First report of an endemic Australian thrips, *Thrips australis* (Thysanoptera: Thripidae) on *Eucalyptus* in Shiraz, Iran

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Abstract

The gum tree thrips, *Thrips australis* (Bagnall) is recorded from Shiraz, Fars province, Iran for the first time. Variation in color and structure of species is discussed and illustrations are provided.

Introduction

The genus *Thrips* Linnaeus is the second largest genus in the Thysanoptera, and currently includes 286 species worldwide (Mound, 2012). However the genus is absent from the Neotropics, apart from introduced species (Mound and Marullo, 1996). Most species in the genus are flower living, although a few are known to breed on leaves (Mound, 1997; Mound and Kibby, 1998). Some members of the genus are well known as pests in various parts of the world, such as *T. angusticeps* Uzel, *T. flavus* Schrank, *T. hawaiiensis* (Morgan), *T. meridionalis* Priesner, *T. tabaci* Lindeman (Moritz *et al*., 2004) as well as Iran (Minaei *et al*., 2007). However, for many species there is little information available on their biology, geographical distributions, host associations and structural variation.

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Recent years have seen much study into the genus *Thrips*. The species of *Thrips* from the Indian region were revised and 33 species were recognized in that area (Bhatti, 1980). Palmer (1992) has given identification keys to 91 species from Oriental and Pacific islands. Nakahara (1994) has treated 62 species from the New World. A key is provided for 8 species from Central America (Mound and Marullo, 1996). Ten pest species of the genus have been treated and a key has been given by Mound and Kibby (1998). Mound and Masumoto (2005) provided an identification key to 41 species from Australia, New Zealand and New Caledonia. An illustrated key is provided to 23 species of the genus *Thrips* from Peninsular Malaysia (Mound and Azidah, 2009). Thirty-four species are recorded from Africa (Mound, 2010) and subsequently an illustrated key is provided to distinguish the 33 species of genus *Thrips* recorded from China (Zhang *et al*., 2011). Finally, an Internet based interactive key has been prepared for 26 species of this genus, including potential invaders from California, North America (Hoddle *et al*., 2012). In Iran, 26 species of the genus are listed (Table 1) (Bhatti *et al*., 2009), although the names of two of them, *T. iranicus* and *T. pistaciae,* remain in doubt because they cannot be recognized from their original descriptions. The purpose of this paper is to report another *Thrips* species from Iran, with illustrations and observed variations within the Iranian specimens.

Materials and methods

The specimens of *Thrips australis* discussed below were collected in Shiraz, Fars province, Iran, by breaking up white flowers of *Eucalyptus camaldulensis* onto a plastic tray. The specimens were removed with a fine brush into a collecting vial containing 95% ethyl alcohol. Microscopic slides were mounted into Canada Balsam after dehydration through a series of ethanol using a form of the protocol given in World Thysanoptera (http://anic.ento.csiro.au/thrips/field_lab/index. html).

Microphotographs were obtained using a Dino-Lite Microscope, Eyepiece Camera. Digital images were enhanced and plates prepared using Adobe Photoshop™. Terminology generally follows Mound *et al*., (1976) and Mound and Masumoto (2005).

Most specimens are deposited at the Department of Plant Protection Collection, Shiraz University, Shiraz, Iran.

Results

Thrips australis (Bagnall)

Isoneurothrips australis Bagnall, 1915 (p. 592)
Thrips lacteicorpus Girault, 1926 (p. 17)
Thrips mediolineus Girault, 1926 (p. 18)
Anomalothrips amygdali Morgan, 1929 (p. 5)
Isoneurothrips marisabelae Ortiz, 1973 (p. 119)

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Specimens of this species were collected from the white flowers of *Eucalyptus camaldulensis* at Shiraz and this is the first report of *T. australis* in Iran. The specimens were compared with one specimen of this species from New Zealand, and also with the available published literature. Although variation in color and structure was observed within the Iranian specimens (Tables 1 and 2), they were distinguishable from other *Thrips* species by almost a complete row of forewing (Figure 1A), six (instead of five) marginal setae on clavus (Figure 1A), and a bullet shaped antennal segment VI (Figure 1B).

Diagnosis

Macropterous

Body typically yellow usually with brown markings medially on tergites III-VIII, tergites IX-X brown; antennal segment I white, II-III brownish yellow (sometimes I-II white, III brownish yellow, remaining segments almost brown; forewing usually shaded; major setae except ocellars and postoculars dark. Antennae 7-segmented (Figure 1C), III-IV with forked sensorial, VI large and bullet-shaped, VII short (Figure 1B). The head is bigger in width than in length (Figure 1D) with ocellar setae III arising within ocellar triangle. Pronotum with 2 pairs of short stout postero-angular setae (Figure 1D); posterior margin with 6, 7 or 8 setae. Mesonotum with lines of sculpture close to campaniform sensilla. Metanotum reticulate medially (Figure 1E), median setae arise behind anterior margin, campaniform sensilla present. Forewing first vein with almost uninterrupted row of setae, clavus with 6 marginal and 1 discal setae (Figure 1A). Abdominal tergite II with 4 lateral setae, tergites V-VIII with paired ctenidia, marginal comb not developed medially on tergite VIII (Figure 1F); IX with 2 pairs of campaniform sensilla; pleurotergites commonly with more than 5 discal setae (Figure 1G). Sternite II with 2 pairs of marginal setae, III-VII with 3 pairs. Sternites with a large number of discal setae (Figure 1H); the number of setae increased toward sternites VII; 3 small setae (sometimes 2 or 4) on sternite II but 14-32 developed setae on sternite VII, in irregular double rows (Figure 1H).

MATERIAL EXAMINED. 7 females, Iran, Fars province, Shiraz, from *Eucalyptus camaldulensis*, 21.06.2012 (KM853); 15 females, same locality, from *Eucalyptus camaldulensis*, 24.06.2012 (KM856); 17 females, Shiraz, from *Eucalyptus camaldulensis*, 24.06.2012 (KM861).

Table 1. *Thrips* species recorded in Iran.

No.	*Thrips* species
1	*Thrips albopilosus* Uzel
2	*Thrips angusticeps* Uzel
3	*Thrips atratus* Haliday
4	*Thrips coloratus* Schmutz
5	*Thrips dubius* Priesner
6	*Thrips euphorbiae* Knechtel
7	*Thrips flavus* Schrank
8	*Thrips fraudulentus* (Priesner)
9	*Thrips fuscipennis* Haliday
10	*Thrips hawaiiensis* (Morgan)
11	*Thrips iranicus* Yakhontov
12	*Thrips major* Uzel
13	*Thrips mareoticus* (Priesner)
14	*Thrips meridionalis* (Priesner)
15	*Thrips minutissimus* Linnaeus
16	*Thrips nigropilosus* Uzel
17	*Thrips pelikani* Schliephake
18	*Thrips physapus* Linnaeus
19	*Thrips pillichi* Priesner
20	*Thrips pistaciae* Yakhontov
21	*Thrips simplex* (Morison)
22	*Thrips tabaci* Lindeman
23	*Thrips trehernei* Priesner
24	*Thrips verbasci* (Priesner)
25	*Thrips vuilleti* (Bagnall)
26	*Thrips vulgatissimus* Haliday

Discussion and Conclusions

Although the species is native to Australia, it has been introduced around the world wherever *Eucalyptus* trees are grown (Mound, 2010). So it seems likely that the presence of this species in Iran is not surprising. Color and size both vary, and as a result the species has been described under five other names (see above). The variation in color of antennal segments and two character states reported here (Table 2), as well as some other variations which have already been mentioned above (Diagnosis section), support the variability of the species. In addition to Australia (Mound and Masumoto, 2005), *Thrips australis* has been recorded from many other parts of the world, including Egypt (Priesner, 1965), Japan (Miyazaki and Kudo, 1988), the Pacific regions (Palmer, 1992), Europe (zur Strassen, 2003), United States (Nakahara, 1994), Central America (Mound and Marullo 1996), Brazil (Monteiro, 2002), Peninsular Malaysia (Mound and Azidah, 2009), Africa (Mound, 2010), Britain (Collins, 2010), China (Zhang *et al*., 2011) and North America (Hoddle *et al*., 2012). Sakimura (1967) and Kirk (1987) have questioned whether *T. australis* is native to Australia on the basis that this species has been found in so many countries around the world. However, neither of these authors considered the many field observations that associate this thrips with white *Eucalyptus* flowers, both in Australia and in other countries (Mound and Masumoto, 2005). In Kenya, *T. australis* is known from crops such as tomato, capsicum, French bean, sunflower and carrot (Icipe, 2012). However, there are currently no records from any crops in Iran.

Table 2. Variation in color and structure of among 39 specimens of *T. australis* collected in Shiraz.

Character	Characteristics	Number of specimens
Color of antennal segments*	I-II white, III brownish yellow	13
	I white, II-III brownish yellow	26
Number of posteromarginal setae on pronotum	6	20
	7	11
	8	8
Number of discal setae on sternites II	2	14
	3	18
	4	7

*Antennal segments IV-VII in all specimens brown.

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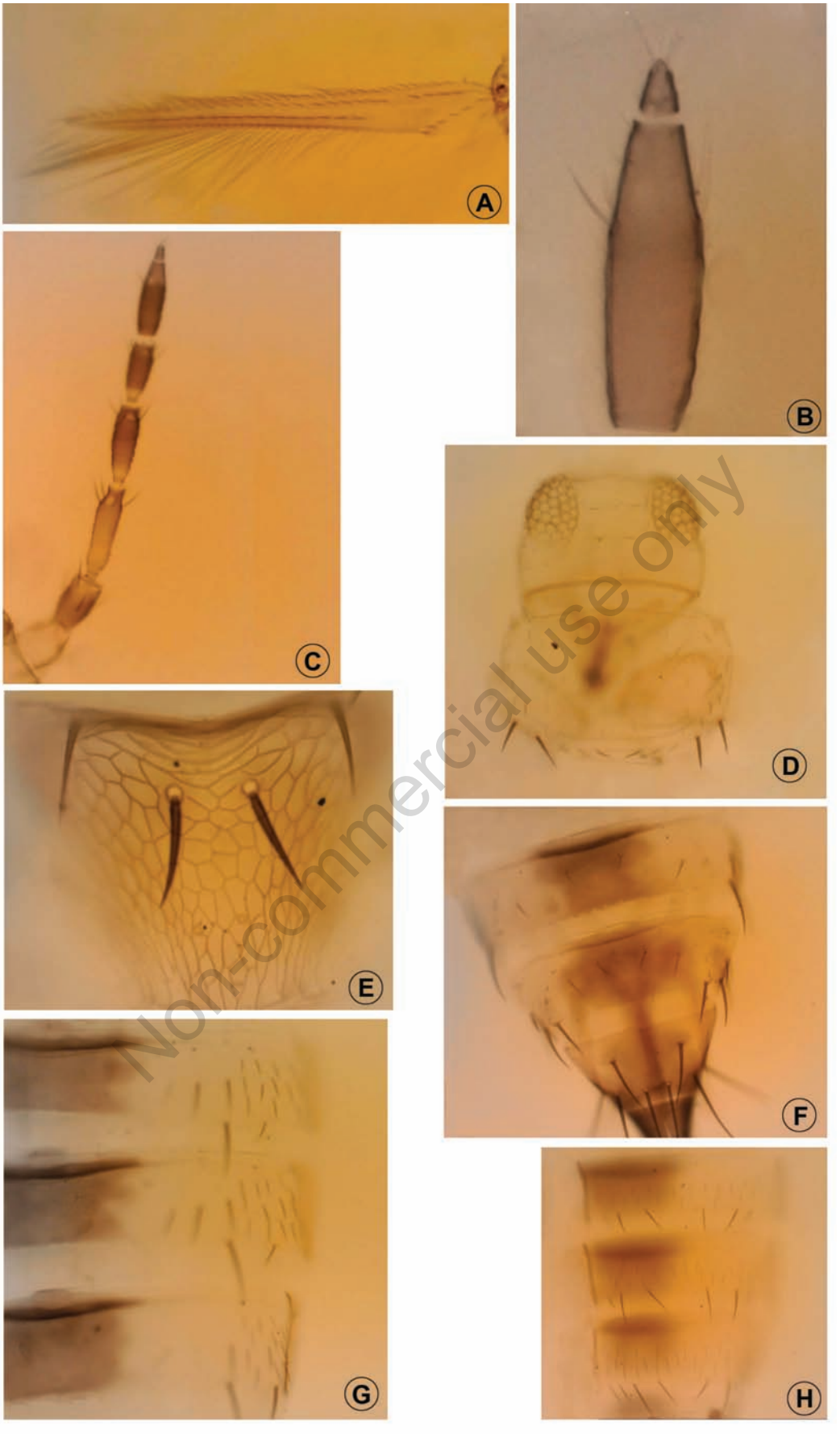

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Figure 1. *T. australis* **(A) forewing; (B) antennal segments VI-VII; (C) left antenna; (D) head and pronotum; (E) metanotum; (F) abdominal tergites VII-IX; (G) abdominal pleurotergites IV-VI; (H) abdominal sternites V-VII.**

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