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Short research contribution

Wojciech CZECHOWSKI¹, Bálint MARKÓ², Alexander RADCHENKO¹

¹Museum and Institute of Zoology, Polish Academy of Sciences, Laboratory of Social and Myrmecophilous Insects, Wilcza 64, 00-679 Warsaw, Poland, e-mail: wcz@miiz.waw.pl

²Babeş-Bolyai University, Department of Taxonomy and Ecology, Clinicilor str. 5-7, 400006 Cluj-Napoca, Romania, e-mail: mbalint@biolog.ubbcluj.ro

RUBBISH DUMPS REVEAL THE DIET OF ANT COLONIES: *MYRMICA SCHENCKI* EM. AND *MYRMICA RUBRA* (L.) (HYMENOPTERA: FORMICIDAE) AS FACULTATIVE POLLEN-EATERS

ABSTRACT: *Myrmica schencki* Em. and *M. rubra* (L.), common Palaearctic ant species, collect fallen male Scots pine (*Pinus sylvestris* L.) inflorescence during the pine blossom time, take it to their nests and then gather it on rubbish piles close to nest-entrances. Dissection of *M. schencki* workers revealed the presence of numerous pollen grains in their crops and midguts proving at least periodical pollenivory of these ants. So far, only some Neotropical ants of the genus *Cephalotes* Latr. have been known to eat pollen.

KEY WORDS: ants, *Myrmica schencki*, *Myrmica rubra*, foraging, pollen-eating.

Pollenivory seems to be very rare in ants despite the pantophagy of the majority of ant species and the undeniable nutrient-richness of pollen. There are very few reports on pollen-eating ants, all dealing with Neotropical species of the genus *Cephalotes* Latr. (= *Zacryptocerus* Wheel., *Cryptocerus* Latr.) (subfamily Myrmicinae), which feed on wind-dispersed pollen settled on leaves (Creighton 1963, 1967, Creighton and Nutting 1965, Baroni Urbani and de Andrade 1997). These ants are characterised by special anatomical and physiological features of their digestive tract, highly adapted to the efficient storage and regurgitation

of undigested pollen grains for their nest-mates, as well as to spitting indigestible pollen cell walls (Roche and Wheeler 1997, Baroni Urbani and de Andrade 1997, de Andrade and Baroni Urbani 1999). The present paper brings, most probably, the first report of at least occasional pollen-eating in Palaearctic ant species, namely *Myrmica schencki* Em. and *M. rubra* (L.).

The observations were carried out in a complex of sand dunes overgrown with pine forest and an adjacent area near the village of Tvärminne on the Hanko Peninsula, southern Finland in mid June 2007. It was the period of maturation of Scots pine (*Pinus sylvestris* L.) inflorescence. About 30 ant species occurred there, including at least six species of the genus *Myrmica* Latr.: *M. rubra* (L.), *M. ruginodis* Nyl., *M. rugulosa* Nyl., *M. sabuleti* Mein., *M. lobicornis* Nyl., and *M. schencki* Em. (Gallé 1991).

The nest holes of each *M. schencki* colony found there and those of some of the local *M. rubra* colonies were either surrounded by piles of male pine inflorescence or such piles adjoined the nest holes. With no particular effort to search, a total of 15 *Myrmica* nests with such piles were found: 11 of *M. schencki* and four of *M. rubra*. The piles of



Figs 1–4. Rubbish dumps consisting of male pine inflorescence at nests of *M. schencki* (in 1 and 3, the nest entrance is marked with an arrow; in 2 the entrance is pointed out by the tip of a knife; length of the knife blade is 10 cm, and in 4 the entrance is well visible. (Photos by W. Czechowski).

pine inflorescence, 10 to 16 cm in diameter in their compact parts (generally bigger in *M. schencki* than in *M. rubra*), were visible from a distance as yellow patches well standing out against the ground (moss or litter). Zones of more dispersed pine inflorescence stretched out within a radius of a further 20–30 cm, but their concentration was still incomparably higher there than in the rest of the area (Figs 1–4).

These accumulations of identical plant elements, rather untypical of North- and Central-European ant species, resembled rubbish dumps consisting of remnants of seeds typically associated with specialised granivorous ant species (so called harvester ants), e.g. ones of the genus *Messor* For. Thus these rubbish dump-like piles around *M. schencki* and *M. rubra* nests suggested that ants intensely pick up fallen male pine inflorescence during pine blossom time probably for the pollen that it contains, then eat pollen out of it, and throw empty inflorescence away.

Observation of one of the *M. schencki* colonies revealed the origin of these peculiar piles indeed. The foragers collected fallen male pine inflorescence, carried it to the

nest, and dragged it inside. The latter was a hard task because of the narrow collar-like nest entrances characteristic of *M. schencki* (see Czechowski 2008). At the same time, particles of inflorescence were, no less laboriously, removed by ants from the nest and left “right on the doorstep”. Two of the *M. schencki* nests observed were situated within a territory of *Formica polyctena* Först. In their cases, layers of pine inflorescence removed from the nests covered concentrations of insect remnants, so called ‘ant cemeteries’, consisting mainly of *F. polyctena* corpses. Such around-nest rubbish dumps are seen in *M. schencki* colonies, which have dumping areas of the wood ants in their range, and are signs of myrmecophagous scavengery of this species (Czechowski 2008).

Dissections of workers taken from one of the nests of *M. schencki* fully confirmed that ants indeed consumed pollen. Altogether 18 *M. schencki* individuals were dissected, and 16 (89%) of them contained pollen in their crops and midguts (Fig. 5). A grain of pine pollen bears two air-sacks which cannot be seen on pollen from the ant gaster (Fig. 6). It is possible that the ants deprive them be-

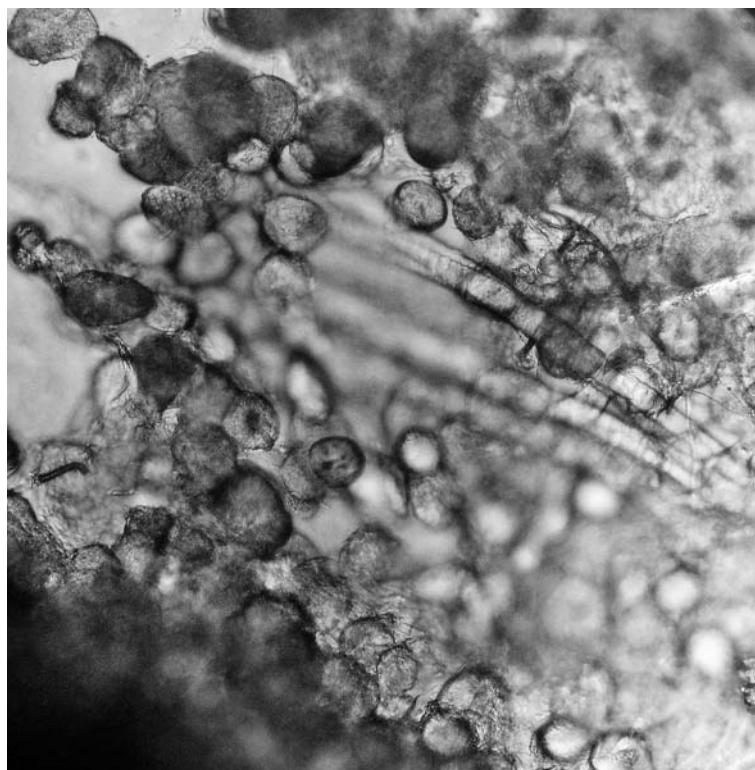


Fig. 5. Content of the *M. schencki* midgut (Photo by B. Markó).



Fig. 6. Pollen grains extracted from the *M. schencki* midgut (Photo by B. Markó).

fore they swallow a grain or air-sacs were destroyed in the ants' alimentary canal.

Interestingly, only these two *Myrmica* species out of several ones which occurred there (see above) were noticed to exploit this food resource, although *M. ruginodis* were much more abundant in those habitats than *M. schencki* and *M. rubra* (see Gallé 1991).

M. schencki is a thermophilic oligotope of dry grasslands and forests, while *M. rubra* is a hygrophilous eurytope occupying very diverse habitats, most typically moist and wet meadows (in the study area it occurred only locally; see Gallé 1991). Both species, besides their predatory and scavenging behaviour, are known to exploit food sources of plant origin – either indirectly (honey dew) or directly (floral and extrafloral nectaries) – to a larger extent than most of the other European *Myrmica* species. For more details of biology of these species see e.g. Collingwood (1979), Elmes and Abbott (1981), Nielsen (1981), Seifert (1988, 2007), Czechowski *et al.* (2002). The pollen-eating described in the present paper completes the picture of phytophagy or, more precisely, mellitophagy of these two ant species.

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REFERENCES

- Baroni Urbani C., de Andrade M.L. 1997 – Pollen eating, storing, and spitting by ants – *Naturwissenschaften*, 84: 256–258.
- Collingwood C.A. 1979 – The Formicidae (Hymenoptera) of Fennoscandia and Denmark – *Fauna Entomol. Scand.* 8, 174 pp.
- Creighton W.S. 1963 – Further studies on the habits of *Cryptocerus texanus* Santschi (Hymenoptera: Formicidae) – *Psyche*, 70: 133–143.

- Creighton W.S. 1967 – Studies on free colonies of *Cryptocerus texanus* Santschi (Hymenoptera: Formicidae) – *Psyche*, 74: 34–41.
- Creighton W.S., Nutting W.L. 1965 – The habits and distribution of *Cryptocerus rohweri* Wheeler (Hymenoptera: Formicidae) – *Psyche*, 72: 59–64.
- Czechowski W. 2008 – Around-nest ‘cemeteries’ of *Myrmica schencki* Em. (Hymenoptera: Formicidae): their origin and a possible significance – *Pol. J. Ecol.* 56: 359–363.
- Czechowski W., Radchenko A., Czechowska W. 2002 – The ants (Hymenoptera, Formicidae) of Poland – Museum and Institute of Zoology PAS, Warszawa, 200 + 1 pp.
- de Andrade M.L., Baroni Urbani C. 1999 – Diversity and adaptation in the ant genus *Cephalotes*, past and present (Hymenoptera, Formicidae) – *Stuttgarter Beitr. Naturk. Serie B (Geologie und Paläontologie)*, 271: 1–889.
- Elmes G.W., Abbott A.M. 1981 – Colony populations of *Myrmica schencki* Emery collected in Jutland, Denmark – *Nat. Jutland*. 19: 53–56.
- Gallé L. 1991 – Structure and succession of ant assemblages in a north European sand dune area – *Holarct. Ecol.* 14: 31–37.
- Nielsen G.M. 1981 – Diurnal foraging activity of two ant species, *Myrmica schencki* Emery and *Formica rufibarbis* F., in a sandy heath area – *Nat. Jutland*. 19: 49–52.
- Roche R.K., Wheeler D.E. 1977 – Morphological specializations of the digestive tract of *Zacryptocerus rohweri* (Hymenoptera: Formicidae) – *J. Morphol.* 234: 253–262.
- Seifert B. 1988 – A taxonomic revision of the *Myrmica* species of Europe, Asia Minor, and Caucasia (Hymenoptera, Formicidae) – *Abh. Ber. Naturkundemus. Görlitz*, 62: 1–75.
- Seifert B. 2007 – *Die Ameisen Mittel- und Nordeuropas* – Iutra-Verlags- und Vertriebsgesellschaft, Görlitz, 368 pp. (in German).

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