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***Strumigenys emmae* (EMERY, 1890) (Hymenoptera: Formicidae) in Poland – first record of this pantropic ant species from Europe with remarks on its biology**

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Abstract: The pantropic ant species *Strumigenys emmae* (EMERY, 1890) was found in Poland and Europe for the first time. Two workers were shifted from humid soil in greenhouse in Poznań, Poland. This species coexists with two other tramp ant species – *Hypoponera ergatandria* (FOREL, 1893) and *Tetramorium insolens* (SMITH, 1861) in the same pavilion, as well as with one species native to Poland – *Lasius niger* (LINNAEUS, 1758), which occasionally forages and nests in the building. Ethological assays with all four species were performed and their possible interactions are discussed. Number of tramp ant species found indoors in Poland is raised to 7 and total number of ant species recorded from the country is raised to 108.

Key words: ants, faunistics, new record, tramp species.

INTRODUCTION

Seven species belong to the genus *Strumigenys* SMITH F., 1860 have been reported from Europe so far. These include *S. argiola* (EMERY, 1869) (Austria, Croatia, France, Greece, Hungary, Italy, Portugal, Serbia, Spain, Switzerland, Turkey), *S. baudueri* (EMERY, 1875) (Bulgaria, Croatia, France, Greece, Hungary, Italy, Malta, Serbia, Spain, Switzerland, Turkey), *S. lewisi* CAMERON, 1886 (Malta - introduced), *S. membranifera* EMERY, 1869 (France, Greece, Italy, Malta, Spain, Turkey, pantropic tramp species), *S. rogeri* EMERY, 1890 (Britain, pantropic tramp species), *S. tenuipilis* (EMERY, 1915) (Andorra, France, Greece, Italy, Malta, Spain, Turkey), *S. tenuissima* (BROWN, 1953) (Greece). Three of them (*S. lewisi*, *S. membranifera* and *S. rogeri*) are tropical tramp species, introduced to Europe by human commerce (BOROWIEC 2014).

Strumigenys emmae (EMERY, 1890) together with *S. membranifera* and *S. rogeri*, is a widespread, pantropic tramp species (WETTERER 2011, 2012a, b), reported from plethora localizations in tropics (summarized in WETTERER 2012b), but has never been found in temperate climate indoors, as an introduced species able to survive only in buildings heated during winter.

Strumigenys emmae, as other species representing this genus is small, cryptic ant, which nests and forages in leaf litter, soil or rotten wood, where hunts collembolans and other soil arthropods (HÖLLDOBLER & WILSON 1990).

In this paper, the first finding of *S. emmae* in Poland, as well as in Europe, is reported. Discovery was made indoors, in Poznań Palm House, Poland. This is also first record of a species of the *S. emmae* species-group from Europe.

MATERIAL AND METHODS

Identification of specimens was made with the use of keys in CZECHOWSKI *et al.* (2012), BOLTON (1994, 2000) and SEIFERT (2013, 2018, 2020). Photographs were prepared using a Canon EOS RP camera with Canon mp-e 65 mm f/2.8 lens on a macro rail. Images were stacked in Helicon Focus Pro 7.6.4 software. Voucher specimens are deposited in the author's private collection and in the Nature Collections in the Faculty of Biology at Adam Mickiewicz University in Poznań, Poland.

Behavioral assays were held on 45 mm diameter covered Petri dishes, cleaned with alcohol after each use. One round of each combination was performed without substrate, and one with about 2 mm of soil from the place where the ants were found. Each time one of the *S. emmae* workers was put in the Petri dish, and after 30 minutes of habituation one worker of *Hypoponera ergatandria* (FOREL, 1893), *Tetramorium insolens* (SMITH F., 1861), and *Lasius niger* (LINNAEUS, 1758) was added (separately). On the following day assays were replicated, but with adding 5 workers (following suggestions by ROULSTON *et al.* 2003) from each of co-occurring species. Each test was performed on both workers of *S. emmae*, as only two of them were found. After each test there was a 60 minutes break.

RESULTS

Strumigenys emmae (EMERY, 1890) (Fig. 1)

Poland: Nizina Wielkopolsko-Kujawska (Wielkopolsko-Kujawska Lowland), Poznań, Poznań Palm House (indoors), UTM: XU20 (52°24'06"N 16°54'03"E), 89 m a.s.l., shifted from humid soil, leg. M. Michlewicz, 12.02.2018, 2 workers.

The Poznań Palm House consists of nine pavilions, which are characterized by different temperature and humidity conditions. *Strumigenys emmae* workers were found in the most humid one (Pavilion VII, "rośliny wodne" – water plants), with big water pool in the middle. Ants were shifted from the soil from under a rock of ca. 60 cm diameter. The rock was located near big aquaterrarium with mata-mata (*Chelus fimbriata*) turtles. Soil under a rock was very humid, and the other tramp ant species, *Hypoponera ergatandria* was also numerous present in the shifted sample. Other ant species which were present in that pavilion include one tramp species – *Tetramorium insolens* present in whole object and native species – *Lasius niger*, occasionally nesting and foraging in the greenhouse.

ETHOLOGICAL ASSAYS

In assays with *Hypoponera ergatandria*, workers of *S. emmae* assumed a ball-like shape by contracting its appendages after each antennae contact with *H. ergatandria*. *Hypoponera ergatandria* workers were not aggressive towards *S. emmae*, and only antennae contact was performed. *Strumigenys emmae* workers returned to their normal position after about 5 seconds after each contact.

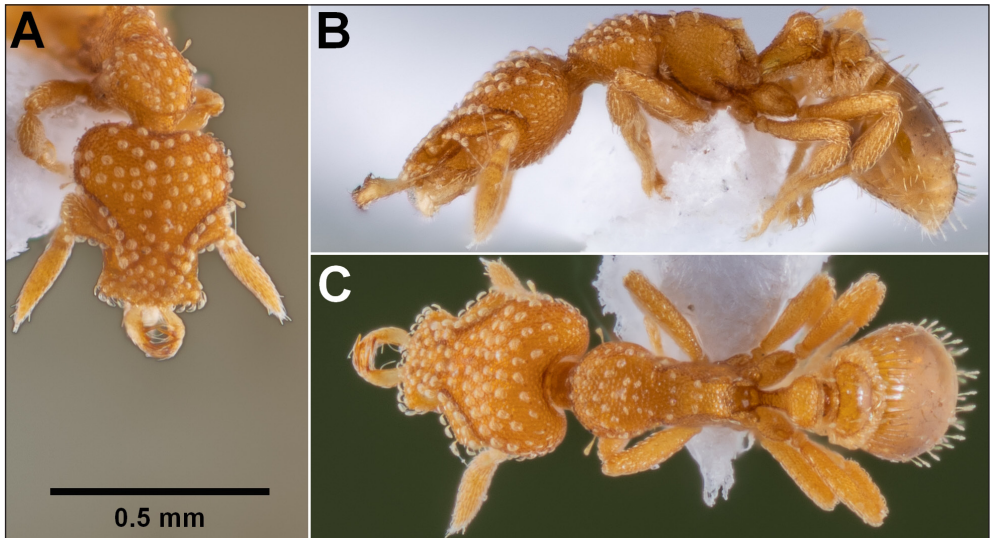


Fig. 1. *Strumigenys emmae* (EMERY, 1890) worker, (A) – head in full-face view, (B) – body in lateral view, (C) – body in dorsal view.

Assays both with *T. insolens* and *L. niger* were similar, but with some differences. Both *T. insolens* and *L. niger* showed aggression towards *S. emmae* workers. Both species were performing biting after some time (about 1-2 seconds) of antennae contact, and *L. niger* performed shaking behavior (quick back and forth movements) during biting attempts. As *S. emmae* workers remain contracted, both *T. insolens* and *L. niger* workers let go after about 5-10 seconds of biting attempts. After that time *S. emmae* workers remain in contracted position longer (compared to assays with *H. ergatandria*) – about 30 seconds.

DISCUSSION

Palm houses and other buildings heated during winter might act as convenient living places for tropical tramp ant species in temperate zone. Some studies show high diversity especially of soil (ZAWIERUCHA *et al.* 2013) and aquatic organisms (KOLICKA *et al.* 2013, 2015, 2016) in such places.

Poznań Palm House was built in 1911, which makes it one of the oldest objects of its kind in Poland. The object was exhaustively studied not only regarding soil and aquatic organisms (cited above), but also ants. First tramp species, *T. insolens*, was reported from Poznań Palm House more than sixty years ago (PISARSKI 1957). Then, after a long time, another global tramp species, *Hypoponera ergatandria*, was reported from that place (SALATA *et al.* 2015). This fact, as well as observations made by the author in other similar sites in Poland (MICHLEWICZ & PLESKOT 2017, other unpublished data obtained by the author) shows, that small, hypogaeic ant species may remain unnoticed for a long time. This may be the reason, why *S. emmae* was undiscovered in that place and why only two workers were found. This meets the results and conclusions by WETTERER (2012b), that *S. emmae* workers, because of their and their colony size, are easy to overlook. If found, only one or two specimens are shifted from the litter in most cases.

Literature data suggest, that *S. emmae* prefers xeric and mesic habitats and mostly occurs in highly disturbed places (DEYRUP *et al.* 2000). In Poznań Palm House it was found in one of the most humid pavilions of the whole object, in humid soil under a rock. Shifting surrounding area (including both dry and humid soil and leaf litter) in that and other pavilions came out negative. This may suggest, that as an effective tramp species, *S. emmae* is able to adapt also to different conditions while living in greenhouse in temperate climate. Observations made by the author suggest, that reason for that may be the fact, that such humid sites were also accumulation places of collembolans, main prey items of *Strumigenys* spp. (WETTERER 2012b).

Biology of *Strumigenys* spp. was studied mostly regarding their food habits (BOLTON 2000, WILSON 1953), but very little effort was put into studying interactions with other ant species. These interactions are especially important in very limited areas, like palm houses, particularly when other ant species are present there. Data obtained through the ethological assays suggest, that because of thanatosis, *Strumigenys emmae* probably is able to coexist with other ant species even if the space is limited. On 45 mm Petri dishes, *S. emmae* workers have not been killed, even by the most aggressive ant, which was used in the assay – *Lasius niger*.

With this paper the total number of ant species recorded from Poland is raised to 108 (including 7 tramp species found indoors).

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