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A comment on Iranian fig wasps (Chalcidoidea: Agaonidae, Pteromalidae)

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Abstract: A total of 5 species of fig wasps from 5 genera including, *Blastophaga*, *Elisabethiella* (Agaonidae), and *Apocrypta*, *Sycophaga*, *Apocryptophagus* (Pteromalidae) are recorded from Iran. Among the collected fig wasps, *Apocryptophagus gigas* (MAYR) is a new record for the Iranian fauna.

Key words: Fig wasp, Agaonidae, Pteromalidae, *Ficus*, Iran.

Introduction

Fig wasps include the pollinating fig wasps (Chalcidoidea: Agaonidae) and a diverse assemblage of non-pollinating fig wasps (Chalcidoidea: Pteromalidae, Eurytomidae, Ormyridae) that are also associated with individual fig tree species (VAN NOORT & VAN HARTEN 2006). The relationship between pollinating fig wasps (Chalcidoidea, Agaonidae) and their host fig trees (*Ficus* L. 1753, Moraceae) is a classic example of an obligate mutualism, where neither partner can reproduce without the other, the wasp providing a pollination service and the fig tree in turn providing a breeding site for the pollinating wasp's progeny (JANZEN 1979). The obligate mutualism between pollinating fig wasps and their host fig trees (*Ficus*, Moraceae) has historically been considered to be a one-to-one relationship (RAMIREZ 1970; WIEBES 1979; WIEBES & COMPTON 1990; VAN NOORT 2004), but increasing evidence is suggesting that the relationship is not as tight as has previously been supposed, with records of more than one species of pollinator associated with a single host and, conversely, of a single pollinator species associated with more than one host fig species (COMPTON & VAN NOORT 1992; WEST & HERRE 1994; WEST et al. 1996; MICHALOUD et al. 1996; KERDELHUÉ & RASPLUS 1996a, 1996b; COOK & RASPLUS 2003; MOLBO et al. 2003; ZHANG et al. 2004).

Local Iranian *Ficus* species richness is fairly high for an arid region. In total 10 species and varieties have been recorded from Iran: *Ficus bengalensis* L., *F. carica* L. var. *genuine* BOISS., *F. carica* L. var. *johannis* BOISS., *F. carica* L. var. *rupestris* HAUSSKN., *F. elastica* ROXBG., *F. elastica* ROXBG. var. *aurea*, *F. eriobotryoides* KUNTH & BOUCHE, *F. persica* BOISS., *F. pumila* L. and *F. religiosa* L. (SABETI 1994). Nine species were recorded from Yemen (VAN NOORT & VAN HARTEN 2006), and seven species were listed for UAE (VAN NOORT & RASPLUS 2010).

The fig wasp fauna of Iran was poorly studied so far (FAZELI 1987; MODARRES AWAL

1997; STOJANOVA & GHAHARI 2009). In this paper, we have collected all the data on Iranian fig wasps from two families Agaonidae and Pteromalidae.

Materials and Methods

The materials were collected by light traps and Malaise traps from different regions of Iran through 2004-2008. Classification, nomenclature and distributional data suggested by BOUCEK et al. (1981), BERG & WIEBES (1992), VAN NOORT (2004), VAN NOORT & VAN HARTEN (2006) and CRUAUD et al. (2010) have been followed.

Results

Totally 5 species of fig wasps from 5 genera and 2 families (Agaonidae and Pteromalidae) were collected from different regions of Iran.

Family A g a o n i d a e

Blastophaga psenes (LINNAEUS 1758)

Cynips psenes LINNAEUS 1758 – Systema naturae (10th Edition) 1: 554.

Blastophaga grossorum GRAVENHORST 1827 – Übersicht der Arbeit und Veränderungen der schlesischen Gesellschaft für vaterländische Kultur 1826: 23.

Blastophaga vaidi JOSEPH 1954 – Agra University Journal of Research (Science) 3: 401-408.

Blastophaga psenes. GRANDI 1929 – Bollettino del Laboratorio di Entomologia del R. Istituto Superiore Agrario di Bologna 2: 1-147. Grandi 1963; Bollettino dell'Istituto di Entomologia della Università degli Studi di Bologna 26: 325-326 (synonymy of *B. grossorum*). WIEBES 1993; Proceedings of the Koninklijke Nederlandse Akademie van Wetenschappen (C) 96: 351 (synonymy of *B. vaidi*).

Material examined: East Azarbayjan province: Arasbaran (976 m), 3 ♀ ♀, on *Ficus* sp., 24 June 2007; Mazandaran province: Behshahr (67 m), 2 ♀ ♀, on *Ficus* sp., 15 August 2007.

Distribution outside Iran: Afrotropical: Eritrea, Ethiopia, South Africa; Australasia: Australia; Palaearctic: Afghanistan, Algeria, Armenia, Canary Islands, Caucasus, France, India, Israel, Italy, Pakistan, Turkey, Ukraine.

Elisabethiella socotrensis (MAYR 1885)

Blastophaga socotrensis MAYR 1885 – Verhandlungen der Zoologisch-Botanischen Gesellschaft in Wien 35: 175-176.

Blastophaga dyscritus WATERSTON 1921 – Transactions of the Entomological Society of London 1921: 417-418.

Blastophaga socotrensis. GRANDI 1928a – Bollettino del Laboratorio di Entomologia del R. Istituto Superiore Agrario di Bologna 1: 69 (placed in subgenus *Elisabethiella*). GRANDI 1928b; Bollettino del Laboratorio di Entomologia del R. Istituto Superiore Agrario di Bologna 1: 159-163 (redescription; synonym *B. dyscritus* WATERSTON 1921).

Elisabethiella socotrensis. WIEBES 1977 – Netherlands Journal of Zoology **27**: 210 (host record by MAYR 1885 incorrect; may have been *F. vasta*). WIEBES 1989 a; Proceedings of the Koninklijke Nederlandse Akademie van Wetenschappen (C) **92**: 117-136 (confirmation of host record, review, key to species). BERG & WIEBES 1989; Koninklijke Nederlandse Akademie van Wetenschappen, Verhandelingen Afdeling Natuurkunde, Tweede Reeks, Deel 89, Amsterdam: 242 (review).

Material examined: Yazd province: Tabas (663 m), 2 ♀ ♀, on *Ficus* sp., 22 September 2006.

Distribution outside Iran: Afrotropical: Ethiopia, Saudi Arabia, Socotra (ex *F. vasta*); Kenya, Zambia (ex *F. wakefieldii*); South Africa, Zimbabwe (ex *F. natalensis*); Uganda, Yemen (host unknown).

Family Pteromalidae

Subfamily Sycoryctinae

***Apocrypta longitarsus* MAYR 1906**

Apocrypta longitarsus MAYR 1906 – Wiener Entomologische Zeitung **25**: 163-164.

Apocrypta minima RISBEC 1951 – Mémoires de l'Institut Français d'Afrique Noire **13**: 389-390.

Apocryptophagus bambeyi RISBEC 1951 – Mémoires de l'Institut Français d'Afrique Noire **13**: 318.

Apocrypta longitarsus MAYR 1906 – ULENBERG & van PELT 1985; Verhandelingen der Koninklijke Nederlandse Akademie van Wetenschappen, Afdeling Natuurkunde, Tweede Reeks **83**: 118-121 (synonymy of *A. minima* & *A. bambeyi*, redescription).

Material examined: Fars province: Kazeroon (842 m), 3 ♀ ♀, on *Ficus* sp., 18 March 2006.

Distribution outside Iran: Afrotropical: Botswana, Cameroon, Comoro Islands, Eritrea, Kenya, Madagascar, Malawi, Namibia, Senegal, South Africa, Tanzania, Yemen, Zambia and Zimbabwe; Palaearctic: Israel.

***Apocryptophagus gigas* (MAYR 1906)**

Eukoebelea gigas MAYR 1906 – Wiener Entomologische Zeitung **25**: 164-165.

Parakoebelea gigas (MAYR 1906) – WIEBES 1968; Zoologische Mededelingen **42**: 318 (combination).

Apocryptophagus gigas (MAYR 1906) – BERG & WIEBES 1992; Koninklijke Nederlandse Akademie van Wetenschappen, Verhandelingen Afdeling Natuurkunde, Tweede Reeks, Deel 89, Amsterdam: 176 (combination).

Material examined: Sistan & Baluchestan province: Mirjaveh (835 m), 1 ♀, on *Ficus* sp., 9 August 2005. **New record for Iran.**

Distribution outside Iran: Afrotropical: Botswana, Comoro Islands, Ethiopia, Kenya, Madagascar, Malawi, Namibia, Senegal, South Africa, Tanzania, Yemen, Zambia and Zimbabwe.

***Sycophaga sycomori* (LINNAEUS 1758)**

Cynips sycomori LINNAEUS 1758 – Systema naturae (10th Edition) **1**: 554.

Sycophaga crassipes WESTWOOD 1840 – Transactions of the Entomological Society of London II: 222-223.

Material examined: East Azarbayjan province: Arasbaran (867 m), 2 ♀ ♀, on *Ficus* sp., 5 June 2007.

Distribution outside Iran: Afrotropical: Botswana, Comoro Islands, Eritrea, Ethiopia, Kenya, Madagascar, Malawi, Namibia, Senegal, South Africa, Tanzania, Yemen, Zimbabwe, Zambia; Palaearctic: Egypt, Greece, Israel, Syria.

Discussion

Upon this research, the fauna of Iranian fig wasps is rather diverse, which it has been resulted from various species and subspecies of fig trees in Iran. The continuing of studies on fig wasps (fauna and biology) is necessary for determining of these beneficial insects. Iran is a large country with various geographical regions and climates and therefore we expect that many other species of fig wasps are remained to be found. On the other hand, fig wasps are a fantastic subject for evolutionary study, especially for investigations of coevolved mutualism between pollinators and their host plants (WIEBES 1979). Comparative approaches to the study of fig wasp evolution were limited until recently by the ambiguity of phylogeny estimates for the lineages involved. Molecular phylogenies provide new opportunities to examine evolutionary hypotheses drawn from the specificity of fig wasp interactions (RAMIREZ 1974; WEIBLEN 2002). Therefore collecting the specimens from different regions of Iran and especially from different species of fig trees and analyzing the specimens will be resulted to reveal of phylogenetic and evolutionary ambiguities.

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Zusammenfassung

5 Feigenwespenarten der Gattungen *Blastophaga*, *Elisabethiella* (Agaonidae) sowie *Apocrypta*, *Sycophaga*, *Apocryptophagus* (Pteromalidae) wurden aus dem Iran nachgewiesen, *Apocryptophagus gigas* (MAYR) stellte einen Erstnachweis für die iranische Fauna dar.

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