SURVEY OF THE ICHNEUOMONOIDEA AND CHALCIDOOIDEA (HYMENOPTERA) PARASITOIDS OF SATURNIIDAE (LEPIDOPTERA) IN IRAN

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ABSTRACT

The present work deals with Ichneumonoidea and Chalcidoidea (Hymenoptera) as parasitoids of Saturniidae (Lepidoptera) in Iran. A total of six species of Braconidae (four genera and two subfamilies), eight species of Ichneumonidae (eight genera and four subfamilies), one species of Eupelmidae, and one species of Pteromalidae are listed in this paper. In addition to the species list, hosts and distributional data are given for all the parasitoids too.

Keywords: Ichneumonoidea, Chalcidoidea, Saturniidae, Parasitoids, Fauna, Iran

INTRODUCTION

Ichneumonoidea (Ichneumonidae and Braconidae) is considered as one of the first major parasitoid lineages in Hymenoptera (Rasnitsyn, 1980, 1988). It comprises a huge group, with probably more than 100,000 species worldwide (Gauld, 2002), of primary parasitoid insects that attack other arthropods, especially the immature stages of other insects (Gauld and Bolton, 1988; Wahl and Sharkey, 1993). Past classifications have sometimes included other groups, such as Stephanidae and Megalyridae (now transferred elsewhere) or they have recognized subfamilies of Braconidae (e.g. Aphidiinae and Apozyginae) and Ichneumonidae (Agriotypinae and Paxylommatinae) as distinct families (Sharkey and Wahl, 1992). On the other hand, members of the Chalcidoidea probably have the greater range of biological diversity than those of any other parasitoid groups. Chalcidoidea is numerically the largest and most biologically diverse in all insect groups. Recently published works indicate that chalcidooids already equal the number of Ichneumonoinds in the described species, and it was believed that 60,000 to 100,000 species is not unreasonable (Gordth, 1979; Noyes, 1990). There is a great amount of confusion about the definition of families, genera and species of Chalcidoidea (Grissel and Schauf, 1997). Members of Chalcidoidea attack insect species of about 339 families representing 15 different orders, including all endopterygote orders, many exopterygotes, and also some arachnids (including pseudoscorpions, ticks, and mites) (Boucek, 1988; Noyes and Valentine, 1989). Chalcidoidea is the most important successful parasitoid group used in applied biological control, with over 800 different species have been used successfully in biocontrol programs in one way or another (Boucek, 1988; Noyes and Valentine, 1989).

Saturniidae, as hosts of those parasitoids, are among the largest and most spectacular families of Lepidoptera, with an estimated 1300-1500 described species worldwide (Grimaldi and Engel, 2005). The royal or regal moths, the giant silk moths, and the emperor moths belong to this family. In Iran, this family was poorly studied and only two species (Neoris huttoni Moore and Saturnia pyri L.) were identified so far (Modarres Awal, 1997). Saturnia pyri is a fruit pest in Iran, which occasionally damages the pear trees (Pyrus communis L.); and also observed on some other fruit and forest trees. The larva is large, voracious, and is a powerful defoliator both in gardens and forests (Esmaili, 2007). These moths are attacked by parasitoids from different families of Hymenoptera especially Ichneumonidae and Braconidae (Peigler, 1994).

Iran is predominantly an arid and semi-arid country, but the northern slopes of Alburz ranges and the Caspian lowland receive 800-2000mm annual rainfall and are the most humid parts of the country. On the other hand, Dasht-e Kavir and Dasht-e Lut deserts are the driest parts with less than 150mm annual precipitation (Zehzad et al., 2002). The highlands receive between 250 and 800mm. From the bioclimatic point of view, the country is divided

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into 14 bioclimatic types. There is no clear cut picture of zoogeographic affinities of the degree of endemism of the Iranian fauna (Zehzad et al., 2002). The aim of the present work is to identify some saturniid’s ichneumonoid and chalcidoid parasitoids in Iran.

MATERIALS AND METHODS

The fauna of ichneumonoid and chalcidoid parasitoids of Iranian Saturniidae was studied in different forests of many provinces through 2004-2006. For collecting the parasitoid specimens, saturniid larvae (totally 43 larvae) were collected from the forests and were reared in optimum condition (26±2 °C, 65±5 %RH, 14: 10 L: D) in an incubator for emergence of harboured parasitoids. In addition to the mentioned main method, some specimens were collected by malaise traps (totally 4 traps) which were set out only in forests of Mazandaran province (northern Iran). The collected parasitoids by malaise traps were considered as parasitoids of saturniids according to Peigler (1994). Classification, nomenclature, and distributional data of parasitoids suggested by Yu and Horstmann (1997), Yu et al. (2005), and Noyes (1998) have been followed.

During the present work, a total of 14 ichneumonoid and 2 chalcidoid parasitoids of Saturniidae were collected from different regions so far. A list of the collected species is presented with hosts and distributional data in Iran provinces (Fig.1) and outside Iran.

Checklist of the collected species

Superfamily Ichneumoidea

Family Braconidae

Subfamily Euphorinae

1- *Meteorus luridus* Ruthe
Distribution in Iran: Kermanshah province: Paveh (1567 m), 2 materials, August 2006.
Host: *Saturnia pavonia* (Rougeot, 1971).
Distribution outside Iran: Palaeartic region.

Subfamily Microgastrinae

2- *Cotesia glomerata* (Linnaeus)
Distribution in Iran: Guilan province: Lahijan (18 m), 5 materials, July 2004.
Host: *Antheraeopsis assama* (Yu et al., 2005).
Distribution outside Iran: Palaeartic region.

3- *Cotesia juniperatae* (Bouché)
Distribution in Iran: Mazandaran province: Ghaemshahr (18 m), Joibar (14 m), Kiakola (23 m), Savadkooh (550 m), 7 materials, September 2006.
Distribution outside Iran: Central Europe and Middle Asia.

4- *Cotesia melanoscela* (Ratzeburg)
Distribution in Iran: East Azarbayjan province: Arasbaran (778 m), 1 material, September 2005.
Host: *Hemileuca maia* (Thompson, 1944; Mason, 1981).
Distribution outside Iran: Palaeartic region.

5- *Dolichogenidea aethiopica* (Wilkinson)
Distribution in Iran: Guilan province: Fooman (39 m), Rasht (39 m), 3 materials, October 2005.
Hosts: *Holocerina angulata*, *Imbrasia tyrrhea*, and several other Lepidoptera in Arctiidae, Lasiocampidae, Noctuidae, Nymphalidae, Pyralidae, Zygaenidae (Walker, 1994).
Distribution outside Iran: Palaeartic region.

6- *Protapanteles immunis* (Haliday)
Distribution in Iran: West Azarbayjan province: Ourmiah (1416 m), Piranshahr (1376 m), 2 materials, June 2005.
Hosts: *Saturnia pavonia*, *Orgyia antiqua* (Linnaeus) (Lymantriidae), and many other Lepidoptera including mostly Geometridae but also Lycaenidae, Noctuidae, Tortricidae, Plutellidae, Coleophoridae (Thompson, 1944; Rougeot, 1971; Papp, 1990; Mason, 1981).

Distribution outside Iran: Palaearctic region.

**Family Ichneumonidae**

**Subfamily Anomaloninae**

7- *Anomalon signatum* Gravenhorst


Host: *Saturnia pavonia* (Packard, 1914).

Distribution outside Iran: Palaearctic region.

**Subfamily Campopleginae**

8- *Campoplex quadrimaculatus* Ratzeburg

Distribution in Iran: Isfahan province: Najaf-Abad (1588 m), 1 material, August 2004.

Host: *Aglia tau* (Packard, 1914).

Distribution outside Iran: Palaearctic region.

**Subfamily Ichneumoninae**

9- *Amblyteles erythronotus* Rondani


Hosts: *Saturnia caecigena* (Lederer, 1951-1952; Rougeot, 1971).

Distribution outside Iran: Southeastern Europe.

**Subfamily Pimplinae**

10- *Agrothereutes fumipennis* (Gravenhorst)


Hosts: *Saturnia pavonia* (Nordström, 1916; Thompson, 1944; Kugler, 1961; Rougeot, 1971; Carlson, 1979; Ebert, 1994).

Distribution outside Iran: Northern Europe including Britain, and Middle Asia.

11- *Coccygomimus indra* (Cameron)

Distribution in Iran: Golestan province: Minoodasht (151 m), 1 material, September 2004. Mazandaran province: Behshahr (57 m), 2 materials, April 2005.

Hosts: *Saturnia pyri*, other Lepidoptera including butterflies, Lymantriidae, Lasiocampidae (Townes et al., 1965).

Distribution outside Iran: China, India, westward into European Russia.

12- *Gelis insolens* (Gravenhorst)


Host: *Saturnia pavonia* (Rougeot, 1971; Carlson, 1979).

Distribution outside Iran: Palaearctic region.

13- *Itoplectis viduata* (Gravenhorst)

Distribution in Iran: Kerman province: Jiroft (1196 m), 3 materials, July 2004. Mazandaran province: Ghaemshahr (18 m), 1 material, Savadkooh (550 m), 3 materials, June 2006.

Hosts: *Hemileuca oliviae*, Noctuidae, Lasiocampidae, Lymantriidae, Nymphalidae, Pieridae, Tortricidae, with mostly one species recorded per family (Carlson, 1979).
Distribution outside Iran: Palaearctic region.

14-Pimpla robusta Rondani
Distribution outside Iran: Palaearctic region.

Superfamily Chalcidoidea
Family Eupelmidae

15-Anastatus bifasciatus Fourcroy
Distribution in Iran: East Azarbayjan province: Arasbaran (805 m), 1 material, October 2005.
Hosts: Samia cynthia, Malacosoma neustria L. (Lasiocampidae), Dendrolimus pini L. (Lasiocampidae), Dendrolimus spectabilis Butler, Gonometa fasciata (Lasiocampidae), three species of Thaumetopoea (Notodontidae), Hemiptera (Coreidae and Pentatomidae) (Arzone, 1971).
Distribution outside Iran: Palaearctic region.

Family Pteromalidae

16-Dibrachys cavus (Walker)
Distribution in Iran: East Azarbayjan province: Arasbaran (805 m), 3 materials, October 2005.
Distribution outside Iran: Palaearctic region.
Comment: D. cavus is extremely polyphagous and can be a primary, secondary, or tertiary parasitoid.

Fig. 1. Map of Iran with boundaries of provinces showing the distribution of the collected ichneumonoid and chalcidoid parasitoids of saturniids. [1- Meteorus luridus Ruthe, 2- Cotesia glomerata (Linnaeus), 3- Cotesia juniperatae (Bouché), 4- Cotesia melanoscela (Ratzeburg), 5- Doliychogenidea aethiopica (Wilkinson), 6- Protapanteles immunis (Haliday), 7- Anomalon signatum Gravenhorst, 8- Camopplex quadrimaculatus Ratzeburg, 9- Amblyteles erythronotus Rondani, 10- Agrothereutes fumipennis (Gravenhorst), 11- Cocygominus indra (Cameron), 12- Gelis insolens (Gravenhorst), 13- Itoplectis viduata (Gravenhorst), 14- Pimpla robusta Rondani, 15- Anastatus bifasciatus Fourcroy, 16- Dibrachys cavus (Walker)].
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