Checklists of the Eucharitidae and Ormyridae (Hymenoptera: Chalcidoidea) of Iran

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Introduction

The Eucharitidae (Hymenoptera: Chalcidoidea) constitute a monophyletic family of solitary parasitoids of ant pupae. Its members are distributed in almost every zoogeographical region in the world but are most abundant in the tropics (HERATY 2002; GADALLAH et al. 2014). The family includes 65 genera and 463 species worldwide, classified into four subfamilies: Akapalinae (single genus), Gollumiellinae (2 genera), Oraseminae (13 genera) and Eucharitinae (49 genera) (NOYES 2016, HERATY 2017). Among the 65 genera, only Eucharis has been recorded to date from Iran (together with the new record of Stilbula herein). A total of 47 species of Eucharis and 41 species of Stilbula have previously been described (HERATY 2017). Eucharitidae are usually indirect parasitoids of ants that oviposit into plant tissues, after which the active first instar or planidium seeks out the host ant. Sometimes the ants collect the larvae during hatching, or directly after it. Using various behavioural strategies, the planidia are carried to the nest where they first attack the host larva and then develop on the ant pupa (BOUČEK 1956; HERATY 2002; TORRÈNS 2013). Eucharis have been reared from Cataglyphis Förster, Formica Linnaeus and Messor Forel (Formicidae) (HERATY 2002, LACHAUD & PÉREZ-LACHAUD 2012).

The family Ormyridae is one of the smallest families of Chalcidoidea, with 147 valid species worldwide, comprised of three genera: Ormyrus Westwood (145 species), Ormyrulhus Bouček (one species) and Eubeckerella Narendran (one species) (NOYES 2016). Ormyrus Westwood is the largest and the most widespread genus in the family (GENÇER 2014, ZEROVA & SERVOGINA 2015). Most species of Ormyrus are parasitoids of gall-makers belonging to the families Agaonidae, Cynipidae, Eurytomidae, Pteromalidae (Hymenoptera), Agromyzidae, Cecidomyiidae, Tephritidae (Diptera), Coleoptera, and
Thysanoptera (Thripidae). The hosts of *Eubeckerella* remain unknown, but *Ormurus* are parasitoids of a gall midge (Diptera: Cecidomyiidae) (Bouček 1986; Zérová & Seryogina 1998; Narendran 1999; Yao & Yang 2004; Noyes 2016).

The family Eucharitidae is poorly represented in Iran, with only four known species (Lotfalizadeh 2008; Ghahari et al. 2016; Samin & Farzaneh 2016). The fauna of Iranian Ormyridae has been closely studied by a number of authors (Gharalil & Zérová 2004; Ghahari et al. 2010, 2016; Lotfalizadeh et al. 2012; Samin 2015), and 11 species of *Ormurus* have been recorded from the country (Moravveji et al. 2016). Recently, two additional species were recorded by Samin & Farzaneh (2016). Iran forms a large part of the Iranian plateau, and covers an area of 1,623,779 km². It is bordered to the north by the Caucasus Mountains, the Middle Asian natural regions, and the Caspian Sea (27 m below sea level), to the west by the Anatolian and Mesopotamian regions, to the east by the eastern part of the Iranian plateau (Afghanistan and adjacent west Pakistan) and the Baluch-Sindian region, and finally to the south by the Persian Gulf and Gulf of Oman, which are connected by the latter to the Indian Ocean (Fig. 1). Climatologically, Iran is a predominantly arid and semi-arid country, but the northern slopes of the Alburz ranges and the Caspian lowlands receive 800 to 2000 mm annual rainfall, making them the most humid parts of the country. The Dasht-e Kavir and Dasht-e Lut deserts are the driest areas, with an annual precipitation of less than 150 mm. The highlands receive between 250 and 800 mm (Zehzad et al. 2002).

The aim of this paper is to catalogue all the currently published data on Iranian Eucharitidae and Ormyridae (Hymenoptera: Chalcidoidea), and is a continuation of a series of checklists of Chalcidoidea of Iran (see Stojanova & Ghahari 2009, Eurytomidae and Torymidae; Ghahari & Van Noort 2011, Agaonidae; Ahd-Rabou et al. 2013, Aphelinidae; Ghahari et al. 2014, Signiphoridae; Ghahari et al. 2015a, Pteromalidae.

**Material and methods**

Published data on the Eucharitidae and Ormyridae fauna of Iran is summarized herein. The checklist comprises the following: the valid taxon name, published records with provincial distribution or, where this information is not available – “Iran (no locality cited)” is given, synonyms in records, general distribution. Classification, nomenclature and distribution data as suggested by Zérová & Seryogina (2015) and Noyes (2016) have been followed. The provinces of Iran appear in Fig. 1.

**Results**

Checklists for the Eucharitidae and Ormyridae species of Iran revealed the presence of five species within two genera, *Eucharis* and *Stilbula* for Eucharitidae, and 13 species of *Ormurus* for Ormyridae. The list of species below appears alphabetically, with distribution data. One species, *Stilbula cyniformis* (Rossi, 1792) (Eucharitidae) is a new record for the fauna of Iran.
Iran Eucharitidae and Ormyridae (Hymenoptera)

Family Eucharitidae Walker, 1846
Subfamily Eucharitinae Walker, 1846
Genus Eucharis Latreille, 1804

Eucharis adscendens (Fabricius, 1787)

Eucharis (Eucharis) adscendens (Fabricius, 1787).

Distribution in Iran. East Azarbaijan (LOTFALIZADEH 2008), Golestan (GHAHARI et al. 2016).

General distribution. Austria, Belarus, Bosnia Herzegovina, Croatia, Czech Republic, Germany, Hungary, Italy, Kazakhstan, Lithuania, Moldova, Poland, Romania, Russia, Serbia, Slovakia, Transcaucasia, Turkey, Ukraine, former USSR.

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**Eucharis carinifera** Gussakovskiy, 1940

*Eucharis (Eucharis) carinifera* Gussakovskiy, 1940.

**Distribution in Iran.** Golestan (Shahkuh) (NIKOL’SKAYA 1952; HERATY 2017), Iran (no locality cited) (BOUČEK 1977; LOTFALIZADEH 2008; NOYES 2016).

**General distribution.** Armenia, Iran, Kazakhstan, Russia, Serbia, Transcaucasia, Ukraine, Uzbekistan.

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**Eucharis punctata** Förster, 1859

*Eucharis (Psilogastrellus) punctata* Förster, 1859.

**Distribution in Iran.** Guilan (SAMIN & FARZANRH 2016).

**General distribution.** Algeria, Austria, Bulgaria, Croatia, Egypt, Europe, Macedonia, Tunisia, Turkey, former Yugoslavia.

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**Eucharis rugulosa** Gussakovskiy, 1940

*Eucharis (Eucharis) rugulosa* Gussakovskiy, 1940.

**Distribution in Iran.** Tehran (LOTFALIZADEH 2008).

**General distribution.** Russia, Ukraine.

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**Genus Stilbula** Spinola, 1811

**Stilbula cyniformis** (Rossi, 1792)

**Material examined.** Mazandaran province, Savadkooh, 36°05'N 52°55'E, 2♀, 14.vi.2011, Malaise trap. New record for the fauna of Iran.

**General distribution.** Austria, Azerbaijan, Bosnia Herzegovina, Caucasus, China, Croatia, Czech Republic, Europe, France, Germany, Hungary, Italy, Japan, Kazakhstan, Korea, Macedonia, Moldova, Romania, Russia, Slovakia, Turkey, Ukraine, USA, former Yugoslavia.

**Comments.** The genus *Stilbula* is here recorded for the first time for Iran. *Stilbula cyniformis* is associated with certain species of Formicidae and Sphecidae (Hymenoptera) (NOYES 2016).

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**Family Ormyridae** Förster, 1856

**Genus Ormyrus** Westwood, 1832

**Ormyrus bingoeiensis** Doğanlar, 1991

**Distribution in Iran.** Lorestan (LOTFALIZADEH et al. 2012).
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**General distribution.** Iran, Turkey.

**Comments.** Association with *Chilaspis israeli* Sternlicht (Hymenoptera: Cynipidae) on *Quercus brantii* (Lotfalizadeh et al. 2012).

*Ormyrus bucharicus* Zerova, 1985

**Distribution in Iran.** Qazvin (Lotfalizadeh et al. 2012).

**General distribution.** Iran, Uzbekistan.

*Ormyrus cupreus* Askew, 1998

**Distribution in Iran.** East Azarbaijan (Lotfalizadeh et al. 2012).

**General distribution.** Europe, Iran, Spain.

*Ormyrus diffinis* (Fonscolombe, 1832)

**Distribution in Iran.** East Azarbaijan (Lotfalizadeh et al. 2012), Golestan, Mazandaran, Northern Khorasan (Ghahari et al. 2016), Khuzestan (Ghahari et al. 2010).

**General distribution.** Bulgaria, Caucasus, Croatia, Czech Republic, France, Germany, Hungary, Iran, Israel, Kazakhstan, Moldova, Montenegro, Russia, Serbia, Slovakia, Spain, Tajikistan, Turkey, Turkmenistan, Ukraine, former Yugoslavia.

*Ormyrus discolor* Zerova, 2005

**Distribution in Iran.** Lorestan, Razavi Khorasan (Lotfalizadeh et al. 2012).

**General distribution.** Iran, Israel.

*Ormyrus gratiosus* (Förster, 1860)

**Distribution in Iran.** East Azarbaijan (Ghahari et al. 2010), Golestan, West Azarbaijan (Samin 2015), Ilam (Gharali & Zerova 2004; Lotfalizadeh et al. 2012; Lotfalizadeh & Gharali 2014).

**General distribution.** Armenia, Austria, Bulgaria, Caucasus, Czech Republic, Finland, France, Georgia, Germany, Hungary, Iran, Kazakhstan, Netherlands, Poland, Russia, Serbia, Slovakia, Spain, Sweden, Switzerland, Turkey, Turkmenistan, Ukraine, UK, Uzbekistan.

**Ormyrus longicornis** Bouček, 1969

**Distribution in Iran.** Guilan (Samin & Farzaneh 2016, on Quercus brantii).

**General distribution.** Azerbaijan, Bulgaria, Europe, Georgia, Russia (Dagestan), Turkey.

**Ormyrus nitidulus** (Fabricius, 1804)


**General distribution.** Algeria, Andorra, Austria, Azerbaijan, Belgium, Bosnia Herzegovina, Bulgaria, Caucasus, Croatia, Czech Republic, Denmark, France, Georgia, Germany, Greece, Hungary, Iran, Italy, Jordan, Netherlands, North Africa, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, UK, USA, former Yugoslavia.


**Ormyrus orientalis** Walker, 1871

**Distribution in Iran.** Chaharmahal & Bakhtiari, East Azerbaijan, Isfahan (Lotfalizadeh et al. 2012; Lotfalizadeh & Gharali 2014), Kordestan (Modarres Awal 1997 as Ormyrus hungaricus Erdös, 1946), Kuhgiloyeh & Boyerahmad (Saeidi 2013, 2015), Mazandaran (Samin 2015), Qazvin (Lotfalizadeh et al. 2012), Razavi
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General distribution. Afghanistan, Azerbaijan, Belarus, Bulgaria, Caucasus, Croatia, Czech Republic, Dominican Republic, France, Georgia, Germany, Greece, Hungary, India, Iran, Iraq, Italy, Moldova, Montenegro, Pakistan, Russia, Serbia, Slovakia, Spain, Sri Lanka, Tajikistan, Turkey, Turkmenistan, Ukraine, Uzbekistan.


Ormyrus pallens Lotfalizadeh et Askew, 2012


General distribution. Endemic to Iran.

Comments. Association with Neuroterus lanuginosus Giraud and Pseudoneuroterus macropterus (Hartig) (Hymenoptera: Cynipidae) on Quercus brantii (Lotfalizadeh et al. 2012).

Ormyrus pomaceus (Geoffroy, 1785)


General distribution. Andorra, Austria, Bulgaria, Caucasus, China, Croatia, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iran, Ireland (both Eire and Ulster), Italy, Japan, Jordan, Moldova, Montenegro, Netherlands, Poland, Romania, Russia, Serbia, Slovakia, South Korea, Spain, Sweden, Turkey, Ukraine, UK.


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**Note.** *O. pomaceus* is a smaller insect than the preceding species; it has a more diverse range of host oak galls in which it may attack inquilines *Synergus* and other chalcidoid parasitoids, in addition to the gall-inducers (Rizzo & Askew 2009).

**Ormyrus rufimanus** Mayr, 1904

**Distribution in Iran.** Golestan (Samin & Farzaneh 2016).

**General distribution.** Austria, Bulgaria, China, France, Germany, Hungary, Poland, Romania, Russia, Spain, Sweden, Ukraine, United Arab Emirates.

**Comments.** Association with *Dryocosmus* sp. (Hymenoptera: Cynipidae) on *Quercus* sp. (Samin & Farzaneh 2016).

**Ormyrus wachtli** Mayr, 1904

**Distribution in Iran.** East Azarbaijan (Lobjalizadeh et al. 2012).

**General distribution.** Austria, Bulgaria, Croatia, Czech Republic, France, Hungary, Iran, Italy, Kazakhstan, Moldova, Romania, Russia, Serbia, Slovakia, Spain, Sweden, Turkey, Ukraine, former Yugoslavia.
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Fig. 2. Number of reported cynipid species as hosts of Iranian Ormyridae.

Fig. 3. Number of reported species of Iranian Ormyridae by province.
Discussion and conclusion

Five Eucharitidae species are known from Iran, although considering the various geographical regions and the climates range in the country, and also the species diversity of Iranian Formicidae (PAKNIA et al. 2008; GHAHARI et al. 2009, 2015b; GHAHARI & COLLINGWOOD 2011, 2013), it may be assumed that more remain to be discovered. It should be noted that the members of Eucharitidae, together with Aphelinidae, Encyrtidae and Eulophidae, are the most important biological control agents of ants (HERATY 2002).

Thirteen species of Ormyridae are known from Iran. The fauna of Turkey is quite similar to that of Iran, with a total of 13 species, of which eight are distributed in both countries; in addition, Azerbaijan and Turkmenistan share three species, and all other neighbouring countries (Afghanistan, Armenia, Iraq and Pakistan) share only one species. In addition to the eight shared species, the other five species in Turkey are: Ormyrus artohokanensis (Doğanlar), O. kazovaensis (Doğanlar), O. salmanticus Nieves-Aldrey; O. tschami (Doğanlar) and O. yeschilirmaka (Doğanlar) (GENÇER 2014). One species, Ormyrus pallens Lotfalizadeh et Askew, is endemic to Iran. Since the species diversity of ormyrids has by no means been studied comprehensively throughout Iran, further faunistic surveys are required. Further, studies of their taxonomy, biology, host association and role in forest ecosystems are also necessary.

Among the 13 ormyrid species in Iran, the host-associations of two species, Ormyrus nitidulus and O. pomaceus have been studied exhaustively as the parasitoids of various gall wasps (Cynipidae). A total of 33 host species of Cynipidae have been recorded for Iranian Ormyridae, of which 19 species are related to the genus Andricus, 14 species to other Cynipidae genera (Fig. 2), one species to Tephritidae (Acanthiophilus helianthi (Rossi)) (Diptera), and one species to Agromyzidae (Phytomyza orobanchiae Kaltenbach) (Diptera).

Systematic collection has taken place in only 19 of the 31 Iranian provinces. Among them, East Azarbaijan, with seven recorded species, has the highest diversity, followed by Lorestan province with four species (Fig. 3). These results are biased towards the provinces in which the majority of sampling has been done. Most species have been recorded from north-western parts of Iran (East Azarbaijan and West Azarbaijan provinces: 7+3 records, respectively); it may be assumed that there is a considerable diversity of species in western and southern areas (Chaharmahal & Bakhtiari, Fars, Ilam, Kermanshah, Kordestan, Kuhgiloyeh & Boyerahmad and Lorestan provinces) because of high diversity of oak trees in these regions. The Zagros mountain range (total length of 1,500 km) is located in these provinces; it begins in north-western Iran, roughly corresponding to Iran’s western border, and spans the whole length of the western and south-western Iranian plateau, ending at Bushehr province. The Zagros Mountains contain several ecosystems. Prominent among them are forest and forest steppe areas with a semi-arid climate. It is therefore assumed that a number of other species remain to be discovered by faunistic samplings in the western and south-western areas of Iran.
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