

Occurrence of fig wasps (Hymenoptera: Chalcidoidea) in *Ficus caria* and *F. microcarpa* in Hatay, Turkey

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Received: 02.11.2011 • Accepted: 11.02.2012

Abstract: This study focuses on fig wasps (Hymenoptera: Chalcidoidea), considering that only 2 fig wasp species, *Blastophaga psenes* (L.) and *Philotrypesis caricae* (L.) (new record) are associated with *Ficus carica* in Turkey. Five fig wasps species, namely *Eupristina verticillata* Waterston, *Walkerella microcarpae* Bouček, *Odontofroggatia ishii* Wiebes, *Philotrypesis taiwanensis* Chen, and *Philotrypesis emeryi* Grandi were found on *Ficus microcarpa* (L.), which is an Asian fig tree, and has been ornamentally cultivated in Turkey since the 1930s. Among them, *E. verticillata* was detected as a specific pollinator of *F. microcarpa*, the rest of the species were not pollinators, and all of them are new records for Turkey. The results suggest that the time of influx of these wasps into Turkey is unknown, but it can be assumed that they came together with *F. microcarpa* when it was brought from somewhere in the world during the period before the Hatay Republic. Distribution, biology, and systematic notes of each species are all given.

Key words: Fig wasps (Hymenoptera), *Ficus carica*, *Ficus microcarpa* (Moreaceae), Hatay, Turkey

The common fig, *Ficus carica* L., is native to Asia and has been cultivated in several countries, as well as in Turkey. Moreover, its pollinator, *Blastophaga psenes* (L.) (Hym., Agaonidae), is native to Asia and was introduced in North America for cultivation of Smyrna figs (*F. carica*). Smyrna figs develop only when fertile seeds are present, and these seeds account for the generally excellent quality and nutty flavor of the fruit. The female fig wasp's role in pollinating certain edible figs, especially Smyrna figs, is critical to the fig grower, as most economically valuable figs require fertilization to ripen. Until now, only 1 species, *B. psenes* (L.), has been recorded from *F. carica* L. in Turkey by several authors (Önder and Akman, 1979; Van Noort and Harten, 2006). For many years, *Ficus microcarpa* L. has been widely used as ornamental

plant in the cities of the Mediterranean and Aegean regions of Turkey. Because it was introduced without its pollinator wasps, the figs dropped while still small and dry. Various studies have been conducted on *F. microcarpa* and its fig wasps in the countries where this plant has been introduced (Wiebes, 1980; Bouček, 1993; Bradsley, 1998; Chen et al., 1999; Van Noort and Harten, 2006). The study was conducted in Hatay Province for obtaining the fig wasps in syconia of *F. carica* and *F. microcarpa* in 2011.

In October of 2011, the fig wasps of *F. microcarpa* were collected by sweeping from the surfaces of tables in the Palm Restaurant of İsdemir, İskenderun, and also, in October, the syconia were collected from several places in İsdemir, Sariseki, and the Center of İskenderun, and were kept in plastic bags for rearing

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the fig wasps. Before this occurrence in April of 2011, the fig wasps of *F. carica* were collected from the leaves and surfaces of syconia by shaking them into a plastic bag. When the wasps started to emerge, the syconia were dissected to obtain male specimens. The wasps were identified using the following resources: Ishii (1934), Wiebes (1980), Bouček et al. (1981), Bouček (1993), Van Noort and Rasplus (1997), Bradsley (1998), Chen et al. (1999), and Farache et al. (2009).

The following wasps were recorded: *Blastophaga psenes* (L.) and *Philotrypesis caricae* (L.) from *F. carica* L. and *Eupristina verticillata* Waterston, *Walkerella microcarpae* Bouček, *Odontofroggatia ishii* Wiebes, *Philotrypesis taiwanensis* Chen, and *Philotrypesis emeryi* Grandi from *F. microcarpa* L. The fig wasps found, except *B. psenes*, are new records for Turkey.

Insects reared and collected from *Ficus carica* L.

Blastophaga psenes (L., 1758) (Agaonidae: Blastophaginae)

Distribution: Afghanistan; Algeria; Armenia; Australia (New South Wales); Canary Islands; Caucasus; Croatia; Eritrea; Ethiopia; Europe; France; India; Iran; Israel; Italy; Nearctic Nepal; North Africa; Pakistan; South Africa; Turkey; Ukraine; United States of America (Arizona, California, Texas); USSR; Central Asia; Yemen. (Linnaeus, 1758; Waterston, 1920; Grandi, 1961; Nikolskaya, 1978; Joseph, 1954; Mkrtchyan, 1968; Bouček, 1977; 1988; Önder and Akman, 1979; Kjellberg et al., 1983; Vovlas and Larizza, 1996; Van Noort and Harten, 2006; Noyes, 2011).

Material examined: 112 ♀♀, 23 ♂♂, Hanyolu, Antakya-Hatay, 630 m, 12.iv.2011 (M. Doğanlar), swept and reared from *F. carica*. It is a pollinator of *F. carica*.

Philotrypesis caricae (L., 1762) (Pteromalidae : Sycoryctinae)

Synonyms:

Cynips caricae L. 1762: ICZN 1964: 31-32, validated under the plenary powers.

Philotrypesis caricae (L.): Mayr 1885: 222, new combination for *Cynips caricae* L.

Distribution: Caucasus; Europe; France; Israel; Italy; Ukraine; United States of America; USSR (Central Asia). (Grandi, 1961; Herting, 1977; Nikolskaya and Zerova, 1978; Noyes, 2011).

Material examined: Turkey: Hatay, Belen, 725 m, 7 ♀♀, 23.iv.2011 (M. Doğanlar); Antakya, Hanyolu, 630 m, 5 fm, 07.v.2011 (M. Doğanlar).

Biology: It is known as parasitoid of *B. psenes* (Noyes, 2011). The specimens were reared from syconia of *F. carica*.

Insects reared and collected from *Ficus microcarpa* L.

Eupristina verticillata Waterston, 1921 (Agaonidae: Agaoninae)

Distribution: Afrotropical; Australia; Bermuda; Brazil (Sao Paulo); Canary Islands; El Salvador; Hawaii; Honduras; India (Kerala); Indonesia (Sumatra); Italy (Sicily); Japan; Madeira; Malaysia (Sarawak); Mexico; People's Republic of China (Hong Kong); Philippines; Puerto Rico; Solomon Islands; Taiwan; Tunisia; United States of America (California, Florida) (Waterston, 1921; Lo Verde et al., 1991; Nadel et al., 1992; Kobbi et al., 1996; Yokoyama, 1996; Chen and Chou, 1997; Yokoyama and Iwatsuki, 1998; Bradsley, 1998; Priyadarsanan, 2000; Koponen and Askew, 2002).

Material examined: Turkey: Hatay, İskenderun, 25 m, 213 ♀♀, 5 ♂♂, 23.x.2011 (M. Doğanlar); İsdemir, 124 ♀♀, 21.x.2011 (G. Şimşek); Sariseki, 18 m, 23 ♀♀, 3 ♂♂, 25.x.

2011 (M. Doğanlar), reared from syconia.

Biology: It was recorded as pollinator of *F. microcarpa*.

Remarks: The species was recorded as pollinator of *F. microcarpa*. By producing tiny seeds within small sized fruit, the pollinator wasp also allows *F. microcarpa* to spread beyond the initial plantings. *F. microcarpa* seems a notorious invader in İsdemir, İskenderun.

Walkerella microcarpae Bouček, 1993 (Pteromalidae: Otitesellinae)

Distribution: People's Republic of China Hong Kong, Hawaii (Oahu), Japan (Okinawa), United States of America (California, Florida (type locality), Bermuda, Grand Cayman, Brazil. (Bouček, 1993; Bradsley, 1998).

Material examined: Hatay, İskenderun, İsdemir, 27 m, 21 ♀♀, 1 ♂, 21.x,2011 (G. Şimşek, M. Doğanlar).

Biology: Unknown

Remarks: This species was reared from syconia of *F. microcarpa* together with *E. verticillata*.

Odontofroggatia ishii Wiebes, 1980 (Eurytomidae: Epichrysomallinae)

Distribution: Southeast Asia (type locality Malaya); Malaysia, Papua-New Guinea; People's Republic of China (Hong Kong); Hawaii (Oahu); Taiwan; USA (California, Florida) (Wiebes, 1980; Bouček, 1988; Bradsley, 1998).

Material examined: İskenderun, 12 m, 2 fm. 1m, 25.x.2011 (M. Doğanlar).

Biology: Females of the *Odontofroggatia* species oviposit through the outside of the syconium by means of an elongate ovipositor that is coiled within the gaster when not in use. Eggs are laid into young ovaries, which are transformed into small galls by larval feeding. The wasps are not parasitic on Agaoninae or other inquilines, and may occur in syconia where agaonines are not present (Bouček, 1988).

Remarks: The species was reared from syconia of *F. microcarpa*.

Philotrypesis taiwanensis Chen, 1999 (Pteromalidae: Sycoryctinae)

Distribution: Taiwan (Chen et al., 1999).

Material examined: Turkey: İskenderun, 12 m, 52 ♀♀. 4 ♂♂, 25.x.2011 (M. Doğanlar).

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Biology: Parasitoid of *E. verticillata* (Noyes, 2011).

Remarks: The specimens of *P. taiwanensis* were reared from syconia of *F. microcarpa*.

Philotrypesis emeryi Grandi, 1926 (Pteromalidae: Sycoryctinae)

Distribution: Indonesia (Sumatra (type locality). Japan, People's Republic of China (Hong Kong), Hawaii (Oahu), United States of America (Florida), Taiwan (Grandi, 1926; Bradsley, 1998; Chen et al., 1999).

Material examined: Hatay, İskenderun, 12 m, 21 ♀♀. 25.x.2011 (M. Doğanlar).

Biology: *Philotrypesis* females oviposit from the outside through the syconium wall and the larvae compete for space and food with those of agaonine pollinators in the female florets

(Bouček, 1988).

Remarks: The specimens of *P. emeryi* were reared from syconia of *F. microcarpa*.

Acknowledgments

The authors wish to express their cordial thanks to Mr. Gürcan Şimşek for providing invaluable information about the phenomenon of fig wasps in İsdemir, İskenderun, and to the reviewers for their invaluable comments.

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