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Original article (Orijinal araştırma)

A faunistic study of Ichneumonidae (Hymenoptera) from Northeastern Anatolia Region (Erzurum: Yakutiye and Uzundere) of Türkiye[1]

Türkiye'nin Kuzey Doğu Anadolu Bölgesi (Erzurum: Yakutiye ve Uzundere) Ichneumonidae (Hymenoptera) türleri üzerine faunistik bir araştırma

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Abstract

This faunistic study was conducted to determine the species of Ichneumonidae collected by insect net from Erzurum, Yakutiye and Uzundere districts of Türkiye between June and November in 2020-2021. As a result of this research, 232 specimens representing 17 species from 14 genera belonging to subfamilies Cremastinae, Cryptinae, Ichneumoninae and Pimplinae were distinguished. Among them, *Mesoleptus vigilatorius* (Förster, 1876), *Mesostenus funebris* Gravenhorst, 1829 and *Cubocephalus associator* (Thunberg, 1822) are new to the Turkish fauna. The collecting area, date of collection, altitude of collection, specimens and sex number, visited plants, their distribution in Türkiye and general geographic distribution of species have been presented.

Keywords: Erzurum, Hymenoptera, Ichneumonidae, new records, Türkiye

Öz

Bu faunistik çalışma, 2020-2021 yıllarının, Haziran ve Kasım ayları arasında Erzurum'un Yakutiye ve Uzundere ilçelerinden atrapla toplanan Ichneumonidae türlerini tespit etmek amacıyla yapılmıştır. Araştırma sonucunda, Cremastinae, Cryptinae, Ichneumoninae ve Pimplinae altfamilyalarına ait 14 cinse bağlı 17 türden 232 örnek ayırt edilmiştir. Teşhis edilen türlerden, *Mesoleptus vigilatorius* (Förster, 1876), *Mesostenus funebris* Gravenhorst, 1829 ve *Cubocephalus associator* (Thunberg, 1822) Türkiye faunası için yeni kayıt durumundadır. Ayrıca türlerin toplama alanları, toplanma tarihi, toplandığı rakım, birey sayısı ve cinsiyeti, ziyaret ettiği bitkiler, Türkiye ve genel coğrafi dağılımları da verilmiştir.

Anahtar sözcükler: Erzurum, Hymenoptera, Ichneumonidae, yeni kayıtlar, Türkiye

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Introduction

With about 25 000 described species (Yu et al., 2016) and between 60 000 and 100 000 estimated (Townes, 1969; Rasnitsyn, 1978), Ichneumonidae or “Darwin wasps” (Klopfstein et al., 2019) constitute one of the most diverse animal groups today and the largest family of parasitoid wasps. The family is divided into more than 40 subfamilies (Broad et al., 2018). Biology of Darwin wasps is extremely diverse. Ichneumonids mostly parasitize the immature stages of the Holometabola, and are frequently associated with Lepidoptera and sawflies (Hymenoptera). Therefore, some species of this family have been intentionally introduced for biological control (Rasplus et al., 2010). Parasitic Hymenoptera have often been used for biological control and these programs demonstrate the great impact that they can have on host populations (Sharkey, 2007).

“A cataloque of the Turkish Ichneumonidae (Hymenoptera)” was the first comprehensive study that summarized all the published data on the Turkish Ichneumonidae (Kolarov, 1995). In this study, 383 species belonging to 19 subfamilies were listed. In the past 27 years, the number of species has reached about 1439, with most valuable contributions by Çaylak & Çoruh (2020a, b), Kıraç & Gürbüz (2020), Kolarov et al. (2020, 2021), Schwarz (2020), Teymuroğlu & Çoruh (2021), Yurtcan et al. (2021), Bulak Korkmaz & Çoruh (2022), Çoruh (2022), Çoruh et al. (2022a, b), Çoruh & Riedel (2022), Doğru (2022), İneciklioğlu (2022), Kaplan & Riedel (2022) and Kolarov & Çoruh (2022). Despite their ecological importance, Darwin wasps are still among the most poorly studied groups of organisms.

In this study, Ichneumonidae material from Erzurum, Yakutiye and Uzundere districts was examined, and new faunistic data is provided.

Materials and Methods

Ichneumonidae species were collected by insect net from natural gardens, orchards, agricultural fields and different weeds in 10 localities (Table 1) of Erzurum (Yakutiye and Uzundere) (Figure 1) in Türkiye (Anatolia), during the 2020-2021 summer. All examined material was collected by the first author and determined by the second author and Janko Kolarov (Bulgaria). After identifying, each species was photographed by the digital shooting unit (Canon EOS 1100 D, Canon EF 100 mm, f/2.8L Macro lens, Kaiser digital), and partially focused images were combined using Helicon focus 6.7.1. software. All the material is deposited in the Entomology Museum Erzurum, Türkiye (EMET). The species recorded from Türkiye for the first time are marked by an asterisk (*). General distributions and associated plants were taken from Yu et al. (2016).

Table 1. Data of collected species

Region	Locality	Altitude (m)	Number of specimens
Yakutiye	Atatürk University Campus	1876	60
	Güzelova	1700	14
Uzundere	Bağbaşı	1000	2
	Erikli	1420	14
	Engüzek kapı	1150	1
	Center	1000	44
	Pehlivanlı	900	84
	Sapaca	1200	2
	Yukarı Serdarlı	1681	11

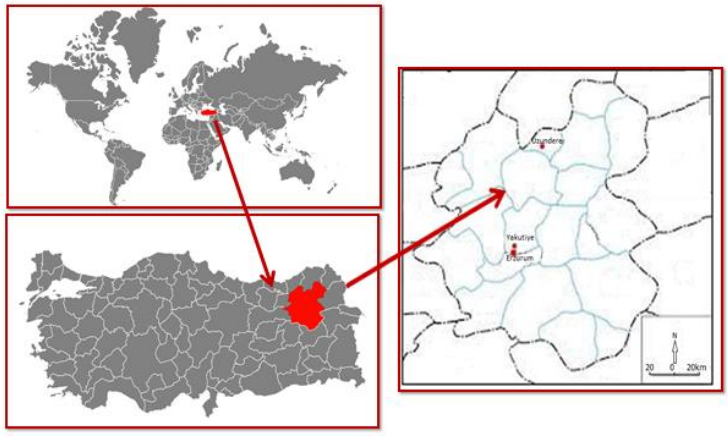


Figure 1. Map of study area.

Study area

Erzurum is a province located in the northeastern Anatolia and at an altitude about 1900 m from sea level. It has 10 districts, two of which are central district. Specimens for this study were collected in Yakutiye (Central district) and Uzundere districts of Erzurum. Uzundere is quite different from other districts with its microclimate features. Contrary to the continental climate, the Black Sea climate is dominant in the district. In addition to all these, Tortum Lake and Waterfall are very important geographical riches of the district**.**

Results

In this study, we report 232 specimens belonging to 14 genera for Erzurum (Yakutiye and Uzundere). Among them, three species, *Mesoleptus vigilatorius* (Förster, 1876), *Mesostenus funebris* Gravenhorst, 1829 and *Cubocephalus associator* (Thunberg, 1822) are new to the Turkish fauna.

Subfamily Cremastinae Förster, 1869

Dimophora nitens (Gravenhorst, 1829)

Material examined. Uzundere: Pehlivanlı, 40°29’40”N, 41°30’07”E, 900 m, 08.IX.2020, 4♀♀, 40°28’37”N, 41°27’39”E, 1000 m, 21.VI.2021, 2♂♂, 3♀♀.

Distribution. Australia and Palearctic. This species is known from Ankara, Çanakkale and Isparta provinces in Türkiye.

References. Kolarov (1997), Kolarov & Beyarslan (1999), Gürbüz (2005) and Çoruh et al. (2014b) (Figure 3a).

Associated plant. *Peucedanum oreoselinum* (L.) (Apiaceae)

Remarks. New records for East Anatolia and Erzurum.

Subfamily Cryptinae Kirby, 1837

Aptesis senicula (Kriechbaumer, 1893)

Material examined. Uzundere: Erikli, 40°32’07”N, 41°33’39”E, 1420 m, 21.VII.2021, 5♀♀; Pehlivanlı, 40°29’40”N, 41°30’07”E, 900 m, 23.IX.2020, ♂, 40°28’37”N, 41°27’39”E, 1000 m, 03.VI.2021, 2♀♀, 21.06.2021, 2♀♀; Yukarı Serdarlı, 40°28’22”N, 41°18’50”E, 1681 m, 21.VI.2021, 3♂♂, 4♀♀.

Distribution. Europe and West Palearctic. This species is known from Adana, Bursa, Mersin, Tunceli and Rize provinces in Türkiye.

References. Beyarslan & Kolarov (1994), Çoruh et al. (2014b), Kolarov et al. (2014c, 2016), Çoruh (2019), Çaylak (2019) and Çaylak & Çoruh (2020b) (Figure 3b).

Remarks. New records for East Anatolia and Erzurum.

Cryptus dianae Gravenhorst, 1829

Material examined. Yakutiye: Güzelova, 40°02'46"N, 41°20'23"E, 1700 m, 26.VII.2020, 2♀♀.

Distribution. Palearctic. This species is known from Isparta province in Türkiye.

References. Gürbüz & Kolarov (2008) and Çoruh (2019) (Figure 3c).

Associated plant. *Angelica sylvestris* L. (Apiaceae), *Euphorbia nicaeensis* All., *Euphorbia segueriana* Neck (Euphorbiaceae), *Peucedanum oreoselinum* (L.) (Apiaceae), *Quercus* spp. (Fagaceae).

Remarks. New records for East Anatolia and Erzurum.

Cryptus viduatorius Fabricius, 1804

Material examined. Uzundere: Erikli, 40°32'07"N, 41°33'39"E, 21.VI.2021, 1420 m, 2♀♀; Center, 41°31'31"N, 41°32'26"E, 21.VII.2021, 1000 m, 7♂♂, 2♀♀. Yakutiye: Atatürk University Campus, 39°53'58"N, 41°14'50"E, 1876 m, 16.VI.2021, 2♀♀; Güzelova, 40°02'46"N, 41°20'23"E, 1700 m, 26.VI.2020, 3♂♂.

Distribution. Palearctic. This species is known from Bilecik, Bursa, Erzurum, Isparta, Içel, Istanbul and Kırklareli provinces in Türkiye.

References. Kolarov (1987), Beyarslan & Kolarov (1994), Kolarov (1995), Kolarov et al. (1997a, 2016), Gürbüz & Kolarov (2008), Çoruh & Çoruh (2008, 2012), Gürbüz et al. (2009a), Çoruh et al. (2014a, b, 2016, 2018), Sarı & Çoruh (2018), Çoruh (2019) and Yılmaz (2020) (Figure 3d).

Associated plants. *Anethum graveolens* L. (Apieae), *Angelica sylvestris* L., *Daucus carota* L. (Apiaceae), *Euphorbia nicaeensis* All., *Euphorbia virgata* Waldst. & Kit. (Euphorbiaceae), *Ferula communis* L., *Heracleum sphondylium* L. (Apiaceae), *Medicago sativa* L. (Fabaceae), *Peucedanum oreoselinum* (L.) (Apiaceae).

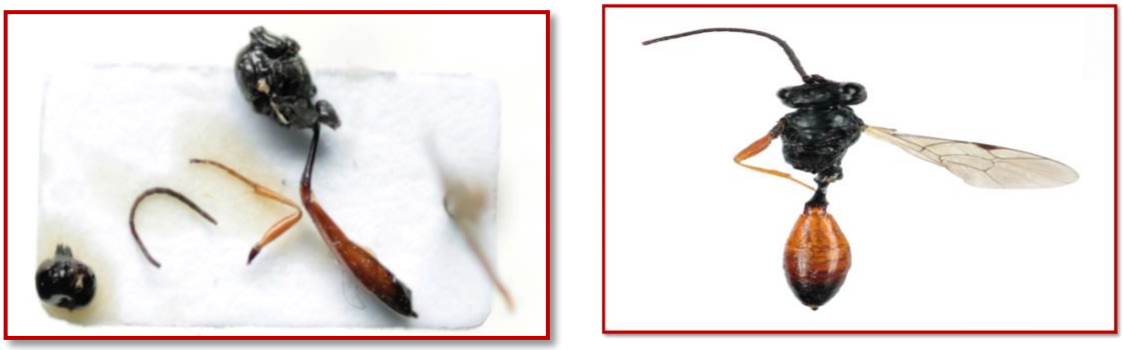


Figure 2. New species: *Mesoleptus vigilatorius.*

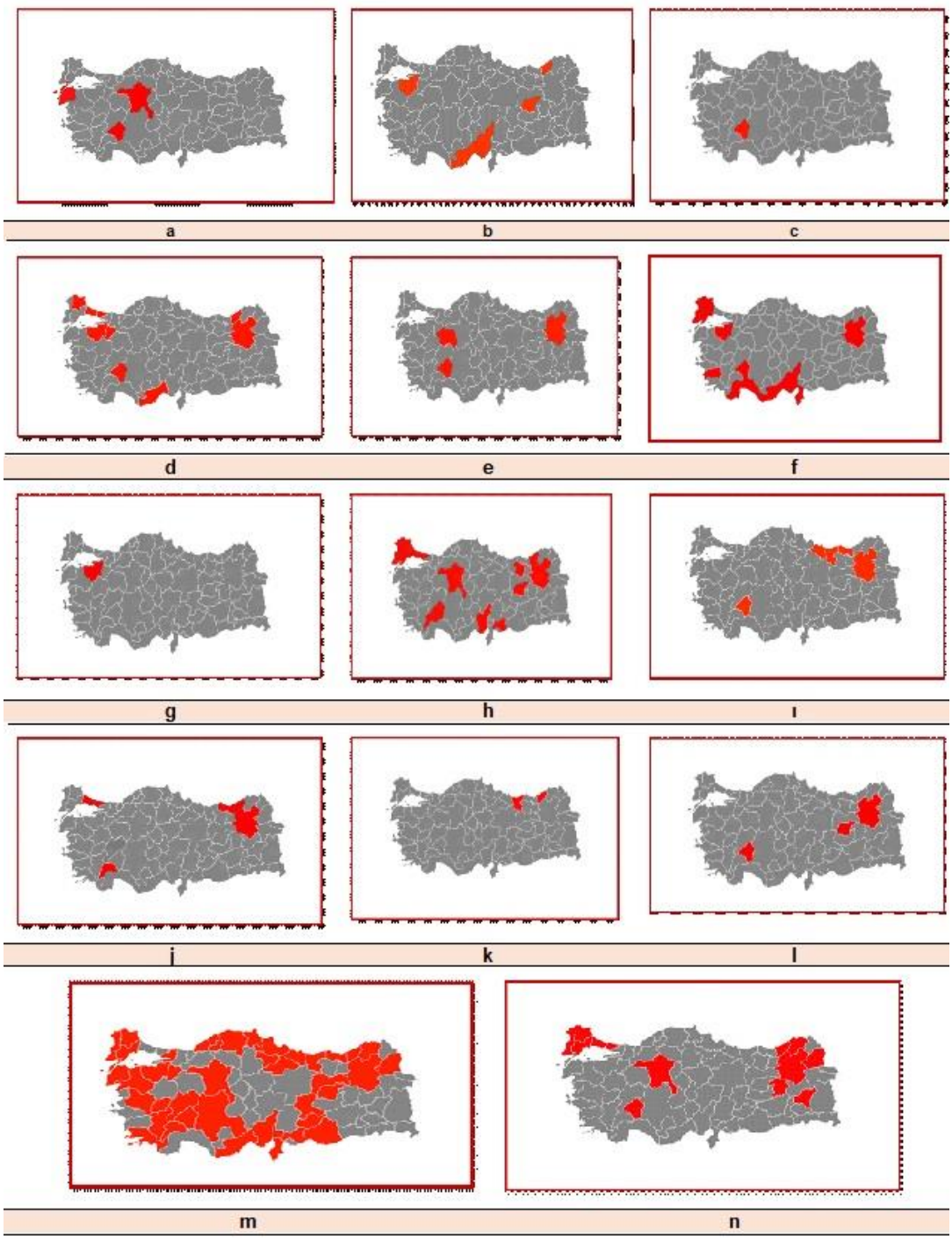


Figure 3. Distribution of species in Türkiye: a) *Dimophora nitens*, *b) Aptesis senicula*, c) *Cryptus dianae*, d) *Cryptus viduatorius*, e) *Dichrogaster longicaudata*, f) *Mesostenus transfuga*, g) *Phygadeuon nitidus*, h) *Trychosis legato,* ı) *Colpognathus celerator,* j) *Heterischnus truncator*, k) *Heterischnus excavates,* l) *Perithous septemcinctorius,* m) *Pimpla spuria,* n) *Scambus brevicornis.*

**Cubocephalus associator* (Thunberg, 1822)

Material examined. Uzundere: Yukarı Serdarlı, 40°28’22”N, 41°18’50”E, 1682 m, 27.VII.2021, 2♂♂.

Distribution. Europe and West Palearctic.

Associated plant. *Angelica* spp. (Apiaceae)

Dichrogaster longicaudata (Thomson, 1884)

Material examined. Uzundere: Center, 41°31’31”N, 41°32’26”E, 21.VI.2021, 1000 m, 2♂♂, 2♀♀. Yakutiye: Güzelova, 40°02’46”N, 41°20’23”E, 1700 m, 19.VII.2020,♂.

Distribution. Holarctic. This species is known from Erzurum, Eskişehir and Isparta provinces in Türkiye.

References. Kolarov & Gürbüz (2007), Kırtay (2008), Gürbüz et al. (2009a), Eroğlu et al. (2011), Çoruh et al. (2016) and Çoruh (2019) (Figure 3e).

Associated plants. *Bauhinia* sp. (Fabaceae), *Oryza sativa* L. (Poaceae)

**Mesoleptus vigilatorius* (Förster, 1876) (Figure 2)

Material examined. Pehlivanlı, 40°03’29”N, 41°20’54”E, 900 m, 19.VIII.2020,♀.

Distribution. Palearctic.

**Mesostenus funebris* Gravenhorst, 1829

Material examined. Uzundere: Center 41°31’31”N, 41°32’26”E, 1000 m, 21.VI.2021, 3♂♂, 2♀♀; Yukarı Serdarlı, 40°28’22”N, 41°18’50”E, 1682 m, 27.VII. 2021, 2♀♀.

Distribution. Palearctic.

Mesostenus transfuga (Gravenhorst, 1829)

Material examined. Uzundere: Bağbaşı, 40°30’32”N, 41°27’38”E, 1000 m, 21.VI.2021, 2♂♂; Pehlivanlı, 40°03’29”N, 41°20’54”E, 900 m, 08.IX.2020, ♀, 40°28’37”N, 41°27’39”E, 1000 m, 21.VI.2021, 3♂♂. Yakutiye: Atatürk University Campus, 39°53’58”N, 41°14’50”E, 1876 m, 16.VI.2021, 2♂♂.

Distribution. Oceanic and Palearctic. This species is known from Adana, Antalya, Aydın, Bursa, Edirne, Erzurum, Hatay, Isparta, Kırklareli, Mersin and Tekirdağ provinces in Türkiye.

References. Soydanbay (1976), Öncüer (1991), Kolarov (1995), Beyarslan & Kolarov (1994), Kolarov et al. (1997a), Çoruh & Çoruh (2008), Gürbüz & Kolarov (2008), Gürbüz et al. (2009b) and Çoruh (2019) (Figure 3f).

Associated plants. *Euphorbia segueriana* Kunst, *E. virgata* Waldst. & Kit. (Euphorbiaceae), *Fraxinus excelsior* L. (Oleaceae), *Pimpinella tragium* Vill. (Apiaceae), *Seseli libanotis* (L.) W. D. J.Koch. (Apiaceae).

Phygadeuon nitidus Gravenhorst, 1829

Material examined. Uzundere: Pehlivanlı, 900 m, 40°29’40”N, 41°30’07”E, 23.IX.2020, 4♂♂.

Distribution. Europe and West Palearctic. This species is known from Bursa province in Türkiye.

References. Çaylak & Çoruh (2020b) (Figure 3g).

Remarks. New record for East Anatolia and Erzurum.

Trychosis legator (Thunberg, 1822)

Material examined. Uzundere: Pehlivanlı, 40°29’40”N, 41°30’07”E, 900 m, 26.VII.2020, 5♀♀, 40°28’37”N, 41°27’39”E, 1000 m, 21.VI.2021, 3♀♀. Yakutiye: Güzelova, 40°02’46”N, 41°20’23”E, 1700 m, 19.VIII.2020, 6♂♂.

Distribution. Palearctic. This species is known from Adana, Ankara, Burdur, Çanakkale, Edirne, Erzurum, Gaziantep, Gümüşhane, Isparta, Istanbul, Kırklareli, Tekirdağ, Tunceli and Rize provinces in Türkiye.

References. Kolarov (1987), Kolarov & Beyarslan (1994a), Kolarov et al. (1997b, 2014c), Gürbüz & Kolarov (2008), Çoruh et al. (2014b, 2016) and Çoruh (2019) (Figure 3h).

Associated plants. *Anethum graveolens* L., *Chaerophyllum bulbosum* L. (Apiaceae), *Cornus sanguinea* L. (Cornaceae), *Daucus carota* L. (Apiaceae), *Euphorbia cyparissias* L., *E. nicaeensis* All., *E. segueriana* Kunst, *E. virgata* Waldst. & Kit. (Euphorbiaceae), *Fraxinus excelsior* L. (Oleaceae), *Heracleum sphondylium* L., *Pastinaca* spp., *Peucedanum oreoselinum* (L.) (Apiaceae), *Quercus* spp. (Fagaceae).

Subfamily Ichneumoninae, Latreille 1802

Colpognathus celerator (Gravenhorst, 1807)

Material examined. Uzundere: Center, 41°31’31”N, 41°32’26”E, 21.VI.2021, 1000 m, 3♂♂, 2♀♀; Pehlivanlı, 40°29’40”N, 41°30’07”E, 900 m, 24.VI.2020, 6♂♂,♀; 26.VII.2020,♂; Sapaca, 40°33’02", 41°34’45”E, 1200 m, 16.VII.2021, 2♀♀. Yakutiye: Atatürk University Campus, 39°53’58”N, 41°14’50”E, 1876 m, 16.VI.2021, 4♂♂, 3♀♀.

Distribution. Palearctic. This species is known from Erzurum, Giresun, Isparta, Ordu and Trabzon provinces in Türkiye.

References. Çoruh & Özbek (2008), Kolarov et al. (2014a), Çoruh et al. (2016), Çoruh (2017) and Özdan & Gürbüz (2019) (Figure 3ı).

Associated plants. *Anthriscus sylvestris* (L.) Hoffm., *Chaerophyllum aromaticum* L. (Apiaceae), *Cornus mas* L. (Cornaceae), *Corylus avellana* L. (Betulaceae), *Daucus carota* L., *Ferulago sylvatica* (Besser) Rchb. (Apiaceae), *Fraxinus excelsior* L. (Oleaceae), *Heracleum sphondylium* L. (Apiaceae), *Oryza sativa* L. (Poaceae), *Peucedanum oreoselinum* (L.) (Apiaceae), *Picea excelsa* Engelm. (Pinaceae).

Remarks. This species was collected while feeding on *Medicago sativa* L.

Heterischnus truncator (Fabricius, 1798)

Material examined. Uzundere: Pehlivanlı, 40°29’40”N, 41°30’07”E, 900 m, 24.VI.2020,♂. Yakutiye: Atatürk University Campus, 39°53’58”N, 41°14’50”E, 1876 m, 16.VI.2021, 3♂♂, 7♀♀.

Distribution. Palearctic. This species is known from Erzurum, Giresun, Isparta, Istanbul and Trabzon provinces in Türkiye.

References. Kolarov (1989, 1995), Yurtcan et al. (1999), Özbek et al. (2003), Çoruh et al. (2014b, 2016), Kolarov et al. (2014b) and Özdan & Gürbüz (2019) (Figure 3j).

Associated plants. *Anethum graveolens* L., *Daucus carota* L. (Apiaceae), *Mentha* spp. (Lamiaceae), *Oryza sativa* L. (Poaceae), *Rubus fruticosus* L., *R. idaeus* L. (Rosaceae), *Setaria glauca* (L.) (Poaceae).

Heterischnus excavatus (Constantineanu, 1959)

Material examined. Yakutiye: Atatürk University Campus, 39°53'58"N, 41°14'50"E, 1876 m, 16.VI.2021, 2♂♂, 2♀♀; Güzelova, 40°03'29"N, 41°20'54"E, 1700 m, 19.VIII.2020,♂.

Distribution. Europe and West Palearctic. This species is known from Giresun and Rize provinces in Türkiye.

References. Kolarov et al. (2014b) (Figure 3k)

Associated plants. *Angelica sylvestris* L., *Laserpitium latifolium* L. (Apiaceae).

Subfamily Pimplinae Wesmael, 1845

Perithous septemcinctorius (Thunberg, 1822)

Material examined. Uzundere: Engüzek kapı, 40°30'36"N, 41°31'20"E, 1150 m, 16.VII.2021,♀; Pehlivanlı, 40°29'40"N, 41°30'07"E, 900 m, 19.VIII.2020, ♀, 40°28'37"N, 41°27'39"E, 1000 m, 03.VI.2021, 2♀♀.

Distribution. Holarctic. This species is known from Erzurum, Isparta and Tunceli provinces in Türkiye.

References. Kolarov & Gürbüz (2004), Çoruh & Kolarov (2010), Kolarov et al. (2014c) and Çoruh (2016) (Figure 3l).

Associated plants. *Ampelopsis hederacea* Ehrh. (Vitaceae), *Carpinus* spp. (Betulaceae), *Chaerophyllum bulbosum* L. (Apiaceae), *Prunus domestica* L., *P. domestica insititia* (L.) Bonnier & Layens., *Pyrus communis* L. (Rosaceae).

Pimpla spuria Gravenhorst 1829

Material examined. Uzundere: Erikli, 40°32'07"K, 41°33'39"E, 1420 m, 21.VII.2021, 7♀♀; Pehlivanlı, 40°29'40"N, 41°30'07"E, 900 m, 26.VII.2020, 4♂♂, 40°28'37"N, 41°27'39"E, 1000 m, 03.VI.2021, 11♂♂, 13♀♀. Yakutiye: Atatürk University Campus, 39°53'58"N, 41°14'50"E, 1876 m, 16.VI.2021, 3♂♂, 11♀♀.

Distribution. Oriental and Palearctic. This species is known from Adıyaman, Adana, Afyon, Ankara, Artvin, Balıkesir, Bilecik, Burdur, Bursa, Çanakkale, Denizli, Edirne, Erzincan, Erzurum, Eskişehir, Gaziantep, Giresun, Hatay, Isparta, Istanbul, Kars, Kırklareli, Kocaeli, Konya, Manisa, Mersin, Muğla, Osmaniye, Ordu, Rize, Şanlıurfa, Tekirdağ, Trabzon, Tunceli, Uşak and Yalova provinces in Türkiye.

References. Özdemir & Kılınçer (1990), Öncüer (1991), Kolarov & Beyarslan (1994b), Kolarov (1995), Kolarov et al. (1997a, b, 1999, 2002, 2014c, 2016), Gürbüz (2004), Kolarov & Gürbüz (2004) Yurtcan (2004), Yurtcan & Beyarslan (2005), Çoruh (2005, 2016), Buncukçu (2008), Çoruh & Özbek (2008), Çoruh & Kolarov (2010), Eroğlu et al. (2011), Çoruh et al. (2014a, b), Sarı & Çoruh (2018), Teymuroğlu (2021) and Yurtcan et al. (2021) (Figure 3m).

Associated plants. *Acer campestre* L. (Aceracea), *Anethum graveolens* L. (Apiaceae), *Chaerophyllum bulbosum* L. (Apiaceae), *Daucus carota* L. (Apiaceae), *Euphorbia nicaeensis*, All. (Euphorbiaceae), *Heracleum sphondylium* L. (Apiaceae), *Tamarix* spp. (Tamaricaceae).

Scambus brevicornis (Gravenhorst 1829)

Material examined. Uzundere: Center 41°31'31"N, 41°32'26"E, 1000 m, 21.VI.2021, 9♂♂, 12♀♀; Pehlivanlı, 40°28'37"N, 41°27'39"E, 1000 m, 21.VI.2021, 13♂♂. Yakutiye: Atatürk University Campus, 39°53'58"N, 41°14'50"E, 1876 m, 16.VI.2021, 14♂♂, 7♀♀; Güzelova, 40°02'46"N, 41°20'23"E, 1700 m, 16.VI.2020, ♂.

Distribution. Holarctic. This species is known from Ankara, Artvin, Bingöl, Bitlis, Edirne, Erzurum, Isparta, Istanbul, Kars, Kırklareli, Rize and Tekirdağ provinces in Türkiye.

References. Özdemir & Kılınçer (1990), Kolarov & Beyarslan (1994b), Kolarov (1995), Kolarov et al. (1999, 2020), Özdemir & Özdemir (2002), Kolarov & Gürbüz (2004), Çoruh (2005), Çoruh et al. (2007), Yurtcan (2007) and Çoruh & Kolarov (2010) (Figure 3n.)

Associated plants. *Alnus glutinosa* (L.) Gaertn (Betulaceae), *Anethum graveolens* L., *Angelica sylvestris* L. (Apiaceae), *Aster tripolium* L., *Cirsium arvense* (L)., *Cirsium vulgare* (Savi) Ten. (Asteraceae), *Cnicus paluster* (L.) Willd. (Asteraceae), *Daucus carota* L. (Apiaceae), *Fraxinus excelsior* L. (Oleaceae), *Heracleum* spp. (Apiaceae), *Larix europaea* DC., *Larix polonica* Rac. (Pinaceae), *Peucedanum oreoselinum* (L). (Apiaceae), *Populus tremula* L. (Salicaceae), *Salvia sylvesris* L. (Lamiaceae), *Suaeda maritima* (L.) Domort. (Amaranthaceae), *Vincetoxicum officinale* Medik (Apocynaceae).

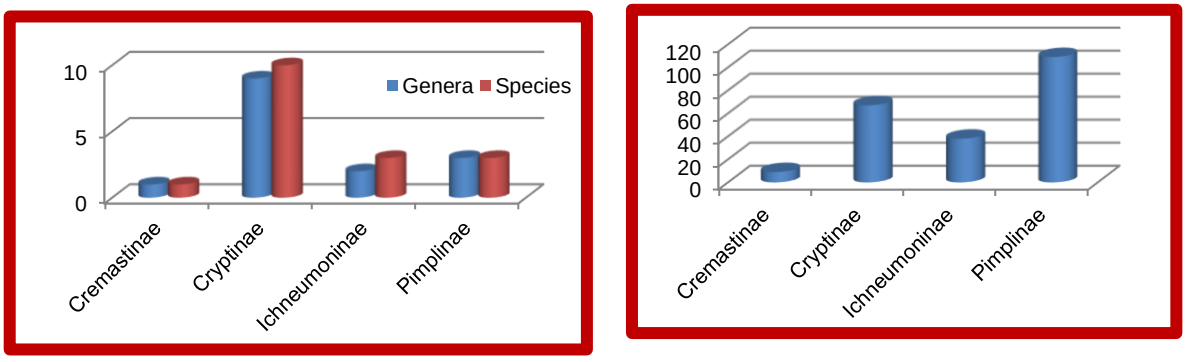
Discussion

The study aimed to reveal the Ichneumonidae (Hymenoptera) fauna in Erzurum, Yakutiye, and Uzundere, and the findings are presented here. The ichneumonids specimens were collected from various altitudes in different months. In total, 17 species of 14 genera belonging to subfamilies Cremastinae, Cryptinae, Ichneumoninae and Pimplinae were identified.

As the study findings have revealed, one species and one genus belonging to subfamily Cremastinae, 10 species and nine genera subfamily Cryptinae, three species and two genera subfamily Ichneumoninae, three species and three genera subfamily Pimplinae were recorded (Figure 4a). Of these, *Mesoleptus vigilatorius*, *Mesostenus funebris* and *Cubocephalus associator* were recorded for the first time for the fauna of Türkiye.

It was noticed that the Pimplinae shows density in terms of the specimen numbers (Figure 4b). Of these, *Scambus brevicornis* and *Pimpla spuria are* the most abundant species, with 56 and 49 specimens, respectively. *Mesoleptus vigilatorius* and *Mesostenus transfuga* are collected as a single specimen in the study area.

All the samples were collected in five different altitude ranges in this study. As can be seen in Table 1, 12 species collected from between 750 and1000 m (A), one species between 1001 and1250 (B), five species between 1251 and1500 m (C), nine species between 1501and1750 (D), six species between 1751 and-2000 m (E) (Figure 5a).



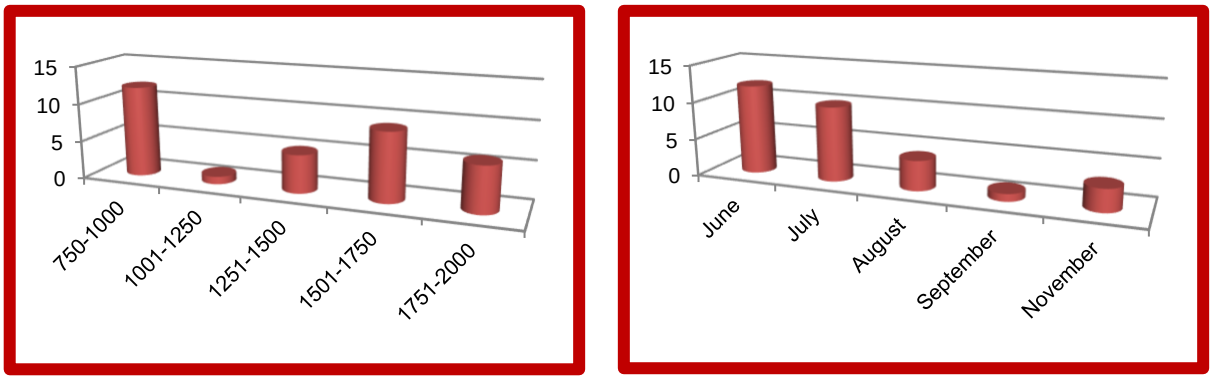
a b

Figure 4. Number of species: a) according to genera and species per subfamily, b) according to specimen numbers.

Table 2. Data of collected species: Specimen numbers (SN), vertical distribution (VD), seasonal dynamics (SD), geographical regions (GR), zoogeographical regions (ZR), associated plant (AP), new record of Türkiye (NRT) of specimens

Name of taxa	SN	VD	SD	GR	ZR	AP	NRT
ORDER: HYMENOPTERA							
FAMILY: ICHNEUMONIDAE Latreille, 1802							
SUBFAMILY: CREMASTINAE Forster, 1869							
Genus *Dimophora* Förster, 1869							
Dimophora nitens	9	A	J, S	CAR, MR, MtR	AUS, WP	x	Kolarov, 1997
SUBFAMILY: CRYPTINAE Kirby, 1837							
Genus *Aptesis* Förster, 1850							
Aptesis senicula	17	A, C, D	J, Jl, N	BSR, EAR, MR, MtR	E, WP		Beyarslan & Kolarov, 1994
Genus *Cryptus* Fabricius, 1804							
Cryptus dianae	2	D	Jl	MtR	WP	x	Gürbüz & Kolarov, 2008
Cryptus viduatorius	16	C, D, E	J, Jl	BSR, EAR, MR, MtR	WP	x	Kolarov, 1987
Genus *Cubocephalus* Ratzeburg, 1848							
Cubocephalus associator	2	D	Jl	*	E, WP	x	New record
Genus *Mesostenus* Gravenhorst, 1829							
**Mesostenus funebris*	7	C, D	J, Jl	*	WP	x	New record
Mesostenus transfuga	8	A	J, N	AR, EAR, MR, MtR	OCE, WP	x	Soydanbay, 1976
Genus *Dichrogaster* Doumerc, 1855							
Dichrogaster longicaudata	5	A, D	J, Jl	CAR, EAR, MtR	HOL	x	Kolarov & Gürbüz, 2007
Genus *Mesoleptus* Gravenhost, 1829							
**Mesoleptus vigilatorius*	1	A	A	*	WP		New record
Genus *Phygadeuon* Gravenhorst, 1829							
Phygadeuon nitidus	4	A	N	MR	E, WP		Çaylak & Çoruh, 2020
Genus *Trychosis* Förster, 1869							
Trychosis legator	14	A, D	Jl, A	BSR, CAR, EAR, MR, MtR, SAR	WP	x	Kolarov, 1987
SUBFAMILY: ICHNEUMONINAE Latreille, 1802							
Genus *Colpognathus* Wesmael, 1845							
Colpognathus celerator	22	A, C, E	J, Jl	BSR, EAR; MtR	WP	x	Çoruh & Özbek, 2008
Genus *Heterischnus* Wesmael, 1859							
Heterischnus truncator	11	A, E	J	BSR, EAR, MtR, MR	WP	x	Kolarov, 1989
Heterischnus excavatus	5	D, E	J, A	BSR	E, WP	x	Kolarov et al., 2014b
SUBFAMILY: PIMPLINAE Wesmael, 1845							
Genus *Perithous* Holmgren, 1859							
Perithous septemcinctorius	4	A, B	J, Jl, A	EAR, MtR	HOL	x	Çoruh & Kolarov, 2010
Genus *Pimpla* Fabricius, 1804							
Pimpla spuria	49	A, C, E	J, Jl	AR, BSR, CAR, EAR, MR, MtR	ORR, WP	x	Özdemir, 1981
Genus *Scambus* Hartig, 1838							
Scambus brevicornis	56	A, D, E	J	CAR, BSR, EAR, MR, MtR	HOL	x	Özdemir & Kılınçer, 1990

Vertical distribution (VD) (meter): A: 750-1000 m., B: 1001-1250 m., C: 1251-1500 m., D: 1501-1750 m., E: 1751-2000 m., Seasonal dynamics (SD): J: June, Jl: July, A: August, S: September, N: November. Geographical regions (GR): AR: Aegean Region, BSR: Black Sea Region, CAR: Central Anatolia Region, EAR: Eastern Anatolia Region, MR: Marmara Region, MtR: Mediterranean Region, SAR: Southeastern Anatolia. Zoogeographical regions (ZR): AUS: Australian, E: Europe, HOL: Holarctic Region, OCE: Oceanic Region, ORR: Oriental, WP: Western Palearctic. AS: Associated Plant.



a b

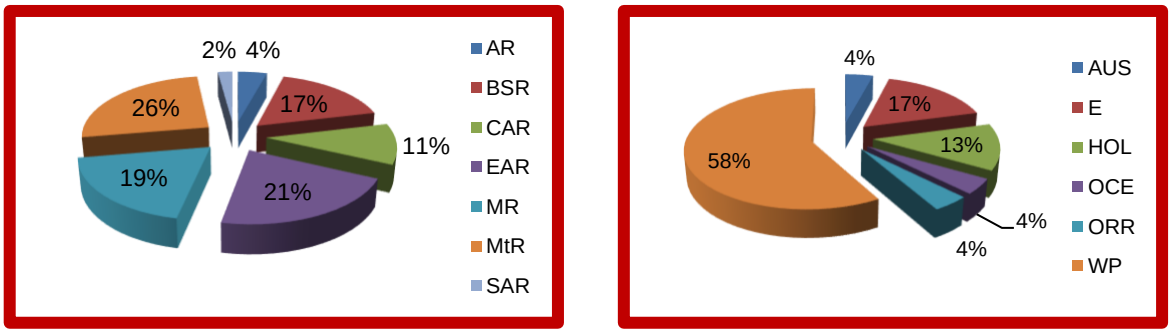
Figure 5. Number of species: a) according to altitude range, b) according to months.

Table 1 reads that most of our insects were collected from an altitude range between 750 and1000 m, but least specimens were collected between 1001 and1250 m with of percentage of 1, 72. The number of species collected was directly proportional to the frequency of visits to the study locality. Despite all this, among the existing species, five species were collected from three different localities, which means that these species were able to live in a wide range of altitudes.

Ichneumon samples were collected mainly in June, July and August as well as in September and November. While a single species entered in insect net in September, most species were collected in June and July (Figure 5b). According to the results, *Aptesis senicula* and *Perithous septemcinctorius* were collected in three different months. Also, six species were collected in only one month. These temporal variations might be because climatic conditions can exert a strong influence on insect abundance and activity (Vasconcellos et al., 2010). Accordingly, we see that, the species identified in the study are active in 5 months a year.

Species were also analyzed for their geographic distributions in Türkiye. Based on this analysis, 12 species were identified from the Mediterranean Region, while 10 were collected from the Eastern Region, previously. The regions where the species were least distributed were the Aegean Region with two samples, and the Southeastern Region with one sample (Figure 6a).

In Table 2, we report that *Pimpla spuria* (35 provinces) was collected in six different regions of Türkiye, and *Trychosis legator* and *Scambus brevicornis* were collected in five different regions. Among the existing species, *Cryptus dianae* (one province), *Phygadeuon nitidus* (one province) and *Heterischnus excavatus* (two provinces) were in only one region.



a b

Figure 6. Number of species: a) according to geographic regions, b) according to zoogeographic region.

There are six main zoogeographic regions in the world for animal distribution (Sclater, 1858). When we examine Table 2, we can see the zoogeographic distribution of the species as follows: 14 species have Western Palearctic distribution, four species European, three species Holarctic, one species Australian, Oceanic and Oriental. In conclusion, Western Palearctic has the highest number of species (Figure 6b).

Cubocephalus associator was found in Europe and West Palaearctic Regions. Although this species is likely to be found in Türkiye, it has only now been discovered. Similarly, *Trychosis legator* was found in six different geographic regions in our country while it had only been commonly seen in West Palearctic Regions in the world before.

Among the existing species, *Cryptus dianae* (Figure 7a) and *Phygadeuon nitidus* (Figure 7b) are rare species for Türkiye, and based on the findings from this study, Erzurum was found to be a second locality for these species.

Figure 7. Rare species for Türkiye: a) *Cryptus dianae,* b) *Phygadeuon nitidus.*

Overall, it is thought that the ecological and faunistic information given about all the above-mentioned species will guide future studies and will be a source for science volunteers to work on this subject. In addition, as in this study, it is predicted that the number of existing species will increase much more with the comprehensive studies to be carried out in many areas that have not been visited in Türkiye.

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