

First record of *Cardiocondyla dalmatica* SOUDEK, 1925 (Hymenoptera: Formicidae) in Austria

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Abstract

The ant *Cardiocondyla dalmatica* SOUDEK, 1925, and also the genus, is recorded from Austria for the first time. The species was found in the National Park Neusiedlersee-Seewinkel, Burgenland, at the margin of “Große Neubrucklacke”, a shallow astatic soda pan. Species identification is explained. The discovery and the habitat are described. The position of a documented nest entrance indicates that nests can be submerged during wet season.

Key words: ants, *Cardiocondyla dalmatica*, first record, Burgenland, national park, Lake Neusiedl, habitat, Austria.

Zusammenfassung

Cardiocondyla dalmatica SOUDEK, 1925 – und damit auch die Gattung – wird erstmals für Österreich nachgewiesen. Die Art wurde im Nationalpark Neusiedlersee-Seewinkel, Burgenland, an den Rändern der Großen Neubrucklacke, einer flachen, astatischen Salzlake gefunden. Die Artunterscheidung wird erklärt. Die Entdeckung und der Lebensraum werden beschrieben. Die Lage eines dokumentierten Nesteingangs lässt darauf schließen, dass Nester in der feuchten Jahreszeit überflutet werden können.

Introduction

In this study we report on the first findings of the ant genus *Cardiocondyla* EMERY, 1869 in Austria. The ants of Austria are well studied, and a checklist includes 133 free living species (STEINER et al. 2017). Two species of *Cardiocondyla* are known from Central Europe in a wide sense (SEIFERT 2018): *Cardiocondyla elegans* EMERY, 1869 and *Cardiocondyla dalmatica* SOUDEK, 1925. *Cardiocondyla elegans* is a West Mediterranean species (SEIFERT 2018) and its distribution range reaches eastwards to the North of Italy (N46.288°, E13.102°; Herbert C. Wagner, in litt.). *Cardiocondyla dalmatica* is distributed from northern Italy (a sympatric zone with *C. elegans* exists), Hungary, and the Balkans to Anatolia, Cyprus, and Iran (SEIFERT 2018). Both species are closely related to each other. *Cardiocondyla dalmatica* was originally described as a variation of *C. elegans* that was synonymized by RADCHENKO (1995), which was followed by SEIFERT (2003, 2007). However, SEIFERT (2018: 187) considered it as an “eastern parapatric sibling species of *C. elegans*”, based on unpublished morphometric data. At present, a safe identification is only possible by a morphometric analysis following SEIFERT (2018).

The surprising findings of *C. dalmatica* happened in the course of an inventory project of the aculeate Hymenoptera at the margins of the soda pans in Seewinkel (District Neusiedl am See, Burgenland), part of the National Park Neusiedler See-Seewinkel.

Material and methods

Specimens examined: 12 workers from Burgenland, District Neusiedl am See, NE of Illmitz, near Rosalia chapel, at margin of “Große Neubrucklacke”, 119 m a.s.l., ca. N47°47.0', E 16°50.6', 29.VII.2021, leg. H. Zettel, det. A. Laciny; 4 workers, from the same locality, 3.VIII.2021, leg. H. Wiesbauer; 4 workers, from the same locality, 10.IX.2021, leg. H. Zettel. Some specimens were dry-mounted, others kept in ethanol; deposited in the authors' reference collections, in the Natural History Museum Vienna, and in the Biology Centre in Linz (Upper Austria).

Identification: The specimens were identified with the key of SEIFERT (2018: p. 82), which uses a discriminant function to separate *C. dalmatica* and *C. elegans*. For a definition of “MGr”, which by error is unexplained in SEIFERT (2018), we used SEIFERT (2003). Five randomly selected specimens were used for morphometric analysis. Specimens were card-mounted, labelled with individual numbers, and measured with a Nikon SMZ1500 binocular microscope equipped with an ocular micrometre, at 125× magnification.

Acronyms used for morphometry (after SEIFERT 2018 and SEIFERT 2003):

- MGr Depth of metanotal groove or depression, measured in lateral view, from the tangent connecting the dorsalmost points of promesonotum and propodeum.
- PeH Maximum petiole height, measured in lateral view, perpendicular to the straight section of ventral petiolar profile at node level.
- PeW Maximum width of petiole, measured in dorsal view.
- PoOc Postocular distance, measured in position of maximum head length, from median occipital margin to median head at the level of the posterior eye margin.
- PpW Maximum width of postpetiole, measured in dorsal view.
- SP Maximum length of propodeal spines; measured in dorsofrontal view, from spine tip to a line orthogonal to the long axis, that touches the bottom of the interspinal meniscus.
- D Discriminant, calculated as:
$$56.7*SP + 156*PeW - 61.9*PoOc - 126.2*PeH - 48.2*PpW + 126.6*MGr + 17.86$$

Field observations at the collection site were conducted by the first and third author in July and August, 2021.

Results

Discovery

The discovery of *C. dalmatica* on July 29 was a lucky circumstance, as the focus of collections was not on ants, but on winged Aculeata like digger wasps and wild bees (Apoidea). When the first author swept the flowers of narrowleaf trefoil, *Lotus tenuis* (Fabaceae; Fig. 1), near the margins of “Große Neubrucklacke” (Figs. 2–3), a soda pan, many small narrow myrmecine ant workers were in the net. He recognized them as “unusual” and “not yet known from Austria”. The ants were very numerous (> 50 workers) and only a small fraction was collected for identification.



Figs. 1–4: (1) A flowering specimen of narrowleaf trefoil, *Lotus tenuis*, at the margin of Große Neubuchlacke. (2) A red backpack marks the nesting site in an overview of the habitat. (3) Location of the nest at the transition between patchy and very patchy vegetation at Große Neubuchlacke. (4) Size of the minute nest entrance (red arrow) compared to a 1 Eurocent coin. © 1: H. Zettel; 2–4: H. Wiesbauer.



Figs. 5–6: (5) Worker of *C. dalmatica* at the nest entrance that is still under construction. (6) Workers at the finished nest entrance. The material around the entrance is strongly solidified, the small, circular entrance hole can be closed when flooded. © H. Wiesbauer.



Figs. 7–8: (7) Worker of *C. dalmatica* (left) moving sediment out of the nest. Another worker (centre) shows aggression towards a third worker, which is probably from another nest. (8) Worker transporting a mite (Trombidiidae) out of the nest. © H. Wiesbauer.

Tab. 1: Morphometric values and discriminant results of five measured specimens of *C. dalmatica*.

Specimen	SP	PeW	PpW	PoOc	PeH	MGr	D
1	0.051	0.192	0.320	0.256	0.205	0.019	-4.032
2	0.064	0.186	0.333	0.244	0.192	0.019	-2.514
3	0.071	0.173	0.321	0.256	0.186	0.019	-3.517
4	0.064	0.167	0.308	0.237	0.179	0.013	-3.046
5	0.071	0.173	0.333	0.256	0.192	0.019	-4.944

Identification by morphometry

The morphometric data of five randomly selected worker specimens were analysed using the discriminant function provided in SEIFERT (2018: p. 82). All examined specimens scored < 0 , consistent with the identification as *C. dalmatica*. Values of examined characters (in millimetres) and discriminants are given in Table 1.

Description of a nesting site

A closer examination of the site by the third author led to the discovery of a nest entrance of *C. dalmatica*. The entrances are extremely small, simple holes (Figs. 4–6) and can only be seen when following foraging worker ants. For further studies and to take more photographs, the site was revisited by the third author on August 3 and August 22.

A nest was located 79 m from the nearest road (Figs. 2, 3), at the south-western bank of the “Große Neubruchlacke”, within a transitional zone which is flooded for several days to weeks annually. The lake’s shallow edges lead to drastic fluctuations of the submerged area, even with only slight changes to the water level.

Pedologically, the locality can be characterized as “solonchak” (salt marsh soil). In close vicinity to the nest, halophytic plants were growing in patchy configuration. The vegetation was dominated by seepweed (*Suaeda prostrata*) while narrow-leaf knotweed (*Polygonum bellardii*) was present in smaller numbers. These annual plants develop in the short temporal window between spring and late fall. In contrast, the marginally less elevated bordering area was bare.

The water levels of the Seewinkel’s soda pans normally show distinct annual patterns with their highest levels in late winter and lowest levels in the fall. These fluctuations mainly result from changes in precipitation, air temperature, wind, and radiation. In the neighbouring “Lange Lacke”, the annual water level fluctuations amount to 25–40 cm (STEINER 2006).

At the time of observation (August 3, 2021), at the end of a dry summer period, the nest entrance was located only approximately 15 cm above the water level. Photographs from spring and winter show that the nesting site is frequently flooded over long periods of time.

Behavioural observations

On August 3, ant workers were transporting sediment out of the nest (Fig. 7). This suggests that it may be a newly founded colony or an older colony performing an enlargement or

translocation of the nest. One ant was observed transporting a mite and disposing of it only a few centimetres from the nest entrance (Fig. 8). Another species of ant, *Tetramorium immigrans* SANTSCHI, 1927, was found to live syntopically.

On August 22, the same nest was located after a brief search. Construction of the nest entrance had been finished in the meantime (Fig. 6). The entrance hole was circular and only around 1.2 mm in diameter (Fig. 4), facilitating a quick closing of the nest. The sediment at the entrance was very firm and could hardly be disturbed, even with forceps. At this time, no nest-construction activities (carrying sediment) were observed anymore, suggesting that the nest building process was finished.

On August 30, after heavy rainfall and at rather cold weather conditions, the first author could not detect any specimens. On September 10, a warm and sunny day, a few more specimens were swept from *Lotus tenuis*.

Discussion

According to SEIFERT (2018: 187), *C. dalmatica* is “strongly thermophilous”. “Natural habitats are probably open riverine or coastal sand-gravel banks and dunes with very sparse herb layer”. He also mentions a “considerable habitat shift to anthropogenous sites”.

The examined nest site of *C. dalmatica* is very special, as hardly any other ants occur there. Only a few specimens of *Tetramorium immigrans* were observed. This agrees with observations of Herbert C. Wagner (in litt.) on the gravelled banks of Tagliamento river, northeast of Osoppo (Italy), where *C. elegans* was the only ant in its habitat. The extreme conditions of this saline environment (patchy vegetation, low pH, flooding) may confer fitness benefits to the ant in competition with other species. However, the place where *C. dalmatica* was swept from *Lotus tenuis* is farther away from the water edge; here other ants were also observed (e.g., *Tapinoma subboreale* SEIFERT, 2011).

The ant fauna of the Seewinkel (District Neusiedl am See) is relatively well investigated (e.g., MALICKY 1986, ASSING 1987, 1989), although many collections are not published in detail (e.g., GEISER et al. 1993). Many identifications from such studies require re-examination after the numerous changes in the taxonomy of Central European ants. There is, however, no doubt that the genus *Cardiocondyla* has hitherto never been reported from Burgenland or any other part of Austria. – How can the new records be interpreted? It is not unlikely that the thermophilous species is presently expanding its territory due to climatic change. On the other hand, *Cardiocondyla dalmatica* may have simply been overlooked. Its habitat is not typical for ants and myrmecologists may not have examined such extreme places.

Although *C. dalmatica* is known from Hungary (SEIFERT 2018, CSÓSZ et al. 2021), specific records are scarce. We received unpublished records from B. Seifert (in litt.) and A. Tartally (in litt.), listed here from East to West: Debrecen: N 47°33', E 21°37'; Szarvas: N 46°51', E 20°32'; Szeged: N 46°15', E 20°09'; Balassagyarmat: N 48°04', E 19°17' (this record can be found on ANTWEB (2021) under the name *C. elegans*); Mohács: N 46°00', E 18°39'. The species is not yet recorded from Western Hungary. Closest to the Austrian record is Mohács, at about 180 km distance from the locality in Illmitz. Slightly closer (c. 150 km) is a record of *C. elegans* from southern Slovakia (Chľaba: N 47°49', E 18°51'; BEZDĚČKA & TĚTÁL 2013), which likely refers to *C. dalmatica* from a zoogeographical point of view.

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