



Study on the genus *Triaspis* Haliday, 1835 (Hymenoptera: Braconidae, Brachistinae) in Northern Iran, with two new records

Fatemeh Zahra Pirouzeh¹, Ali Asghar Talebi^{1*}, Samira Farahani²

¹ Department of Agricultural Entomology, Faculty of Agriculture, Tarbiat Modares University, 14115-336, Tehran, I.R. Iran.

² Research Institute of Forests and Rangelands, Agricultural Research Education and Extension Organization (AREEO), Tehran, I. R. Iran.

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ABSTRACT. In the present work, occurrence of the genus *Triaspis* Haliday, 1835 (Hymenoptera: Braconidae, Brachistinae) is taxonomically surveyed. The study was conducted in the North of Iran during 2010–2011. Six species were collected and identified: *Triaspis armeniaca* Tobias, 1976; *T. caudate* (Nees, 1816); *T. complanellae* (Hartig, 1847); *T. obscurella* (Nees, 1816); *T. pallipes* (Nees, 1816); *T. thoracica* (Curtis, 1860), of which two species, *T. armeniaca* and *T. caudate* are recorded for the first time for the Iranian fauna. Diagnostic and geographical distribution are provided.

Key words: Braconidae, Brachistinae, *Triaspis*, new records, Iran.

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Introduction

Recently, several Braconidae subfamilies have been studied in Northern (Farahani *et al.* 2012, 2013, 2014 a,b,c) and Southern (Hormozgan) provinces of Iran (Ameri *et al.* 2013, 2014a,b), however the subfamily Brachistinae Foerster, 1863 has poorly been studied (Gadallah and Ghahari 2013; Farahani *et al.* 2016).

Brachistinae is a rather small cosmopolitan subfamily of Braconidae described within 12 genera in two tribes and 412 species worldwide, of which 156 species were recorded from Western Palearctic (Yu *et al.* 2012). Brachistines adults have an un-articulated carapace that

covers the metasoma dorsally, formed by the fusion the first three metasomal tergites. Specimens of this subfamily can be easily confused with subfamily Cheloninae Foerster, 1863, but brachistines are recognizable by the presence of only two submarginal cell in the forewing (Shaw and Huddleston 1991). Members of the Brachistinae are solitary egg-larval endoparasitoids of Coleoptera, especially Curculionidae and Chrysomelidae. Some of them have also been recorded in association with other taxa including Diptera, Hymenoptera and Lepidoptera (Tobias 1986; Shaw and Huddleston 1991; Yu *et al.* 2012).

Corresponding author: Ali Asghar Talebi, E-mail: talebiala@modares.ac.ir

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Triaspis Haliday, 1835 is a cosmopolitan genus with about 114 described species worldwide, mostly distributed in the Palaearctic Region (Yu *et al.* 2012). *Triaspis* species have a carapace with two transverse furrows, marking the boundaries between the first three tergites.

The genus *Triaspis* was taxonomically studied in several countries however its knowledge is very limited in Iran (Gadallah and Ghahari 2013; Farahani *et al.* 2016). The first occurrence of *Triaspis* from Iran was recorded by Shahhosseini and Kamali (1989) that reported *T. thoracica* (Curtis, 1860) on *Bruchus rufimanus* Boheman (Col.: Chrysomelidae). Only six species of *Triaspis* have been recorded from Iran (Farahani *et al.* 2016). As a part of an ongoing comprehensive research on the braconid fauna of Iran, we surveyed the fauna of *Triaspis* species in north of the country.

Material and methods

Material was collected using Malaise traps during 2010–2011 from different habitats on several localities in north central part of Iran, covering the areas in Alborz, Qazvin, Guilan, Mazandaran and Tehran provinces. Specimens were extracted from Malaise traps and transferred to the laboratory. They were treated with 70% ethanol and finally placed on a glass plate with filter paper to

dry. The dried specimens were mounted and labeled. The specimens were identified according to the keys in Tobias (1986) and Belokobylskij (1998). Morphological terminology follows Tobias (1986). Photographs were taken with an Olympus™ SZX9 stereomicroscope equipped with a Sony™ CX21 digital camera. All specimens are deposited in the insect collection of the Department of Entomology, Tarbiat Modares University, Tehran (TMUC; Iran). Synonyms, geographical distribution, host record and diagnosis of the newly recorded species are presented.

Results

A total of 55 specimens of genus *Triaspis* were collected using Malaise traps. Six species of the genus *Triaspis* were identified: *Triaspis armeniaca* Tobias, 1976; *T. caudata* (Nees, 1816); *T. complanellae* (Hartig, 1847); *T. obscurella* (Nees, 1816); *T. pallipes* (Nees, 1816); *T. thoracica* (Curtis, 1860), of which *T. armeniaca* and *T. caudata* are recorded for the first time for the Iranian fauna. The most abundant species was *Triaspis caudata* (54.55%) followed by *Triaspis obscurella* (Nees, 1816) with an abundance of 20% (Table 1). The species are listed below alphabetically and the newly recorded species marked with an asterisk (*).

Table 1. Species number and abundance of the genus *Triaspis* (Hymenoptera: Braconidae) in northern Iran.

Species	Previously recorded species	Collected species	New records	Number of specimens	Frequency (%)
<i>Triaspis armeniaca</i> Tobias 1976	-	*	*	1	1.82
<i>Triaspis caudata</i> (Nees, 1816)	-	*	*	30	54.55
<i>Triaspis complanellae</i> (Hartig, 1847)	*	*	-	7	12.72
<i>Triaspis obscurella</i> (Nees, 1816)	*	*	-	11	20
<i>Triaspis pallipes</i> (Nees, 1816)	*	*	-	5	9
<i>Triaspis thoracica</i> (Curtis, 1860)	*	*	-	1	1.82
Total	4	6	2	55	100

Key to species of the genus *Triaspis* known in this study

(This key was originally developed by Tobias (1986) that modified based on species collected in this study)

1. Body with light colored pattern (Fig. 1A).2
- Body entirely black (Fig. 2A).3
2. Length of mesosoma 1.1 times longer than high; ovipositor sheath as long as metasoma and propodeum together.
..... *Triaspis thoracica* (Curtis, 1860)
- Length of mesosoma 1.5 times longer than high (Fig. 1D); ovipositor sheath as long as body (Fig. 1G).
..... *Triaspis armeniaca* Tobias, 1976
3. Carapace short and round; ovipositor sheath as long as mesosoma and metasoma together.*Triaspis pallipes* (Nees, 1816)
- Carapace long and oval; length of ovipositor sheath in variable length.....4
4. Ovipositor sheath longer than body (Fig. 2G).*Triaspis caudata* (Nees, 1816)
- Ovipositor sheath shorter than body.
.....5
5. Ovipositor sheath short, as long as one-third to half metasoma; palps and legs yellowish.
.....*Triaspis complanellae* (Hartig, 1847)
- Ovipositor sheath as long as metasoma; palps and legs brownish.
.....*Triaspis obscurella* (Nees, 1816)

Genus *Triaspis* Haliday, 1835

Triaspis armeniaca Tobias, 1976*
(Figs. 1 A–G)

Material examined: Mazandaran province: Gaznasara (36°16' N, 52°10'E, 2013 m a. s. l.), 27.vi.2011, 1♀, leg.: M. Khayrandish & A. Nadimi.

General distribution: Armenia (Yu *et al.* 2012), Iran (**new record**).

Diagnostic characters (Female): length of body 2.9 mm; antennae with 25 segments; head 1.5 times as wide as its length, temples 1.5 times as long as eyes (Fig. 1B); length of oral cavity 2.4 times as long as malar space (Fig. 1A), mesosoma 1.6 times as long as high (Fig. 1D), anterior margin of radial cell as long as stigma (Fig. 1E); first and second metasomal tergites with longitudinal striae, third metasomal tergite smooth (Fig. 1F); length of ovipositor sheath as long as body (Fig. 1G). Body brownish; base of antennal segments yellowish; head and mesonotum brown, metanotum black (Fig. 1C), propodeum and metasoma dark brown; legs yellowish dark brown.

Triaspis caudata (Nees, 1816)*
(Figs. 2 A–G)

Material examined: Qazvin province: Loshan (36°40'N, 49°25'E, 259m a. s. l.), 20.vi.2010, 1♀; Guilan province: Roodsar, Rahim Abad, Ziaz (36°52'N, 50°13' E, 490 m a. s. l.), 23.x.2010, 7♀; Roodsar, Rahim Abad, Orkom (36°45'N, 50°18'E, 1201m a. s. l.), 06.vi.2010, 5♀, 20.vi.2010, 1♀; Ghazichak (36°45'N, 50°19'E, 1803 m. a. s. l.), 04.vii.2010, 9♀; Mazandaran province: Gaznasara (36°16'N, 52°10'E, 2013 m a. s. l.), 11.vii.2011, 7♀, leg.: M. Khayrandish & A. Nadimi.

General distribution: Palaearctic (Yu *et al.* 2012), Iran (**new record**).

Diagnostic characters (Female): Length of body 2.0–2.4 mm; antennae with 21–24 segments; head in dorsal view, 1.7 times as wide as its length; temples 0.8 times as long as eyes (Fig. 2B), length of oral cavity 1.6 times as long as malar space (Fig. 2A), mesosoma 1.5 times as long as high (Fig. 2D); anterior margin of radial cell as long as stigma (Fig. 2E); first and second metasomal tergites with longitudinal folds, third metasomal tergite almost smooth (Fig. 2F); ovipositor sheath noticeably longer than body (Fig. 2G).

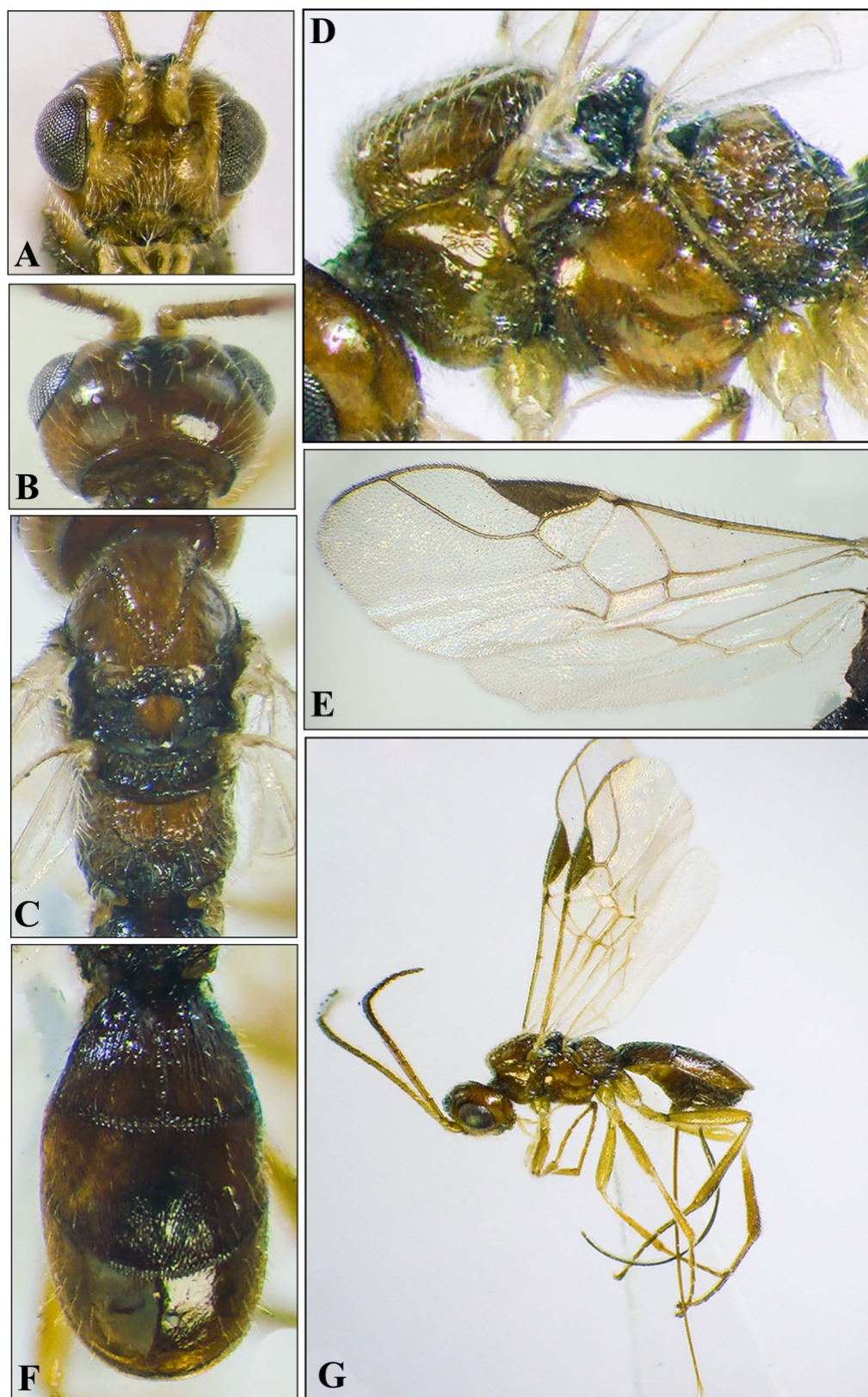


Figure 1. *Triaspis armeniaca*: A. Head, in front view; B. Head, dorsal view; C. Mesosoma, dorsal view; D. Mesosoma, lateral view; E. Wings; F. Metasoma, dorsal view; G. Adult.

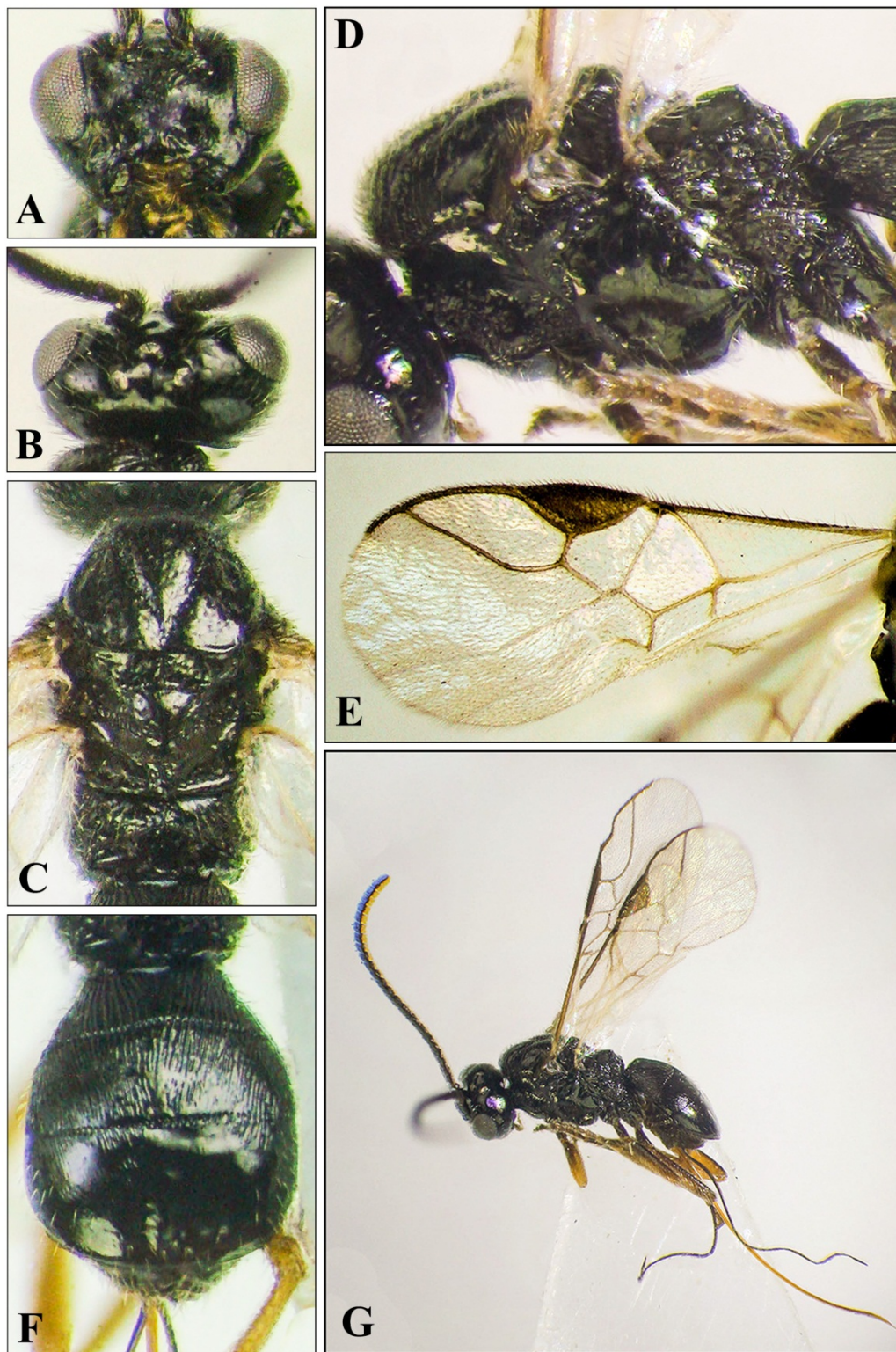


Figure 2 *Triaspis caudata*: **A.** Head, in front view; **B.** Head, dorsal view; **C.** Mesosoma, dorsal view; **D.** Mesosoma, lateral view; **E.** Wings; **F.** Metasoma, dorsal view; **G.** Adult.

Body black, propodeum and metasoma black; legs darkened, in greater part dark brown.

Host record: Host records of *T. caudata* include Coleoptera, with most records involving species of Curculionidae (Yu *et al.* 2012).

***Triaspis complanellae* (Hartig, 1847)**

Material examined: Mazandaran province: Noor, Chamestan, Joorband (36°26' N, 52°07'E, 272m a. s. l.), 24.vi.2011, 5♀; Qazvin province: Zereshek Road (36°21'N, 50°03'E, 1553m a. s. l.), 03.vi.2010, 1♀; Guilan province: Ghazichak (36°45'N, 50°19'E, 1803 m. a. s. l.), 12.vi.2010, 1♀, leg.: M. Khayrandish & A. Nadimi.

General distribution: Palaearctic (Yu *et al.* 2012).

Diagnostic characters (Female): Length of body 2.1–2.8 mm; antennae with 23–24 segments; head 1.9–2.0 times as wide as its length, temples 0.7 times as long as eyes; mesosoma 1.4 times as long as high, anterior margin of radial cell as long as stigma; first and second metasomal tergites with longitudinal striae, third metasomal tergite smooth; length of ovipositor sheath as long as one-third-half of metasoma. Body entirely black, propodeum and mesosoma sometimes dark brown; palps and legs yellowish.

Host record: A parasitoid of *Gymnetron antirrhini* Paykull (Col.: Curculionidae) and *Tischeria ekebladella* Bjerkander (Lep.: Tischeriidae) (Yu *et al.* 2012).

***Triaspis obscurella* (Nees, 1816)**

Material examined: Guilan province: Ghazichak (36°45' N, 50°19' E, 1803 m. a. s. l.), 05.vi.2010, 7♀; Guilan province: Roodsar, Rahim Abad, Ziaz (36°52' N, 50°13' E, 490 m a. s. l.), 04.vii.2010, 2♀; Mazandaran province: Noor, Chamestan, Joorband (36°26'N, 52°07' E, 272m a. s. l.), 27.vi.2011, 1♀, leg.: M. Khayrandish & A. Nadimi.

General distribution: Palaearctic (Yu *et al.* 2012).

Diagnostic characters (Female): Length of body 1.7–2.3 mm; antennae with 20–24 segments; head 2.0–2.1 times as wide as its length, temples 0.8 times as long as eyes; mesosoma 1.5 times as long as high, anterior margin of radial cell as long as stigma; first and second metasomal tergites with longitudinal striae, third metasomal tergite smooth; length of ovipositor sheath as long as metasoma. Body entirely black; palps and legs brownish to dark brownish.

Host record: *Triaspis obscurella* is recorded on different coleopteran families, with most records involving species of Curculionidae (Yu *et al.* 2012).

***Triaspis pallipes* (Nees, 1816)**

Material examined: Guilan province: Ghazichak (36°45'N, 50°19' E, 1803 m. a. s. l.), 22.vi.2010, 1♀; Guilan province: Roodsar, Rahim Abad, Ziaz (36°52'N, 50°13' E, 490 m a. s. l.), 03.vii.2010, 3♀; Mazandaran province: Noor, Chamestan, Joorband (36°26'N, 52°07'E, 272m a. s. l.), 27.vi.2011, 1♀, leg.: M. Khayrandish & A. Nadimi.

General distribution: Palaearctic and Oriental (Yu *et al.* 2012).

Diagnostic characters (Female): Length of body 2.0–2.4 mm; antennae with 22–23 segments; head 2.0–2.1 times as wide as its length, temples 0.8–0.9 times as long as eyes; mesosoma 1.2 times as long as high, anterior margin of radial cell as long as stigma; carapace round, first and second metasomal tergites with longitudinal striae, third metasomal tergite smooth; length of ovipositor sheath as long as mesosoma and metasoma together. Body entirely black; palps and legs brownish to dark brownish.

Host record: *Triaspis pallipes* parasitizes on Curculionidae and Chrysomelidae (Coleoptera) (Yu *et al.* 2012).

***Triaspis thoracica* (Curtis, 1860)**

Material examined: Guilan province: Roodsar, Rahim Abad, Ziaz (36°52' N, 50°13'E, 490 m a. s. l.), 06.xi.2010, 1♀, leg.: M. Khayrandish & A. Nadimi.

General distribution: Neotropical and Western Palaearctic (Yu *et al.* 2012).

Diagnostic characters (Female): Length of body 3.4 mm; antennae with 23 segments; head 1.7 times as wide as its length, temples 1.2 times as long as eyes; mesosoma 1.1 times as long as high, anterior margin of radial cell as long as stigma; first and second metasomal tergites with longitudinal striae, third metasomal tergite smooth; length of ovipositor sheath as long as metasoma and propodeum together. Body with reddish pattern.

Host record: Chrysomelidae (Yu *et al.* 2012).

Discussion

Eight species of the genus *Triaspis* in this study and previous literatures (Gadallah and Ghahari 2013; Farahani *et al.* 2016) are known in Iran. In this study, two species are recorded for the first time for Iran: *Triaspis armeniaca* Tobias 1976 and *Triaspis caudate* Nees, 1816. Two species *T. caudata* Nees, 1816 and *T. complanellae* Hartig, 1847 were collected in both the northern and southern slopes of the Alborz Mountains, but the others (e. g., *T. armeniaca*, *T. obscurella*, *T. pallipes* and *T. thoracica*) found only in northern slopes. *Triaspis caudata* was the most abundant species captured in the five Malaise traps which installed in Qazvin, Guilan and Mazandaran provinces.

The species of the genus *Triaspis* are reported as larval parasitoid of the families Curculionidae, Chrysomelidae, Buprestidae and Anobiidae (Coleoptera) as well as Tischeriidae, Tortricidae and Coleophoridae (Lepidoptera); Chloropidae (Diptera) and Eulophidae (Hymenoptera), which includes important agricultural pests (Yu *et al.* 2012).

Among adjacent countries of Iran, most important studies on the genus *Triaspis* have been done in Russia, which revealed existence of 11 species (Yu *et al.* 2012). Among the species which recorded in our studies from Iran, three species (e.g., *T. caudata*, *T. complanella*, *T. obscurella*) are distributed in the Palaearctic, one species (e.g., *T. pallipes*) from Palaearctic and Oriental and one species (e. g., *T. thoracica*) from Neotropical and western Palaearctic). However, *T. armeniaca* has only been reported from Armenia (Yu *et al.*, 2012). Our finding was also showed that the most abundant species was *T. caudata* (54.55%) followed by *Triaspis obscurella* (Nees, 1816) (20 %) (Table 1). Iran is one of the largest countries in Southwest Asia and considered as a biogeographic multidimensional bridge connecting the Palaearctic, Oriental, and Afrotropical regions (Abivardi 2001). Further studies, in the different parts of Iran are needed to increase our knowledge on the taxonomy of the subfamily Brachistinae.

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مطالعه جنس *Triaspis* Haliday, 1835 (Hymenoptera: Braconidae, Brachistinae) در شمال ایران، به همراه دو رکورد جدید

فاطمه زهرا پیروزه^۱، علی اصغر طالبی^۱، سمیرا فراهانی^۲

۱ گروه حشره شناسی، دانشکده کشاورزی، دانشگاه تربیت مدرس، صندوق پستی ۳۳۶-۱۴۱۱۵، تهران، ایران.

۲ موسسه تحقیقات جنگل ها و مراتع کشور، سازمان تحقیقات، آموزش و ترویج کشاورزی، تهران، ایران

* پست الکترونیکی نویسنده مسئول مکاتبه: talebia@modares.ac.ir

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چکیده: در تحقیق حاضر، وضعیت تاکسونومیک زنبورهای جنس *Triaspis* Haliday, 1835 (Hymenoptera: Braconidae, Brachistinae) مورد ارزیابی قرار گرفت. این تحقیق در شمال ایران طی سال های ۱۳۸۹ تا ۱۳۹۰ انجام شد. شش گونه جمع آوری و شناسایی شد که عبارتند از *Triaspis armeniaca* Tobias, 1976، *T. obscurella*، *T. complanellae* (Hartig, 1847)، *T. caudate* (Nees, 1816) و *T. pallipes* (Nees, 1816) و *T. thoracica* (Curtis, 1860) که از بین آن ها دو گونه *T. armeniaca* و *T. caudate* اولین بار برای فون ایران گزارش می شوند. ویژگی های افتراقی و انتشار جغرافیایی گونه ها ارایه شده است.

واژگان کلیدی: *Triaspis*، Braconidae، Brachistinae، گزارش جدید، ایران