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Research article

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Chalcidoidea (Hymenoptera) obtained from common reed, *Phragmites australis* (Cav.) Trin. ex Steud. (Poaceae) in Iran with new records and descriptions of two new species

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Abstract. Fourteen species of Chalcidoidea (Encyrtidae, Eulophidae, Eupelmidae, Eurytomidae, Pteromalidae and Torymidae) were obtained from the common reed, *Phragmites australis* (Cav.) Trin. ex Steud. (Poaceae) in the Urmia region, in the northwest of Iran. Among these species, two new species of Pteromalidae are described hereafter: *Norbanus persicus* Lotfalizadeh & Rasplus sp. nov. and *Stenomalina delvarei* Lotfalizadeh & Rasplus sp. nov. *Anagyrus* near *alienus* Japoshvili, 2002, *Asitus* sp., *Cheiloneurus paralia* (Walker, 1837), *Echthroplexiella obscura* (Hoffer, 1952), *Neococcidencyrtus poutiersi* (Mercet, 1922) (all Encyrtidae), *Aprostocetus orithyia* (Walker, 1839) (Eulophidae), *Eupelmus phragmitis* Erd s, 1955 (Eupelmidae), *Aximopsis deserticola* (Zerova, 2004) comb. nov., *Tetramesa phragmitis* (Erd s, 1952) and *Tetramesa* sp. (all Eurytomidae), *Homoporus febriculosus* (Girault, 1917) (Pteromalidae) and *Torymus arundinis* (Walker, 1833) (Torymidae) were also obtained from our laboratory rearing. Nine of these species are recorded for the first time from Iran.

Keywords. Encyrtidae, Eulophidae, Eupelmidae, Pteromalidae, Eurytomidae, *Norbanus*, *Stenomalina*, Torymidae, new species, new record.

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Introduction

The genus *Phragmites* Adans. (Poales, Poaceae) comprises the most common species of grasses (Poonawala *et al.* 1999). These monocot species are perennial, rhizomatous, stoloniferous and relatively tall (2.0–6.0 m). Among them, the common reed, *Phragmites australis* (Cav.) Trin. ex Steud., known as “Nei” in Persian, is a clonal and sub-cosmopolitan species (Clevering & Lissner 1999) and extremely abundant in the temperate regions (Haslam 1972). It is an invasive plant in some parts of its distribution, and there is a considerable body of scientific knowledge on its biology and ecology (Mal & Narine 2004; Kiviat 2013; Srivastava *et al.* 2013). Over the world, *P. australis* is known to host a huge diversity of insect species and at least 140 herbivorous species are associated with the common reed in Europe (Schwarzländer & Häfliger 1999; Tschardtke, 1999; Tewksbury *et al.* 2002), causing significant damage. Among these insect species, more than 70%, attack the leaves and the stems (Tewksbury *et al.* 2002). Schwarzländer & Häfliger (1999) revealed that 50% of these phytophagous species are specialists, associated only with the genus *Phragmites*. Tewksbury *et al.* (2002) considered that 40% of the species associated with *Phragmites* are monophagous, and that Diptera Linnaeus, 1758 (with 55 species) and Lepidoptera Linnaeus, 1758 (with 45 species) are the two most represented insect orders. Several phytophagous species associated with *Phragmites* are rhizome-feeders, e.g., lepidopterous and some others stem-borers, e.g., moths and chloropid flies (Barczak *et al.* 2013). These phytophagous insects have been investigated for their efficiency in controlling of *P. australis* in North America (Tewksbury *et al.*, 2002) and at least two species of European noctuid moths viz., *Archanara geminipuncta* Haworth, 1809 and *A. neurica* (Hübner, 1808) are being tested as potential biological control agents in North America.

However, little attention has been given to the numerous parasitic wasps that parasitize the phytophagous insects associated with *Phragmites* spp. Among them, Chalcidoidea Latreille, 1817 (Hymenoptera) is the most represented superfamily and about 152 species belonging to 10 families of chalcid wasps have been cited worldwide. About 39% of associated Chalcidoidea with *Phragmites* spp. (61 species from 9 families) have been reported with phytophagous insects on *Phragmites australis* (Table 1) (Noyes 2020). While most of the chalcid species are parasitoids, *Tetramesa* spp. (Hym.: Eurytomidae) are phytophagous.

The aim of this study was to investigate the parasitic community associated with some phytophagous insects developing in the common reed in Iran. Our study is a first step towards a more comprehensive survey and we here describe the diagnostic characters of these wasps for future bio-ecological studies.

Material and methods

Preliminary probes to find overwintered and attacked stems of common reed by splitting them had shown that stems with a maximum height of 50 to 120 cm were more infected than higher and flowered stems. Upon awareness of this, we started to collect the likely attacked samples of reed stems at several times during March–April of 2016. Samples were picked out from about 50 cm from the top of the stems whose maximum height was between 40 and 140 cm. About 500 samples of reed stems were collected in nine dry/moist and dense /rare reed stands from four different sites on the edges of farmlands and abandoned areas in the Urmia region: Orümīyeh, Azarbaijan-e Gharbi (= West-Azarbaijan) Province, Iran. The sites and their geographical coordinates (Anonymous 2006) are given below:

Tāzehkand-e Qāterchī: 37°39' N, 44°58' E, 1335 m a.s.l., 13 km SW of Urmia

Kelisā Kandī: 37°29' N, 45°01' E, 1600 m a.s.l., 2.5 km SW of Urmia

Hāshtīān: 37°47' N, 44°39' E, 1680 m a.s.l., 50 km NW of Urmia

Hesar-e Türkmen: 37°26' N, 45°13' E, 1293 m a.s.l., 15 km SE of Urmia

Table 1. Number of chalcid genera and species reported from *Phragmites australis* (Cav.) Trin. ex Steud. (Noyes 2020).

Family	Number of genera	Number of species
Aphelinidae	1	2
Encyrtidae	17	25
Eulophidae	4	13
Eupelmidae	2	4
Eurytomidae	2	4
Mymaridae	1	1
Pteromalidae	8	10
Signiphoridae	1	1
Torymidae	1	1
Total	37	61

According to the above mentioned area, we prepared four separate glass boxes (30 × 40 × 80 cm), covered by muslin for maintenance of reed stem samples and rearing of insects at the entomology laboratory of the Department of Plant Protection, Faculty of Agriculture, Urmia University.

The collected reed stems were brought to the laboratory. They were placed into the prepared boxes according to the related area, checked daily, and the emerging wasps and their likely hosts were collected with an aspirator. In order to collect the insects inside the boxes, we first moved them to the side of the window and then carefully removed part of the box's cover to collect the insects inside them with an aspirator. In cases where insects escaped from the box they were gathered next to the window glass, and subsequently also collected with an aspirator. The emerging dates of the specimens were recorded daily. Wasps were subsequently preserved in 75% ethanol before identification.

Collected specimens were air dried and card-mounted. Specimens were examined with a Leica M205C stereo microscope and a Leica CLS 150X fiber optic light source. Imaging was conducted using a Keyence VHX-5000 multiple-focus imaging system, and assemblage and edition were done with Adobe Photoshop CS4[®] software.

The reared chalcidoids were identified using the keys of Ferrière (1955), Claridge (1958), Zerova (1976, 2010), Graham (1987), Noyes (1987), Bouček & Rasplus (1991), Graham & Gijswijt (1998), Trjapitzin (2006), Zerova & Seryogina (2006), Rizzo & Mitroiu (2010), Mitroiu (2015) and Gibson & Fusu (2016).

The type material and all studied specimens are deposited in the HMIM (Hayk Mirzayans Insect Museum, Tehran, Iran) and in CBGP insect collection (Centre de Biologie pour la Gestion des Populations, Montferrier-sur-Lez, France). Identified families, genera and species were listed alphabetically.

Abbreviations

- F1–F6 = funicular segments 1–6
 POL = distance between posterior ocelli
 OOL = distance between posterior ocellus and the eye
 GT1–GT6 = gastral tergites 1–6

Results

The survey for the collection and rearing of the chalcid wasp composition associated with common reeds in the Urmia region resulted in the identification of 203 specimens (162 ♀♀ and 41 ♂♂), pertaining to 14 species, 13 genera and 6 families: Encyrtidae Walker, 1837 (5 species), Eurytomidae Walker, 1832 (3), Torymidae Walker, 1833 (1), Eupelmidae Walker, 1833 (1), Eulophidae Westwood, 1829 (1) and Pteromalidae Dalman, 1820 (3). Of these, two species of Pteromalidae appeared to be new for science and are described hereafter. Nine species of chalcidoid wasps were sampled for the first time in Iran. Among them, two species, namely *Tetramesa phragmitis* Erdős, 1952 and *Tetramesa* sp., are phytophagous on common reed. Our rearing of the phytophagous insects associated with the common reed in Iran yielded several putative hosts of the bred chalcid wasps: Chloropidae Verrall, 1888 (3 species), Crambidae Latreille, 1810 (1), Cecidomyiidae Newman, 1835 (2), Mordellidae Latreille, 1802 (1), Agromyzidae Fallén, 1823 (1) and Pseudococcidae Heymons, 1915 (1).

Family Encyrtidae Walker, 1837
Subfamily Tetracneminae Howard, 1892
Genus *Anagyrus* Howard, 1896

Anagyrus near *alienus* Japoshvili, 2012

Fig. 1

Material examined

IRAN – **West-Azərbaycan Province** • 2 ♀♀, 1 ♂; Urmia, Häshtian; 37°47' N, 44°39' E; 1680 m a.s.l.; Apr.–early May 2017; Y. Karimpour leg., ex *Phragmites australis*; HMIM • 3 ♀♀, 2 ♂♂; Urmia, Hesar-e Türkmän; 37°26' N, 45°13' E; 1293 m a.s.l.; Apr. 2017; Y. Karimpour leg., ex *Phragmites australis*; HMIM • 1 ♀, 1 ♂; Urmia, Tāzehkand-e Qāterchī; 37°39' N, 44°58' E; 1335 m a.s.l.; Apr.–early May 2017; Y. Karimpour leg., ex *Phragmites australis*; HMIM.

Remarks

Our specimens possess all the diagnostic characters of *A. alienus*, but the females are slightly larger (2.2 mm) than the type specimens of *A. alienus* (1.7 mm). Furthermore, the scape (Fig. 1B) is also slightly wider than in *A. alienus* (about 2.5 × vs 3.3 × as long as broad in *A. alienus*), consequently our specimens could represent an undescribed species. *Anagyrus alienus* was previously known from Turkey and our sampling locality is close to the type locality. The biology of *A. alienus* is unknown (Japoshvili 2012). Our sampling reveals an association of *A. near alienus* with *P. australis*, on which it is associated with a species of Pseudococcidae (Hemiptera) that appears to be a pest of *P. australis*.

Genus *Asitus* Erdős 1955

Asitus sp.

Fig. 2

Material examined

IRAN • 1 ♂; West-Azərbaycan Province, Urmia, Hesar-e Türkmän; 37°26' N, 45°13' E; 1293 m a.s.l.; Apr. 2017; Y. Karimpour leg.; ex *Phragmites australis*; HMIM.

Remarks

Asitus phragmitis (Ferrière, 1955) is a parasitoid of Pseudococcidae on *Phragmites australis* in the Caucasus, several European countries, USA and Pakistan (Ferrière 1955; Guerrieri 1989; Noyes 2020). Our specimen is closely related to *A. phragmitis* and shares several characters with that species: body

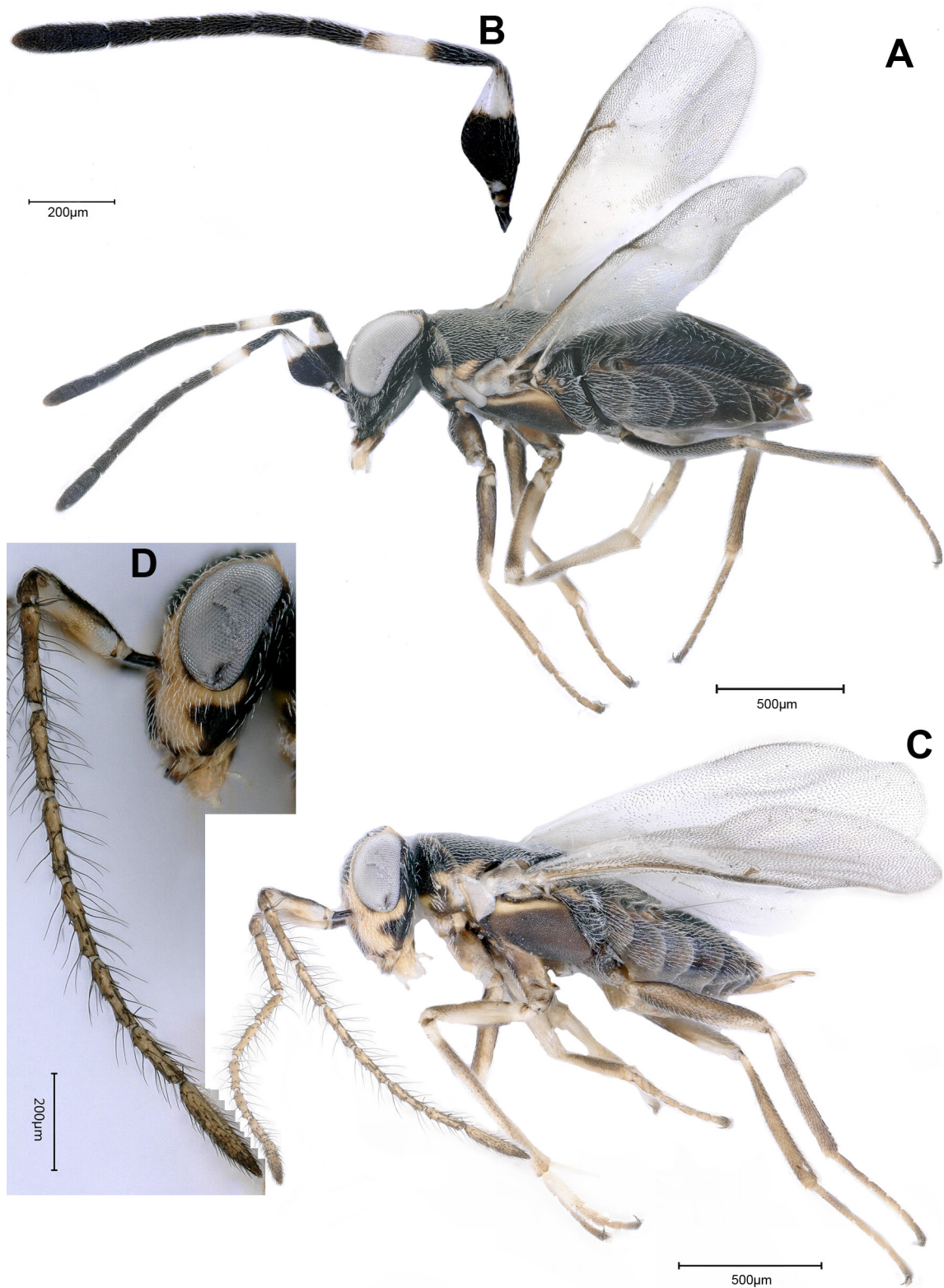


Fig. 1. *Anagyrus* near *alienus* Japoshvili, 2012. **A.** Female body in lateral view. **B.** Right antenna of female. **C.** Male body in lateral view. **D.** Left antenna of male.

Table 2. Features distinguishing male *Asitus* sp. from *A. phragmitis* (Ferrière, 1955).

Characters	<i>Asitus</i> sp.	<i>A. phragmitis</i> (from Guerrieri 1989)
POL/ OOL	About 1.3 × (Fig. 2B)	1.5 ×
Funicle	Filiform, all funicular segments longer than wide (Fig. 2C)	Moniliform, at least F6 transverse
Clava	Long, about 5 × as long as wide	Short, about 2 × as long as wide
Funicle + clava	About 1.2 × as long as head width	Slightly shorter than head width, about 0.9 ×
Pedicel	Shorter than F1+F2, about 0.8 × (Fig. 2C)	As long as F1+F2
Metanotum and propodeum	Reticulate (Fig. 2B)	Smooth
Fore wing fringe	Shorter on frontal margin than on dorsal margin, about 0.5 × (Fig. 2A)	Same length on frontal and dorsal margins
Marginal vein	Long, 2 × as long as wide	Short, about as long as wide

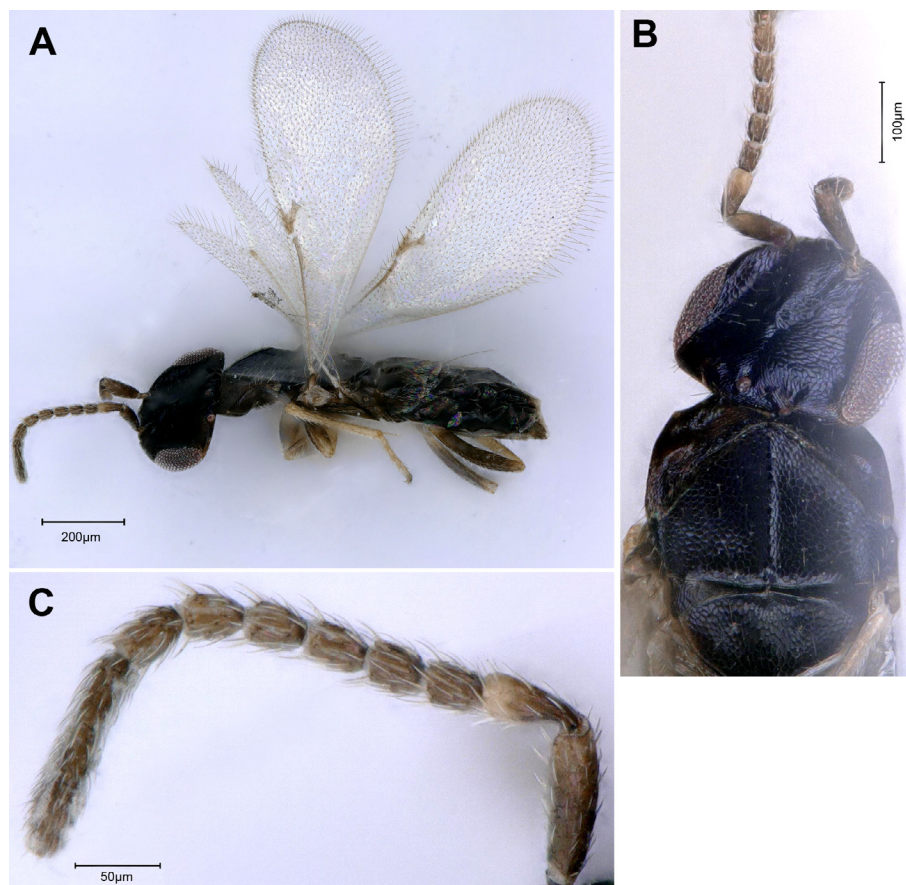


Fig. 2. *Asitus* sp. A. Male in lateral view. B. Head and mesosoma in dorsal view. C. Antenna of female.

dorsoventrally flattened; head prognathous, head and mesosoma finely reticulate; antennae inserted just above clypeus and widely separated from each other; pronotum divided into two subtriangular parts; notauli absent; scutellum wider than long, about $1.9\times$ as wide as long, anteriorly reaching the base of the tegula. However, it differs from *A. phragmitis* in several characters (Table 2) and in our opinion very probably represents a new species. Because we only sampled a single male, we will not describe this species and await further samples.

Subfamily Encyrtinae Walker, 1837
Tribe Cheiloneurini Hoffer, 1955
Genus *Cheiloneurus* Westwood 1833

Cheiloneurus paralia (Walker, 1837)

Fig. 3

Material examined

IRAN • 1 ♀; West-Azarbaijan Province, Urmia, Hesar-e Türkman; 37°26' N, 45°13' E; 1293 m a.s.l.; Apr. 2017; Y. Karimpour leg.; ex *Phragmites australis*; HMIM.

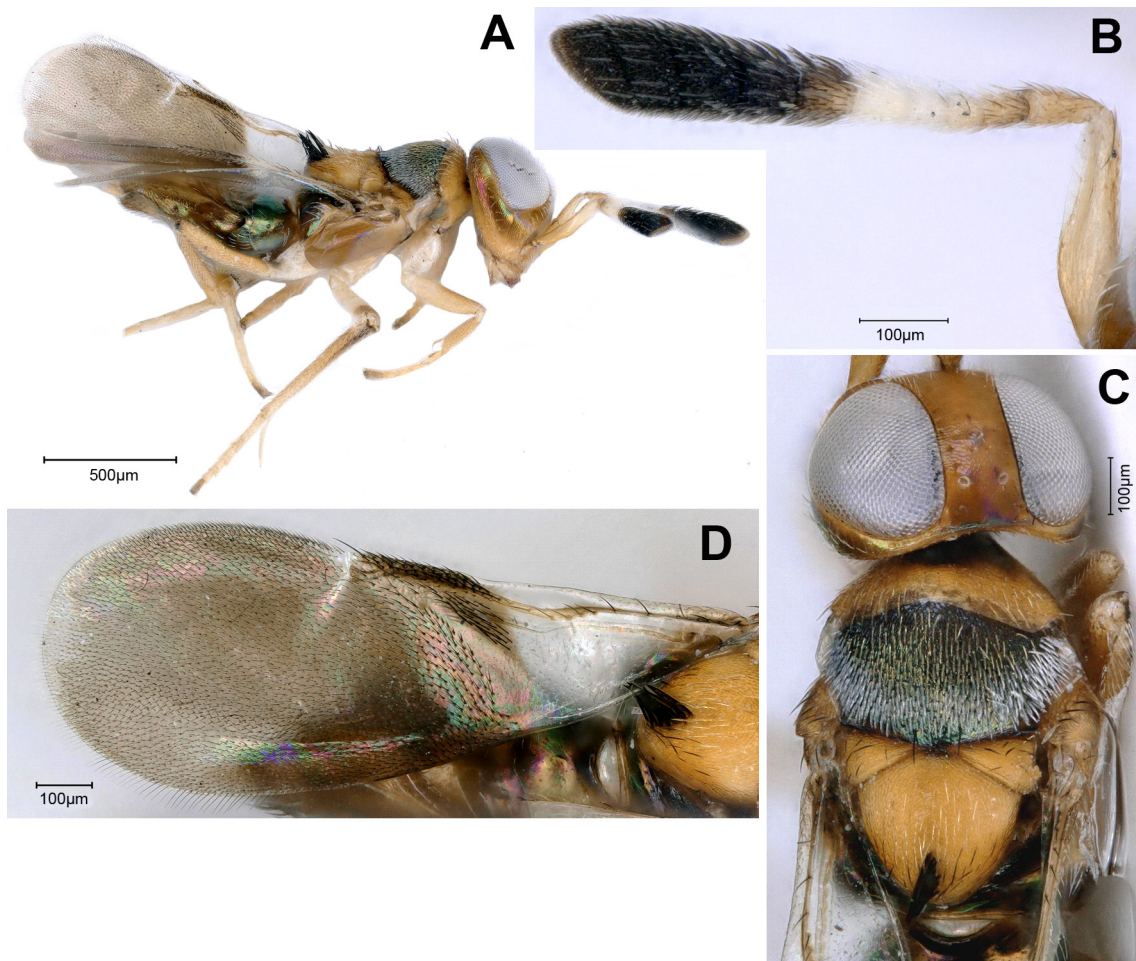


Fig. 3. *Cheiloneurus paralia* (Walker, 1837). **A.** Female in lateral view. **B.** Antenna of female. **C.** Head, pronotum, mesoscutum and mesoscutellum in dorsal view. **D.** Fore wing.

Remarks

Our specimen fits well the description given by Claridge (1958), but the head exhibits a faint metallic-green tinge (Fig. 3A, C). Body mainly rufo-fuscous (Fig. 3A), funicle with three white segments, F6 black (Fig. 3B); mesonotum entirely greenish; fore wings mainly fuscous except basally and distally (Fig. 3D); propodeum and abdomen dark with blue-green reflections; scape approximately $5\times$ as long as wide, funicular segments almost quadrate, club slightly widened, truncate apically (Fig. 3B); scutellar ‘hair-brush’ well developed (Fig. 3C); gaster short, as long as thorax.

This species is widely distributed in the Palaearctic region (Noyes 2020) and in Iran (Fallahzadeh & Japoshvili 2010). *Cheiloneurus paralia* is a parasitoid of different mealybug families (Asterolecaniidae Cockerell, 1896, Cerococcidae Balachowsky, 1942, Coccidae Stephens, 1829, Eriococcidae Cockerell 1899, Kermesidae Kosztarab, 1996 and Pseudococcidae) on Poaceae such as *Festuca rubra* L. (Claridge 1958; Noyes 2020). Therefore, it may be associated with a pseudococcid species on *P. australis*. It has been reported on *Peliococcus kimmericus* (Kiritshenko, 1940) on *Lactuca serriola* L. (Asteraceae) in Iran (Fallahzadeh *et al.* 2006).

Tribe Encyrtini Walker, 1837
Genus *Echthroplexiella* Mercet, 1921

Echthroplexiella obscura (Hoffer, 1954)

Fig. 4

Material examined

IRAN • 1 ♀; West-Azarbaijan Province; Urmia, Kelisā Kandī; 37°29' N, 45°01' E; 1600 m a.s.l.; Apr. 2017; Y. Karimpour leg.; ex *Phragmites australis*; HMIM.

Remarks

This species is distributed in the north and east of Europe (Askew 1970; Kalina 1989; Trjapitzin 1989) and represents a new record from Iran. The biology of *E. obscura* is still unknown, but the species could be associated with a pseudococcid species on *P. australis*.

Some of the more important diagnostic characters of *E. obscura* are: body length of female 1.5 mm (range 1.2–1.6 mm; Trjapitzin 2006); body brownish-yellow to light brown with dark brown metasoma (Fig. 4A); scape much ($4\times$) longer than wide, funicular segments wider than long, claval segments fused, obliquely truncate, shorter than the funiculus (Fig. 4C); notauli complete (Fig. 4B); brachypterous, forewing with 2 wide transverse dark bands, middle large band occupying their whole width, distal band broad, faintly fading away to the margin of the wing, hyaline band between the two bands very narrow; marginal vein $2\times$ as long as broad, postmarginal vein as long as broad, stigma vein a little longer than broad; protruding part of ovipositor sheath longer than $\frac{1}{5}$ of the length of metasoma (Fig. 4A).

Genus *Neococcidencyrtus* Compere, 1928

Type species

Neococcidencyrtus alula Compere, 1928, by monotypy.

Neococcidencyrtus poutiersi (Mercet, 1922)

Fig. 5

Material examined

IRAN • 1 ♀; West-Azarbaijan Province, Urmia, Hāshtīān; 37°47' N, 44°39' E; 1680 m a.s.l.; Apr. 2017; Y. Karimpour leg.; ex *Phragmites australis*; HMIM.

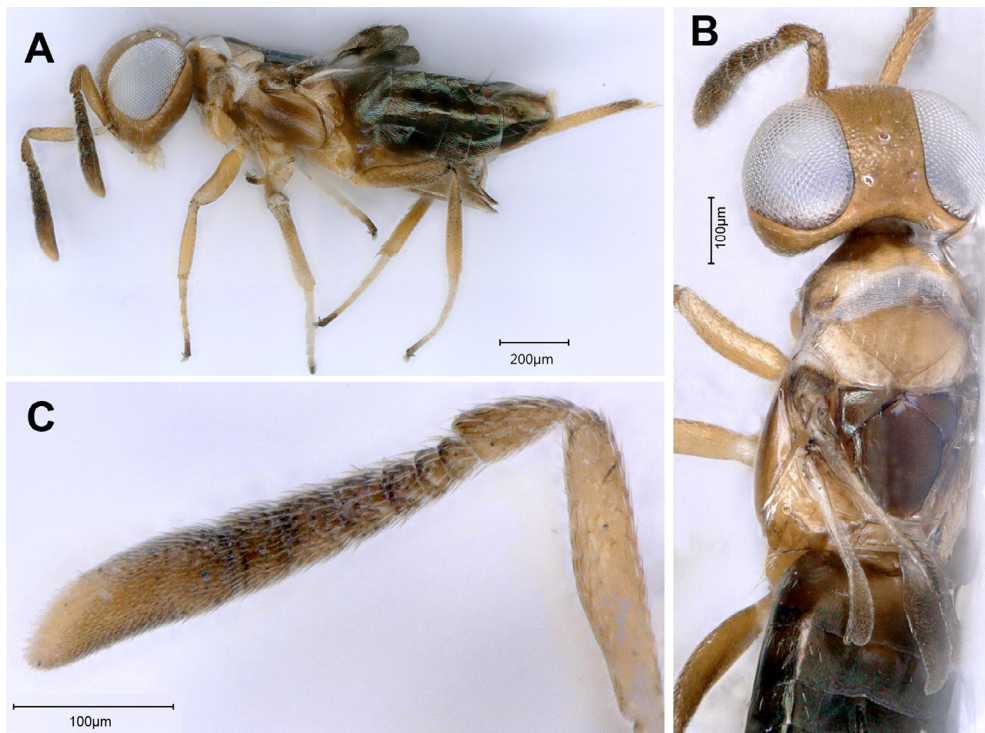


Fig. 4. *Echthroplexiella obscura* (Hoffer, 1954). **A.** Female in lateral view. **B.** Head and mesosoma in dorsal view. **C.** Antenna of female.

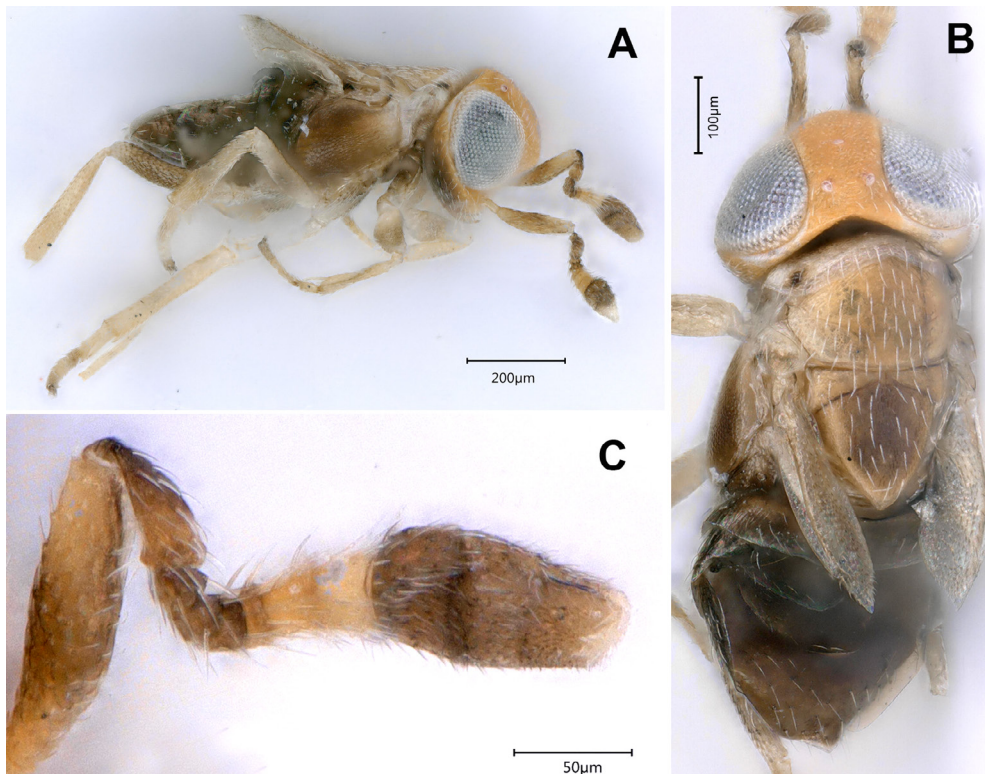


Fig. 5. *Neococcidencyrthus poutiersi* (Mercet, 1922), ♀. **A.** Lateral view. **B.** Dorsal view. **C.** Antenna.

Remarks

This species is only known from Turkmenistan and is a parasitoid of Diaspididae Targioni-Tozzetti, 1868 (Hemiptera Linnaeus, 1758) (Noyes 1987, 2020). This is the first record for Iran.

The species is about 2 mm long; brachypterous (Fig. 5A–B), fore wing mostly infusate with interrupted hyaline fascia, venation extending over at least two-thirds of wing, linea calva interrupted by 2–3 setae; fronto-vertex in dorsal view narrower than the eye width (Fig. 5B); funicle in female 6-segmented, F6 about 2 × as broad as the first segment and much broader than the pedicel (Fig. 5C).

Family Eulophidae Westwood, 1829
Subfamily Tetrastichinae Graham, 1987
Genus *Aprostocetus* Westwood, 1833

Aprostocetus orithyia (Walker, 1839)
Fig. 6

Material examined

IRAN – **West-Azarbaijan Province** • 14 ♀♀, 5 ♂♂; Urmia, Kelisä Kandī, 37°29' N, 45°01' E; 1600 m a.s.l.; Apr. 2017; Y. Karimpour leg.; ex *Phragmites australis*; HMIM • 11 ♀♀, 3 ♂♂; Urmia, Häshtian, 37°47' N, 44°39' E; 1680 m a.s.l.; Apr. 2017; Y. Karimpour leg.; ex *Phragmites australis*; HMIM • 8 ♀♀, 5 ♂♂; Urmia, Hesar-e Türkmän; 37°26' N, 45°13' E; 1293 m a.s.l.; Apr.–May 2017; Y. Karimpour leg.; ex *Phragmites australis*; HMIM.

Remarks

Aprostocetus orithyia is only known from Europe, develops on fly larvae (Cecidomyiidae and Chloropidae) and this sampling represents a new record for Iran. *Aprostocetus orithyia* belongs to the *lycidas* species group (Graham 1987). On *P. australis*, the species could be a parasitoid of the aforementioned dipterous families.

Main morphological characters: body generally metallic with yellowish tibiae and tarsi (Fig. 6A), antenna with scape as long as the eye, reaching above the level of vertex; funicle very long and slender, 3-segmented, F1–F2 3.05 ×, F3 about 2.6 × as long as broad (Fig. 6B); clava with a relatively shorter and less conspicuous, straight terminal spine. Mid lobe of mesoscutum strongly reticulate (Fig. 6F), areoles of reticulation about 3–4 × as long as broad, with a median line, and a single row of adnotaular setae on each side. Fore wing apically ciliate, submarginal vein with 2 dorsal setae, speculum absent. Spur of mid tibia longer than half the length of the basitarsus and distinctly longer than the width of the tibia. Metasoma as long as head plus thorax (Fig. 6A).

Family Eupelmidae Walker, 1833
Subfamily Eupelminae Walker, 1833
Genus *Eupelmus* Dalman, 1820

Eupelmus phragmitis Erdős, 1955
Fig. 7

Material examined

IRAN • 1 ♀; West-Azarbaijan Province, Urmia, Tāzehkand-e Qāterchī; 37°39' N, 44°58' E; 1335 m a.s.l.; Apr. 2017; Y. Karimpour leg.; ex *Phragmites australis*; HMIM.

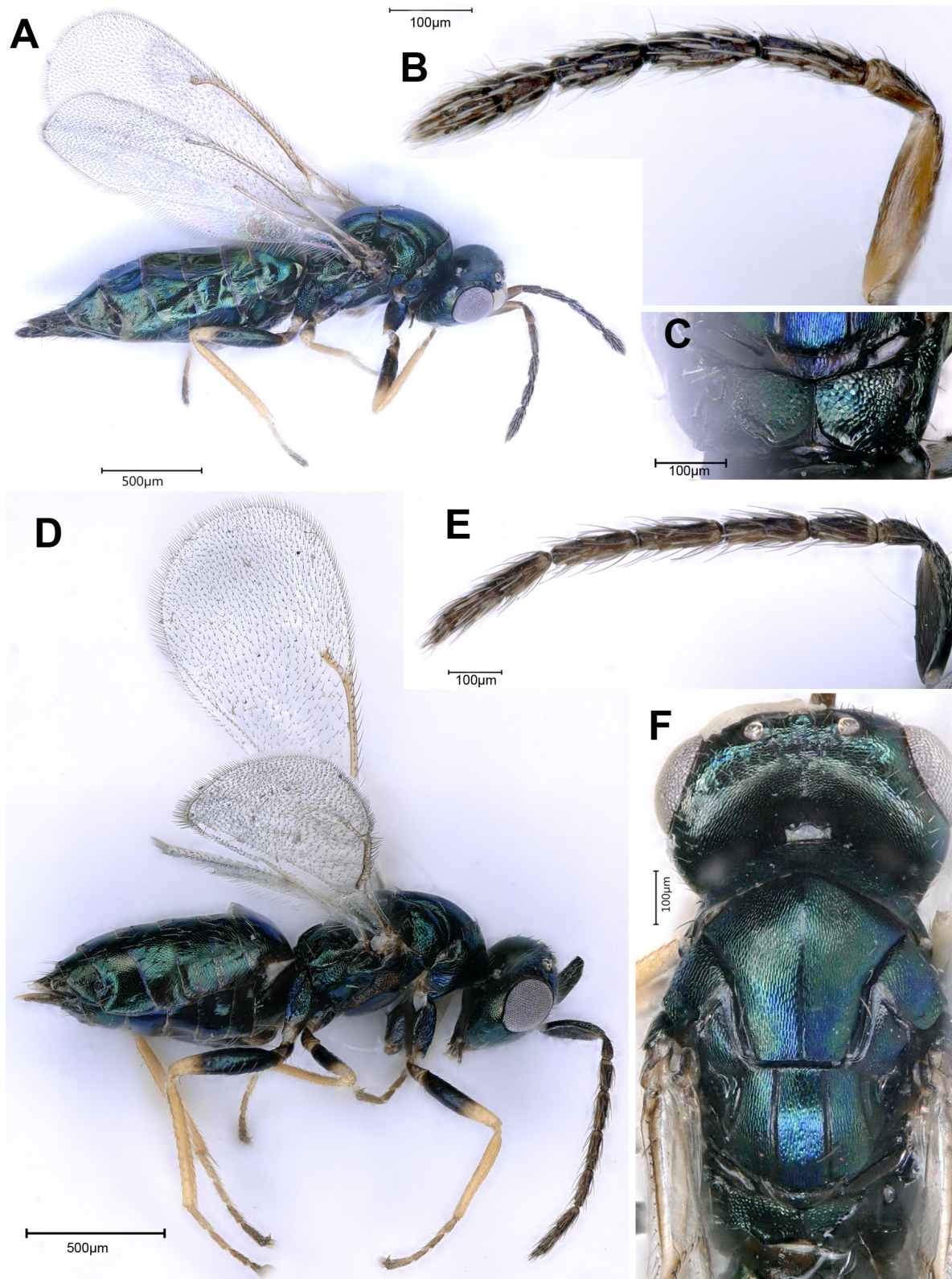


Fig. 6. *Aprostocetus orithyia* (Walker, 1839). **A.** Female in lateral view. **B.** Antenna of female. **C.** Propodeum in dorsal view. **D.** Male in lateral view. **E.** Antenna of male. **F.** Head and mesosoma of female in dorsal view.

Remarks

Eupelmus phragmitis is distributed in the Czech Republic, Greece, Hungary, Israel, Romania, Ukraine and South Korea, and is a parasitoid of *Tetramesa phragmitis* (Hym.: Eurytomidae) (Gibson & Fusu 2016). The species may be associated with the same host on *P. australis* in Iran.

This species belongs to the *stramineipes* species group (Gibson & Fusu 2016). All the features of the sampled specimen well match those reported by Gibson & Fusu (2016), in the couplet 18. It shares the following combination of characters: scrobal depression obviously more deeply reticulate than frontovertex; antennal scape entirely dark, clava lighter than funicle, anellus slightly longer than wide, similarly dark as rest of funicle; fore wing hyaline, infuscate below marginal and stigma veins, dorsally with basal cell and disc uniformly setose except for linea calva, with complete marginal fringe, marginal vein much longer relative to stigma vein; legs sometimes with all femora similarly yellow; ovipositor sheath pale, apparent length of ovipositor sheath distinctly shorter than metatibia. However, it has the following variations: body metallic green (Fig. 7A–B) with obviously golden reflections and reddish-

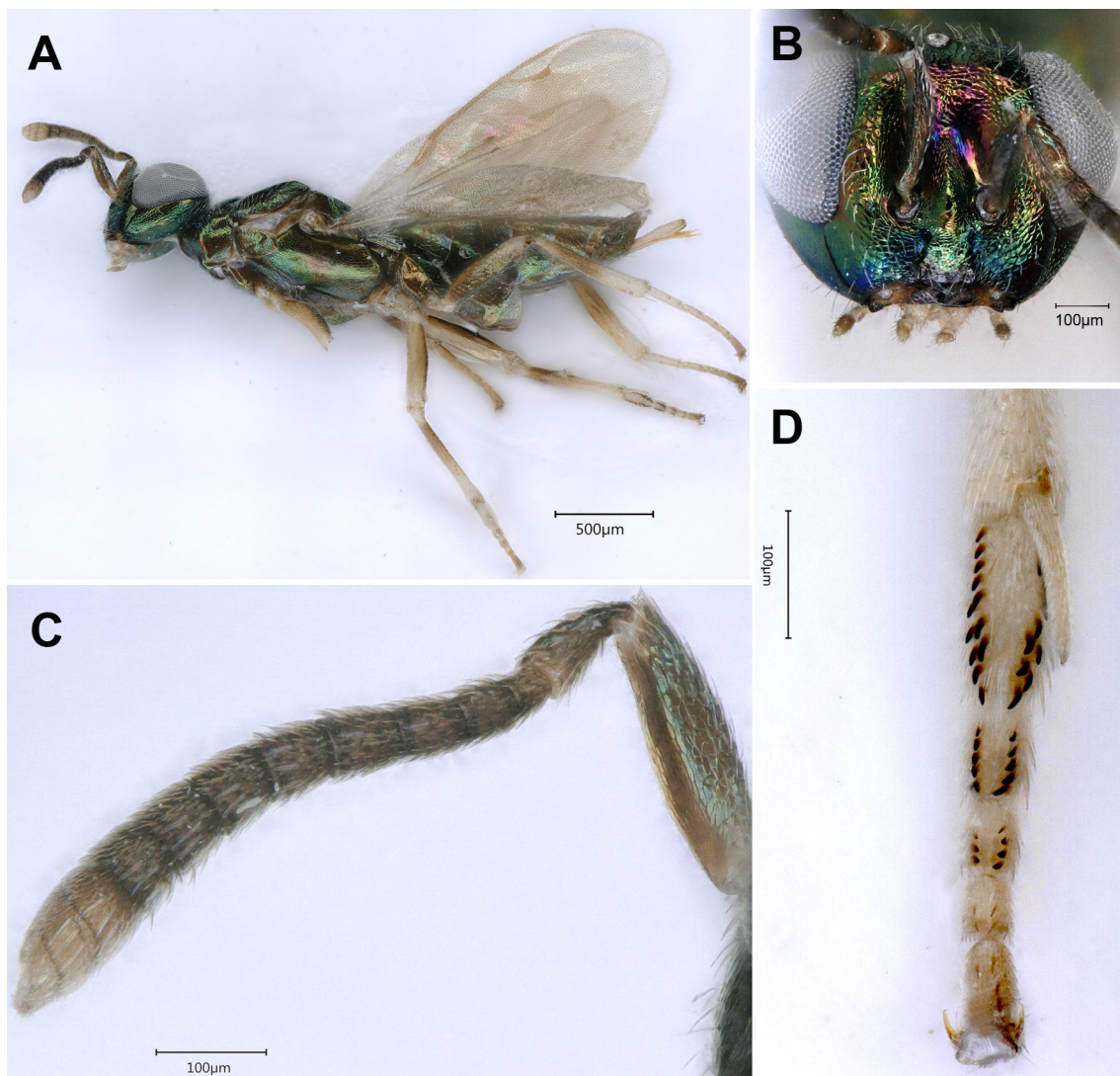


Fig. 7. *Eupelmus phragmitis* Erdős, 1955. **A.** Female in lateral view. **B.** Head in frontal view. **C.** Antenna of female. **D.** Mid tarsus in ventral view.

violet reflections on the scrobal depression, tegula brownish-yellow, legs more extensively pale, slightly darker femur and tibiae medially; F1 less transverse, clava slightly lighter than the rest of antenna (Fig. 7C).

Family Eurytomidae Walker, 1832
Subfamily Eurytominae Walker, 1832
Genus *Aximopsis* Ashmead, 1904

Aximopsis deserticola (Zerova, 2004) comb. nov.

Fig. 8

Material examined

IRAN – **West-Azərbayjan Province** • 1 ♀; 1 ♂; Urmia, Häshtian; 37°47' N, 44°39' E; 1680 m a.s.l.; Apr. 2017; Y. Karimpour leg.; ex *Phragmites australis*; HMIM • 1 ♀; 1 ♂; Urmia, Hesar-e Türkmän; 37°26' N, 45°13' E; 1293 m a.s.l.; Apr. 2017; Y. Karimpour leg.; ex *Phragmites australis*; HMIM.

Remarks

The species has been reported from fruits of *Cuscuta approximata* Bab. (Cuscutaceae) in Tajikistan and Turkmenistan (Zerova 2010).

This species has characters of the *nodularis* species group (Lotfalizadeh *et al.* 2007), and with sharing conspicuous mesopleural shelf, carinate fore coxae and distinctly petiolate gaster, it is consequently transferred from *Eurytoma* Illiger, 1807 to the genus *Aximopsis*. *Aximopsis deserticola* can be separated from closely related species by the following set of characters: head round and slightly wider than long in frontal view (Fig. 8B); inner orbital margin coarsely punctate, and appearing to be slightly carinate; all funicular segments in female distinctly longer than wide (Fig. 8E), F1 about 2.5 × as long as its width; fore coxa distinctly carinate in frontal view; mesopleuron with an obvious ventral shelf, carinate anteriorly and with an oblong comb anteromedially (Fig. 8D); marginal vein as long as postmarginal vein, slightly longer than stigmal vein, postmarginal vein about 1.5 × as long as stigmal vein (Fig. 8C); metasoma of female rounded, as long as mesosoma in lateral view (Fig. 8A), with long petiole, slightly longer than wide.

Genus *Tetramesa* Walker, 1848

Tetramesa phragmitis (Erdös, 1952)

Fig. 9

Material examined

IRAN – **West-Azərbayjan Province** • 9 ♀♀, 1 ♂; Urmia, Hesar-e Türkmän; 37°26' N, 45°13' E; 1293 m a.s.l.; Apr.–early May 2017; Y. Karimpour leg.; ex *Phragmites australis*; HMIM • 14 ♀♀, 2 ♂♂; Urmia, Tāzehkand-e Qāterchī; 37°39' N, 44°58' E; 1335 m a.s.l.; Apr.–early May 2017; Y. Karimpour leg.; ex *Phragmites australis*; HMIM.

Remarks

This species is known as a gall-stem wasp of *Phragmites australis*. *Tetramesa phragmitis* is widely distributed in the Palaearctic region from Europe to Japan (Bouček 1968; Zerova 1978; Kalina 1989; Zerova & Fursov 2016).

This species has recently been redescribed (Zerova & Fursov 2016) and our specimens exhibit the following variations: body larger, 5 mm (vs 2.7–4.3 mm in Zerova & Fursov 2016), mainly dark,

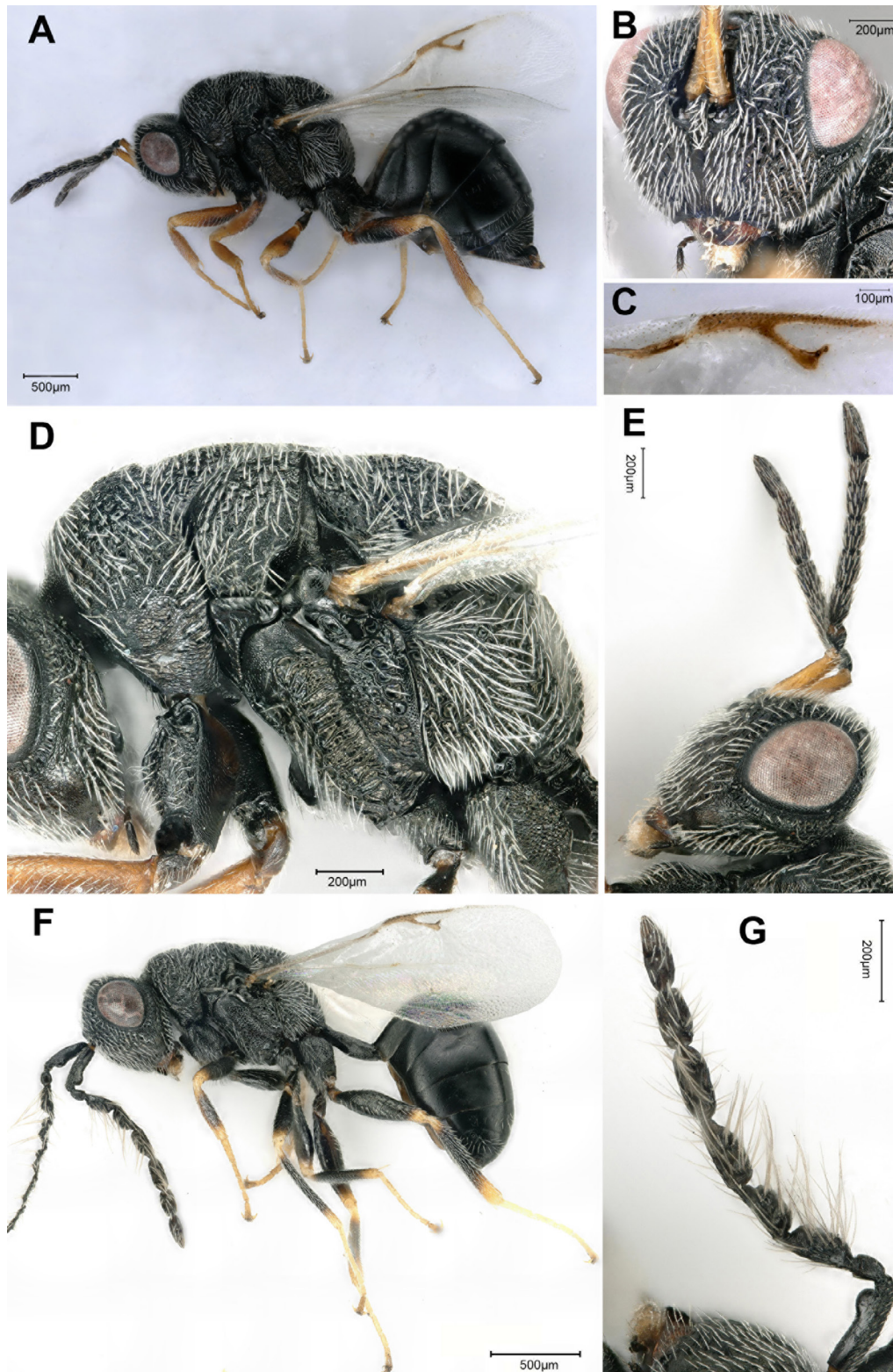


Fig. 8. *Aximopsis deserticola* (Zerova, 2004) comb. nov. **A.** Female in lateral view. **B.** Head of female in frontal view. **C.** Fore wing venation. **D.** Mesosoma in lateral view. **E.** Head and antennae in lateral view. **F.** Male in lateral view. **G.** Male antenna.

with yellow spots reduced to head, below eyes and lower face (Fig. 9A, E) vs yellow spots on head and thorax, also much lighter specimens occur in Israel and Tajikistan (Zerova & Fursov 2016). Fore wing (Fig. 9C) mainly infusate with two distinct dark spots, the first one under marginal and stigmal veins and the second as a V-shaped dark spot below submarginal vein vs unclear yellow spot under marginal vein (Zerova & Fursov 2016); and distinctly dark-brown veins vs yellowish veins (Zerova & Fursov 2016).

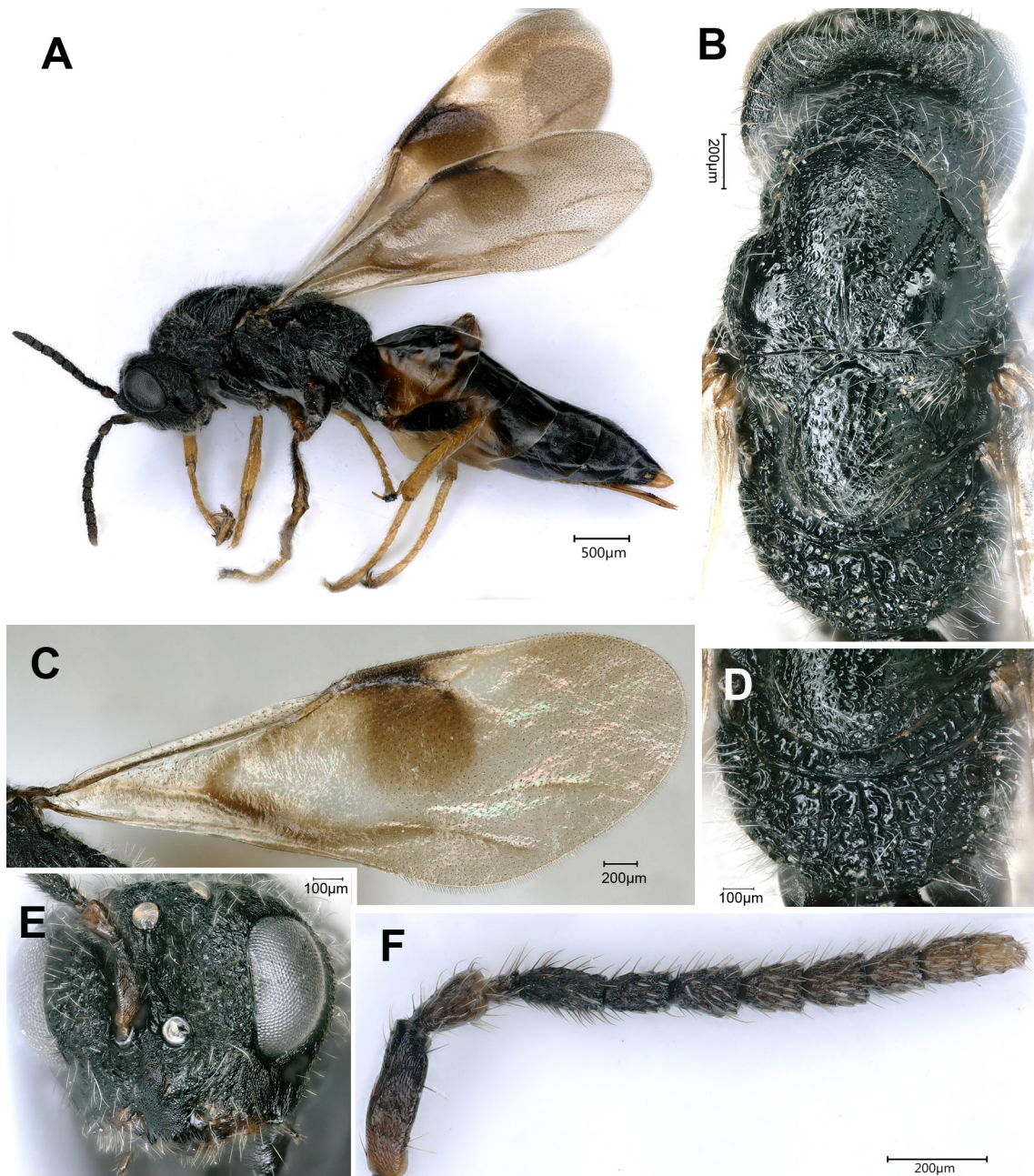


Fig. 9. *Tetramesa phragmitis* (Erdős, 1952). **A.** Female in lateral view. **B.** Head and mesosoma in dorsal view. **C.** Fore wing. **D.** Propodeum in dorsal view. **E.** Head in frontal view. **F.** Antenna of female.

Genus *Tetramesa* Walker, 1848

Tetramesa sp.

Fig. 10

Material examined

IRAN – West-Azərbaycan Province • 4 ♀♀, 1 ♂; Urmia, Häshtian; 37°47' N, 44°39' E; 1680 m a.s.l.; Apr. 2017; Y. Karimpour leg.; ex *Phragmites australis*; HMIM • 3 ♀♀; Urmia, Hesar-e Türkmän; 37°26' N, 45°13' E; 1293 m a.s.l.; Apr. 2017; Y. Karimpour leg.; ex *Phragmites australis*; HMIM.

Remarks

Only *T. phragmitis* has previously been reported from *Phragmites* spp. (Noyes 2020). Based on the key of Claridge (1961), our specimens are closely related to *Tetramesa cornuta* (Walker, 1832) in the couplet 17, sharing with this species the following characters: funicular segments short with F5 quadrate;

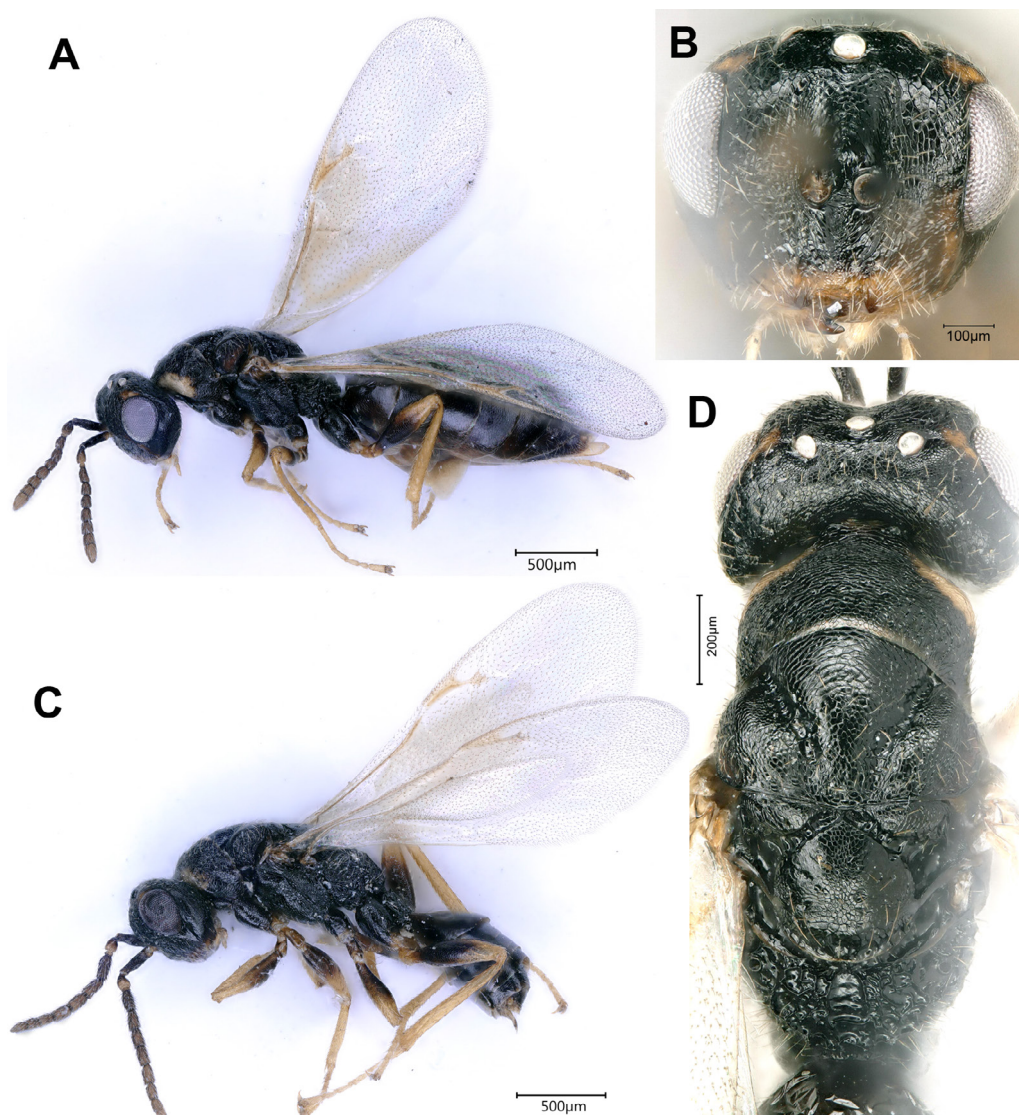


Fig. 10. *Tetramesa* sp. **A.** Female in lateral view. **B.** Head of female in frontal view. **C.** Male in lateral view. **D.** Head and mesosoma in dorsal view.

pronotum transverse (Fig. 10D), about $2\times$ as wide as long; mid tibial spur relatively long, longer than half length of basitarsus; longer GT3 non-emarginate posteriorly. However, the female appears to be larger than is reported for *T. cornuta*; marginal vein at most as long as stigmal vein (vs marginal vein twice as long as stigmal vein in *T. cornuta*); metasoma longer than the combined length of head plus mesosoma (75:65) (vs metasoma shorter than combined length of head and mesosoma in *T. cornuta*). In the male, the funicular segments are slightly longer than in the female (Fig. 10C) but a more distinct sexual dimorphism was observed in *T. cornuta* (Claridge 1961: figs 97–98). This species clearly is different from *T. cornuta* and may be new. However, further specimens are required and we also need to examine several type specimens belonging to the genus *Tetramesa* to ascertain its novelty.

Family Pteromalidae Dalman, 1820
 Subfamily Pteromalinae Dalman, 1820
 Genus *Homoporus* Thomsen, 1878

Homoporus febriculosus (Girault, 1917)
 Figs 11–12

Material examined

IRAN – West-Azərbaycan Province • 4 ♀♀, 1 ♂; Urmia, Kelisā Kandī; 37°29' N, 45°01' E; 1600 m a.s.l.; Apr.–early May 2017; Y. Karimpour leg.; M.-D. Mitroiu det.; ex *Phragmites australis*; HMIM • 8 ♀♀, 1 ♂; Urmia, Hāshtian; 37°47' N, 44°39' E; 1680 m a.s.l.; Apr.–early May 2017; Y. Karimpour leg.; M.-

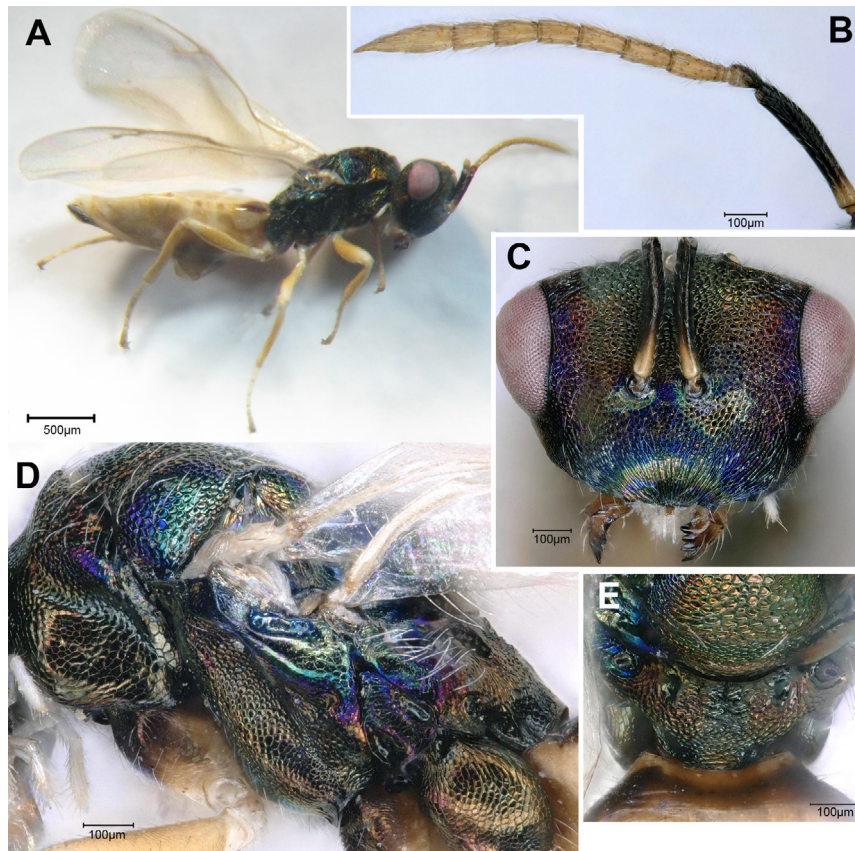


Fig. 11. *Homoporus febriculosus* (Girault, 1917), female. **A.** Lateral view. **B.** Antenna. **C.** Head in frontal view. **D.** Metasoma in lateral view. **E.** Head in dorsal view.

D. Mitroiu det.; ex *Phragmites australis*; HMIM • 2 ♀♀; Urmia, Hesar-e Türkmän; 37°26' N, 45°13' E; 1293 m a.s.l.; Apr.–early May 2017; Y. Karimpour leg.; M.-D. Mitroiu det.; ex *Phragmites australis*; CBGP • 1 ♀, same collection data as for preceding; HMIM

Remarks

Homoporus febriculosus is a Palearctic species that is distributed from UK to Turkey and also reported from Canada (Noyes 2020). It is known as a parasitoid of some Diptera (Agromyzidae, Cecidomyiidae, Chloropidae) and Hymenoptera (Braconidae Latreille, 1829, Cephidae Newman, 1834 and Eurytomidae) and in our rearing, it seems to be parasitoid of *Tetramesa* spp. (Eurytomidae) and *Lipara* spp. (Chloropidae) associated with *P. australis*.

All the characters of the sampled specimens well match those reported by Gahan (1933) with the following variations: much larger, body length of females vary from 3.3 to 3.8 mm and males from 2.5

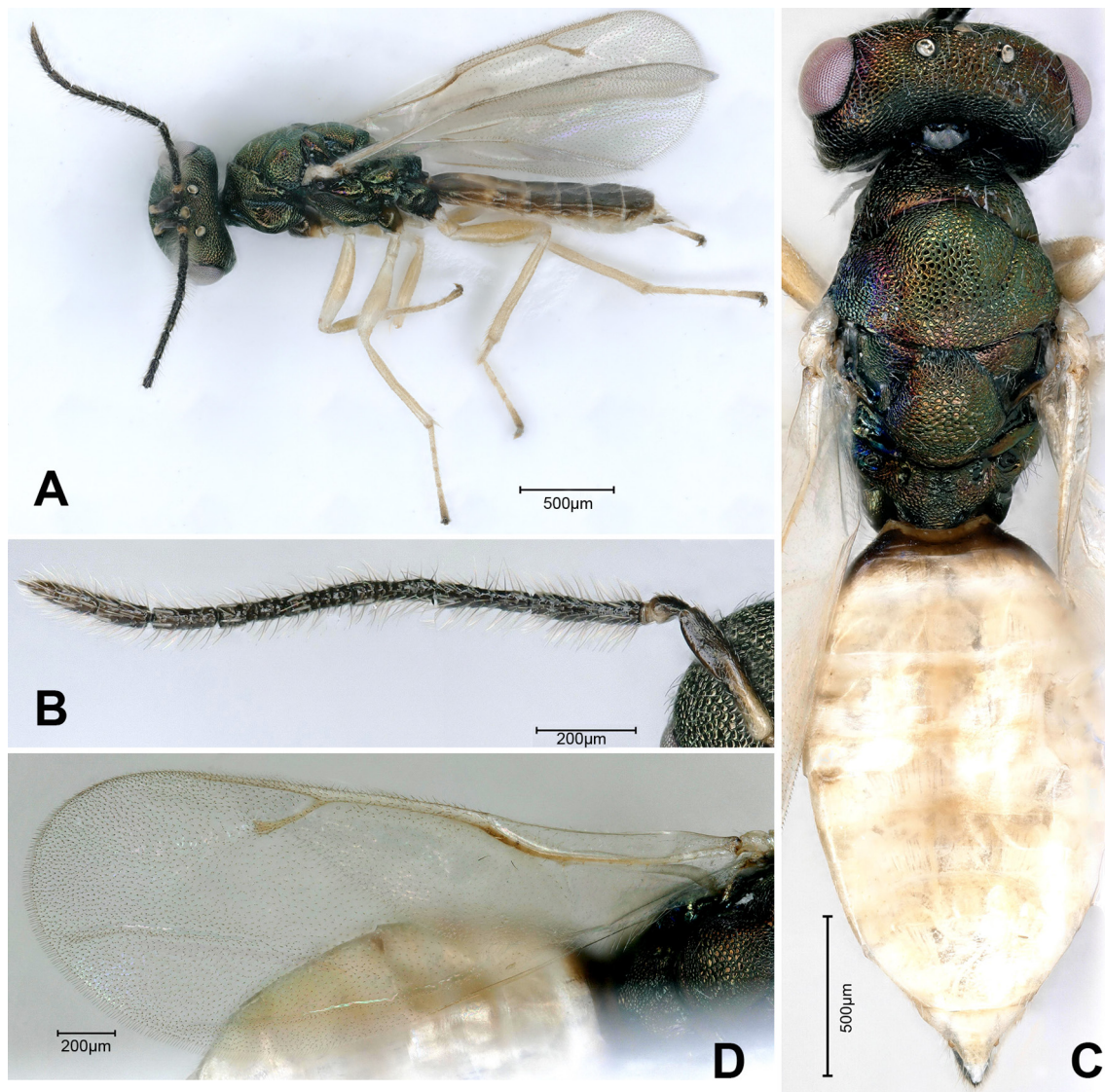


Fig. 12. *Homoporus febriculosus* (Girault, 1917). **A.** Male in lateral view. **B.** Male antenna. **C.** Female in dorsal view. **D.** Fore wing of female.

to 3.17 mm vs female 2–2.8 mm and males 1.2–2.3 mm (Gahan 1933); head and mesosoma dark, with slight metallic greenish-blue to violet tinge versus dark metallic green (Gahan 1933).

Genus *Norbanus* Walker, 1843

Norbanus Walker, 1843: 159.

Type species

Norbanus dysaules Walker, 1843, designated by Ashmead (1904).

Norbanus persicus Lotfalizadeh & Rasplus sp. nov.

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Figs 13–14

Diagnosis

Relatively large species (3.45–4.17 mm); metallic green mesosoma and brown metasoma; in female all funicular segments long longer than broad, F1 about 3.7× as long as broad; in male funicular segments filiform, long and not pedicellate; clypeus dorsally strigose; hind margin of first tergite straight or slightly convex in posterior part; fore wing of male and female with basal cell and basal vein entirely bare especially in basal half, postmarginal vein shorter than marginal vein.

Etymology

This species is named after the ancient name of Iran (*Persia*).

Material examined

Holotype

IRAN • ♀; West-Azarbaijan Province, Urmia, Hāshtān; 37°47' N, 44°39' E; 1680 m a.s.l.; Apr.–early May 2017; Y. Karimpour leg.; ex *Phragmites australis*; HMIM.

Paratypes

IRAN – **West-Azarbaijan Province** • 11 ♀♀, 3 ♂♂; same collection data as for holotype; Apr. 2017; HMIM • 2 ♀♀, 1 ♂; same collection data as for holotype; Apr. 2017; CBGP • 15 ♀♀, 1 ♂; Urmia, Hesar-e Türkmān; 37°26' N, 45°13' E; 1293 m a.s.l.; Apr.–May 2017; Y. Karimpour leg.; ex *Phragmites australis*; HMIM • 6 ♀♀; Urmia, Tāzehkand-e Qāterchī; 37°39' N, 44°58' E; 1335 m a.s.l.; Apr.–early May 2017; Y. Karimpour leg.; ex *Phragmites australis*; HMIM.

Description

Female holotype (Fig. 13A)

BODY LENGTH. 3.85 mm.

COLOR. Head and mesosoma black, with slight metallic greenish reflections, metasoma brown without metallic reflections. Eyes brownish. Ocelli honey-yellow. Pilosity on the body long and whitish. Mandibles brown, teeth dark brown. Antenna (Fig. 13C) brown with scape, light brown to yellow distally, clava yellow. Coxae brown, femora brown medially and yellow apically and basally, all tibiae and tarsi pale yellow, claws and arolia darker. Wings hyaline, tegula and wing venation yellowish-brown (Fig. 14D), wing setae dark.

HEAD. Reticulate, lower face finely striated, striation not reaching halfway to level of toruli; head in dorsal view slightly wider than mesosoma (18:15) (Fig. 13B), $2\times$ as broad as long (18:9). Scrobes shallow, almost invisible in dorsal view. Temple short, in dorsal view a little less than half length of eye (Fig. 13B). POL slightly longer than OOL (35:33) and $2.3\times$ distance between anterior and posterior ocelli. Head in frontal view $1.23\times$ as broad as high (Fig. 13E); malar space $0.64\times$ eye height (35:55). Eyes separated by $1.7\times$ their height; eye height about $1.48\times$ length; anterior margin of clypeus emarginate (Fig. 11E); lower margins of toruli distinctly above level of lower margins of eyes (Fig. 13E). Antennal formula: 11263; antennal scape $5.7\times$ longer than wide (80:14), longer than eye height (33:25), reaching to beyond

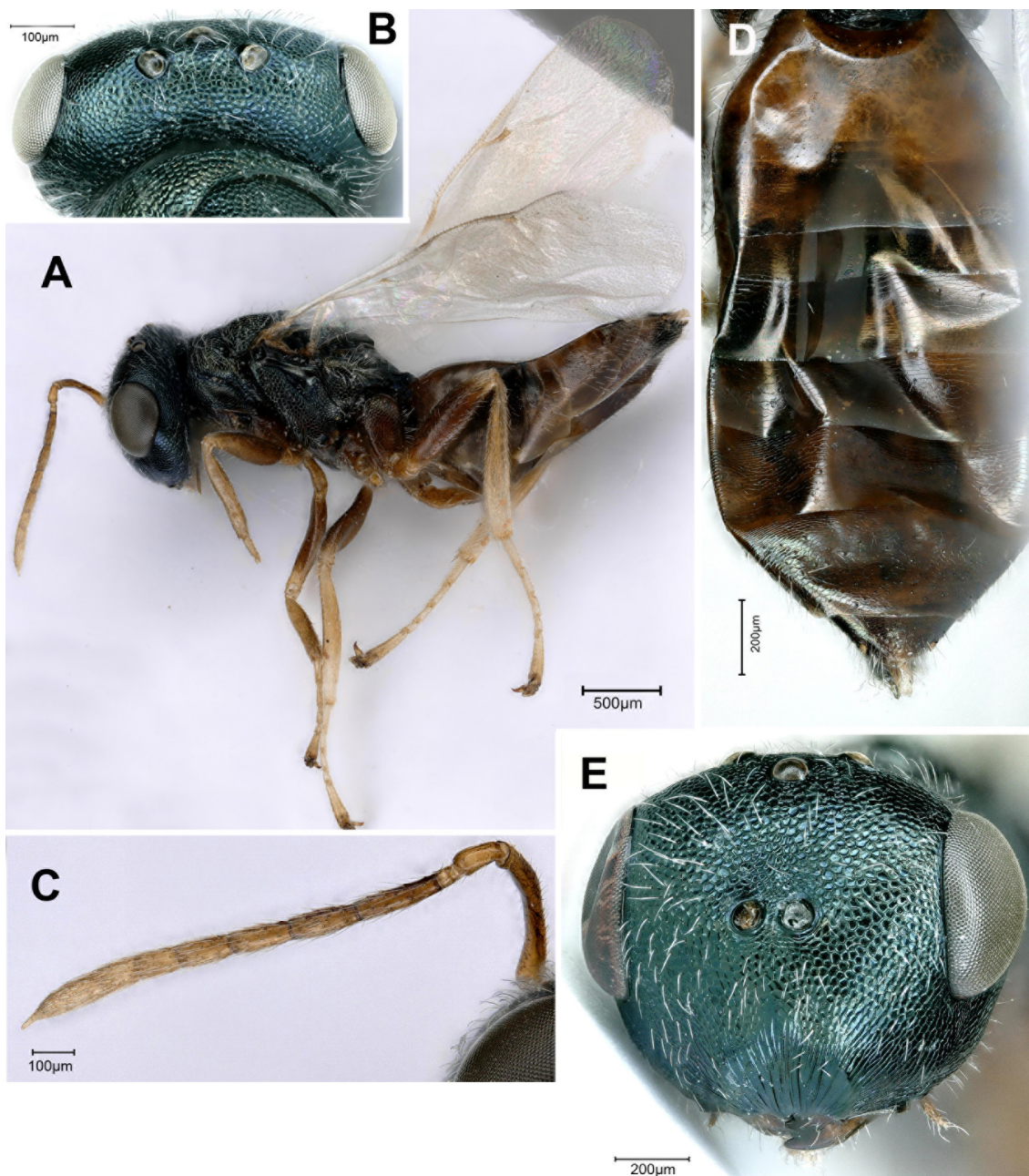


Fig. 13. *Norbanus persicus* Lotfalizadeh & Rasplus sp. nov., paratype, ♀ (HMIM). **A.** Lateral view. **B.** Head in dorsal view. **C.** Antenna. **D.** Metasoma in dorsal view. **E.** Head in frontal view.

median ocellus; pedicel plus funicle $1.16\times$ as long as head width (70:60); pedicel in dorsal view $2\times$ as long as broad and $1.8\times$ as long as anelli; all funicular segments longer than broad (Fig. 13C), flagellum slightly clavate, 1st anellus transverse, the second quadrate, about $1.8\times$ as long as the first (9:5), F1 $1.8\times$ longer than pedicel and longer than each of F2–F6, relative measurements: F1 (54:13), F2 (45:15), F3 (40:15), F4 (35:15), F5 (29:16), F6 (25:17); clava $3.05\times$ as long as broad and slightly longer than combined length of F5 and F6 (55:54), with conspicuous spicula at apex; each funicular segment and 2 basal claval segments at least with 2 sparse rows of placoid sensilla.

MESOSOMA. In dorsal view $1.47\times$ as long as broad, mesosomal length: 120, width: 75, height: 65. Pronotum $3.2\times$ as broad as long (62:19); mesoscutum $1.1\times$ as broad as long (85:75), dull, finely reticulate, with long white setae. Notauli incomplete, reaching to about half length of mesoscutum, with reticulations on lateral lobes of mesoscutum finer medially. Scutellum slightly shorter than mesoscutum (84:98) and about as wide as long, moderately convex, frenal line absent, but frenal area with finer reticulation than rest of scutellum, with normal pilosity. Upper mesepimeron smooth. Metapleuron and dorsellum uniformly reticulate. Propodeum $0.57\times$ as long as scutellum (48:84), uniformly reticulate except two small depressions near its anterior margin submedially, spiracle oval and separated from metanotum by its lesser diameter.

FORE WING (Fig. 13A, D). Length $2.40\times$ width (220:92); with basal cell and basal fold glabrous; costal cell with one row of setae on ventral surface and a few additional setae distally; basal cell open below; speculum large, extending to stigmal vein; wing pilosity including marginal fringe short; stigma hardly capitate. Relative measurements, costal cell: 85; M: 37; S: 17; PM: 28.

METASOMA (Fig. 13D). Ovate acuminate, dorsally slightly reticulate-imbricate, except for T1 which is mainly smooth, $2\times$ as long as broad (136:68), slightly shorter than head plus mesosoma (136:145), and $1.24\times$ as long as mesosoma (136:110); hind margin of T1 straight, T1 about $\frac{1}{3}$ of metasoma length (45:136); hind margins of T2 and T3 straight. Ovipositor sheaths short, not visible in dorsal view (Fig. 13A).

Male (Fig. 14B)

Smaller than female. Scape and pedicel usually yellowish-brown, exceeding level of vertex by slightly less than one quarter scape length (Fig. 14B); funicular segments long and thin, with uniform width, covered with whorls of long and dense setae; pedicel plus flagellum $0.74\times$ head plus mesosoma; proximal funicular segments usually not widened distally, F1–7 gradually decreasing in length, each segment with more than one row of placoid sensilla.

Variation

Body length of females varies from 2.67–5.40 mm and males from 3.45–4.17 mm. Antennae of female in smaller specimens entirely yellow. Metasoma and femura of female dark-brown to dark in some specimens. Metasoma of males darker than females. Wings slightly fuscate, especially in larger specimens but entirely hyaline in smaller specimens.

Biological association

Host unknown. This species was reared from *Phragmites australis* in northwest Iran. Within the reared phytophagous insects, *Chilo phragmitella* (Hübner, 1810) (Lepidoptera: Crambidae) is its most likely host.

Distribution

Only known from Iran.

Remarks

The species closely resembles *N. tenuicornis* Bouček, 1970 known from Europe, Africa and China. It mainly differs in body size and coloration, and some antennal characters. Detailed diagnostic features of both species are provided in Table 3.

The male of this species is similar to that of the genus *Gugolzia* Delucchi & Steffan, 1956 in having the antennae inserted far above the center of the face, but the distinct antennal spicula of *N. persicus* Lotfalizadeh & Rasplus sp. nov. (less visible in Fig. 14C, due to whorls of long and dense setae) runs it to the group of pteromalids with spiculated antennae that males in the genus *Gugolzia* miss. In addition, the

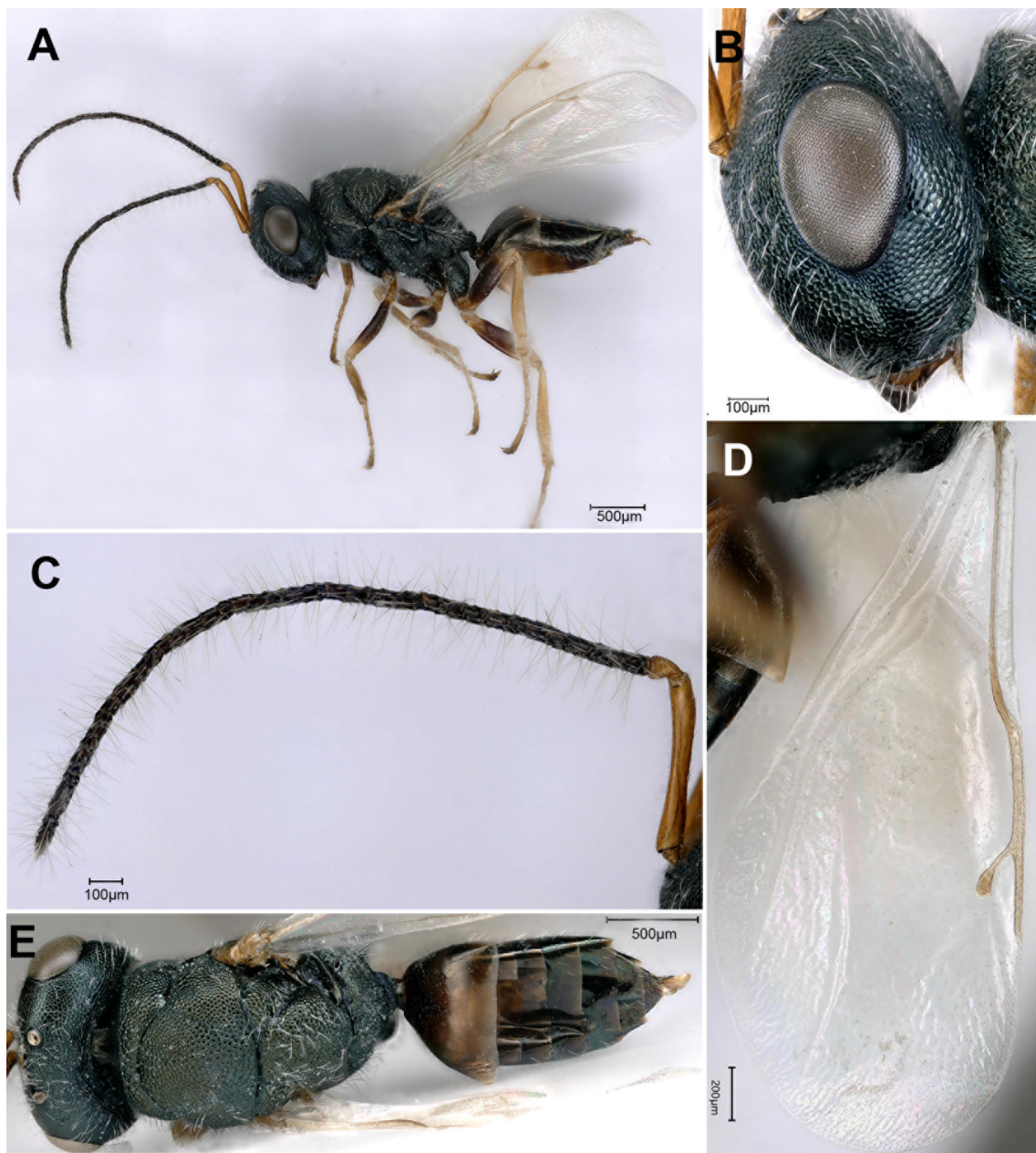


Fig. 14. *Norbanus persicus* Lotfalizadeh & Rasplus sp. nov., paratype, ♂ (HMIM). **A.** Lateral view. **B.** Head in lateral view. **C.** Antenna. **D.** Fore wing. **E.** Dorsal view.

Table 3. Features distinguishing both sexes of *Norbanus persicus* Lotfalizadeh & Rasplus sp. nov. from *N. tenuicornis* Bouček, 1970.

Morphological features	<i>N. persicus</i> Lotfalizadeh & Rasplus sp. nov. Figs 13–14	<i>N. tenuicornis</i> Bouček, 1970 (Mitriou 2015: figs 195–200)
Body length (♀)	Large species (about 3.8 mm)	Small species (less than 2 mm)
Coloration, body (♂ & ♀)	Metallic green	Metallic blue
Coloration, gaster (♀)	Brown, without metallic reflections	Blue metallic
Coloration, funicular segments (♂)	Dark	Pale brown
Antennal funicular segments (♀)	Longer (F1 about 3.7 × as long as broad)	Shorter (F1 about 2 × as long as broad)
Position of toruli on face (♀)	Closer to median ocellus	Equidistant from median ocellus and ventral margin of clypeus
Sculpture of clypeus dorsally (♀)	Strigose	Mostly reticulate
Shape of funicular segments (♂)	Filiform	Pedicellate

female shares 2-segmented annelli (vs 3-segmented annelli in *Gugolzia*), distinctly spiculated antennae and distinctly small prepectus runs to the genus *Norbanus*.

The key to the species of *Norbanus* in the Palaearctic (Rizzo & Mitriou 2010) was updated (see Appendix), including the female and male of the new species of *Norbanus* described above, *N. rasplusi* Lotfalizadeh, 2015 (Lotfalizadeh 2015) as well as the male of *N. tenuicornis*.

Genus *Stenomalina* Ghesquière, 1946

Stenomalina delvarei Lotfalizadeh & Rasplus sp. nov.

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Figs 15–16

Diagnosis

Clypeus medially pointed and with lateral teeth, dorsally finely strigose; malar space slightly more than half the length of an eye; pedicel + flagellum 0.9 × as long as head width, elongate funicular segments (distinctly longer than wide); temple converging slightly behind the eye dorsally, slightly more than 1/3 as long as eyes; propodeum, with an inverted Y-shaped median carina; costal cell ventrally with three rows of short setae near dorsal margin; basal third of wing bare, postmarginal vein longer than marginal and stigma veins; metasoma lanceolate, short, 1.7 × as long as broad, relatively shorter metasoma (shorter than head + mesosoma).

Etymology

We dedicate this species to our friend Gérard Delvare for his overall contribution to the taxonomy of Chalcidoidea.

Material examined

Holotype

IRAN • ♀; West-Azerbaijan Province, Urmia, Tāzehkand-e Qāterchī; 37°39' N, 44°58' E; 1335 m a.s.l.; Apr. 2017; Y. Karimpour leg.; ex *Phragmites australis*; HMIM.

Paratypes

IRAN – **West-Azerbaijan Province** • 1 ♀, 1 ♂; same collection data as for holotype; HMIM • 1 ♀; Urmia, Hāshtīān; 37°47' N, 44°39' E; 1680 m a.s.l.; Apr. 2017; Y. Karimpour leg.; ex *Phragmites australis*; CBGP • 1 ♂; same collection data as for preceding; HMIM.

Description

Female (holotype)

BODY LENGTH. 3.85 mm.

COLOR. Head and mesosoma dark with metallic green reflection (Fig. 15D); metasoma dark dorsally, T1 with green, golden and violet reflections (Fig. 15D); antennal scape, pedicel and anelli yellowish-brown, flagellum black (Fig. 15B); coxae concolorous with mesosoma, distally brown, trochanters yellow, femora brown, distally and basally yellow; tibiae and tarsi whitish-yellow, last tarsal segments brownish, pretarsi fuscous. Tegula brownish. Forewing slightly infuscate below marginal vein; rest of wing, and the hindwing hyaline; venation brown. Wing setae dark (Fig. 15E).

HEAD. Reticulate, with finer reticulation in scrobes and on lower face, clypeus dorsally finely striated, clypeal margin pointed medially with lateral teeth (Fig. 16B), striation reaching half way to level of toruli; head in dorsal view as wide as mesosoma (Fig. 15D), $2.2\times$ as broad as long (112:50). Scrobes shallow, almost invisible in dorsal view. Temple relatively long, in dorsal view a little less than length of eye (23:28) (Fig. 15D). POL shorter than OOL (23:28) and $1.5\times$ distance between anterior and posterior ocelli (23:15). Head in frontal view $1.32\times$ as broad as high (150:114) (Fig. 16B); malar space $0.63\times$ eye height (40:64). Eyes separated by $1.7\times$ their height (102:58); eye height about $1.33\times$ length (64:48); anterior margin of clypeus slightly toothed medially (Fig. 16B); lower margins of toruli distinctly above level of lower margins of eyes (Fig. 16B). Antennal (Fig. 15B) formula: 11253; antennal scape $6.8\times$ longer than wide (115:18), shorter than eye height (115:139), reaching to median ocellus, inserted approximately mid-way between the anterior margin of the clypeus and the median ocellus; pedicel plus flagellum $0.9\times$ as long as head width (112:104); pedicel in dorsal view $1.75\times$ as long as broad (35:20) and $2.3\times$ as long as anelli (35:15); funicular segments all longer than broad, filiform, 1st and 2nd anelli transverse, F1 $1.28\times$ longer than pedicel (45:35) and longer than each of F2–F5 funicular segments, relative measurements: F1 (45:22), F2 (43:22), F3 (37:22), F4 (37:22), F5 (28:22), F6 (28:22); clava about $3.6\times$ as long as broad and longer than combined length of F5 and F6 (72:61); each funicular segment and 2 basal claval segments at least with 2 to 3 sparse rows of placoid sensilla.

MESOSOMA. Dorsally coarsely reticulate, with long white setae, mediodorsally with larger reticulation; in dorsal view $1.4\times$ as long as broad (200:140) (Fig. 15D), mesosomal length: 200, width: 140, height: 125. Pronotum $2.55\times$ as broad as long; mesoscutum slightly longer than broad (148:140); mesosoma $1.6\times$ longer than high (200: 125). Notauli incomplete and not reaching posterior margin of mesoscutum, reaching about middle of mesoscutum, with finer reticulations on lateral lobes of mesoscutum. Scutellum slightly longer than wide (70:65), moderately convex, rounded posteriorly, slightly shorter than mesoscutum (55:58), frenulum distinct. Propodeum (Fig. 16A, E) $0.5\times$ as long as scutellum (26:55), inclined, finely reticulate, with distinctly raised median carina, forking to an inverted Y-shape carina delimiting nucha, with distinct costula, base of propodeum submedially with two small depressions, enclosed with distinct carinae; spiracle oval and separated from metanotum by its lesser diameter.

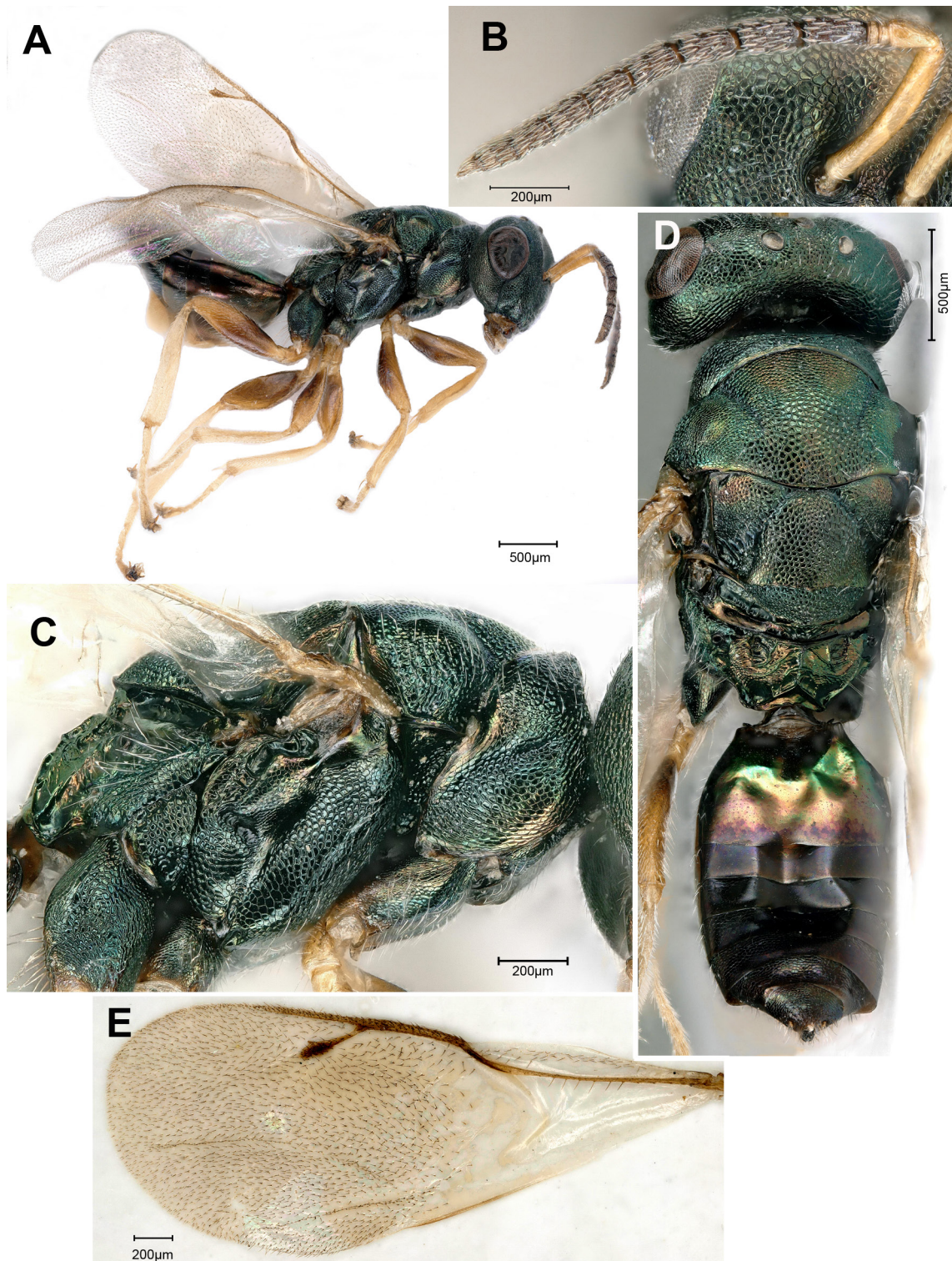


Fig. 15. *Stenomalina delvarei* Lotfalizadeh & Rasplus sp. nov. A–C. Holotype, ♀ (HMIM). A. Lateral view. B. Antenna. C. Mesosoma in lateral view. D–E. Paratype, ♂ (HMIM). D. Dorsal view. E. Fore wing.

FORE WING (Fig. 2D). Length $2.45 \times$ its width (275:112); costal cell ventrally with three rows of short setae near dorsal margin; basal third of wing bare, basal cell bare and open below; speculum narrow and unobvious, open below; disc covered with short and dense pilosity. Relative measurements: costal cell: 105; M: 40; S: 30; PM: 45.

GASTER (Fig. 15D). Lanceolate, dorsally in some parts slightly reticulate, except for GT2-GT4 which is mainly smooth, $1.7 \times$ as long as broad (170:100), shorter than head plus mesosoma (170:204); hind margin of GT1 straight, GT1 is the larger tergite, ca $0.4 \times$ metasoma length (GT1: 70); hind margins of GT2 and GT3 straight. Ovipositor sheaths short, concealed or only very slightly exerted in dorsal view (Fig. 52).

Male

Similar to female except for following: body length 3.4 mm; head and mesosoma with golden reflections (Fig. 16C); F1–2 yellowish ventrally (Fig. 16D). Propodeum (Fig. 16E) with less raised carinae beside submedian depressions.

Variation

Body length of females based on available specimens varies from 3.85 to 4.07 mm.

Biological association

Host unknown. This species was reared from *Phragmites australis* in northwest Iran. Species of Chloropidae are its most likely host.

Distribution

Only known from Iran.

Remarks

The female is closely related to females of *Stenomalina rossiliensis* Graham, 1986 and *S. liparae* (Giraud, 1863) also reared from *Phragmites australis*, and may be separated by the following key:

Key to species of *Stenomalina* associated with *Phragmites australis*

1. Metasoma short, $1.7 \times$ as long as broad; antenna short, pedicel + flagellum $0.9 \times$ as long as head width *Stenomalina delvarei* Lotfalizadeh & Rasplus sp. nov.
– Metasoma long, more than $2.5 \times$ as long as broad; antenna long, pedicel + flagellum distinctly longer than head width (more than $1.2 \times$) 2
2. Funicular segments longer than wide (about $1.3\text{--}1.5 \times$), excepted F6 quadrate or very slightly elongate *Stenomalina liparae* (Giraud, 1863)
– All funicular segments longer than wide (about $1.5\text{--}2.1 \times$), F6 about $1.5 \times$ as long as wide
..... *Stenomalina rossiliensis* Graham, 1986

Stenomalina delvarei Lotfalizadeh & Rasplus sp. nov. shares the following characters with *S. rossiliensis*: elongate funicular segments (more than $1.3 \times$ as long as wide) and the sculpture of the propodeum, with an inverted Y-shaped median carina. Considering some morphological characters mentioned by Graham & Claridge (1965), this species is similar to *Stenomalina liparae* and shares the following characters: malar space slightly more than $\frac{1}{2}$ as long as eye; elongate funicular segments; temple converging slightly behind the eye dorsally, slightly more than $\frac{1}{3}$ as long as eyes; lanceolate metasoma, relatively shorter metasoma (shorter than head + mesosoma).

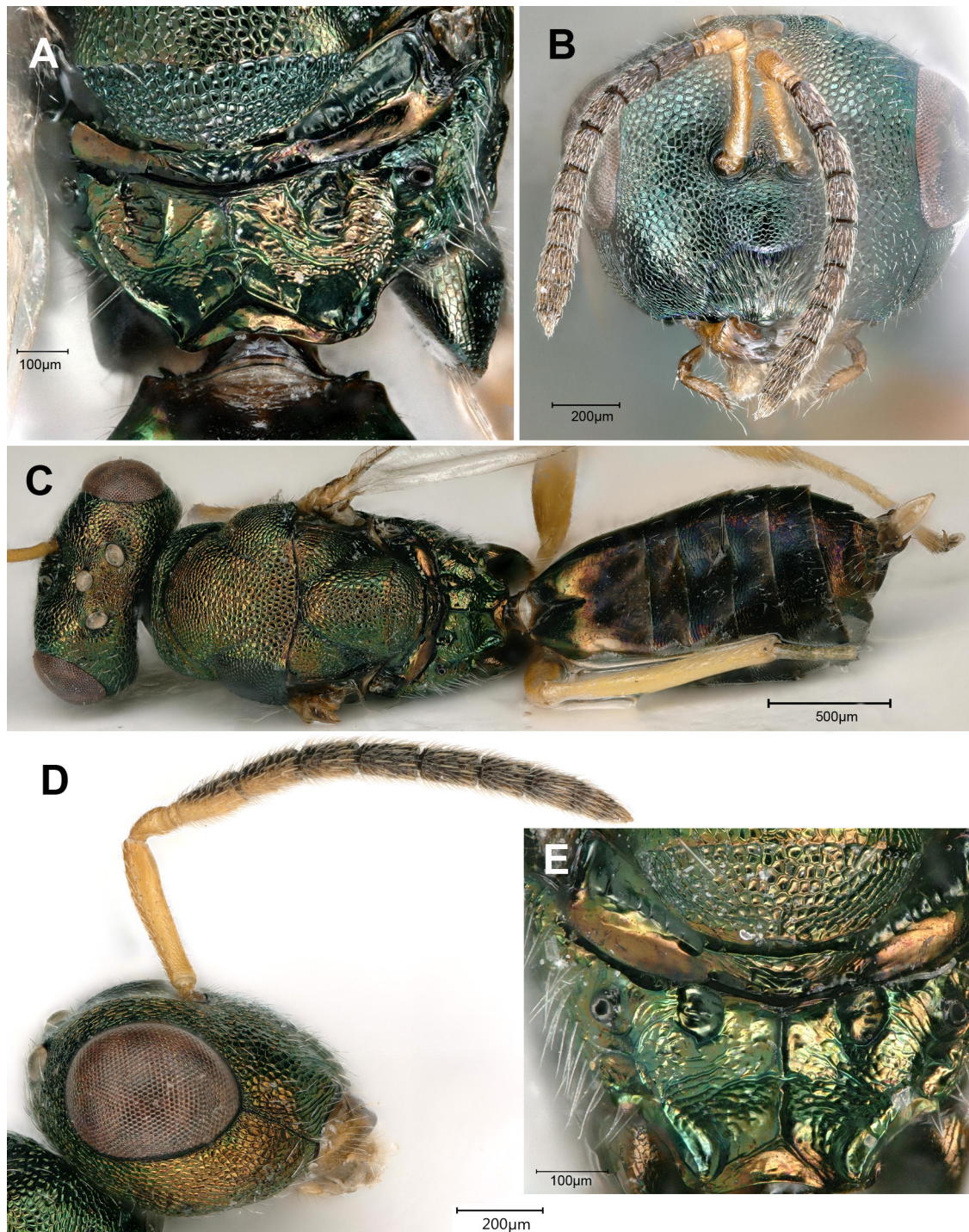


Fig. 16. *Stenomalina delvarei* Lotfalizadeh & Rasplus sp. nov. **A–B.** Holotype, ♀ (HMIM). **A.** Propodeum in dorsal view. **B.** Head and antennae in frontal view. **C–E.** Paratype, ♂ (HMIM). **C.** Dorsal view. **D.** Head and antenna in lateral view. **E.** Propodeum in dorsal view.

Family Torymidae Walker, 1833
Subfamily Toryminae Walker, 1833
Genus *Torymus* Dalman, 1820

Torymus arundinis (Walker, 1833)

Fig. 17

Material examined

IRAN • 2 ♀♀; West-Azarbaijan Province, Urmia, Kelisā Kandī; 37°29' N, 45°01' E; 1600 m a.s.l.; Apr. 2017; Y. Karimpour leg.; ex *Phragmites australis*; HMIM.

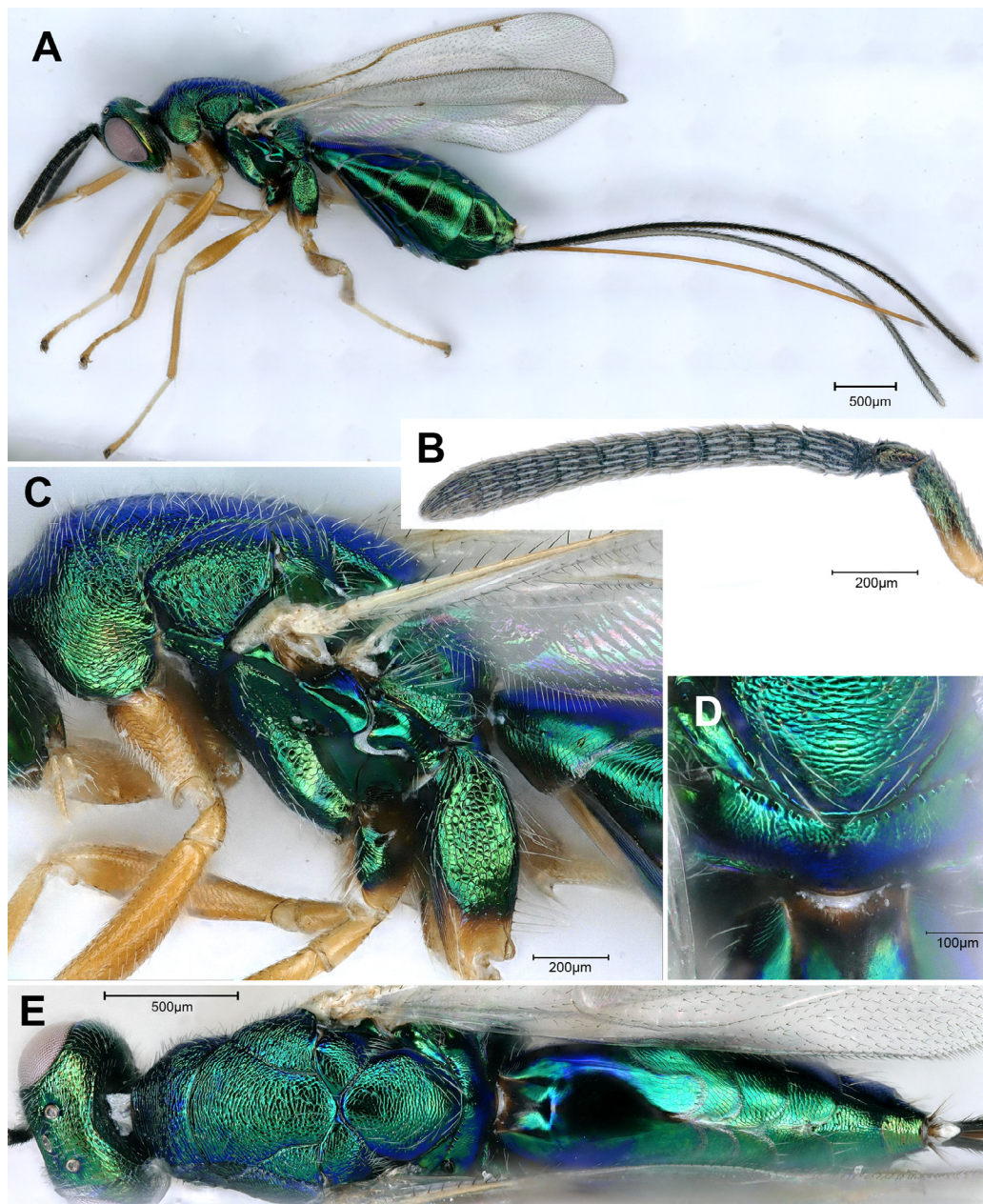


Fig. 17. *Torymus arundinis* (Walker, 1833). **A.** Female in lateral view. **B.** Antenna of female. **C.** Mesosoma in lateral view. **D.** Female in dorsal view.

Remarks

Torymus arundinis is widely distributed in Europe, but has not yet been reported from the Middle East (Noyes 2020), our specimens represent a new record for Iran. The species may be a parasitoid of Cecidomyiidae (Diptera) on *P. australis*.

Body length 3.40 mm (including ovipositor, 7.5 mm), ovipositor longer than body (18:15) (Fig. 17A); scape relatively short, not reaching above vertex, all funicular segments longer than wide, F1 longer than F2 (34:30) (Fig. 17B); scutellum without any frenal indication, entirely reticulate, with some piliferous punctures in lateral and dorsal margins (Fig. 17D–E); propodeum (Fig. 17E) with slightly engraved sculpture; hind coxae pilose dorsally in basal half (Fig. 17C); below the cubital line of fore wing with 2–3 rows of setae; metasoma with very long basal sternite, reaching about half the length of the metasoma ventrally.

Discussion

This is the first effort to study Chalcidoidea associated with *P. australis* in Iran. It revealed the presence of 14 species in five different families, of which two newly reared parasitoids, *N. persicus* Lotfalizadeh & Rasplus sp. nov. and *S. delvarei* Lotfalizadeh & Rasplus sp. nov., were described. However, the genera *Aximopsis*, *Echthroplexiella*, *Homoporus* and *Neococcidencyrtus* were added to former known listed Chalcidoidea on *P. australis* (Table 1), with the following species *A. deserticola*, *E. obscura*, *H. febriculosus* and *N. poutiersi*. Including these new findings to the list of Chalcidoidea on *P. australis*, the updated list reaches up to 67 species of 35 genera.

Furthermore, the family Encyrtidae with the maximum presence of species (4 spp.) revealed that in this area their hosts (mostly Hemiptera) could be the main pests of *P. australis*.

Myartseva (1982) reported 13 species of Encyrtidae in Turkmenistan. Based on the present study, only 21% of obtained chalcidoids (two species of *Tetramesa*) are the pest of *P. australis* and the rest are parasitoids of other insects. Therefore, supplementary investigations are highly advised to reveal the biological association of these parasitoids with supposed insect pests of the families Agromyzidae, Chloropidae, Crambidae, Cecidomyiidae, Mordellidae and Pseudococcidae.

Within the identified species, *Aprostocetus orithyia* and *Norbanus persicus* Lotfalizadeh & Rasplus sp. nov. were the most abundant, that may be parasitoids of Cecidomyiidae and Crambidae, respectively. Finally, the species which have been introduced in this study were collected and identified from a limited area in northwestern Iran. Iran is very diverse in terms of climatic conditions and topography, and the reed plant is spread in many areas of country. Given this diversity, there is no doubt that herbivorous insects associated with reeds and their parasitoids have a considerable diversity throughout Iran, and further studies in different parts of Iran will lead to further identifications of new species and new records as well.

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Appendix. Updated key to species of the genus *Norbanus* Walker, 1843 in the Palaearctic region (female & male) (modified after Rizzo & Mitroiu 2010). For asterisked figures (*), see Rizzo & Mitroiu (2010).

1. Female 2
– Male 13
2. Hind margin of first tergite straight or slightly convex in posterior part (fig. 1*) 3
– Hind margin of first tergite three-lobed (fig. 2*) 8
3. Fore wing with basal cell and basal vein entirely bare; postmarginal vein shorter than marginal vein (fig. 3*) 4
– Fore wing with basal cell moderately to extensively pilose or, at least, with basal vein pilose; postmarginal vein at least as long as (but often clearly longer than) marginal vein (fig. 5*) 5
4. Antennal funicular segments short, with F1 about 2× as long as broad; clypeus dorsally reticulate generally; small species, less than 2 mm; metasoma with metallic blue reflections; all body metallic blue *N. tenuicornis* Bouček, 1970
– Antennal funicular segments long, with F1 about 3.7× as long as broad; clypeus dorsally strigose; large species, more than 2 mm; metasoma non-metallic, brown or whitish-yellow; body metallic green, gaster without metallic reflections *N. persicus* Lotfalizadeh & Rasplus sp. nov.
5. Basal cell uniformly hairy (fig. 4*); antennal club before spicula either gradually becoming pointed or globose 6
– Basal cell completely bare or at most pilose in its distal half (figs 5*–6*); antennal club before spicula always gradually becoming pointed, never globose 7
6. Speculum present; antenna slender with all segments longer than wide, gradually becoming shorter towards antennal apex; club two-segmented, globose, ending with a thin spicula (fig. 22*); head transverse in dorsal view (fig. 13*) *N. meridionalis* (Masi, 1922)
– Speculum absent; antenna short, thickening towards apex, with segments from 3rd to 6th subquadrate; club in appearance unisegmented with segments fused; club pointed bearing a short stocky spicula (fig. 19*); head globose in dorsal view with large rounded temples (fig. 7*) *N. brevicornis* Szelényi, 1974
7. Basal cell: few setae present on the basal vein and sometimes near it (fig. 5*); head strongly transverse in dorsal view, with eyes in lateral position and temples receding, $POL \leq OOL$ (fig. 9*) *N. scabriculus* (Nees, 1834)
– Basal cell hairy on the entire distal half (fig. 6*); head transverse but temples present and eyes in antero-lateral position; $POL \geq OOL$ (fig. 10*) *N. globulariae* (Szelényi, 1941)
8. Gaster very long and narrow, more than 4 times as long as broad and about twice as long as head plus mesosoma together, orange with distal third black; very large species (more than 10 mm) *N. guyoni* (Giraud, 1870)
– Gaster much shorter and broader, at most about 3 times as long as broad and not much longer than head plus mesosoma together (fig. 8*), smaller species (up to 7 mm but usually less) 9
9. Gena with strongly developed quadrangular lamina at base of mandible (fig. 16*) *N. calabrus* (Masi, 1942)
– Gena with at most slightly developed rounded lamina at base of mandible (fig. 15*) 10

10. Sculpture of head and mesosoma very shallow, effaced *N. laevis* (Bouček, 1969)
 – Sculpture of head and mesosoma deep, not effaced 11
11. Antenna without an obvious spicula (cf. fig. 17*), dark, proximal part of flagellum broader than pedicel; head in dorsal view about 2.1–2.2 × as wide as long and slightly wider than high in frontal view; head bluish-black, mesosoma bluish, eyes reddish; gaster at most with basal half orange
 *N. cerasiops* (Masi, 1922)
 – Antenna with distinct spicula (fig. 20*), yellowish, proximal part of flagellum about as broad as pedicel; head in dorsal view more than 2.3 × as wide as long and slightly higher than wide in frontal view; head and mesosoma coppery-green to blackish, eyes brownish; gaster anteriorly without any reddish-orange coloration 12
12. Antenna darker towards pedicel; gaster brownish; head in dorsal view about 2.5 × as wide as long *N. obscurus* (Masi, 1922)
 – Antenna lighter towards pedicel (scape, pedicel and 1st anellus yellow), F6 and clava slightly darker than the rest of funicle; gaster reddish-brown in its median part, with metallic greenish-blue reflections distally; head in dorsal view, shorter, 2.3 × as wide as long
 *N. rasplusi* Lotfalizadeh, 2015
13. Hind margin of first tergite straight or slightly convex in posterior part 14
 – Hind margin of first tergite three-lobed 18
14. Basal cell uniformly hairy 15
 – Basal cell completely bare or at most pilose in its distal half 16
15. Speculum present; head transverse in dorsal view (fig. 11*); antenna with pedicellate funicular segments with whorls of setae (fig. 18*) *N. meridionalis* (Masi, 1922)
 – Speculum absent; head globose in dorsal view with large rounded temples; antenna with wider segments, covered by very dense short setae *N. brevicornis* Széleányi, 1974
16. Funicular segments long and not pedicellate (Figs 12C, 14B)
 *N. persicus* Lotfalizadeh & Rasplus sp. nov
 – Funicular segments pedicellate 17
17. Basal cell: few setae present on the basal vein and sometimes near it; head strongly transverse in dorsal view, with eyes in lateral position and temples receding, $POL \leq OOL$
 *N. scabriculus* (Nees, 1834)
 – Basal cell hairy on the entire distal half; head transverse, but temples present and eyes in antero-lateral position; $POL \geq OOL$ *N. globulariae* (Széleányi, 1941)
18. Gaster mostly orange; antenna with pedicellate funicular segments with whorls of setae 19
 – Gaster blackish, at most slightly paler basally; antenna with wide segments, covered by very dense short setae 20
19. Base of gaster, next to petiole, orange, only tip black; antenna shorter, pedicellus plus flagellum only about 1.2 times as long as width of head; tibia entirely yellow *N. guyoni* (Giraud, 1870)
 – Both base and tip of gaster black; antenna longer, pedicellus plus flagellum 1.5 times as long as width of head; tibia infuscated medially *calabrus* (Masi, 1942)

20. Antenna with pedicellus plus flagellum shorter than head width; head about 2.1–2.2 as broad as long in dorsal view (fig. 12*); head bluish-black, mesosoma bluish, eyes reddish
 *N. cerasiops* (Masi, 1922)
- Antenna with pedicellus plus flagellum longer than head width (fig. 21*); head about 1.9 as broad as long in dorsal view (fig. 14*); head and mesosoma dark green, eyes brownish 21
21. Funicular segments long and with uniform width; metasoma uniformly blackish
 *N. obscurus* (Masi, 1922)
- Funicular segments pedicellate; metasoma not uniformly blackish, with whitish or yellowish marks 22
22. Funicular segments with two whorls of long setae and few sensillae (1–2); metasoma brownish-black, with distinct metallic reflections, except extensively whitish to yellowish dorsally and ventrally in proximal half or slightly less *N. tenuicornis* Bouček, 1970
- Funicular segments with several whorls of long setae and with several sensillae in two rows; metasoma whitish-yellow with its tip and extreme base black, without metallic reflection
 *N. rasplusi* Lotfalizadeh, 2015