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Research Article

Occurrence of eulophid wasps (Hymenoptera: Chalcidoidea, Eulophidae) in rice fields of eastern Guilan, Iran

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Abstract: Considering the importance of parasitic wasps in biological control of pests, a faunal study was conducted in the year 2012 on eulophid wasps (Hym.: Chalcidoidea) in rice fields in the east of Guilan province, southern coast of Caspian Sea. Several specimens were captured via Malaise traps. The specimens were identified as *Aprostocetus deobensis* (Graham), *Aprostocetus mycerinus* (Walker), *Elasmus phthorimaeae* Ferrière and *Hemiptarsenus* sp. Two species, *A. deobensis* and *A. mycerinus* are new records for Iran. In addition, association of *A. deobensis*, *A. mycerinus* and *E. phthorimaeae* with rice is new.

Keywords: Eulophidae, *Aprostocetus*, New record, New association, Parasitoids

Introduction

Rice (*Oryza sativa* L.) is one of main agricultural crop in the north of Iran (southern coast of Caspian Sea). Insect fauna associated with this plant has not been studied in detail except some important rice pests (Mohammadzadeh Fard and Hodjat, 2007). Recently, Bayegan *et al*. (2014a, b) reported two chalcidoid wasps (Hymenoptera) from rice fields of Iran. A wide range of Eulophidae (17 genera and 42 species) has been reported associated with rice (Noyes, 2014).

A total of 62 parasitoids have been recorded in association with pests of various crops (including rice) in Manipur of India (Subharani *et al*., 2010). During the study in south-eastern Indian rice fields in search for biocontrol agents of rice pests, seven new species (*Elasmus alaris* Narendran, *E. bathyskius* Narendran, *E. caligneus* Narendran, *E. neoflavescens* Narendran, *E. neoflavocorpus* Narendran & Hema, *E. scutellofurvus* Narendran and *E. zatonus* Narendran & Sheeba) of the family Eulophidae were described (Narendran *et al*., 2008). Gurr *et al.* (2011) listed two genera of eulophids, *Ootetrastichus* and *Tetrastichus* as parasitoids of delphacid (Hemiptera: Delphacidae) hosts in the Philippines, Vietnam, Malaysia and Thailand. There are some other reports of eulophids on rice pests (Heong *et al*., 1992; Nacro *et al*., 1997; Williams *et al*., 1999).

Considering the importance of parasitoid wasps of the superfamily Chalcidoidea (especially Eulophidae), in biological control of insect pests (Graham, 1987) a study was conducted in the north of Iran to identify this family in the rice fields of east Guilan province.

Materials and Methods

Collection of specimens were done in the rice fields of east Guilan province - north of Iran (on the coast of the Caspian Sea)-during March to September 2011 and 2012 by the first author.

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Specimens were collected using three Malaise traps set up in the rice fields of Kuyeh, Lashkajan, Rahim-Abad, Zardab-Mahalle, Daryasar, Gelsefid, Layalestan, Roudbaneh and Sheykhanbar. The traps were alternated in these localities throughout the two years. The specimens were weekly taken from the traps and separated.

Specimens were placed in 75% ethanol for further examination and were identified by the second author using reliable keys and descriptions (Abolhassanzadeh *et al*., 2013; Graham, 1987, 1995; Narendran *et al*., 2008; Yefremova and Strakhova, 2010). External morphology was illustrated using an Olympus™ SZH, equipped with a Canon™ A720 digital camera. The specimens are deposited in the insect collection of the Department of Plant Protection, Research Center of Agriculture and Natural Resources of East-Azarbaijan province, Tabriz, Iran.

Results and Discussion

Four eulophids have been identified within collected materials. These species belong to three genera: *Aprostocetus* Westwood, *Elasmus* Westwood and *Hemiptarsenus* Westwood. Identified species are discussed separately.

Eulophidae: Tetrastichinae

***Aprostocetus deobensis* (Graham, 1987)** (Fig. 1)

Material examined: Iran, Guilan province, Kuyeh (37°05'85"N, 50°16'14"E), 07.viii.2012, 12♀♀. Zardab-Mahalleh (37°08'50"N, 50°16'75"E), 30.vii.2012, 8♀♀ 2♂♂. Daryasar (37°10'71"N, 50°16'75"E), 09.viii.2012, 1♀.

Diagnostic note: Body mostly dark brown with some parts brown to yellow (Fig. 1A); antennae fuscous to black (Fig. 1C); mesopleuron, prepectus, mouth edge, legs and tegulae yellow; antennal funicles slender, but stouter than pedicellus, clava 2.45-2.70 times as long as broad, its first segment slightly longer than broad (Fig. 1C); marginal vein more than 4.5 times the length of stigmal vein (Fig. 1B).

This species has not been reported from rice fields and it is considered as parasitoid of the sawflies (Hym.: Tenthredinidae) on Salicaceae host plant (Noyes, 2014). Three species of this genus, including *Aprostocetus formosanus* (Timberlake) (Heong *et al*., 1992), *A. procerae* (Risbec) (Nacro *et al*., 1997) and an unknown species have been reported as associated with rice (Williams *et al*., 1999), but association of *A. deobensis* with rice is new. Considering that this species has been collected in different localities and on different dates, it seems that there may be other hosts associated with this parasitoid.

According to Graham (1987) this species is included in the "*auranticus*" species group of *Aprostocetus.*

This species is reported for the first time from Iran (Guilan province: Daryasar, Kuyeh and Zardab-Mahalleh) and has previously been reported from France, Russia and Sweden (Noyes, 2014).

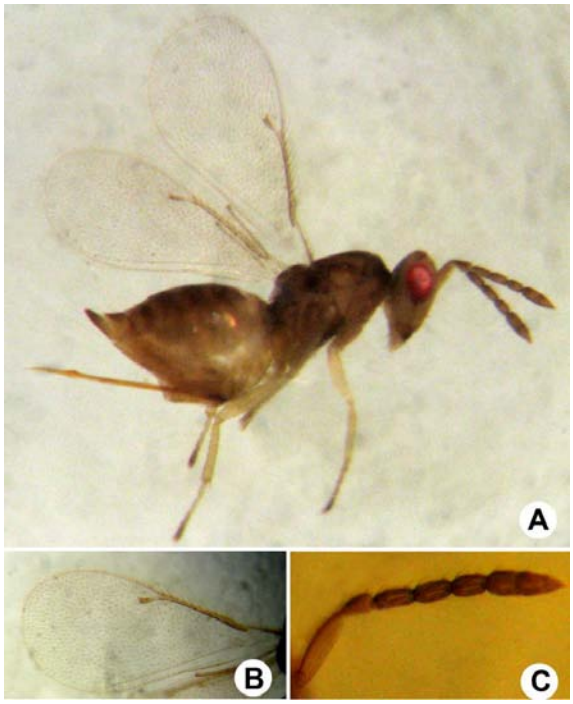

Figure 1 *Aprostocetus deobensis*: (A): Female in lateral view, (B): Fore wing, (C): Female antenna.

***Aprostocetus mycerinus* (Walker, 1839)** (Fig. 2)

Material examined: Iran, Guilan province, Roudbaneh (37°11'63"N, 50°05'41"E), 07.viii.2012, 2♀♀. Layalestan (37°10'63"N, 50°10'93"E), 30.vii.2012, 4♀♀. Lashkajan

(37°05'82"N, 50°10'20"E), 09.viii.2012, 2♀♀. Sheykhanbar (37°12'29"N, 50°02'21"E.), 25.viii.2012, 2♀♀.

Diagnostic note: Body generally bronze-green with metallic reflection in some parts (Fig. 2A), antenna brown with yellow scape and pedicellus (Fig. 2B), fore, mid and hind coxae distally yellow; scape long and reaches to vertex, all funicular segments longer than broad (F1 about 3.5 times); excreted part of ovipositor 2.5 times length of hind tibia.

Figure 2 *Aprostocetus mycerinus*: (A): Female in lateral view, (B): Female antenna.

The two reported *Aprostocetus* species can be separated by the following characters: Antennal funicular segments of *A. mycerinus* (Fig. 2B) longer than *A. deobensis* (Fig. 1C), body in *A. mycerinus* darker than *A. deobensis* with metallic reflection (Fig. 2A), while mostly dark brown in *A. deobensis* (Fig. 1A).

According to Graham (1987) this species belongs to the subgenus *Ootetrastichus*. This species has only been reported in Salicaceae host plants (Noyes, 2014). This species is collected from Lahijan and Rudsar and is new record for Iranian fauna. It has been reported from Europe and China (Noyes, 2014).

Eulophidae: Eulophinae

***Elasmus phthorimaeae* Ferrière, 1947** (Fig. 3)

Material examined: Iran, Guilan province, Roudsar, Lashkajan (37°05'82"N, 50°10'20"E) and Kuyeh (51°33'38"N, 47°94'94"E), 07.viii.2012, 4♂♂ & 7 ♀♀.

Diagnostic note: *Elasmus phthorimaeae* has following morphological characters: Body mainly yellow, thorax sometimes extensively yellow-marked (Fig. 3E); propodeum black (Fig. 3E), legs mainly yellow and hind coxae with dorsal edge black (Figs. 3A, C); first funicular segment longer than pedicellus, third funicular segment about 1.85 times as long as broad; forewing with a long wedge-shaped bare strip extending from the base, and with an isolated subcubital line of setae upon it, wings often hyaline, sometimes weakly infuscated or with a weak cloud under stigmal vein. Funicular segments often distinctly longer than wide (Fig. 3B). Apex of gaster acute; last tergite usually as long as broad.

The genus *Elasmus* Westwood, 1833 is a very distinctive genus of Chalcidoidea with over 255 species described worldwide (Gauthier *et al*., 2000; Noyes, 2014). Species of the genus *Elasmus* are recoded from various regions in the Palaearctic (Graham, 1995; Yefremova and Strakhova 2010), Oriental (Narendran *et al*., 2008), Australian (Gunawardene and Taylor, 2012) and Nearctic (Burks, 1965) regions. Up to now, Nine species belonging to this genus have been recorded

from Iran (Talebi *et al*., 2011; Abolhassanzade *et al.*, 2013; Shafiee *et al.*, 2014; Lotfalizadeh and Hosseini, 2014).

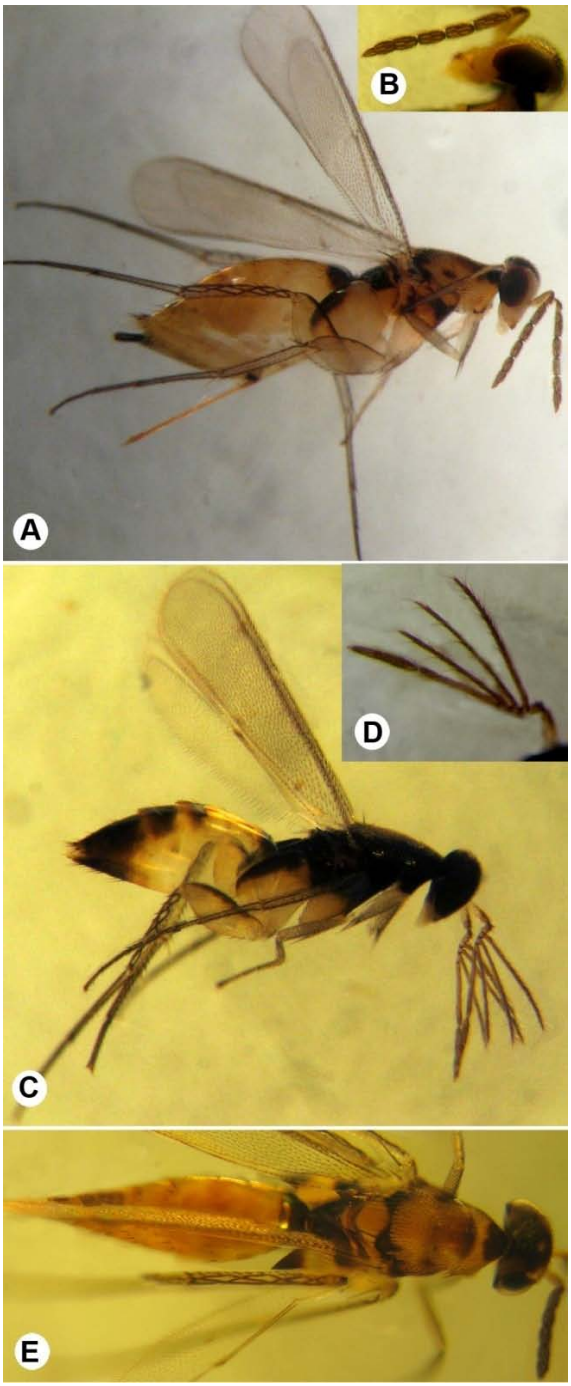

Figure 3 *Elasmus phthorimaeae*: (A): Female in lateral view, (B): Female antenna, (C): Male in lateral view, (D): Male antenna, (E): Female in dorsal view.

The species of *Elasmus* are either primary ectoparasitoids of the larvae and pupae of Lepidoptera or hyperparasitoids on them through various Hymenoptera, in particular the Ichneumonidae and Braconidae (Narendran *et al*., 2008). *Phthorimaeae operculella* (Zeller) (Lep.: Gelechidae) has been reported as host of *E. phthorimaeae* (Noyes, 2014), however, it may attack other lepidopterous pests in rice paddy fields.

Five *Elasmus* species (*Elasmus albopictus* Crawford, 1910, *Elasmus brevicornis* Gahan, 1922, *Elasmus johnstoni* Ferrière, 1929, *Elasmus sugonjaevi* Yefremova & Strakhova, 2009 and *Elasmus* sp.) have been reported as associated with rice but association of *E. phthorimaeae* with rice is new.

Elasmus phthorimaeae has been recorded from Europe, United Arab Emirates, Yemen (Noyes, 2014), Asia, Africa and America (Graham, 1995) and Iran: Kerman province (Abolhassanzadeh *et al*., 2013).

***Hemiptarsenus* sp.** (Fig. 4)
Material examined: Iran, Guilan province, Langroud, Gelsefid (37°09'73"N, 50°12'44"E), 19.vii.2012, 4♀♀.
Remarks: We collected these specimens but were unable to identify them to the species level. Specimens seem to belong to a new species that we hesitate name it as new species because of insufficient number of specimens. *Hemiptarsenus unguicellus* (Zetterstedt, 1838) and an un-identified species have been reported from rice fields. This species was collected in Langroud area.

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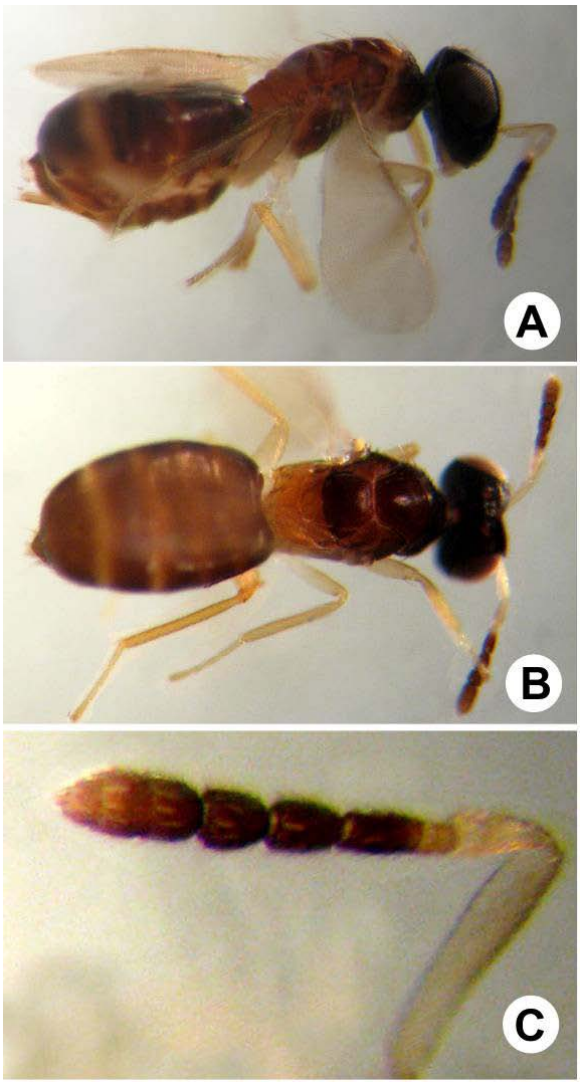

Figure 4 *Hemiptarsenus* sp.: (A): Female in lateral view, (B): Female in dorsal view, (C) Female antenna.

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گونههایی از زنبورهای خانوادهی Eulophidae (Hymenoptera: Chalcidoidea) در شالیزارهای شرق استان گیلان

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چکیده: با توجه به اهمیت زنبورهای پارازیتویید در کنترل بیولوژیک آفات، مطالعه فونستیک روی زنبورهای خانواده Eulophidae (Hym.: Chalcidoidea) در مزارع برنج شرق استان گیلان (جنوب دریای خزر) انجام گرفت. چندین نمونه توسط تله مالیز جمعآوری گردید. نمونهها براساس اطلاعات ریختشناسی تحت عناوین *Aprostocetus deobensis* (Graham)، *Aprostocetus mycerinus* (Walker)، *Elasmus phthorimaeae* Ferrière و *Hemiptarsenus* sp. شناسایی شدند. از بین آنها دو گونهی *A. deobensis* و *A. mycerinus* برای فون ایران گزارش جدید میباشند. همچنین ارتباط گیاه برنج با گونههای *A. deobensis*، *A. mycerinus* و *E. phthorimaeae* برای اولین بار گزارش میگردد.

واژگان کلیدی: گزارش جدید، میزبان جدید، پارازیتوئید، *Aprostocetus*، Eulophidae