

Research Article

A contribution to the knowledge of Braconinae (Hymenoptera: Braconidae) in some parts of northern and southern Iran

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Abstract: The fauna of the braconid genera *Atanycolus* Foerster, *Glyptomorpha* Holmgren, *Pseudovipio* Szepligeti and *Vipio* Latreille belonging to the subfamily Braconinae were studied in some parts of northern (Alborz, Qazvin, Gilan and Tehran) and southern provinces of Iran (Hormozgan). Specimens were collected using Malaise traps during 2010–2012. Eight species were identified of which two species, namely *Glyptomorpha kaspariyani* Tobias, 1976 and *Vipio striolatus* Telenga, 1936 are new records for the fauna of Iran. An identification key for the collected genera and species is provided.

Keywords: Braconinae, *Glyptomorpha*, *Vipio*, new records, Iran

Introduction

The Braconidae is a large and widespread family of parasitoid wasps which is classified into about 46 subfamilies and 1,032 genera (Yu *et al.*, 2012). There are approximately 17,605 recognized species and thousands of species are still undescribed (Yu *et al.*, 2012). The subfamily Braconinae Nees is one of the largest and most diverse groups within the Braconidae, comprising 188 genera in 12 tribes and about 2900 species worldwide (Yu *et al.*, 2012). Members of this subfamily are solitary or gregarious ectoparasitoids of concealed larvae of holometabolous insects, especially Coleoptera (Shaw and Huddleston, 1991; Yu *et al.*, 2012). The taxonomy of the subfamily Braconinae in the Palaearctic region was studied by various authors (Papp, 1966, 2000, 2005, 2008; Tobias, 1986; Beyarslan, 2010, 2011). *Atanycolus* Foerster, 1862 is a cosmopolitan genus with 61 species distributed around the world, of which 12 species

were known in the Palaearctic region (Tobias, 1986; Yu *et al.*, 2012). Members of this genus are ectoparasitoid of larvae of various species of wood and bark-boring beetles i.e. Buprestidae, Cerambycidae and Curculionidae (Wang *et al.*, 2009). The genus *Glyptomorpha* Holmgren, 1868 includes 34 species of which 13 species have been reported from the Palaearctic region (Tobias, 1986), but it is especially diverse in the subtropical region (Papp, 1966; Tobias, 1986; Quicke and Sharkey, 1989). Species of *Glyptomorpha* are parasitoids of various Coleoptera, especially are recorded on beetle larvae which live beneath bark or in dead wood including Buprestidae and Cerambycidae but some have also been recorded on Noctuidae (Lepidoptera) (Beyarslan *et al.*, 2006). The genus *Pseudovipio* Szepligeti, 1896, includes 12 species in the Palaearctic region, most of them reported only from central Asia (Tobias, 1986). Hosts of this genus are confined to the orders of Coleoptera and Lepidoptera (Yu *et al.*, 2012). The genus *Vipio* Latreille, 1804, contains 25 species in the Palaearctic, mostly in the south Palaearctic region (Tobias, 1986). The few host records illustrated that the species of the genus *Vipio* attack Lepidoptera, Coleoptera and Symphyta larvae in

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concealed habitats (Quicke and Sharkey, 1989). Although, several faunistic and taxonomic studies have been carried out on the Braconidae in Iran (Monajemi and Esmaili, 1981; Al-e-Mansour and Mostafavi, 1993; Achterberg and Mehrnejad, 2002; Mehrparvar *et al.*, 2005; Dezianian and Quicke, 2006; Rakhshani *et al.*, 2007a, 2007b, 2008a, 2008b; Fallahzadeh and Saghaei, 2010; Ameri *et al.*, 2012; Farahani and Talebi, 2012; Farahani *et al.*, 2012, 2013a, 2013b), the fauna of Braconinae is poorly studied in Iran (Ghahari *et al.*, 2011, 2012; Ghahari and Fischer, 2011; Rastegar *et al.*, 2012; Shestakov, 1926; Telenga, 1936). This study was carried out to survey the Braconinae fauna in northern and southern Iran. The objective of this study was to determine the species of the subfamily Braconinae (excluding the large genus, *Bracon*), to get an idea on its situation in northern and southern provinces of Iran.

Materials and Methods

Material for this study was collected from different habitats of northern (Alborz, Qazvin, Gilan and Tehran provinces) and southern Iran (Hormozgan province) during 2010–2012 using Malaise traps and sweeping net. The specimens were removed from Malaise traps and sorted weekly. After that they were treated with 100% ethanol for five minutes followed by hexamethyldisilazane (HMDS) for 30 minutes and finally placed on a glass plate to dry (Heraty and Hawks, 1998). The dried specimens were card mounted and labeled. The collected specimens were identified using key provided by Tobias (1986). Images were taken with an OlympusTM SZX9 stereomicroscope equipped with a Sony CX21 digital camera. The terminology used in this paper follows Tobias (1986) and Yoder *et al.* (2010). All specimens are deposited in the insect collection of the Department of Entomology, Tarbiat Modares University, Tehran.

Results

Eight species in four genera of Braconinae (Hymenoptera: Braconidae) including *Atanycolus* Foerster (1 species), *Glyptomorpha*

Holmgren (2 species), *Pseudovipio* Szepligeti (2 species) and *Vipio* Latreille (3 species) were collected and identified from the studied areas. They include six previously reported species, *Pseudovipio inscriptor* (Nees, 1834), *P. castrator* (Fabricius, 1798), *Atanycolus ivanovi* (Kokujev, 1898), *Glyptomorpha pectoralis* (Brulle, 1832), *Vipio mlokoszewiczi* (Kokujev, 1898), *V. nomioides* (Shestakov, 1926), and two newly recorded species namely *G. kaspariyani* (Tobias, 1979) and *V. striolatus* (Telenga, 1936), which are marked by an asterisk in the text. The identified species are listed alphabetically.

Atanycolus ivanovi (Kokujev, 1898)

Material examined: 7 ♀♀, Alborz province: Karaj (35°46'08.88" N, 50°56'55.20" E, 1277 m a. s. l.), 21–28.xi.2010, 2 ♀♀; Tehran province: Shahriar (35°40'08.10" N, 50°56'56.64" E, 1168 m a.s.l.), 06–13.ix.2010, 1 ♀; Gilan province: Rudsar, Ziaz (36°52'34.44" N, 50°13'17.40" E, 537 m a.s.l.), 06–13.ix.2010, 1 ♀; Qazvin province: Zereshk Road (36°25'23.88" N, 50°06'37.68" E, 1926 m a. s. l.), 02–09.vi.2011, 2 ♀♀; 16–23.vii.2011, 1 ♀; leg. M. Khayrandish.

Distribution in Iran: Ilam province (Ghahari *et al.*, 2011), Alborz, Gilan, Qazvin and Tehran provinces (current study).

General distribution: Palaearctic (Yu *et al.*, 2012), Iran (Shestakov, 1926).

**Glyptomorpha kaspariyani* Tobias 1976

Material examined: 1 ♀, Tehran province: Peykanshahr, (35°4'9.19" N, 51°09'58.88" E, 1278 m a. s. l.), 16–23.vii.2013, 1 ♀; leg. M. Zargar.

Distribution in Iran: Tehran province (current study).

General distribution: Palaearctic (Yu *et al.*, 2012). New record for the fauna of Iran.

Glyptomorpha pectoralis (Brulle, 1832)

Material examined: 8 ♀♀, Hormozgan province: Faryab (27°28'5.32" N, 57°4'25.42" E, 313 m a. s. l.), 09–16.iv.2012, 1 ♀; Minab-Chelo (27°10'30.39" N, 57°01'9.79" E, 16 m a. s. l.), 28.vii–05.viii.2012, 1 ♀; leg. A. Ameri;

Gilan province: Rudsar, Ghazichak (36°45'52.62" N, 50°20'01.08" E, 1787 m a.s.l.), 15–22.viii.2010, 1♀; Qazvin province: Koochin (36°22'14.22" N, 49°40'20.02.28" E, 1514 m a. s. l.), 19–26.vii.2011, 3♀♀; 10–17.viii.2011; Zereskh Road (36°25'23.88" N, 50°06'37.68" E, 1926 m a. s. l.), 10–17.viii.2011, 1♀; 16–23 .vii. 2011, 1♀; leg. M. Khayrandish.

Distribution in Iran: Iran (province not defined) (Shestakov, 1926; Fallahzadeh and Saghaei, 2010), Gilan, Hormozgan and Qazvin provinces (current study).

General distribution: Palaearctic, Ethiopian and Oriental (Yu et al., 2012), Iran (Shestakov, 1926).

***Pseudovipio castrator* (Faricius, 1798)**

Material examined: 8 ♀♀, Hormozgan province: Ramkan (26°52'25.2" N, 56°01'7.3" E, 34 m a. s. l.), 28.iii–05.iv.2012, 1♀; leg. A. Ameri; Qazvin province: Zereskh Road (36°25'23.88" N, 50°06'37.68" E, 1926 m a. s. l.), 16–23.vii.2011, 3 ♀♀; 10–17.viii.2011, 1♀; 04–12.ix.2011, 2♀♀; 19–27.viii.2011, 1♀; leg. M. Khayrandish.

Distribution in Iran: Lorestan province (Ghahari et al., 2012), Hormozgan and Qazvin provinces (current study).

General distribution: Palaearctic and Ethiopian (Yu et al., 2012), Iran (Telenga, 1936).

***Pseudovipio inscriptor* (Nees, 1834)**

Material examined: 12♀♀, Hormozgan province: Ramkan (26°52'25.2" N, 56°01'7.3" E, 34 m a. s. l.), 08–16.iv.2012, 1♀; 16–23.iv.2011, 1♀; 14–21.v.2012, 1♀; Zakin (27°28'53.2" N, 56°18'27.03" E, 680 m a. s. l.), 08–16.iv.2012, 1♀; leg. A. Ameri; Qazvin province: Loshan (36°40'14.58" N, 49°25'38.52" E, 295 m a. s. l.), 22–30.iv.2011, 3♀♀; Zereskh Road (36°25'23.88" N, 50°06'37.68" E, 1926m a. s. l.), 02–09.vi.2011, 1♀; 14–22.VI.2011, 1♀; 15–23.vii.2011, 2♀♀; 09–17.viii.2011, 1♀; leg. M. Khayrandish.

Distribution in Iran: Ilam province (Ghahari et al., 2011), Hormozgan and Qazvin provinces (current study).

General distribution: Palaearctic (Yu et al., 2012), Iran (Telenga, 1936).

***Vipio mlokoszewiczi* Kokujev, 1898**

Material examined: 7♀♀, Alborz province: Karaj (35°46'08.88" N, 50°56'55.20" E, 1277 m a. s. l.), 18–25.v.2010, 1♀; Qazvin province: Loshan (36°40'09.12" N, 49°25'37.74" E, 291 m a. s. l.), 18–25.v.2011, 4♀♀; Tehran province: Peykanshahr, National Botanical Garden (35°44'19.91" N, 51°10'52.49" E, 1265 m a. s. l.), 09–18.v.2010, 2 ♀♀; leg. M. Khayrandish.

Distribution in Iran: Iran (province not defined) (Telenga, 1936; Fallahzadeh and Saghaei, 2010), Alborz, Qazvin and Tehran provinces (current study).

General distribution: Palaearctic (Yu et al., 2012), Iran (Telenga, 1936).

***Vipio nomioides* Shestakov, 1926**

Material examined: 3♀♀, Alborz province: Chalous Road, Shahrestanak (35°57'34.98" N, 51°22'20.34" E, 2305 m a. s. l.), 14–23.vii.2010, 3♀♀; leg. M. Khayrandish.

Distribution in Iran: Iran (province not defined) (Telenga, 1936; Fallahzadeh and Saghaei, 2010), Alborz province (current study).

General distribution: Palaearctic (Yu et al., 2012), Iran (Shestovkov, 1926).

****Vipio striolatus* Telenga, 1936**

Material examined: 2♀♀, Tehran province: Shahriar (35°40'08.10" N, 50°56'56.64" E, 1168 m a. s. l.), 15–22.vi.2010, 1♀; 22–29.vi.2010, 1♀; leg. M. Khayrandish.

Distribution in Iran: Tehran province (current study).

General distribution: Palaearctic (Yu et al., 2012). New record for the fauna of Iran.

Key to the genera and species collected from some parts of northern and southern Iran (based on females)

1. Basal vein curved to nervulus (Fig. 2C); apical segment of antenna blunt (Fig. 2E) (genus *Glyptomorpha*).....2
- Basal vein not curved to nervulus; apical segment of antenna conical (Fig. 2F)3

2. Length of ovipositor 2.0 X as long as body (Fig. 3A); stigma with yellow basal spot (Fig. 2D); second abdominal tergite quadrangular (Fig. 1A)..... ***Glyptomorpha pectoralis* (Brulle, 1832)**
 - Length of ovipositor slightly longer than body (Fig. 3B); stigma completely black (Fig. 2C); second metasomal tergite not quadrangular (Fig. 1B)... ***Glyptomorpha kaspariyani* Tobias, 1976**
3. Scape parallel-sided, with distinct constriction at base and projecting margin apically (Fig. 2A); third and fourth metasomal tergites with transverse sculptured furrows on posterior margin (Fig. 1C)... ***Atanycolus ivanovi* (Kokujev, 1898)**
 - Scape gradually broadening apically, lacking sharp basal constriction; third and fourth metasomal tergites without transverse sculptured furrows on posterior margin4
4. Ventral margin of clypeus with two tufts of long hair (Fig. 2B); second metasomal tergite with distinct oval field (Fig. 1D) (genus ***Vipio***)..... 5
 - Ventral margin of clypeus without two tufts of long hair; second metasomal tergite lacking distinct oval field (genus ***Pseudovipio***)7
5. Length of ovipositor as long as body (Fig. 3D); propodeum sculptured in middle area (Fig. 1D)..... ***Vipio nomioides* Shestakov, 1926**
 - Length of ovipositor as long as abdomen; propodeum completely sculptured6
6. Third abdominal tergites rugose; propodeum with coarse long wrinkles (Fig. 1E); hind coxa reddish dark brown (Figs. 3E).....
 ***Vipio striolatus* Telenga, 1936**
 - Third metasomal tergites smooth (Fig. 1F), propodeum rugose-punctate; hind coxa black (Fig. 3F)..... ***Vipio mlokoszewiczi* Kokujev, 1898**
7. Ovipositor longer than metasoma; sixth sternite projecting beyond apex of metasoma (Fig. 3H); third metasomal tergite with black spot on lateral sides (Fig. 1G); hind femura without black spot apically
 ***Pseudovipio inscriptor* (Nees, 1834)**
 - Ovipositor shorter than metasoma; sixth sternite not projecting beyond apex of metasoma (Fig. 3G), third metasomal tergite without black spot on lateral sides (Fig. 1H);

hind femura with black spot apically ***Pseudovipio castrator* (Faricius, 1798)**

Discussion

According to our research and previous literature 54 species of Braconinae are known in Iran (Fallahzadeh and Saghaei, 2010; Ghahari and Fischer, 2011; Ghahari *et al.*, 2011, 2012). According to the results of our studies, it is evident that five species (excluding the large genus, *Bracon*) were found only in the northern parts of Iran (i.e. *G. kaspariyani*, *A. ivanovi*, *V. mlokoszewiczi*, *V. striolatus* and *V. nomioides*) while three species (i.e. *P. inscriptor*, *P. castrator* and *G. pectoralis*) have been collected from both southern and northern parts of Iran. Our findings and previous studies (Fallahzadeh and Saghaei, 2010; Ghahari *et al.*, 2011, 2012; Ghahari and Fischer, 2011; Rastegar *et al.*, 2012; Shestakov, 1926; Telenga, 1936) showed that the North of Iran has more diverse fauna in comparison to the South. The northern region of Iran is characterized by great variability of vegetations, natural ecosystems and farm lands due to significant differences in topography and changing climates. According to our sampling, most of the specimens were collected from March to May in Hormozgan province and from May to November in northern Iran. In the present study, the male specimens were not identified to species level, because most of the literature and identification keys are based on females. Further investigations are needed to determine the relationships between males and females in different species.

Among the neighboring countries of Iran, most studies on Braconinae have been conducted in Turkey (Beyarslan *et al.*, 2006, 2010; Beyarslan, 2010, 2011; Beyarslan and Aydogdu, 2013) and Russia (Tobias, 1986). The number of recorded species of the subfamily Braconinae is comparatively higher in these countries because of the extensive samplings in larger areas. Since the sampling sites included a small part of Iran, it would be expected that many additional species remain to be discovered in future surveys.

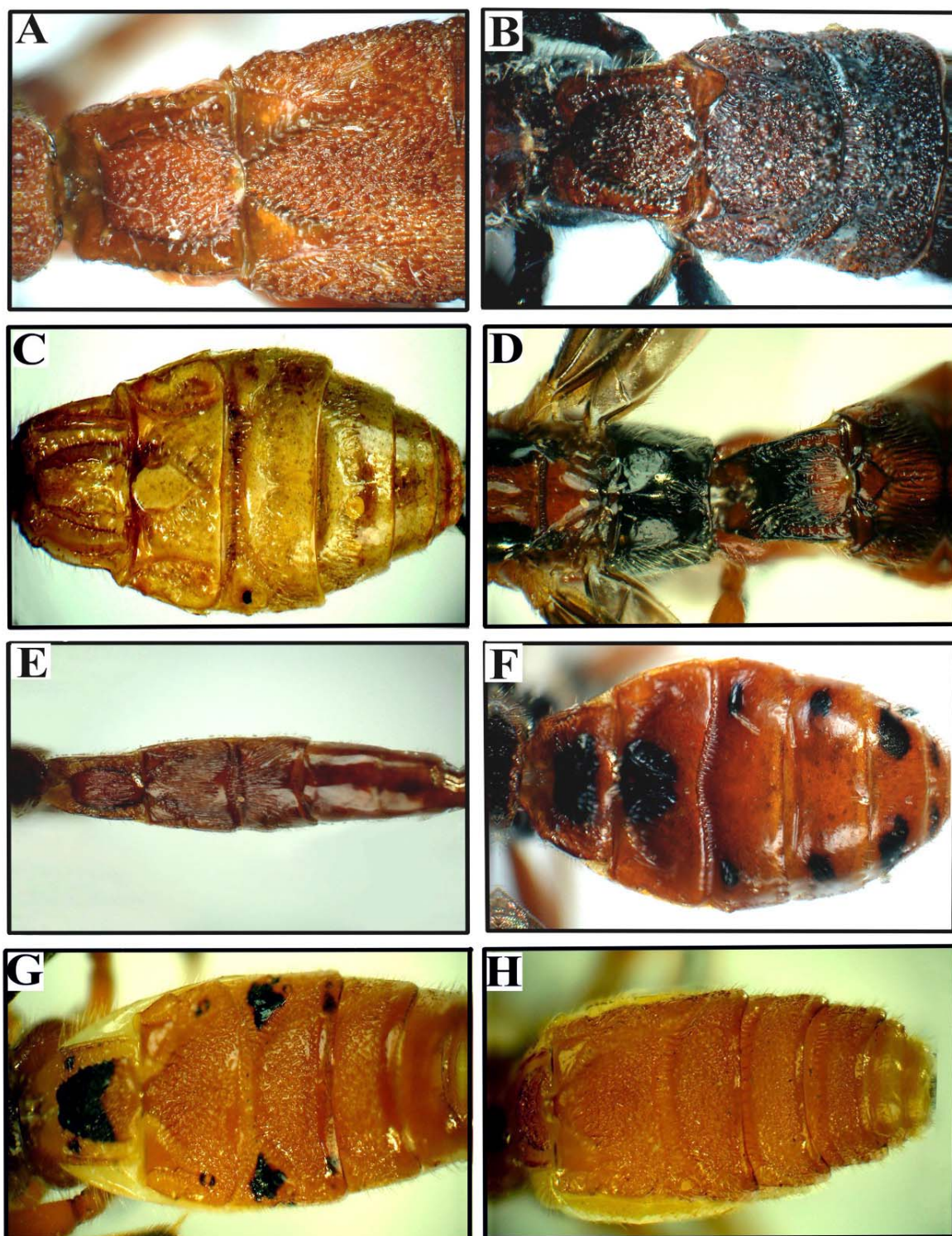


Figure 1 Metasoma of Braconinae species: A. *Glyptomorpha pectoralis*; B. *Glyptomorpha kaspariyani*; C. *Atanycolus ivanovi*; D. *Vipio nomioides*; E. *Vipio striolatus*; F. *Vipio mlokossewiczii*; G. *Pseudovipio inscriptor*; H. *Pseudovipio castrator*.

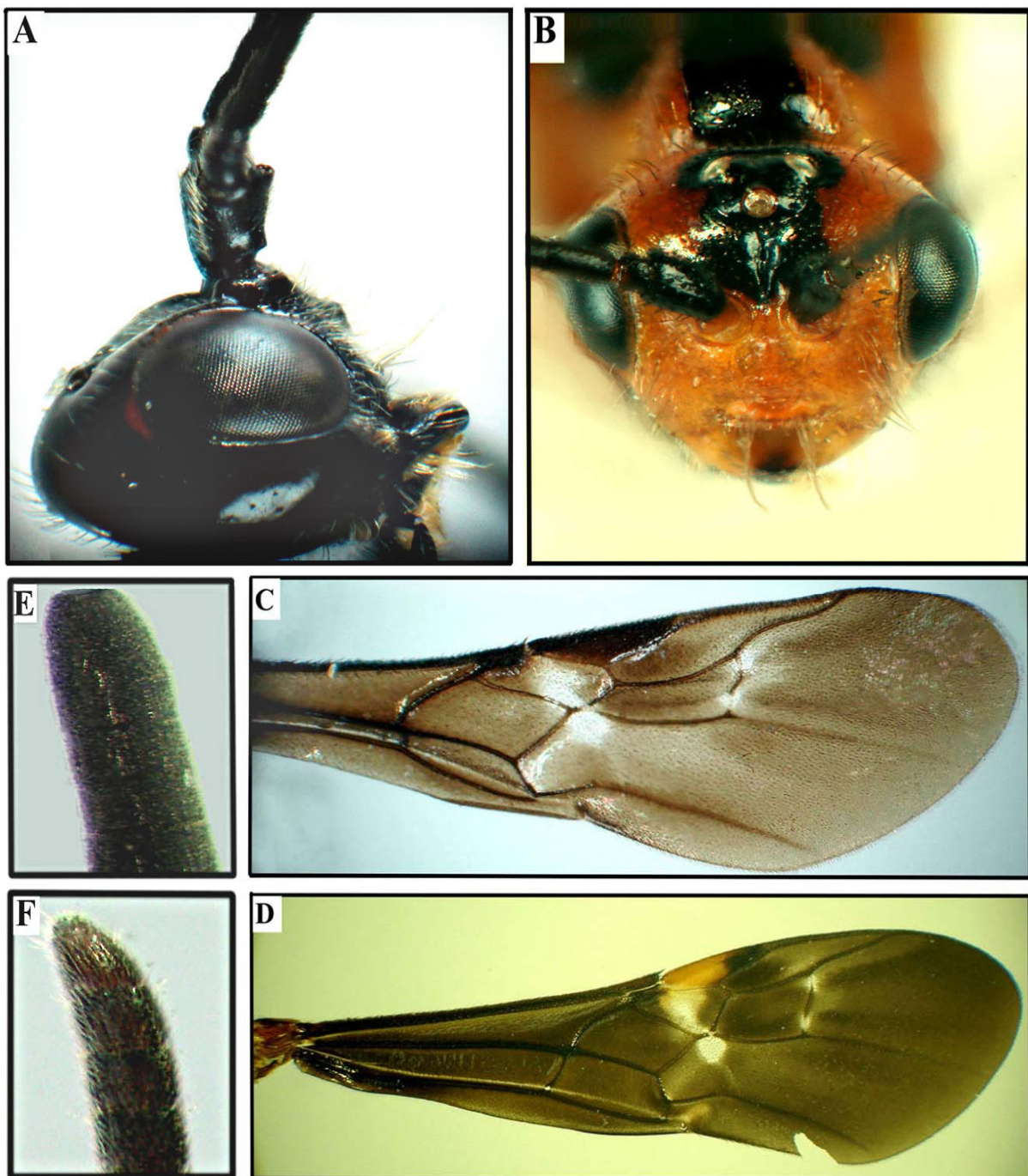


Figure 2 A. head of *Atanycolus ivanovi* (lateral view); B. head of *Vipio nomioides* (front view); C. forewing of *Glyptomorpha kaspariyani*; D. forewing of *Glyptomorpha pectoralis*; E. antenna of *Glyptomorpha kaspariyani*; F. antenna of *Atanycolus ivanovi*.

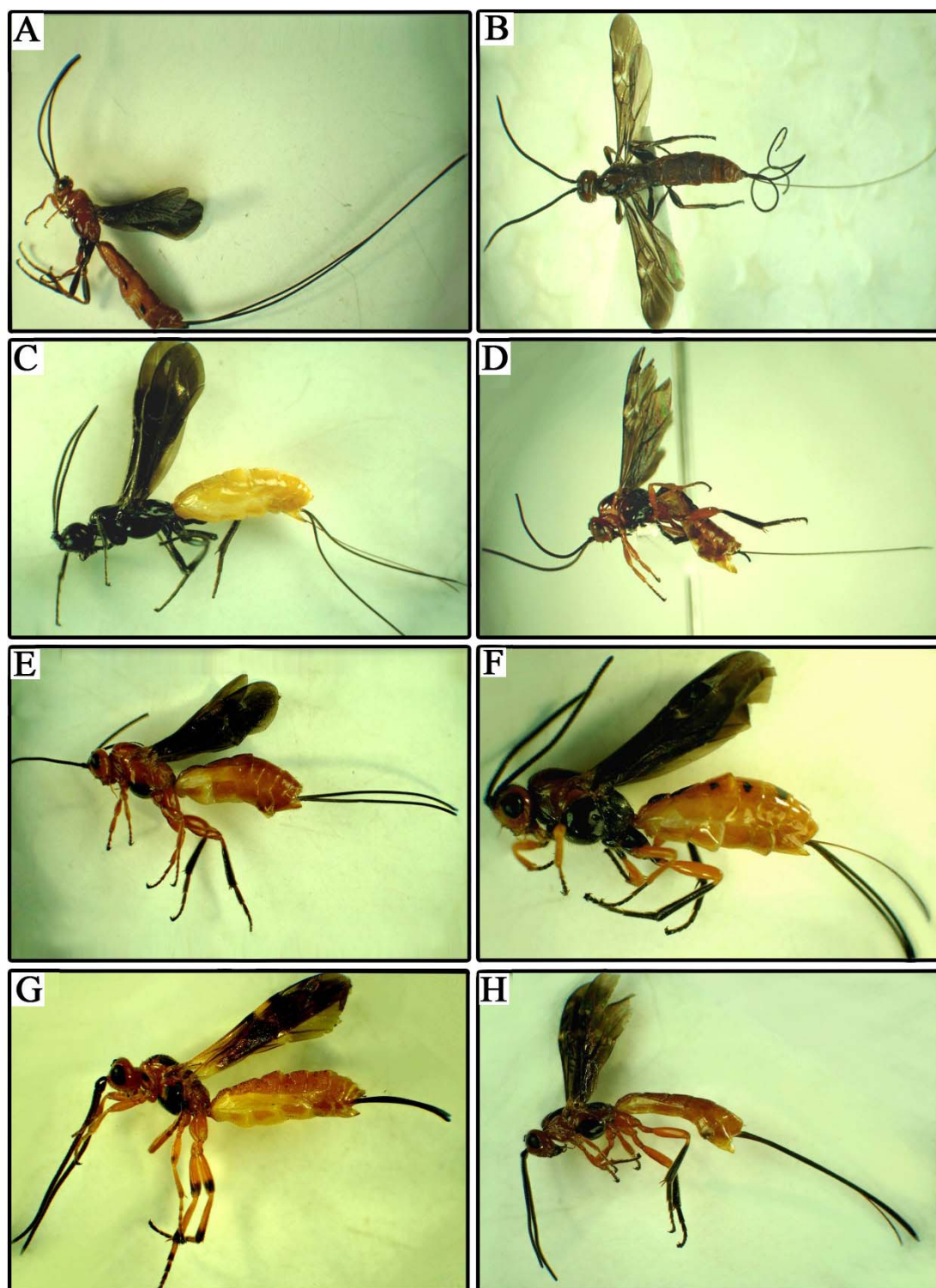


Figure 3 General habitus of Braconinae species: A. *Glyptomorpha pectoralis*; B. *Glyptomorpha kaspariyani*; C. *Atanycolus ivanovi*; D. *Vipio nomioides*; E. *Vipio striolatus*; F. *Vipio mlokoszewiczi*; G. *Pseudovipio inscriptor*; H. *Pseudovipio castrator*.

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مشارکت در ارتقای دانش زنبورهای زیرخانواده *Braconinae* (Hymenoptera: Braconidae) در بخش‌هایی از مناطق شمالی و جنوبی ایران

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چکیده: فون زنبورهای جنس‌های *Pseudovipio*, *Glyptomorpha* Holmgren, *Atanycolus* Foerster و *Vipio* Latreille و *Szepligeti* متعلق به زیرخانواده *Braconinae* مطالعه گردید. نمونه‌ها در طی سال‌های ۱۳۸۹-۱۳۹۱ از بخش‌هایی از شمال (استان‌های البرز، تهران، قزوین و گیلان) و جنوب ایران (استان هرمزگان) جمع‌آوری شد. هشت گونه مورد شناسایی قرار گرفت که از آنها دو گونه به‌نام‌های *Vipio striolatus* Telenga, 1936 و *Glyptomorpha kaspariyani* Tobias, 1976 برای فون ایران گزارش جدید هستند. ویژگی‌های ریخت‌شناسی و کلیدشناسایی جنس‌ها و گونه‌های جمع‌آوری شده ارائه گردید.

واژگان کلیدی: *Vipio*, *Glyptomorpha*, *Braconinae*، گزارش جدید، ایران