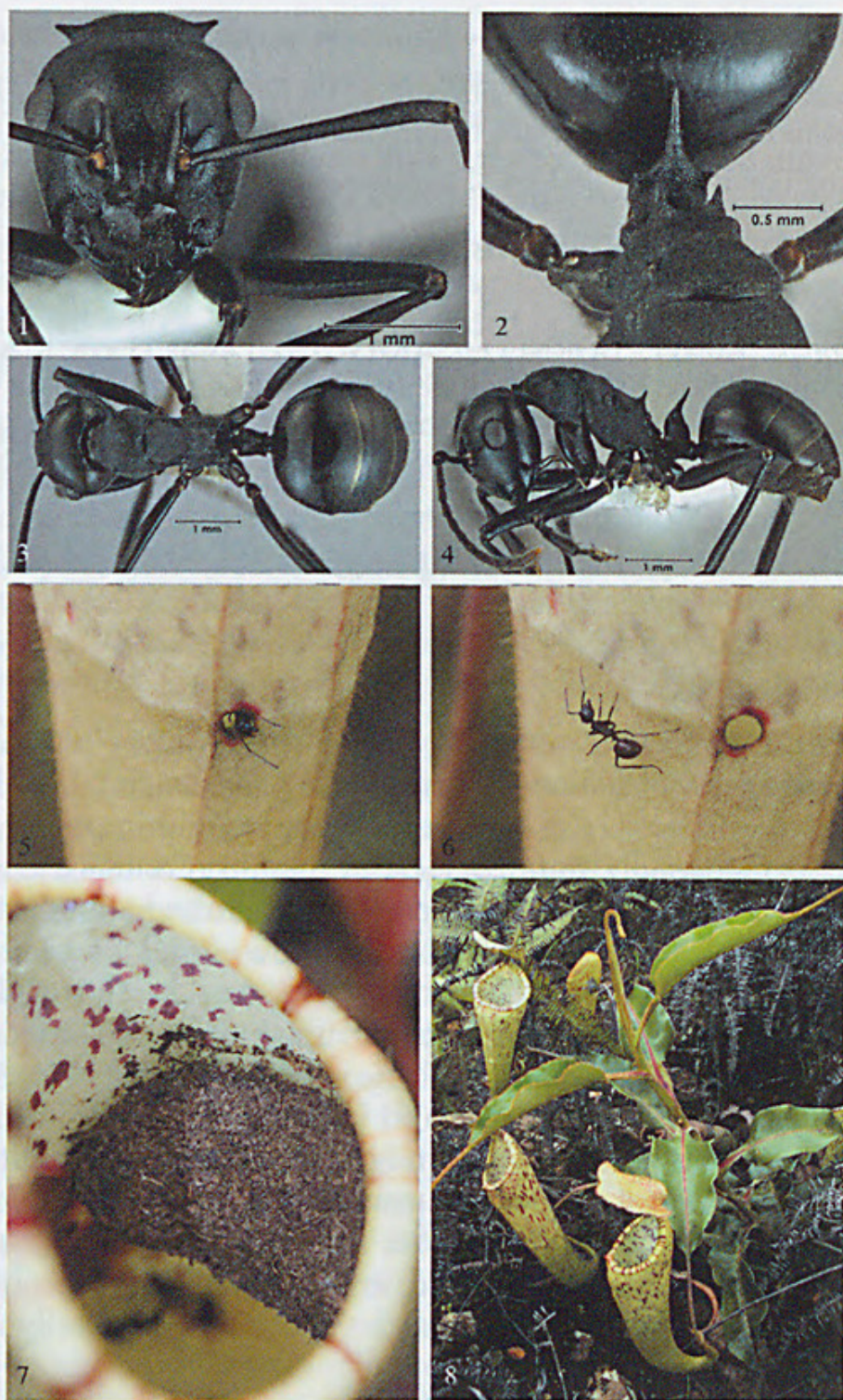
(Figs 1-8)

Types. *Holotype* worker: BORNEO, SARAWAK, Lawas, Paya Maga, 04°27'N, 115°33'E, 1810 m, 11.x.2010, T.U. Grafe (worker). *Paratypes*: data as for holotype, 20 workers, 1 queen, 8 males. Type distribution: Holotype, most paratype workers, paratype queen and paratype males in QMBA; 2 paratypes each in ANIC, BMNH, MCZC, SMKS, UBDG.

Description. Worker. Dimensions (holotype cited first): TL c. 7.26, 6.85-8.47; HL 1.78, 1.65-1.93; HW 1.59, 1.53-1.81; CI 89, 87-94; SL 2.07, 1.93-2.18; SI 130, 120-135; PW 1.00, 0.94-1.15; MTL 2.50, 2.37-2.65 (1+12 measured).

Mandibles with 5 teeth. Anterior clypeal margin widely medially truncate with truncate portion shallowly emarginate and flanked by blunt angles. Clypeus with posteriorly raised median carina; straight in profile, posteriorly rounding into moderately impressed basal margin. Frontal triangle distinct. Frontal carinae sinuate with margins only weakly raised at midlength; central area relatively wide with distinct frontal furrow. Sides of head in front of eyes converging towards mandibular bases in weakly convex line; behind eyes sides widely rounding into convex occipital margin. Eyes convex, in full face view clearly breaking lateral cephalic outline. Ocelli lacking in holotype; median ocellus indicated by shallow pit in some paratypes. Pronotal humeri armed with bluntly terminated, laterally directed, spines, about as long as their basal width; lateral pronotal margins rather blunt, becoming indistinct before reaching promesonotal suture. Mesonotum with lateral margins rounded anteriorly, somewhat raised and subparallel posteriorly towards distinct metanotal groove. Propodeal dorsum only marginally longer than wide, with rather blunt, subparallel, lateral margins, terminating posteriorly in vertically elevated spines; propodeal declivity oblique, laterally expending towards very conspicuous, rather large, propodeal spiracles. Petiole armed with two short, tooth-like, lateral spines and long, acute, dorsoposteriorly elevated median spine, weakly bent upwards from its midlength. Anterior face of first gastral segment distinctly higher than full height of petiole, widely rounding onto gastral dorsum.

Mandibles very finely longitudinally striate with numerous piliferous pits; sculpture distinctly finer towards masticatory borders. Clypeus very finely reticulate-punctate with rest of head shagreened. Mesosoma and petiole, including spines, distinctly reticulate-punctate, opaque. Gaster very finely shagreened, polished.



Figs 1-8. *Polyrhachis (Myrmothrinax) nepenthicola* sp. n. (1) head in full face view; (2) petiole in frontal view; (3) dorsal view; (4) lateral view; (5) ant exiting pitcher through a small hole and (6) foraging at the border between the waxy and secretory zones of the pitcher; (7) nest inside the pitcher; (8) *Nepenthes stenophylla* at the study site in northern Sarawak. Photographs 5-8 courtesy of T. Ulmar Grafe.

Mandibular masticatory borders with numerous, semierect, golden hairs. Clypeus with only few short golden setae along anterior margin and single, medium length hair laterally. A few long, erect hairs on frontal coxae; numerous long hairs lining margins of segments on gastral venter and around apex. Closely appressed golden pubescence rather diluted on head and gaster; it is almost completely absent from mesosoma and petiole.

Black or dark reddish-brown, with head, gaster and appendages a shade lighter; funicular and tarsal segments progressively lighter towards apices. Mandibles along masticatory borders with narrow, light reddish-brown band.

Queen. Dimensions: TL c. 10.23; HL 2.25; HW 2.03; CI 90; SL 2.59; SI 127; PW 1.65; MTL 3.18 (1 measured). Very similar to worker with usual differences indicating caste, including three ocelli and complete thoracic structure. Pronotal humeri produced into blunt, tooth-like spines; their outer margins merging into rather blunt and short pronotal margins. Mesoscutum virtually as wide as long, with lateral margins converging anteriorly and forming moderately rounded anterior margin; median line only shallowly impressed; parapsides weakly raised along their entire length. Mesoscutum in profile with anterior margin rounded onto virtually flat dorsum. Mesoscutellum convex, distinctly raised above dorsal plane of mesosoma. Propodeal dorsum with lateral margins indistinct; propodeal spines shorter, somewhat anteroposteriorly flattened. Propodeal spiracles similar, but larger, than in worker. Petiole with lateral spines distinctly longer than in worker, almost 2x as long as wide at base; median petiolar spine shorter than in worker, with apex bluntly rounded. Head, mesosoma and petiole finely reticulate-punctate, with anterior margin of mesoscutum medially smooth and polished; gaster shagreened. Pubescence and colour virtually as in worker.

Males in QMBA spirit collection.

Etymology. The specific name is derived from a combination of the generic name of the host pitcher plant, *Nepenthes stenophylla*, and the Latin suffix *-cola*, meaning inhabitant.

Remarks. *Polyrhachis nepenthicola* stands closest to *P. triaena* Wheeler and also described from Sarawak (Wheeler 1919), with both species sharing a similar size (HL 1.65-1.93 in *P. nepenthicola* versus HL 1.68-1.78 in *P. triaena*). However, both species differ in a number of other characters, with *P. nepenthicola* featuring a distinctly wider head (CI 89-94), shorter antennal scapes (SI 120-128), almost quadrate propodeal dorsum and the conspicuously large propodeal spiracles. In contrast, the head in *P. triaena* is narrower (CI 82-85), antennal scapes longer (SI 157-159), propodeal dorsum almost 2x as long as wide and the propodeal spiracles relatively flat.

The nest of *Polyrhachis nepenthicola* was collected from the pitcher of *Nepenthes stenophylla* (Fig. 8) growing alongside the road in secondary vegetation of the sub-montane, mixed dipterocarp forest.

For detailed aspects of its biology (Figs 5-7) see Grafe and Kohout (in press).

Acknowledgements

I am very grateful to Assoc. Prof. Dr T. Ulmar Grafe, Department of Biology, University Brunei Darussalam, for supplying the specimens of this new species and for the information, including photographs, relating to its unique nesting habit. I am much indebted to Dr Steve O. Shattuck (ANIC) for his patience and care in preparation of the digital images used for the illustrations. Finally, my sincere thanks go to Dr Geoff B. Monteith (QMBA) for reading and commenting on a draft of the manuscript.

References

- CLARKE, C. and KITCHING, R.L. 1995. Swimming ants and pitcher plants: a unique ant-plant interaction from Borneo. *Journal of Tropical Ecology* **11**: 589-602.
- DOROW, W.H.O. 1995. Revision of the ant genus *Polyrhachis* Smith, 1857 (Hymenoptera: Formicidae: Formicinae) on subgenus level with keys, checklist of species and bibliography. *Courier Forschungsinstitut Senckenberg* **185**: 1-113.
- EMERY, C. 1925. Hymenoptera, Fam, Formicidae, subfam. Formicinae. In: *Genera Insectorum*. (Wytzman ed.) Fasc. 183. Bruxelles; 302 pp.
- FOREL, A. 1915. Results of Dr. E. Mjöberg's Swedish scientific expeditions to Australia, 1910-1913. 2. Ameisen. *Arkiv för Zoologi* **9**(16): 1-119.
- GRAFE, T.U. and KOHOUT, R.J. in press. A new case of ants inhabiting pitcher plants. *Ecotropica* (2013).
- KOHOUT, R.J. 1999. Australian *Polyrhachis* and their nesting habits (Formicidae: Formicinae). *Proceedings of the International Colloquia on Social Insects*. V.E. Kypiatkov (Ed.). Russian Language Section of the IUSI. Socium. St Petersburg (1994), **3-4**: 217-222.
- KOHOUT, R.J. 2008. A review of the *Polyrhachis* ants of Sulawesi, with descriptions of new species (Hymenoptera: Formicidae: Formicinae). *Memoirs of the Queensland Museum – Nature* **52**(2): 255-317.
- ROBSON, S.K.A. and KOHOUT, R.J. 2005. Evolution of nest-weaving behaviour in arboreal nesting ants of the genus *Polyrhachis* Fr. Smith (Hymenoptera: Formicidae). *Australian Journal of Entomology* **44**(2): 164-169.
- ROBSON, S.K.A. and KOHOUT, R.J. 2007. A review of the nesting habits and socioecology of the ant genus *Polyrhachis* Fr. Smith. *Asian Myrmecology* **1**: 81-99.
- ROGER, J. 1863. Die neu aufgeführten Gattungen und Arten meines Formiciden-Verzeichnisses, nebst Ergänzung einiger früher gegebenen Beschreibungen. *Berliner Entomologische Zeitschrift* **7** (Beilage): 1-65.
- SMITH, FR. 1857. Catalogue of the hymenopterous insects collected at Sarawak, Borneo; Mount Ophir, Malacca; and at Singapore, by A.R. Wallace. *Journal of the Proceedings of the Linnean Society of London, Zoology* **2**: 42-88.
- THORNHAM, D.G., SMITH, J.M., GRAFE, T.U. and FEDERLE, W. 2012. Settling the trap: cleaning behaviour of *Camponotus schmitzi* ants increases long-term capture efficiency of their pitcher plant host, *Nepenthes bicalcarata*. *Functional Ecology* **26**: 11-19.
- WHEELER, W.M. 1919. The ants of Borneo. *Bulletin of the Museum of Comparative Zoology at Harvard College* **63**(3): 43-147.



Kohout, Rudolf J. 2013. "Polyrhachis (Myrmothrinax) nepenthicola, a new species of the Thrinax-group inhabiting pitcher plants (Hymenoptera: Formicidae: Formicinae)." *The Australian Entomologist* 40(1), 47–52.

View This Item Online: <https://www.biodiversitylibrary.org/item/310757>

Permalink: <https://www.biodiversitylibrary.org/partpdf/344170>

Holding Institution

Entomological Society of Queensland

Sponsored by

Atlas of Living Australia

Copyright & Reuse

Copyright Status: In copyright. Digitized with the permission of the rights holder.

Rights Holder: Entomological Society of Queensland

License: <http://creativecommons.org/licenses/by-nc-sa/4.0/>

Rights: <http://biodiversitylibrary.org/permissions>

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at <https://www.biodiversitylibrary.org>.