

# ***Myrmecophilus jordanicus*, a new species of ant cricket from Jordan and Israel, with notes on the synonymy of *Myrmecophilus nigricornis* (Orthoptera: Myrmecophilidae)**

THOMAS STALLING

Möndenweg 26, D-79594 Inzlingen, Germany. E-mail: [stalling@gmx.de](mailto:stalling@gmx.de)

<https://orcid.org/0000-0003-2734-4922>

## ABSTRACT

A new species of ant cricket, *Myrmecophilus* (*Myrmophilina*) *jordanicus* n. sp., is described from Israel and Jordan. Detailed information is provided about the host ant species of this myrmecophilous species and its habitat. *Myrmecophilus nigricornis* Chopard, 1963, n. syn., is considered a junior synonym of *Myrmecophilus ochraceus* Fischer, 1853, and the fate of the type specimens of the latter is discussed.

KEYWORDS: Biodiversity, Orthoptera, Myrmecophilidae, ant crickets, new species, new synonymy, systematics, taxonomy, Levant, Middle East.

## INTRODUCTION

Ant crickets of the genus *Myrmecophilus* Berthold, 1827 are minute myrmecophilous crickets that inhabit ant nests as commensals. Some species of *Myrmecophilus* are associated with particular host ant species, while others are generalists and may cohabit with different ants (Hölldobler & Kwapich 2022). The genus comprises 64 species and is found in North and Central America, in the northwestern part of South America, the central and southern Europe, North Africa, Middle, Southern and South-Eastern Asia, Australia and on various tropical and subtropical islands, being partly introduced with invasive ant species. The genus is not recorded from the Sub-Saharan Africa, main part of South America and the northern regions of the Holarctic Region (Hsu *et al.* 2020; Cigliano *et al.* 2024). The genus *Myrmecophilus* is currently subdivided into three subgenera *Myrmecophilus* Berthold, 1827, *Myrmophilina* Silvestri, 1912, and *Paramyrmecophilus* Gorochov, 1986 (Cigliano *et al.* 2024).

Four ant cricket species have been reported from Israel and Jordan so far. Two species of the nominal subgenus *Myrmecophilus*: *M.* (*Myrmecophilus*) *orientalis* Stalling, 2010, described from Jordan and Eastern Turkey (Stalling, 2010) has since been found in various places throughout Israel (specimens in the collection of the Steinhardt Museum of Natural History, Tel Aviv, and unpubl. data by A. Weinstein), and *M.* (*Myrmecophilus*) *wahrmani* Chopard, 1963 described from the southern part of Israel (Chopard, 1963) has since been found in other places in Israel and Jordan (Stalling *et al.* 2024). Two other species belong to the subgenus

*Myrmophilina*: *M. (Myrmophilina) americanus* Saussure, 1877 (Chopard, 1963), and *M. (Myrmophilina) nigricornis* Chopard, 1963, described from Israel (Chopard 1963) and later mentioned for Jordan (Stalling 2010). Wetterer and Hugel (2014) suggested that specimens identified by Chopard (1963) might instead belong to *Myrmecophilus cottami* Chopard, 1922 or *Myrmecophilus surcoufi* Chopard, 1919, but did so without examining the relevant specimens. However, the material collected in the last years by A. Weinstein confirms the presence of *M. americanus* in Israel.

In this study, museum materials and specimens collected by myself have been examined to update the information on the ant crickets of the Middle East. A previously undescribed species has been found, and another species has been recognized as a junior synonym of *Myrmecophilus ochraceus* Fischer, 1853.

#### MATERIALS AND METHODS

This study is based on the specimens of *Myrmecophilus* stored in the following collections and institutions: the Steinhardt Museum of Natural History, Tel Aviv University, Tel Aviv, Israel (SMNHHTAU); Muséum National d'Histoire Naturelle, Paris, France (MNHN); and the private Research Collection of Thomas Stalling, Inzlingen, Germany (RCTS).

Serial images of specimens were combined with Zerene Stacker v.1.04. Measurements were taken using the 'Fiji' software (Schindelin *et al.* 2012). Specimen identification was performed following Chopard (1963) and Stalling (2010), and by direct comparison with material of other species occurring in the Middle East.

#### TAXONOMY

Family Myrmecophilidae Saussure, 1874

Genus *Myrmecophilus* Berthold, 1827

Subgenus *Myrmophilina* Silvestri, 1912

***Myrmecophilus jordanicus* n. sp.**

(Figs 1, 2)

**LSID:** urn:lsid:zoobank.org:act:68AC20F4-8A4E-431C-9EF3-D1E25A4280F3.

**Etymology:** This species is named after the Jordan River, which flows in the midst of its distribution area.

**Diagnosis:** *Myrmecophilus jordanicus* n. sp. differs from *M. (Myrmophilina) ochraceus* and *M. (Myrmophilina) cyprius* Stalling, 2017 in having the overall darker body and visibly shorter setae (setae on frons only about half as long as the diameter of the antennae on the third segment, but about as long as the diameter of the antennae in *M. ochraceus* and *M. cyprius*; appressed setae on pronotum and tergites about 0.02 mm long, while they are about 0.03 mm in *M. ochraceus* and *M. cyprius*). The ovipositor of *M. jordanicus* n. sp. has straight outer edges in the apical area, whereas it has convex outer edges in *M. ochraceus* and *M. cyprius*. The



**Figs 1, 2.** Holotype of *Myrmecophilus jordanicus* sp. n. (female), Ma'an Governorate, Shawbak, Jordan (20.v.2009): (1) lateral view, (2) dorsal view. Scale bars: 1 mm.

new species differs from *M. (Myrmophilina) americanus* in being paler and much larger (the latter is dark reddish brown with a pale beige mesonotum, and has an average body length of 1.9 mm in females and 1.4 mm in males) and in having only one spine in the proximal third on the basitarsus (usually two spines, one proximal and one distal, are present in *M. americanus*). The female ovipositor is elongated in *M. jordanicus* n. sp., whereas the outer valvae of the ovipositor are ladle-shaped in *M. americanus*.

**Description: Adult female.** Measurements: body length 2.3 mm; pronotum 0.9 mm long and 1.4 mm wide; hind femur 1.3 mm; hind tibia 1.1 mm; cerci 1.3 mm;

ovipositor 1.3 mm. Body hump-backed; pronotum arched, narrowed distally; body rufous-ochreous, except slightly paler posterior half of pronotum (Fig. 1). Pronotum and tergites densely covered with short, about 0.02 mm, appressed setae; frons with about 0.05-mm-long setae. Antennae almost as long as body and dark ochreous; first two segments pale ochreous. Labrum, labium and palpi dark ochreous; maxillar palpi five-segmented; labial palpi three-segmented. Eyes black, round. Hind legs: hind femur 1.4× as long as wide; hind tibia with five spurs on inner side and three spines on outer side; first segment of basitarsus slender with one spine in proximal third and two apical spurs. Cerci round in cross-section, pointed distally, and densely covered with appressed setae, with long, robust, erect setae among them. Epiproct small and rounded, not recessed. Subgenital plate rounded, not recessed; inner valvae (viewed ventrally) rounded, about 5× as long as wide; outer valvae in lateral view elongated with rounded tip, slightly flattened apically (Fig. 2).

**Male.** Males appear similar to females, but slightly smaller (body length 2.1 mm), with subgenital plate short and recessed, covered with golden-yellow setae. Male phallic complex has dorsal ends of clearly visible epiphallic ancorae. (The internal male phallic complex has not been dissected to preserve the only existing male paratype.)

**Variability:** The paratypes vary in size only.

**Holotype:** ♀ adult **Jordan:** “20.5.2009 / JOR-Shawbak / N 30° 31' 44.3" / E 35° 33' 01.9", 1400 m / leg. D. & T. Stalling / Holotype *Myrmecophilus / jordanicus* / Stalling, 2024”. There is also a host ant specimen on the needle (*Messor* sp.). The holotype is deposited in the SMNHTAU collection.

**Paratypes:** **Jordan:** *Ma'an Governorate:* 2♀ nymphs, Shawbak, 30°31'44"N 035°33'02"E, 1400 m, 20.v.2009, D. & T. Stalling, in *Messor* nest (RCTS); *Ajloun Governorate:* 2 ex. (♂ adult and nymph of unidentified sex), Ajloun, 32°19'21"N 35°43'50"E, 890 m, 29.v.2009, D. & T. Stalling, in *Messor luridus* Santschi, 1927 nest (RCTS). **Israel:** ♀ adult, *Samaritan Desert:* Migdalim, 32°05'06"N 035°21'05"E, 700 m, 8.xii.2017, L. Friedman (SMNHTAU).

**Distribution:** Israel and Jordan.

**Biology and habitat:** The new species lives in the nests of the harvester ants of the genus *Messor* Forel, 1890. In Jordan, the species was found in the semi-arid Mediterranean bioclimatic zone in stony grassland with small perennial bushes grazed by goats (Shawbak, Fig. 3), and in the sub-humid Mediterranean bioclimatic zone in limestone hills, covered by evergreen Kermes Oak forest (*Quercus coccifera*), partly cultivated with olive groves and crop fields (Ajloun). Both localities belong to the Mediterranean vegetation region (Al-Eisawi 1996). In Israel, the species was found in the transition area—between the Mediterranean zone and a semi-desert consisting of bare hills—covered by the Mediterranean scrub comprising *Sarcopoterium spinosum*, *Amygdalus* sp. and *Crataegus* sp., with geophytes such as *Drimia maritima* (L. Friedman, pers. comm., Fig. 4).

**Remarks:** *Myrmecophilus jordanicus* sp. n. belongs to the subgenus *Myrmophilina* Silvestri, 1912 with respect to the following characteristics: outer valvae of female (viewed laterally) rounded (vs. double-pointed in the subgenus *Myrmecophilus*); setae on the front and antenna long, erect and bushy (vs. short and inconspicuous



**Figs 3, 4.** (3) Habitat of *Myrmecophilus jordanicus* sp. n., Ma'an Governorate, Shawbak, Jordan (20.v.2009); (4) habitat of *Myrmecophilus jordanicus* sp. n., Samarian Desert, Migdalim, Israel (25.iii.2024; photo by L. Friedman).

in the subgenus *Myrmecophilus*); hind basitarsus with one spine in the proximal position (two or three dorsal spines in the proximal, medial and sometimes distal positions in the subgenus *Myrmecophilus*).

The internal male phallic complex has not been dissected in order to preserve the only existing male paratype, and because its significance for the differentiation of the *Myrmecophilus* species is unclear.

Subgenus *Myrmophilina* Silvestri, 1912

*Myrmecophilus ochraceus* Fischer, 1853

(Fig. 5)

*Myrmecophilus ochraceus* Fischer, 1853: 21–22.

*Myrmecophilus nigricornis* Chopard, 1963: 174–175, n. syn.

**Material examined:** **Israel:** *Judean Hills:* ♀ adult, Abu Gosh near Jerusalem, 7.v.1948, A. Moscona (MNHN); *Central Negev:* ♀ adult, Wadi Abyad, 27.iii.1952, J. Wahrman (MNHN); ♀ adult, Asluj, 26.xii.1956, O. Yarkoni (SMNHTAU).

#### **Taxonomic status of *Myrmecophilus nigricornis***

*Myrmecophilus nigricornis* was described by Chopard in 1963 based on material from the Jerusalem area in Israel. According to the original description, the holotype had been deposited in the “Hebrew University Collection”, which was transferred to the National Collection of Insects of Tel Aviv University in 1992 and should have been kept in the SMNHTAU, but could not be located (L. Friedman, pers. comm.). Subsequently, I examined the Orthoptera collection of the National Museum of Natural History in Paris that houses a lot of Chopard material, but failed to locate the labelled *M. nigricornis* holotype there as well. However, a female specimen designated by Chopard as a paratype of this species with the exact collecting data of the holotype was found, labelled as: “PARATYPE / MNHN-EO-ENSIF4499 / A. Moscona 7.v.1948 / Israel Abu Gosh near Jerusalem / *Myrmecophilus nigricornis* Chp. PARATYPE” (Fig. 5). Since the data of the holotype corresponded to this specimen instead of the paratype data given by Chopard (1963), I presume that it is the actual holotype, which was mistakenly labelled as a paratype instead of the holotype.

We also found two (out of five) assumed paratypes of *M. nigricornis* in the examined holdings of the SMNHTAU and MNHN, both not labelled as paratypes: one adult female from Asluj [=Mash'abe Sade, 31°00'N 34°46'E] and another adult female from Wadi Abyad [=Nahal Lavan, 30°54'N 34°31'E], which probably belongs to *M. jordanicus* n. sp.

Chopard (1963) did not provide any differential diagnosis for *M. ochraceus* in the original description of *M. nigricornis*. The presumed holotype, an adult female, clearly shows all the characteristics of the subgenus *Myrmophilina*. It has a beige coloured body, long setae on the frons and body, an elongated ovipositor with straight outer edges at the tip, which distinguishes it from both *M. jordanicus* n. sp. and *M. americanus*. The whereabouts of the holotype of *M. ochraceus* is unknown



Fig. 5. Presumed holotype specimen of *Myrmecophilus nigricornis* Chopard, 1963 with the corresponding labels, in the collection of the National Museum of Natural History, Paris, France; Collection: Insects - Orthoptera (EO), Specimen MNHN-EO-ENSIF4499. Photo by Marion Depaertere.

(Cigliano *et al.* 2024); therefore, it cannot be used for verification purpose. Instead, various specimens of *M. ochraceus* from the author's collection from the area of the type locality in Sicily have been used for comparison. No characters distinguishing *M. nigricornis* and *M. ochraceus* could be found; consequently, *M. nigricornis* Chopard, 1963 is here considered a junior subjective synonym of *M. ochraceus* Fischer, 1853.

#### DISCUSSION

The genus *Myrmecophilus* from the eastern Mediterranean has been poorly studied due to the scarcity of the available material. The discovery of an undescribed species in this area is therefore not surprising, and it is to be expected that further new species will be discovered in the future. The differentiation of the species is not easy, which is why the specimens of *M. jordanicus* n. sp. from Jordan, which are used here as the type specimens, were erroneously regarded as *M. orientalis* (paratypes) and *M. nigricornis* by Stalling (2010).

*Myrmecophilus ochraceus* was originally described by Fischer (1853) from Sicily, but the species is widely distributed in the Mediterranean region. Its range extends from Morocco and Spain in the west to Greece, Turkey and Syria in the

east (Ramme 1951; Willemse & Willemse 2008; Espadaler & Olmo-Vidal 2011; Ünal 2011; Stalling 2016). The occurrence in Israel fits well into this distribution pattern, expanding the distribution of *M. ochraceus* further to the south.

#### ACKNOWLEDGEMENTS

Many thanks are due to Netta Dorchin and Laibale Friedman (SMNHATAU, Israel), Laure Desutter-Grandcolas (MNHN, France), Martin Husemann (State Museum of Natural History, Karlsruhe, Germany) and Amir Weinstein (SMNHATAU, Israel) for providing specimens for examination, to Brian Taylor (Nottingham, United Kingdom) for identifying the host ants and to Ionuț Ștefan Iorgu (Suceava, Romania), two anonymous reviewers and Mike B. Mostovski (SMNHATAU, Israel) for helpful comments on the manuscript.

#### REFERENCES

- AL-EISAWI, D.M.H. 1996. *Vegetation of Jordan*. UNESCO, Regional Office for Sciences and Technology for the Arab States, Cairo. 284 pp.
- CHOPARD, L. 1963. Notes sur la faune des orthopteroïdes d'Israël et de quelques régions limitrophes (Blattodea, Gryllacridoidea, Gryllodea). *Bulletin of the Research Council of Israel* **10b**: 161–176.
- CIGLIANO, M.M., BRAUN, H., EADES, D.C. & OTTE, D. 2024. *Orthoptera Species File Online*. Version 5.0/5.0. <http://Orthoptera.SpeciesFile.org> (accessed 07.01.2024)
- ESPADALER, X. & OLMO-VIDAL, J.M. 2011. The myrmecophilic cricket *Myrmecophilus* in Spain (Orthoptera, Myrmecophilidae). *Sociobiology* **57**: 321–328. <https://core.ac.uk/download/pdf/147043397.pdf>
- FISCHER, L.H. 1853. *Orthoptera Europaea*. Paris, London. 454 pp.
- HÖLLDOBLER, B. & KWAPICH, C.L. 2022. *The guests of ants: How myrmecophiles interact with their hosts*. Belknap Press of Harvard University Press, Cambridge, MA. 576 pp.
- HSU, P.-W., HUGEL, S., WETTERER, J.K., TSENG, S.-P., OOI, C.-S.M., LEE, C.-Y. & YANG, C.-C.S. 2020. Ant crickets (Orthoptera: Myrmecophilidae) associated with the invasive yellow crazy ant *Anoplolepis gracilipes* (Hymenoptera: Formicidae): evidence for cryptic species and potential co-introduction with hosts. *Myrmecological News* **30**: 103–129. [https://doi.org/10.25849/myrmecol.news\\_030:103](https://doi.org/10.25849/myrmecol.news_030:103)
- RAMME, W. 1951. Zur Systematik, Faunistik und Biologie der Orthopteren von Südost-Europa und Vorderasien. *Mitteilungen aus dem Zoologischen Museum in Berlin* **27**: 1–431.
- SCHINDELIN, J., ARGANDA-CARRERAS, I., FRISE, E., KAYNIG, V., LONGAIR, M., PIETZSCH, T., PREIBISCH, S., RUEDEN, C., SAALFELD, S., SCHMID, B., TINEVEZ, J.Y., WHITE, D.J., HARTENSTEIN, V., ELICEIRI, K., TOMANCAK, P. & CARDONA, A. 2012. Fiji: an open-source platform for biological-image analysis. *Nature Methods* **9**(7): 676–682. <https://doi.org/10.1038/nmeth.2019>
- STALLING, T. 2010. A new species of ant-loving cricket, *Myrmecophilus* Berthold, 1827, and comments on *M. nigricornis* (Chopard, 1963) from the Middle East (Orthoptera: Myrmecophilidae). *Zoology in the Middle East* **49**(1): 89–94. <https://doi.org/10.1080/09397140.2010.10638394>
- STALLING, T. 2016. The presence of the ant-loving Cricket *Myrmecophilus ochraceus* in Sardinia, Italy (Orthoptera: Myrmecophilidae). *Fragmenta entomologica* **48**(1): 17–18. <https://doi.org/10.13133/2284-4880/164>
- STALLING, T., Waitzbauer, W. & Weinstein, A. 2024. Contribution to the knowledge of the ant cricket *Myrmecophilus wahrmani* Chopard, 1963 (Orthoptera: Myrmecophilidae) with the description of the female. *Zoology in the Middle East* **70**(1): 74–79. <http://dx.doi.org/10.1080/09397140.2024.2314339>
- ÜNAL, M. 2011. *Turkish Orthoptera Site (TOS)*. <http://www.orthoptera-tr.org> (accessed 13.03.2024)
- WILLEMSE, F. & WILLEMSE, L. 2008. An annotated checklist of the Orthoptera-Saltatoria from Greece including an updated bibliography. *Articulata Beiheft* **13**: 1–91.