ASIAN MYRMECOLOGY Volume 2, 125 - 127, 2008
ISSN 1985-1944 © D. MEZGER & M. PFEIFFER

SHORT COMMUNICATION

Record of a mixed colony of two dacetine species: *Strumigenys rotogenys* and *Pyramica mitis* (Myrmicinae) from Gunung Mulu National Park, Sarawak, Malaysia

DIRK MEZGER & MARTIN PFEIFFER

Institute of Experimental Ecology, University of Ulm, Germany

* Corresponding author's email: dirk.mezger@uni-ulm.de

Keywords: *Strumigenys*, *Pyramica*, Formicidae, mixed colony, nesting behaviour, alluvial forest, Borneo

Of the large number of tropical ant species, few are known to share their nests with other ant species (Seifert 2007). Two types of communal nesting exist: compound nests, where two species live close together but have separate brood chambers, and mixed colonies, in which the two species use a common brood chamber (Wilson 1971). Each of these types can be divided into several subtypes according to the relation between the ant species involved. Species interactions in compound nests range from cleptobiosis, where two species live close together and one steals food from the other, to parabiosis which is a nesting symbiosis where two species live close together, use the same nest and use common foraging trails, but keep their brood separate (Hölldobler & Wilson 1990). Mixed colonies are in most cases parasite–host relationships ranging from temporary to permanent parasitism (inquilinism).

The myrmicine tribe Dacetini comprises over 870 species with nine genera of soil and leaf litter inhabiting ants. Dacetine ants are distributed in all biogeographical regions, but mostly in tropical and subtropical areas (Bolton 2000). Some species of this tribe are known to live in association with other ants: e.g. *Pyramica maynei* (Forel, 1916) from Ivory Coast lives together with *Platythyrea conradti* Emery, 1899 as a commensal (Yeo *et al*. 2006); *Pyramica inquilina* (Bolton, 1983), from Congo, is supposed to live as a socially parasitic dacetine in nests of *Pyramica lujae* (Forel, 1902) (Bolton 1983); *Strumigenys xenos* Brown, 1955 is a social parasite of *Strumigenys perplexa* (Smith, 1876) in Australia (Brown 1955) and New Zealand (Taylor 1968). In Asia one *Strumigenys* species from Java was reported to live in a compound nest with species of *Diacamma* and *Pachycondyla*, while another *Strumigenys* lived together with *Pseudolasius* sp., but the relations between these species remain unclear (Kaufmann *et al*. 2003). Here we report on a new association between *Strumigenys* and *Pyramica* from Bornean alluvial forest.

The study was conducted in Gunung Mulu National Park (4° 57'N, 114° 47'E) in Sarawak (Malaysia) on Borneo. The climate in this area is wet tropical with mean temperatures of about 26°C and 4000 to 5000 mm rain per year (Sarawak Weather Service, pers. comm.). While the slope of Gunung Mulu is covered with several types of forest (Hazebroek & Morshidi 2001), we conducted our study in the alluvial forest at the foot of the mountain, which is flooded several times a year for one or two days. We had two observation periods: 25 March to 8 April 2007 and 8 to 23 August 2007. In both periods we collected nests with the same method in mature alluvial forest, along the plank walkway to Deer Cave and Lang's Cave. We looked for small tree saplings whose stems were covered with soil and a root mass from climbers and small epiphytes. We checked the root mass covering these stems for ant nests. Whenever we encountered ants, we carefully removed the root mass together with the ant nest and put these in a terrarium pending a closer examination. We made subsequent observations in the laboratory, except for observations of diel activity which were per-

formed outside the house under a shady roof. We conducted these observations on 22 August 2007 from 10:00 to 22:00 h and checked activity at least every half-hour; preliminary surveillance detected no incidence of ant activity outside this time period. Ants were identified with reference to Bolton (2000). Videos of these ant nests can be downloaded from www.antbase.net (Mezger 2008).

We detected 18 nests of *Strumigenys rotogenys* Bolton, 2000. All of these nests were attached to stems of small tree saplings. These nests were situated in soil attached on the root mass of climbing plants and epiphytes. We found all of these dacetine nests 5-10 cm above ground level. Each nest housed eight to 80 worker ants, with a mean of 36 worker ants per nest ($n = 7$; SD = ± 24.0). Each nest but one (possibly incomplete) contained one dealate queen, and we discovered from zero to eight alate sexuals in each nest ($n = 7$; mean = 2; SD = ± 2.6). We observed diel activity of *S. rotogenys* at three nests; these ants were active only from 13:00 h to 19:00 h with a slight activity peak between 15:00 h and 18:00 h. In two cases, a nest of *Oligomyrmex* sp. was found at a distance of about 10 cm from the S. *rotogenys* nests. Ten encounters between workers of the two ant species were observed in the field. Only once a worker of *Oligomyrmex* showed aggressive behaviour by biting the dacetine ant. In the other nine encounters, neither ant showed any reaction toward the other species.

In one nest we discovered *S. rotogenys* occurring together with *Pyramica mitis* Brown, 2000. In this nest we found about 20 individuals of *S. rotogenys* and about 60 individuals of *P. mitis*. This nest contained one dealate queen each of *S. rotogenys* and *P. mitis*, but no winged gynes. Three brood chambers were discovered. While the differentiation of the brood of these species was difficult, larger brood could be assumed to be of *Strumigenys* since *P. mitis* is only half the body size of *S. rotogenys*. In the largest brood chamber, there were 33 *P. mitis* and three *S. rotogenys* workers and about 40 larvae and pupae: larvae were of several size classes and pupae of two size classes, with a suspected five pupae of *Strumigenys* (based on their larger size). In a smaller nest chamber 12 *P. mitis* were found together with about ten brood items, mostly pupae. A still smaller third nest chamber contained eight *P. mitis* and two *S. rotogenys* workers together with six larvae and one small pupa (suspected to be of *Pyramica*). As both species carried brood of all size classes, it seems likely that in some cases the brood of the other species was taken away. Brood was carried away from the light. Five to 10 cm away – still in the root mass on the same stem – there were nests of *Hypoponera* sp., *Pheidole* sp. and *Acanthomyrmex ferox* Emery, 1883. When these species were encountered by a *Pyramica* worker, the dacetine attacked and chased them away. When *S. rotogenys* encountered another ant species, no aggressive behaviour was observed.

The root mass around saplings is a very unusual nesting habitat for ants, but besides the two dacetine species we discovered at least six further ant species with this nesting habit. This mode of living seemed to be an adaptation to cope with periodic flooding events in the alluvial forest since we found these nests nowhere in Gunung Mulu National Park other than in periodically flooded alluvial forest areas (unpublished results). In an intensive study of nesting ant habits at Gunung Kinabalu, in which nest types were compared along an altitudinal gradient (500 to 1520 m asl) in dipterocarp forest, this nesting type was completely absent (Malsch 2002).

Since we found many colonies of *S. rotogenys* without *P. mitis*, and a whole colony of *P. mitis* including a wingless queen in a Winkler sample of alluvial forest without *S. rotogenys* (unpublished results) it is likely that this was a facultative association. This association most likely matches the mixed-colony type since there was no separation of the brood of the two species; in the present case we have no evidence for any form of parasitism.

The rarity of possible host species in the tropics might be one of the reasons why few species live in communal nests in tropical habitats (Seifert 2007). But on the other hand, the rarity of communal nesting might be an artefact because it is impossible to detect communal nests with the most commonly used methods of ant research in tropical regions, Winkler-extraction or pitfall trapping (Agosti *et al*. 2000). So, although we report on a single case of communal nesting, recording this seems worthwhile and might stimulate further research on interspecific interactions of tropical ants.

ACKNOWLEDGEMENTS

We are especially grateful to David Bierbach who discovered the first of these dacetine nests. We thank Herik Köhler, Johannes Renninger, Kerstin Degenhardt and Merle Schanz who helped with nest collections and observations and two anonymous reviewers for their valuable suggestions. We are grateful to Lucy Chong and the Sarawak Forestry Department for granting research permission and helpful contacts. We thank Brian Clark and his staff at Gunung Mulu National Park for their kind cooperation. This study was partly funded by a DFG grant to M.P. (Project PF 441/3-1).

REFERENCES

Agosti D, Majer JD, Alonso LE and Schultz TR, eds. (2000) *Ants: Standard Methods for Measuring and Monitoring Biodiversity.* Washington, London, Smithonian Institution Press, 280.

Bolton B, 1983. The Afrotropical dacetine ants (Formicidae). *Bulletin of the British Museum of Natural History, Entomology* 46: 267-416.

Bolton B, 2000. *The Ant Tribe Dacetini.* The American Entomological Institute, Gainesville, 370 pp.

Brown WL, 1955. The first social parasite in the ant tribe Dacetini. *Insectes Sociaux* 2(3): 181-186.

Hazebroek HP and Morshidi KA, 2001. *National Parks of Sarawak.* Natural History Publications, Kota Kinabalu, 502 pp.

Hölldobler B and Wilson EO, 1990. *The Ants.* The Belknap Press of Harvard University Press, Cambridge, Mass., 732 pp.

Kaufmann E, Malsch AKF, Erle M and Maschwitz U, 2003. Compound nesting of *Strumigenys* sp. (Myrmicinae) and *Diacamma* sp. (Ponerinae), and other nesting symbioses of myrmicine and ponerine ants in Southeast Asia. *Insectes Sociaux* 50: 88-97.

Malsch AKF, 2002. *Kausale Faktoren für die Abnahme der Artenvielfalt von Ameisen-Untersuchung entlang eines Höhengradienten am Mt. Kinabalu, Sabah, Malaysia.* Dissertation, Johann Wolfgang Goethe Universität, Frankfurt am Main, 192 pp.

Mezger D, 2000. *Pyramica* sp. and *Strumigenys* cf. *rotogenys*: Two ant species living together in the same nest. Downloaded from http://www.antbase.net/sprache-englisch/ants-southeast-asia/ant-movies-3.html on 15 September 2008.

Seifert B, 2007. Sozialparasitismus. In: *Ameisen Mittel- und Nordeuropas* (Seifert B, ed) lutra-Verlags- und Vertriebsgesellschaft, Tauer, 41-57.

Taylor RW, 1968. The Australian workerless inquiline ant *Strumigenys xenos* Brown (Hymenoptera-Formicidae) recorded from New Zealand. *New Zealand Entomologist* 4(1): 47-49.

Wilson EO, 1971. *The Insect Societies.* Harvard University Press, Cambridge, Massachusetts, 548 pp.

Yeo K, Molet M and Peeters C, 2006. When David and Goliath share a home: Compound nesting of *Pyramica* and *Platythyrea* ants. *Insectes Sociaux* 53: 435-438.

Received: 8 May 2008; accepted: 23 September 2008

Editors' note: *Pyramica* now belongs to *Strumigenys* according to Baroni Urbani C and De Andrade ML (2007. The ant tribe Dacetini: Limits and constituent genera, with descriptions of new species (Hymenoptera / Formicidae). *Annali del Museo Civico di Storia Naturale Giacomo Doria (Genova)* 99: 1-191.).