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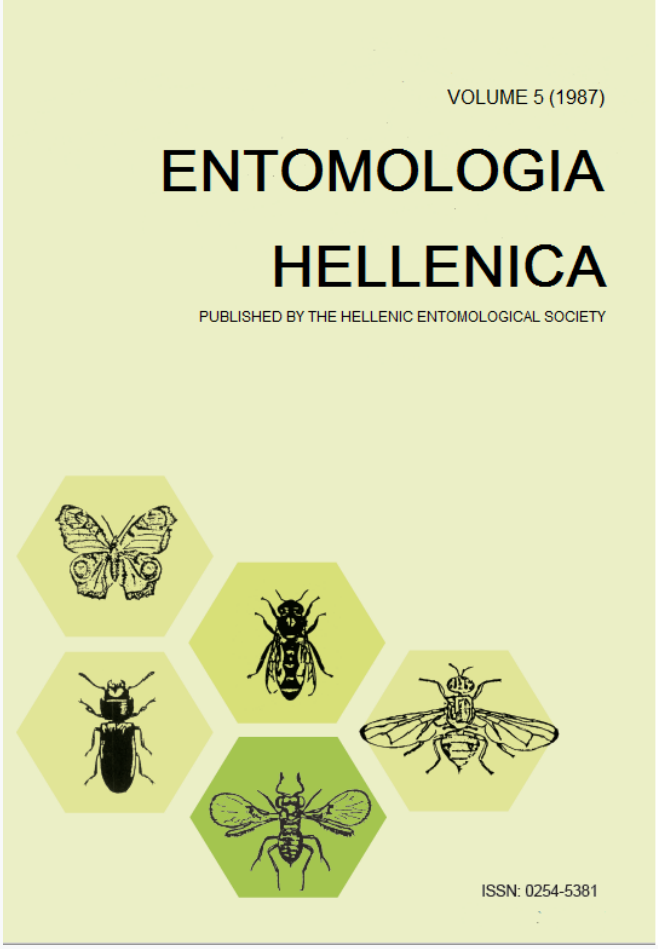

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Flight Period of some Parasitoids and a Predator of the Olive Black Scale (*Saissetia oleae* Olivier) on Corfu Island[1]

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ABSTRACT

The time of year the adults (flight period) of the parasitoids of *S. oleae: Metaphycus helvolus, Metaphycus lounsburyi, Scutelista cyanea* and *Moranila californica* and the predator *Chilocorus bipustulatus* are present, was determined in three areas of Corfu island: Linia, Kontocali and Avliotes. *M. helvolus* apparently has two flight periods: the first is from April till July and the second from November till December. All the other natural enemies have only one flight period per year. The flight period of *M. lounsburyi* is from April till August, while *S. cyanea* flies from August till the end of September or the first days of October, and *M. californica* adults are present from July till the middle of December. Adults of *C. bipustulatus* appeared from July till December or the middle of January.

Introduction

This work has been carried out to determine when do the adults of the common natural enemies of *Saissetia oleae* Oliv. (Homoptera: Coccidae) appear on Corfu island. The time period when adult natural enemies are found is called here «flight period».

The flight periods of *Metaphycus helvolus* (Compere) (mainly a parasitoid of the third stage) and *Metaphycus lounsburyi* (Howard) (a parasitoid of the fourth stage) (Hymenoptera: Encyrtidae), as well as the flight period of the egg-predators *Scutelista cyanea* Motsch. and *Moranila californica* (Howard) (Hymenoptera: Pteromalidae), and *Chilocorus bipustulatus* (L) (Coleoptera: Coccinelidae) (a predator of the first larval stage) were determined. These parasitoids are the main natural enemies of the olive black scale on Corfu island (Stratopoulou and Kapatos 1984, Stratopoulou et al. 1981, Viggiani et al. 1975, Viggiani 1978).

This study was conducted in three, scale infested, olive orchards located in three different regions of the Corfu island (north, south, central part of the island).

Materials and Methods

The three olive orchards under examination were located in Avliotes (north), Linia (south) and Kontocali (central Corfu) and contained satisfactory levels *S. oleae* populations. In each orchard, 10 trees were randomly sampled every fortnight during the spring, summer and autumn, while during the winter a sample was taken every month. From each tree, one to three bunches of stems were randomly removed. Each bunch was then shaken in such a way as all the existing parasitoids of *S. oleae* would be disloged and fall into 90×60 cm bags. The bags were brought to the laboratory where the parasitoids were killed by ethyl acetate and identified.

Results and Discussion

The time periods when the adults of the parasitoids *M. helvolus, M. lounsburyi, S. cyanea* and *M. californica* and the predator *C. bipustulatus* were found in the regions of Linia, Avliotes and Kontocali are given in Table 1. The presence of the adult natural enemies in the field is called «flight period».

According to the data shown in Table 1, *M. helvolus* has two flight periods each year in all three regions. The first period lasts from April until July and the second period begins in November and ends in December. In the Linia region there was a

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TABLE 1. Flight period of some parasitoids of *S. oleae* in three different areas of Corfu island.

Location	*M. helvolus*	*M. lounsburyi*	*S. cyanea*	*M. californica*	*C. bipustulatus*
Linia	21/4-23/7 10/11-2/12	8/4-14/8	9/8-17/10	-	8/7-16/1
Kontocali	27/4-17/7 20/9-26/11	27/4-28/8	4/8-26/9	-	12/6-13/11
Avliotes	22/4-18/7 20/9-22/11	28/4-22/8	12/8-22/9	27/6-11/12	11/7-11/12

delay of the starting time of about 50 days. The end of this period almost coincides in all three regions. The difference in the Linia region may be the result of the local climatological conditions (it is drier during the winter months) or the physiology of the host plant. As far as the parasitoids *M. lounsburyi, S. cyanea, M. californica* and the predator *C. bipustulatus* are concerned, only one flight period per year was observed. The adults of the endoparasite *M. lounsburyi* begin to appear in April and end in August in all regions studied. *S. cyanea* flies from August until the end of September or the first days of October. *M. californica* adults coexist with the adults of the other species in Avliotes from July until the middle of December, but for reasons which are not known at present it did not appear in the other two regions. The adults of *C. bipustulatus* are also found from July till December or the middle of January. It is important to state here that the interval between two flight periods is the developmental period of the different immature stages of each parasitoid within or on its host.

The adults of the parasitoid species of *S. oleae* that can be found in the olive orchards of Corfu from April till January are shown in Table 2: In April, May and June *M. helvolus* and *M. lounsburyi*, in July *M. helvolus, M. lounsburyi, S. cyanea, M. californica* and *C. bipustulatus*, in August *M. lounsburyi, S. cyanea, M. californica* and *C. bipustulatus*, in September *S. cyanea, M. californica* and *C. bipustulatus*, in October *M. californica* and *C. bipustulatus*, in November and December *M. helvolus, M. californica* and *C. bipustulatus* and in January *C. bipustulatus*. The knowledge of the duration of the «flight period» of the parasitoids of *S. oleae* is very important because we can thus determine the date we should release them. By establishing the «flight period» of a parasitoid species, we can schedule the time of release with the purpose of reinforcing the natural population and accelerate the biological control of the olive black scale. This can be done by releasing the laboratory reared parasitoid earlier than the emergence date of the natural parasitoid, provided that *S. oleae* is in the proper stage to be attacked by the released parasitoid. The knowledge of the exact flight period of the parasitoids of *S. oleae* can also be useful in estimating the possible losses caused by the repeated applications of insecticides either against *Dacus oleae* or *S. oleae* (G. Viggiani et al. 1973, Fimiani 1964).

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TABLE 2. Presence of some parasitoids of olive black scale per month*.

A	M	J	J	A	S	O	N	D	J
M.H. M.L.	M.H. M.L.	M.H. M.L.	M.H. M.L. M.C. C.B.	- M.L. M.C. C.B. S.C.	- - M.C. C.B. S.C.	- - M.C. C.B. -	M.H. - M.C. C.B. -	M.H. - M.C. C.B. -	- - - C.B. -

*M.H. = *Metaphycus helvolus*, M.L. = *M. lounsburyi*, M.C. = *Moranila californica*, C.B. = *Chilocorus bipustulatus*, S.C. = *Scutelista cyanea*.

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KEY WORDS: *Metaphycus helvolus, Metaphycus lounsburyi, Scutelista cyanea, Moranila californica, Chilocorus bipustulatus, Saissetia oleae*

Περίοδος Πτήσεως των Διαφόρων Παρασίτων του *Saissetia oleae* Olivier στην Κέρκυρα

Μ.Β. ΜΑΚΡΟΠΟΔΗ

Ινστιτούτο Ελαιάς Κέρκυρας

ΠΕΡΙΛΗΨΗ

Στην εργασία αυτή μελετήθηκε η χρονική διάρκεια παρουσίας σε πτήση των παρασίτων του *Saissetia oleae: Metaphycus helvolus, Metaphycus lounsburyi, Scutelista cyanea, Moranila californica* και *Chilocorus bipustulatus* σε τρεις περιοχές της Κέρκυρας: Λίνια, Κοντόκαλι και Αυλιώτες. Το *M. helvolus* έχει δύο περιόδους πτήσεως, η πρώτη είναι από τον Απρίλη έως τον Ιούλιο, ενώ η δεύτερη από το Νοέμβρη έως το Δεκέμβρη. Τα άλλα παράσιτα που αναφέρονται έχουν μία μόνον περίοδο πτήσεως το χρόνο. Συγκεκριμένα, το *M. lounsburyi* είναι σε πτήση από τον Απρίλη έως τον Αύγουστο, το *S. cyanea* από τον Αύγουστο μέχρι το τέλος του Σεπτέμβρη ή αρχές Οκτώβρη, το *M. californica* από τον Ιούλιο μέχρι τα μέσα του Δεκέμβρη και το *C. bipustulatus* από τον Ιούλιο έως το Δεκέμβρη ή τα μέσα Ιανουαρίου.