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Presence of Thysanoptera Species in the Urban Green Spaces of Iran: New Records Along with Illustrated Type Specimens

Minoo HEIDARI LATIBARI[1]* Samaneh SEPAHI[2]
Mostafa GHAFOURI MOGHADDAM[3]*

[1]Institute of Entomology, Biology Centre, Czech Academy of Sciences, České Budějovice, CZECH REPUBLIC
[2]Department of Plant Protection, Faculty of Agriculture, Shahid Bahonar University of Kerman, IRAN
[3]Yas com., Zahedan, Sistan and Baluchestan, P. O. Code: 98169–87383, IRAN
e-mails: [1]*hlminoo@yahoo.com, [2]samanesepahi@yahoo.com, [3]*m.ghafourim@yahoo.com
ORCIDs: [1]*0000-0003-4158-8034, [2]0000-0003-1568-1294, [3]*0000-0002-1942-9689

ABSTRACT

We present a list of Thysanoptera species found in the Mashhad metropolitan region (north-east of Iran). A total of 24 sampling sites were set up on *Pinus mugo* Turra and *Platycladus orientalis* (L.), two ornamental trees important commonly found in urban areas, to better understand the fauna and distribution of thrips populations. Thysanoptera fauna consists of 13 species in eight genera, two subfamilies and three families, of which three have never been recorded in Razavi Khorasan province. In terms of species, the highest number of species belonged to the family Thripidae. The present study tentatively suggested that *P. mugo* and *P. orientalis* attract most species of adult thrips (Thysanoptera) but do not support reproduction. We examined and illustrated the types of eleven of currently accepted synonyms of *Haplothrips reuteri* (Karny, 1907), *H. subtilissimus* (Haliday, 1852), *Aptinothrips rufus* (Haliday, 1836), *Chirothrips africanus* Priesner, 1932, *C. manicatus* (Haliday, 1836), *Thrips atratus* Haliday, 1836, and *T. vulgatissimus* Haliday, 1836, together with information on distributions and diagnosis that are useful for recognising each species. The purpose of this study is to fill in the knowledge gaps regarding the distribution of Thysanoptera in the diverse urban green spaces (UGSs).

Key words: Fringed winged, ornamental, urban ecosystems, type, Iran, Palaearctic.

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INTRODUCTION

Urban green space is an important refuge for biodiversity in urban areas (Aronson et al, 2017). Insects are key components of urban ecological networks and are greatly impacted by anthropogenic activities (Sattler et al, 2011). However, the green patches in urban areas provide habitats for many insects and other arthropods, some of which have attained pest status (Robinson, 2005). Therefore, it is crucial to understand the relationship between urban green spaces and insect biodiversity. The process of urbanization in Iran has progressed sharply in recent decades, with urban areas expanding nearly ten-fold over the last 40 years, and a rapid trend that will be maintained in the coming 20 years. Mashhad, the second-largest city in Iran, is a typical example of urban development. Hence, understanding the biodiversity-urbanization relationships in Mashhad may provide a suitable model for other cities in Iran, and worldwide.

Thrips (Thysanoptera) comprise a hyperdiverse monophyletic clade of insects distributed worldwide (Buckman et al, 2012). Thysanopterans present a wide range of feeding strategies from phytophagy and mycophagy to predatory (Mound, 2004), making them a suitable model taxon to better understand the responses of insect herbivores and predators to gradients in urban vegetation structure and diversity. Thrips also provide important ecosystem services. For example, some the species such as *Frankliniella intonsa* (Trybom, 1895) and *Thrips tabaci* Lindeman, 1889 are indicators of changes in agroecosystems, climate changes and air pollution (Vasiliu-Oromulu et al, 2008). Some phytophagous thrips species are highly hosted plant-specific but sometimes exhibit remarkable host shifts (Mound, 1997). Polyphagous species sometimes are locally associated exclusively with a single host plant. Polyphagy and host range might be related to the availability of particular compounds in the host plants (Terry, 1997), or such thrips species might be unusually flexible in their feeding behaviour. The world fauna of Thysanoptera has +6,300 named species divided into nine extant families into two suborders, Tubulifera (one family) and Terebrantia (eight families and 90% of pest species) (Mound, 1997; Mound & Morris, 2007; ThripsWiki, 2021).

There are 270 distinct species of thrips from Iran (Mirab-Balou, 2018), but just a few species such as *Frankliniella occidentalis* Pergande, 1895 and *T. tabaci*, are known as ornamental plants pests in urban green spaces (Cloyd, 2009). Up to the present, there are just a few scattered studies conducted on thrips species associated with urban green spaces (i.e., in Poland by Czepiel, 2004; in China and Qatar by Mirab-Balou et al, 2014a, b), and a few common species of thrips in the global urban environment were mentioned by Robinson (2005). The current study is the first study devoted to documenting the biodiversity of thrips species in Mashhad's urban green spaces, an area where there is a scarcity of information about the species composition, ecological connections, and the number of thrips present.

MATERIAL AND METHODS

The specimens studied were obtained by field sampling in urban green spaces in northeastern Iran (Razavi Khorasan province; Fig. 1). Mashhad (36°18′N, 59°34′E) is

the second-largest city in Iran (with a population of 3.372 million in 2016) and occupies an area of 328 km^2. Mashhad has a typical concentric urban expansion pattern, and its green space accounted for 4% of the area covered. By random selection from a satellite map using Google Maps® and subsequent extensive field surveys in the study area, we identified 24 suitable green study patches (Fig. 1). The selected patches varied from 30 to 720 ha in size (Table 1). The vegetation was mainly composed of managed lawn mixed with some canopy species, woodland and shrubs (*Pinus mugo* Turra and *Platycladus orientalis* (L.)). Most of the patches were intensively managed, including frequent weed removal and tree care (see photograph in the lower left of Fig. 1). Methods used for collecting were hand-searching and beating sheets (Ng & Zaimi, 2018). Beating the plant parts, thrips were dislodged and landed on the cloth where they can easily be seen. Then we collected with an alcohol-soaked cotton swab and put it in a vial of alcohol. Samples were taken from leaves, branches and buds of *P. mugo* and *P. orientalis*. Samples collected were processed onto permanent microscopic slides in Canada Balsam, after maceration in 5% NaOH and dehydration through a series of alcohols of 70%, 80%, and 90% (Ng & Zaimi, 2018). These slides were then dried at 45 °C on a slide warmer, before being transferred into an oven for at least one month. All studied slides are deposited in the Entomology Museum of the Ferdowsi University of Mashhad, Iran (EMFUM).

Identifications and diagnoses were carried out with a differential interference contrast (DIC) microscope (Micros® MCX100) as indicated in the photomicrographs. Pictures of slide-mounted Bagnall's specimens photographed by an Olympus® BX63 microscope with phase contrast. The software running for image acquisition is cellSens Dimension 1.15, Core Version xv 3.14 (build 14760). Images were acquired digitally using Helicon Focus® software. These images are ©The Trustees of the Natural History Museum, London, and made available under Creative Commons License 4.0.

The Canadian specimen, *Taeniothrips lemanis* Treherne, 1924, was taken using a Leica® DM6B upright microscope equipped with a DMC4500 camera and Leica® Application Suite (LAS) X version 3.7.3. Each of the image stacks was taken using the software optimized number of steps based on the defined distance between in-focus vertical extremes of the specimen/structure in the field of view. Before imaging the specimen, white balancing, and configuration of the gamma correction and exposure were done manually to optimize the image quality. Images of the *Taeniothrips lemanis* Treherne, 1924 holotype (CNC1881689) are provided by B.M.T. Brunet at the Canadian National Collection of Insects, Arachnids and Nematodes, ©Her Majesty The Queen in Right of Canada, as represented by the Minister of Agriculture and Agri-Food, licensed under the Open Government License - Canada. All images were further processed using various minor adjustment levels in Adobe Photoshop® such as image cropping and rotation, adjustment of contrast and brightness levels, color saturation, and background enhancement. Morphological terminology follows Priesner (1948), Bailey (1951) and Bhatti (1988, 2006). Distributions in Iran were followed by Mirab-Balou et al, (2018). The list of Iranian provinces follows the Standard ISO 3166 and acronyms consisting of two

capital letters are used (Table 2). The distribution maps of all species were generated using SimpleMappr (Shorthouse, 2010). Acronyms for depositories are listed below:

CNC	Canadian National Collection, Ottawa, Canada
DU	Depository Unknown
EMFUM	Entomology Museum of Ferdowsi University of Mashhad, Mashhad, Iran
FNHM	Finnish Natural History Museum, Helsinki, Finland
NHMUK	Natural History Museum, London, United Kingdom
SNM	Statens Naturhistoriske Museum, Copenhagen, Denmark

Fig. 1. Map of the study area within Iran (created by Maphill). The location of 24 green patches surveyed in this study is shown as the location icon. The sample photograph in the lower left shows the vegetated and managed conditions of most surveyed green patches.

Table 1. List of 24 urban green patches of Mashhad metropolis in the northeast of Iran.

Green Space Name	No. species	Green Space Name	No. species
Mashhad River Park	2	Alandasht Garden	3
Chehel Baze Park	1	Bahar Park	2
Khorshid Kouhestan Park (First site)	3	Vahdat Park	2
Khorshid Kouhestan Park (Second site)	1	Aftab Boostan (First site)	8
Pardis Qaem Park	4	Aftab Boostan (Second site)	5
Astane Qods Garden (First site)	5	Behesht Park	3
Astane Qods Garden (Second site)	1	Basij Park	2
Pansado-Davazdah Dastgah Park	3	Eram Park	4
Mellat Park	6	Nosrat Park	1
Malek Abad Garden (First site)	5	Raja Park	4
Malek Abad Garden (Second site)	2	Karim Abad	1
Kooh Sangi Park	4	Qaleh Sakhteman	1

Table 2. The standard codes for provinces of Iran.

Province	Code	CD	Province	Code	CD
Alborz	AL	Central	Kordestan	KD	West
Ardebil	AR	North West	Lorestan	LO	West
Bushehr	BS	South	Markazi	MK	Central
Chaharmahal and Bakhtiari	CM	Central	Mazandaran	MN	North
East Azarbaijan	EA	North West	North Khorasan	KS	East
Esfahan	ES	Central	Qazvin	QZ	Central
Fars	FA	South	Qom	QM	Central
Guilan	GI	North	Razavi Khorasan	KV	East
Golestan	GO	North	Semnan	SM	Central
Hamadan	HD	West	Sistan and Baluchestan	SB	East
Hormozgan	HG	South	South Khorasan	KJ	East
Ilam	IL	West	Tehran	TE	Central
Kerman	KE	South East	West Azarbaijan	WA	North West
Kermanshah	KH	West	Yazd	YA	Central
Khuzestan	KZ	South West	Zanjan	ZA	North West
Kohgiluyeh and Boyer-Ahmad	KB	South	**31 Provinces**	**IR - Western Asia**	

CD: Cardinal Directions.

RESULTS

Our current study is one of several that focus on the taxonomy, distribution and species composition of Thrips species in Iran's urban green spaces, thereby providing a list of three families, two subfamilies, eight genera and thirteen species in the 24 urban green patches. In terms of species, the highest number of species belonged to the family Thripidae. *Aeolothrips intermedius* Bagnall, 1934, *Chirothrips africanus* Priesner, 1932 and *Thrips vulgatissimus* Haliday, 1836 are new records for Razavi Khorasan province.

Taxonomic treatment

Class Insecta Linnaeus, 1758

Order Thysanoptera Haliday, 1836

Suborder Terebrantia Haliday, 1836

Family Aeolothripidae Uzel, 1895

Genus *Aeolothrips* Haliday, 1836

***Aeolothrips intermedius* Bagnall, 1934** (Figs. 2, 15A, 16)

Aeolothrips fasciata adusta Uzel, 1895.

Aeolothrips fasciata aptera Karny, 1910.

Aeolothrips intermedius Bagnall, 1934.

Aeolothrips pontica Derbeneva, 1966.

Type information. Lectotype ♀ - Zurich, Switzerland (NHMUK).

Material examined. LECTOTYPE, SWITZERLAND • Zurich; Uetliberg; 2500 ft; female; July 1925; ex. *Medicago sativa* L.; Bagnall Coll.; B. M. Reg. No. 1932–339; drawer 51:1:4; no. barcode: #010153697; other catalog numbers: NHMUK:ecatalogue:6077695; occurrence ID: 74fe984d-dd94-4f4f-acf1-13e9374078f0 (NHMUK; Fig. 15A). IRAN • Razavi Khorasan province; Mashhad County; 01.VI.2017; 3 females and 2 males; collected on *P. mugo*; M. Heidari Latibari leg. (EMFUM).

Diagnosis. Female: Length of fore wing distal dark band at anterior margin 1.0-1.5 times the length of pale area between the dark bands; spermatheca with 7-9 rather strong spiniform processes on sides of median groove. **Male:** Abdominal tergites IV-V with well-developed dorsal tubercles.

Geographical distribution. Oriental (China, India, Pakistan); **Palaearctic** (Albania, Austria, Bulgaria, China, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iran (AL, EA, ES, FA, GI, GO, HD, IL, KB, KD, KE, KH, KZ, MK, QZ, TE, WA, YA, ZA; Fig. 15), Italy, Latvia, Lithuania, Montenegro, Netherlands, North Africa, Norway, Poland, Portugal, Romania, Russia, Serbia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom).

Note. This species is recorded for the first time in Razavi Khorasan province, Iran.

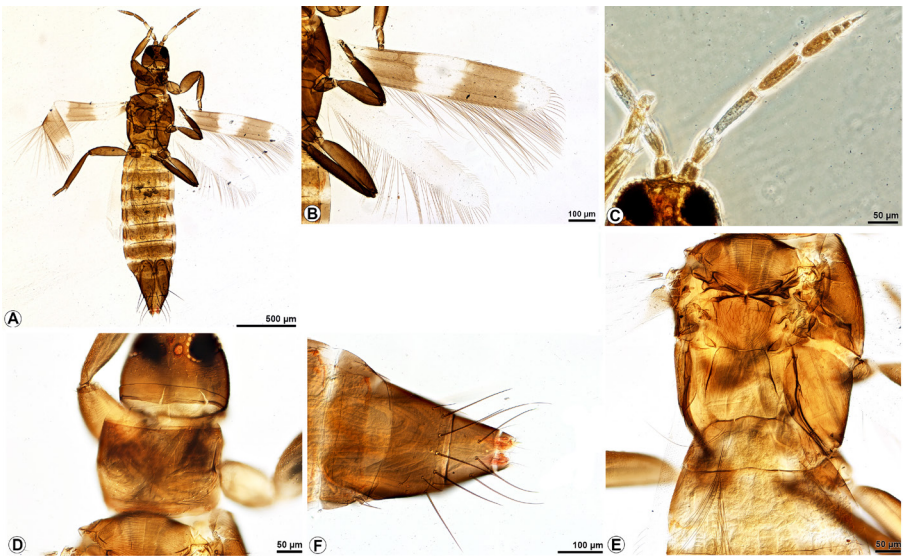

Fig. 2. *Aeolothrips intermedius* Bagnall, 1934. Lectotype, female (©NHMUK, #010153697). **A.** Habitus, ventral view. **B.** Wings, meso femur/tibia and meta femur/tibia. **C.** Antenna. **D.** Head, pronotum and fore femur, dorsal view. **E.** Mesonotum, metanotum and abdominal tergites I-II, dorsal view. **F.** Abdominal tergites VIII-X, dorsal view.

Family Phlaeothripidae Uzel, 1895

Subfamily Phlaeothripinae Uzel, 1895

Genus *Haplothrips* Amoyet & Serville, 1843

Haplothrips caespitis Priesner, 1936 (Figs. 3, 15B, 17)

Haplothrips caespitis Priesner, 1936.

Type information. Paratype ♀ - Managil, Sudan (NHMUK).

Material examined. PARATYPE, SUDAN • Managil; female; 16.I.1930; ex. *Cymbopogon proximus* (Maharaib) at roots; H. B. Johnston 145; drawer 51:6:104; no. barcode: #012816889; other catalog numbers: NHMUK:ecatalogue:9239467; occurrence ID: 875cb389-6283-471d-93d0-39658a45891c (NHMUK; Fig. 15B). IRAN • Razavi Khorasan province; Mashhad County; 17.IX.2017; 2 females; collected on *P. mugo*; M. Heidari Latibari leg. (EMFUM).

Diagnosis. Female: Distal cilia of forewing smooth; head with maxillary stylets retracted to eyes, scarcely one-tenth of head width apart medially; postocular setae acute, scarcely extending beyond posterior margin of eyes; pronotal major setae acute and short, epimeral and posteroangular setae longest but scarcely longer than antennal segment III; fore tarsal tooth minute; mesopresternum reduced to two triangles; forewing with five or six duplicated cilia; sub-basal setae arranged in a triangle, finely acute and shorter than epimeral setae; metanotum with one pair of setae medially; abdominal tergites VII and VIII with seven or eight minor setae medially; tergite IX setae S1 and S2 finely acute, about 0.6 times as long as tube; tube 1.8 times as long as basal width.

Geographical distribution. Afrotropical (Sudan); **Oriental** (Pakistan); **Palaearctic** (Austria, Czech Republic, Estonia, France, Germany, Hungary, Iran (HD, KV, KZ; Fig. 16), Italy, Poland, Romania).

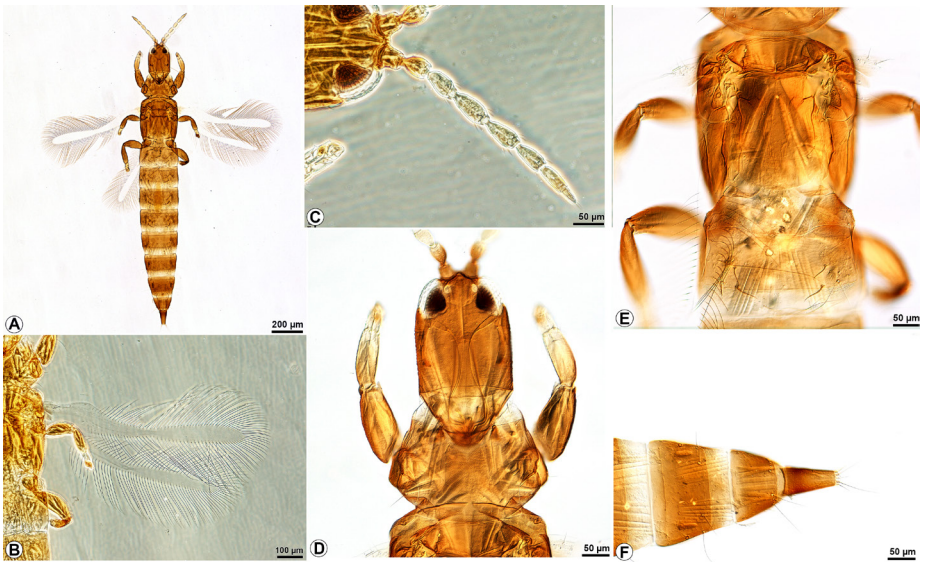

Fig. 3. *Haplothrips caespitis* Priesner, 1936. Paratype, female (©NHMUK, #012816889). **A.** Habitus, ventral view. **B.** Wings, mid and hind leg. **C.** Antenna. **D.** Head, pronotum, mesonotum and fore femur, dorsal view. **E.** Mesonotum, metanotum and abdominal tergites I, dorsal view. **F.** Abdominal tergites VIII-X, dorsal view.

***Haplothrips reuteri* (Karny, 1907)** (Figs. 4, 5, 15C-D, 18)

Haplothrips reuteri Karny, 1907.

Haplothrips tenuisetosus Bagnall, 1933.

Haplothrips satanas Bagnall, 1933.

Type information. Unknown type status - former Yugoslavia (DU).

Material examined. HOLOYPE, SUDAN • G. R. F.; Wad Madani; female; 7.IV.1932; ex. from flowers of *Dolicha lablab* (L.); identified as *Haplothrips tenuisetosus* Bagnall, 1933; BM 1933-628; A. P. G. Michal.; drawer 51:6:110; no. barcode: #012816890; other catalog numbers: NHMUK:ecatalogue:9239468; occurrence ID: fdd8a67f-3ddf-4242-bcda-e158c43cb929 (NHMUK; Fig. 15C). **HOLOTYPE**, FRANCE • Perpignan; female; VIII.1926; ex. *Centaurea solstitialis* L.; identified as *Haplothrips satanas* Bagnall, 1933; Bagnall Coll.; B. M. Reg. No. 1932-339; drawer 51:6:110; no. barcode: #012816891; other catalog numbers: NHMUK:ecatalogue:9239470; occurrence ID: f9266cf9-e26b-41f9-b03b-155a602156c2 (NHMUK; Fig. 15D). IRAN • Razavi Khorasan province; Mashhad County; 24.III.2017; 4 females and 2 males; collected on *P. mugo*; M. Heidari Latibari leg. (EMFUM).

Diagnosis. Female: Distal cilia of forewing with surface rough; head with maxillary stylets 0.6-0.7 of head width apart, retracted to postocular setae; postocular setae pointed, long, extending beyond posterior margin of eyes; antennal segment III with two sensoria; pronotum with five pairs of finely pointed major setae, anteromarginal

setae more than twice as long as discal setae but shorter than anteroangulars; tergite VII with two campaniform sensilla not close to each other, and three to six micro setae present on tergites VII and VIII. Tergite IX setae S1, S2 and S3 acute, S1 long, a little shorter than tube, sub- equal to S2, S1 on other tergites pointed or finely pointed. **Male:** Pseudovirga bifid at tip, bearing two small appendages at apex.

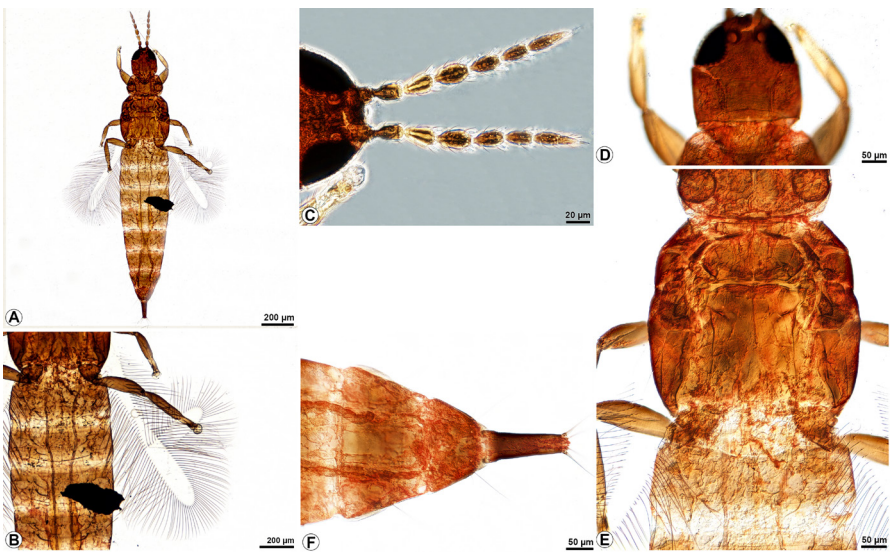

Fig. 4. *Haplothrips tenuisetosus* Bagnall, 1933. Holotype, female (©NHMUK, #012816890) [synonym of *Haplothrips reuteri* (Karny)]. **A.** Habitus, ventral view. **B.** Wings and hind leg. **C.** Antenna. **D.** Head, pronotum and fore femur/tibia, dorsal view. **E.** Pronotum, mesonotum, metanotum and abdominal tergites I, dorsal view. **F.** Abdominal tergites VIII-X, dorsal view.

Geographical distribution. Afrotropical (Sudan, Yemen); **Nearctic** (North America); **Oriental** (China, India, Pakistan,); **Palaearctic** (Albania, Austria, Bulgaria, China, Egypt, former Yugoslavia, France, Greece, Iran (AL, EA, ES, FA, GO, KE, KJ, KS, KV, KZ, MN, QZ, TE, ZA; Fig. 17), Lithuania, Mongolia, Qatar, Romania, Russia, Siberia, Slovenia, Spain, Turkey, Ukraine).

Notes. We examined the female holotype of *Haplothrips tenuisetosus* Bagnall, 1933 and a male holotype of *Haplothrips satanas* Bagnall, 1933 (NHMUK), which are currently synonyms of *Haplothrips reuteri* (Karny, 1907).

***Haplothrips subtilissimus* (Haliday, 1852)** (Figs. 6, 19)

Haplothrips subtilissimus Haliday, 1852.

Phloeothrips pallicornis Reuter, 1879.

Cryptothrips ovivorus Vasiliev, 1922.

Haplothrips atricornis Priesner, 1925.

Haplothrips inoptata Priesner, 1925.

Type information. Unknown type status - England (DU).

Fig. 5. *Haplothrips satanas* Bagnall, 1933. Holotype, female (©NHMUK, #012816891) [synonym of *Haplothrips reuteri* (Karny)]. **A.** Habitus, ventral view. **B.** Wings, mid and hind leg. **C.** Antenna. **D.** Head, pronotum and fore femur/tibia, dorsal view. **E.** Pronotum, mesonotum, metanotum and abdominal tergites I, dorsal view. **F.** Abdominal tergites VIII-X, dorsal view.

Fig. 6. *Phloeothrips pallicornis* Reuter, 1879. Syntype, female (©FNHM, #GV.33087) [synonym of *Haplothrips subtilissimus* (Haliday)]. **A.** Habitus, dorsal view. **B.** Head, pronotum and pro femur, dorsal view. **C.** Fore wing and abdominal tergites V-X, dorsal view. **D.** Antenna. **E.** Syntype labels.

Material examined. SYNTYPE, FINLAND • Ab Turku; Ispoinen; ykj: 6710:3240; Reuter Odo Morannal leg.; female; http://id.luomus.fi/GV.33087 (square label, with a QR barcode; printed); Mus. Zool.

H: fors, Spec. typ. No. 6032; identified as *Phloeothrips pallicornis* Reuter, 1879; Photographed 2020, Pekka Malinen (FNHM). IRAN • Razavi Khorasan province; Mashhad County; 31.V.2017; 2 females and 2 males; collected on *P. mugo* and *P. orientalis*; M. Heidari Latibari leg. (EMFUM).

Diagnosis. Female: Antennae 8-segmented, segment III with one small sense cone, IV with 4 similar sense cones; VIII short; head longer than wide; maxillary stylets less than 0.5 of head width apart, retracted to postocular setae, maxillary bridge complete; postocular setae with blunt to weakly capitate apices, scarcely 0.7 as long as dorsal length of compound eyes; pronotum with 5 pairs of major setae with blunt to weakly capitate apices; epimeral sutures complete; prosternal basantra present, mesopresternum complete; fore tarsus without a tooth; fore wing constricted medially, with 8-12 duplicated cilia; sub-basal setae S1 and S2 capitate, S3 almost pointed. Tergite IX setae all acute, about 0.5 as long as tube. **Male:** With no pore plate on sternite VIII; fore tarsal tooth present; tergite IX setae S2 short and stout.

Geographical distribution. Nearctic (North America); **Oriental** (China); **Palaearctic** (Albania, Austria, Bulgaria, China, Croatia, Czech Republic, Denmark, Finland, France, Germany, Hungary, Iran (FA, HD, KV, TE; Fig. 18), Italy, Japan, Latvia, Netherland, Norway, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Switzerland, Ukraine, United Kingdom).

Notes. We examined the female syntype of *Phloeothrips pallicornis* Reuter, 1879 (FNHM), which is the current synonym of *Haplothrips subtilissimus* (Haliday, 1852).

Haplothrips tritici (Kurdjumov, 1912) (Fig. 20)

Haplothrips tritici Kurdjumov, 1912.

Haplothrips paluster Priesner, 1922.

Haplothrips cerealis Priesner, 1939.

Type information. Unknown type status - Russia (DU).

Material examined. IRAN • Razavi Khorasan province; Mashhad County; 22.IV.2017; 3 females; collected on *P. mugo* and *P. orientalis*; M. Heidari Latibari leg. (EMFUM).

Diagnosis. ***Female:*** Head with postocular setae pointed, rarely weakly blunt, long, extending beyond posterior margin of eyes but sometimes shorter and not extending so far; maxillary bridge about 0.3-0.4 of head width, usually retracted to postocular setae; antennal segment III with two sensoria; pronotum with five pairs of major setae, anteromarginals pointed, usually twice as long as discal setae and smaller than anteroangulars, mesopresternum eroded medially; tergite IX setae S1 usually blunt, sometimes weakly blunt or finely pointed.

Geographical distribution. Australasian (Australia); **Nearctic** (North America); **Oriental** (China); **Palaearctic** (Albania, Algeria, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, China, Croatia, Czech Republic, Finland, France, Germany, Hungary, Iran (AL, CM, EA, ES, FA, GO, IL, KB, KD, KE, KH, KV, KZ, LO, MK, MN, QM, QZ, SM, TE, WA, YA, ZA; Fig. 19), Iraq, Italy, Korea, Lithuania, Macedonia, Moldova, Netherlands, Norway, Poland, Portugal, Romania, Russia, Siberia, Slovakia, Slovenia, Spain, Sweden, Turkey, Ukraine).

Family Thripidae Stevens, 1829

Subfamily Thripinae Stevens, 1829

Genus *Aptinothrips* Haliday, 1836

***Aptinothrips rufus* (Haliday, 1836)** (Figs. 7, 21)

Thrips (*Aptinothrips*) *rufus* Haliday, 1836.
Thrips (*Aptinothrips*) *nitidulus* Haliday, 1836.
Aptinothrips rufa connaticornis Uzel, 1895.
Uzelliella lubbocki Bagnall, 1908.
Aptinothrips intermedius Priesner, 1920.
Aptinothrips groenlandica Richter, 1928.

Type information. Unknown type status - England (DU, probably lost).

Fig. 7. *Thrips (Aptinothrips) nitidulus* Haliday, 1836. Holotype, female (©SNM) [synonym of *Aptinothrips rufus* (Haliday)]. **A.** Habitus, lateral view. **B.** Voucher specimen (centre) with data label (left side). **C.** Data label (right side).

Material examined. HOLOTYPE, ENGLAND • West Greenland; Kujalleq; Igaliku-Fjord; female; 21.VIII.1989; W. Lindley; identified as *Thrips* (*Aptinothrips*) *nitidulus* Haliday, 1836 and *A. groenlandica* Richter (SNM). IRAN • Razavi Khorasan province; Mashhad County; 04.V.2017; 5 females; collected on *P. mugo*; M. Heidari Latibari leg. (EMFUM).

Diagnosis. ***Female:*** Antennae 6-segmented; antennal segment VI shaded with brown; segment VI large resulting from fusion of 3 segments, VI twice as long as V; head elongate

with vertex weakly reticulate; pronotum weakly trapezoidal, without long setae; Meso and metanota transverse; prosternal basantra with no setae; ferna almost continuous medially; meso and metafurca without spinula; tergite IX posteromedian pair of setae short; tergites and sternites without craspedum and weakly reticulate; tarsi 1-segmented. **Male:** sternites without pore plates; tergite IX with 2 pairs of stout thorn-like setae.

Geographical distribution. Australasian (Australia); **Nearctic** (North America); **Neotropical** (Costa Rica); **Oriental** (China); **Palaearctic** (Albania, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, China, Croatia, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Iran (AL, EA, GO, HD, IL, KE, KD, KH, KS, KV, QZ, TE, WA, ZA; Fig. 20), Ireland, Italy, Lithuania, Netherlands, North Africa, Norway, Poland, Portugal, Qatar, Romania, Russia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom).

Notes. We examined the female holotype of *Thrips* (*Aptinothrips*) *nitidulus* Haliday, 1836 (SNM), which is currently known as a synonym of *Aptinothrips rufus* (Haliday, 1836).

Genus *Chirothrips* Haliday, 1836

Chirothrips africanus Priesner, 1932 (Figs. 8, 15E, 22)

Chirothrips africanus Priesner, 1932.

Chirothrips aethiops Bagnall, 1932.

Chirothrips ramakrishnai Ananthakrishnan, 1957.

Type information. Unknown type status - Egypt (DU).

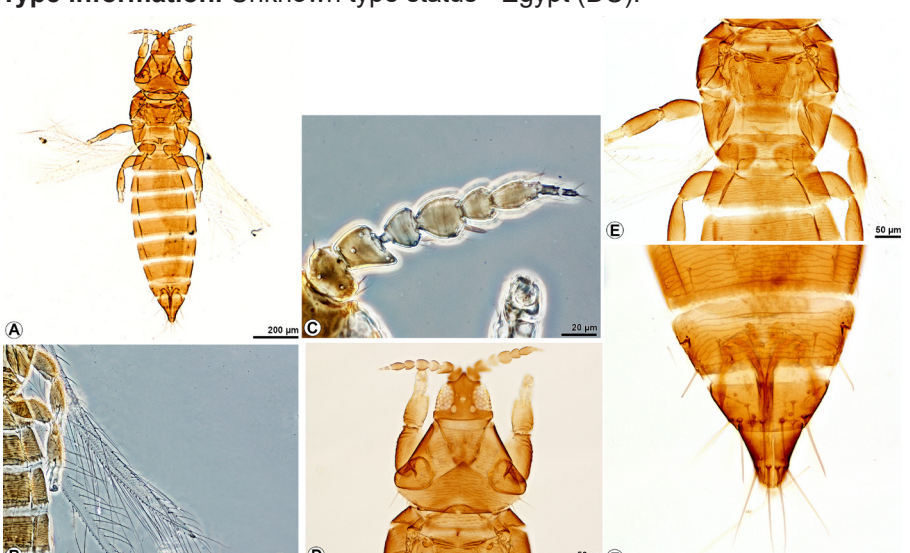

Fig. 8. *Chirothrips aethiops* Bagnall, 1932. Holotype, female (©NHMUK, #012816892) [synonym of *Chirothrips africanus* Priesner]. **A.** Habitus, ventral view. **B.** Wings, mid and hind leg. **C.** Antenna. **D.** Head, pronotum, mesonotum and fore leg, dorsal view. **E.** Mesonotum, metanotum and abdominal tergites I-III, dorsal view. **F.** Abdominal tergites VII-X, dorsal view.

Material examined. HOLOTYPE, SUDAN • G. R. F.; Wad Medani; female; 05.II.1931; ex. *Medicago sativa* L.; identified as *Chirothrips aethiops* Bagnall, 1932; BM 1933–628; W. P. L. Cameron; drawer 51:2:29; no. barcode: #012816892; other catalog numbers: NHMUK:ecatalogue:9239471; occurrence ID: 230aba34-3d7a-46b6-84b1-e4b0f401725f (NHMUK; Fig. 15E). IRAN • Razavi Khorasan province; Mashhad County; 01.IV.2017; 2 females; collected on *P. mugo*; M. Heidari Latibari leg. (EMFUM).

Diagnosis. ***Female:*** Head prolongation in front of eyes scarcely 7; Ocellar region with 4 ante-ocellar setae; Antennal segment II outer margin almost straight.

Geographical distribution. Afrotropical (Ethiopia, Sudan, Yemen); **Nearctic** (North America); **Oriental** (India,); **Palaearctic** (Algeria, China, Cyprus, Egypt, Iran (GO, KV, SB; Fig. 21), Italy, Taiwan, Turkey, Uzbekistan).

Notes. This species is recorded for the first time in Razavi Khorasan province, Iran. We examined the holotype, a female specimen, of *Chirothrips aethiops* Bagnall, 1932 (NHMUK), which is the current synonym of *Chirothrips africanus* Priesner, 1932.

***Chirothrips manicatus* (Haliday, 1836)** (Figs. 9, 10, 11, 12, 15F-I, 23)

Thrips (*Chirothrips*) *manicatus* Haliday, 1836.

Thrips longipennis Burmeister, 1838.

Chirothrips antennatus Osborn, 1883.

Chirothrips manicata adusta Uzel, 1895.

Chirothrips fusca Coesfeld, 1898.

Chirothrips similis Bagnall, 1909.

Chirothrips manicata aptera Schille, 1912.

Chirothrips albicornis Priesner, 1926.

Chirothrips ammophilae Bagnall, 1927.

Chirothrips takahashii Moulton, 1928.

Chirothrips microptera Maltbaek, 1929.

Chirothrips brachyptera Maltbaek, 1929.

Chirothrips productus Bagnall, 1932.

Chirothrips ambulans Bagnall, 1932.

Chirothrips laingi Bagnall, 1932.

Chirothrips testacea Hukkinen, 1935.

Chirothrips bagnalli Hood, 1938.

Chirothrips longisetis Priesner, 1949.

Type information. Unknown type status - England (DU).

Material examined. LECTOTYPE, ENGLAND • Durham; Gillside; female; 1908; ex. 'grass'; identified as *Chirothrips similis* Bagnall, 1909; Bagnall Coll.; B. M. Reg. No. 1932–339; drawer 51:2:30; no. barcode: #012816893; other catalog numbers: NHMUK:ecatalogue:9239472; occurrence ID: f1db639a-a54f-44a6-b300-512acac31399 (NHMUK; Fig. 15F). **LECTOTYPE**, SPAIN • Galicia; female; identified as *Chirothrips ambulans* Bagnall, 1932; BM 1932–339; drawer 51:2:30; no. barcode: #012816894; other catalog numbers: NHMUK:ecatalogue:9239473; occurrence ID: 2a9b8ad9-e71b-48b3-a05f-980cf0d90670 (NHMUK; Fig. 15G). **LECTOTYPE**, FRANCE • Plage de Hyères; female; IX.1927; ex. *Ammophila*; identified as

Chirothrips laingi Bagnall, 1932; Bagnall Coll.; B. M. Reg. No. 1932–339; drawer 51:2:30; no. barcode: #012816895; other catalog numbers: NHMUK:ecatalogue:9239474; occurrence ID: a7dfbdf0-3f35-4e75-bda8-0bc50080dc46 (NHMUK; Fig. 15H). **SYNTYPE**, FRANCE • Plage de Hyères; female; IX.1927; ex. *Ammophila*; identified as *Chirothrips ammophilae* Bagnall, 1927; Bagnall Coll.; B. M. Reg. No. 1932–339; drawer 51:2:30; no. barcode: #012816896; other catalog numbers: NHMUK:ecatalogue:9239475; occurrence ID: 49388a51-b3c0-4d80-bc24-d5e625d74023 (NHMUK; Fig. 15I). IRAN • Razavi Khorasan province; Mashhad County; 22.VI.2017; 2 females and 4 males; collected on *P. mugo*; M. Heidari Latibari leg. (EMFUM).

Diagnosis. Female: shaded forewings; head much smaller than the trapezoidal pronotum; antennae 8-segmented, segment I greatly enlarged, II strongly asymmetric; sense cones on III & IV simple; forewing slender and acute; mesothoracic furca well-developed with large lateral wing-like lobes; tergites with a simple antecostal ridge; sternite posterior margin with craspedum of small dark tubercles and submarginal row of similar smaller tubercles. **Male:** micropterous; tergites with strong lines of sculpture medially; sternites III–VII with small circular glandular area.

Geographical distribution. Australasian (Australia); **Nearctic** (North America); **Palaearctic** (Albania, Algeria, Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iran (AL, EA, GI, GO, HD, KE, KH, KZ, KS, QZ, KV, SB, YA; Fig. 22), Ireland, Italy, Korea, Latvia, Lithuania, Macedonia, Netherlands, Norway, Poland, Portugal, Romania, Russia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom).

Notes. We studied the female lectotype of *Chirothrips similis* Bagnall, 1909, female lectotype of *Chirothrips ambulans* Bagnall, 1932, female lectotype of *Chirothrips laingi* Bagnall, 1932, and female syntype of *Chirothrips ammophilae* Bagnall, 1927 (NHMUK), which all were synonymized under *Chirothrips manicatus* (Haliday, 1836).

Fig. 9. *Chirothrips similis* Bagnall, 1909. Lectotype, female (©NHMUK, #012816893) [synonym of *Chirothrips manicatus* (Haliday)]. **A.** Habitus, ventral view. **B.** Wings, mid and hind leg. **C.** Antenna. **D.** Head, pronotum and fore leg, dorsal view. **E.** Pronotum, mesonotum, metanotum and abdominal tergites I-II, dorsal view. **F.** Abdominal tergites VII-X, dorsal view.

Fig. 10. *Chirothrips ambulans* Bagnall, 1932. Lectotype, female (©NHMUK, #012816894) [synonym of *Chirothrips manicatus* (Haliday)]. **A.** Habitus, ventral view. **B.** Antenna. **C.** Abdominal tergites VIII-X, dorsal view. **D.** Head, pronotum, mesonotum and fore leg, dorsal view. **E.** Mesonotum, metanotum and abdominal tergites I-III, dorsal view.

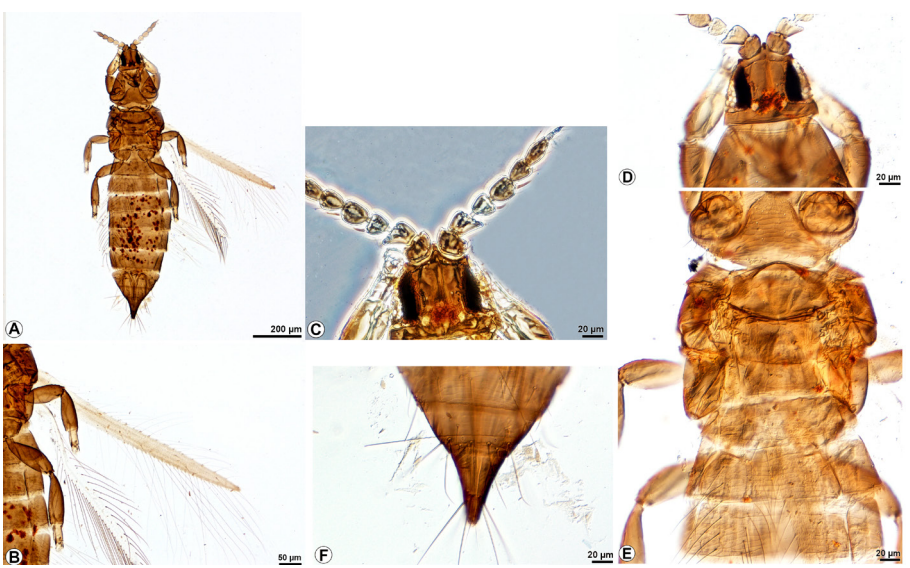

Fig. 11. *Chirothrips laingi* Bagnall, 1932. Lectotype, female (©NHMUK, #012816895) [synonym of *Chirothrips manicatus* (Haliday)]. **A.** Habitus, ventral view. **B.** Wings, mid and hind leg. **C.** Antenna. **D.** Head, pronotum and fore leg, dorsal view. **E.** Pronotum, mesonotum, metanotum and abdominal tergites I-III, dorsal view. **F.** Abdominal tergites VIII-X, dorsal view.

Fig. 12. *Chirothrips ammophilae* Bagnall, 1927. Syntype, female (©NHMUK, #012816896) [synonym of *Chirothrips manicatus* (Haliday)]. **A.** Habitus, ventral view. **B.** Wings, head, mesosoma, abdominal sternites, ventral view. **C.** Antenna. **D.** Head, pronotum and fore leg, dorsal view. **E.** Pronotum, mesonotum, metanotum and abdominal tergites I-III, dorsal view. **F.** Abdominal tergites VII-X, dorsal view.

Genus *Frankliniella* Karny 1910

***Frankliniella intonsa* (Trybom, 1895)** (Fig. 24)

Thrips intonsa Trybom, 1895.
Physopus vulgatissima nigropilosa Uzel, 1895.
Physopus vulgatissima fulvicornis Uzel, 1895.
Physopus vulgatissima albicornis Uzel, 1895.
Physopus vulgatissima adusta Uzel, 1895.
Thrips pallida Karny, 1907.
Physopus brevistylis Karny, 1908.
Frankliniella breviceps Bagnall, 1911.
Frankliniella vicina Karny, 1922.
Frankliniella intonsa maritima Priesner, 1925.
Frankliniella formosae Moulton, 1928.
Frankliniella formosae tricolor Moulton, 1928.
Frankliniella intonsa rufula Keler, 1936.
Frankliniella intonsa norashensis Yakhontov & Jurbanov, 1957.
Type information. Unknown type status - Finland (DU).

Material examined. IRAN • Razavi Khorasan province; Mashhad County; 08.V.2017; 8 females and 4 males; collected on *P. mugo*; M. Heidari Latibari leg. (EMFUM).

Diagnosis. Female: antennal segments I & II, VI-VIII brown, III-V yellow with apex brown; forewing pale; head with 3 pairs of ocellar setae, pair III on anterior margins of ocellar triangle; major postocular setae less than half as long as ocellar setae III; antennae 8-segmented, III & IV with sense cone forked; pronotum with 2 pairs of long setae on anterior margin, 2 pairs of long posteroangulars, and one pair posteromedially; metanotum with median setae arising at anterior margin; campaniform sensilla usually absent; forewing with both longitudinal veins bearing complete row of setae tergites V-VIII each with a ctenidium laterally, on VIII anterolateral to spiracle; tergite VIII posterior margin with a comb of slender widely spaced microtrichia; sternites with no discal setae. **Male:** similar to female but paler, sternites III-VII with transverse glandular area; tergites IX-X with major setae sometimes stout.

Geographical distribution. Australasian (Australia); **Nearctic** (North America); **Oriental** (Indonesia, Malaysia, Philippines); **Palaearctic** (Albania, Algeria, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iran (AL, EA, ES, FA, GI, GO, HD, IL, KE, KD, KH, KS, KV, KZ, MK, MN, QZ, TE, WA, YA, ZA; Fig. 23), Italy, Japan, Korea, Latvia, Lithuania, Macedonia, Mongolia, Netherlands, Norway, Poland, Portugal, Qatar, Romania, Russia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Taiwan, Turkey, Ukraine, United Kingdom).

Genus *Limothrips* Haliday, 1836

Limothrips angulicornis Jablonowski, 1894 (Fig. 25)

Limothrips angulicornis Jablonowski, 1894.

Limothrips setariae Jones, 1912.

Limothrips adusta Karny, 1914.

Type information: Unknown type status - Poland (DU).

Material examined. IRAN • Razavi Khorasan province; Mashhad County; 02.09.2017; 2 females and 1 male; collected on *P. mugo*; M. Heidari Latibari leg. (EMFUM).

Diagnosis. Female: Major setae at apex of abdomen dark brown; head longer than wide, prolonged in front of eyes, without long setae; antennae 8-segmented, II with distal external margin produced into a tooth; III & IV with sense cone forked; VIII longer than VII; pronotum with one pair of prominent slender posteroangular setae; metanotal median setae small and arising behind anterior margin; forewing slender, first vein with 3 setae widely spaced on distal half, second vein with about 8 equally spaced setae; abdominal tergites with median pores situated close to posterior margin; VIII without a marginal comb but with one pair of stout setae laterally; IX with one pair of thorn-like setae laterally; X with one pair of stout thorn-like setae near apex. **Male:** Apterous, head without ocelli; tergite IX with median pair of setae very short and stout; sternites without glandular areas.

Geographical distribution. Australasian (Australia); **Nearctic** (North America); **Palaearctic** (Bulgaria, China, Cyprus, Hungary, Iran (AL, EA, FA, GO, HD, KE, KS, KV, KZ, MN, WA; Fig. 24), Italy, Macedonia, Netherlands, North Africa, Poland, Portugal, Romania, Russia, Slovakia, Slovenia, Spain, Turkey, Ukraine, United Kingdom).

Genus *Odontothrips* Amyot & Serville, 1843

***Odontothrips confusus* Priesner, 1926** (Fig. 26)

Odontothrips confusus Priesner, 1926.

Type information. Unknown type status - Hungary (DU).

Material examined: IRAN • Razavi Khorasan province; Mashhad County; 18.VI.2017; 5 females and 2 males; collected on *P. mugo*; M. Heidari Latibari leg. (EMFUM).

Diagnosis. Female: Antennae 8-segmented; segments III-IV constricted to apex, each with forked sense cone; segment VI sense cone with enlarged oval base; dorsal apex of segment I with pair of setae; head wider than long; three pairs of ocellar setae present, pair III as long as distance between compound eyes, arising on or just outside anterior margins of ocellar triangle; pronotum with two pairs of long posteroangular setae; discal area with weak sculpture lines and about 10 setae; fore tibia apex with two small teeth on ventral/inner margin but without a stout seta at inner apex; mesonotum with paired anterior campaniform sensilla, median setae close to posterior margin; metanotum weakly reticulate; median setae long, arising at anterior margin; campaniform sensilla present or absent; fore wing first vein with setal row almost complete but with a small sub-apical gap; setal row complete on second vein; abdominal tergites with no ctenidia, segments II-III with sculpture lines medially, but none medially on remaining tergites; tergite VIII with posteromarginal comb broadly interrupted medially, with long slender microtrichia laterally; VIII with group of microtrichia anterolateral to spiracle; IX with 2 pairs of campaniform sensilla, X with long split; sternites without discal setae, S1 on VII arising in front of margin. **Male:** Tergite IX with pair of stout setae posterolaterally; sternites without pore plates; extruded genitalia with two pairs of stout endothecal spines supported by elongate canaliculi.

Geographical distribution. Palaearctic (Austria, Bulgaria, China, Croatia, Cyprus, Czech Republic, France, Germany, Greece, Hungary, Iran (AL, FA, GO, HD, KD, KE, KS, KV, LO, MK, QZ, WA, YA, ZA; Fig. 25), Italy, Lithuania, Poland, Romania, Russia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom).

Genus *Thrips* Linnaeus, 1758

***Thrips atratus* Haliday, 1836** (Figs. 13, 15J, 27)

Thrips atratus Haliday, 1836.

Physothrips atrata adusta Uzel, 1895.

Ceratothrips britteni Bagnall, 1914.

Taeniothrips longicornis Priesner, 1926.

Type information. Holotype, ♀ - England (NHMUK).

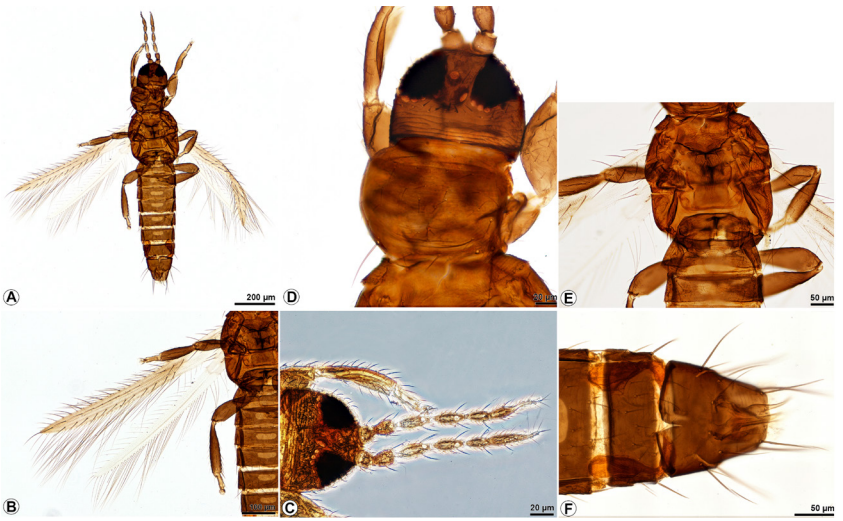

Fig. 13. *Ceratothrips britteni* Bagnall, 1914. Holotype, male (©NHMUK, #010153998) [synonym of *Thrips atratus* Haliday]. **A.** Habitus, ventral view. **B.** Wings, mid/hind leg, mesosoma, abdominal sternites, ventral view. **C.** Antenna and head. **D.** Head, pronotum and fore leg, dorsal view. **E.** Mesonotum, metanotum and abdominal tergites I-III, dorsal view. **F.** Abdominal tergites VIII-X, dorsal view.

Material examined. HOLOTYPE, ENGLAND • Cumbria Great Salkeld; male; 16.IX.1913; ex. *Scabiosa succisa*; identified as *Ceratothrips britteni* Bagnall, 1914; Bagnall Coll.; B. M. Reg. No. 1932-339; drawer 51:4:70; no. barcode: #010153998; other catalog numbers: NHMUK:ecatalogue:6181003; occurrence ID: 4789e205-8b02-41d2-ac77-f9902cff0abd (NHMUK; Fig. 15J). IRAN • Razavi Khorasan province; Mashhad County; 16.IX.2017; 2 females and 2 males; collected on *P. mugo*; M. Heidari Latibari leg. (EMFUM).

Diagnosis. Female: Antennae 8-segmented; segments III-IV each with forked sense cone; head with cheeks convex, with 2 pairs of ocellar setae; pair III arising on anterior margins of, and slightly longer than side of, ocellar triangle; postocular setae pairs I & III well-developed but shorter than ocellar setae pair III, postocular setae pair II minute; pronotum anterior margin longest setae no more than 1.5 times as long as discal setae; with 2 pairs of long posteroangular setae; posterior margin with 3 (or 4) pairs; mesonotum with anterior campaniform sensilla, median setae arise well in front of posterior margin; metanotum with parallel lines of sculpture converging medially at posterior; median setae arising near anterior margin; campaniform sensilla present; fore wing first vein with 5 or more setae on distal half; second vein with complete row of about 14 setae; abdominal tergite II with 3 lateral marginal setae, V-VIII with paired ctenidia, on VIII posteromesad to spiracles; tergite VIII posteromarginal comb complete, microtrichia long and regular; pleurotergites each with 3-4 discal setae, posterior margin not dentate; tergite IX with 2 pairs of campaniform sensilla, X with median split; sternite II with few or no discal setae, III-VII with 8-20 discal setae in irregular double row, most numerous on posterior sternites; sternite VII setae S1 arise in front of margin. **Male:** tergite VIII without posteromarginal comb; tergite IX median setae slender; sternites III-VII with broadly transverse pore plate in front of discal setae, these pore plates progressively smaller on posterior sternites.

Geographical distribution. Nearctic (Canada); **Oriental** (China); **Palaearctic** (Albania, Belgium, Bosnia and Herzegovina, Bulgaria, China, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iran (FA, GO, HD, KB, KD, KE, KH, KS, KV, MK, MN, QZ, SB, TE, YA, ZA; Fig. 26), Italy, Ireland, Latvia, Lithuania, Macedonia, Moldova, Mongolia, Netherlands, North Africa, Norway, Poland, Portugal, Romania, Russia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom).

Notes. We examined the holotype, a male specimen, of *Ceratothrips britteni* Bagnall, 1914 (NHMUK), which is the current synonym of *Thrips atratus* Haliday, 1836.

***Thrips vulgatissimus* Haliday, 1836** (Figs. 14, 28)

Thrips vulgatissimus Haliday, 1836.

Physopus pallipennis Uzel, 1895.

Physopus pallipennis adusta Uzel, 1895.

Taeniothrips lemanis Treherne, 1924.

Taeniothrips gracilis Priesner, 1926.

Taeniothrips atricornis Priesner, 1926.

Taeniothrips americanus Moulton, 1929.

Physothrips gentianae Bagnall, 193.

Taeniothrips tahvanus Hukkinen, 1936.

Type information. Unknown type status - England (DU).

Fig. 14. *Taeniothrips lemanis* Treherne, 1924. Holotype, female (©CNC, #1881689) [synonym of *Thrips vulgatissimus* Haliday]. **A.** Habitus, ventral view. **B.** Wings, mid/hind leg, mesosoma, abdominal sternites, ventral view. **C.** Antenna [broken]. **D.** Head, pronotum and mesonotum, dorsal view. **E.** Mesonotum, metanotum and abdominal tergites I-III, dorsal view. **F.** Abdominal tergites VIII-X, dorsal view **G.** Holotype labels.

Fig. 15. Type labels of Thysanoptera species in ©NHMUK. **A.** *Aeolothrips intermedius* Bagnall, 1934. **B.** *Haplothrips caespitis* Priesner, 1936. **C.** *Haplothrips tenuisetosus* Bagnall, 1933. **D.** *Haplothrips satanas* Bagnall, 1933. **E.** *Chirothrips aethiops* Bagnall, 1932. **F.** *Chirothrips similis* Bagnall, 1909. **G.** *Chirothrips ambulans* Bagnall, 1932. **H.** *Chirothrips laingi* Bagnall, 1932. **I.** *Chirothrips ammophilae* Bagnall, 1927. **J.** *Ceratothrips britteni* Bagnall, 1914.

Material examined. HOLOTYPE, CANADA • British Colombia, Hatzic; female; 22.IV.1917; ex. off buds of *Acer macrophyllum*; identified as *Taeniothrips lemanis* Treherne, 1924; R.C. Treherne leg.; Type No. 679; specimen ID No. #CNC1881689 (CNC; Fig. 14G). IRAN • Razavi Khorasan province; Mashhad County; 05.IV.2017; 2 females and 4 males; collected on *P. mugo*; M. Heidari Latibari leg. (EMFUM).

Diagnosis. ***Female:*** Antennae 8-segmented, sense cone on III & IV small and forked head with no setae in front of fore ocellus, one pair of long setae on anterior margins of ocellar triangle; pronotum with 2 pairs of posteroangular setae; metanotum with transverse lines at anterior but longitudinal lines on posterior half; median setae not at anterior margin; forewing first vein with 3 or 4 setae on distal half; tergite II with 3 lateral marginal setae; V-VIII with ctenidia laterally, on VIII posteromesad of spiracle; posteromarginal comb on tergite VIII complete with slender microtrichia; sternites with transverse row of about 12 discal setae; pleurotergites with 2, 3 or 4 discal setae. **Male:** tergite VIII without posteromarginal comb; sternites III-VII with broadly transverse pore plate in front of discal setae.

Geographical distribution. Australasian (Australia); **Nearctic** (Canada); **Palaearctic** (Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iran (FA, HD, IL, KH, KS, KV, LO, MK, QZ, TE, ZA; Fig. 27), Ireland, Italy, Latvia, Macedonia, Netherlands, Norway, Poland, Romania, Russia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom).

Notes. This species is recorded for the first time in Razavi Khorasan province, Iran. We examined the holotype of *Taeniothrips lemanis* Treherne, 1924 (CNC), a female specimen, which is the current synonym of *Thrips vulgatissimus* Haliday, 1836. The Canadian specimen is in pretty rough shape, however, with several appendages and the antennae separated from the remainder of the body. The body also appears to have broken/split in several locations.

DISCUSSION

Rapid urbanization is generally considered to be one of the main drivers of biodiversity loss, resulting in major local extinctions, decreases in native species diversity, changes in species composition and outbreaks of individual species (McKinney, 2002). Therefore, it is important to preserve green spaces within urban areas for insect biodiversity. Additionally, pest control is critical for protecting trees since trees are such an integral part of the urban ecosystem, however, this issue receives a great deal less attention than it deserves. In areas with urban green spaces, thysanopteran species are considered as one of the major pests (Robinson, 2005). Many thrips species are found in urban areas (e.g., Mirab-Balou et al, 2014a, b). But there have been no significant attempts yet to explore the Thysanoptera fauna in Iranian urban green spaces compared to other ecosystems (Fekrat & Manzari, 2014; Mirab-Balou et al, 2018). Only Mirab-Balou et al, (2015) have empirically studied Thysanoptera on ornamental plants in Iran. From urban green spaces in Romania, Vassiliu-Oromulu et al, (2009) recorded 20 species, and among them, *Frankliniella intonsa* was considered the most frequent species that matches our data. In urban green spaces of Hangzhou (Zhejiang Province in China), Mirab-Balou et al, (2014a) reported 26 species of thrips, and their results indicated that the fauna of thrips in urban ecosystems was quite diverse and abundant. During a recent report published by Mirab-Balou et al, (2014), nine new thrips were documented in the urban environments of Doha (Qatar), which were all new records for Qatari fauna. A total of four of the species with the greatest relevance to our present study were found in Qatar, including *Aptinothrips rufus*, *Chirothrips manicatus*, *Frankliniella intonsa*, and *Haplothrips reuteri*.

According to the number of species collected, Aeolothripidae has the lowest number of species (one), then followed by Phlaeothripidae (four) and Thripidae (eight) (Table 3). Based on the total number of specimens, *Aptinothrips rufus* and *Frankliniella intonsa* were the most abundant species in both urban and agricultural areas, which are also widespread throughout the world. Based on the results of the current research, it can be concluded that Thysanoptera species can be found in urban environments in varying densities. A study of the Thysanoptera fauna in Razavi Khorasan province has

been carried out by Fekrat & Manzari (2014) who found 45 species and 20 genera belonging to three families but have still been little studied and its systematics remains insufficient. This study increased the number of species to forty-eight.

We also found that the two species *Aeolothrips intermedius* and *Haplothrips subtilissimus* act as predators (Table 3), which could be effective biocontrol agents of different pests and therefore would potentially be relevant for biological control. The other species found in these surveys were phytophagous on many graminicolous and florivorous plants) (Table 3). All species have been collected from *Pinus mugo* and *Platycladus orientalis*, but neither are the exclusive hosts of these species. Our observation shows that no colonies built up on young or senescent needles of *P. mugo* and *P. orientalis*, and the absence of pre-adults has confirmed this proof. Hence, thrips in urban environments can only be considered casuals. We do not yet know the original host associations of these thrips. They may have host-shifted from other plants' leaves onto tree needles a long time ago, or they may have evolved as oligophages. Consequently, the presence of adults on a plant, even when they are in large numbers, does not necessarily indicate primary host associations with the plant (Mound, 2013). It may be worthwhile to pursue further studies to verify the original host associations.

Table 3. Associated thrips species with urban green spaces in northeast of Iran (Mashhad metropolis, Razavi Khorasan Province).

Family	Subfamily	Species	Host associations
Aeolothripidae	–	*Aeolothrips intermedius* Bagnall	Predatory (Facultative)
Phlaeothripidae	Phlaeothripinae	*Haplothrips caespitis* Priesner	Phytophagy (Graminicolous)
Phlaeothripidae	Phlaeothripinae	*Haplothrips reuteri* (Karny)	Phytophagy (Florivorous)
Phlaeothripidae	Phlaeothripinae	*Haplothrips subtilissimus* (Haliday)	Predatory
Phlaeothripidae	Phlaeothripinae	*Haplothrips tritici* (Kurdjumov)	Phytophagy (Graminicolous)
Thripidae	Thripinae	*Aptinothrips rufus* (Haliday)	Phytophagy (Graminicolous)
Thripidae	Thripinae	*Chirothrips africanus* Priesner	Phytophagy (Florivorous)
Thripidae	Thripinae	*Chirothrips manicatus* (Haliday)	Phytophagy (Florivorous)
Thripidae	Thripinae	*Frankliniella intonsa* (Trybom)	Phytophagy (Florivorous)
Thripidae	Thripinae	*Limothrips angulicornis* Jablonowski	Phytophagy (Graminicolous)
Thripidae	Thripinae	*Odontothrips confusus* Priesner	Phytophagy (Florivorous)
Thripidae	Thripinae	*Thrips atratus* Haliday	Phytophagy (Florivorous)
Thripidae	Thripinae	*Thrips vulgatissimus* Haliday	Phytophagy (Florivorous)

From the biogeographical point of view, all the thirteen species we collected are found in the Palaearctic region. *Haplothrips caespitis*, *H. reuteri* and *Chirothrips africanus* have already been recorded from the Afrotropical region (Mirab-Balou, 2018). We expect that more thrips are common to both Iran and the Afrotropical region, as share similar climatic and floral conditions (i.e., Heraty et al, 2019; Rakhshani et al, 2019; Ghafouri Moghaddam et al, 2018, 2019a, b, 2021, 2022; Derafshan et al, 2020,

2021; Moravvej et al, 2022). However, further field research is necessary to verify this hypothesis. Other regions documented six species (Australasian), ten species (Nearctic), nine species (Oriental) and one species (Neotropical). It is evident from distribution maps that eastern Iran has been largely ignored and sparsely sampled (Figs 15-27), and since many different species of insects are found in these areas (Heidari Latibari et al, 2016a, b, 2020, unpublished), thus, constant research is needed.

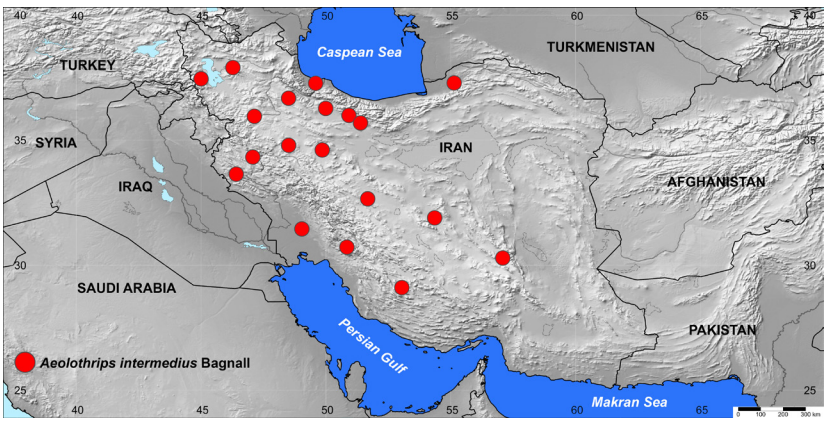

Fig. 16. Distribution map of *Aeolothrips intermedius* Bagnall, 1934 from Iran.

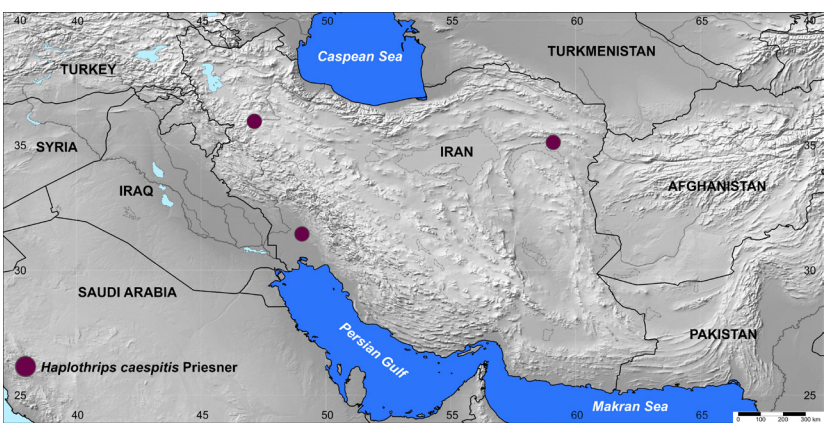

Fig. 17. Distribution map of *Haplothrips caespitis* Priesner, 1936 from Iran.

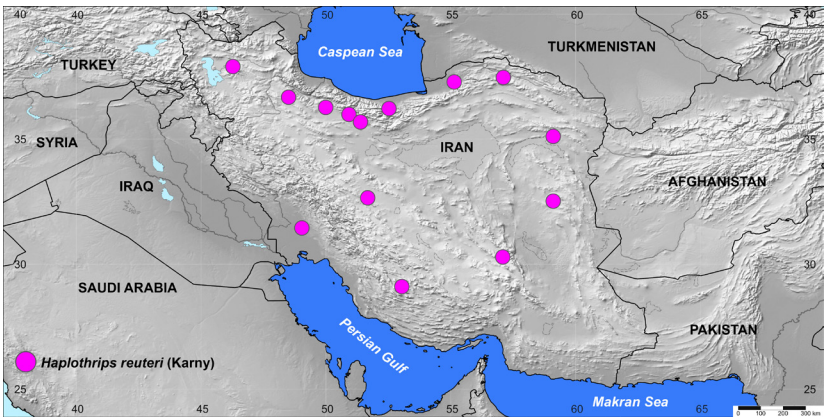

Fig. 18. Distribution map of *Haplothrips reuteri* (Karny, 1907) from Iran.

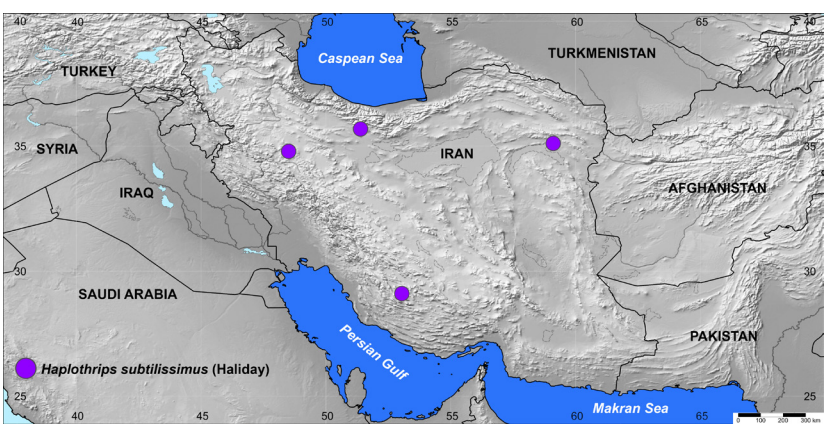

Fig. 19. Distribution map of *Haplothrips subtilissimus* (Haliday, 1852) from Iran.

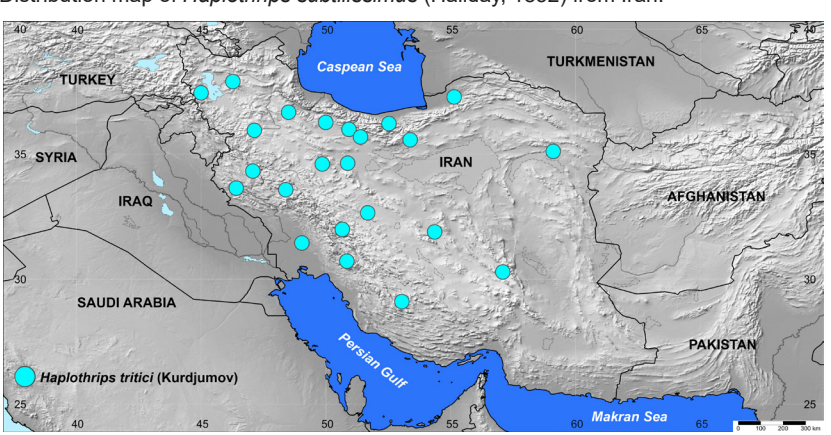

Fig. 20. Distribution map of *Haplothrips tritici* (Kurdjumov, 1912) from Iran.

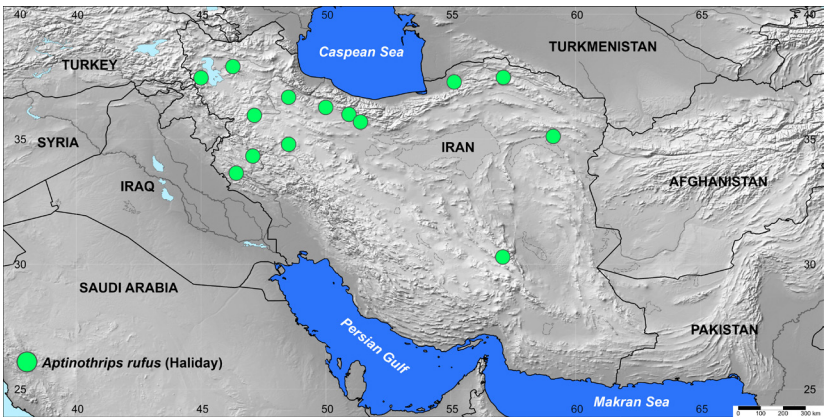

Fig. 21. Distribution map of *Aptinothrips rufus* (Haliday, 1836) from Iran.

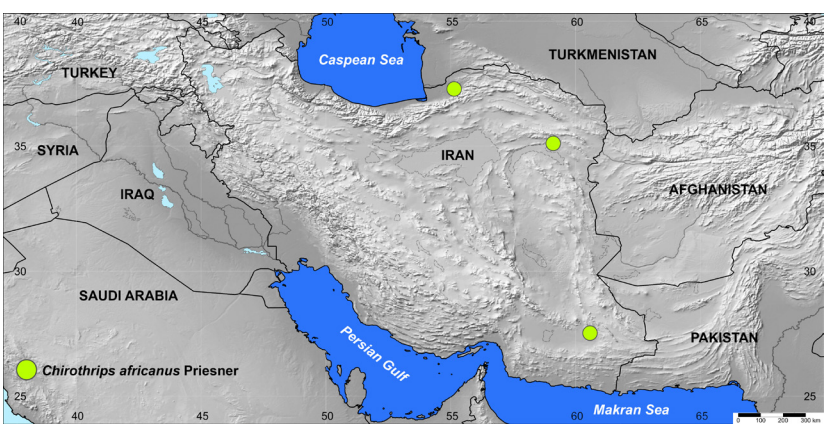

Fig. 22. Distribution map of *Chirothrips africanus* Priesner, 1932 from Iran.

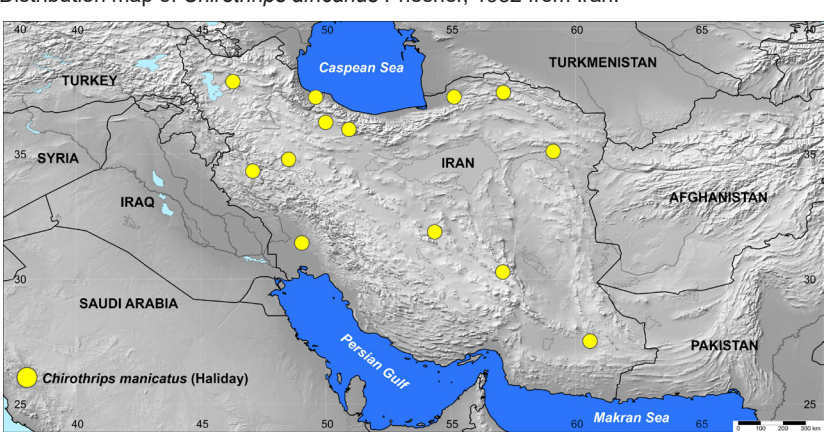

Fig. 23. Distribution map of *Chirothrips manicatus* (Haliday, 1836) from Iran.

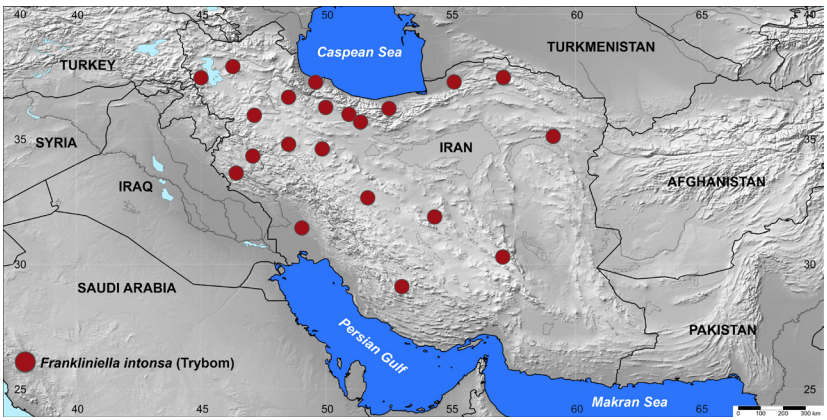

Fig. 24. Distribution map of *Frankliniella intonsa* (Trybom, 1895) from Iran.

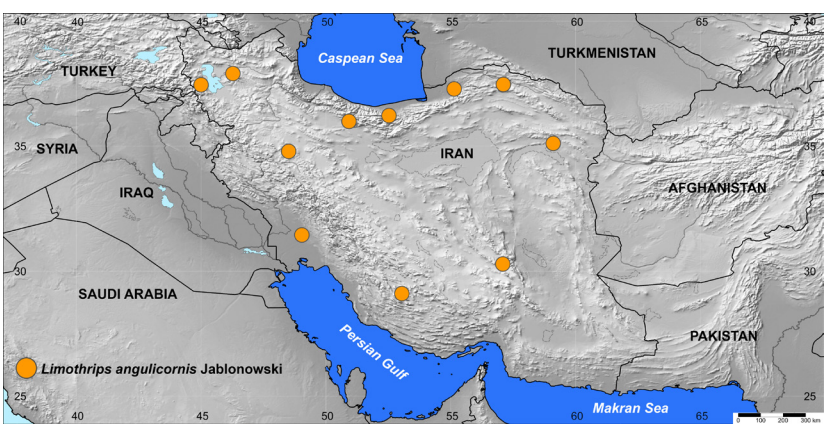

Fig. 25. Distribution map of *Limothrips angulicornis* Jablonowski, 1894 from Iran.

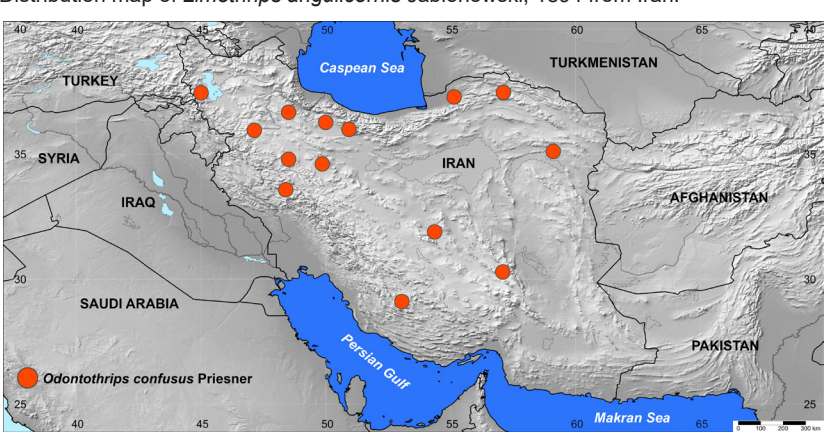

Fig. 26. Distribution map of *Odontothrips confusus* Priesner, 1926 from Iran.

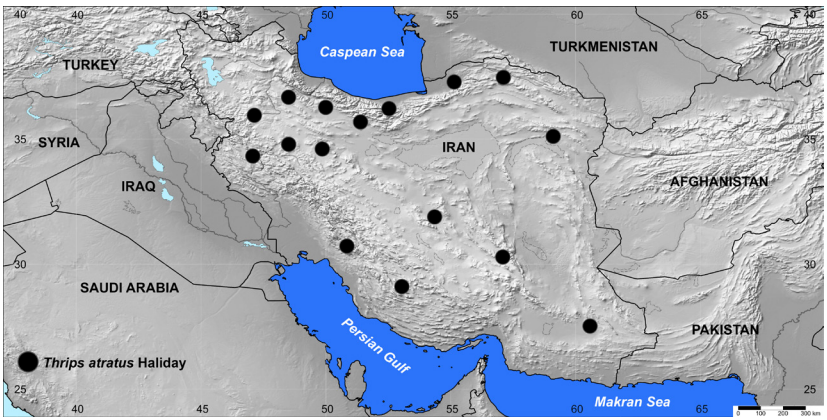

Fig. 27. Distribution map of *Thrips atratus* Haliday, 1836 from Iran.

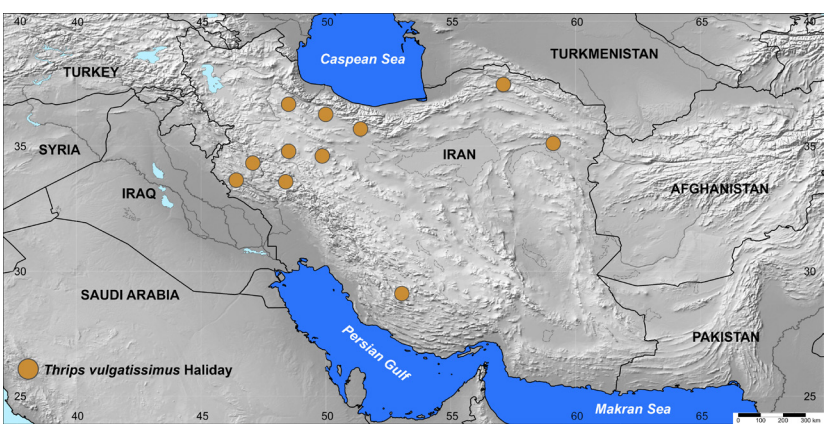

Fig. 28. Distribution map of *Thrips vulgatissimus* Haliday, 1836 from Iran.

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