Hindawi Publishing Corporation
Psyche
Volume 2012, Article ID 391525, 3 pages
doi:10.1155/2012/391525

Research Article

Unusual Ant Hosts of the Socially Parasitic Ant *Anergates atratulus* (Schenck, 1852) (Hymenoptera, Formicidae)

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Received 2 December 2011; Revised 2 February 2012; Accepted 24 February 2012

Academic Editor: Robert Matthews

The extreme inquiline ant *Anergates atratulus* (Schenck, 1852) (Hymenoptera, Formicidae) was collected in ant nests of *Tetramorium moravicum* Kratochvil, 1941 in Bulgaria and of *T. chefketi* Forel, 1911 in Bulgaria and Turkey. The reported ant hosts belong to the *Tetramorium chefketi* species complex in contrast with the typical hosts from *Tetramorium caespitum*/*impurum* complex. This finding confirms the assumption that a broader range of host species for the socially parasitic species *A. atratulus* may be expected. Present data on the new host species expand knowledge about biology of this rare ant species, included in the IUCN Red List of threatened species.

1. Introduction

Anergates atratulus (Schenck, 1852) is a rare workerless socially parasitic ant from the Palaearctic region, which has even been introduced together with its host in North America [1]. This extreme inquiline is represented only by female and pupoid type male individuals, whose morphology and anatomy indicate a highly specialized level of parasitism [2]. The body of males is depigmentated, the cuticle is thin, the petiole and postpetiole are widely connected, and degenerate mandibles, palps, and antennae are observed. Female wing venation is reduced and the occipital region is narrowed [3]. Mature females are typically physogastric and found in queenless host nests [2, 3].

Although *A. atratulus* was reported previously mainly in *Tetramorium caespitum* (Linnaeus, 1758) and *T. impurum* (Förster, 1850) [4–7] nests within the *Tetramorium caespitum*/*impurum* complex, it was also recorded from Sicily (Italy) from a nontypical low altitude (300 m) in a nest of *T. diomedeum* Emery, 1908, which is a member of the *Tetramorium ferox* complex [8]. Future clarification of the complicated taxonomic composition of the *Tetramorium caespitum*/*impurum* complex will probably enlarge the number of known host ant species parasitized by *A. atratulus* [5].

The only report about *T. chefketi* Forel, 1911 as a host of *A. atratulus* was given by Schulz and Sanetra [9] as an amendment of the identified material published by Heinze [10] from Tavşanli (Turkey, Kütahya district). *Tetramorium moravicum* Kratochvil, 1941 was also mentioned in Sanetra and Buschinger [5] as a possible host of *A. atratulus*, but without any additional data and references.

In Bulgaria, *A. atratulus* was reported to parasitize *T. caespitum* nests in several mountains—the Western Balkan Range, Vitosha, Osogovska, Rhodopes, and the Black Sea coast [11, 12], but no specific habitats and collecting data for this species were given in these studies.

The first data on the presence of *A. atratulus* in Turkey was given by Heinze [10] who reported parasitized *T. chefketi* nests in Anatolia [9]. Following the record of Çamlitepe and Aktaç [13] from the European part of Turkey without mentioning the host species, Aktaç et al. [14] recorded *A. atratulus* in a *T. caespitum* nest in the same region (Kofçaz-Ahmetler Village, Kirklareli district). More recently, Schulz and Sanetra [9] found this species in a *T. caespitum* nest in Erciyes Mountain, Kayseri district in Anatolia.

The present study identifies known localities of *A. atratulus* in Bulgaria and Turkey from nests of two nontypical ant host species: *T. chefketi* and *T. moravicum*. The new data

broaden the knowledge about the biology of this extremely rare ant species, included in the IUCN Red List of threatened species [15].

2. Results

2.1. *Anergates atratulus (Schenck, 1852)*

2.1.1. Studied Material from Bulgaria. Eastern Rhodopes, Krumovgrad district, near Golyama Chinka Village (41°24′28″ N 25°34′43″ E), 430 m, 21.07.2009, leg. A. Lapeva-Gjonova, 1 gyne in a nest of *Tetramorium chefketi*; Konyavska Mountain, Kyustendil district, the main road to the TV tower (42°21′54″ N 22°49′39″ E), 1170 m, 22.09.2009, leg. A. Lapeva-Gjonova, 3 gynes in a nest of *Tetramorium moravicum*.

The first habitat is in the Eastern Rhodopes (South Bulgaria)—a mountain with relatively low altitude and increased Mediterranean climate influence. The collecting locality was situated in an open dry area close to an oak and pine forest. One alate *A. atratulus* gyne was collected from a *T. chefketi* nest under a stone. The second habitat was in the Konyavska Mountain (West Bulgaria), where three alate gynes were collected from a *T. moravicum* nest, also under a stone, on talus in the beech forest belt.

2.1.2. Studied Material from Turkey. Sündiken Mountain, Eskişehir district, Mihalicçik-Yalimkaya Village (39°58′ 31″ N 31°14′05″ E), 1198 m, 10.08.2010, leg. K. Kiran and V. Aksoy, 1 gyne in a *T. chefketi* nest; Bozok Plateu, Yozgat district, Büyükincirli Village (39°38′17″ N 34°55′08″ E), 1049 m, leg. K. Kiran and V. Aksoy, 1 gyne in a *T. chefketi* nest.

The first habitat was in the northwest of Central Anatolia in an old forest zone, almost more than 100 years old, occupied by *Pinus nigra* Arn. trees. The slope of the area was nearly 30% and the underlying stones were very few and small. The second locality was a broad river bank with *Salix* and *Populus* trees in the steppe zone of northeast Central Anatolia. Both gynes were collected from nests in the ground without stones on them.

No gynes of the host *Tetramorium* species were found in any of the investigated nests.

3. Discussion

Tetramorium chefketi and *T. moravicum* from the *Tetramorium chefketi* species complex are nontypical hosts of the socially parasitic ant *A. atratulus*. This study provides the first specific data about the presence of *A. atratulus* in a nest of *T. moravicum*, a xerophilous species inhabiting sunny, dry, and open places with low and scarce herb vegetation [16]. This ant host species is distributed in the Western Palaearctic from Southern France to the Caucasus [17].

The present record from Bulgaria represents the first report of *A. atratulus* parasitizing a *T. chefketi* nest in Europe since Heinze [10] and the redetermination of the host species *T. caespitum* given by Schulz and Sanetra [9] from the Anatolian part of Turkey. In Bulgaria, however, the habitat of the host is situated at a much lower altitude (430 m) than in Tavşanli (1000 m) in Turkey. *Tetramorium chefketi* is a species distributed from the eastern part of Southern Europe to Kyrgyzstan [17].

Host queens were not found in any of the parasite-occupied nests, supporting previous data about *A. atratulus*'s exploitation of already orphaned *Tetramorium* colonies [2, 3].

Our results confirm the previous suggestion that *A. atratulus* parasitizes a wide range of ant host species of the genus *Tetramorium*. Although *A. atratulus* usually exploits *T. caespitum*, a common Palaearctic ant species, this inquiline species is very rare and is included in the IUCN Red List of threatened species. Conservation measures are aimed to protect host ant species and the habitats they occupy. *Tetramorium chefketi* and *T. moravicum* inhabit mainly, as in the case of *T. caespitum,* open, sun-exposed, and dry areas. Future investigations will clarify whether *T. chefketi* and *T. moravicum* are normally local hosts of *A. atratulus* or not. However, data from these two host *Tetramorium* species might have been rare simply due to their limited geographical distributions compared to *T. caespitum*. Present results will be useful for local-scale needs in conservation management of native xerophylous places and for examining the evolution of specific social parasite-host relationships.

Acknowledgments

The authors would like to thank Professor A. Buschinger for the useful information about the *Anergates atratulus* host range. They are also indebted to the referees and to the editor for critical comments and recommendations on an earlier version of the paper. This study partly was supported by TUBITAK (The Scientific and Technological Research Council of Turkey) (Project no. 109T088).

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