

The Cockroach Wasps of Turkey, with a New Record of the Genus *Trirogma* Westwood 1841 (Hymenoptera: Ampulicidae)

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ABSTRACT

In this study, the genus *Trirogma*, which belongs in the subfamily Ampulicinae (Hymenoptera: Ampulicidae), was recorded for the first time from Turkey. The new record is based on a male specimen of *Trirogma caerulea* Westwood, 1841 from the Antalya province. Unlike other members of the genus, which have a limited distribution in the Oriental region and its immediate surroundings, *T. caerulea* has a relatively wider distribution in the Palearctic. With this study, the distribution area of this species was extended to the western Mediterranean coasts of Turkey, which is also the westernmost distribution point of the genus. A preliminary list of the species of Ampulicidae found in Turkey was also presented.

Key words: Ampulicidae, Hymenoptera, new record, *Trirogma*, Turkey.

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INTRODUCTION

The family Ampulicidae is a small group within Apoidea, commonly known as “cockroach wasps” with reference to their prey. It currently contains 205 valid species belonging to six genera within the subfamilies Ampulicinae and Dolichurinae (Pulawski, 2022). Members of this family mostly have a tropical distribution, except for the almost cosmopolitan genera *Ampulex* and *Dolichurus* (Ohl & Spahn, 2010). Most of these wasps are small to large sized and mostly have black integument, with some species having white or red markings, but many tropical species in *Ampulex* and all *Trirogma* have a metallic green or blue coloration (Soliman, Gadallah, Ohl & Al Dhafer, 2017). As far as is known, all species of Ampulicidae prey on cockroaches to provide food for their larvae. Some species of this group are considered as biological control agents due to their ability to hunt cockroaches (Veltman & Wilhelm, 1991; Lebeck, 1991).

Although many studies have been carried out on spheciform wasps, especially the Crabronidae and Sphecidae (Gülmez & Can, 2015; Yıldırım, Ljubomirov, Özbek & Yüksel, 2016; Can & Gülmez, 2018; 2019; 2021; Kaplan & Yıldırım, 2020; 2021), there are remarkably few published reports of the Ampulicidae (de Beaumont, 1967; 1969; Gayubo & Özbek, 2005; Bayındır, Gürbüz, Ljubomirov & Pohl, 2013; Yıldırım et al., 2016; Dollfuss, 2017; Makrousov & Proshchalykin, 2021). In Turkey, Ampulicidae has been represented by three species of the genus *Dolichurus*: *Dolichurus bicolor*, *D. corniculus* and *D. haemorrhous*. Prior to this study, there was no report of the genus *Trirogma*. Except for *Dolichurus corniculus*, which is included in the catalog by Ljubomirov & Yıldırım (2008), data on this family have never been compiled in Turkey.

The current study aims to contribute to the knowledge of Turkish fauna of Ampulicidae, with a new record of the genus *Trirogma*. This paper also presents an annotated species list of family Ampulicidae in Turkey.

MATERIAL AND METHODS

A species list of Turkish Ampulicidae is prepared based on the available literature and newly collected specimen from the Antalya province in 2021. Data on the presence of *Trirogma caerulea* in Turkey were generated with the help of citizen scientists. The specimen was identified using the key by Girish Kumar & Sheela (2018). The material is deposited in the Department of Biology, Tokat Gaziosmanpaşa University, Tokat, Turkey. The photographs of the specimens were taken using a Leica M205C stereomicroscope controlled by the Leica Application Suite 3 software. For each species, its current name, its distribution in Turkey and in the world and also some taxonomic notes are presented.

RESULTS

Family Ampulicidae Shuckard, 1840

Subfamily Dolichurinae Dahlbom, 1842

Tribe Dolichurini Dahlbom, 1842

Genus *Dolichurus* Latreille, 1809 (Fig. 1)

Dolichurus Latreille 1809: 387. Type species: *Pompilus corniculus* Spinola 1808, designated by Latreille 1810: 438.

Thyreosphex Ashmead 1904: 282. Type species: *Thyreosphex stantoni* Ashmead 1904, by monotypy.

Diagnosis: Both antennal sockets covered by a single median platform like lobe; metasternum emarginated posteriorly; metasoma inserted above and somewhat behind hind coxae; fore wing media diverging after cu-a; hind wing media diverging before cu-a; hind wing jugal lobe present; notauli well developed, complete to posterior scutal margin or nearly so; propodeal outline rather sharply bent in profile (Bohart & Menke, 1976; Girish Kumar & Sheikh, 2018; Anagha, Girish Kumar & Sureshan, 2020).

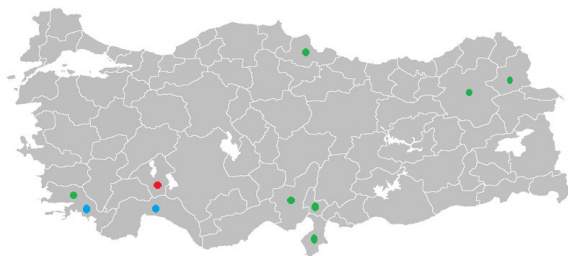


Fig. 1. Distribution map of species of *Dolichurus* in Turkey (Red: *D. bicolor*, green: *D. corniculus*, blue: *D. haemorrhous*).

Dolichurus bicolor Lepeletier de Saint Fargeau, 1845

Records from Turkey: Isparta (Bayındır et al, 2013).

Global distribution: Austria, Belgium, Finland, France, Germany, Greece, Italy, Portugal, Slovenia, Spain, Switzerland, Russia, Turkey, Ukraine (Pulawski, 2022).

Notes: This species was recorded from the province of Isparta in southwestern Turkey. Two specimens of this species were caught at an altitude of 1500 meters in the Kasnak Oak Nature Reserve (Bayındır et al, 2013).

Dolichurus corniculus (Spinola, 1807)

Records from Turkey: Hatay (de Beaumont, 1967; 1969), Erzurum (Gayubo & Özbek, 2005), Kars (Yıldırım et al, 2016), Adana, Muğla, Osmaniye, Samsun (Dollfuss, 2017).

Global distribution: Algeria, Andorra, Austria, Belarus, Belgium, Bulgaria, Croatia, Czechia, Estonia, Finland, France, Germany, Great Britain, Greece, Hungary, Italy, Iran, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Russia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey (Pulawski, 2022).

Notes: This species, which is distributed in the Mediterranean, Eastern Anatolia, and Black Sea geographical regions of Turkey, is the most common ampulicid in this country. De Beaumont (1967) gave the first record of this species for Turkey with two male specimens from Hatay. Three more male specimens were reported by de Beaumont (1969) from the same province. He stated that the two specimens identified in 1967 were different terms of their sculpture. It was also emphasized by the author that these could be geographical or individual variations. Also, de Beaumont pointed out that the identification of the specimens from Hatay is still controversial due to the lack of females of the species reported from this province (de Beaumont, 1969).

***Dolichurus haemorrhous* A. Costa, 1886**

Records from Turkey: Muğla (Dollfuss, 2017), Antalya (Makrousov & Proshchalykin, 2021).

Global distribution: Egypt, France, Germany, Greece, Iran, Italy, Malta, Morocco, Portugal, Russia, Spain, Turkey, Ukraine (Pulawski, 2022).

Notes: This species has been detected only in the western Mediterranean region of the country. A total of ten male specimens were recorded from Turkey in the literature and no female of the species was recorded. The male of this species is diagnostically problematic as it is very similar to that of *Dolichurus corniculus*. This situation was emphasized by the researchers who carried out the study as follows. Dollfuss (2017) noted that the males of *D. haemorrhous* and *D. corniculus* are very similar, and they cannot always be clearly distinguished. Makrousov & Proshchalykin (2021) also stated that not all used distinguishing characters allow reliable distinction of these species. Makrousov & Proshchalykin (2021) suggested that studying the male genitalia of both species may be useful for species differentiation. They also studied the genitalia of male specimens collected from Turkey. In the same study, they said that both species could only be different color forms of *D. corniculus*.

Subfamily Ampulicinae Shuckard, 1840

Tribe Ampulicini Shuckard, 1840

Genus *Trirogma* Westwood, 1841

Trirogma Westwood, 152. Type species: *Trirogma caerulea* Westwood, 1841, by monotypy.

Diagnosis: Medium to large wasps, 10-33 mm long; integument of body metallic green-blue or purple, with mandibles sometimes white in males; wings not banded. Forewing media diverging at or before cu-a; hind wing media diverging after cu-a;

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metasoma distinctly petiolate; antennal bases covered by a median frontal platform (Fig. 2c); metasternum emarginate posteriorly but not Y-shaped, petiole inserted above and after hind coxae (Bohart & Menke, 1976; Girish Kumar & Sheela, 2017; Soliman et al, 2017).

***Trirogma caerulea* Westwood, 1841**

Material examined: Antalya: Konyaalti, 50 m, 36°54'19"N, 30°39'26"E, 20.10.2021, ♂; Leg. Leyla & Samet Kılınç (citizen scientists).

Global distribution (Fig. 3): China, India, Indonesia, Iran, Iraq, Taiwan, Saudi Arabia, Singapore, Sri Lanka, United Arab Emirates (Pulawski, 2022).

Short description (Male): Length: 9.8 mm (Fig. 2). Integument shining metallic blue; antennal flagellomeres and mandible black; wings hyaline; veins brown. Setae on dorsal part of clypeus and half of inner margin of the compound eyes dense, white and appressed, completely covering integument; other parts of the body covered with scattered erect white setae.

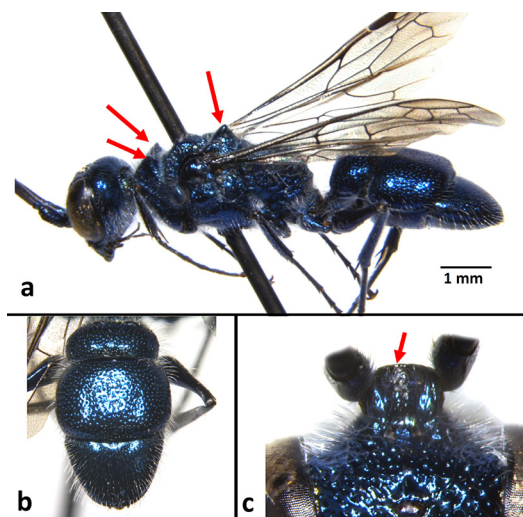


Fig 2. Some taxonomic characters of *Trirogma caerulea* ♂ a. Habitus, lateral view (scutellar tubercle and pronotum with a pair of large, pointed tubercles indicated). b. Mesosoma, dorsal view. c. Frontal lobe.

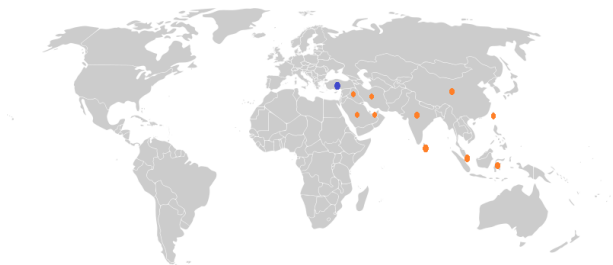


Fig. 3. Distribution map of *Trirogma caerulea* in the world (Orange: previous records, blue: new record).

Head rounded in frontal view; frons with strong rugose punctures; vertex shiny with scattered punctures; medial lobe of clypeus widely and slightly indented; with distinct rounded lateral lobes; dorsal part of clypeus uniformly weakly convex. Flagellomeres dull with rough surface; F1, F2 and F3 equal length.

Pronotum with widely crenulated lateral part; posterior border of pronotal lobe uniformly crenulated as straight line; posterolateral tubercle of pronotum sharply angled (Fig. 2a); notauli strongly crenulate; scutellum with a cone like projection at middle (Fig. 2a); mesopleural groove and sternaulus crenulate; mesopleuron shiny and sparsely punctuated; dorsal and posterior surface of propodeum broadly reticulated and shiny; the upper part of the lateral projections of the propodeum transversely striated.

Metasoma with visible three segments; tergal and sternal punctures well-defined, interspaces shiny (Fig. 2b); T2 with larger punctures than T1 and T3; S2 with a bisinuate groove interrupted at median tubercle.

DISCUSSION

The genus *Trirogma* is herewith reported for the first time from Turkey based on the record of a single specimen of *Trirogma caerulea*. Only one male of the species was caught dwelling in the urban area in the center of Antalya, and many specimens were also photographed from the same region at different times in early October 2021 (Fig. 4). It was also observed that the cockroach population was high in the region where the species was caught. In the light of the information given by the citizen scientist, it is thought that their possible prey is the American cockroach *Periplaneta americana*.

This species was originally found in the Oriental region, but in the last few years has expanded its distribution westwards into the Palearctic region. The species was recently recorded in countries of the Arabian Peninsula and Middle East, such as Saudi Arabia, United Arab Emirates, Iraq, and Iran (Ebrahimi, 2008, Ohi, 2011; Dollfuss, 2017; Soliman et al, 2017). The location in this study is now the westernmost point in the Palearctic region, approximately 1300 km away from the nearest known record (Iraq, Baghdad).



Fig. 4. Photographs of different individuals of the species from the same region.

It is not yet known whether the species spread west in the Palearctic region or was transported to Turkey. Since this species has not been encountered before along the southern border of Turkey, including the border with Iraq and Iran, it is thought that the species was probably transported to Antalya by human activity. The fact that Antalya is Turkey's most important tourism center and hosts millions of foreign

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tourists every year supports this possibility. Furthermore, the humid and warm climate of Antalya seems to be suitable for this species to reproduce in the region. On the other hand, studies on spheciformes species in Turkey are generally carried out in natural habitats. Therefore, this species may have been overlooked until now, as there has not been enough research done in urban area, where cockroaches are densely populated. Future studies are required in order to reveal the possible way of entry of this species into Turkey.

A complete list of species belonging to the Ampulicidae is given for the first time. With the addition of this new genus record, the number of genera belonging to this family in Turkey has increased to two and the number of species to four. Considering Turkey's location, climate diversity and habitat richness, it is thought that species existing in neighboring countries such as *Ampulex assimilis*, *A. compressa*, *A. fasciata* and *Dolichurus turanicus* can also be found in Turkey. Thus, the number of species belonging to the family is expected to increase even more in the future.

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