A Checklist of the Trombidioidea (Acari: Prostigmata) of Iran

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Abstract: This paper reviews the research on taxonomy of the Trombidioidea in Iran, with an updated checklist of 32 species (+5 undetermined species) belonging to five families and 22 genera. Among them, 27 species (+1 undetermined species) are reported based on larval only, three undetermined species based on adults only, and six species based on both larval and post-larval stages. Also, 14 species (+3 undetermined species) and 10 genera belonging to the family Trombidiidae, one undetermined species belonging to the family Podothrombiidae, 13 species (+1 undetermined species) and seven genera belonging to the family Microtrombidiidae, three species, three genera belonging to the family Neothrombiidae and two species and one genus belonging to the family Achaemenothrombiidae. Major contributions to the Iranian fauna of the Trombidioidea were made by Alireza Saboori and his colleagues, and Zhi-Qiang Zhang. There have been some studies on the biology and the application of the Trombidioidea in biological control in Iran.

Keywords: velvet mites, larvae, predators, Trombidioidea, ectoparasites, faunistics, biology

Introduction

The Parasitengona is one of the most diverse groups of the Trombidiformes (Zhang, 2010). It includes about 15 superfamilies, over 60 families and 8000 species and includes over half of all species of the Trombidiformes (Smith et al., 2001; Zhang and Fan, 2007; Walter et al., 2009; Zhang, 2010). Mačol & Wohltmann (2012) listed 1784 species of terrestrial Parasitengona excluding Trombiculidae and Walchiidae. Many known species of the Trombidina are water mites (over 6000 species, mostly known from adults) and chiggers (over 2000 species of Trombiculidae and Leewenhoekiidae, mostly known from larvae parasitic on vertebrates). Trombidina except chiggers were mostly described as post-larval forms in early years but larvae have been of interest for description in the last few decades (Zhang, 2010). Kamali et al. (2001) listed 1040 species from 430 genera of Acari of Iran and most of their records were undescribed species which were reported in M. Sc. theses and Ph. D. dissertations. For this reason, we ignored this reference but for described species we used the original papers. Saboori et al. (2007) presented a checklist of terrestrial Parasitengona of Iran including species which were reported until 2005. We hope that this paper will help stimulate further studies of this important group of mites in Iran and also facilitate access to Iranian literature for researchers outside Iran.

Material and Methods

The following abbreviations were used: L = Larva, DN = Deutonymph and AD = Adult.
**Historical review**

**Trombidiidae**

*Allothrombium pulvinum* Ewing, 1917 is the first record of Trombidiidea from Sari, Mazandaran province, Iran (Zhang and Faraji, 1994). Zhang and Norbakhsh (1995) described a new genus *Monotrombium* and three new species of *Allothrombium* as ectoparasites of wheat aphids and presented a key to world larval genera of Trombidiidae and a key to world larval species of *Allothrombium*. Later, one of these species i.e., *A. triticum* was considered as junior synonym of *A. meridionale* Berlese, 1910 by Wohltmann and Mąkol (2009). They added a comment about this synonymy and mentioned both species separately in their checklist (Mąkol & Wohltmann, 2012). *Allothrombium shirazicum* Zhang, 1996 was described as ectoparasite of *Forda marginata* Koch (Pemphigidae) from Shiraz, Fars province (Zhang and Rastegari 1996). Zhang and Rastegari (1996) presented a key to Iranian larval species of *Allothrombium*. Biology of *A. pulvinum* was reported from West Mazandaran by Saboori and Zhang (1996). All active instars of *Trombium southcotti* Zhang and Saboori, 1996 were described from Koliak village, Nowshahr, Mazandaran province and a new host for *Allothrombium triticium* was recorded by Zhang and Saboori (1996a, b).

Description of deutonymph and adult and brief biology of *Allothrombium shirazicum* were reported in 1997–1999, respectively (Saboori and Zhang, 1997; Saboori, 1998, 1999; Saboori & Kamali, 1999). A checklist of Iranian Trombidiidae was presented by Saboori (1998). Adult of *Allothrombium triticum* was described from Tehran (Saboori and Kamali, 2000). Hosseini et al. (2002) investigated host preference of *A. pulvinum* larvae on three aphid species.

Two new genera, *Iranitrombium* and *Azaritrombium* were described from East and West Azerbaijan provinces, respectively (Saboori et al., 2003, 2005). The latter was considered as a junior synonym of *Dolichothrombium* by Mąkol and Sevsay (2011) after rearing its adults in the laboratory. A key to world larval genera of Trombidiidae was presented by Saboori et al. (2003). Preference of adults of *A. pulvinum* for eggs of *Planococcus citri* (Risso) and *Pulvinaria aurantii* Cockerell on citrus leaves was studied by Saboori et al. (2003). Hosseini et al. (2005) studied predation rate, prey preference and functional response of *A. pulvinum* deutonymphs on *Tetranychus urticae* and *Amphitetranychus viciensis*. Saboori et al. (2006) described a new genus and species from larvae ectoparasitic on *Hyalopterus pruni* (Geoffroy) (Hemiptera: Aphididae) from Oskoo, East Azerbaijan province.

Two new species of larval *Trombidium* were described from East Azerbaijan province and a key to Iranian genera of Trombidiidae (larva) was presented (Saboori and Haddad Irani-nejad 2007; Saboori et al. 2008). Saboori and Lazarboni (2008) described a new genus and species, *Cicaditrombium weni* from Astaneh, Markazi province. New morphological data for the larva of *Allothrombium neapolitanum* Oudemans, 1910 has been presented by Saboori et al. (2008) for specimens that were collected from Tonekabon, Mazandaran province. They also presented distribution and host record of *Allothrombium* larvae. Genetic variation in populations of *A. pulvinum* from Northern Iran revealed by mitochondrial coxI and nuclear rDNA ITS2 sequences was studied by Khalili Mahani et al. (2009). Shirafkan et al. (2012) studied proteinase, carbohyrdrase and lipase activities in the gut of *A. pulvinum*.

**Podothrombiidae**

Deutonymph of an undetermined species of *Podothrombius* was collected from soil surface in Koliak village, Nowshahr, Mazandaran province (Saboori 1998; Saboori et al., 2007).

**Microtrombidiidae**

*Willmannella kazerunica* Zhang and Saboori, 1997 is the first record of the family Microtrombidiidae in Iran. It was described as an ectoparasite of an undetermined Diptera from Kazerun, Fars province (Zhang and Saboori, 1997). Saboori et al. (2000) and Saboori and Nemati (2001) described two new
species of *Eutrombidium* from Ahwaz, Khuzestan province as ectoparasite of *Gryllus domesticus* L. and *G. desertus* L. (Orthoptera: Gryllidae), both with deeply cleft lateral coxala I, coxalae II and III. Karimi Irvanlou *et al.* (2000) described three new species of larval *Eutrombidium* from Alborz and Tehran provinces. In 2002, *Trichotrombidium rafieiae* Saboori was described as ectoparasite of a house fly, *Musca domestica* L. (Diptera: Muscidae) and a key to world larval species of *Trichotrombidium* was presented (Saboori 2002a).

Saboori *et al.* (2009) described the first Asian species of the genus *Enemothrombium* from larvae as ectoparasite of undetermined *Chironomidae* (Diptea) from Kaka Reza village, Khorram Abad, Lorestan province and presented a key to world larval species. *Empitrombium pesici* Saboori and Hakimitabar was described as the first non-American species of the genus from larvae reared from eggs in the laboratory at room temperature collected from Ramsar, Mazandaran province (Saboori *et al.*, 2009b). They presented a key to world larval species of *Empitrombium*. A new genus and species, *Persianthrombium farajii* Sedghi, Saboori and Hakimitabar, 2010 was described from larvae ectoparasitic on *Locusta* sp. (Orthoptera: Acrididae) from Jahrom, Fars province and a key to world larval genera of the *Neothrombiidae*. A new species of *Neosilphitrombium* was described from larvae ectoparasitic on *Opatroides punctatus* Brullé, 1832 (Coleoptera: Tenebrionidae) from Mashhad and Gonabad, Khorasan Razavi province by Saboori *et al.* (2011). They presented a key to world larval species of the genus.

**Achaemenothrombiidae**

This family was established by Saboori *et al.* (2010) to accommodate the new genus *Achaemenothrombium*. One species, *A. cyrusi*, was collected as ectoparasite of *Catocala* sp. (Lepidoptera: Noctuidae) from Tehran and another one, *A. talebii* (Karimi Irvanlou and Kamali, 2001) was collected from Varamin, both from Tehran province. A key to families of larval Trombidioidea and to species of *Achaemenothrombium* (larva) is presented as well (Saboori *et al.*, 2010). Saboori *et al.* (2010) suggested that the collection date of the latter may be incorrect while its host record (grasshopper) is correct but collecting an undescribed species of the genus as ectoparasite of a moth (unpublished data) supported this assumption that members of this genus have an association with Lepidoptera and that the host record of *A. talebii* may be incorrect.

**Results**

**Superfamily TROMBIDIOIDEA Leach, 1815**

**Family TROMBIDIIDAE Leach, 1815**

**Subfamily ALLOTHROMBIINAE Thor, 1935**

Genus *Allothrombium* Berlese, 1903

*Allothrombium pulvinum* Ewing, 1917 (AD, DN, L)

New record: Tehran Province.

Previous records: Mazandaran, Guilan, North Khorasan, Razavi Khorasan, West and East
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Azerbaijan and Ardebil provinces (Zhang and Faraji; 1994; Saboori and Zhang, 1996; Saboori, 1998; Khalili Mahani et al., 2009)  
Distribution: UK, Spain, Iran, China, USA (Zhang and Faraji; 1994; Saboori and Zhang, 1996; Saboori, 1998; Haitlinger, 2006a; Saboori et al. 2007, 2008; Khalili Mahani et al., 2009).

A. mossi Zhang, 1995 (L)  
Previous record: Chaharmahal va Bakhtiari Province (Zhang and Norbakhsh, 1995).  
Distribution: Iran.

A. neapolitanum Oudemans, 1910 (L)  
Previous record: Mazandaran province (Saboori et al., 2008).  
Distribution: Italy, Switzerland, Iran (Oudemans, 1910; Makol & Wohltmann, 2012; Saboori et al., 2008).

A. shirazicum Zhang, 1996 (AD, DN, L)  
Previous records: Fars Province (Zhang and Rastegari, 1996), Markazi and Semnan provinces (Saboori, 1999; Saboori and Zhang, 1997; Saboori and Kamali, 1998, 1999).  
Distribution: Iran.

A. triticum Zhang, 1995 (AD, L)  
New records: Alborz and Tehran provinces.  
Previous records: Mazandaran province (Zhang and Saboori, 1996a), Chaharmahal va Bakhtiari province (Zhang and Norbakhsh, 1995).  
Distribution: Turkey (Haitlinger, 2000), Spain (Goldarazena and Zhang, 1997), Greece (Haitlinger, 2006b), Moldova & Ukraine (Haitlinger, 2008), Iran (Zhang and Norbakhsh, 1995; Zhang and Saboori, 1996a; Saboori and Kamali, 2000; Saboori et al., 2008).

Monotrombium simplicium Zhang, 1995 (L)  
New record: East Azerbaijan  
Previous records: Mazandaran (Zhang and Saboori, 1996b).  
Distribution: Iran.

Trombidium southcotti Zhang and Saboori, 1996 (AD, DN, L)  
Previous record: Mazandaran (Zhang and Saboori, 1996b).  
Distribution: Iran.

T. barooghi Saboori and Haddad Irani-nejad, 2007 (L)  
Previous record: East Azerbaijan province (Saboori and Haddad Irani-nejad, 2007).  
Distribution: Iran.

T. payamiensis Saboori, Lotfollahi and Haddad Irani-nejad, 2008 (L)  
Previous record: East Azerbaijan province (Saboori et al., 2008).  
Distribution: Iran.

Cicaditrombium weni Saboori and Lazarboni, 2008 (L)  
New records: Fars and Alborz provinces.  
Previous record: Markazi province (Saboori and Lazarboni, 2008).  
Distribution: Iran.

Subfamily DOLICHOTHROMBIINAE  
Makol, 2007  
Dolichothrombium raphanicum (Saboori, Bagheri and Haddad Irani-nejad, 2005) (L)  
Previous record: East Azerbaijan province (Saboori et al., 2005)  
Distribution: Iran.

Dolichothrombium sp. (AD)  
New record: Tehran province.  
Previous records: North Khorasan and Hormozgan provinces (Saboori et al., 2007).  
Subfamily PARATROMBIINAE Makol, 2007  
Paratrombium sp. (AD)  
Previous records: Mazandaran and Semnan provinces (Saboori et al., 2007).

TROMBIDIIDAE incertae sedis  
Note. Of the following genera and species, the set of characters or the quality of descriptions do not allow appropriate affiliation to any of the subfamilies within Trombidiidae (Makol and Wohltmann, 2012).

Iranitrombium miandoabicum Saboori, Hajiganbar and Haddad Irani-nejad, 2003 (L)  
Previous record: West Azerbaijan (Saboori et al., 2003).  
Distribution: Iran.
Oskootrombium prasadi Saboori, Bagheri and Haddad Irani-nejad, 2006 (L)
Previous records: East Azarbaijan Province (Saboori et al., 2006).
Distribution: Iran.

Family PODOTHROMBIDIIDAE Thor, 1935
Podothrombium sp. (AD, L)
New record: Ardabil province.
Previous record: Mazandaran province (Saboori et al., 2007).

Family MICROTROMBIDIIDAE Thor, 1935
Subfamily VALGOTHROMBIINAE Gabryś, 1999
Enemothrombium Berlese, 1910
E. wohltmanni Saboori, Shojaei and Hakimitabar, 2009 (L)
Previous records: Lorestan province (Saboori et al., 2009).
Distribution: Iran.
Subfamily EUTROMBIDIINAE Thor, 1936
Eutrombidium Thor, 1935
E. djordjevici Saboori and Pešić, 2006 (L)
New records: Markazi, Fars and East Azerbaijan provinces.
Distribution: Iran, Montenegro (Saboori and Pešić, 2006).
E. elburzensis Karimi Irvanlou, Kamali and Talebi, 2000 (L)
Previous records: Alborz and Tehran provinces (Karimi Irvanlou et al., 2000).
Distribution: Iran.
E. fathipouri Karimi Irvanlou, Kamali and Talebi, 2000 (L)
Previous record: Alborz province (Karimi Irvanlou et al., 2000).
Distribution: Iran.
E. mossaedghi Saboori and Nemati, 2001 (L)
Previous record: Khuzestan province (Saboori and Nemati, 2001).
Distribution: Iran.
E. sepasgosariani Saboori, Nemati and Mosaddegh, 2000 (L)
Previous record: Khuzestan province (Saboori et al., 2000).
Distribution: Iran.
E. sorbasiensis Mayoral and Barranco, 2004 (L)
New records: Alborz and Razavi Khorasan provinces.
Previous records: East Azerbaijan province (Azimi et al., 2011).
Distribution: Spain (Mayoral and Barranco, 2004), Iran (Azimi et al., 2011).
E. tehranicum Karimi Irvanlou, Kamali and Talebi, 2000 (L)
Previous records: Tehran and Alborz provinces (Karimi Irvanlou et al., 2000).
Distribution: Iran.
E. aegyptium Karimi Irvanlou, Kamali and Talebi, 2000 (L)
Previous record: Alborz province (Karimi Irvanlou et al., 2000).
Distribution: Iran.

Subfamily MICROTROMBIDIINAE Thor, 1935
Atractothrombium Feider, 1952
Atractothrombium sp. (L)
Previous record: Alborz and Razavi Khorasan provinces (Hakimitabar et al., 2012).
Persianthrombium Sedghi, Saboori and Hakimitabar, 2010
P. farajii Sedghi, Saboori and Hakimitabar, 2010 (L)
Previous records: Fars province (Sedghi et al., 2010).
Distribution: Iran.
Trichotrombidium Kobulej, 1951
T. rafieiae Saboori, 2002 (L)
New record: Tehran province
Previous record: Markazi province (Saboori, 2002).
Distribution: Iran (Saboori, 2002), Montenegro (Saboori and Pešić, 2006).
Willmannella Feider, 1952
W. kazerunica Zhang and Saboori, 1997 (L)
Previous record: Fars province (Zhang and Saboori, 1997).
Distribution: Iran.
Empitrombium Southcott, 1994
E. pesici Saboori and Hakimitabar, 2009 (L)
Previous record: Mazandaran province (Saboori et al., 2009).
Distribution: Iran.
Family NEOTHROMBIIIDAE Feider, 1959

*Neothrombium* Feider, 1959
*N. neglectum* (Bruyant, 1909) (L)

New records: Khuzestan and Golestan provinces.

Previous record: Fars province (Saboori and Ostovan, 2001).

Distribution: Austria (Willmann, 1950), Bulgaria (Berón, 1995), France and Italy (Oudemans, 1912), Germany (Kneissl, 1914), Poland (Haitlinger, 1998; Mażol et al., 2009), Romania (Feider, 1945), former USSR (Feider, 1955), China (Fan, 1984), and Iran (Saboori and Ostovan, 2001). A collection site was not specified in Kneissl (1914) and Feider (1945).

*Southcottella* Saboori, 2002
*S. nematii* Saboori, 2002 (L)

Previous record: Khuzestan province (Saboori, 2002).

Distribution: Iran.

*Neosilphitrombium* Fain, 1992
*N. tenebrionidum* Saboori, Hajiqanbar and Hakimitabar, 2011 (L)

Previous record: Razavi Khorasan province (Saboori et al., 2011).

Distribution: Iran.

Family ACHAEMENOTHROMBIIIDAE

Saboori, Wohltmann and Hakimitabar, 2010
*Achaemenothrombium* Saboori et al., 2010
*A. cyrusi* Saboori et al., 2010 (L)

Previous record: Tehran province (Saboori et al., 2010).

Distribution: Iran.

*A. talebii* (Karimi Irvanlou and Kamali, 2001) (L)

Previous record: Tehran province (Karimi Irvanlou and Kamali, 2001; Saboori et al., 2010).

Distribution: Iran.

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فهرست کندهای بالاخانواده Trombidioidea (Acari: Prostigmata) در ایران

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چکیده: در این مقاله، به‌عوضه‌های مربوط به رده‌بندی بالاخانواده Trombidioidea در ایران به‌همراه فهرست جزئی شده‌ای از 27 گونه (به اضافه 1 گونه شناسایی نشده) متعلق به نوی خانواده و 22 گونه مورد بررسی قرار گرفتند. در میان آنها، 27 گونه (به اضافه 1 گونه شناسایی نشده) هم‌اکنون براساس مرحله لاروی، سه گونه شناسایی نشده نشانه برای بررسی باحال و شش گونه براساس مرحله لاروی و پس‌لاروی گزارش می‌شوند. همچنین 14 گونه (به اضافه 3 گونه شناسایی نشده) و 10 گونه به خانواده Podothrombiidae یک گونه شناسایی نشده به‌خانواده Trombidiidae شناسایی نشده و ۷ گونه به‌خانواده Microtrombidiidae و دو گونه و یک گونه به‌خانواده Achaemenothrombiidae و Neothrombiidae تعلق دارند. کارهای عمدی در مورد فن بالاخانواده Trombidioidea در ایران را صورت‌های همکاران، گزینه‌های زیست‌شناسی و انجام نویزهای طبیعی در زمینه زیست‌شناسی و کاربرد در کنترل بولوژیک در ایران صورت گرفته است.

واژگان کلیدی: کندهای مخلوطی، لاروها، شکارگرها، Trombidioidae، ارگ‌های بروئی، فونیستیک، زیست‌شناسی