PARASITOID (HYMENOPTERA: PARASITICA) DIVERSITY IN FRUIT ORCHARDS OF TERCEIRA ISLAND (AZORES), WITH NEW RECORDS FOR THE AZORES AND PORTUGAL

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With 2 tables

ABSTRACT. A list of Parasitic Hymenoptera genera and species found in fruit orchards of Terceira Island is presented. A total of 34 genera, 10 species and 37 morphospecies were identified, including two new species for Portugal (*Meteorus ictericus* and *Meteorus rufus*), and a new undescribed species, pertaining to *Encarsia* genus.

RESUMO. Apresenta-se uma lista de géneros e espécies de Himenópteros parasitóides encontrados em culturas frutícolas da ilha Terceira. Foram identificados 34 géneros, 10 espécies e 37 morfoespécies, destacando-se a presença de duas espécies novas para Portugal (*Meteorus ictericus* e *Meteorus rufus*) e uma espécie do género *Encarsia* ainda não descrita para a Ciência.

INTRODUCTION

Parasitoids are insects that undergo their larval development by feeding on arthropod hosts, either internally (endoparasitoids) or externally (ectoparasitoids). Usually, the individual host (either at egg, larvae, pupae or adult stage) is killed during the parasitoid larval development (GOULET & HUBER, 1993). Because of their life-

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strategies, the parasitoids, namely the parasitic wasps (Hymenoptera, Parasitica), play an essential role in the maintenance of agro-ecosystems' equilibrium, where they are one of the most important groups. They help to control species that damage different kinds of crops, maintaining the equilibrium of pests' populations, being therefore crucial in non aggressive pest control. Thus, inventories and knowledge of Parasitic Hymenoptera diversity and biology are very important for crop management.

Several studies involving Parasitic Hymenoptera have been developed in the Azores, especially regarding the relation between one parasitoid species and its host(s) (e. g. Oliveira, 1992; Soares *et al.*, 1997), or about the biology of a specific species (e. g. Oliveira & Tavares, 1992; Pinto & Tavares, 1992). However, the knowledge of the Hymenoptera fauna that occurs in the Azores is scarce and outdated, with few important faunistic studies (e. g. Carthy, 1955; Erlandsson, 1978). Therefore it is necessary to develop more basic taxonomic and faunistic work on this insect order. The aim of this work is to contribute to reduce this lack of information. We present here a preliminary list of the Parasitic Hymenoptera species and genera found in several fruit crops (apple, banana, orange and peach orchards) of Terceira Island. Moreover, we present new records for the Azores and Portugal.

MATERIAL AND METHODS

The parasitoids were collected in 10 orchards of four different fruit crops (apple, banana, orange and peach orchards) from three geographical areas of Terceira Island (Azores, Portugal): Angra do Heroísmo, Biscoitos and São Sebastião (Table 1). Field work was carried out during September (Orange orchards) and October (Apple, Bananas and Peach orchards) 2003. Non-attractive Malaise traps were used to capture the specimens (Townes, 1972; New, 1998), with samples being collected after one week of exposure. All the samples were stored in recipients filled with ethanol (70%) glycerinated at 4%. Afterwards, samples were sorted according to Oliver & Beattie's (1996) methodology: all individuals were sorted to the morphospecies level (RTUs = recognizable taxonomic units). Whenever it was possible, the specimens were mounted, labelled and identified to the genus and species level.

RESULTS

We present here the first results of the above-mentioned study, particularly from three of the 10 sampled sites: B2B, S10P, T6L (Table 1). A total of 1722 parasitic wasps were sampled, with 74% of these individuals being collected in T6L (1278

Table 1 - Details on the sampling sites: Site code; Area; Locality; Fruit orchards type (Fruit); Altitude (in meters, Alt.); Longitude (X) and latitude (Y) of each sampling site, in UTM coordinates (referred to the Fuse 26).

Site code	Area	Locality	Fruit	Alt.	x	y
B2B	Biscoitos	Canada da Obra	Banana	100	478176	4293317
B5L	Biscoitos	Canada do Rego	Orange	132	477658	4292980
B8M	Biscoitos	Canada do Pavão	Apple	244	476387	4292358
B10P	Biscoitos	Arrochela	Peach	96	476078	4293382
S3B	São Sebastião	Porto Judeu	Banana	42	490966	4278171
S4L	São Sebastião	Jogo da Bola	Orange	142	492326	4280550
S8M	São Sebastião	Porto Novo	Apple	53	492996	4280556
S10P	São Sebastião	Salga	Peach	49	491603	4277987
T2B	Angra do Heroísmo	Bicas de Cabo Verde	Banana	112	478920	4280257
T6L	Angra do Heroísmo	São Bartolomeu	Orange	160	475916	4281457

individuals), 15% in B2B (255 individuals) and 11% in S10P (189 individuals). A total of 34 genera, 10 species and 37 morphospecies were identified (Table 2). According to BORGES *et al.* (2005), all the identified genera and species represent novelties for the Azorean fauna, with the exception of *Cales noacki*, *Dinotrema* sp., *Baeus* sp., *Telenomus* sp. and *Tetrastichus* sp., which were previously recorded for São Miguel Island, *Encarsia* sp., already found in São Miguel and Pico islands and *Diglyphus isaea*, earlier recorded for Terceira Island. A remarkable fact is the identification of two new species for Portugal (*Meteorus ictericus* and *Meteorus rufus*) (K. van Achterberg, pers. comm.) and one still undescribed species (*Encarsia* sp.) (A. Polaszek, pers. comm.).

CONCLUSIONS

With this work, the knowledge of the Parasitic Hymenoptera fauna of the Azores was enhanced. A total of 30 potential new species for the Azores were found, together with 6 confirmed new records (*Encyrtus aurantii*, *Metaphicus flavus*, *Meteorus ictericus*, *Meteorus rufus*, *Tetracnemoidea brevicornis*, *Wesmaelia petiolata)*. In fact, this work constitutes the first citation of *Meteorus ictericus* and *Meteorus rufus* for Portugal. Another remarking fact is the new undescribed *Encarsia* species, found in T6L. We suggest that further work should be carried out in other Azorean islands to improve the knowledge of this important insect group.

Table 2 - Checklist of the identified Parasitic Hymenoptera's genera and species, with reference to the sampling site code (Site code) and the number of individuals collected (N.º Ind.) f/ff - female/females; m/mm - male/males; indet. - sex indetermined. † New for the Azores (Borges et al., 2005); * New for Portugal (according to K. van Achterberg, pers. comm.); ? New for Science (according to A. Polaszek, pers. comm.).

	Site code	N.º Ind.
Chalcidoidea		
Aphelenidae		
Aphelinus Dalman, 1820 sp. 1†	S10P, T6L	2 ff, 3 ff
Aphelinus Dalman, 1820 sp. 2†	T6L	2 ff
Aphytis Howard, 1900 sp. 1†	B2B, S10P, T6L	2 ff, 7 ff, 43 ff
Aphytis Howard, 1900 sp. 2†	T6L	1 f
Aphytis Howard, 1900 sp. 3†	T6L	1 f
Cales noacki Howard, 1907 cf.	S10P, T6L	3 indet., 25 indet.
Centrodora Förster, 1878 sp. 1†	B2B, T6L	1 f, 1 f
Centrodora Förster, 1878 sp. 2†	T6L	4 ff
Coccophagus Westwood, 1833 sp.†	T6L	1 m
Encarsia Förster, 1878 sp. 1	B2B, S10P, T6L	2 ff, 3 indet., 10 ff
Encarsia Förster, 1878 sp. 2	S10P, T6L	1 indet., 1 f
Encarsia Förster, 1878 sp. 3?	T6L	1 indet.
Encarsia Förster, 1878 sp. 4	T6L	5 ff
Encyrtidae		
Encyrtus aurantii (Geoffroy, 1785)†	T6L	1 indet.
Metaphycus flavus (Howard, 1881)†	T6L	5 ff + 6 mm
Tetracnemoidea brevicornis (Girault, 1915)†	T6L	3 mm
Eulophidae		
Ceranisus Walker, 1841 sp. cf.†	S10P	2 indet.
Chrysocharis Förster, 1856 sp.†	S10P	1 f
Diglyphus isaea Walker, 1833 cf.	T6L	1 f
Elasmus Westwood, 1833 sp.†	T6L	1 m
Sympiesis Förster, 1856 sp. cf.†	B2B, T6L	1 m, 2 mm
Tetrastichus Haliday, 1844 sp. cf.	T6L	10 ff
Mymaridae		
Anagrus Haliday, 1833 sp. 1†	B2B, S10P, T6L	15 ff + 1 m, 8 ff + 2 indet., 121 ff + 25 mm
Anagrus Haliday, 1833 sp. 2†	B2B, S10P, T6L	3 ff, 2 ff, 1 f
Anaphes Haliday, 1833 sp. 1 cf.†	T6L	1 indet.
Anaphes Haliday, 1833 sp. 2†	B2B	2 indet.
Litus cynipseus Haliday, 1833 cf.†	B2B	1 indet.
Ooctonus Haliday, 1833 sp.†	B2B, T6L	2 ff, 3 ff + 2 m
Polynema Haliday, 1833 sp.†	B2B, S10P	1 f, 2 indet.
Pteromalidae		
Cyrtogaster vulgaris Walker, 1833 cf.†	B2B, S10P, T6L	1 f, 1 f + 1 m, 6 ff + 2 mm
Seladerma Walker, 1834 sp. cf.†	T6L	1 indet.
Signiphoridae		
Signiphora Ashmead, 1880 sp. cf.†	T6L	1 f
Ichneumonoidea		
Braconidae		
Dinotrema Foerster, 1862 sp.	B2B, T6L	2 ff, 3 ff
Meteorus ictericus (Nees, 1812)*	S10P, T6L	5 ff, 8 ff

	Site code	N.º Ind.
Braconidae (Cont.)		
Meteorus rufus (De Geer, 1773)*	T6L	1 f
Microplitis sp. (Foerster, 1862)*	S10P, T6L	1 f, 4 ff
Misaphidus (Rondani, 1848) sp.†	T6L	1 f + 1 m
Orthostigma (Ratzeburg, 1844) sp. 1*	B2B, T6L	6 ff, 3 ff
Orthostigma (Ratzerburg, 1844) sp. 2*	B2B, T6L	12 ff, 1 f
Wesmaelia petiolata (Wollaston, 1858)†	S10P	1 f
Ichneumonidae		
Netelia Gray, 1860 sp.†	B2B, T6L	1 f, 1 f
Platygastroidea		
Scelionidae		
Baeus Haliday, 1833 sp.	B2B	1 indet.
Telenomus Haliday, 1833 sp. 1	B2B, T6L	1 m + 2 indet.
Telenomus Haliday, 1833 sp. 2	S10P	1 m
Telenomus Haliday, 1833 sp. 3	S10P, T6L	1 m + 1 f, 254 indet.
Proctotrupoidea		
Diapriidae		
Psilus Panzer, 1801 sp.†	T6L	4 indet.
Trichopria Ashmead, 1893 sp.†	T6L	3 indet.

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