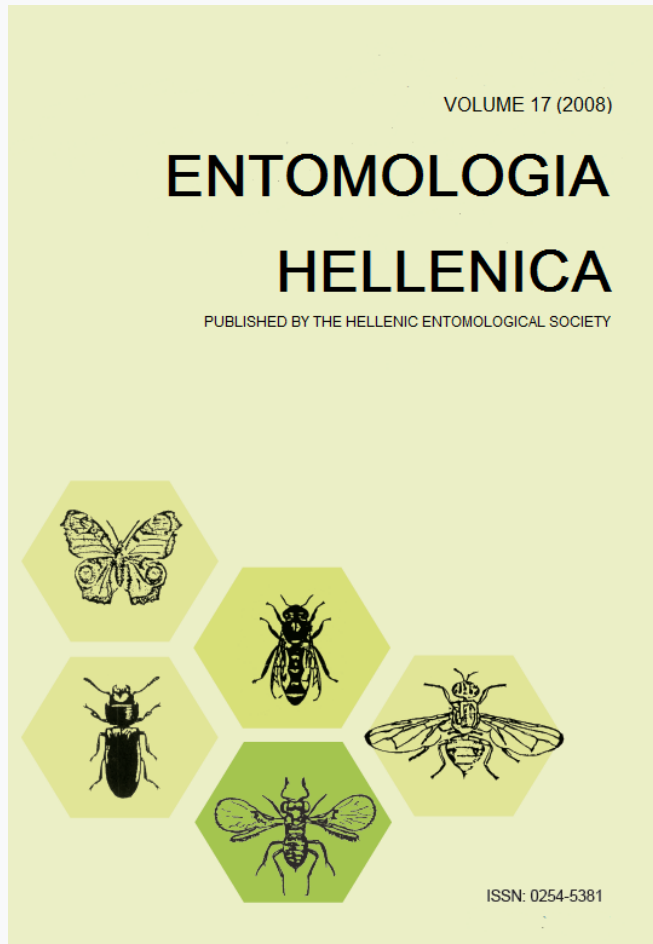


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The scale insect *Dynaspidiotus abietis* (Schrank) on *Abies cephalonica* (Pinaceae)

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ABSTRACT

Data on phenology and morphology of the scale insect *Dynaspidiotus abietis* (Schrank) (Hemiptera: Diaspididae), found on fir trees *Abies cephalonica* (Pinaceae) on mount Taygetos (Peloponnesus - southern Greece), are presented. The species is biparental and oviparous. During this study (June 2004 – August 2006) *D. abietis* completed one generation per year. It overwintered as mated pre-ovipositing female adult. Ovipositions were recorded from May to July. The majority of the hatches of the crawlers were observed in June. Predated individuals of the scale which were found during the study period were attributed to the presence of the predator *Chilocorus bipustulatus* (L.) (Coleoptera: Coccinellidae).

Introduction

There are many species belonging to family Diaspididae that infest fir trees in Europe. Major species include: *Chionaspis austriaca* Lindinger, *Diaspidiotus ostreaeformis* (Curtis), *Dynaspidiotus abieticola* (Koroneos), *D. abietis* (Schrank), *Fiorinia japonica* Luwana, *Lepidosaphes juniperi* Lindinger, *L. newsteadi* (Šulc), *Leucaspis lowi* Colvée, *L. pini* (Hartig), *Parlatoria parlatoriae* (Šulc) and *Unaspidiotus corticispini* (Lindinger) (Ben-Dov 2006).

Of the aforementioned species, *D. ostreaeformis*, *D. abieticola*, *D. abietis*, *L. juniperi*, *L. lowi* and *L. pini* have been previously reported in Greece (Balachowsky 1932, 1950, Koroneos 1934, Balachowsky et al. 1956, Soria et al. 2000, Ben-Dov 2006) but they are not considered as major pests, as they do not build up populations. However, scale insects

belonging to the family Coccidae, such as *Physokermes hemicryphus* (Dalm.), *P. picae* Sch., *Eulecanium sericeum* (Lind.) and *Nemolecanium graniformis* (Wünn), which were found on *Abies cephalonica* Loud. and *A. borisii-regis* Matff., as well as *Marchalina hellenica* (Gennadius) (Margarodidae), are regarded as more important and have been studied mainly due to them excreting honeydews, on which bees are fed (Santas 1983, Santas 1991, Stathas, 2001).

The scale insect *Dynaspidiotus abietis* (Schrank) (Hemiptera: Diaspididae) (the hemlock scale) is a species of Nearctic and Palaearctic region. It has been recorded in many European countries and in the Mediterranean basin (Balachowsky 1935, Pellizzari 1975, Kozár et al. 2004, Ben-Dov 2006). It has been found to infest more than 26 species of plants which belong to the families: Aceraceae, Cupressaceae, Pinaceae and Rosaceae (Ben-Dov 2006). In Greece, there is only

one reference by Koroneos (1934), who refers to this scale as *Aspidiotus abietis* (Schr.) Loew, on *A. cephalonica* on mountain Parnitha and Oeta (central Greece).

It is reported that *D. abietis*, overwinters in Germany as 2nd instar nymph and it completes one generation per year (Schmutterer 1959). The parasitoids *Aphytis abnormis*, *A. mytilaspidis*, *Aspidiotiphagus citrinus*, *Coccophagus similis*, *Prospaltella aspidiocola*, *P. aurantii*, *P. gigas*, *P. leucaspidis*, and *Pteroptrix dimidiata* and the predator *Chilocorus bipustulatus* (L.) (Coleoptera: Coccinellidae) are referred to as natural enemies of the scale (Kozstarab and Kozár 1988).

Although *D. abietis* was found in small populations on mount Taygetos in Greece and does not appear to be a serious pest of fir trees, population dynamics of *D. abietis* on mount Taygetos are presented in the current study. The reason for undertaking such a study was partly because there are no ecological data of this species in Greece. In addition, as it has been previously reported (Firempong 1982, Biche and Sellami 1999) host species and environmental conditions influence somatometrical features in scale insects.

Materials and Methods

Dynaspidiotus abietis was found on fir trees *A. cephalonica* in southern Greece, (Peloponnesus, mount Taygetos). The author identified this species at the Laboratory of Entomology & Agricultural Zoology of the Technological Institute of Kalamata. Identification was confirmed by Dr Ferenc Kozár (Plant Protection Institute, Hungarian Academy of Sciences). Female adults of the scale were deposited to the collection of the Hungarian Academy of Sciences. It was

studied in the area where it was found (in northwestern part of the mountain Taygetos) from June 2004 to August 2006.

Twenty samples consisting of branches 25cm long, were cut from 10 infested fir trees that were located in a forest area northeastern of County Dyrachi (37°12'18''N, 22°13'31''E) in an altitude of 1080m and brought to the laboratory into plastic bags. The samples were examined under binocular stereoscope and the number of each instar as well as the number of the predated, parasitized and dead individuals on the needles were recorded.

The study of the morphology was made on 9 male and 15 female adults of *D. abietis*.

The parasitized individuals of the scale were kept in the laboratory under controlled conditions at 25°C, 65% R.H. and under a photoperiod of 16:8 (L:D) until the emergence of parasitoid adults. The monitoring of the predators was done by shaking branches of the infested trees over a 1x1m cloth; species and numbers of predators (immature stages and adults) fallen on the cloth were recorded. Samplings were conducted every 15 days from April to September and once a month for the rest of the year.

Results and Discussion

Dynaspidiotus abietis was found to infest only needles of the fir trees, in low infestation levels. The scale cover of the female adult has an elliptical shape settled along the needle of the fir tree. The exuviae are located almost in the center of the scale cover and have elliptical shape too. The length of the scale cover is about 2.4mm and its width which covers completely the width of the needle is about 1.5mm. The color of the scale cover is ash – grey. The body of the female adult is

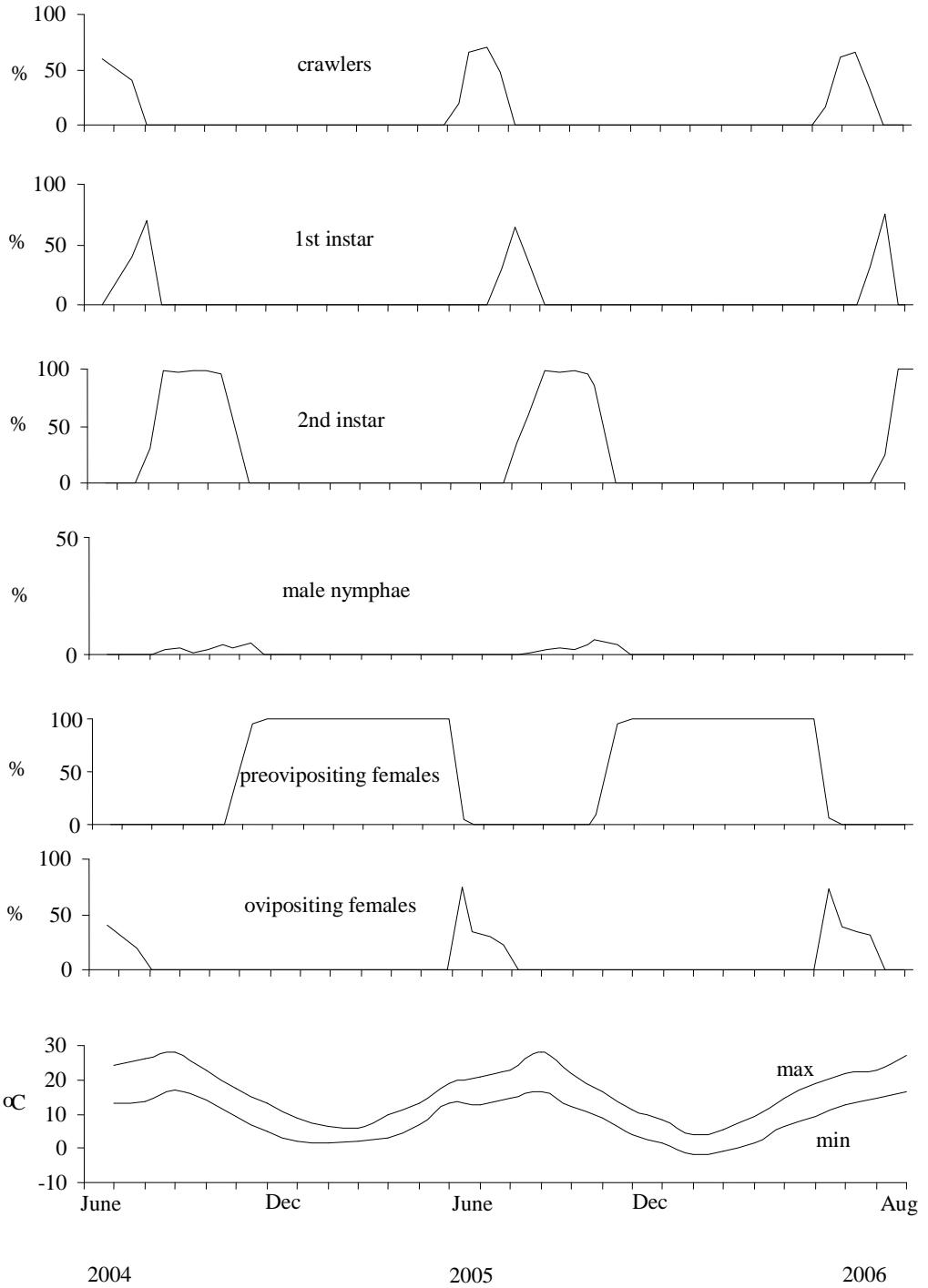


FIG. 1. Developmental stages of *D. abietis* (percentage composition) on fir trees and monthly average temperatures) from June 2004 to August 2006, on mount Taygetos.

almost round – slightly pear shaped, its diameter is about 1.5mm and it has yellow color. The scale cover of the male is more elongated with a length of 1.5-1.7mm.

Similar dimensions have been reported for *D. abietis* (female scale cover: 1.8-2.1mm and male scale cover: 1.4-1.6mm) by Balachowsky (In: Ben-Dov 2006). Silvestri (1920) reports smaller dimensions (female body length about 1.2mm and female scale cover length about 1.5mm), but refers to the scale species as *A. abietis* found in Italy on *Pinus silvestris*. Differences in dimensions can be attributed to different hosts.

In Fig. 1, the percentage composition of the *D. abietis* population during the study is presented. As shown, the scale completed one generation per year and overwintered as mated preovipositing female. Ovipositing females were recorded from 2nd week of May to the beginning of July, while the hatches of the crawlers were recorded from the end of May to the beginning of July, during both years of this study. First instar nymphs were recorded during July and 2nd instar nymphs from August to October.

From the above, it appears that *D. abietis* completes one generation per year and overwinters as a preovipositing adult female. As shown in Fig. 1, the preoviposition period was the longest stage of the scale's life cycle. The presence of male nymphs during the period August – September and their absence during the next months indicates that the overwintering females were mated. One generation per year has been previously reported in northern countries like Germany, where it overwinters as 2nd instar nymph (Schmutterer 1959). Minor differences on the phenology of *D. abietis* in Greece and Germany could be ascribed to the corresponding environmental differences of the two countries, as well as to the different host species on which the scale was found.

During the examination of the samples from the mountain Taygetos, three preovipositing female adults of the scale

were found parasitized from an unidentified endoparasitic larvae in May 2005. A number of endoparasite species has been recorded as well in other countries (Kozstarab and Kozár 1988).

Small numbers of individuals of the scale were found destroyed by predators in June 2005, July 2005 and May 2006 in percentages that reached 2.1%, 1.4% and 0.5% of the population of the scale, respectively. On infested branches of fir trees, small numbers (1-4) of larvae and adults of the predator *C. bipustulatus* (L.) (Coleoptera: Coccinellidae) were found in June and July 2005 and May and August 2006.

The predated scales and the predators were found almost at the same period (except August 2006). From these observations, although it was not confirmed in the laboratory, the presence of the predator could be related with *D. abietis*. The occasional presence of the predator could be partly explained from the low infestation level on the fir trees. The action of the *C. bipustulatus* on the *D. abietis* is also reported in another study (Kozstarab and Kozár 1988).

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KEYWORDS: *Dynaspidiotus abietis*, *Abies cephalonica*, *Chilocorus bipustulatus*, phenology, Taygetos.

Το κοκκοειδές έντομο *Dynaspidiotus abietis* (Schrank) επί του *Abies cephalonica* (Pinaceae)

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ΠΕΡΙΛΗΨΗ

Μελετήθηκαν στοιχεία της οικολογίας και δίδονται και λίγα μορφολογικά στοιχεία του κοκκοειδούς εντόμου *Dynaspidiotus abietis* (Schrank) (Hemiptera: Diaspididae), το οποίο βρέθηκε στο όρος Ταύγετος της Μεσσηνίας επί της ελάτης *Abies cephalonica* (Pinaceae). Είναι είδος αμφιγονικό και ωοτόκο. Κατά τη διάρκεια της μελέτης (Ιούνιος 2004 – Αύγουστος 2006), διαπιστώθηκε ότι το *D. abietis* συμπληρώνει μια γενεά το έτος. Διαχειμάζει ως γονιμοποιημένο προ-ωοτοκίας θήλυ ακμαίο. Ωοτοκίες παρατηρήθηκαν κατά τους μήνες Μάιο – Ιούλιο. Το μεγαλύτερο μέρος των εκκολάψεων των ερπουσών καταγράφηκε κατά το μήνα Ιούνιο. Παρασιτισμένα άτομα του κοκκοειδούς που βρέθηκαν κατά τη διάρκεια της μελέτης, αποδόθηκαν στην παρουσία του αρπακτικού εντόμου *Chilocorus bipustulatus* (L.) (Coleoptera: Coccinellidae).