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Pteromalidae (Hymenoptera: Chalcidoidea) associated with plant galls in the south-eastern Iran, with three new records

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ABSTRACT. Six species of pteromalid wasps associated with plant galls, *Rosa beggeriana* Schrenk, *Ephedra major* Host and *Salix pycnostachya* Andersson were collected from Kerman province, during 2010-2011. The identified wasps belong to four genera: *Caenacis* Förster, 1856, *Gastrancistrus* Westwood, 1833, *Mesopolobus* Westwood, 1833, and *Pteromalus* Swederus, 1795. Three species are newly recorded for the Iranian fauna: *Gastrancistrus ephedrae* Dzhankmen, 1994 (Pireninae), *Pteromalus cyniphidis* (Linnaeus, 1758) and *P. dolichurus* (Thomson, 1878) (Pteromalinae). *Gastrancistrus ephedrae* is associated with an unknown species of insect on *E. major*, *P. bedeguaris* (Thomson, 1878) with *Diplolepis fructuum* (Rübsaamen, 1882) (Hym.: Cynipidae) on *R. beggeriana*, *P. cyniphidis* and *P. dolichurus* with an unknown species of insect in leaf galls on *S. pycnostachya*, and *Caenacis* cf. *inflexa* and *Mesopolobus sericeus* with *D. fructuum* on *R. beggeriana*. Three new biological associations were found: *M. sericeus* with *D. fructuum*, and *P. cyniphidis* and *P. dolichurus* with *S. pycnostachya*. Short taxonomic comments, hosts and geographical distribution of the species are briefly mentioned.

Key words: Gall wasps, parasitoids, new host associations, new records, Iran

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Introduction

Galls are morphologically very diverse, from simple leaf rolls and folds to complex structures with extrafloral nectars, hairs, spines and sticky resins on their surface (Stone and Schönrogge 2003). Galls are caused by different insect orders, such as Hymenoptera, Diptera, Coleoptera, Lepidoptera and have attracted attention as a very convenient source of information on

herbivore-plant relationships and on the interaction between herbivores and their natural enemies (Nazemi-Rafie *et al.* 2007; Nazemi *et al.* 2008; Redfern 2011). The gall wasps are one of the most common groups of gall making insects (Claridge and Dawah, 1994); most of its representatives belong to the family Cynipidae (Nazemi *et al.* 2008). However, a few sawflies such as Tenthredinidae and chalcid wasps such as Eurytomidae also cause galls (Claridge and

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Dawah 1994; Redfern 2011). The gall wasps mostly attack oaks, roses and related plants (Redfern 2011). Many species of chalcid wasps (Chalcidoidea) belonging to different families have been reared from gall plants, among which the Pteromalidae is one of the considerable groups (Mahdavi and Madjd-zadeh 2013). With over 3500 described species belonging to almost 600 genera, Pteromalidae is one of the largest families of Chalcidoidea and includes small wasps (2–3 mm on average) that are common in most terrestrial ecosystems (Noyes 2015).

The species of the family Pteromalidae are primary or secondary parasitoids attacking other insect groups such as Coleoptera, Diptera, Lepidoptera, Hymenoptera, Hemiptera and some Arachnida (Bouček and Rasplus 1991). Members of the family Pteromalidae have been obtained from galls of all tribes of Cynipidae. Because of the great diversity of insects attacked, pteromalids play a major role in agriculture, forestry, and nature in general (Bouček and Heydon 1997; Mitroiu *et al.* 2011) and several species have been used successfully in biological control programs all over the world (Bouček and Rasplus 1991).

The aims of this study are to: 1) add new distributional records to the list of Iranian Chalcidoidea; 2) present preliminary information concerning the pteromalid wasps associated with several plant species: *Ephedra major* Host, *Salix pycnostachya* Andersson and *Rosa beggeriana* Schrenk, in order to further investigate the parasitoid communities related to these plant species in Iran in the future.

Materials and Methods

Fresh and dry galls found on three host plant species, begger rose (*Rosa beggeriana*), ephedra (*Ephedra major*), and willow (*Salix pycnostachya*) were collected in two sites, Bidkhan and Sang-e-Sayad in Kerman province, south-east Iran from 2010 to 2011.

The galls were transferred to the laboratory and kept at room temperature in mesh-covered transparent plastic rearing containers until the emergence of parasitoids. The containers were checked every day and emerged parasitoids removed. The emerged parasitoid wasps were preserved in 75% ethanol and then card-mounted following Noyes (1982).

The pteromalid wasps were identified using Graham (1969), Dzhanokmen (1994), and Bouček and Rasplus (1991). Observations were made using Krüss MSZ5400 and Nikon SMZ800 stereomicroscopes. Images were taken using a Leica DFC500 digital camera attached to a Leica M205A automated research stereomicroscope. The images were then processed with Zerene Stacker®. Their clarity was further enhanced using Adobe Photoshop®. The material is deposited in the Madjdzadeh Collection, Department of Biology, Shahid Bahonar University of Kerman, Kerman, Iran (MACO) and the Mitroiu Collection, Alexandru Ioan Cuza University of Iasi, Faculty of Biology, Romania (MICO). General data regarding geographical distribution and short comments are given for each species. The identified species are ordered alphabetically, based on subfamily and genus name. For further information e.g. synonymy, see Graham (1969) and Noyes (2015).

Results

Subfamily Pireninae

Gastrancistrus ephedrae Dzhanokmen, 1994 (Figs. 1–2)

Material examined: Iran: Kerman province, Bardsir, Sang-e-Sayad, 29°35'3.7"N, 56°30'77.2"E, 2869m, 02.v.2010, ex. *E. major* (M. Mahdavi), 5 ♀.

Diagnosis: The species is very close to the European *G. acontes* Walker, 1840, but differs from it mainly in the longer postmarginal vein, as compared with the marginal vein.

General distribution: Kazakhstan (Noyes 2015). This subfamily, genus and species are reported from Iran for the first time.

Subfamily Pteromalinae

Caenacis cf. inflexa (Ratzeburg, 1848)

Material examined: Iran: Kerman province: Bardsir, Bidkhan, 29°36'23.1"N, 56°29'57.7"E, 2825m, 09.vi.2010, ex. *Diplolepis fructuum* on *R. beggeriana* (M. Mahdavi), 2♀; Bardsir, Bidkhan, 29°40'31.9"N 56°31'32.8"E, 2464m, 03.v.2010, ex. *Diplolepis fructuum* on *R. beggeriana* (M. Mahdavi), 1♀.

Diagnosis: According to Graham (1969), the females of *Caenacis inflexa* can be separated from the females of *C. lauta* mostly by having a longer metasoma, shorter propodeum, weaker propodeal costula, and more pilose fore wing basal cell.

Remarks: The specimens examined during this study virtually have all the characters of the species, except they have a glabrous basal cell, with only the basal fold pilose. Thus they may represent an undescribed species, but more specimens are needed to evaluate the variability of this character within the two closely related species.

General distribution: West Palaearctic (Noyes, 2015). *Caenacis inflexa* is already reported from Iran (Lotfalizadeh and Gharali 2008).

Mesopolobus sericeus (Forster, 1770)

Material examined: Iran: Kerman province: Bardsir, Bidkhan, 29°36'45.3"N, 56°30'38.2"E, 2746m, 16.iii.2010, ex. *Diplolepis fructuum* on *R. beggeriana* (M. Mahdavi), 1♀; Bardsir, Bidkhan, 29°36'45.3" N, 56°30'38.2" E, 2746m, 30.v.2011, ex. *Diplolepis fructuum* on *R. beggeriana*(M. Mahdavi), 1♀.

Diagnosis: *Mesopolobus fasciventris* Westwood, 1833 and *M. sericeus* are similar in biology and morphology, the females of both species have elongate body, gaster longer than head and mesosoma together, head in dorsal view with width of postorbital region rather more

than half the transverse diameter of eye, two antennal anelli and body have green colouration. *Mesopolobus sericeus* can be separated from *M. fasciventris* by having a stronger median incision on the clypeus (Askew, 1961).

General distribution: West Palaearctic and Central Asia (Noyes, 2015). This species is already reported from Iran (Hasani and Madjdzadeh 2012).

Pteromalus bedeguaris (Thomson, 1878)

Material examined: Bardsir, Bidkhan, 29°36'23.1" N, 56°29'57.7" E, 2825m, 30.v.2011, ex. *Diplolepis fructuum* on *R. beggeriana* (M. Mahdavi), 1♀; Bardsir, Bidkhan, 29°34'67.8"N, 56°30'46.8"E, 3077m, 30.v.2011, ex. *Diplolepis fructuum* on *R. beggeriana* (M. Mahdavi), 4♀; Bardsir, Bidkhan, 29°35'20.1"N, 56°30'77.6"E, 2870m, 30.v.2011, ex. *Diplolepis fructuum* on *R. beggeriana* (M. Mahdavi), 1♀.

Diagnosis: This species can be distinguished from other species of the genus mainly by a combination of dark body colour, long metasoma (usually distinctly longer than head plus mesosoma), and short marginal vein, as compared with the stigmal vein.

General distribution: Nearctic and Palaearctic regions (Noyes, 2015). This species is already reported from Iran (Lotfalizadeh and Gharali, 2008).

Pteromalus cyniphidis (Linnaeus, 1758) (Figs. 3–4)

Materials examined: Kerman province: Bardsir, Bidkhan, 29°36'1.3" N, 56°30'38.4" E, 2782m, 04. viii.2010, ex. Leaf galls on *S. pycnostachya* (M. Mahdavi), 2♀ 2♂; Bardsir, Bidkhan, 29°34'95.6"N, 56°30'61.2"E, 2897m, 04.viii.2010, ex. Leaf galls on *S. pycnostachya* (M. Mahdavi), 1♀.

Diagnosis: According to Graham (1969), this species belongs to the *capreae* species group, together with *P. dolichurus* (Thomson, 1878),

P. chlorogaster (Thomson, 1878) and *P. aureolus* (Thomson, 1878). It differs from all these species mainly by the very long metasoma, about twice as long as mesosoma.

Remarks: *Pteromalus capreae* (Linnaeus, 1761) was placed in synonymy with *P. cyniphidis* by Vikberg and Askew (2006).

General distribution: Nearctic and Palaearctic regions (Noyes 2015). This species is reported from Iran for the first time.

***Pteromalus dolichurus* (Thomson, 1878)**
(Figs. 5–6)

Material examined: Kerman province: Bardsir, Bidkhan, 29°36'1.3" N, 56°30'38.4" E, 2782m, 04.viii.2010, ex. leaf galls on *S. pycnostachya* (M. Mahdavi), 3♀.

Diagnosis: This species is very close to *P. cyniphidis* differing mainly in the shorter metasoma.

General distribution: West Palaearctic (Noyes, 2015). It is a new species record for Iran.

Discussion

In this survey we report six species belonging to two subfamilies of Pteromalidae, Pireninae and Pteromalinae, associated with plant galls on *R. beggeriana*, *E. major*, and *S. pycnostachya*. Among these, three species, *G. ephedrae*, *P. cyniphidis* and *P. dolichurus* are newly recorded for the fauna of Iran. From galls on *E. major* we obtained several specimens of *G. ephedrae*. This is the second record of this species in the world, after Kazakhstan (Dzhanokmen 1994).

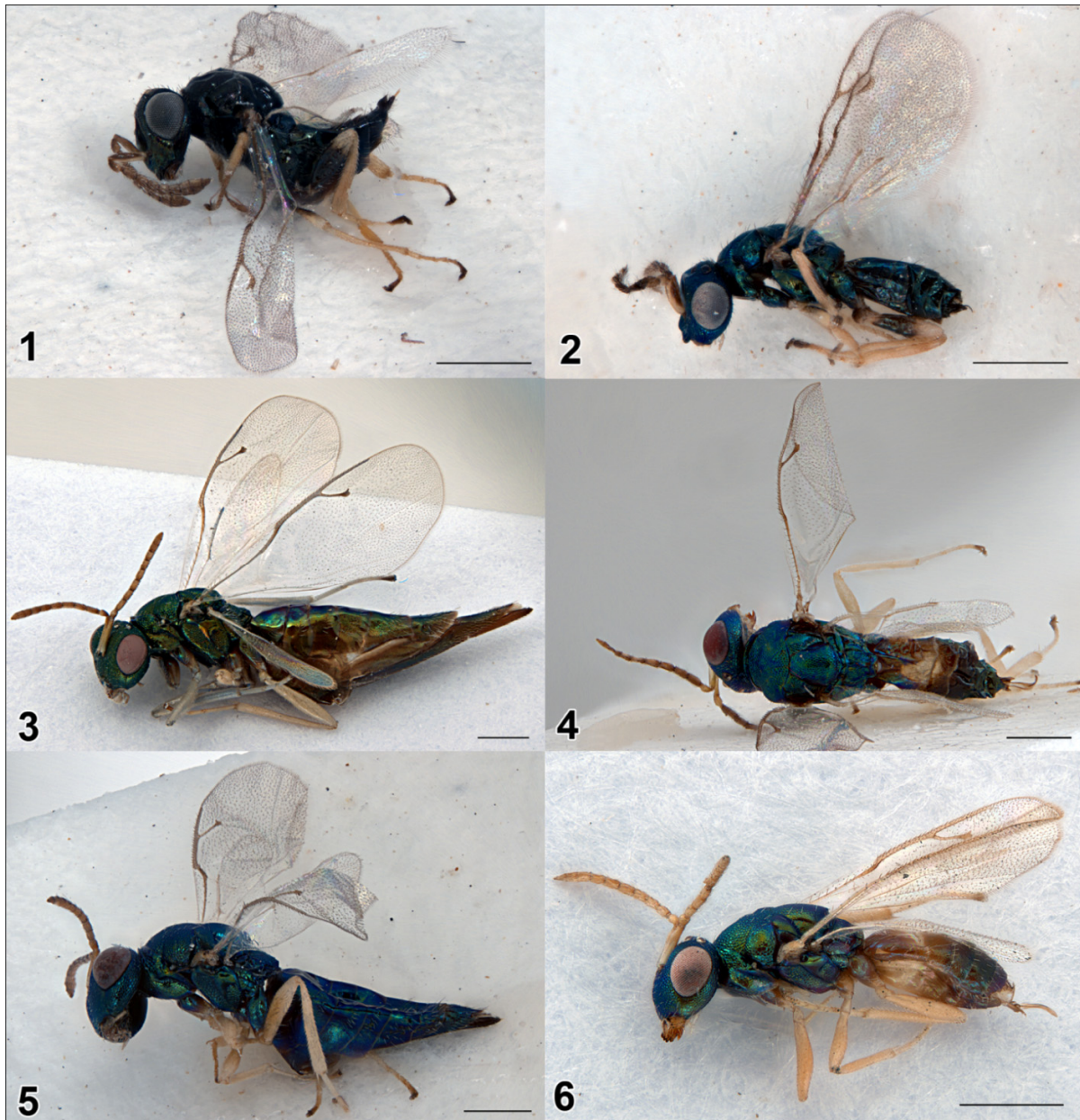
Regarding the parasitoids of *D. fructuum* in the Western Palaearctic region, Askew *et al.* (2006) reported only one species, while Lotfalizadeh (2012) listed 24 species of Hymenoptera associated with this species in Iran. *Diplolepis fructuum* was already reared on *R. beggeriana* in Iran, Afghanistan, Kazakhstan, China and Mongolia (Lotfalizadeh *et al.* 2012).

Two pteromalid species, *Caenacis cf. inflexa* and *Pteromalus bedeguaris* have been recorded as associated with *D. fructuum* in the Palaearctic region (Lotfalizadeh *et al.* 2006). *Pteromalus bedeguaris* has already been recorded as associated with *D. fructuum* on *R. beggeriana* in Kerman province, South-east of Iran (Lotfalizadeh *et al.* 2012) and is also associated with *D. fructuum* on Dog rose (*Rosa canina* L.) and the Damask rose (*Rosa damascena* Mill.) in West-Azarbaijan province, North-west of Iran (Lotfalizadeh *et al.* 2006; Mohammadi *et al.* 2011). It was also already reported as associated with *E. major* in Kerman province, South-east of Iran (Mahdavi and Madjdzadeh 2013).

Mesopolobus sericeus is recorded in associated with *D. fructuum* on *R. beggeriana* for the first time. This is rather unusual because this species is mainly associated with cynipids on oaks (Noyes 2015).

There are little information on host associations of the pteromalid species collected in the present study. *Caenacis inflexa* is parasitic on the larvae of the cynipid, *Periclistus brandtii* (Ratzeburg, 1831) in the galls of *Diplolepis rosae* (L.) (e.g. Callan 1944; Askew 1961). Valkeila (1959) recorded it from Finland as a parasite of *Periclistus caninae* (Htg.) in galls of *Diplolepis mayri* (Schlechtendal, 1877) on *Rosa cinnamomea* L. (Graham, 1969).

In Iran, Lotfalizadeh *et al.* (2006) reported this species as a parasitoid of the rose leaf gall, *Diplolepis nervosa* and *D. fructuum* (Hym.: Cynipidae). *Mesopolobus sericeus* was recently reported from Iran (Khorasan Razavi province), where it was collected on *Tamarix* sp. (Hasani *et al.* 2011). This species is a common parasitoid of more than 20 species of gall-making Cynipidae and their inquiline (Hymenoptera) (Noyes 2015).



Figures 1-6. Species of Pteromalidae associated with plant galls: **1.** *Gastrancistrus ephedrae* Dzhankmen, 1994, female; **2.** *G. ephedrae*, male; **3.** *Pteromalus cyniphidis*, (Linnaeus, 1758), female; **4.** *P. cyniphidis*, male; **5.** *Pteromalus dolichurus*, (Thomson, 1878), female; **6.** *P. dolichurus*, male. Scale bar: 0.5 mm.

It is among the species that inhabits cynipid galls on oak in Britain, but it has also been recorded from cynipid galls on plants other than oak (Askew 1961). *Pteromalus*

bedeguaris is regarded as a common parasitoid of larvae of *Diplolepis* species on *Rosa* (Daneshvar *et al.* 2009; Lotfalizadeh *et al.* 2006, 2012; Mohammadi *et al.* 2011). It is also

recorded as hyperparasitoid of *Glyphomerus stigma* Fabricius, 1793, *Orthopelma mediator* (Thunberg, 1824), *Periclistus brandtii* (Ratzeberg, 1831) and *Torymus bedeguaris* (Linnaeus, 1758) (Noyes 2015). Two species, *Pteromalus cyniphidis* and *P. dolichurus* are recorded here as associated with *S. pycnostachya* for the first time. They are probably parasitoids of some species of Tenthredinidae (Hymenoptera).

In conclusion, more investigations and complementary samplings are needed in order to investigate the complete insect fauna, geographical distribution and trophic associations of chalcid wasps associated with the studied host plant species in Iran.

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زنبورهای خانواده (Hymenoptera: Chalcidoidea) Pteromalidae مرتبط با گال‌های گیاهی در جنوب شرق ایران با ثبت سه گزارش جدید گونه

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شش گونه از زنبورهای خانواده Pteromalidae مرتبط با گال‌های گیاهی، *Rosa beggeriana* Schrenk و *Ephedra major* Host و *Salix pycnostachya* Andersson از استان کرمان در طی سال‌های ۱۳۸۹ و ۱۳۹۰ جمع آوری گردید. گونه‌های شناسایی شده متعلق به چهارجنس: *Gastrancistrus* Westwood, 1833, *Mesopolobus Caenacis* Förster, 1856 و *Gastrancistrus* Westwood, 1833 و *Pteromalus* Swederus, 1795 بودند. سه گونه: *Pteromalus ephedrae* Dzhanokmen, 1994 (Pireninae), *Pteromalus cyniphidis* (Linnaeus, 1758) (Pteromalinae) و *P. dolichurus* (Thomson, 1878) برای اولین بار از ایران گزارش می‌شوند. *Gastrancistrus ephedrae* در ارتباط با یک گونه حشره ناشناخته روی *E. major* (Thomson, 1878) و *P. bedeguaris* (Thomson, 1878) مرتبط با *Diplolepis fructuum* و *P. cyniphidis* روی *R. beggeriana* (Rübsaamen, 1882) (Hym.: Cynipidae) و *P. dolichurus* در ارتباط با یک گونه حشره ناشناخته در گال‌های برگ *S. pycnostachya*، *C. aenacis* cf. *inflexa* و *Mesopolobus sericeus* در ارتباط با *D. fructuum* روی *R. beggeriana* بودند. سه ارتباط زیستی جدید کشف شد: *M. sericeus* با *D. fructuum*، *P. cyniphidis* و *P. dolichurus* با *S. pycnostachya*. نکات کوتاه تاکسونومیک، میزبان و پراکنش جغرافیایی گونه‌ها به اختصار ذکر شده‌اند.

واژگان کلیدی: زنبورهای گال‌زا، پارازیتوییده‌ها، ارتباطات میزبانی جدید، گزارش‌های جدید، ایران.