

Thrips (Insecta, Thysanoptera) of Iran: a revised and updated checklist

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Abstract

In Iran, as a result of recent changes in nomenclature 201 species and one species group of the insect Order Thysanoptera, are here listed in 70 genera and five families. In considering species listed previously from this country, the presence of 7 species is considered not confirmed, and 12 species are excluded from the Iranian list. Problems in the study of Iranian Thysanoptera are discussed briefly.

Keywords

Iran, list, species, Thysanoptera

Introduction

Iran forms a large part of the Iranian plateau, and covers an area of 1,623,779 km². It is bordered in the north by the Caucasus Mountains, Middle Asian natural regions and the Caspian Sea (-27 m below sea level); in the west by the Anatolian and Mesopotamian regions; in the east by the eastern part of the Iranian plateau (Afghanistan and adjacent west Pakistan) and the Baluch-Sindian region; and finally in the south by the Persian Gulf and Oman Sea, which are connected by the latter to the Indian Ocean (Zehzad et al. 2002).

In Iran, the first record of thrips species was of three species, *Frankliniella intonsa* (Trybom), *Thrips flavus* Schrank and *T. tabaci* Lindeman, as pests of summer crops (Afshar 1938), and after that there were several scattered studies of this group in vari-

ous parts of this country. Recently the extensive Iranian literature on these insects was summarised by Bhatti et al. (2009a), who listed 177 species in 62 genera. However that checklist needs further consideration for four reasons:

1. The checklist by Bhatti et al. (2009a) covers the literature until 2007 and since then several important works on Thysanoptera of Iran have been published, including a further 13 genera and 38 species recorded or described. Moreover, a few recent name changes have become available.
2. There are some misinterpretations of “Iranian Persian literature” in Bhatti et al. (2009a). Thus a few species have appeared in Iranian literature as potential pests or as exotic pests without any supporting data or records from Iran.
3. Bhatti et al. (2009a) did not employ the standard suprageneric classification of Thysanoptera, so the utility of the checklist for students is limited.
4. The restricted distribution of the journal in which the book (Bhatti et al. 2009a) was published limits its utility to entomologists in Iran as well as the world.

Thrips studies in Iran: problems

Relevant information about thrips species recorded from Iran is severely lacking. For example, until the end of 2007, 187 primary references had been published on Iranian Thysanoptera, but, of these, 123 (65%) appeared only as “abstracts”. Almost all of these consisted solely of species lists, without any further information being provided as to the number of collected specimens, their sex, or the habitats in which the species were collected. In one of these abstracts (Mortazaviha 1995) even the specific locality where the species were collected is not given, and for 15 thrips species collection details are restricted to the country “Iran”. A further problem is the difficulty in tracing collections in which relevant voucher specimens were placed; and for many species there appear to be no extant voucher specimens. For example, *Haplothrips minutus* was recorded by Kheyrandish Koshkoei et al. (2000), but when asked for a loan of material Kheyrandish Koshkoei (personal communication, 2006) responded that he did not have access to any specimens of that species. Similarly, two papers (Mehrnejad and Panahi 2006; Kazemi and Mehrnejad 2011) concerning the biology and pest status of *Liothrips austriacus* (Karny) have been published from work carried out at the “Pistachio Research Institute” in Rafsenjan, Kerman Province, but no specimens of that species are available from that Institute at present (F. Kazemi, personal communication, 2013). Furthermore, in recent years Majid Mirab-balou has described or recorded several thrips species from Iran, but the specimens (including type specimens) have been deposited in China (Mirab-balou and Chen 2012a, b).

The third problem, related to the above, is imprecise reporting by Iranian authors. Several species have been reported from Iran despite the original specific identifications on which these reports are based remaining tentative. For example, the Iranian

records for three *Haplothrips* species reported by Bagheri and Alavi (2007) are based on specimens identified by zur Strassen as “perhaps” those species (Minaei and Mound 2008). Similarly, three *Aeolothrips* species recorded by Fallahzadeh et al. (2011) were only tentatively identified to species by Bhatti (Minaei 2013a).

A revised checklist of Thysanoptera from Iran

The following checklist is organized following the standard taxonomic hierarchy, and is based on published literatures including Bhatti et al. (2009a). For each suprageneric category a brief description is provided based largely on the Iranian fauna. Higher level taxonomy in the checklist follows Mound (2011a). Nomenclature follows that used in a web-based world checklist (ThripsWiki 2013), which should also be referred to for full synonymies for the names listed here. The checklist includes references for all additions and changes in taxonomic status or changes in synonymy made since the publication of the previous checklist by Bhatti et al. (2009a), and the symbol + is used to indicate these changes.

Suborder Terebrantia

The Terebrantia comprises eight families (Mound 2011a) of which four (Aeolothripidae, Melanthripidae, Stenurothripidae, Thripidae) are represented in Iran. Terebrantia species are largely phytophagous, feeding in flowers and on leaves.

Family Aeolothripidae

The family includes 194 extant species in 23 genera (ThripsWiki 2013), mostly from the temperate areas of the northern and southern hemispheres. Adults and larvae of many species in this family appear to be facultative predators of other small arthropods, in that they feed on both floral tissues as well as on thrips and mites that live in flowers. However, some species are almost certainly solely phytophagous, a few being univoltine in flowers of particular plant species (Tyagi et al. 2008), whereas in the warmer parts of the world, a considerable number of species are obligate predators (Hoddle 2003).

In this family, the most species-rich genus, *Aeolothrips* was interpreted by Bhatti (1988) in a different way to other specialists, with *Aeolothrips* restricted to *albicinctus* Haliday. Bhatti's interpretation put all other species from the original genus into four further genera (*Arabthrips* Bhatti, *Coleothrips* Haliday, *Fabothrips* Bhatti, *Podaeolella* Priesner). In this paper, that interpretation is not accepted. Four genera including 23 species are recognized in this family in Iran.

***Aeolothrips* Haliday, 1836**

- + *afghanus* Jenser, 1984 male described by Minaei et al. (2013)
albicinctus Haliday, 1836
collaris Priesner, 1919
+ *cursor* Priesner, 1939 added by Mirab-balou and Chen (2012c)
deserticola Priesner, 1929
+ *eremicola* Priesner, 1938 added by Zolfaghari et al. (2012); male described by Alavi et al. (2013)
fasciatus (Linnaeus, 1758)
gloriosus Bagnall, 1914
heinzi zur Strassen, 1990
intermedius Bagnall, 1934
+ *modestus* zur Strassen, 1966 added by Minaei (2013a)
mongolicus Pelikan, 1985
+ *montivagus* Priesner, 1948 added by Mirab-balou and Chen (2012c)
tenuicornis Bagnall, 1926
versicolor Uzel, 1895
+ *wittmeri* Priesner, 1935 added by Alavi et al. (2012)
+ *zurstrasseni* Minaei described by Minaei (2013a)

***Indothrips* Bhatti, 1967**

- bhushani* Bhatti, 1967

***Orothrips* Moulton, 1907**

- priesneri* (Titschack, 1958)

***Rhipidothrips* Uzel, 1895**

- brunneus* Williams, 1913
flavus Tunç, 1991
gratiosus Uzel, 1895
unicolor zur Strassen, 1965

Family Melanthripidae

Melanthripids were considered to be members of the Aeolothripidae until recently. The family now includes 66 extant species in four genera: *Ankothrips* (13 species), *Cranothrips* (11 species), *Dorythrips* (6 species) and *Melanthrips* (35 species). All species in the family are flower-feeding but each genus exhibits a remarkable discontinuity in geographical distribution: *Cranothrips* and *Dorythrips* are known only from the Southern Hemisphere, whereas *Ankothrips* and *Melanthrips* are mainly from the Northern Hemisphere but each with one or two species from South Africa (Pereyra and Mound 2009, Hoddle et al. 2013). In Iran, seven species in two genera have been recorded.

Ankothrips Crawford, 1909

+ *zayandicus* Minaei, Haftbaradarn & Mound, 2012 described by Minaei et al. (2012)

Melanthrips Haliday, 1836

fuscus (Sulzer, 1776)

+ *hei* Mirab-balou & Chen, 2012 described by Mirab-balou and Chen (2012a)

knechteli Priesner, 1936

pallidior Priesner, 1919

rivnayi Priesner, 1936

separandus Priesner, 1936

Family Stenurothripidae

The extant species in this group were placed in the family Adiheterothripidae (Bhatti 1986), but this is now considered a synonym of Stenurothripidae (Bhatti 2006). The three extant genera of this family occur in California and in the Mediterranean region through to India (Mound and Marullo 1999). The species in this family apparently all breed in flowers, and they probably have a high degree of host specificity. All four species of *Holarthrothrips* breed in the male flowers of date palms and its relatives (Mound et al. 2013b). Only one species is recorded in Iran.

***Holarthrothrips* Bagnall, 1927**

josephi Bhatti, 1986

Family Thripidae

Thripids include 2020 species in 284 genera worldwide (ThripsWiki 2013). Most of them are phytophagous on higher plants, with a few species on ferns (Mound 2002), and a few are obligate predators (Mound 2011b). However, some polyphagous pest thrips such as *Frankliniella occidentalis* and *Thrips tabaci* can behave as facultative predators (Wilson et al. 1996). One genus in Brazil comprises species that are ectoparasitic on Hemiptera (Cavalleri et al. 2010). Four subfamilies within the Thripidae are currently recognized worldwide, and each of these is represented in Iran.

Thripidae—Dendrothripinae

More than 90 species, in 11 genera, are recognized worldwide in this subfamily (ThripsWiki 2013). All of the species live on leaves. Five species in two genera have been recorded in Iran.

Dendrothrips* Uzel, 1895degeeri* Uzel, 1895*karnyi* Priesner, 1921*phyllireae* (Bagnall, 1927)*saltator* Uzel, 1895***Pseudodendrothrips* Schmutz, 1913***mori* (Niwa, 1908)**Thripidae—Panchaetothripinae**

Wilson (1975) provided an account of the members of this subfamily that is now considered to include 136 species in 38 genera. The species in this subfamily are all leaf feeding usually associated with older, senescing leaves (Mound et al. 2013b). Seven species in six genera have been found in Iran so far.

Caliothrips* Daniel, 1904impurus* (Priesner, 1928)+ *quadrifasciatus*

the species is recorded as *Caliothrips graminicola* Bagnall & Cameron, 1932 in Iranian literature

Heliothrips* Haliday, 1836haemorrhoidalis* (Bouche, 1833)***Parthenothrips* Uzel, 1895***dracaenae* (Heeger, 1854)***Retithrips* Marchal, 1910***syriacus* (Mayet, 1890)***Rhipiphorothrips* Morgan, 1913***cruentatus* Hood, 1919***Selenothrips* Karny, 1911**+ *rubrocinctus* (Giard, 1901)

added by Mirab-balou and Chen (2012d)

Thripidae—Sericothripinae

This group is treated as a subfamily of Thripidae to include three genera: *Hydatothrips* Karny, *Neohydatothrips* John, *Sericothrips* Haliday (ThripsWiki 2013). This subfamily

includes 148 species worldwide, and these are usually found in association with flowers but with some species breeding on leaves (Mound and Tree 2009). Bhatti (2006) proposed *Papiliothrips* as a new genus and transferred *Neohydatothrips gracilicornis* and two species of *Sericothrips* to the genus, but this is not accepted here. Two species in one genus are reported in Iran so far.

***Neohydatothrips* John, 1929**

gracilicornis (Williams, 1916)

tadzhicus (Pelikan, 1964)

Thripidae—Thripinae

This is the largest group of Thripidae with 1644 species in 232 genera (ThripsWiki 2013). The species exhibit a wide range of biologies, and most of the species of thrips regarded as pests are included in this subfamily (Mound 1997). Bhatti et al. (2009a) synonymized *Chirothrips aculeatus* Bagnall with *Chirothrips pedestris* (Karny). However, this was not accepted by other researchers (Minaei and Mound 2010a). Moreover, in contrast to zur Strassen (2003) and Bhatti et al. (2009a), three *Chirothrips* species recorded in Iran (*africanus* Priesner, *manicatus* (Haliday), *pallidicornis* Priesner), together with *ammophilae* Bagnall, were placed in a *manicatus* species group by Minaei and Mound (2010a) due to the difficulty in separating them from each other by morphological characters, and this approach is accepted here. Two species listed under the genus *Thrips*, *T. iranicus* Yakhontov and *T. pistaciae* Yakhontov, are not recognizable at present due to the poor descriptions (see Bhatti et al. 2009a). In addition, *T. fraudulentus* (Priesner) is very similar to *T. atratus* Haliday. Laurence Mound (personal communication 2010) examined the holotype of *fraudulentus* in the Forschungsinstitut Senckenberg, Frankfurt, and although there are differences in the lengths of the antennae the recognition of *fraudulentus* as a distinct species remains doubtful. In Iran, 110 species and one species-group in 35 genera in this subfamily are recognized.

***Agalmothrips* Priesner, 1965**

parviceps (Priesner, 1965)

***Anaphothrips* Uzel, 1895**

+ *obscurus* (Müller, 1776)

sudanensis Trybom, 1911

male described by Mirab-balou and Chen (2010)

***Aptinothrips* Haliday, 1836**

elegans Priesner, 1924

rufus (Haliday, 1836)

stylifer Trybom, 1894

Arorathrips Bhatti, 1990

+ *mexicanus* (Crawford DL, 1909) added by Minaei and Alichì (in press)

Bregmatothrips Hood, 1912

bournieri Pelikan, 1988

Chirothrips Haliday, 1836

aculeatus (Bagnall, 1927)

+ *atricorpus* (Girault, 1927)

stat. rev. by Minaei and Mound (2010a)

kurdistanus zur Strassen, 1967

+ *manicatus* species-group

defined by Minaei and Mound (2010a)

+ *maximi* Ananthakrishnan, 1957

added by Mirab-balou et al. (2013)

+ *meridionalis* Bagnall, 1927

stat. rev. by Minaei and Mound (2010a)

molestus Priesner, 1926

Collembolothrips Priesner, 1935

mediterraneus Priesner, 1935

Drepanothrips Uzel, 1895

reuteri Uzel, 1895

Eremiothrips Priesner, 1950

antilope (Priesner, 1923)

arya (zur Strassen, 1975)

+ *bhattii* Minaei, 2012

described by Minaei (2012)

dubius (Priesner, 1933)

efflatouni (Priesner, 1965)

farsi Bhatti & Telmadarraiy, 2003

shirabudinensis (Yakhontov, 1929)

+ *similis* Bhatti, 1988

added by Ramezani et al. (2009)

taghizadehi (zur Strassen, 1975)

tamaricis (zur Strassen, 1975)

varius (Bhatti, 1967)

+ *zurstrasseni* Bhatti, Bagheri & Ramezani, 2009 described by Bhatti et al. (2009b)

Euphysothrips Bagnall, 1926

minozzii Bagnall, 1926

Exothrips Priesner, 1939

redox Bhatti, 1975

Ficothrips Minaei, 2012

+ *moundi* Minaei, 2012

described by Minaei (2012a)

Frankliniella Karny, 1910

- intonsa* (Trybom, 1895)
occidentalis (Pergande, 1895)
pallida (Uzel, 1895)
schultzei (Trybom, 1910)
tenuicornis (Uzel, 1895)

Kakothrips Williams, 1914

- + *dentatus* Knechtel, 1939 added by Mirab-balou and Chen (2011a)
pisivorus (Westwood, 1880)
priesneri Pelikan, 1965

Limothrips Haliday, 1836

- angulicornis* Jablonowski, 1894
+ *cerealium* (Haliday, 1836) added by Mirab-balou et al. (2013)
denticornis (Haliday, 1836)
schmutzi Priesner, 1919
transcaucasicus Savenko, 1944

Megalurothrips Bagnall, 1915

- + *distalis* (Karny, 1913) added by Mirab-balou and Chen (2011b)

Microcephalothrips Bagnall, 1926

- abdominalis* (Crawford DL, 1910)

Mycterothrips Trybom, 1910

- consociatus* (Targioni-Tozzetti, 1887)
+ *hamedaniensis* Mirab-balou, Shi & Chen, 2011 described by Mirab-balou et al. (2011)
latus (Bagnall, 1912)
salicis (Reuter, 1879)
tschirkunae (Yakhontov, 1961)
+ *weii* Mirab-balou, Shi & Chen, 2011 described by Mirab-balou et al. (2011)

Odontothrips Amyot & Serville, 1843

- confusus* Priesner, 1926
loti (Haliday, 1852) added by Mirab-balou and Chen (2011b)
meliloti Priesner, 1951
phlomidinus Priesner, 1954

Oxythrips Uzel, 1895

- + *claripennis* Priesner, 1940 added by Mirab-balou and Chen (2013)
halidayi Bagnall, 1924

retamae (Priesner, 1934)
ulmifoliorum (Haliday, 1836)
wiltshirei Priesner, 1954

***Parascolothrips* Mound, 1967**

priesneri Mound, 1967

***Pezothrips* Karny, 1907**

bactrianus (Pelikan, 1968)

***Psilothrips* Hood, 1927**

bimaculatus (Priesner, 1932)

***Rubiothrips* Schliephake, 1975**

+ *parisae* Mirab-balou & Chen, 2013 described by Mirab-balou and Chen (2013)
 + *tongi* Mirab-balou & Chen, 2013 described by Mirab-balou and Chen (2013)
 + *vitalbae* (Bagnall, 1926) added by Mirab-balou and Chen (2013)
vitis (Priesner, 1933)

***Scirtothrips* Shull, 1909**

mangiferae Priesner, 1932

***Scolothrips* Hinds, 1902**

latipennis Priesner, 1950
longicornis Priesner, 1926
rhagebianus Priesner, 1950

***Sitothrips* Priesner, 1931**

arabicus Priesner, 1931

***Sphaeropothrips* Priesner, 1928**

vittipennis (Bagnall, 1927)

***Stenchaetothrips* Bagnall, 1926**

+ *biformis* (Bagnall, 1913) added by Mirab-balou and Chen (2011a)

***Stenothrips* Uzel, 1895**

graminum Uzel, 1895

***Taeniothrips* Amyot & Serville, 1843**

inconsequens (Uzel, 1895)

Tamaricothrips Priesner, 1964*tamaricis* (Bagnall, 1926)**Tenothrips Bhatti, 1967***discolor* (Karny, 1907)*frici* (Uzel, 1895)*latoides* (Pelikan, 1968)*reichardti* (Priesner, 1926)**Thermothrips Pelikan, 1949**+ *mohelensis* (Pelikan, 1949)

added by Mirab-balou and Chen (2013)

Thrips Linnaeus, 1758*alavii* Mirab-balou, Tong & Chen, 2012 described by Mirab-balou et al. (2012b)*albopilosus* Uzel, 1895+ *alliorum* (Priesner, 1895)

added by Mirab-balou et al. (2012b)

angusticeps Uzel, 1895*atratus* Haliday, 1836+ *australis* Bagnall, 1915

added by Minaei (2012b)

dubius Priesner, 1927*euphorbiae* Knechtel, 1923*flavus* Schrank, 1776*fraudulentus* (Priesner, 1954)*fuscipennis* Haliday, 1836*hawaiiensis* (Morgan, 1913)*iranicus* Yakhontov, 1951*major* Uzel, 1895*mareoticus* (Priesner, 1932)*meridionalis* (Priesner, 1926)*minutissimus* Linnaeus, 1758*nigropilosus* Uzel, 1895*pelikani* Schliephake, 1964*physapus* Linnaeus, 1758*pillichi* Priesner, 1924*pistaciae* Yakhontov, 1951*simplex* (Morison, 1930)*tabaci* Lindeman, 1889*trehernei* Priesner, 1927*verbasci* (Priesner, 1920)*vuilleti* (Bagnall, 1933)*vulgatissimus* Haliday, 1836

Suborder Tubulifera- Family Phlaeothripidae

Only a single family is recognized in this suborder, the Phlaeothripidae, with two subfamilies, Idolothripinae and Phlaeothripinae. Species of Phlaeothripidae are diverse in their biologies. Idolothripinae are all considered to feed on fungal spores (Mound and Palmer 1983). In the Phlaeothripinae, three “lineages” (*Haplothrips*, *Liothrips* and *Phlaeothrips*) have been recognized (Mound and Marullo 1996). The *Haplothrips* lineage is now well defined as the tribe Haplothripini (Mound and Minaei 2007, Minaei and Mound 2008). Members of this tribe are usually phytophagous, but some *Haplothrips* species are predators on other small arthropods, and one unusual Haplothripine species has been demonstrated to be a predator of the eggs of social wasps (Cavalleri et al. 2013). Members of the “*Phlaeothrips* lineage” are fungus feeders on fungal hyphae (Mound et al. 2013a). Species in the “*Liothrips* lineage” are leaf-feeding on the leaves of shrubs and trees, and many of these are involved in the induction of galls on leaves (Ananthakrishnan and Raman 1989). Four species in four genera of Idolothripinae, and 41 species in 15 genera of Phlaeothripinae, are recognized in Iran.

Subfamily Idolothripinae

Allothrips Hood, 1908

+ *pillichelus bournieri* Mound, 1972 added by Minaei (2011)

Compsothrips Reuter, 1901

albosignatus (Reuter, 1884)

Megathrips Targioni-Tozzetti, 1881

flavipes (Reuter, 1901)

Pseudocryptothrips Priesner, 1919

meridionalis Priesner, 1919

Subfamily Phlaeothripinae

Tribe Haplothripini

Bagnalliella Karny, 1920

+ *yuccae* (Hinds, 1902) added by Mirab-balou et al. (2012a)

Dolicholepta Priesner, 1932

micrura (Bagnall, 1914)

Haplothrips Amyot & Serville, 1843

- aculeatus* (Fabricius, 1803)
andresi Priesner, 1931
clarisetis Priesner, 1931
distinguendus (Uzel, 1895)
eragrostidis Priesner, 1931
flavicinctus (Karny, 1910)
flavitibia Williams, 1916
ganglbaueri Schmutz, 1913
globiceps (Bagnall, 1934)
+ *herajius* Minaei & Aleosfoor, 2013 described by Minaei and Aleosfoor (2013)
kermanensis zur Strassen, 1975
kurdjumovi Karny, 1913
leucanthemi (Schrank, 1781)
maroccanus Priesner, 1950
phyllophilus Priesner, 1914
reuteri (Karny, 1907)
subtilissimus (Haliday, 1852)
tamaricinus Priesner, 1939
tritici (Kurdjumov, 1912)
vuilleti Priesner, 1920

Neobeegeria Schmutz, 1909

- dalmatica* Schmutz, 1909
gigantea (Priesner, 1934) added by Minaei and Behmanesh (2012)
persica Priesner, 1954

Plicothrips Bhatti, 1979

- apicalis* (Bagnall, 1915)

Liothrips lineage**Ataliothrips Bhatti, 1995**

- reuteri* (Bagnall, 1913)

Cephalothrips Uzel, 1895

- coxalis* Bagnall, 1926
monilicornis (Reuter, 1885)

Liothrips Uzel, 1895

- austriacus* (Karny, 1909)
jakhontovi Kreutzberg, 1955
pragensis Uzel, 1895
setinodis (Reuter, 1880)

Phlaeothrips* lineage**Aleurodothrips* Franklin, 1909**+ *fasciapennis* Franklin, 1909

added by Mirab-balou and Chen (2012b)

***Hindsiothrips* Stannard, 1958**+ *sisakhti* Minaei, 2013

described by Minaei (2013b)

Hoplandrothrips* Hood, 1912bidens* (Bagnall, 1910)*hungaricus* Priesner, 1961***Hoplothrips* Amyot & Serville, 1843**

+ An unknown species

added by Jalali Sandi et al. (2011)

Idiothrips* Faure, 1933**+ *bellus* Faure, 1933*Idiothrips ficus* Bhatti, 1967 is synonymized with *bellus* by Minaei (2013b)Phlaeothrips* Haliday, 1836***coriaceus* Haliday, 1836***Stictothrips* Hood, 1924***faurei* Hood, 1924**Unconfirmed Thysanoptera species****Aeolothripidae*****Aeolothrips***

Cheraghian and Barimani Varandi (2000) reported *A. insularis* Priesner from Iran based on a specimen identified by zur Strassen as “near *insularis*” (e-mail from zur Strassen to Bhatti, see Bhatti et al. 2009a). Therefore, the record of *Aeolothrips insularis* in Iran is doubtful (see also Bhatti et al. 2009a). Moreover, the records of two other species in the genus, *balati* Pelikan and *citricinctus* Bagnall from Iran are also not confirmed (see Minaei 2013a).

Phlaeothripidae

Haplothrips

The report of *H. minutus* (Uzel) from Iran is based on specimens identified by zur Strassen with a query (?). Similarly, the reports of three other species of *Haplothrips*, (*caespitis* Priesner, *longipes* Bagnall, and *rabinovitchi* Priesner) from Iran have also not been confirmed (Minaei and Mound 2008).

Species removed from the Iranian Thysanoptera list

Thripidae

***Caliothrips striatopterus* (Kobus, 1892):** this species was recorded by Manzari (2004) in an informal newsletter as a cursory report, and so is excluded from the Iranian list (see also Bhatti et al. 2009a, Minaei and Aleosfoor 2013).

***Chaetanaphothrips* Haliday, 1836**

The only mention of this genus in an Iranian context appeared in a text book (Esmaili 1983) with these thrips noted as potential pests in the north of Iran, but no species was recorded. The species in the genus are widespread in tropical and subtropical countries, and also in greenhouses in temperate areas including Europe (zur Strassen 2003); it is possible the genus may be found in Iran as well. However, at present there is no evidence to indicate the occurrence of any species of the genus in Iran.

Frankliniella

***cephalica* (Crawford DL, 1910):** the species appeared in the Iranian literature as a potential pest in the north of Iran but with no recorded details of occurrence (Esmaili 1983). *F. cephalica* has been recorded between Bermuda and Trinidad, and in Mexico and Colombia as well as Japan and Taiwan (Hoddle et al. 2013).

***sulphurea* Schmutz, 1913:** the species is considered as a good species by Bhatti et al. (2009a), but is usually considered a synonym of *schultzei*. The body colour in *schultzei* is variable and the species has 17 synonyms from various tropical countries around the world (Cavalleri and Mound 2012).

***tritici* (Fitch, 1855):** the species appeared in the Iranian literature as an external plant quarantine element (but not recorded) (Salavatian 1996). *F. tritici* is widespread in North America (Hoddle et al. 2013).

***Scirtothrips citri* (Moulton, 1909)**: the Californian citrus thrips was mentioned in the text book by Esmaili (1983) in which the author described damage to the flowers, leaves and fruits of citrus plants. However, no evidence was provided concerning the presence of this species in Iran. In addition to California, the species has been found in Arizona and Mexico (Hoddle et al. 2013).

***Scolothrips sexmaculatus* (Pergande, 1890)**: the species was first reported from Iran by Shishehbor (1991) based on specimens that were not authentically determined. The name was used subsequently by a few other Iranian authors. The species identified has been recorded with certainly only from North America (including California) (Hoddle et al. 2013). According to Mound (2011b), Old World records probably all refer to *S. rhagebianus*, which has been recorded in Iran (see also Bhatti et al. 2009a).

***Thrips coloratus* Schmutz, 1913**: the species was recorded by Manzari (2004) in an informal newsletter as a cursory report and although potentially it might occur in Iran (zur Strassen 2003), it is excluded here.

Phlaeothripidae

Haplothrips

***bagnalli* (Trybom, 1910)**

nr. *bagrolis* Bhatti, 1973

***cerealis* Priesner**

The first two species listed above have already been excluded from the Iranian list by Minaei and Aleosfoor (2013), whilst the third is a misidentification of *Haplothrips tritici* (Kurdjumov) (Minaei and Mound 2008). There is no evidence of the presence of *cerealis* in Iran (Minaei and Mound 2010b).

***rasouliani* Mirab-balou & Chen**: this name recently appeared in a paper (Mirab-balou et al. 2012c) but it is not available under the terms of the International Commission on Zoological Nomenclature International Commission on Zoological Nomenclature according to article 8.1, and so it is excluded here.

Discussion

Knowledge of the natural biological systems of Iran is variable. Despite excellent floristic studies, such as Flora Iranica that now provides an identification system to more than 10,000 plant species (Rechinger 1989), comprehensive studies on the insect fauna of this country are lacking. Iran, in particular, is a bridge between the faunas of the European and Oriental Realms, and this produces considerable difficulties in studying any single group. In addition, the number of species recorded from any given

area in this country almost totally depends on where particular specialists have lived or spent their careers. Consequently, field sampling of the thrips fauna of Iran has been uneven across the various Provinces, and so the results do not necessarily represent the biological diversity of any given area. Although there are a few thrips (especially those that are well known as crop pests) that are found almost all over Iran, several Provinces have yet to be surveyed for their thrips fauna. Even in those Provinces that have been apparently well-surveyed, there are still thrips species remaining to be discovered. For instance, Fars Province has been surveyed for at least 14 years continuously yet there are still several examples of recently collected material from the Province in the Collection of Department of Plant Protection, Shiraz University, that represent unrecorded, or even undescribed species. Despite this, faunistic knowledge of these tiny insects in Iran is better than in neighbouring countries, presumably due to political unrest in most of the neighbouring countries.

Although the fauna of Iran shares many species with the European Mediterranean region, other areas have a considerable effect on the Iranian fauna. For example, among the 125 species from the family Thripidae recorded here, 91 are also present in the European Mediterranean area (zur Strassen 2003). Of the remaining species, 11 have been described from Iran and most of the other 23 species are from the Oriental.

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References

- Afshar DJ (1938) Pests of summer crops, vegetables, industrial plants and forages in Iran and their control. Ministry of Agriculture, Tehran, Iran, 124 pp.
- Alavi J, Fekrat L, Modarres Awal M, Zolfaghari M, Minaei K (2013) *Aeolothrips eremicola* (Thysanoptera, Aeolothripidae): first record of the male from Iran. *Zootaxa* 3683: 289–291. <http://biotaxa.org/Zootaxa/article/view/zootaxa.3683.3.5>, doi: 10.11646/zootaxa.3683.3.5
- Alavi J, Mosallaei MK, Sajjadi M (2012) First report of *Aeolothrips wittmeri* (Thysanoptera: Aeolothripidae) from Iran. *Proceeding of the 20th Iranian Plant Protection Congress. Plant Diseases, Weed Science, Entomology, Acarology, Zoology*, 195.
- Ananthakrishnan TN, Raman A (1989) Thrips and gall dynamics. Oxford & IBH Publ. Co. 120pp.
- Bagheri S, Alavi J (2007) New records of 20 species Thysanoptera on forest and rangeland plants for Iran and Khuzestan province. *Proceedings of the 17th Iranian Plant Protection Congress, Tehran, Karaj*, 78.

- Bhatti JS (1986) A new species of *Holarthrothrips* from Iraq, with notes on host plants and key to species, along with clarification of the position of this genus among Thysanoptera. *Zoology (Journal of Pure and Applied Zoology)* 1: 1–33.
- Bhatti JS (1988) The orders Terebrantia and Tubulifera of the superorder Thysanoptera (Insecta). A Critical Appraisal. *Zoology (Journal of Pure and Applied Zoology)* 1: 167–240.
- Bhatti JS (2006) The classification of Terebrantia (Insecta) into families. *Oriental Insects* 40: 339–375. doi: 10.1080/00305316.2006.10417487
- Bhatti JS, Alavi J, zur Strassen R, Telmadarraiy Z (2009a) Thysanoptera in Iran 1938–2007. An Overview. Part 1. *Thrips* 7–8: 1–373.
- Bhatti JS, Bagheri S, Ramezani L (2009b) A new species of *Eremiothrips* (Insecta: Terebrantia: Thripidae) from Khuzestan province in Iran. *Thrips* 10: 1–23.
- Bhatti JS, Telmadarraiy Z, Kumar V, Tyagi K (2003) Species of *Eremiothrips* in Iran (Terebrantia: Thripidae). *Thrips* 2: 49–110.
- Cavalleri A, Kaminski LA, Mendonca Jr MS (2010) Ectoparasitism in *Aulacothrips* (Thysanoptera: Heterothripidae) revisited: host diversity on honeydew-producing Hemiptera and description of a new species. *Zoologischer Anzeiger* 249: 89–101. doi: 10.1016/j.jcz.2010.09.002
- Cavalleri A, Mound LA (2012) Toward the identification of *Frankliniella* species in Brazil (Thysanoptera, Thripidae). *Zootaxa* 3270: 1–30. <http://www.mapress.com/zootaxa/2012/ft/zt03270p030.pdf>
- Cavalleri A, Souza AR, Prezotto F, Mound LA (2013) Egg predation within the nests of social wasps: a new genus and species of Phlaeothripidae, with consideration of the evolutionary consequences of Thysanoptera invasive behaviour. *Biological Journal of the Linnean Society* 109: 332–341. doi: 10.1111/bij.12057
- Cheraghian A, Barimani Varandi H (2000) First record of three species of Thysanoptera in the north of Iran. *Proceedings of the 14th Iranian Plant Protection Congress, Vol. 1*: 297.
- Esmaili M (1983) *Important Pests of Fruit Trees*. Sepehr Publishing, Tehran, 578 pp.
- Fallahzadeh M, Azarmi E, Saghaei N, Alemansoor H, Alavi J (2011) Faunistic survey of Thysanoptera in Fars province, Iran. *Munis Entomology & Zoology* 6: 251–261. <http://www.munisentzool.org/yayin/vol6/issue1/251-261.pdf>
- Hoddle MS (2003) The effect of prey species and environmental complexity on the functional response of *Franklinothrips orizabensis*: a test of the fractal foraging model. *Ecological Entomology* 28: 309–318. doi: 10.1046/j.1365-2311.2003.00518.x
- Hoddle MS, Mound LA, Paris D (2013) *Thrips of California* 2012. http://keys.lucidcentral.org/keys/v3/thrips_of_california/Thrips_of_California.html [accessed 5.vii.2013]
- Jalali Sendi J, Zibae I, Minaee K (2011) An Investigation on thrips fauna of Guilan province, north of Iran (Insecta: Thysanoptera). *Munis Entomology & Zoology* 6: 325–329. <http://www.munisentzool.org/yayin/vol6/issue1/325-329.pdf>
- Kazemi F, Mehrnejad MR (2011) Population fluctuations and damage of the pistachio fruit thrips, *Liothrips austriacus* (Thy.: Phlaeothripidae) on *Pistacia vera* and *Pistacia atlantica*, subspecies *P. mutica* in Rafsanzan. *Iranian Journal of Forest and Range Protection Research* 8: 165–177. [in Persian]

- Kheyrandish Koshkoei M, Moharramipour S, Kamali K (2000) A report on Thysanoptera sub-order Tubulifera in Kerman and records of three new species for Iran fauna. Proceedings of the 14th Iranian Plant Protection Congress, Vol. I, 354.
- Manzari S (2004) Report of three species of thrips from Iranian islands in Persian Gulf. Newsletter of Entomological Society of Iran 21: 2. [in Persian]
- Mehrnejad MR, Panahi B (2006) The influence of hull cracking on Aflatoxin contamination and insect infestation in pistachio nuts. Applied Entomology and Phytopathology 73: 105–123. [in Persian]
- Minaei K (2011) Fungal spore-feeding thrips (Thysanoptera: Phlaeothripidae: Idolothripinae) from Iran with record of a fourth genus. Journal of Insect Science 11: 1–5. <http://www.insectscience.org/11.51/i1536-2442-11-51.pdf>, doi: 10.1673/031.011.5101
- Minaei K (2012a) *Ficothrips*, a new genus of Thripinae Thysanoptera from Iran. Zootaxa 3361: 63–68.
- Minaei K (2012b) First report of an endemic Australian thrips, *Thrips australis* (Thysanoptera: Thripidae) on *Eucalyptus* in Shiraz, Iran. Journal of Entomological and Acarological Research 44: 42–45. <http://www.pagepressjournals.org/index.php/jear/article/view/jear.2012.e9/pdf>, doi: 10.4081/jear.2012.e9
- Minaei K (2012c) The genus *Eremiothrips* (Thysanoptera: Thripidae) in Iran, with one new species. Zootaxa 3349: 56–62.
- Minaei K (2013a) The genus *Aeolothrips* in Iran (Thysanoptera: Aeolothripidae) with one new species. Zootaxa 3630: 594–600. doi: 10.11646/zootaxa.3630.3.14
- Minaei K (2013b) The *Phlaeothrips*-lineage of fungus feeding thrips in Iran with a new species of *Hindsiothrips*. Zootaxa 3599: 279–290. doi: 10.11646/zootaxa.3630.3.14
- Minaei K, Aleosfoor M (2013) A new species of *Haplothrips* from southern Iran (Thysanoptera, Phlaeothripidae). ZooKeys 275: 91–99. doi: 10.3897/zookeys.275.4433
- Minaei K, Alich M (in press) The grass-living thrips (Insecta: Thysanoptera) from Iran with the first record of the genus *Arorathrips* Bhatti. Journal of Entomological and Acarological Research.
- Minaei K, Behmanesh M (2012) First record of *Neoheegeria gigantea* (Thys.: Phlaeothripidae) from Iran. Journal of Entomological Society of Iran 32: 135–136.
- Minaei K, Haftbaradaran F, Khosravi AR (2013) Occurrence of males among Aeolothripidae (Thysanoptera), with description of the male of *Aeolothrips afghanus*. Zootaxa 3681: 286–288. doi: 10.11646/zootaxa.3681.3.8
- Minaei K, Haftbaradaran F, Mound LA (2012) A new *Ankothrips* species (Thysanoptera: Melanthripidae) from Iran with unusually short setae. Zootaxa 3552: 37–42. <http://www.mapress.com/zootaxa/2012/f/zt03552p042.pdf>
- Minaei K, Mound LA (2008) The Thysanoptera Haplothripini (Phlaeothripidae) of Iran. Journal of Natural History 42: 2617–2658. <http://www.tandfonline.com/doi/pdf/10.1080/00222930802354159>, doi: 10.1080/00222930802354159
- Minaei K, Mound LA (2010a) Grass-flower thrips of the genus *Chirothrips* (Thysanoptera: Thripidae), with a key to species from Iran. Zootaxa 2411: 33–43. <http://www.mapress.com/zootaxa/2010/f/zt02411p043.pdf>

- Minaei K, Mound LA (2010b) Taxonomic problems in character state interpretation: variation in the wheat thrips *Haplothrips tritici* (Kurdjumov) (Thysanoptera: Phlaeothripidae) in Iran. *Deutsche Entomologische Zeitschrift* 57: 233–241. doi: 10.1002/mmnd.201000020
- Mirab-balou M, Chen XX (2010) First description of the male of the wheat thrips, *Anaphothrips obscurus* (Thysanoptera: Thripidae). *Zootaxa* 2540: 65–68.
- Mirab-balou M, Chen XX (2011a) Iranian Thripinae with ctenidia laterally on the abdominal tergites (Thysanoptera: Thripidae). *Natura Montenegrina* 10: 435–466.
- Mirab-balou M, Chen XX (2011b) The *Megalurothrips* genus-group in Iran (Thysanoptera: Thripidae). *Munis Entomology & Zoology* 6: 944–952. <http://www.munisentzool.org/yayin/vol6/issue2/944-952.pdf>
- Mirab-balou M, Chen XX (2012a) A new species of *Melanthrips* from Iran (Thysanoptera: Melanthripidae) with a key to the Iranian species. *Entomological News* 122: 407–415. doi: 10.3157/021.122.0502
- Mirab-balou M, Chen XX (2012b) *Aleurodothrips fasciapennis* Franklin: A newly recorded genus and species for Iran (Thysanoptera: Phlaeothripidae). *Munis Entomology & Zoology* 7: 334–338. <http://www.munisentzool.org/yayin/vol7/issue1/334-338.pdf>
- Mirab-balou M, Chen XX (2012c) Iranian thrips of the family Aeolothripidae with four newly recorded species. *Vestnik Zoologie* 46: 499–507.
- Mirab-Balou M, Chen XX (2012d) The subfamily Panchaetothripinae (Thysanoptera: Thripidae) in Iran, with the first report of genus *Selenothrips* Karny. *Entomotaxonomia* 34: 22–29.
- Mirab-Balou M, Chen XX (2013) New Records and Two New Species of the *Anaphothrips* Genus-Croup in Iran (Insecta: Thripidae). *Acta Zoologica Bulgarica* 65: 159–164
- Mirab-Balou M, Minaei K, Chen XX (2013) An illustrated key to the genera of Thripinae (Thysanoptera, Thripidae) from Iran. *Zookeys* 317: 27–52. doi: 10.3897/zookeys.317.5447
- Mirab-balou M, Shi M, Chen XX (2011) Two new species of the genus *Mycterothrips* from Western Iran (Thysanoptera: Thripidae). *Zootaxa* 3130: 57–62.
- Mirab-balou M, Shi M, Chen XX (2012a) A newly recorded genus and species of Haplothripini (Thysanoptera: Phlaeothripidae) from Iran. *Far Eastern Entomologist* 240: 1–8.
- Mirab-balou M, Tong XL, Chen XX (2012b) A new record and new species of the genus *Thrips* (Thysanoptera: Thripidae), with a key to species from Iran. *Journal of Insect Sciences* 12: 1–15. doi: 10.1673/031.012.9001
- Mirab-balou M, Tong XL, Chen XX (2012c) Iranian *Haplothrips* with forewings sub-basal setae arranged in a triangle (Tubulifera: Phlaeothripidae). *Persian Gulf Crop Protection* 1: 15–21. http://cropprotection.ir/files_site/paperlist/Journal1-2-130726165154.pdf
- Mortazaviha A (1995) Introduction of 15 species of thrips (Thysanoptera) collected in Iran. *Proceedings of the 12th Iranian Plant Protection Congress, Junior College of Agriculture, Karaj*, 341.
- Mound LA (1997) Biological diversity. In: Lewis, T (Ed) *Thrips as Crop Pests*. CAB International, Wallingford, 197–215.
- Mound LA (2002) *Octothrips lygodii* sp.n. (Thysanoptera, Thripidae) damaging weedy *Lygodium* ferns in southeastern Asia, with notes on other Thripidae reported from ferns. *Australian Journal of Entomology* 41: 216–220. doi: 10.1046/j.1440-6055.2002.00297.x

- Mound LA (2011a) Order Thysanoptera Haliday, 1836. In: Zhang Z-Q (Ed) Animal biodiversity: An outline of higher-level classification and survey of taxonomic richness. Zootaxa 201–202. <http://www.mapress.com/zootaxa/2011/f/zt03148p202.pdf>
- Mound LA (2011b) Species recognition in the genus *Scolothrips* (Thysanoptera, Thripidae), predators of leaf-feeding mites. Zootaxa 2797: 45–53. <http://www.mapress.com/zootaxa/2011/f/zt02797p053.pdf>
- Mound LA, Dang LH, Tree DJ (2013a) Genera of fungivorous Phlaeothripinae (Thysanoptera) from dead branches and leaf-litter in Australia. Zootaxa 3681: 201–224. <http://www.mapress.com/zootaxa/2013/f/zt03681p224.pdf>, doi: 10.11646/zootaxa.3681.3.1
- Mound LA, Marullo R (1996) The Thrips of Central and South America: An Introduction. Memoirs on Entomology, International 6: 1–488.
- Mound LA, Marullo R (1999) Two new basal-clade Thysanoptera from California with Old World affinities. Journal of the New York entomological Society 106: 81–94.
- Mound LA, Minaei K (2007) Australian thrips of the *Haplothrips* lineage (Insecta: Thysanoptera). Journal of Natural History 41: 2919–2978. doi: 10.1080/00222930701783219
- Mound LA, Palmer JM (1983) The generic and tribal classification of spore-feeding Thysanoptera. Bulletin of the British Museum (Natural History) (Entomology) 46: 1–174.
- Mound LA, Tree DJ (2009) Identification and host-plant associations of Australian Sericothripinae (Thysanoptera, Thripidae). Zootaxa 1983: 1–22. <http://www.mapress.com/zootaxa/2009/f/zt01983p022.pdf>
- Mound LA, Tree DJ, Paris D (2013b) OZ THRIPS, Thysanoptera in Australia. <http://www.ozthrips.org/> [accessed 5.vii.2013]
- Pereyra V, Mound LA (2009) Phylogenetic relationships within the genus *Cranothrips* (Thysanoptera, Melanthripidae) with consideration of host associations and disjunct distributions within the family. Systematic Entomology 34: 151–161. doi: 10.1111/j.1365-3113.2008.00445.x
- Ramezani L, Bhatti JS, Mossadegh MS, Soleimannejadian E (2009) Discovery of *Eremiothrips similis* Bhatti 1988 in Iran (Insecta: Terebrantia: Thripidae). Thrips 11: 1–18.
- Ramezani L, Mossadegh MS, Soleimannejadian E, Bagheri S, Minaei K (2011) The first report of the genus and species of *Florithrips tragardhi* (Thysanoptera: Thripidae) from Iran. Journal of Entomological Society of Iran 31: 101–103.
- Rechinger KH (1989) Fifty years of botanical research in the Flora Iranica area (1937-1987). In: Tan K (Ed) The Davis and Hedge Festschrift: plant taxonomy, phytogeography and related subjects. Edinburgh, University Press, 301–349.
- Salavatian M (1996) Plant Quarantine in Iran (Pests, Diseases and Weeds). Agricultural Research and Education Organization, Educational Technology Services Bureau, Agricultural Education Press, Karaj, 279 pp.
- Shishehbor P (1991) Population dynamics of *Tetranychus turkestanii* (U. & N.) (Acari: Tetranychidae) on Castor bean in Southwestern Iran. Proceedings of the 10th Plant Protection Congress of Iran, 88.
- ThripsWiki (2013) ThripsWiki - providing information on the World's thrips. <http://thrips.info/wiki/> [accessed 5.vii. 2013]

- Tyagi K, Kumar V, Mound LA (2008) Sexual dimorphism among Thysanoptera Terebrantia, with a new species from Malaysia and remarkable species from India in Aeolothripidae and Thripidae. *Insect Systematics and Evolution* 39: 155–170. doi: 10.1163/187631208788784093
- Wilson LJ, Bauer LR, Walter GH (1996) Phytophagous thrips are facultative predators of twospotted spider mites (Acari: Tetranychidae) on cotton in Australia. *Bulletin of Entomological Research* 86: 297–305. doi: 10.1017/S0007485300052597
- Wilson TH (1975) A monograph of the subfamily Panchaetothripinae (Thysanoptera: Thripidae). *Memoirs of the American Entomological Institute* 23: 1–354.
- Zehzad B, Kiabi BH, Madjnoonian H (2002) The natural areas and landscape of Iran: an overview. *Zoology in the Middle East* 26: 7–10. doi: 10.1080/09397140.2002.10637915
- Zolfaghari M, Alavi J, Ravan S, Farsi-moghadam A (2012) Faunal study of Thysanoptera in the Sistan region of Iran. *Proceeding of the 20th Iranian Plant Protection Congress. Plant Diseases, Weed Science, Entomology, Acarology, Zoology*, 137.
- zur Strassen R (2003) Die terebranten Thysanopteren Europas und des Mittelmeer-Gebietes. *Die Tierwelt Deutschlands* 74: 1–271. [in German]