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New records of a genus and three species of flowerflies (Diptera: Syrphidae) with notes on saproxylic species in Iran

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ABSTRACT. In this study a total of 37 syrphid species belonging to 25 genera were identified in Mazandaran province, northern Iran. One genus and species, *Brachyopa* (*Brachyopa*) *bicolor* (Fallén, 1817) and two species *Heringia* (*Neocnemodon*) *latitarsis* (Egger, 1865) and *Cheilosia soror* (Zetterstedt, 1843) are recorded for the first time from Iran. In addition, saproxylic syrphids of Iran are briefly discussed.

Key words: New records, hoverfly, forest area, saproxylic species, Iran

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Introduction

The flowerflies (Diptera: Syrphidae) have a worldwide distribution, with almost 188 genera and 6,000 species described worldwide. Approximately 1800 species have been recorded from Palaearctic region (Thompson & Rotheray, 1998). The syrphids fauna of Iran has relatively been less explored than the other countries. Only about 56 genus and 200 species of Syrphidae is recorded from Iran (Gilasian et al., 2015). Good attempt was recently conducted by some authors to enhance our knowledge about syrphid flies in Iran (Golmohamadzadeh Khiaban & Parchami, 2001; Gilasian, 2004; Dusti & Hayat, 2006; Garali & Reemer, 2008, 2010; Khaghaninia, 2011; Naderloo et al., 2011), but our finding in forest areas is little. For example, we don't have enough information about saproxylic syrphids, and their habitats. Saproxylic organisms are species that are dependent on dead wood, sap, wood-inhabiting fungi or decaying materials associated with the woody parts of trees (Speight, 1989). Nowadays there is great concern for survival of saproxylic species because their habitats are threatened by deforestation and degradation (Reemer,

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2005; Fayt et al., 2006). Hence, conservation of these organisms has recently considered because these species are functionally important to debris decomposition and nutrient cycling through trophic interactions in forest ecosystem. Consequently, we focus on forest region of Mazandaran province and set the traps near forest ridge to collect forest compatible syrphids. Of course, presence of other syrphid species in wide range of study area is important for us as biodiversity data.

Material and methods

The fieldwork was conducted in Sari city near the Caspian Sea in Mazandaran province in north of Iran (Fig. 1). Along an altitudinal gradient four sites were selected in Sari-Kiasar forest region which located in south of sari city. Also one site was selected in Dasht-e naz which is located far from Kiasar in low land zone in north east of sari city (Table 1). Kiasar is mostly included deciduous mixed forest trees dominated by beech, oak, alder, maple, hornbeam, ironwood, Caucasian elm. Also rice, wheat, rapeseed, and citrus and peach trees are some dominant agricultural plants of this region. Dasht-e naz is contained only 55 ha of forest trees (Mostly oak and ironwood) as a protected park which surrounded with agricultural lands.

Since the efficiency of traps depends on behavior of species, we used four kinds of traps such as: Malaise trap (Burgio & Sommaggio, 2007; Petanidou et al., 2011), window trap (Irvine & Woods, 2007), yellow pan trap, and white pan trap (Kula, 1997; Bennewicz, 2011). In each station three Malaise traps, three window traps, nine yellow and nine white pan traps were set near forest ridge and were established in protected areas. Samplings were taken every other week in both spring and summer (six months) in 2015. The specimens were picked out from the traps and then treated with 96% ethanol for 5 minutes followed by hexamethyldisilazane (HMDS) for 30 min and finally dried for further study (Gilasian et al., 2015). The specimens were identified based on Sack (1928–1932), Stackelberg (1988), Thompson & Rotheray (1998), Hippa et al. (2001), Stubbs & Falk (2002), Van Veen (2004) and Speight & Sarthou (2011).

Results

In this study 1622 individuals belonging to 37 syrphid species and 25 genera were obtained, of which one genus and 3 species were new to Iran and 8 species were new to Mazandaran province. More species were found in higher elevation. Number of collected species in Dasht-e naz (20m), Pahnekola (175m), Alamdardeh (396m), Haftkhal (855m) and Alikola (1640m) were 14, 14, 15, 20 and 27 respectively. Number of individuals of *Melanostoma mellinum* (Linnaeus, 1758) and *Sphaerophoria scripta* (Linnaeus, 1758) were considerably exceptional, but eleven species were included only one specimen. Abundance, faunal composition and distribution of species are shown in Table 3.

In some resources (Speight & Castella, 2001; Reemer, 2005; Speight, 2014) macrohabitat preferences of Syrphidae were divided to different categories such as forest species and non-forest species. Forest species were also divided to saproxylic and non-saproxylic species. Based on this information, 15 species of collected syrphids were strongly or relatively compatible to forest areas, of which 4 species were saproxylic syrphids (Table 3). Although there isn't any published paper about saproxylic syrphids in Iran, literature review of faunistic studies showed that 8 species were reported in some Province in previous studies (Table 2). So, we added *Brachyopa* (*Brachyopa*) *bicolor* to the list.

Table 1. Study sites in forest region of Sari city, Mazandaran province, Iran.

Sampling site	Latitude	Longitude	Elevation (m)
Dasht-e naz	36° 41′ 56″ N	53° 12′ 37″ E	20
Pahnehkola	36° 27′ 30″ N	53° 05′ 67″ E	175
Alamdardeh	36° 21′ 21″ N	53° 14′ 50″ E	396
Haftkhal	36° 17′ 13″ N	53° 23′ 32″ E	855
Alikola	36° 13′ 00″ N	53° 39′ 45″ E	1640

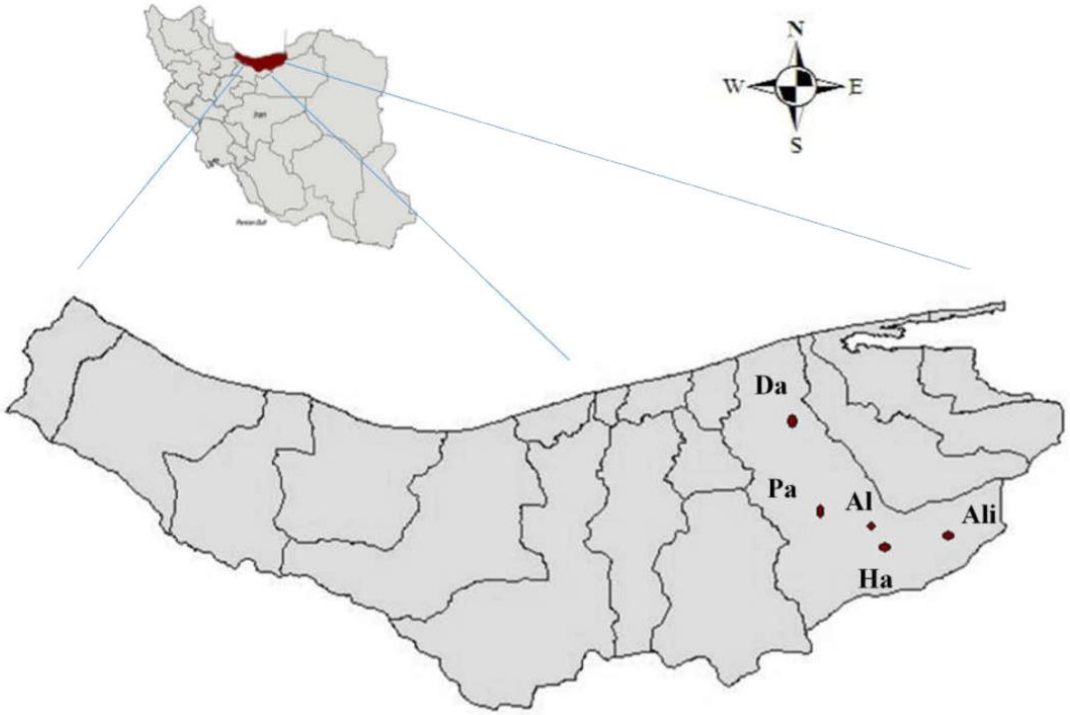

Figure 1. Location of Mazandaran province and study sites in Iran. **Da** (Dasht-e naz), **Pa** (Pahnehkola), **Al** (Alamdardeh), **Ha** (Haftkhal), **Ali** (Alikola).

Genus *Brachyopa* Meigen, 1822

Type species: *Musca conica* Panzer

Diagnosis: Eye bare; arista bare or plumose, located on basal part of third segment of antenna; postpronotum hairy; metasternum bare; subscutellar fringe absent; katepimeron bare; cell r_1 open, vein R_{4+5} ending at or before apex of wing; crossvein r-m located before midpoint of discal cell.

***Brachyopa* (*Brachyopa*) *bicolor* (Fallén, 1817)**

Material examined: Iran: Mazandaran province: Sari city, Haftkhal, 36°17′16″ N, 53°23′43″ E, 855m, 21.IV.2015, 1♀, leg., M. Babaei, Malaise trap.

Diagnosis: Scutum entirely black; arista bare or nearly so, scutellum yellowish-orange, mesopleuron with black setulae; wing hyaline, without dark maculae; legs mostly yellowish-orange except more or less darkened tarsi; abdomen yellowish-orange (Fig. 2A); Third segment of antenna with a small sensory pit (Fig. 2B).

Distribution: Sweden and Finland in northern Europe, Great Britain in western Europe, Central Europe to Roumania, Bulgaria and former Yugoslavia in eastern Europe, Transcaucasia and Kirghizstan (Peck, 1988; Speight, 2014).

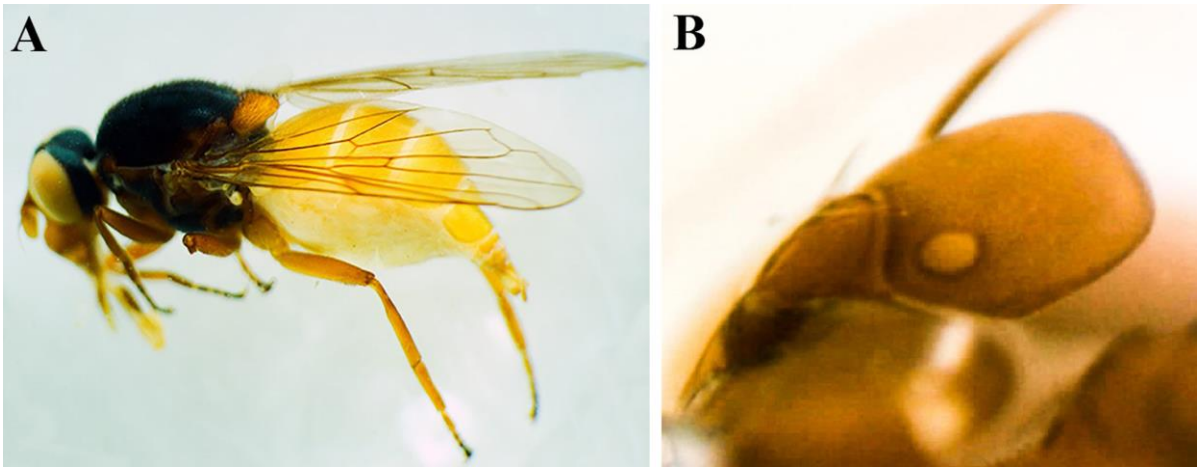

Figure 2. *Brachyopa* (*Brachyopa*) *bicolor*, **A.** female: lateral view, **B.** sensory pit on third segment of antenna.

***Heringia* (*Neocnemodon*) *latitarsis* (Egger, 1865)**

Material examined: Iran: Mazandaran province: Sari city, Alikola, 36°13′00″ N, 53°39′45″ E, 1640m, 01.V.2015, 1♂, leg., M. Babaei, Malaise trap.

Diagnosis: Third segment of antenna less than 1.5 times as long as wide; mid and hind trochanter with spur in male (Fig. 3A); first segment of fore tarsus 2 times as wide as second segment in lateral view (Fig. 3B); mid tibia broadened medially (Fig. 3C); abdominal sternite 3 with a keel like process medially (Fig. 3D).

Distribution: Distributed in Great Britain and Central Europe eastward to Transcaucasia (Peck, 1988; Stubbs & Falk 2002; Van Veen, 2004).

***Cheilosia soror* (Zetterstedt, 1843)**

Material examined: Iran: Mazandaran province: Sari city, Alamdardeh, 36°21′21″ N, 53°14′50″ E, 396m, 8–29.IX.2015, 2♂♂, leg., M. Babaei, Malaise trap.

Diagnosis: Eye bare, face bare; median facial tubercle broad, arista pubescent (Fig. 4A); third segment of antenna bright reddish yellow at least basally; legs partly yellow (Fig. 4B); scutellum with distinct black marginal setae.

Distribution: North Africa, Most of Europe and Fennoscandia, Siberia and Japan (Stubbs & Falk 2002; Van Veen, 2004; Speight, 2014).

Discussion

It is considerable that 11 species of collected syrphids were included only one specimen (Table 3). This can be a concerning subject because it is probable that they fall into the risk as vulnerable or endangered species due to deforestation or climate change. So we should be more conscious to conserve them by preventing habitat loss or habitat fragmentation. On another aspect, finding four saproxylic species in a small part of Mazandaran forest area encourages us to explore more saproxylic species. We believe that hyrcanian mixed forest is included divers flora and fauna, so that we can find many rare and unreported species. For this purpose, we should improve collecting techniques and should search appropriate sites which are close to species habitat.

Environment factors often vary with the altitudinal gradient (Maveety et al., 2014). Therefore, it is expected that the composition of plant species may change in different altitudinal gradient and conse-

quently may influence species composition of flowerflies. Hence, distinct communities of insects are found along an altitudinal gradient (Deutsch et al., 2008). That's probably a reason that the highland site, Alikola, yielded more species composition of flowerflies than lowlands (Table 3). Another reason to gain this result is that it is located in ecotone zone between forest and rangeland. Thus, more plant species are expected to dwell in this zone and consequently may cause to enrich syrphid species.

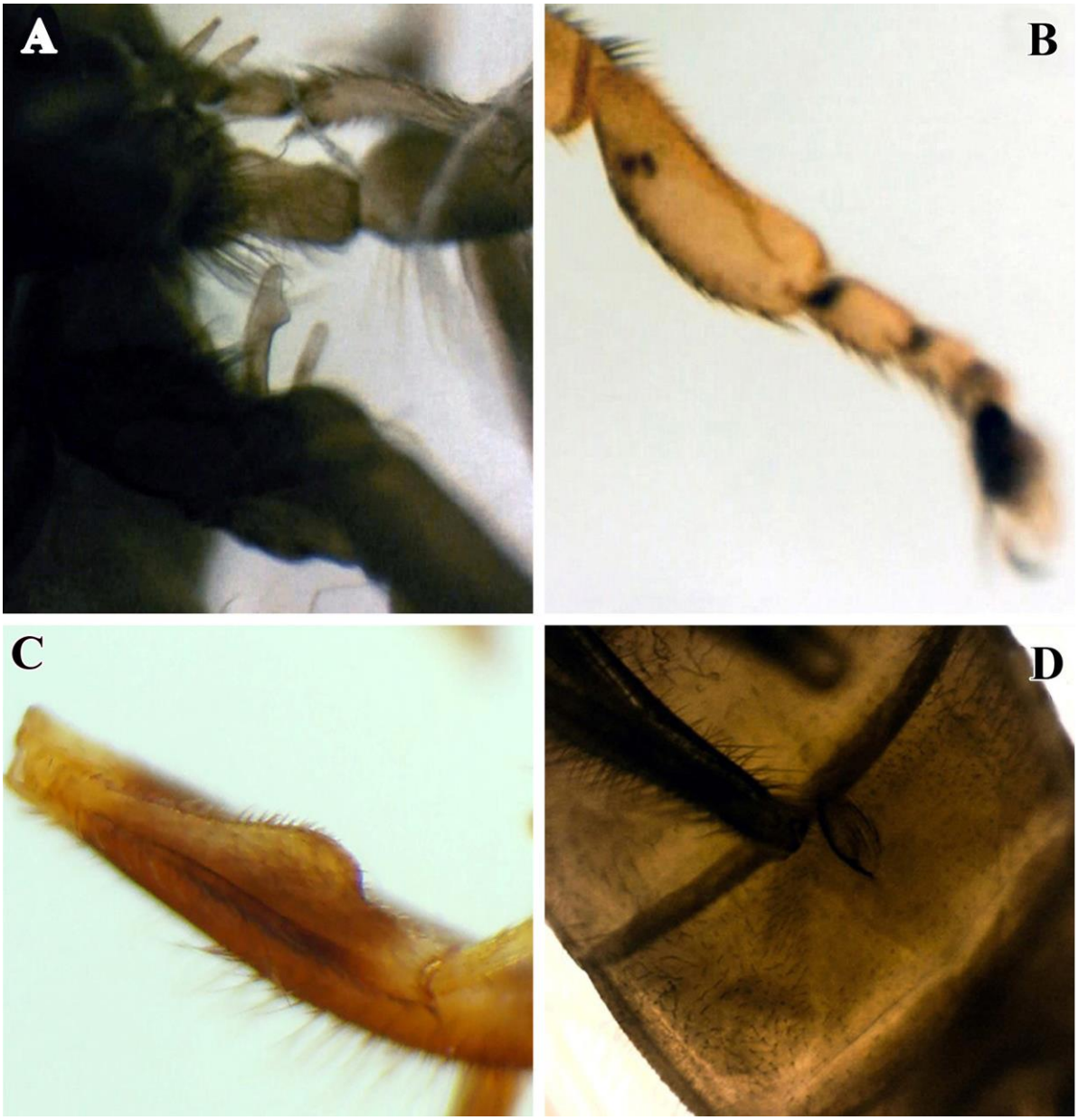

Figure 3. *Heringia* (*Neocnemodon*) *latitarsis*, male, **A.** spur on hind trochanter, **B.** first segment of fore tarsus, **C.** swollen process on dorsal surface of mid tibia, **D.** Keel-like projection on sternite 3.

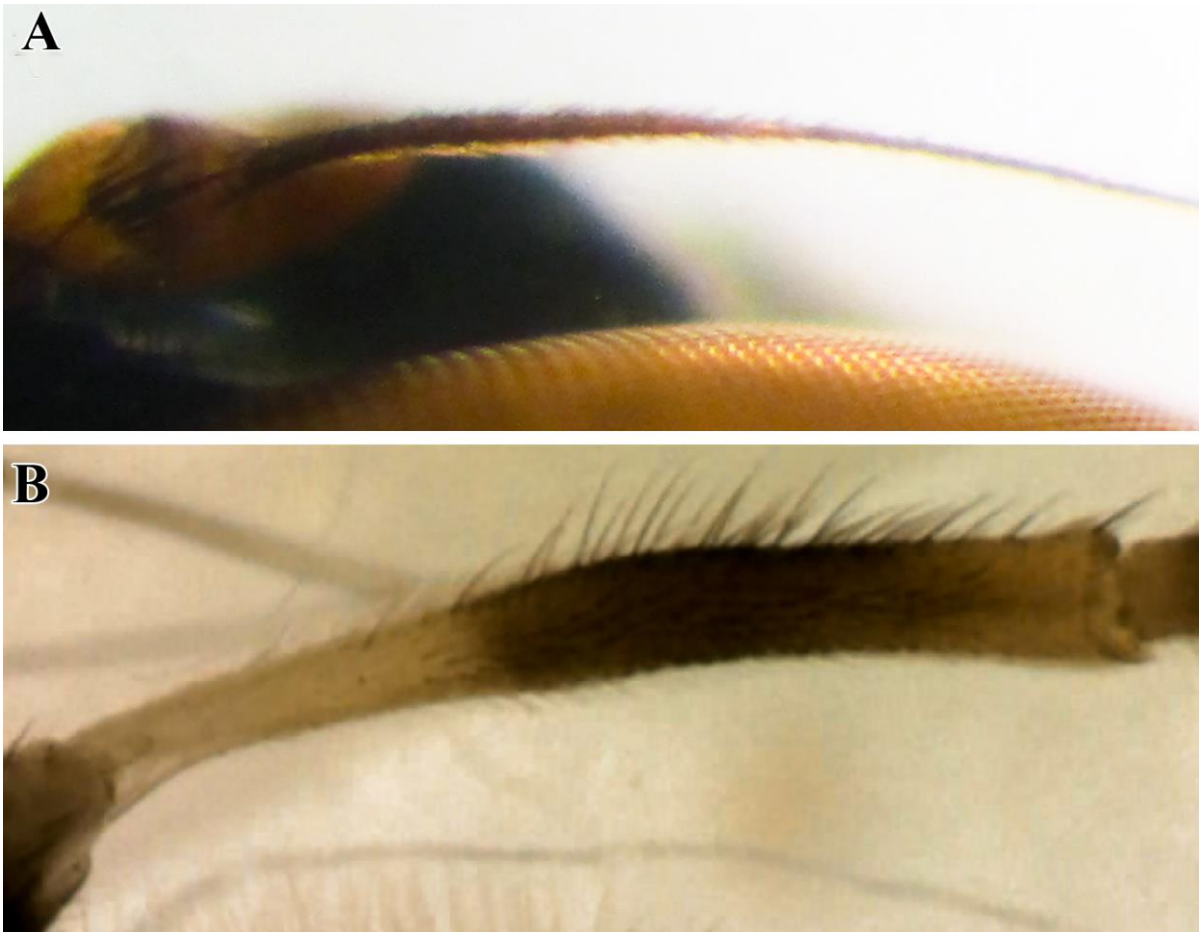

Figure 4. *Cheilosia soror*, male, **A.** pubescent arista, **B.** leg with yellow part.

Table 2. A review of saproxilic syrphids in Iran.

Species	Distribution	Literature
Ceriana conospoides (Linnaeus, 1758)	West Azarbayjan	Khiaban et al. (1998)
Chalcosyrphus nemorum (Fabricius, 1805)	East Azarbayjan	Khaghaninia (2011)
Ferdinandea cuprea (Scopoli, 1763)	East Azarbayjan	Khaghaninia et al. (2014)
Mallota cimbiciformis (Fallén, 1817)	Iran	Peck (1988); Amirimoghadam et al. (2004)
Mallota fuciformis (Fabricius, 1794)	Iran	Peck (1988); Amirimoghadam et al. (2004)
Milesia semiluctifera (Villers, 1798)	Ghazvin	Gharali & Reemer (2014)
Myathropa florae (Linnaeus, 1758)	West Azarbayjan, Guilan, Sistan & baluchestan, Khorasan, Mazandaran	Khiaban et al. (1998); Moetamedi nia et al. (2002); Sadeghi et al. (2002); Amirimoghadam et al. (2004); Gilasian & Vujic (2004)
Xylota segnis (Linnaeus, 1758)	Fars	Gharali et al. (2000)

Table 3. Composition of collected hoverflies in different elevations in study sites and their distribution in Iran. Species with one asterisk are strongly or relatively compatible to forest areas (based on Reemer (2005) and Speight (2014)), but two asterisks are representative of saproxilic syrphids.

Species	Number of specimens collected in the studied sites					Distribution in Iran (cited in catalogue and checklist) (Dousti & hayat, 2006; Kazerani et al., 2012; Gilasian et al., 2015)
	Dasht-e naz (20m)	Pahneh kola (175m)	Alamd ardeh (396m)	Haftkhal (855m)	Alikola (1640m)	
Brachyopa (*Brachyopa*) *bicolor* (Fallén, 1817)* *				1		New to Iran
Chalcosyrphus nemorum (Fabricius, 1805) **		1				East Azarbayjan, new to Mazandaran
Cheilosia melanopa (Zetterstedt, 1843) *					1	Mazandaran
Cheilosia soror (Zetterstedt, 1843) *			2			New to Iran
Chrysotoxum cautum (Harris, 1776) *	3	9		2	2	Khorasan, Mazandaran, Semnan and Golestan
Chrysotoxum octomaculata Curtis, 1837*					1	Mazandaran, East Azarbayjan
Epistrophe eligans (Harris, 1780) *					1	Mazandaran, Hamedan
Epistrophe nitidicollis (Meigen, 1822) *				1		Mazandaran
Episyrphus balteatus (De Geer, 1776)	8			4	7	Generally distributed
Eristalinus aeneus (Scopoli, 1763)	3					Generally distributed, new to Mazandaran
Eristalinus megacephalus (Rossi, 1794)	6					Generally distributed, new to Mazandaran
Eristalinus sepulchralis (Linnaeus, 1758)		1				Generally distributed, new to Mazandaran
Eristalis arbustorum (Linnaeus, 1758)	3	2		1	5	Generally distributed
Eristalis tenax (Linnaeus, 1758)	19	4	7	4	5	Generally distributed
Eupeodes corollae (Fabricius, 1794)	1		2	26	2	Generally distributed
Eupeodes latifasciatus (Macquart, 1829)					1	Tehran, Sistan and baluchestan
Ferdinandea cuprea (Scopoli, 1763) **		1				East Azarbayjan, new to Mazandaran
Heringia (Neocnemodon) latitarsis (Egger, 1865) *					1	new to Iran

Table 3. Continued.

Species	Number of specimens collected in the studied sites					Distribution in Iran (cited in catalogue and checklist) (Dousti & hayat, 2006; Kazerani et al., 2012; Gilasian et al., 2015)
	Dasht-e naz (20m)	Pahneh kola (175m)	Alamd ardeh (396m)	Haftkhal (855m)	Alikola (1640m)	
Ischiodon scutellaris (Fabricius, 1805)	3					Generally distributed
Melanogaster nuda (Macquart, 1829)					17	Mazandaran, Kordestan, East Azarbayjan
Melanostoma mellinum (Linnaeus, 1758)	5	10	15	307	388	Generally distributed
Melanostoma scalare (Fabricius, 1794)				1	1	Mazandaran, Alborz, Guilan, Ghazvin
Meliscaeva auricollis (Meigen, 1822) *			1		2	Guilan, Markazi, Mazandaran,
Merodon avidus (Rossi, 1790) *		2	1		21	Guilan, Golestan, Mazandaran
Myathropa florea (Linnaeus, 1758) **			1	1		West Arzarbayjan, Guilan, Khorasan, Mazandaran
Paragus bicolor (Fabricius, 1794)			1	5	3	Generally distributed
Paragus haemorrhous Meigen, 1822		1	6	11	1	Generally distributed
Paragus quadrifasciatus Meigen, 1822				1		Generally distributed, new to Mazandaran
Platycherius fulviventris (Macquart, 1829)	1	1	1	1		Guilan, khorasan, new to Mazandaran
Scaeva pyrastri (Linnaeus, 1758)	6			1		Generally distributed
Spazigaster ambulans (Fabricius, 1798)					1	Zanjan, Ghazvin, new to Mazandaran
Sphaerophoria rueppelli (Wiedemann, 1830)	70	11	1	13	2	Generally distributed
Sphaerophoria scripta (Linnaeus, 1758)	24	19	69	325	120	Generally distributed
Syrphus ribesii (Linnaeus, 1758)				2	1	Generally distributed
Syrphus vitripennis Meigen, 1822					2	Generally distributed
Syritta pipiens (Linnaeus, 1758) *	2		3	3		Generally distributed
Xanthandrus comtus (Harris, 1780) *				2		Mazandaran, Golestan
Number of species	14	14	15	20	27	

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Conflict of Interests

The authors declare that there is no conflict of interest regarding the publication of this paper.

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گزارش‌جدید از یک جنس و سه گونه از مگس‌های گل (Diptera: Syrphidae) و تحلیلی بر گونه‌های ساپروکسیلیک در ایران

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چکیـــده: در این مطالعه تعداد ۳۷ گونه متعلق به ۲۵ جنس از مگس‌های سیرفیده جمع‌آوری و شناسایی شدند. یک جنس و گونه *Brachyopa* (*Brachyopa*) *bicolor* (Fallén, 1817) و دو گونه *Heringia* (*Neocnemodon*) *latitarsis* (Egger, 1865) و *Cheilosia soror* (Zetterstedt, 1843) برای اولین بار از ایران گزارش شدند. همچنین در این مطالعه مگس‌های سیرفیده ساپروکسیلیک ایران به‌طور مختصر مورد بحث قرار گرفته است.

واژگـــان کلیـــدی: گـزارش جدیـد، مگـس‌هـای گـل، منطقـه جنگلـی، گونـه‌هـای ساپروکسیلیک، ایران