

PORTRAIT OF AN INSECT: *MARCHALINA HELLENICA* GENN. (STERNORRHYNCHA: COCCINA: MARGARODIDAE), IMPORTANT PRODUCER OF HONEYDEW IN GREECE

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Abstract

There are described and discussed some morphologic characteristics of the male and female development stages of *Marchalina hellenica* Genn. From the morphologic point of view, there could be differentiated a stage before the oviposition by the adults. The growing number of rhinaries and the metamorphose of the buccal apparatus of the mature foundresses coincide with the beginning of the migration, and the phase of the oviposition. It is possible to suppose *Marchalina hellenica* Genn. can be visited by all kinds of ants, that trophobiotically use all insects that suck the sap of trees.

Keywords: *Margarodidae* / *Marchalina hellenica* / honeydew producer / Greece

Introduction

The basis of the forest honey is represented by the honeydew, a secretion with a high content of sugar, supplied by insects that suck the sap, and excrete the excess of sugar from their food. The investigations about the insects that are producing honeydew in Greece were effected above all by SANTAS (1983). He is the one that, from 1977 to 1981 undertook investigations in all the country. During these, the trees visited by bees (that is, *Pinus* spp. and *Abies* spp.) were examined about the presence of the sap sucking insects. SANTAS (1983) thought 5 species were more important to producing forest honey, at the same time mentioning that, according to the actual level of knowledge, there cannot be made more exact estimations of the honeydew producers in Greece, on the basis of honey bees. *Marchalina hellenica* is mentioned as the most important honeydew producing insect, from which seems to originate all the pine honey in Greece. This species is spread all over the eastern area of the Mediterranean Sea. The host plants are pines: first of all, *Pinus halepensis* Mill., and, to a smaller extent, *Pinus pinea* L., *Pinus sylvestris* L., and *Pinus brutia* Ten. NIKOLOPOULOS (1965) and SANTAS (1979) wrote about the biology and morphology of *Marchalina hellenica*. In the said investigations, the morphologic description was achieved by means of a stereo-magnifying glass. Besides, there are no measurable and clear values for the male and female stages.

Investigation area

The Aleppo pine forest lays in the dune region of the western coast of Peloponnese (southern Greece), namely in Zacharo, 25 km south of Pirgos.

According to the climatic-geographic criteria, Peloponnese belongs to the Mediterranean tropical area, and the west coast – to the vegetation area of the Mediterranean evergreen deciduous forests, with an evergreen oak area (*Quercus petraea*) (communion *Quercion ilicis*). In this area, the Aleppo pine (*Pinus halepensis*) is a frequently encountered tree, that prefers the climate of the coastal areas. Through afforestations, there was obtained a notable extension of the areas occupied by the same. Thanks to the greater precipitations in the north-western area of Peloponnese (800-1000 mm of yearly precipitations, as compared to only 800 mm in the north-eastern Peloponnese), the sandy earth is more richer in water, so there could also exist a richer weed vegetation.

Material and method

The area was investigated in February-April, and September-November, 1992. According to SANTAS (1983), the honeydew production begins in June, and ends in the following spring. Honeybees are collecting honeydew only during the period from August to October, and also, in smaller quantities, in March and April. Beekeepers have introduced a few years before into that area *Marchalina hellenica*, that is suspended to the top of trees pine branches that proceeded from elsewhere, and on which there

were different larvae stages. From there, *Marchalina hellenica* has rapidly spread, having a higher reproduction rate, and nowadays it exists in all the pine forest.

During the year there were noticed and collected different development stages of the male and female insects, that were to be found on *Pinus halepensis*. The biologic material was prepared according to SZELEGIEWICZ method (1978), and was included in a Berles mixture. The estimation was made by a Zeiss microscope, at an 100-400 enlargement. Approximately 200 scuta were classified, and recorded according to age and development stage.

Results

Morphology

Table I includes some morphological data. Females have a heavy and stodgy body, similar to a sack, and have no wings (Fig. 1).

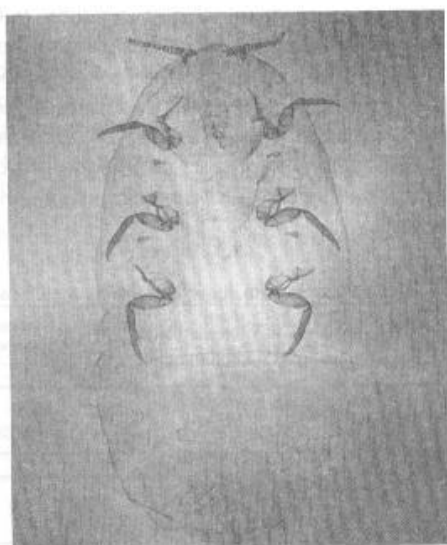


Fig. 1 a – *Marchalina hellenica* founder in maturation, on *Pinus halepensis*, in spring of 1992.

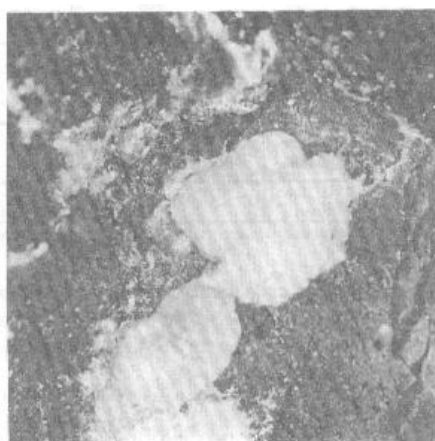


Fig. 1 b – Mature founder, in spring of 1992 (a Berlese preparation).

The female larvae are very much similar to adults, but in those the stilets and the second maxilla are well developed, while with the maturing founders the buccal apparatus is in retrogression. Legs and antennae are well developed in all the female and male stages. That is why all the examined stages are able to move freely. Eyes are formed as ocelli. In the sexually mature feminine stages, the number of the sensory

cells on the segments of antenna is growing (see Table I). Both the female and the male insects are defending themselves against heat by producing a viscous cover.

Table I

Morphologic and biologic data about *Marchalina hellenica* Genn.

Stage	Period	SA No.	Rhinaries	Body length (mm)	Brushes	Viscous cover	Honeydew prod.	Color
Male								
Larva	11/04/92	7	-	Ø 1.8 1.57-1.82 n = 4	+	+(a little)	-	Dark brown
Female								
L 1	April	6	-	Ø1.0 0.91-1.18 n = 20	+	?	?	Beige
	IX/X	6	-	Ø2.21 + 1.68-2.8 n = 21	+	+	+	Beige
L 2	7/IV/92	9	3 rd SA basal part	6.5 and 9 n = 2	+	+	+	Beige
	24/X/92	9	3 rd SA basal part	3.3 +3.7 n = 2	+	+	+	Beige
Adults								
Sexually Im-mature	February-April	11	3 rd SA basal 1	Ø 8.7 (7-11) n = 54	Partially+	+	Partially +	Beige
Sexually mature	April	11	3 rd SA basal 2	-	+	+(a little)	-	Brilliant yellow

SG = antenna segment; 1 = number of rhinaries on the antenna segments is small and irregular; 2 = number of rhinaries on the antenna segments is growing

Male larvae stages were collected on the leaves of *Asphodelus aestivus*. The anal ring is surrounded by 6 spines. Both the thoracic and ventral sclerites are provided with visible spines (Fig. 2). The larva stage described by NIKOLOPOULOS (1964) is shown in Fig. 3.

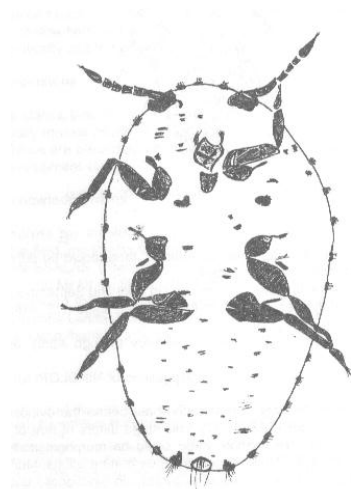


Fig. 2 – Male larval stage, in spring of 1992 (drawing by A. Thondorf)

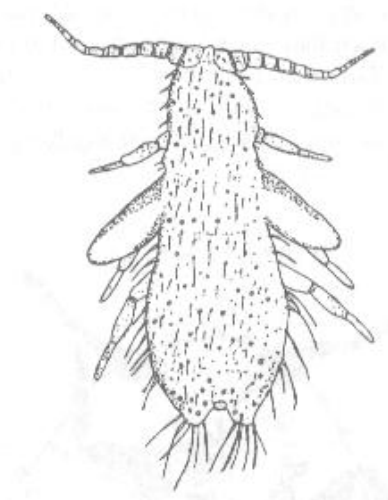


Fig. 3 – An older male larval stage (NIKOLOPOULOS, 1964)

Development and life places

Although *Marchalina hellenica* is bisexual, its reproduction occurs mainly by parthenogenesis, as males are very few. Commonly, a generation a year appears. Eggs are laid naked, and they are wrapped in a viscous cover. Before *Pinus halepensis* blossoms (March – April), the founders lay eggs in great numbers on all the pine parts. There are preferred the thicker or younger branches, but many times also the roots, especially if they are exposed to the air. In these places there occurs the development of the first (feminine) stage of larva. All the feminine larva stages are changing the place they are sucking of. On the tree, they are located in great numbers on the lower part of the branch, or on the part of the trunk that is opposed to bad weather. In September/October, we noticed under a bit of bark of about 3 cm² up to 15 L 1 larvae, closely grouped together. The trunk parts, where bark is not thick yet, are not occupied.

Visits by ants

The following ant species are trophobiotically using *Marchalina hellenica*: *Camponotus athiops* (Latr.), *Crematogaster schmidtii* (Mayr.), *Pheidole pallidula* (Nyl.), *Acantholepis melas* (Emery).

Discussions

On the basis of the segments of antenna, there could be differentiated in females three development stages, namely:

1. nymphs, of the first age (L 1, existing in April and September);
2. nymphs, of the second age, or the pre-adult stage (L 2, existing in September, October, and April);
3. Sexually immature (existing in February through April), and sexually mature adults (April).

These results coincide with the investigations of NIKOLOPOULOS (1965), and SANTAS (1979).

The founder on the way to maturation has, before the oviposition, a rest period of 10 to 15 days (SANTAS, 1983). This stage differs of that of the mature founders. In the present investigation, there could be morphologically differentiated, without doubt, sexually immature and sexually mature adults. Multiplication of rhinaries, and the involution of the buccal apparatus do functionally occur together with the beginning of the migration phase and of the egg laying.

In the works of SANTAS (1979), there are mentioned two larval stages in the case of males: a stage of pupa, and a stage of winged adult of *Marchalina hellenica*, but nevertheless the description is absent. Within the framework of Hemipteroidea, there is excluded the presence of a pupa stage. The male larval stage, detected by the author, as concerns its morphologic characteristics (for instance, the number of the antenna segments, their size, lack of wing formation), is different as compared to the stage described by NIKOLOPOULOS (1964). According to all probabilities, in the case of the biologic material collected on the Western coast of Peloponnese, it is about a younger larval stage (7 antenna segments), while NIKOLOPOULOS describes in his work an older larval stage (10 antenna segments). Later investigations have to clarify if both correspond to the larval stages One and Two of SANTAS (1979), or if there are, eventually, more male larval stages. The problem of the phytophagous relation between the males collected from the leaves of *Asphodelus aestivus*, and the aerial or earthly parts of the plant rests further open. The night precursory to collection, a strong storm uprooted the pines, so there was the possibility males to fall to the earth, together with the detached bark, and then to climb onto the leaves of *Asphodelus aestivus*.

Marchalina hellenica could probably be visited by all ant species, that as a rule trophobiotically use the insects that are currently sucking the sap of trees.

Conclusions

The stages that nourish themselves (and so produce honeydew), as well as the sexually mature adults of *Marchalina hellenica* could be differentiated without doubt. There are presented and discussed some morphologic characteristics of the male development stages.

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