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**A study of the subfamily Pimplinae
(Hymenoptera: Ichneumonidae)
in the north of Iran, with eleven new species records**

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Abstract

This study was conducted to determine parasitoid species of the subfamily Pimplinae (Hymenoptera: Ichneumonidae) in the north of Iran during 2010. A total of 267 specimens of Pimplinae were captured with malaise traps. Twenty one species in 13 genera were identified. Of these, 11 species are new for the fauna of Iran: *Itoplectis alternans* (GRAVENHORST 1829), *Pimpla asiatica* KASPARYAN 1973, *P. insignatoria* (GRAVENHORST 1807), *Dolichomithus agnoscendus* (ROMAN 1939), *Liotryphon punctulatus* (RATZEBURG 1848), *Clistopyga incitator* (FABRICIUS 1793), *C. laevis* KASPARYAN 1981, *Tromatobia lineatoria* (VILLERS 1789), *T. ornata* (GRAVENHORST 1829), *Schizopyga flavifrons* HOLMGREN 1856 and *Zabrachypus primus* CUSHMAN 1920. With this study, the number of the Pimplinae species known from Iran increases to 53 species. Furthermore, seasonal abundance emergence periods and distribution of pimpline ichneumon wasps through biodiversity hotspots of Iran are provided.

Key words: Pimplinae, Ichneumonidae, identification, hotspot, Iran

Zusammenfassung

Vorliegende Arbeit erfasst die Pimplinae (Hymenoptera: Ichneumonidae) des Nordirans aus Malaisde-Aufsammlungen des Jahres 2010. Insgesamt wurden 267 Exemplare gesammelt, die sich auf 21 Arten in 13 Gattungen verteilen. Folgende 11 Arten davon stellen Neunachweise für den Iran dar: *Itopectis alternans* (GRAVENHORST 1829), *Pimpla asiatica* KASPARYAN 1973, *P. insignatoria* (GRAVENHORST 1807), *Dolichomithus agnoscendus* (ROMAN 1939), *Liotryphon punctulatus* (RATZEBURG 1848), *Clistopyga incitator* (FABRICIUS 1793), *C. laevis* KASPARYAN 1981, *Tromatobia lineatoria* (VILLERS 1789), *T. ornata* (GRAVENHORST 1829), *Schizopyga flavifrons* HOLMGREN 1856 und *Zabrachypus primus* CUSHMAN 1920. Somit sind aktuell 53 Pimplinae aus dem Iran bekannt.

Introduction

The subfamily Pimplinae WESMAEL 1845 (Hymenoptera: Ichneumonidae) contains approximately 1500 known species in about 70 genera in the world, of which 330 species occur in the Palearctic region (YU & HORSTMANN 1997). The Pimplinae is a biologically diverse subfamily in comparison to the other subfamilies of Ichneumonidae (GAULD et al. 2002). Members of the tribe Pimplini are idiobiont endoparasitoids of lepidopterous pupae within cocoons. In the tribe Ephialtini, the *Dolichomitus* genus-group, specializes on deeply concealed hosts in wood and the *Tromatobia* genus-group parasitizes spider egg sacs (i.e. *Tromatobia*, *Zaglyptus*). The species of the *Polysphincta* genus-group (i.e. *Polysphincta* and *Clistopyga*) are koinobiont ectoparasitoids of spiders (FITTON et al. 1987; GAULD et al. 2002; FINCH 2005; GAULD & DUBOIS 2006). The pimpline parasitic wasps have also been considered as useful biodiversity indicators in different habitat types (the natural forests, the disturbed forests and agricultural ecosystems) (FRASER et al. 2008)..

The first records of the Pimplinae from Iran were made by TOWNES et al. (1965). Other researchers who have studied the Pimplinae fauna of Iran are: (AUBERT 1969; KASPARYAN 1973; MOMOI 1973; KASPARYAN 1974; CONSTANTINEANU & PISICA 1977; HERARD et al. 1979; KASPARYAN 1981; SELFA et al. 1988; KOLAROV 1995; TSANKOV & MIRCHEV 1999; KOLAROV & GHAHARI 2005, 2006; MASNADI-YAZDINEJAD 2006, 2007; MASNADI-YAZDINEJAD & JUSSILA 2008; GHAHARI & JUSSILA 2011). Also some new records were added to the list of the Pimplinae fauna of Iran by ecological works on some pests (RADJABI 1986; SHOJAEI 1996; SEDGHIAN 2001; NIKDEL et al. 2004; KARIMPOUR & HORSTMANN 2007). A total of 42 species of Pimplinae have previously been recorded from different parts of Iran. Yet, our knowledge of the Pimplinae fauna in Iran is very incomplete. There are also no large collections of Pimplinae in Iran, even in the north, where are the best studied sites. Only 12 pimplines were previously recorded from Tehran, Gilan and Mazandaran provinces.

The northern region of Iran is characterized by a great variability in vegetation, natural ecosystems and farm lands due to significant variations in topography and climate. This region is also affected by higher human population density and economic activities than other parts of Iran. In terms of biodiversity hotspots, this region can be regarded as the

end of two major biodiversity hotspots. The southern slopes of the Alborz Mountains with Tehran and Alborz provinces belong to the Irano-Anatolian hotspot, whereas the northern one, with Gilan and Mazandaran provinces, is the eastern extension of the Caucasus biodiversity hotspot (Fig. 1) (MYERS et al. 2000). The elevations range from below sea level at the Caspian Sea coast to more than 5000 meters in the Damavand Mountain (5671 meters). The vegetation and climate throughout the region are also very diverse.

The current study is the first large scale survey of the pimpline parasitoid fauna in northern Iran. The purposes of this study are (1) to identify the Pimplinae fauna in the north of Iran, (2) to increase our knowledge about distribution, abundance, seasonal adult emergence, habitat preference and faunal changes with altitude on two different slopes of the Alborz Mountains and through the biodiversity hotspots of Iran.

Material and Methods

Study sites

The present study was carried out in 16 localities in Gilan and Tehran provinces (35°40'51" N and 37°22'61" E) in northern Iran during 2010 (Figure 2). Recently, the western part of Tehran province was renamed as Alborz province, but here we refer to it just as Tehran province. The Alborz Mountains separate the tropical Caspian Sea area (Gilan and Mazandaran) from Tehran province. The Gilan province with an area of 14,042 km² extends along the Caspian Sea and in the northern slopes of the Alborz Mountains. Situated between high mountains of Alborz and the Caspian Sea, Gilan has a humid subtropical climate with heavy annual rainfall of about 1500 mm, moderate temperature, high relative humidity leading to diverse vegetation. The main part of precipitation comes in autumn and winter and October is the rainiest month of the year. The relative humidity is about 80% which decreases with altitude. The minimum temperature at sea level is +3°C in January. From March it rises and reaches its maximum of about +30°C in July-August. The Alborz Mountains provide many unique types of vegetation at various altitudes in addition to the Caspian coast flora. The known natural biome of this region is the Caspian Hyrcanian mixed forest but coastal plains have been almost converted to urban sites and rice paddies. As the elevation increases, the flora gradually differentiates and diversifies from humid forests below 700 m a.s.l. to pure oriental Beech or mixed forests at middle altitude (700-1500 m a.s.l.) (Figure 3). Shrublands and steppes occur in the upper mountains and the highest elevations are covered with Alpine tundra and meadows (MARVIE MOHAJER 2006).

Tehran province covers an area of 18,909 km² and is located in the southern slopes of the Alborz Mountains with various vegetations and climates. This area receives an average annual rainfall of about 240 mm that usually starts from October. The maximum precipitation occurs in March with 47 mm and April with 34 mm. The southern part of the province has a semi-arid steppe climate and the northern one an alpine character. The climate in the mountain regions of northern Tehran is cold and semi-humid and in higher elevations is cold with a long winter. The coldest months of the year are December-

February with about -1- -2°C. The spring begins in March and the temperature gradually rises to 30-35°C from mid July to mid September. The province is the most densely-populated region in Iran with many different valleys and rivers which makes it very heterogeneous with agricultural production as well as with rich pastures (Figure 4).

Collecting specimens

Material for the present study was collected using malaise traps with alcohol as killing and preserving agent and with standard net-sweeping during 2010. The specimens were collected during March to November at four locations in each province (Tehran and Gilan). Two malaise traps were placed in each location. The geographical and main floristic characteristics of each location are presented in Table 1. Sampling procedures were similar at different locations. Malaise traps were placed in different habitats such as forest, range land or orchards. The specimens were extracted from the malaise traps and sorted weekly. They were then treated with 70% ethanol and finally placed on a paper plate for drying. The dried specimens were then card-mounted and labeled. The collected specimens of Pimplinae were identified using the keys provided by various authors (TOWNES 1969; KASPARYAN 1973, 1974; EVENHUIS & VLUG 1983; GAULD et al. 2002; GAULD & DUBOIS 2006; SHAW 2006; ZWAKHALS 2006; KASPARYAN & KHALAIM 2007; ZWAKHALS 2010). All specimens were deposited in the insect collection of the Department of Entomology, Tarbait Modares University, Tehran, Iran.

Results

A total of 225 (120♂♂ and 105♀♀) and 42 (16♂♂ and 26♀♀) specimens of the subfamily Pimplinae were collected from Gilan and Tehran provinces, respectively. Among them 19 species belonging to 14 genera in Gilan province and 10 species in 8 genera in Tehran province have been identified. The genera *Tromatobia* FORSTER 1869 and *Zabrachypus* CUSHMAN 1920 are newly recorded for the fauna of Iran. Eleven species are new records for the fauna of Iran: *Itoplectis alternans* (GRAVENHORST 1829), *Pimpla asiatica* KASPARYAN 1973, *P. insignatoria* (GRAVENHORST 1807), *Dolichomithus agnoscendus* (ROMAN 1939), *Liotryphon punctulatus* (RATZEBURG 1848), *Clistopyga incitator* (FABRICIUS 1793), *C. laevis* KASPARYAN 1981, *Tromatobia lineatoria* (VILLERS 1789), *T. ornata* (GRAVENHORST 1829), *Schizopyga flavifrons* HOLMGREN 1856 and *Zabrachypus primus* CUSHMAN 1920. The newly recorded species are marked with one asterisk (*) and the newly recorded genera with two asterisks (**), respectively in the following list:

Tribe Pimplini

****Pimpla asiatica* KASPARYAN 1973**

Material examined: Tehran province: Karaj (N= 35° 46' 34" E= 50° 56' 79", 1278 m) 1♂, 17-24.V.2010, 1♀, 1-7.VI.2010, leg. M. Kheirandish.

Hosts: *Cydia pomonella* LINNAEUS 1758 (KASPARYAN 1974).
Distribution: China, Turkmenistan, Tajikistan, Kazakhstan (KASPARYAN 1974), new record for Iran.

****Pimpla insignatoria* (GRAVENHORST 1807)**

Material examined: Gilan province: Ghazichak (N= 36° 45' 959" E= 50° 19' 587", 1803 m) 1♂, 3-10.V.2010, leg. A. Nadimi.

Hosts: *Agonopterix nervosa* (HAWORTH 1812) (Lep.: Oecophoridae) and *Thera obeliscata* HÜBNER 1878 (Lep.: Geometridae) (SHAW 2006).

Distribution: West Palaearctic (YU et al. 2005; SHAW 2006), new record for Iran.

***Pimpla rufipes* (MILLER 1759)**

Material examined: Gilan province: Astaneh-e-Ashrafieh (N= 37° 22' 61" E= 49° 57' 964", 2 m) 2♂♂, 12-19.IV.2010, 1♂, 19-26.IV.2010, 1♂, 26.IV.2010-3.V.2010, 2♀♀, 10-17.V.2010, 1♂, 1-7.VI.2010, 1♂, 14-21.VI.2010, 2♂♂, 13-20.IX.2010, 1♀, 1-8.XI.2010, 3♂♂1♀, 3.IX.2010, 1♂, 11-17.X.2010; Ziaz (N= 36° 52' 574" E= 50° 13' 290", 537 m): 1♂, 17-24.V.2010, 1♂, 7-14.VI.2010, 1♀, 27.IX.2010-4.X.2010, 1♀, 11-17.X.2010, 1♀, 17-24.X.2010; Orkom (N= 36° 45' 739" E= 50° 18' 198", 1201 m): 3♂♂, 10-17.V.2010, 1♂, 17-24.V.2010, 2♂♂, 7-14.VI.2010, 1♂, 5-12.VII.2010; Ghazichak (N= 36° 45' 959" E= 50° 19' 587", 1803 m) 1♂, 13-20.IX.2010; Tehran province: Arangeh (N= 35° 55' 120" E= 51° 5' 154", 1891 m) 1♀, 19-26.VII.2010; Sarzariat (N= 35° 55' 173" E= 51° 6' 854", 1980 m) 1♀, 7-14.VI.2010; Shahrestanak (N= 35° 58' 271" E= 51° 21' 430", 2235 m) 1♂, 2-9.VIII.2010, leg. A. Mohammadi-Khoramabadi.

Hosts: *Arctia caca* LINNAEUS 1758 (Lep.: Arctidae), *Lixus iridis* OLIVIER (Col.: Curculionidae), *Malacosoma neustria* LINNAEUS 1761 (Lep.: Lasiocampidae), *Lymantria dispar* LINNAEUS 1758 (Lep.: Lymantriidae), *Hyphantria cunea* DRURY 1770 (Lep.: Arctiidae) (SULLIVAN et al. 2010), *Lacanobia oleracea* LINNAEUS 1758, *Acrionicta rumicis* (LINNAEUS 1758) (Lep.: Noctuidae) (OKYAR & YURTCAN 2007).

Distribution: Palearctic (YU et al. 2005), Iran (Golestan, Azarbaijan-e-Sharghi and Mazandaran provinces) (KOLAROV & GHAHARI 2006), new record for Gilan and Tehran provinces.

***Pimpla spuria* GRAVENHORST 1829**

Material examined: Gilan province: Astaneh-e-Ashrafieh (N= 37° 22' 61" E= 49° 57' 964", 2 m): 2♂♂, 13.III.-5.IV.2010, 1♂, 12-19.IV.2010, 1♂, 19-26.IV.2010, 1♂1♀, 3-10.V.2010, 1♂1♀, 17-24.V.2010, 1♂, 5-12.VII.2010, 1♂1♀, 9-16.VIII.2010, 2♂♂3♀♀, 16-23.VIII.2010, 1♂1♀, 30.VIII.2010-6.IX.2010, 3♂♂1♀, 6-13.IX.2010, 5♂♂1♀, 2♀♀, 20-27.IX.2010, 27.IX.2010-4.X.2010, 1♂, 4-11.X.2010, 1♂, 11-17.X.2010, 1♀, 17-24.X.2010, 1♂, 2♀♀, 24.X.2010-1.XI.2010, 1♀, 8-15.XI.2010; Ziaz (N= 36° 52' 574" E= 50° 13' 290", 537 m): 2♂♂, 1-7.VI.2010, 1♂5♀♀, 8-15.XI.2010, 1♀, 28.VI.2010-5.VII.2010, 1♀, 26.VII.2010-2.VIII.2010; Orkom (N= 36° 45' 739" E= 50° 18' 198", 1201 m): 1♂, 12-19.IV.2010, 1♀, 24-31.V.2010, 1♂, 7-14.VI.2010, 1♀, 28.VI.2010-5.VII.2010,

1♂, 28.VI.2010-5.VII.2010, 1♀, 9-16.VIII.2010, 1♂, 16-23.VIII.2010, 2♀♀, 30.VIII.2010-6.IX.2010, 1♀, 11-17.X.2010, 1♀, 17-24.X.2010, 3♀♀, 8-15.XI.2010; Ghazichak (N= 36° 45' 959" E= 50° 19' 587", 1803 m): 3♂♂, 12-19.IV.2010, 1♂, 3-10.V.2010, 2♂♂, 10-17.V.2010, 1♂, 17-24.V.2010, 3♂♂1♀, 24-31.V.2010, 7♂♂, 1-7.VI.2010, 4♂♂1♀, 7-14.VI.2010, 2♂♂, 1♀, 14-21.VI.2010, 4♂♂1♀, 21-28.VI.2010, 1♂, 28.VI.2010-5.VII.2010, 2♂♂, 5-12.VII.2010, 1♂1♀, 12-19.VII.2010, 1♀, 2-9.VIII.2010, 1♀, 13-20.IX.2010, 1♀, 20-27.IX.2010, 1♂1♀, 27.IX.2010-4.X.2010, 1♀, 1-8.XI.2010; Tehran province: Shahryar (N= 35° 40' 135" E= 50° 56' 944", 1168 m): 1♀, 27.IX.2010-4.X.2010, 1♀, 11-17.X.2010, 1♂, 17-24.X.2010; Karaj (N= 35° 46' 34" E= 50° 56' 79", 1278 m) 1♀, 14-21.VI.2010, 1♀, 21-28.VI.2010, 1♀, 11-17.X.2010; Arangeh (N= 35° 55' 120" E= 51° 5' 154", 1891 m): 1♂1♀, 14-21.VI.2010, 1♀, 28.VI.2010-5.VII.2010, 1♂1♀, 5-12.VII.2010, 2♂♂, 12-19.VII.2010, 1♂, 19-26.VII.2010, 1♀, 9-16.VIII.2010, leg. A. Mohammadi-Khoramabadi.

Hosts: *Sesamia nonagrioides* LEFEBVRE (Lep.: Noctuidae) (BAYRAM et al. 2007) and *Cydia pomonella* L. (Lep.: Tortricidae) (KASPARYAN 1974).

Distribution: Near East, North Africa, Oriental region, Europe, Palaearctic (YU et al. 2005), Iran, Azarbaijan-e-Sharghi (Tabriz) and Golestan (Astarabad) (KASPARYAN 1974), Khuzestan and Mazandaran provinces (KOLAROV & GHAHARI 2006), new record for Gilan and Tehran provinces.

****Itopectis alternans* (GRAVENHORST 1829)**

Material examined: Gilan province: Astaneh-e-Ashrafieh (N= 37° 22' 61" E= 49° 57' 964", 2 m): 1♀, 12-19.IV.2010, 1♀, 19-26.IV.2010; Orkom (N= 36° 45' 739" E= 50° 18' 198", 1201 m) 1♂, 6-13.IX.2010 leg. A. Mohammadi-Khoramabadi.

Remarks: Based on some difference in coloration of hind tibia and geographical distribution, KASPARYAN (1973) introduced two subspecies for the species. In *I. alternans alternans* (GRAVENHORST 1829), hind tibia is trichromatic and distributed in Western Europe to France and Romania, Caucasus and east of Altai (KASPARYAN 1973). This species is recorded as primary parasitoid of pupae of several families of Lepidoptera and also as secondary parasitoid from cocoons of other hymenopterous parasitoids (DELUCCHI 1982; EVENHUIS & VLUG 1983). LUPI (2005) reported the horse-chestnut leafmining moth, *Cameraria ohridella* DESCHKA & DIMIC (Lep.: Gracillariidae) as host of this species (LUPI 2005). Also reared from *Autographa gamma* (LINNAEUS 1758) (Lep.: Noctuidae) (OKYAR & YURTCAN 2007).

Distribution: Palaearctic and Oriental regions (KASPARYAN 1973; YU et al. 2005), Turkey (OKYAR & YURTCAN 2007), new record for Iran.

***Itopectis maculator* (FABRICIUS 1775)**

Material examined: Tehran province: Yonjehzar, 8♂♂ reared from pupae of *Yponomeuta malinellus* ZELL. leg. S.A. Mortazavi.

Hosts: *Tortrix viridana* LINNAEUS 1758, *Swammerdamia pyrella* (VILLERS 1789), *Yponomeuta cognatella* HÜBNER 1816, *Y. malinella* ZELLER 1838, *Y. padella* LINNAEUS 1758, *Plutella maculipennis* CURTIS 1832 (KASPARYAN 1973); *Zeiraphera diniana* GUENEE 1845 (DELUCCHI 1982); *Pandemis heparana* SCHIFFERMÜLLER 1776,

Adoxophyes orana FISCHER von RÖSLERSTAMM 1834, *Archips rosana* LINNAEUS 1758 and *Hedya nubiferana* HAWORTH 1811, *Y. malinellus* ZELLER 1838 (EVENHUIS & VLUG 1983) *Lamprosticta culta* SCHIFFERMÜLLER 1776, *Autographa gamma* (LINNAEUS 1758) (Lep.: Noctuidae) (OKYAR & YURTCAN 2007).

Distribution: Palaearctic region (YU et al. 2005), Forest-steppe and steppe zones of the USSR (KASPARYAN 1973), Turkey (OKYAR & YURTCAN 2007), Iran (Azarbaijan-e-Gharbi) (KOLAROV & GHAHARI 2006), new record for Gilan and Tehran provinces.

***Itoplectis melanocephala* (GRAVENHORST 1829)**

Material examined: Gilan province: Astaneh-e-Ashrafieh (N= 37° 22' 61" E= 49° 57' 964", 2 m) 1♀, 24.X.2010-1.XI.2010, leg. A. Mohammadi-Khoramabadi.

Remarks: mainly found in the Forest-steppe and steppe zones (KASPARYAN 1973).

Distribution: Palaearctic and Ethiopian region (YU et al. 2005), Russia, Kazakhstan, Tajikistan (KASPARYAN 1973) and Iran (KOLAROV & GHAHARI 2006).

***Itoplectis tunetana* (SCHMIEDEKNECHT 1914)**

Material examined: Gilan province: Ziaz (N= 36° 52' 574" E= 50° 13' 290", 537 m) 1♀, 27.IX.2010-4.X.2010; Orkom (N= 36° 45' 739" E= 50° 18' 198", 1201 m) 2♀♀, 26.IV.2010-3.V.2010; Tehran province: Shahrestanak (N= 35° 58' 271" E= 51° 21' 430", 2235 m) 1♀, 12-19.VII.2010, 1♀, 2-9.VIII.2010, leg. A. Mohammadi-Khoramabadi.

Remarks: RADJABI 1986 reported this species as pupal parasitoid of *Yponomeuta malinellus* Z. under its junior synonym *I. europeator* from high altitudes of Tehran and Azarbaijan-e-Gharbi (Marand) provinces (RADJABI 1986). Other hosts are *Yponomeuta padellus* L., *Y. rorella* HÜBNER 1796, *Anarsia lineatella* ZELLER 1839, *Pandemis chondrillana* HERRICH-SCHAFFER 1860 (KASPARYAN 1973).

Distribution: Europe, North Africa, Eastern Palearctic region (YU et al. 2005) and Iran (Azarbaijan-e-Sharghi) (KASPARYAN 1973), new record for Gilan and Tehran provinces.

Tribe Ephialtini

****Dolichomitus agnoscendus* (ROMAN 1939)**

Material examined: Gilan province: Orkom (N= 36° 45' 739" E= 50° 18' 198", 1201 m) 1♀, 16-23.VIII.2010, 3♀♀, 30.VIII.2010-6.IX.2010; Ghazichak (N= 36° 45' 959" E= 50° 19' 587", 1803 m) 1♂, 2-9.VIII.2010, leg. A. Mohammadi-Khoramabadi.

Remarks: *Dolicomithus romanicus* CONSTANTINEANU & PISCICA 1970 is a junior synonym of the species (ZWAKHALS 2010).

Hosts: *Nathrius brevipennis* (MULSANT 1839), *Grammoptera ruficornis* (FABRICIUS 1781) and *Pogonocherus hispidus* (LINNAEUS 1758) (Col.: Cerambycidae), *Ptinomorphus imperialis* (LINNAEUS 1767) (Col.: Anobiidae) (SHAW 2006).

Distribution: Europe (YU & HORSTMANN 1997; YU et al. 2005), new record for Iran.

***Endromopoda detrita* (HOLMGREN 1860)**

Material examined: Gilan province: Orkom (N= 36° 45' 739" E= 50° 18' 198", 1201 m), 1♀, 28.VI.2010-5.VII.2010, leg. M. Kheirandish; Tehran province: Karaj (N= 35° 46' 34" E= 50° 56' 79", 1278 m) 1♂, 10-17.V.2010, 1♀, 17-24.V.2010, leg. A. Nadimi; Shahrestanak (N= 35° 58' 271" E= 51° 21' 430", 2235 m) 1♂1♀, 23-30.VIII.2010, 1♀, 30.VIII.2010-6.IX.2010, leg. M. Kheirandish.

Hosts: *Synanthedon formicaeformis* ESPER 1779, (Lep.: Sesiidae), *Syricoris lacunana* DENIS & SCHIFFERMÜLLER 1775, *Hedya dimidioalba* RETZIUS 1783, *Lobesia botrana* DENIS & SCHIFFERMÜLLER 1775., *Rhyacionia buoliana* SCHIFFERMÜLLER 1775, *Eupoecilia ambiguella* MEYRIK 1921 (Lep.: Tortricidae), *Argyresthia laevigatella* HERRICH-SCHAFER 1855 (Lep.: Yponomeutidae), *Chilo phragmitellus* HUBNER 1805. (Lep.: Crambidae), *Cephus cinctus* NORTON C. *pygmaeus* L. (Hym.: Cephidae), *Andricus lignicolus* (HARTIG 1840) (Hym.: Cynipidae) (KASPARYAN & KHALAIM 2007), *Lipara lucens* MEIGEN 1830 *L. similis* SCHINER 1854, *L. rufitarsis* LOEW 1858 (Dip.: Chloropidae) (NARTSHUK 2006).

Distribution: Palaearctic, Nearctic, Oriental region (YU et al. 2005), Iran (Gilan province) (MASNADI-YAZDINEJAD & JUSSILA 2008), new record for Tehran province.

***Exeristes roborator* (FABRICIUS 1793)**

Material examined: Gilan province: Ghazichak (N= 36° 45' 959" E= 50° 19' 587", 1803 m) 1♀, 24-31.V.2010, leg. A. Nadimi; Tehran province: Shahrestanak (N= 35° 58' 271" E= 51° 21' 430", 2235 m) 1♀, 19-26.VII.2010, leg. M. Kheirandish.

Hosts: *Diplolepis fructuum* (RÜBSAAMEN 1898) and *D. rosae* (LINNAEUS 1758.) (Hym.: Cynipidae) reported as hosts of *E. roborator* from Iran (TALEBI et al. 2004; LOTFALIZADEH et al. 2009).

Distribution: Palaearctic, Ethiopian, Oriental region (YU et al. 2005), Iran (Chahar Mahal, Zanjan and Kerman provinces (KOLAROV & GHAHARI 2006), Azarbaijan-e-Sharghi (LOTFALIZADEH et al. 2009)), new record for Gilan and Tehran provinces.

****Liotryphon punctulatus* (RATZEBURG 1848)**

Material examined: Gilan province: Ziaz (N= 36° 52' 574" E= 50° 13' 290", 537 m): 2♀♀, 1-8.XI.2010, 1♀, 15-22.XI.2010; Tehran province: Arangeh (N= 35° 55' 120" E= 51° 5' 154", 1891 m) 1♂, 13-20.IX.2010, 1♀, 4-11.X.2010; Sarzariat (N= 35° 55' 173" E= 51° 6' 854", 1980 m) 1♂, 1-7.VI.2010, leg. A. Mohammadi-Khoramabadi.

Hosts: *Pennisetia hylaeiformis* LASPEYRES 1801, *Synanthedon culiciformis* FABRICIUS 1775, *S. myopaeformis* (BORKHAUSEN 1789), *S. spheciformis* SCHIFFERMÜLLER & DENIS 1776, *S. tipuliformis* (CLERK 1759) (Lep.: Sesiidae), *Archips*

oporana LINNAEUS 1758, *Cydia pactolana* ZELLER 1840, *C. pomonella* L., *Retinia resinella* LINNAEUS 1758 (Lep.: Tortricidae), *Apomyelois bistratella* HULST 1887 (Lep.: Pyralidae) (SHAW 2006).

Distribution: Palaearctic region (KASPARYAN & KHALAIM 2007), new record for Iran.

***Scambus nigricans* (THOMSON 1877)**

Material examined: Gilan province: Astaneh-e-Ashrafieh (N= 37° 22' 61" E= 49° 57' 964", 2 m) 1♀, 19-26.IV.2010, leg. A. Nadimi, 2♀♀, 3-10.V.2010, 1♀, 24.X.2010-1.XI.2010, leg. M. Kheirandish; Ziaz (N= 36° 52' 574" E= 50° 13' 290", 537 m) 1♀, 1-7.VI.2010, leg. A. Nadimi; Orkom (N= 36° 45' 739" E= 50° 18' 198", 1201 m) 1♀, 30.VIII.2010-6.IX.2010, leg. M. Kheirandish; Ghazichak (N= 36° 45' 959" E= 50° 19' 587", 1803 m) 1♀, 2-9.VIII.2010, leg. M. Kheirandish.

Hosts: *Epiblema scutulana* DENIS & SCHIFFERMÜLLER 1775, *Grapholita discretana* WOCKE 1861 (Lep.: Tortricidae), *Depressaria pastinacella* STANTON 1849 (Lep.: Oecophoridae), *Platyptilia nemoralis* ZELLER 1841 (Lep.: Pterophoridae), *Dioryctria abietella* DENIS & SCHIFFERMÜLLER 1775 (Lep.: Pyralidae), *Alsophila aescularia* SCHIFFERMÜLLER 1775, *Apocheima hispidaria* SCHIFFERMÜLLER 1775, *Lycia pomonaria* (HUBNER 1790), *Phigalia pilosaria* (DENIS & SCHIFFERMÜLLER 1775) (Lep.: Geometridae), *Gortyna flavago* SCHIFFERMÜLLER 1776 (Lep.: Noctuidae), *Hartigia linearis* (SCHRANK 1781) (Lep.: Cephidae) (KASPARYAN & KHALAIM 2007), *Lipara lucens* MEIGEN 1830 (Dip.: Chloropidae) (NARTSHUK 2006) and *Zeiraphera diniana* GUENEE 1845 (Lep.: Tortricidae) (DELUCCHI 1982).

Distribution: Palaearctic region (YU et al. 2005) and Iran (Kerman and Ardebil provinces) (KOLAROV & GHAHARI 2005, 2006), new record for Gilan and Tehran provinces.

***Sericopimpla* genus-group**

****Clistopyga incitator* (FABRICIUS 1793)**

Material examined: Gilan province: Ziaz (N= 36° 52' 574" E= 50° 13' 290", 537 m) 1♀, 17-24.V.2010, leg. M. Kheirandish, 1♀, 27.IX.2010-4.X.2010, 1♀, 1-8.XI.2010, leg. A. Mohammadi-Khoramabadi; Orkom (N= 36° 45' 739" E= 50° 18' 198", 1201 m) 1♀, 6-13.IX.2010, 1♀, 1-8.XI.2010, leg. A. Mohammadi-Khoramabadi; Ghazichak (N= 36° 45' 959" E= 50° 19' 587", 1803 m) 1♀, 14-21.VI.2010, leg. M. Kheirandish 1♀, 5-12.VII.2010, 1♂, 16-23.VIII.2010, leg. A. Mohammadi-Khoramabadi; Tehran province: Karaj (N= 35° 46' 34" E= 50° 56' 79", 1278 m) 1♀, 3-10.V.2010; Shahrestanak (N= 35° 58' 271" E= 51° 21' 430", 2235 m) 1♀, 23-30.VIII.2010, leg. A. Mohammadi-Khoramabadi.

Hosts: *Segestria senoculata* (LINNAEUS 1758) (Arachnida: Araneae: Segestriidae) (FITTON et al. 1987).

Distribution: Palaearctic and Ethiopian region (YU et al. 2005), new record for Iran.

****Clistopyga laevis* KASPARYAN 1981**

Material examined: Gilan province: Ziaz (N= 36° 52' 574" E= 50° 13' 290", 537 m) 2♀, 17-24.V.2010; Orkom (N= 36° 45' 739" E= 50° 18' 198", 1201 m) 1♀, 1-7.VI.2010, 2♂♂1♀, 7-14.VI.2010, leg. A. Mohammadi-Khoramabadi

Distribution: Russia (KASPARYAN & KHALAIM 2007), new record for Iran.

*****Tromatobia lineatoria* (VILLERS 1789)**

Material examined: Gilan province: Ziaz (N= 36° 52' 574" E= 50° 13' 290", 537 m) 1♀, 5-12.VII.2010, leg. A. Nadimi, 1♀, 19-26.VII.2010, leg. A. Mohammadi-Khoramabadi, Ghazichak (N= 36° 45' 959" E= 50° 19' 587", 1803 m) 1♀, 19-26.VII.2010, leg. A. Mohammadi-Khoramabadi.

Remarks: All members of the genus are parasitoids of spider egg masses. A revision by HORSTMANN 2001 showed that the species previously known as *Tromatobia oculatoria* (FABRICIUS 1798) should be renamed to *T. lineatoria* (VILLERS 1789).

Hosts: *Araneus diadematus* CLERK 1757, *Zygiella x-notata* (CLERK 1757), *Philodromus aureolus* (CLERK 1757), *P. cespitum* (WALCHENAER 1802) and *Gongylidium rufipes* (LINNAEUS 1758) (FITTON et al. 1987).

Distribution: Europe, Near East (YU et al. 2005), new record for Iran.

*****Tromatobia ornata* (GRAVENHORST 1829)**

Material examined: Gilan province: Ziaz (N= 36° 52' 574" E= 50° 13' 290", 537 m) 1♀, 1-8.XI.2010, leg. A. Mohammadi-Khoramabadi.

Hosts: *Argiope bruennichi* (SCOPOLI 1772) and *Agalenatea redii* (SCOPOLI 1763) (Araneae: Araneidae) (SHAW 2006).

Distribution: Palaearctic and Oriental regions (YU et al. 2005), Turkey (GURBUZ & AKSOYLAR 2005; KASPARYAN & KHALAIM 2007), new record for Iran.

***Zaglyptus multicolor* (GRAVENHORST 1829)**

Material examined: Gilan province: Orkom (N= 36° 45' 739" E= 50° 18' 198", 1201 m) 1♂, 6-13.IX.2010, leg. M. Kheirandish; Tehran, Karaj (N= 35° 46' 34" E= 50° 56' 79", 1278 m) 1♂1♀, 11-17.X.2010, leg. A. Mohammadi-Khoramabadi.

Distribution: palaearctic and Oriental region, Europe (KASPARYAN & KHALAIM 2007) and Iran (KOLAROV & GHAHARI 2006).

****Schizopyga flavifrons* HOLMGREN 1856**

Material examined: Gilan province: Orkom (N= 36° 45' 739" E= 50° 18' 198", 1201 m) 1♀, 19-26.VII.2010, leg. A. Mohammadi-Khoramabadi.

Hosts: This genus attacks mature or immature spiders of the families Clubionidae and Miturgidae (FITTON et al. 1987; GAULD & DUBOIS 2006).

Distribution: Palearctic and Oriental region (YU et al. 2005), new record for Iran.

***Zabrachypus primus* CUSHMAN 1920**

Material examined: Gilan province: Orkom (N= 36° 45' 739" E= 50° 18' 198", 1201 m) 1♂, 5-12.IV.2010, leg. A. Nadimi, 2♂♂, 12-19.IV.2010, leg. A. Nadimi, 1♀, 10-17.V.2010, leg. M. Kheirandish, 1♀, 17-24.V.2010, 1♂1♀, 7-14.VI.2010, 2♂♂, 12-19.VII.2010, 1♂, 28.VII.2010, 1♂, 16-23.VIII.2010, 1♂1♀, 23-30.VIII.2010, 5♂♂2♀♀, 30.VIII.2010-6.IX.2010, 4♂♂1♀, 6-13.IX.2010, 1♂, 20-27.IX.2010, leg. A. Mohammadi-Khoramabadi; Ghazichak (N= 36° 45' 959" E= 50° 19' 587", 1803 m) 2♂♂1♀, 1-7.VI.2010, 2♀♀, 30.VIII.2010-6.IX.2010, 1♀, 27.IX.2010-4.X.2010, leg. A. Mohammadi-Khoramabadi.

Remarks: *Zabrachypus* is a small Holarctic genus with nine described species. Nothing is known about their biology and host associations (GAULD & DUBOIS 2006).

Distribution: Palaearctic and Nearctic region (YU et al. 2005), Near East (Turkey) (YURTCAN & BEYARSLAN 2006), new record for Iran.

***Zatypota bohemani* (HOLMGREN 1860)**

Material examined: Gilan province: Ghazichak (N= 36° 45' 959" E= 50° 19' 587", 1803 m) 1♀, 20-27.IX.2010; Tehran province: Arangeh (N= 35° 55' 120" E= 51° 5' 154", 1891 m) 1♀, 30.VIII.2010-6.IX.2010, 1♀, 13-20.IX.2010; Sarzariat (N= 35° 55' 173" E= 51° 6' 854", 1980 m) 1♂, 10-17.V.2010, 1♀, 7-14.VI.2010, 1♂, 21-28.VI.2010, 2♀♀, 19-26.VII.2010, 1♀, 26.VII.2010-2.VIII.2010, leg. A. Mohammadi-Khoramabadi.

Hosts: *Theridion mystaceum* L. KOCH 1870 (Araneae: Theridiidae).

Distribution: Palaearctic region (YU et al. 2005), Iran (Fars province) (MASNADI-YAZDINEJAD 2006), New record for northern Iran.

Abundance and distribution

The most abundant species in Gilan was *P. spuria* (45.9% of all collected specimens) followed by *Z. primus* (14.4%) and *P. rufipes* (13.1%) (Figure 5). In Tehran province, *P. spuria* (38.1%) was the most common species followed by *Z. bohemani* (19.1%) and *E. detrita* (11.9%) (Figure 6). *Pimpla spuria* was observed in large numbers at all sites especially in Ghazichak (1803 m) and Astaneh-e-Ashrafieh (-2m), to mention two extreme altitudes with different vegetations. It seems likely that this parasitoid has several hosts in the north of Iran. The second species of Pimplini, *P. rufipes* is also distributed in all study areas, however *P. asiatica* was only found in Karaj, where rosaceous fruit trees like peach, cherry and apple are cultivated. *P. insignatoria* was captured only in Ghazichak. *Itoplectis alternans*, *I. melanocephala* and *I. tunetana* were present in similar numbers and occurred in places to an altitude of 1225 m in Gilan province but *I. tunetana* was present at high altitudes of Tehran province (Table 2).

Within the tribe Ephialtini, the most abundant species was *S. nigricans* (3.1%) followed by *D. agnoscendus* (2.2%), *L. punctulatus* (1.3%), *E. roborator* (0.9%) and *E. detrita* (0.4%), respectively. However *S. nigricans* was present at all altitudes in Gilan province, but other ephialtines were only found in Ziaz. The ephialtines, *E. detrita*, *E. roborator* and *L. punctulatus* were also captured in Tehran province (Table 3). *Zabrachypus primus*

was the most abundant species of the polysphinctines (Figure 5). This species only occurred in the Orkom and Ghazichak villages. *Clistopyga incitator*, *C. laevis*, *T. lineatoria*, *T. ornata*, *Z. multicolor* and *S. flavifrons* were collected from altitudes of about 500 m in two provinces, but *Z. bohemani* was found at higher altitudes from about 1700 m in greater numbers in Tehran province.

The abundance of specimens varied significantly among months (table 2 and 3). In Gilan the lowest number of pimelines was collected in March with less than 1% followed by October with 5.7%. This is probably due to low temperatures in May and heavy rainfall in October. The number of captured specimens increased to June and then decreased during July - August. The highest number of specimens was captured in September with 51 individuals. In Tehran province sampling was significantly different. No specimens were captured in March, April and November because of low temperatures. In May appeared the first specimens with gradually increasing numbers to a maximum of 12 specimens in July.

The number of captured specimens also varied with the location. In Gilan 12.7% of the specimens were collected in Ziaz followed by 27.1% in Astaneh-e-Ashrafieh, 29.4% in Orkom and finally 30.9% in Ghazichak. In Tehran province, half of the specimens were captured in Arangeh+Sarziarat. In Karaj, Shahrestanak and Shahryar were 22.7%, 20.5% and 6.8% of the specimens collected. One of our traps was damaged several times in Shahrestanak which led to a lower collection result than in Arangeh+Sarziarat.

The collected species preferred different habitats. *P. spuria*, *P. rufipes* and *S. nigricans* were common in humid and deciduous forests as well as in orchards and pastures. *D. agnoscendus* was captured in deciduous forests, hazelnut orchards and pasture. *P. asiatica*, *E. roborator*, *L. punctulatus* and *Z. bohemani* occurred in different types of orchards. Although *I. melanocephala* was only captured from humid forests, the habitats of *I. alternans* extended from humid forests to hazelnut orchards and *I. tunetana* occurred in deciduous forests, rosaceous and hazelnut orchards. *C. incitator*, *C. laevis*, *T. lineatoria*, *T. ornata*, *S. flavifrons*, *Z. multicolor*, *Z. bohemani* and *Z. gregori* preferred orchards, deciduous forests and in the case of *Z. gregori* pasture as well. Hedgerows probably are important in the selection of habitat by *Z. bohemani*, *E. detrita*, *Z. multicolor* and *P. asiatica*. Some species like *I. alternans*, *I. melanocephala*, *S. nigricans* were found in habitats without hedgerows and the rest showed no preference.

Based on the number of collected species, Orkom in Gilan province with 12 Pimplinae species was the most diverse location. The following ranking was observed: Ghazichak with 10, Ziaz with 9, Shahrestanak with 6, Astaneh-e-Ashrafieh and Karaj with 5, Arangeh+Sarziarat with 4 and finally Shahryar with just one species.

In Tehran province 56.3, 75 and 60% of the collected specimens were females in *P. spuria*, *Z. bohemani* and *E. detrita*, respectively. While from *I. tunetana*, *E. roborator* and *C. incitator* only females were captured (Fig. 5). Conversely, in Gilan province, the percentage of females was found to be 38.1, 36.4 and 30% in *P. spuria*, *Z. primus* and *P. rufipes*, respectively and all the collected specimens of *I. melanocephala*, *I. tunetana*, *S. nigricans*, *L. punctulatus*, *T. lineatoria*, *T. ornata*, *S. flavifrons* and *Z. bohemani* were females (Fig. 6).

Adult emergence

The results of this study clearly showed that the adults of *P. spuria* and *P. rufipes* were active throughout the growing season in the both Theran and Gilan provinces (Table 2). However, the number of collected specimens of both species were lower in Theran province. We think the use of pesticides in orchards and cultivated crops in Tehran province, mainly in spring, can negatively affect the occurrence of these species. Adults of *I. alternans* and *I. tunetana* and *P. insignatoria* emerged in two distinct periods, April-May and September-October. Both species probably have two generations per year. While, *I. melanocephala* was only captured in late October.

Capture patterns of the tribe Ephialtini showed that *S. nigricans* adults emerged throughout the season, while the traps data indicated there were two distinct adult emergence periods for *L. punctulatus* and *E. detrita* in Tehran province. *D. agnoscendus* was captured only in August and *E. roborator* appeared in two provinces at two-months interval (Table 3). Adult emergence of *Z. primus* and *C. incitator* was quite interesting, because both species were active during the growing season (Table 3). However, *C. laevis* was only found in Gilan province from May-June, *T. lineatoria* and *Z. multicolor* in July, *Z. bohemani* in September and *T. ornata* in November. In Tehran province, *Z. bohemani* was active during most of the sampling period, while *C. incitator* was captured in early May and late August and *Z. multicolor* in October (Table 3). These periods of adult emergence could reflect the number of generation(s) of species in northern Iran and be very useful for biological and ecological studies of these parasitoid species.

Distribution through hotspots of Iran

Our study shows that nine species occur in both hotspots (i.e. *P. spuria*, *P. rufipes*, *I. tunetana*, *E. roborator*, *E. detrita*, *C. incitator*, *L. punctulatus*, *Z. multicolor* and *Z. bohemani*), one species only in the Irano-anatolian biodiversity hotspot (i.e. *P. asiatica*) and 9 species in the Caucasus biodiversity hotspot (i.e. *P. insignatoria*, *I. alternans*, *I. melanocephala*, *D. agnoscendus*, *S. nigricans*, *C. laevis*, *T. lineatoria*, *T. ornata*, *S. flavifrons*, *Z. primus*). Some species such as *I. melanocephala*, *S. nigricans*, have been collected previously from both biodiversity hotspots (MASNADI-YAZDINEJAD & JUSSILA 2008). The most important result may be that the distribution of *I. alternans*, *C. incitator*, *T. lineatoria* and *Z. primus* would end in the Caucasus biodiversity hotspot.

Discussion

According to our research and previous literature 53 species of Pimplinae are known to be present in Iran. Of these, 11 species (*Itoplectis alternans*, *Pimpla asiatica*, *P. insignatoria*, *Dolichomithus agnoscendus*, *Liotryphon punctulatus*, *Clistopyga incitator*, *C. laevis*, *Tromatobia lineatoria*, *T. ornata*, *Schizopyga flavifrons* and *Zabrachypus primus*) are new records for the Pimplinae fauna of Iran. The five remaining species (*Pimpla rufipes*, *P. spuria*, *Itoplectis tunetana*, *Exeristes roborator* and *Zatypota*

bohemani) are new records for northern Iran, so the number of known species for northern Iran increases to 28 species.

The lower number of pimpline specimens in Tehran province may result from the negative effects of human activities. Especially, application of pesticides in orchards may drift to nearby areas. In the present study, the malaise traps and sampling sites were located near orchards and pasture which are heavily influenced by human activities. On the other hand, our results revealed the presence of a complex of potential natural enemies in such areas. They need more attention of their bioecology for their conservation and we should increase our knowledge of them in cultivated ecosystems so they can be used in biological control within an IPM program.

In Gilan province, four malaise traps (in Ziaz and Orkom) were located in plantations of hazelnut (*Corylus avellana* L.). A study on the Ichneumonid parasitoids of *Hyphantria cunea* (DRURY) (Lep.: Arctiidae), a pest of hazelnut in Turkey showed that *P. rufipes* is one of the parasitoids of this important pest (SULLIVAN et al. 2010). Adults of this parasitoid emerged from 10 May to 14 June (Ziaz, Orkom), early to mid July (Orkom) and 13 September to 17 October (Ziaz, Ghazichak). The species, *P. rufipes* showed longer emergence period (12 April to 14 June and 6 september to 8 November) and more abundance in Astaneh-e-Ashrafieh (Gilan province), located in the lowest altitude with warmer, more humid climate and more divers and dense vegetation. There is no host record for this species in Iran. Our findings showed that more studies are required to clarify the host-parasitoid association.

So far, no long period sampling and large-scale survey has been done in forests and cultivated lands of northern Iran. Consequently, this study provides new insights for ecological studies in the future. Following studies must be focused on the elucidation of their host-parasitoid relationships and the possibility of application or conservation of these species as natural enemies of pests in cultivated lands or forests.

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Table 1: Geographical characteristics of sampling locations in Gilan and Tehran provinces during 2010.

Locality		Latitude and longitude	Altitude (m)	Habitat
Shahryar, Tehran province		N= 35° 40' 135" E= 50° 56' 944"	1168	Rosaceus Orchard
Karaj, Tehran province		N= 35° 46' 336" E= 50° 56' 79"	1278	Rosaceus Orchard
Arangeh, Tehran province		N= 35° 55' 120" E= 51° 5' 154"	1891	Rosaceus Orchard
Sarziarat, Tehran province		N= 35° 55' 173" E= 51° 6' 854"	1980	Rosaceus Orchard
Shahrestanak, Tehran province		N= 35° 57' 583" E= 51° 22' 329"	2305	Rosaceus Orchard and pasture
Astaneh-e-Ashrafieh , Gilan province		N= 37° 22' 61" E= 49° 57' 964"	-2	humid forest
Ziaz, Gilan province		N= 36° 52' 574" E= 50° 13' 290"	537	Hazelnut
Orkom, Gilan province		N= 36° 45' 739" E= 50° 18' 198"	1201	Deciduous forests and hazelnut
Ghazichak,, Gilan province		N= 36° 45' 959" E= 50° 19' 587"	1803	hazelnut and pasture

Table 2: Seasonal adult emergence of Pimplini in the north of Iran during 2010.

Sampling dates	Parasitoid species						
	<i>I. alternans</i>	<i>I. melanocephala</i>	<i>I. tunetana</i>	<i>P. asiatica</i>	<i>P. insignatoria</i>	<i>P. rufipes</i>	<i>P. spuria</i>
13 March–5 April							*
5 April – 12 April							
12 April – 19 April	*					*	*
19 April – 26 April	*					*	*
26 April – 3 May			*			*	
3 May – 10 May					*		*

Sampling dates	Parasitoid species						
	<i>I. alternans</i>	<i>I. melanocephala</i>	<i>I. tunetana</i>	<i>P. asiatica</i>	<i>P. insignatoria</i>	<i>P. rufipes</i>	<i>P. spuria</i>
10 May – 17 May						*	*
17 May – 24 May				*		*	*
24 May – 31 May							*
31 May – 7 June				*		*	*
7 June – 14 June						*	*
14 June – 21 June						*	*
21 June – 28 June							*
28 June – 5 July							*
5 July – 12 July						*	*
12 July – 19 July			*				*
19 July – 26 July						*	*
26 July – 2 Aug							*
2 August – 9 August			*			*	*
9 August – 16 August							*
16 August – 23 August							*
23 August – 30 August							
30 August – 6 September							*
6 September – 13 September	*					*	*
13 September – 20 September						*	*
20 September – 27 September							*
27 September – 4 October						*	*
4 October – 11 October							*
11 October – 17 October			*			*	*
17 October – 24 October						*	*
24 October – 1 November		*					*

Sampling dates	Parasitoid species						
	<i>I. alternans</i>	<i>I. melanocephala</i>	<i>I. tunetana</i>	<i>P. asiatica</i>	<i>P. insignatoria</i>	<i>P. rufipes</i>	<i>P. spuria</i>
1 November – 8 November						*	
8 November – 15 November							*
15 November – 22 November							*

Table 3: Seasonal adult emergence of Ephialtini in the north of Iran during 2010.

Sampling date	Parasitoid species												
	<i>D. agnoscendus</i>	<i>E. detrita</i>	<i>E. roborator</i>	<i>L. punctulatus</i>	<i>S. nigricans</i>	<i>C. incitator</i>	<i>C. laevis</i>	<i>T. lineatoria</i>	<i>T. ornata</i>	<i>Z. multicolor</i>	<i>S. flavifrons</i>	<i>Z primus</i>	<i>Z. bohemani</i>
13 March – 5 April													
5 April – 12 April												*	
12 April – 19 April												*	
19 April – 26 April					*								
26 April – 3 May													
3 May – 10 May					*	*							
10 May – 17 May		*										*	*
17 May – 24 May		*				*	*					*	
24 May – 31 May			*										
31 May – 7 June				*	*		*					*	
7 June – 14 June							*					*	*
14 June – 21 June						*							
21 June – 28 June												*	
28 June – 5 July		*											
5 July – 12 July						*		*					

Sampling date	Parasitoid species												
	<i>D. agnoscendus</i>	<i>E. detrita</i>	<i>E. roborator</i>	<i>L. punctulatus</i>	<i>S. nigricans</i>	<i>C. incitator</i>	<i>C. laevis</i>	<i>T. lineatoria</i>	<i>T. ornata</i>	<i>Z. multicolor</i>	<i>S. flavifrons</i>	<i>Z primus</i>	<i>Z. bohemani</i>
12 July – 19 July												*	
19 July – 26 July			*					*			*		*
26 July – 2 Aug													*
2 Aug – 9 Aug	*				*								
9 Aug – 16 Aug													
16 Aug – 23 Aug	*					*						*	
23 Aug – 30 Aug		*				*						*	
30 Aug – 6 Sept	*	*			*							*	*
6 Sept – 13 Sept						*				*		*	
13 Sept – 20 Sept				*									*
20 Sept – 27 Sept												*	*
27 Sept – 4 Oct.						*						*	
4 Oct. – 11 Oct.				*									
11 Oct. 17 Oct.										*			
17 Oct. – 24 Oct.													
24 Oct. – 1 Nov.					*								
1 Nov. – 8 Nov.				*		*			*				

Sampling date	Parasitoid species												
	<i>D. agnoscendus</i>	<i>E. detrita</i>	<i>E. roborator</i>	<i>L. punctulatus</i>	<i>S. nigricans</i>	<i>C. incitator</i>	<i>C. laevis</i>	<i>T. lineatoria</i>	<i>T. ornata</i>	<i>Z. multicolor</i>	<i>S. flavifrons</i>	<i>Z primus</i>	<i>Z. bohemani</i>
8 Nov. – 15 Nov.													
15 Nov. – 22 Nov.				*									



Fig. 1: Biodiversity hotspots of Iran, the study area is shown with a rectangle.



Fig. 2: Iran's provinces (Gilan and Tehran) where the pimpline wasps have been collected.



Fig. 3: Caspian hyrcanian forests of Gilan province in the northern slopes of the Alborz Mountain.



Fig. 4: Habitats of Tehran province located in the southern slopes of the Alborz Mountain.

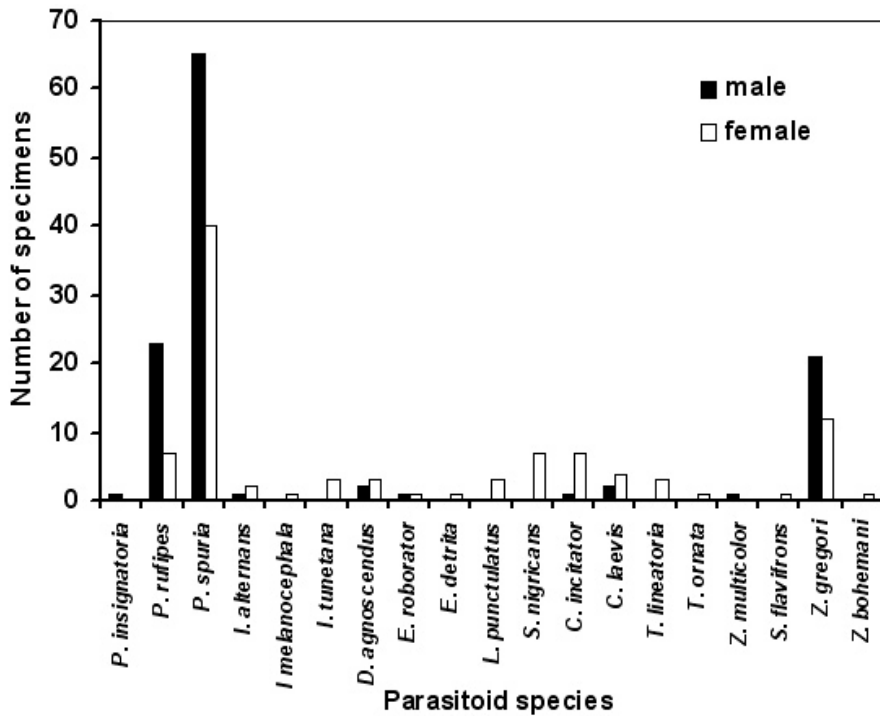


Fig. 5: Abundance of Pimplinae species in Tehran province during 2010.

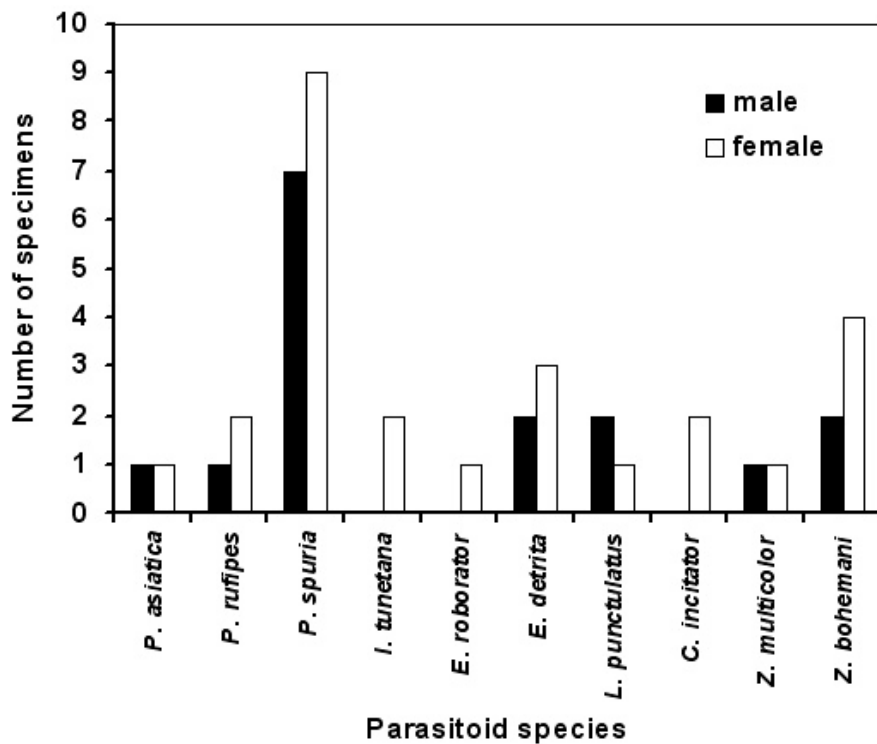


Fig. 6: Abundance of Pimplinae species in Gilan province during 2010.

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