

New Records on the Ichneumonidae Fauna (Hymenoptera) of the Black Sea Coast of Turkey

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ABSTRACT

In this study, Ichneumonidae (Hymenoptera) species collected from Black Sea Coast (Rize) of Turkey are presented. In total 15 species belonging to the subfamilies Metopiinae, Ophioninae, Orthocentrinae, Oxytorinae, Pimplinae and Tryphoninae were determined. Of these, *Exochus alpinus* (Zetterstedt, 1838), *Cylloceria borealis* (Roman, 1925), *Orthocentrus patulus* Holmgren, 1858 and *Zatypota albicoxa* (Walker, 1874) are new records for the Turkish fauna. In addition, new localities for the other species are recorded. We discuss the geographical and zoogeographical records of all the species.

Key words: Darwin wasps, Hymenoptera, Ichneumonidae, new records, Rize, Turkey.

INTRODUCTION

Hymenoptera is one of the four large insect orders exceeding 100,000 species in the world, the other major orders being Coleoptera, Lepidoptera and Diptera (Gauld & Bolton, 1988; Wahl & Micheal, 1993).

Ecologically and economically few groups of insects are so important to mankind as the Hymenoptera. Bees provide the vital ecosystem service of pollination in both natural and managed systems (Gallai, Salles, Settele, & Vaissiere, 2009) while parasitic Hymenoptera control populations of phytophagous insects (Tscharntke, Bommarco, Clough, Crist, & Kleijn, 2007) and can be effective agents for control of pest insects (Bale, van Lenteren, & Bigler, 2008; Brodeur & Boivin 2004; Jonsson, Wratten, Landis, & Gurr, 2008).

Ichneumonidae is the first megadiverse Apocrita family in the world with 25,285 species (Yu, Achterberg, & Horstmann, 2016). The family is divided into more than 40 subfamilies (Broud, Shaw, & Fitton, 2018). Consequently, the biology of ichneumonids is extremely diverse. Ichneumonids mostly parasitize the immature stages of the Holometabola, and are frequently associated with Lepidoptera and sawflies (Hymenoptera). Ectoparasitism is considered the primitive condition and endoparasitism has evolved several times independently within the family (Rasplus, Villemant, Paiva, Delvare, & Roques, 2010).

Studies on Ichneumonidae of Turkey have gained acceleration in recent years. Çoruh, Gürbüz, Kolarov, Yurtcan, & Özdan (2013), reported 975 species in 282 genera for Turkey Ichneumonidae fauna. Now, the number of Ichneumonidae species has reached 1316 with valuable studies: Yaman, 2014; Özdan, 2014; Çoruh, Kolarov, & Çoruh, 2014a; Çoruh, Kolarov, & Özbek, 2014b; Kolarov, Çoruh, & Çoruh, 2014a; Kolarov, Yıldırım, Çoruh & Yüksel, 2014b; Riedel, Kolarov, Çoruh & Çoruh, 2014; Kolarov, Çoruh, & Çoruh, 2015; Kolarov, Çoruh, & Çoruh, 2016; Çoruh, 2017; Kolarov, Çoruh, & Çoruh, 2017; Narmanlıoğlu & Çoruh, 2017; Çoruh, Kolarov, & Çoruh, 2018; Riedel, Diller, & Çoruh, 2018; Sarı & Çoruh, 2018; Çoruh, 2019a, b; Vas, 2019a, b; Özdan & Gürbüz, 2019; Çoruh, Kolarov & Ercelep, 2019; Çaylak & Çoruh 2020a, b; Kolarov, Çoruh, & Çoruh, 2020; Kırac & Gürbüz, 2020; Schwarz, 2020, Teymuroğlu, & Çoruh 2021, Kolarov, Çoruh & Ercelep, 2021, Yurtcan, Çoruh, Kolarov, Özdan, Gürbüz, & Erkaya, 2021; Çoruh, Kolarov, & Ercelep, 2022).

The purpose of this study is to identify the Ichneumonidae species collected from Black sea region, to make this data available to researchers and relevant people and to contribute the biodiversity.

MATERIAL AND METHODS

Data sampling

Adult ichneumonid samples were collected by sweeping net on flowering plants in six different localities and altitudes at above level (10-200 m) (Table 1) of Rize (Fig. 1, 2) in Turkey (Anatolia), during summer of 2016-2017. Collected specimens were preserved in 70 % ethanol. All examined material was collected by the second

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author and Halil Çoruh and determined by authors and deposited in the Entomology Museum Erzurum, Turkey (EMET). New record of species is marked by an asterisk (*). General distributions (Table. 2), hosts and associated plants of the species were taken from Yu et al, (2016).

Table 1. Data of collected species.

	Locality	Year	Altitude (M.)
Rize	Ardeşen	2016-2017	10
	Çayeli		10
	Derepazari		50
	Güneysu		150
	İyidere		210
	Pazar		37

Table 2. Zoogeographic distribution of collected species.

Zoogeographical Regions	Afrotropical	Eastern Palearctic	European Region	Nearctic	Neotropical	Oceanic	Oriental	Western Palearctic
<i>Colpotrochia cincta</i>		•	•					•
<i>Exochus alpinus</i>				•				
<i>Exochus prosopius</i>		•	•					•
<i>Enicospilus ramidulus</i>	•	•	•				•	•
<i>Cylloceria borealis</i>		•	•				•	•
<i>Orthocentrus patulus</i>			•					•
<i>Oxytorus luridator</i>			•					•
<i>Clistopyga rufator</i>		•	•					•
<i>Pimpla aquilonia</i>		•	•	•				•
<i>Pimpla rufipes</i>			•		•			•
<i>Pimpla spuria</i>		•	•				•	•
<i>Scambus nigricans</i>		•	•					•
<i>Zatypota albicoxa</i>		•	•				•	•
<i>Ctenochira angulata</i>		•	•					•
<i>Oedemopsis scabricula</i>		•	•	•			•	•



Fig. 1. Map of study area.



Fig 2. Photographs of study area.

Study area

Rize is a province located in the northeastern Turkey and has a coast to the Black Sea. Located in the Black Sea Region, Rize is surrounded by Trabzon in the west, Artvin in the east, Bayburt in the southwest, and Erzurum in the south (Anonymous, 2021).

In general, the land of Rize province are covered with a very diverse and very lush vegetation. Nearly 48% of Rize provincial lands are covered with forest and heaths. Forest are found up to an altitude of 2800 m. 24% is covered with cultivated and plated areas.

RESULTS

During the investigation, we found 15 species belonging to Metopiinae, Ophioninae, Ophioninae, Orthocentrinae, Oxytorinae, Pimplinae and Tryphoninae. The species list is given below.

Subfamily Metopiinae Förster, 1869

Colpotrochia cincta (Scopoli, 1763)

Material examined: Rize: İyidere, 210 m, 23.07.2016, 2 ♀♀; 02.08.2017, 1 ♂.

Distribution: Palaearctic, known from Turkey (Kolarov, Çoruh, Yurtcan, & Gürbüz, 2009; Kolarov & Çalmaşur, 2011; Çoruh & Özbek, 2011; Çoruh, Kolarov, & Çoruh, 2014a; Çoruh, Kolarov, & Özbek, 2014b; Kolarov, Yıldırım, Çoruh, & Yüksel, 2014b).

Hosts: *Acronicta aceris*, *Acronicta rumicis*, *Aletia conigera*, *Axylia*, *Mythimna turca*, *Papestra biren*.

Associate plant: *Peucedanum oreoselinum*.

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***Exochus alpinus (Zetterstedt, 1838)**

Material examined: Rize: Ardeşen, 02.08.2017, 2 ♀♀; Güneysu, 150 m, 16.06.2016, 1 ♀.

Distribution: Palaearctic, new for Turkey.

Hosts: *Acleris rhombana*, *Apotomis sauciana*, *Archips xylosteana*, *Epinotia solandriana*, *Epinotia tetraquetrana*, *Hedya dimidiana*, *Phauda flammans*, *Triaxomera parasitella*.

Exochus prosopius Gravenhorst, 1829

Material examined: Rize: İyidere, 210 m, 29.06.2016, 1 ♀; 23.07.2017, 2 ♂♂; 02.08.2017, 1 ♂.

Distribution: Palaearctic, known from Turkey (Kolarov, Çoruh, Yurtcan & Gürbüz, 2009; Çoruh et al, 2014b; Kolarov, Çoruh, & Çoruh 2017).

Subfamily Ophioninae Shuckard, 1840

Enicospilus ramidulus (Linnaeus, 1758)

Material examined: Rize: Güneysu, 150 m, 05.07.2017, 1 ♀; İyidere, 210 m, 09.06.2017, 2 ♂♂ 5♀♀.

Distribution: Afrotropical, Palaearctic, Oriental, known from Turkey (Kolarov, 1995; Kolarov, Pekel, Özbek, Yıldırım, & Çalmaşur, 2000; Gürbüz, 2004, 2005; Beyarşlan, Yurtcan, Erdoğan, & Aydoğdu, 2006; Okyar & Yurtcan, 2007; Çoruh & Çoruh, 2008, Gürbüz, Kırtay & Birol, 2009; Kıracı & Gürbüz, 2020; Çoruh et al, 2014b; Kolarov, Çoruh & Çoruh, 2014a; Çoruh & Çalmaşur, 2016; Kolarov et al, 2017; Kolarov et al, 2020).

Hosts: *Agrotis segetum*, *Anarta myrtilli*, *Axylia putris* [*Nicotiana tabacum*], *Catocala electa*, *Cucullia absinthii*, *Dendrolimus pini*, *Dypterygia scabriuscula*, *Eriogaster lanestris*, *Hadena bicurris*, *Hadena rivularis*, *Hyles euphorbiae*, *Hyphantria cunea* [*Corylus avellana*], *Lacanobia oleracea*, *L. pisi*, *Melanchra persicariae*, *Nematus salicis*, *Ochropleura praecox*, *Panolis flammea*, *Phalera bucephala*, *Phlogophora meticulosa*, *Poecilocampa populi*.

Associate plants: *Alnus glutinosa*, *Carum carvi*, *Oryza sativa*, *Salvia glutinosa*, *Seseli libanotis*.

Subfamily Orthocentrinae Förster, 1869

***Cylloceria borealis (Roman, 1925)**

Material examined: Rize: İyidere, 210 m, 09.06.2017, 1 ♂.

Distribution: Holarctic, new for Turkey.

***Orthocentrus patulus Holmgren, 1858**

Material examined: Rize: Pazar, 37 m, 31.08.2017, 1 ♀.

Distribution: Europe, new for Turkey.

Subfamily Oxytorinae Thomson, 1883***Oxytorus luridator* (Gravenhorst, 1820)**

Material examined: Rize: Pazar, 37 m, 31.08.2017, 1 ♀.

Distribution: Europe, known for Turkey (Kolarov, Çoruh & Çoruh, 2015; Kolarov, Çoruh & Çoruh, 2016).

Associate plants: *Sparganium* sp.

Subfamily Pimplinae***Clistopyga rufator* Holmgren, 1856**

Material examined: Rize: Çayeli, 10 m, 16.06.2017, 1 ♀.

Distribution: Palaearctic, known from Turkey (Yurtcan, 2004, 2007; Çoruh, 2005; Çoruh, Özbek, Kolarov, 2007; Buncukçu, 2008; Çoruh & Özbek, 2008; Gürbüz, Ljubomirov, Kolarov, Yurtcan, Tabur, Çoruh & Buncukçu, 2008; Gürbüz et al, 2009; Çoruh, 2009, 2010; Birol, 2010; Çoruh & Kolarov, 2010; Çoruh, Çalmaşur & Tozlu, 2010; Özdan, 2014; Çoruh et al, 2014b; Çoruh, 2016; et al, 2021).

Host: *Clubiona juvenis*.

***Pimpla aquilonia* Cresson, 1870**

Material examined: Rize: İyidere, 210 m, 09.06.2017, 1 ♂; Pazar, 37 m, 11.07.2017, 1 ♂.

Distribution: Holarctic, known from Turkey (Yurtcan & Beyarslan, 2005, Çoruh & Kolarov, 2010; Çoruh et al, 2014a; Çoruh, 2016)

Hosts: *Archips fuscocupreanus*, *Argiope argentata*, *Choristoneura diversana*, *Coleophora serratella*, *Croesia semipurpurana*, *Cymolomia hartigiana*, *Dendrolimus albolineatus*, *Epinotia nigricana*, *Grapholita molesta*, *Lambdina fiscellaria* [*Abies balsamea*], *Lambdina fiscellaria lugubrosa*, *Magdalis frontalis*, *Orgyia leucostigma*, *Orthosia hibisci*, *Parasteatoda tepidariorum*, *Psilocorsis cryptolechiella*, *Rheumaptera hastata*, *Spilonota ocellana*, *Teleiodes saltuum*, *Tortrix viridana*, *Zeiraphera griseana*,

Associate plants: *Listera ovata*.

***Pimpla rufipes* Brullé, 1846**

Material examined: Rize: İyidere, 210 m, 23.06.2017, 1 ♀.

Distribution: Palaearctic, Neotropical, known from Turkey (Çoruh, 2005, 2009; Okyar & Yurtcan, 2007; Çoruh & Özbek, 2008; Kolarov & Çalmaşur, 2011; Özbek & Çoruh, 2012, Çoruh, 2016).

Hosts: *Hyphantria cunea*, *Malacosoma neustria*, *Plusia* sp.

Remarks: This species obtained from *Malacosoma neustria* and *M. franconica*, *Yponomeuta malinella* in our previous study (Çoruh & Özbek, 2008).

***Pimpla spuria* Gravenhorst, 1829**

Material examined: Rize: Derepazarı, 50 m, 23.06.2016, 1 ♂; Pazar, 37 m, 04.07.2017, 1 ♂.

Distribution: Palaearctic, Oriental, known for Turkey (Fahringer, 1922; Özdemir & Kılınçer, 1990; Öncüer, 1991; Kolarov & Beyarslan, 1994; Kolarov, Yurtcan, & Beyarslan, 1997a; Kolarov, Beyarslan & Yurtcan, 1997 b; Kolarov, Özbek, & Yıldırım, 1999; Kolarov, Yurtcan & Beyarslan, 2002; Gürbüz, 2005; Kolarov & Gürbüz, 2004; Çoruh, 2005; Gürbüz, 2005; Yurtcan & Beyarslan, 2005; Kırtay, 2008; Çoruh, Çalmaşur, & Tozlu, 2010; Çoruh & Kolarov, 2010; Eroğlu, Kırac & Birol, 2011; Kolarov et al, 2014b; Çoruh et al, 2014a; Çoruh, 2016; Kolarov et al, 2016; Sarı & Çoruh, 2018; Kırac & Gürbüz, 2020).

Hosts: *Agonopterix heracliana*, *Agonopterix propinquella*, *Archips rosana*, *Calliteara pudibunda*, *Canephora hirsuta*, *Cydia funebrana*, *Cydia pomonella*, *Cynaeda dentalis*, *Depressaria pastinacella*, *Enarmonia formosana*, *Etiella zinckenella*, *Eupithecia vulgata*, *Eupoecilia ambiguella*, *Gypsonoma aceriana*, *Hyphantria cunea*, *Larentia clavaria*, *Lobesia botrana*, *Loxostege sticticalis*, *Lymantria dispar*, *Naranga aenescens*, *Ostrinia nubilalis*, *Pempelia genistella*, *Psoricoptera gibbosella*, *Sesamia nonagrioides*, *Tebenna bjerckandrella*, *Yponomeuta malinella*, *Yponomeuta padella*.

Associated plants: *Acer campestre*, *Anethum graveolens*, *Chaerophyllum bulbosum*, *Daucus carota*, *Daucus carota sativus*, *Euphorbia nicaeensis*, *Heracleum sphondylium*, *Tamarix* sp.

Remarks: This species obtained from *Malacosoma neustria* and *Yponomeuta malinella* in our previous study (Çoruh & Özbek, 2008).

***Scambus nigricans* Thomson, 1877**

Material examined: Rize: İyidere, 210 m, 05.08.2017, 1 ♀; Pazar, 37 m, 23.07.2017, 1 ♂, 01.08.2017, 1 ♂.

Distribution: Palaearctic, known from Turkey (Kolarov & Beyarslan, 1994; Kolarov et al, 1997a; Kolarov et al, 1999; Kolarov et al, 2002; Kolarov & Gürbüz, 2004; Çoruh, 2005; Yurtcan, 2007; Çoruh et al, 2007, Çoruh & Kolarov, 2010; Çoruh et al, 2010; Kolarov & Çalmaşur, 2011; Özbek & Çoruh, 2012; Çoruh et al, 2014b; Çoruh, 2016; Kolarov et al, 2017; Kolarov et al, 2020; Yurtcan et al, 2021).

Hosts: *Adaina microdactyla*, *Aethes francillana*, *Aethes williana*, *Agonopterix heracliana*, *Alsophila aescularia*, *Apocheima hispidaria*, *Cnephasia stephensiana*, *Cochylis atricapitana*, *Cydia delineana*, *Cydia discretana*, *Cydia pactolana*, *Depressaria daucella*, *Depressaria pastinacella*, *Dioryctria simplicella*, *Epiblema cirsiana*, *Epiblema scutulana*, *Gortyna flavago*, *Hartigia linearis*, *Heptamelus ochroleucus*, *Lampronia morosa*, *Lipara lucens*, *Lycaena dispar batava*, *Lycia pomonaria*, *Malacosoma neustria*, *Mompha conturbatella*, *Myelois circumvoluta*, *Noeeta pupillata*, *Oxyina parietina*, *Phigalia pilosaria*, *Platyptilia nemoralis*, *Pseudaletia unipuncta*, *Rhyacionia buoliana*, *Scrobipalpa clintoni*, *Triedris paleana*.

Associated plants: *Anethum graveolens*, *Chaerophyllum bulbosum*, *Daucus carota*, *Euphorbia nicaeensis*, *Heracleum sphondylium*, *Peucedanum oreoselinum*.

Remark: This species was collected on *Heracleum pastinacifolium* in our previous study (Kolarov et al, 2020).

***Zatypota albicoxa (Walker, 1874)**

Material examined: Rize: Pazar, 37 m, 19.07.2017, 2 ♀♀.

Distribution: Palaearctic, Oriental, new for Turkey.

Hosts: *Parasteatoda lunata*, *Parasteatoda merapiensis*, *Parasteatoda oculiprominens*, *Parasteatoda simulans*, *Parasteatoda tabulata*, *Parasteatoda tepidarium*, *Theridion limatum*.

Associate plants: *Oryza sativa*.

Subfamily Tryphoninae Shuckard, 1840***Ctenochira angulata* (Thomson, 1883)**

Material examined: Rize: Pazar, 37 m, 27.08.2017, 1 ♂.

Distribution: Palaearctic, known from Turkey (Yurtcan & Beyarslan, 2002; Yaman, 2014; Kolarov et al, 2016; Çoruh, 2019).

***Oedemopsis scabricula* (Gravenhorst, 1829)**

Material examined: Rize: Ardeşen, 10 m, 05.08.2017, 3 ♀♀.

Distribution: Holarctic, Oriental, known from Turkey (Çoruh, Özbek, Kolarov, 2005; Beyarslan, Erdoğan, Çetin, & Aydoğdu, 2006; Çoruh et al, 2014a; 2014b; Yaman, 2014; Çoruh, 2019, Kolarov et al, 2017).

Hosts: *Acleris variegana*, *Aleimma loeflingiana*, *Ancylicus apicella*, *Archips oporana*, *Archips rosana*, *Blastobasis lignea*, *Cacoecimorpha pronubana*, *Choristoneura rosaceana*, *Cladius difformis*, *Clepsis costana*, *Croesia holmiana*, *Ditula angustiorana*, *Epinotia albanguana*, *Epinotia solandriana*, *Epiphyas postvittana*, *Eudemis profundana*, *Euproctis similis*, *Pandemis cerasana*, *Pandemis heparana*, *Ptycholoma lecheana*, *Rhyacionia buoliana*, *Selania leplastriana*, *Spilonota ocellana*, *Tortrix viridana*, *Yponomeuta cagnagella*.

Zoogeographical notes

Enicospilus ramidulus is the species with the multiregional ranges is the species *Enicospilus ramidulus*, distributed in Afrotropical, Palaearctic and Oriental zoogeographical regions.

Three species have distributional ranges in two zoogeographical regions of them: *Pimpla rufipes* distributed in Western Palaearctic and Neotropical regions; *Pimpla spuria* and *Zatypota albicoxa* distributed in Palaearctic and Oriental regions.

Two species, *Cylloceria borealis* and *Pimpla aquilonia* have Holarctic distribution. Most of the species have Palaearctic distribution. Of them, *Colpotrochia cincta*, *Exochus alpinus*, *E. prosopius*, *Clistopyga rufator*, *Scambus nigricans* and *Ctenochira angulata*.

European distribution ranges have 2 species - *Orthocentrus patulus* and *Oxytorus luridator*.

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