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A contribution on the subfamilies Helconinae, Homolobinae, Macrocentrinae, Meteorinae, and Orgilinae (Hymenoptera: Braconidae) of southeastern Anatolia with new records from other parts of Turkey

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Abstract: This study was carried out in order to determine the species of the subfamilies Homolobinae, Macrocentrinae, Meteorinae, and Orgilinae in southeastern Anatolia, Turkey. Malaise and light traps and sweeping nets were used to obtain adult specimens from various habitats in the study area during 2010 and 2011. The collected materials from southeastern Anatolia and from new localities of other regions were identified and a total of 11 species from 5 genera determined, of which the species *Diospilus morosus* Reinhard is a new record for southeastern Anatolia. All species are new records on the basis of provinces of Turkey. The distributions of the species were evaluated considering the zoogeographic regions.

Key words: Homolobinae, Macrocentrinae, Meteorinae, Orgilinae, Fauna, southeastern Anatolia, Turkey

1. Introduction

The subfamily Helconinae includes 276 species in 34 genera and 4 tribes, of which the most widespread is Diospilini. The tribe Diospilini contains species of braconids recorded from less deeply concealed phytophagous beetles, such as Curculionidae and Nitidulidae (Coleoptera). Curculionids are plant feeders, some being serious pests of cultivated crops (Shaw and Huddleston, 1991; Özbek and Hayat, 2003). Nitidulids are one of the important groups of insects occurring in Turkey (Audusio et al., 2002). Some species are considered serious pests of date palms throughout the world. Nitidulids also attack ripe fruits, causing them to rot, and the damage is reflected in reduced yield and lower fruit quality (Glazer et al., 2007). *Diospilus capito* has been reported to be the most common species found in pollen beetle larvae (Kevvâi et al., 2005). The subfamily Homolobinae comprises 158 species in 3 genera and 2 tribes. The members of the tribe Homolobini are endoparasites of larvae of mainly Noctuidae and Geometridae (Lepidoptera), but Lymantriidae and Lasiocampidae are also parasitized (van Achterberg, 1979). We have recorded so far only the species of the tribe Homolobini in Turkey. The subfamily Macrocentrinae includes 223 species, 8 genera, and 1 tribe, Macrocentrini. Macrocentrines are all koinobiont endoparasitoids of

lepidopteran larvae, and most of the species are gregarious. The adults can easily be recognized by the presence of several teeth on the apex of the hind trochantellus. *Macrocentrus* is an interesting genus biologically because some—presumably all—of the gregarious species develop by polyembryony. The species of *Macrocentrus* attack various concealed microlepidopteran larvae of Sesiidae, Oecophoridae, Gelechiidae, and Tortricidae (Shaw and Huddleston, 1991). We have recorded so far only the species of *Macrocentrus* in Turkey. The Meteorinae, sister-group of the Euphorinae (sensu stricto), is a moderately large subfamily comprising about 174 species worldwide. Meteorines are sometimes classified as a tribe, *Meteorini*, within the Euphorinae (Shaw and Huddleston, 1991). The species of Meteorinae are solitary or gregarious koinobiont endoparasitoids of larval Coleoptera and Lepidoptera. Many species of *Meteorus* have broad host ranges. The most frequently utilized hosts are Noctuidae, Geometridae, and Tortricidae, but many other lepidopterans including Hepialidae, Zygaenidae, Tineidae, Gelechiidae, Pyralidae, Papilionidae, Lycaenidae, Nymphalidae, Lasiocampidae, Thaumetopoeidae, and Arctiidae are also parasitized (Shaw and Huddleston, 1991). The Orgilinae is a moderately large subfamily comprising about 354 species, 12 genera, and 3 tribes worldwide (Beyarslan, 1996, 2011; Yu et al., 2006).

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The known hosts of Orgilinae belong to the lepidopteran families Coleophoridae, Gelechiidae, Tortricidae, Pyralidae, and Oecophoridae. The Turkish fauna of Helconinae, Homolobinae, Macrocentrinae, Meteorinae, and Orgilinae is poorly investigated. A total of 55 species have been recorded so far with studies performed in the Mediterranean, Aegean, Black Sea, Marmara, and central and eastern Anatolia (except Ardahan, Erzurum, Iğdır, and Kars) regions of Turkey. Four of these species are new records for science (Fahringer, 1922; Taeger, 1988; Beyarslan, 1996, 2011; Beyarslan et al., 2004, 2008; Yılmaz et al., 2010; Beyarslan and Cetin Erdoğlan, 2011; Beyarslan and Aydoğdu, 2012).

2. Materials and methods

Adult specimens of Helconinae, Homolobinae, Macrocentrinae, Meteorinae, and Orgilinae were collected from various habitats in southeastern Anatolia. Sweeping nets were used to obtain samples on grass-type plants. Samples were also collected by malaise and light traps. The specimens were then pinned and appropriately labeled. Identified specimens are deposited in the Museum of Trakya University in Edirne. The host records, general distributions, and the host plants of host species of the species from Turkey are given by Fahringer (1922), Muesebeck (1970), Tobias (1986), Taeger (1988), van Achterberg (1987, 1992), Beyarslan (1996), Belokobylskij and Lobodenko (1997), Tobias (2000), Beyarslan et al. (2004), Beyarslan et al. (2008), Ghahari et al. (2009a, 2009b), Yılmaz et al. (2010), Aguirre et al. (2011), Beyarslan (2011), Beyarslan and Çetin Erdoğlan (2011), and Beyarslan and Aydoğdu (2012). The host plants of the host species are shown in parentheses throughout the text. Localities, altitudes of the localities, collection dates, sexes, the number of sampled individuals, and collectors of each species are given. Relevant literature was used for taxonomical examination of the material collected. The specimens were identified mostly using the keys by Tobias (1986), Taeger (1988), and Shaw and Huddleston (1991).

3. Results

3.1. Subfamily Helconinae Foerster, 1862

Diospilus capito (Nees, 1834)

Material examined: Malatya-Hekimhan, (38°59'N, 37°50'E), 1400 m, *Prunus* sp., 1306 m, grassland, 01.VI.2007, leg. Beyarslan, 1♂. Kırşehir-Mucur-Pınarkaya, (38°16'N, 34°43'E), 995 m, orchard, 19.XI.2007, leg. Çoban, 2♀♀.

Distribution: Palaearctic. In Turkey: Afyon, Amasya, Bartın, Bursa, Düzce, Giresun, Gümüşhane, Kastamonu, Kocaeli, Konya, Tokat (Beyarslan et al., 2008).

Hosts: Various species of the families Attelabidae, Chrysomelidae, Curculionidae, Elateridae, and Nitidulidae (Coleoptera).

Diospilus inflexus Reinhard, 1862

Material examined: Ordu-Akkuş-Düğencili, (40°48'N, 48°01'E) 1350 m, *Pinus* sp., 05.VII.2003, leg. Beyarslan, 1♀.

Distribution: Palaearctic. In Turkey: Amasya, Ankara, Antalya, Bilecik, Bolu, Burdur, Çankırı, Çorum, Edirne, Elazığ, Giresun, Gümüşhane, İçel, Karabük, Kastamonu, Kırklareli, Kırşehir, Konya, Rize, Sakarya, Sinop, Sivas, Tekirdağ, Tokat, Trabzon, Yalova, Zonguldak (Beyarslan et al., 2008).

Host: Unknown.

Diospilus morosus Reinhard, 1862

Material examined: Adıyaman-Merkez-Toptepe, (37°30'N, 38°18'E), 825 m, grassland, 02.VI.2011, leg. Beyarslan, 1♂.

Distribution: Palaearctic. In Turkey: Afyon, Amasya, Bartın, Bursa, Düzce, Giresun, Gümüşhane, Kastamonu, Kocaeli, Konya, Tokat (Beyarslan et al., 2008).

Hosts: Various species of the families Chrysomelidae, Curculionidae, and Erotylidae (Coleoptera).

3.2. Subfamily Homolobinae van Achterberg, 1979

Homolobus (Apatia) truncator (Say, 1829)

Material examined: Adıyaman-Çemberlitaş, (37°48'N, 38°20'E), 685 m, *Olea* sp., 21.IV.2007, leg. Beyarslan, 1♀. Eskişehir-Sivrihisar-Babatat, (39°31'N, 31°37'E), 868 m, grassland, 10.VI.2007, leg. Yurtcan, 3♀♀, 1♂. Kırıkkale-Karakeçili, (39°34'N, 33°21'E), 839 m, *Helianthus* sp., 11.VII.2007 2♀♀, leg. Şahsuvaroğlu, 3♂♂. Kayseri-Bünyan-Ekrek, (38°39'N, 36°03'E), 1330 m, *Triticum* sp., 22.VI.2009, leg. Beyarslan, 1♀.

Distribution: Holarctic, Ethiopian, Neotropical, Oriental. In Turkey: Aydın, Söke, Priene the ancient city (van Achterberg, 1979); Ankara (Belshaw and Quicke, 2002).

Host: It is an important parasitoid of various species of the families Cosmopterigidae, Crambidae, Noctuidae, and Lasiocampidae (Lepidoptera).

3.3. Subfamily Macrocentrinae Foerster, 1862

Macrocentrus bicolor Curtis, 1833

Material examined: Edirne-Güllapoğlu, (41°38'N, 26°37'E), 44 m, grassland, 25.V.2011, leg. Keleş, 1♀.

Hosts: Various species of the families Chimabachidae, Gelechiidae, Gracillariidae, Lyonetiidae, Oecophoridae, Pyralidae, Tineidae, and Tortricidae (Lepidoptera).

Distribution: Palaearctic, Oriental, (van Achterberg, 1979). Turkey (The specimen from Turkey (Haeselbarth Collection, München) is very similar and probably belongs to the species *M. bicolor*) (Achterberg, 2001).

Macrocentrus collaris (Spinola, 1808)

Bracon collaris Spinola, 1808.- Insectorum Liguria species novae aut rariores, quas in agro Ligustico nuper detexit, descripsit, et iconibus illustravit (Hymenoptera). 2. Genua. 262 pp.

Macrocentrus collaris: Curtis, 1837.- A guide to an arrangement of British insects; being a catalogue of all the named species hitherto discovered in Great Britain and Ireland. Second edition, greatly enlarged. London. 294 pp. (copied 87-126)

Material examined: Şanlıurfa-Bozova-Yaslıca, (38°40'N, 41°15'E), 1450 m, grassland, 16.VI.2007, leg. Gözüaçık, 1♀. Diyarbakır-Bismil-Diktepe, (37°50'N, 40°43'E), 611 m, *Triticum* sp., 03.VII.2010, leg. Beyarslan, 2♀♀. Diyarbakır-Ergani, (38°15'N, 39°45'E), 955 m, 26.VI.2007, leg. Beyarslan, 1♀. Diyarbakır-Merkez, (37°52'N, 40°13'E), 677 m, 13.VII.2010, leg. Gözüaçık, 1♀. Konya-Kadınhanı, (38°14'N, 32°10'E), 1030 m, 22.VI.2009, leg. Beyarslan, 1♀. Mardin-Derik-Böğrek Köyü, (37°36'N, 40°26'E), 780 m, 03.V.2011, leg. Gözüaçık, 1♂. Mardin-Nusaybin, (37°03'N, 41°13'E), 1035 m, 29.IV.2011, leg. Gözüaçık, 1♀. Siirt-Merkez, (37°55'N, 41°57'E), 930 m, 30.VII.2009, leg. Beyarslan, 1♂. Trabzon-Maçka-Hamsiköy, (40°40'N, 39°28'E), 183 m, 05.VIII.2005, leg. Beyarslan, 1♂.

Distribution: Palaearctic, Ethiopian, Neotropical, Oceanic, Oriental. In Turkey: Tekirdağ (Beyarslan et al., 2006). Adana, Adapazarı, Adıyaman, Aksaray, Ankara, Antalya, Bursa, Çanakkale, Bozcaada, Çankırı, Edirne, Elazığ, Erzurum, Gaziantep, Hatay, İçel, Kahramanmaraş, Karaman, Kastamonu, Kayseri, Kırklareli, Kırşehir, Malatya, Nevşehir, Niğde, Sivas, Şanlıurfa, Yozgat (Beyarslan and Aydoğdu, 2012).

Hosts: Elateridae (Coleoptera). Lymantriidae, Noctuidae, Nymphalidae, Tortricidae, Yponomeutidae (Lepidoptera).

Meteorus rubens (Nees, 1811)

Material examined: Batman-Hasankeyf-Suçel, (37°43'N, 41°25'E), 615 m, 03.VII.2010, leg. Beyarslan, 1♀. Diyarbakır-Çınar-Leblebitaş, (37°43'N, 40°25'E), 335 m, 21.VI.2011, ♀♀, 1♂♂. Diyarbakır-Devegeçidi, (38°20'N, 39°56'E), 604 m, 04.VII.2010, leg. Gözüaçık, 2♀♀. Diyarbakır-Ergani, (38°16'N, 39°46'E), 955 m, 20.V.2009, leg. Gözüaçık, 2♀♀, 06.VI.2007, 1♀. Mardin-Mazıdağı-Evlice, (37°30'N, 40°31'E), 1000 m, 31.V.2011, leg. Beyarslan, 2♀♀.

Distribution: Holarctic, Neotropical, Oriental. In Turkey: Van (Atlıhan et al., 2003). Adana, Adapazarı, Afyon, Ağrı, Ankara, Bolu, Bursa, Çanakkale, Gökçeada, Çorum, Denizli, Edirne, Gümüşhane, İçel, İzmir, Kahramanmaraş, Kastamonu, Kırklareli, Manisa, Muğla, Şanlıurfa, Sinop, Tekirdağ (Beyarslan et al., 2004). Adana, Adapazarı, Adıyaman, Afyon, Amasya, Ankara, Antalya, Artvin, Balıkesir, Bayburt, Bilecik, Bolu, Bursa, Çanakkale, Gökçeada, Çorum, Edirne, Elazığ, Erzurum, Gaziantep, Giresun, Isparta, Kastamonu, Kırklareli, Kırşehir, Konya, Malatya, Manisa, Niğde, Osmaniye, Rize, Samsun, Sivas, Tekirdağ, Tokat, Trabzon (Yılmaz et al., 2008).

Host: Various species in the families Chloropidae (Diptera); Coleophoridae, Gelechiidae, Geometrida, Lasiocampidae, Lymantriidae, Noctuidae, Nymphalidae, Pieridae, Thaumetopoeidae, Tortricidae, Yponomeutidae (Lepidoptera).

Meteorus pulchricornis (Wesmael, 1835)

Material examined: Elazığ-Merkez-Karaçavuş, (38°40'N, 38°56'E), 1050 m, 12.VI.2008, leg. Gözüaçık, 3♀♀.

Distribution: Palaearctic, Oceanic, Oriental. Introduced into USA. In Turkey: Adana, Artvin, Bartın, Çanakkale, Gümüşhane, İçel, Tekirdağ (Yılmaz et al., 2010). Kırklareli, Muğla (Beyarslan et al., 2004).

Host: Various species of the families Crambidae, Erebiidae (Arctiidae), Geometridae, Hesperidae, Herminiidae, Lasiocampidae, Lycaenidae, Lymantriidae, Nolidae, Nymphalidae, Lyonetiidae, Noctuidae, Papilionidae, Plutellidae, Psychidae, Pyralidae, Tineidae, Tortricidae (Lepidoptera).

Meteorus versicolor (Wesmael, 1835)

Material examined: Şanlıurfa-Siverek-Batıköy, (37°45'N, 39°19'E), 385 m, 18.V.2011, leg. Beyarslan, 4♀♀.

Distribution: Holarctic, Oriental. Introduced into Canada, USA. In Turkey: İzmir (Öncüer et al., 1977). Adana, Afyon, Aydın, Muğla, Tekirdağ, Van (Beyarslan et al., 2004). Adana (Kamuran and Kornoşor, 2008). Adana, Adıyaman, Amasya, Edirne, Hatay, Elazığ, İçel, Malatya, Zonguldak (Yılmaz et al., 2010).

Hosts: Various species of the families Arctiidae, Argyresthiidae, Geometridae, Lasiocampidae, Lycaenidae, Lymantriidae, Noctuidae, Nolidae, Notodontidae, Nymphalidae, Pieridae, Pyralidae, Thaumetopoeidae, Tortricidae (Lepidoptera).

3.4. Subfamily Orgilinae Ashmead, 1900

Orgilus (Orgilus) pimpinellae Niezabitowski, 1910

Material examined: Diyarbakır-Ergani, (38°15'N, 39°45'E), 995 m, 26.VI.2007, leg. Gözüaçık, 1♀. Diyarbakır-Merkez, (38°10'N, 39°52'E), 677 m, 13.VII.2010, leg. Gözüaçık, 1♀. Mardin-Mazıdağı-Cemireş, (37°36'N, 40°27'E), 1000 m, 01.VII.2010, 1♀, leg. Beyarslan, 1♂.

Distribution: Palaearctic. In Turkey: Burdur, Bilecik, İçel, Kahramanmaraş, Şanlıurfa, Tekirdağ (Beyarslan, 1996). Adapazarı, Artvin, Aydın, Bartın, Bayburt, Bilecik, Bolu, Burdur, Bursa, Çanakkale, Edirne, Elazığ, Erzincan, Erzurum, Eskişehir, Giresun, Gümüşhane, Isparta, İstanbul, Kahramanmaraş, Kastamonu, Kayseri, Kırklareli, Malatya, Muğla, Niğde, Ordu, Sinop, Sivas, Tekirdağ, Trabzon, Tunceli (Beyarslan et al., 2011).

Host: Various species of the families Acrolepiidae, Coleophoridae, Gelechiidae, Momphidae: Oecophoridae, Pyralidae (Lepidoptera).

Orgilus (Orgilus) obscurator (Nees, 1812)

Material examined: Erzincan-Reşadiye-Salur, (39°55'N, 38°31'E), 1610 m, *Rubus* sp. 22.VIII.2008, leg. Beyarslan, 2♀♀.

Distribution: Holarctic. Introduced into Canada and USA. In Turkey: Amasya, Bolu, Edirne, Erzurum, Malatya, Samsun, Tokat (Beyarslan et al., 2011).

Host: Various species of the families Oecophoridae, Coleophoridae, Lasiocampidae, Gelechiidae, Crambidae, Momphidae, Psychidae, Tortricidae, Scythrididae, Yponomeutidae (Lepidoptera).

4. Discussion

Twelve species were recognized within the material collected from new localities in Turkey. Among these, 6 species are new records for the Turkish southeastern Anatolia region. Distributions of the species according to zoogeographical regions are as follows: 8 species Palaearctic; 1 species Holarctic; 1 species Holarctic, Nearctic, Oriental; 1 species Holarctic, Neotropical, Oriental Ethiopian; 1 species Palaearctic, Ethiopian, Nearctic, Oriental. The species of Helconinae, Homolobinae, Macrocentrinae, Meteorinae, and Orgilinae are parasitoids of economically important agricultural pests. The most common species in Turkey appeared to be *Diospilus capito*, *Homolobus truncator*, *Macrocentrus collaris*, *Meteorus rubens*, and *Orgilus pimpinellae*, which were recorded from various provinces in Turkey (Beyarslan, 1996; Beyarslan et al., 2004, 2008; Yilmaz et al., 2008; Beyarslan et al., 2011; Beyarslan and Aydođdu, 2012). *Diospilus capito* is parasitoid of various species of Attelebidae, Chrysomelidae, Curculionidae, Elateridae, and Nitidulidae (Coleoptera). It is an important population regulatory factor for *Meligethes aeneus* (Nitidulidae), which is a serious pest on oil seed rape (Husberg and Hokkanen, 2001). *Homolobus truncator* is a nocturnal, koinobiont, endoparasitoid of numerous species of exposed, lepidopterous larvae, primarily of

the families Geometridae, Noctuidae, Cosmopterigidae, Crambidae, and Lasiocampidae. Among its recorded hosts are a number of economically important agricultural pests such as *Agrotis ipsilon*, *Helicoverpa zea*, *Spodoptera exigua* and *S. frugiperda*, *Malacosoma neustria* L., and *Autographa gamma* (L.) (Yu et al., 2005). *Macrocentrus collaris* parasitized species of Elateridae, Anobiidae (Coleoptera); Geometridae, Lymantriidae, Noctuidae, Nymphalidae, Tortricidae, and Yponomeutidae (Lepidoptera). This species is considered the most important population regulatory factor for *Agrotis* spp., particularly *Agrotis segetum* and *A. ipsilon* (Singh, 1993). Both of these pests are abundant in Turkey (Özbek and Hayat, 2003). *Meteorus rubens* is a parasitoid of species of Chloropidae (Diptera), and Coleophoridae, Gelechiidae, Geometridae, Lasiocampidae, Lymantriidae, Noctuidae, Nymphalidae, Pieridae, Thaumetopoeidae, Tortricidae, and Yponomeutidae (Lepidoptera). It has been used as a biological control agent of *Agrotis ipsilon* (Noctuidae), which is an important agricultural pest in Turkey and abroad (Awadallah et al., 1995; Özbek and Hayat, 2003). *Orgilus pimpinellae* parasitized species of Acrolepiidae, Coleophoridae, Gelechiidae, Momphidae, Oecophoridae, and Pyralidae (Lepidoptera). This species was reported to be an important biological control agent (Lozan et al., 2008).

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