A CONTRIBUTION TO THE ICHNEUMON WASPS (HYMENOPTERA: ICHNEUMONIDAE) FROM THE FORESTS OF NORTHERN IRAN

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ABSTRACT: Ichneumonid wasps (Hymenoptera: Ichneumonidae) from the forests of Northern Iran is preliminary studied in this paper. A total of eleven species from ten genera (including *Cylloceria*, *Ichneumon*, *Ischnus*, *Lissonata*, *Phaestacoenitus*, *Perithorus*, *Polysphincta*, *Protichneumon*, *Scambus*, *Temelucha*) and seven subfamilies (including Banchinae, Cremastinae, Cryptinae, Cyllocerinae, Ichneumoninae, Phrudinae and Pimplinae) were collected. All species are new records for Iranian fauna.

KEY WORDS: Ichneumonidae, Parasitoid, Fauna, New record, Forests, Iran

Ichneumonidae parasitize mainly larvae and pupae of holometabolous insects, excluding Megaloptera and Siphonaptera, whereas some species are almost completely restricted to the immature stages of Holometabola (a few groups use egg nests of Pseudoscorpionida and egg cocoons of Araneae or adult Araneae). Unlike microhymenoptera, ichneumonids rarely parasitize individual eggs, and a few are egg-larval parasitoids, laying an egg into the host egg but consuming the host in its larval stage (Heinrich, 1977; Gauld, 1988; Wahl & Sharkey, 1993). Symphyta parasitism is quite common in Ichneumonidae, having arisen on several separate occasions. Ectoparasitism is a primitive condition for the ichneumonids. External parasitoids generally parasitize hosts in concealed locations, such as stem tunnels, pupal cells, leaf rolls, or cocoons. Many species inject venom before the eggs are laid. The resulting paralysis may be temporary or permanent, or fatal. The egg is sometimes deposited next to the host, especially when the paralysis is permanent. If only temporary paralysis is induced, the egg is often deposited on the host but where the host cannot reach it (Townes, 1972; Wahl & Sharkey, 1993). Endoparasitism evolved independently on several occasions within the ichneumonids, the exact number of times within each family being unclear. Although certain advantages are gained by developing inside the host, the ichneumonid is subject to attack by the host's immune system. A variety of strategies are used to overcome this, including the injection of viruses at the time of the oviposition. These serve to control the immune reactions of the host (Gupta, 1991; Noort, 2004). Ichneumonids have been used successfully as biocontrol agents and given the largely undocumented fauna there is a huge potential for their utilization in managed biocontrol programs (Gupta, 1987). Comprehensive quantitative biodiversity surveys will enable the identification of hotspots of species richness and endemism; essential base line data that will enable informed future conservation management decisions.

Forests form an integral part of life on earth, providing a range of benefits at local, national and global levels, covering approximately 40% of the world's total land mass (FAO 1995). Forest ecosystems are distinct, coherent communities comprised of a variety of life forms and a physical environment with which they interact (Slocombe, 1993). Integral to this concept is that the system should have sufficient diversity and complexity and an inherent capacity to be self-sustaining in the absence of catastrophic disturbances. A sustainable ecosystem has the capacity across the landscape for renewal, for recovery from a wide range of disturbances, and for retention of its ecological resiliency, while meeting the current and future needs of people for desired levels of values, uses, products and services (Werner, 1996). In view of the ecological attributes of forest ecosystems, the choice and evaluation of biological control tactics may vary. The influence on the classical approach to biological control has been analyzed by Pschorn-Walcher (1977). The vast, diverse, relatively less disturbed, long-lived and highly stable in space and time ecosystem confers both advantages and disadvantages for biological control. Diversity confers an advantage for foreign exploration as a large complex of natural enemies is available from which to choose. However, this could also make it more difficult for colonization of new species of natural enemies. There would be expected to be a greater chance for the introduced natural enemies to be in competition with related native natural enemies since there is a high probability that relatives would be present in the rich forest fauna. The vastness and diversity create sampling and evaluation problems but less disturbance allow long term evaluations to be more exact (Dowden, 1962; Dahlsten et al., 1998).

Although the fauna of the Iranian Ichneumonidae was studied rather well (Kolarov & Ghahari, 2005, 2006, 2007, 2008) but the fauna of these powerful parasitoids was not perfectly studied in the forests of northern Iran so far. In this paper we present the result of a preliminary faunistic survey from Iranian northern forests.

MATERIAL AND METHOD

The materials were collected by light and malaise traps located in different forests of northern Iran (Mazandaran and Guilan province). Additionally, the preserved specimens in insect collection of Ghaemshahr and Amol Islamic Azad Universities were checked and the results are used in this paper. Classification, nomenclature and distributional data of Ichneumonidae suggested by Kasparyan (1981), Yu & Horstmann (1997) and Yu et al. (2005) have been followed.

RESULTS

Totally 11 Ichneumonidae species of 10 genera and 7 subfamilies were collected and identified from the forests of Northern Iran (Mazandaran and Guilan province). The list of species which all of them are newly recorded from Iran is given below.

Subfamily Banchinae

Genus *Lissonota* Gravenhorst, 1829

***Lissonata flavovariegata* (Lucas, 1849)**

Material: Mazandaran province: Savadkooh (1♂), October 2004.

Subfamily Cremastinae

Genus *Temelucha* Förster, 1869

***Temelucha observator* Aubert, 1966**

Material: Mazandaran province: Sari: Shahid Zare Park (2♂♂), July 2001.

Subfamily Cryptinae

Genus *Ischnus* Gravenhorst, 1829

***Ischnus agitator* (Olivier, 1792)**

Material: Mazandaran province: Ghaemshahr: Ahangarkola (1♀, 1♂), September 1999.

Subfamily Cyllocerinae

Genus *Cylloceria* Schiødte, 1868

***Cylloceria melancholica* (Gravenhorst, 1820)**

Material: Guilan province: Lahijan (2♂♂), July 2006.

Subfamily Ichneumoninae

Genus *Ichneumon* Linnaeus, 1758

***Ichneumon illuminatorius* Gravenhorst, 1829**

Material: Guilan province: Lahijan (1♀), July 2006.

Genus *Protichneumon* Thomson, 1893

***Protichneumon fusorius* Linnaeus, 1893**

Material: Mazandaran province: Savadkooh (1♀, 1♂), October 2004.

Subfamily Phuridinae

Genus *Phaestacoenitus* Smits van Burgst, 1913

***Phaestacoenitus caucasicus* Kasparyan, 1983**

Material: Mazandaran province: Amol (1♀), September 2003.

Subfamily Pimplinae

Genus *Perithorus* Holmgren, 1859

***Perithorus scurra* (Panzer, 1804)**

Material: Mazandaran province: Ramsar (2♀♀), October 2003.

Genus *Polysphincta* Gravenhorst, 1829

***Polysphincta tuberosa* Gravenhorst, 1829**

Material: Mazandaran province: Savadkooh (1♀), October 2004.

Genus *Scambus* Hartig, 1838

***Scambus foliae* (Cushman, 1938)**

Material: Mazandaran province: Behshahr: Abbas-Abad (2♀♀), July 2002.

***Scambus signatus* (Pfeffer, 1913)**

Material: Mazandaran province: Ghaemshahr: Ahangarkola (1♀), June 2002. Guilan province: Roodbar (2♀♀), September 2004.

DISCUSSION

Biological control of insect pests has much potential for successful implementation in forests. Despite the high probability for success, a lack of practical information has largely delayed the use of biological control in operational programs in forested ecosystems. There is little practical information available to help foresters integrate biocontrol with other management objectives. Furthermore, there is still a generally poor understanding among forest professionals of the realistic extent and effectiveness of using the biological control to manage forest pests (Franz, 1971; Berryman, 1982). Though the biological control is an important pest management strategy in forested ecosystems, continued research is needed to develop even better recommendations for specific pests (Turnock et al., 1976; Dahlsten & Mills, 1999).

Forested environments have several characteristics that make them excellent candidates for the use of biological control to accomplish pest management goals. Most forests tend to be diverse, stable systems. Diversity creates increased opportunities for biological control by providing an array of habitats for natural enemies. The relative stability of most forests provides natural enemies with the conditions necessary to maintain viable populations in an area. Rotation intervals in forests are long and growth rates are relatively slow. The value of individual forest trees is usually low compared with that of landscape or Christmas trees. Therefore, tactics used to manage forest pests need to be inexpensive. Biological control programs can be a relatively low-cost option for longterm pest management (Franz, 1970; Pschorn-Walcher, 1977). Tolerance for damage caused by foliage- or sap-feeding insects is generally higher in forest stands than in urban forests or plantations, where the aesthetic appearance of trees is a major concern. Relatively healthy trees are likely to tolerate and recover from moderate and occasionally high levels of leaf feeding. Biotic and abiotic forest disturbances, such as outbreaks of native insects are natural influences in forest ecosystems. Many forest insects play important roles in forest succession by selectively killing or retarding the growth of certain tree species while leaving others untouched (Castello et al., 1995). Some mortality of forest trees is acceptable and even appreciated for wildlife values and because mortality of weak or suppressed trees will benefit the long-term productivity of the forest. This outlook is compatible with biological control, where low or tolerable populations of pest insects can be expected to persist. Many forest insect outbreaks tend to be extensive, covering vast geographic areas. Areas affected by the outbreak may be remote and difficult to access. From a logistical, environmental and economic standpoint, only a small portion of most outbreaks could ever be treated using conventional insecticides. Many natural enemies, on the other hand, are capable of increasing their numbers in response to changes in pest density. This enables these natural enemies to eventually exert their influence on pest populations over large areas. Emphasizing biological control in forest pest management is appropriate because it can be ecologically compatible with other management objectives, is generally unobtrusive and is often a relatively inexpensive option for long-term pest control (Dowden, 1962; Dreistadt et al., 1990).

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