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**A NEW MORPHOLOGICAL STRUCTURE ON *KERMES VERMILIO*
(PLANCHON) (HEMIPTERA: COCCOIDEA: KERMESIDAE).**

ABSTRACT

A NEW MORPHOLOGICAL STRUCTURE ON *KERMES VERMILIO* (PLANCHON)
(HEMIPTERA: COCCOIDEA: KERMESIDAE).

Kermes vermilio (Planchon) is a common scale insect living on *Quercus ilex* L. in urban environments in Southern Italy. Morphological studies on the nymphs and prepupae showed the presence of a pair of membranous ventral frontal lobes, situated just antero-medially to each basal antennal segment. Similar lobes are only currently known in the family Eriococcidae. These structures are therefore here recorded in the Kermesidae for the first time, although it is thought probable that they are present on other species of the family. Their function is unknown.

Key words: phylogenetic relationships, Pseudococcidae, Dactylopiidae, Coccidae, Lecanodiaspididae.

INTRODUCTION

Kermes vermilio (Planchon) is a rather common Mediterranean gall-like scale insect living mainly on *Quercus ilex* L. on which it does not cause damage. However, since 1987, it has been reported as a pest on ornamental *Q. ilex* trees in some Central and Southern Italy urban environments, and heavy infestations have recently been recorded in Tuscany, Emilia and Basilicata regions (Belcari & Minnocci, 1989; Belcari, 1991; Del Bene & Landi, 1992; Andreatta, 1996; Marotta *et al.*, 1998).

K. vermilio has one generation per year, overwintering as the 1st-instar nymph. Females develop through three nymphal stages, while males develop through four. Morphological characters have previously only been studied on the crawler, 3rd-instar nymph and adult female (Balachowsky, 1950; Borchsenius, 1960).

During the present investigations on the biology of this species, all instars of both sexes were studied taxonomically and it was found that large, ventral frontal lobes were present on male and female nymphs and on the prepupa. These structures are here recorded for the first time in the family Kermesidae, although it is considered likely that they are also present on other species of the family.

MATERIALS AND METHODS

Specimens for light microscopy were collected during April and May between 1993 and 1995 at Rapolla (PZ), Basilicata region, Southern Italy. All suitable specimens were mounted on glass slides, using the permanent mounting procedure described in Bullington & Kosztarab (1985). Observations and photos were made under phase contrast, using a Zeiss Axiophot Microscope.

RESULTS

Pairs of ventral frontal lobes were observed on 2nd-instar males and females, and on 3rd-instar females and prepupal males. Each lobe arises laterally on a swollen area, here referred to as the frontal swelling, which is situated between the base of the antennae and the upper part of clypeolabral shield. The lobes appear membranous but vary considerably in size and length depending on the instar and the degree of body growth in each stage. They are much more pronounced and recognisable on newly-moulted specimens, when they stick out from the ventral surface. On 2nd-instar (Fig. 1) and 3rd-instar (Fig. 2) females, the “frontal swelling” is not very pronounced and the frontal lobes are sausage-shaped and about as long as the antennae. On 2nd-instar males (Figs 3, 4, 5), the “frontal swelling” and the frontal lobes are together T- or handlebar-shaped and the lobes are shorter than the antennae. On the male prepupa, the frontal lobes resemble those of third-instar female but are shorter. Their function is unknown.

DISCUSSION AND CONCLUSION

Frontal lobes have been recorded previously only in the family Eriococcidae and even then Williams (1985) commented: “These structure seem to have been ignored in most other works but Dr J.M. Cox and the present writer have observed them in numerous species from all zoogeographical regions” (see Williams, 1985, for further details; those found in *Acanthococcus aceris* (Signoret) are shown in Figs 6 and 7). There is no mention of these structures on the Kermesidae in any of the available morphological descriptions or illustrations (Nearctic (Hamon *et al.*, 1976; Bullington & Kosztarab, 1985; Baer & Kosztarab, 1985; Miller & Miller, 1993a); Palaearctic (Borchsenius, 1960; Sternlicht, 1969, 1972; Koteja & Zag-Ogaza, 1972; Saakyan-Baranova & Muzafarov, 1972)).

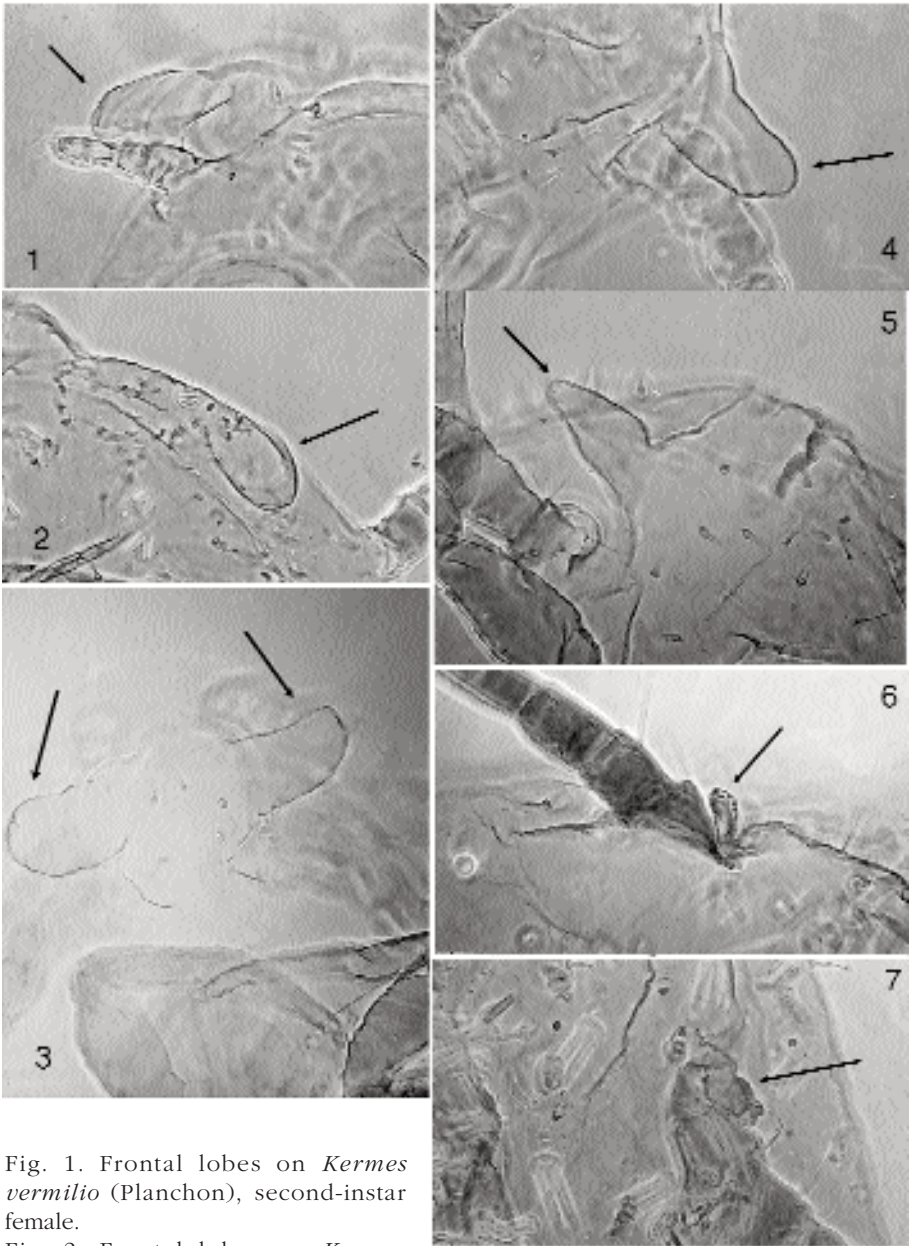


Fig. 1. Frontal lobes on *Kermes vermilio* (Planchon), second-instar female.

Fig. 2. Frontal lobes on *Kermes vermilio* (Planchon), third-instar female.

Figs 3, 4, 5. Frontal lobes on *Kermes vermilio* (Planchon), second-instar male.

Figs 6, 7. Frontal lobes on *Acanthococcus aceris* (Signoret), adult female.

The family Kermesidae Signoret includes about 70 species in 9 genera, but the taxonomic status of several species and the relationships between some genera in this family and others in the Coccoidea remains controversial. In the past, the genus *Kermes* Boitard has been placed in the Pseudococcidae, Eriococcidae, Dactylopiidae and Coccidae. Balachowsky included it in the Eriococcidae (1942) and Pseudococcidae (1948), while Goux (1946), Ferris (1955, 1957) and Borchsenius (1960) suggested a close relationship between *Kermes* and the family Eriococcidae. From a study of the males, Giliomee (1968) concluded that the genus was closest to the Coccidae and Lecanodiaspididae, while Koteja & Zag-Ogaza (1972) considered that the Kermesidae had probably evolved from the Eriococcidae at an early stage. Boratynski & Davies (1971) and Miller & Kosztarab (1979) stated that the Kermesidae and Eriococcidae were closely related, while Baer & Kosztarab (1985) and Kosztarab & Bullington (1987) concluded that Kermesidae had arisen from an eriococcid-like ancestor.

The cladistic studies of Miller & Miller (1993a) when studying *Eriokermes* suggested that the Kermesidae were closest to the Coccidae and that the Eriococcidae were closest to the Pseudococcidae, although in another paper on *Puto* (Miller & Miller, 1993b), the Eriococcidae were found to be closer to the Kermesidae than to the Pseudococcidae. More recent phylogenetic analyses suggest that the Kermesidae and Eriococcidae are closely related (Miller & Williams, 1995; Miller & Hodgson, 1997).

The frontal lobes observed in *Kermes vermilio* might be further evidence for the close relationship between the Kermesidae and the Eriococcidae. Their real taxonomic and phylogenetic importance can be tested only when new morphological studies have been made on other species.

REFERENCES

- ANDREATTA, G., 1996 - Attacchi di *Kermococcus vermilio* Planch. su leccio (*Quercus ilex* L.) nella Pineta di Lido di Volano. *Monti e Boschi*, 47 (3): 38-41.
- BAER, R.G., KOSZTARAB, M., 1985 - A morphological and systematic study of the first and second instars of the Family Kermesidae in the Nearctic region (Homoptera: Coccoidea). *Bulletin of the Virginia Experimental Station, Virginia Polytechnic Institute and State University, Blacksburg*, 85 (11): 119-261.
- BALACHOWSKY, A., 1942 - Essai sur la classification des cochenilles (Homoptera: Coccoidea). *Annales de Grignon École National d'Agriculture, (Series 3)*, 3: 34-48.
- BALACHOWSKY, A., 1948 - Les cochenilles de France, d'Europe, du nord de l'Afrique, et du bassin Méditerranéen. IV. Monographie des Coccoidea; Classification - Diaspididae (Première partie). *Actualités Science et Industrie, Entomologie Appliquée*, 1054: 243-394.

- BALACHOWSKY, A., 1950 - Les *Kermes* (Hom. Coccoidea) des Chênes en Europe et du le Bassin Méditerranéen. *Proceedings of VIII International Congress of Entomology, Stockholm*: 739-754.
- BELCARI, A., 1991 - Ulteriori acquisizioni sulla biologia e sulle possibilità di controllo in Toscana di *Kermes vermilio* (Planchon) (Rhynchota: Kermesidae). *Disinfestazione*, 8(6): 23-26.
- BELCARI, A., MINNOCCI, A., 1989 - Attacchi di *Kermes vermilio* (Planchon) (Rhynchota: Kermesidae) su *Quercus ilex* in Toscana. *Disinfestazione*, 6(5): 48-52.
- BORATYNSKY, K., DAVIES, R.G., 1971 - The taxonomic value of male Coccoidea with an evaluation of some numerical techniques. *Biological Journal of the Linnean Society*, 3: 57-102.
- BORCHSENIUS, N.S., 1960 - Fauna USSR: Homoptera, 8, families Kermococcidae, Asterolecaniidae, Lecanodiaspididae, Acleridae. Fauna SSSR, Novaya Seriya, 77. 282pp.
- BULLINGTON, S.W., KOSZTARAB, M., 1985 - Revision of the Family Kermesidae (Homoptera) in the Nearctic region based on adult and third-instar females. *Bulletin of the Virginia Experimental Station, Virginia Polytechnic Institute and State University, Blacksburg*, 85 (11): 1-119.
- DEL BENE, G., LANDI, S., 1992 - *Kermes vermilio* (Planchon) e i suoi nemici naturali in Toscana. *Atti Giornate Fitopatologiche*, 1: 229-236.
- FERRIS, G.F., 1955 - Atlas of Scale Insects of North America. Vol. VII. Families Acleridae, Asterolecaniidae, Conchaspidae, Dactylopiidae and Lacciferidae. Stanford University Press, Berkeley, California. 233pp.
- FERRIS, G.F., 1957 - A review of the family Eriococcidae (Insecta: Coccoidea). *Microentomology*, 22: 81-89.
- GILIOREE, J.H., 1968 - The morphology and relationships of the male of *Lecanodiaspis elytropappi* Munting & Giliomee (Homoptera: Coccoidea). *Journal of the Entomological Society of Southern Africa*, 30: 185-197.
- GOUX, L., 1946 - Les affinités réelles des cochenilles du genre *Kermococcus* démontrées par l'étude du développement post-embryonnaire. *Bulletin du Muséum d'Histoire Naturelle de Marseille*, 6(3-4): 98-101.
- HAMON, A.B., LAMBDIN, P.L., KOSZTARAB, M., 1976 - Life history and morphology of *Kermes kingi* in Virginia (Homoptera: Coccoidea: Kermesidae). *Virginia Polytechnic Institute and State University, Research Division Bulletin, Blacksburg*, 111; 1-32.
- KOSZTARAB, M., BULLINGTON, S.W., 1987 - Mouth structure and relationships in the Kermesidae (Homoptera), with a key to the world genera. *Bollettino del Laboratorio di Entomologia Agraria Filippo Silvestri, Portici*, 43 (Suppl., 1986): 23-27.
- KOTEJA, J., ZAG-OGAZA, B., 1972. Morphology and taxonomy of the male *Kermes quercus* (L.) (Homoptera: Coccoidea). *Acta Zoologica Cracoviensia*, 17: 195-215.
- MAROTTA, S., TRANFAGLIA, A., RIPULLONE, F., 1998 - Le cocciniglie delle querce in Basilicata (Homoptera, Coccoidea). *Atti XVIII Congresso Nazionale Italiano di Entomologia, Maratea 21-26 giugno 1998*: 55.
- MILLER, D.R., HODGSON, C.J., 1997 - Phylogeny. Pp 229-250 in Ben-Dov, Y., Hodgson, C.J. (eds) *Soft Scales Insects - Their Biology, Natural Enemies and Control*. Vol. 7A. Elsevier Science Publ. 452pp.
- MILLER, D.R., KOSZTARAB, M., 1979 - Recent advances in the study of scale insects. *Annual Review of Entomology*, 24: 1-27.

- MILLER, D.R., MILLER, G.L. 1993a - Description of a new genus of scale insect with a discussion of relationships among families related to the Kermesidae (Homoptera: Coccoidea). *Systematic Entomology*, 18: 237-251.
- MILLER, D.R., MILLER, G.L., 1993b - A new species of *Puto* and a preliminary analysis of the phylogenetic position of the *Puto* group within the Coccoidea (Homoptera: Pseudococcidae). *Jeffersoniana*, 4: 1-35.
- MILLER, D.R., WILLIAMS, D.J., 1995 - Systematic revision of the family Micrococcidae (Homoptera: Coccoidea), with a discussion of its relationships and a descriptions of a gynandromorph. *Bollettino del Laboratorio di Entomologia Agraria Filippo Silvestri, Portici*, 50 (1993): 199-247.
- SAAKYAN-BARANOVA, A.A., MUZAFAROV, S.S., 1972 - The structure, biology and interrelationships of *Kermococcus quercus* (Homoptera, Kermococcidae) and its parasites (Hymenoptera, Chalcidoidea). I. *Entomologicheskoye Obozreniye*, 51(3): 498-519.
- STERNLICHT, J.B., 1969 - *Kermes bytinskii* n. spec. (Coccoidea, Kermesidae) in Israel and observations on its life history. *Israel Journal of Entomology*, 4: 251-270.
- STERNLICHT, J.B., 1972 - A new species of *Kermes* Boitard (Coccoidea, Kermesidae) from England on oak. *The Entomologist's Gazette*, 23(4): 259-266.
- WILLIAMS, D.J., 1985 - The British and some other European Eriococcidae (Homoptera: Coccoidea). *Bulletin of the British Museum (Natural History), Entomology Series*, 51 (4): 347-393.