

DESCRIPTION OF THE FINAL INSTAR OF *TRICHOMALOPSIS PEREGRINA*
(HYMENOPTERA, PTEROMALIDAE), WITH DATA AND COMMENTS
ON THE PREIMAGINAL STAGES

JOSÉ TORMOS¹, ENRIC FRAGO², JESÚS SELFA², JOSEP DANIEL ASÍS¹, JULI PUJADE-VILLAR³ AND MIGUEL GUARA⁴

¹Área de Zoología, Facultad de Biología, Universidad de Salamanca. 37071-Salamanca, Spain
e-mail: tormos@usal.es

²Departament de Zoologia, Facultat de Biologia, Universitat de València
Dr. Moliner 50. 46100-Burjassot, València, Spain

³Departament de Biologia Animal, Facultat de Biologia, Universitat de Barcelona
Avinguda Diagonal 645. E-08028 Barcelona, Spain

⁴Departament de Botànica, Facultat de Biologia, Universitat de València
Dr. Moliner 50, 46100-Burjassot, València, Spain

ABSTRACT

The preimaginal stages of *T. peregrina* are described. The egg displays a sculptured chorion, which is found only on those deposited externally. The immature larvae are characterized by their peculiarities in (a) a setose ring on the thoracic and abdominal segments, (b) an anal notch and (c) size and the sensory structures of the head capsule. The final instar is described and illustrated. Morphological structures of diagnostic value are discussed. The most salient character shown by the mature larva of this species lies in the epistoma, which is complete.

Key Words: Hymenoptera, preimaginal stages, Pteromalidae, *Trichomalopsis*

RESUMEN

Se describen las fases de huevo y larva de *T. peregrina*. El huevo, como es característico en los que se depositan externamente, presenta un corion ornamentado. Las larvas inmaduras exhiben peculiaridades en (a) el anillo setoso de los segmentos torácicos y abdominales, (b) la escotadura anal y (c) el tamaño, y estructuras sensoriales, de la cápsula cefálica. El estado de carácter más sobresaliente presentado por la larva madura de esta especie radica en la presencia de un epistoma totalmente diferenciado.

Translation provided by the authors.

The family Pteromalidae includes 3506 species in 588 genera (Noyes 2003). The life-history of this family is extremely varied, including solitary and gregarious species, ectoparasitoids and endoparasitoids, koinobionts and idiobionts, primary and secondary parasitoids, and even predators. The genus *Trichomalopsis* Crawford, 1913, with 54 species (Noyes 2003) attacks Diptera, Hymenoptera, and Lepidoptera, and its species are either primary parasitoids of larvae or pupae, or hyperparasitoids. This study addresses the preimaginal stages of a species of this genus, *Trichomalopsis peregrina* (Graham, 1969). *Trichomalopsis peregrina* attacks Hymenoptera and Lepidoptera, and is a primary ectoparasitoid or hyperparasitoid. Within *Trichomalopsis* the main studies of mature larvae have been carried out by Proper (1931), who described the preimaginal stages of *Trichomalopsis hemiptera* (Walker, 1836), and Best & Simpson (1975), who reported

on *Trichomalopsis americana* (Gahan, 1933). Clausen (1972) and Finlayson (1987) published compendia in which work on immature parasitoids was detailed.

MATERIALS AND METHODS

Preimaginal instars of *T. peregrina* were obtained from *Euproctis chrysorrhoea* (L., 1758) (Lymantriidae) larvae in winter tents made on *Crataegus* sp. at the Spanish locality of Jarafuel (Zacaé) (Valencia province). The tents were collected and transported to the laboratory on 20 Jan 2004 and held for the emergence of imago in order to identify the parasitoids.

Nine mature larvae, 2 immature larvae and 1 egg of *T. peregrina* were fixed and preserved in 70% ethyl alcohol (ETOH) for subsequent study and description. The methodology used in their preparation was similar to that employed by Tormos et al.

(2004). The ensuing descriptions essentially employ the terminology and organization used by Finlaysson (1987) and Tormos et al. (2004). Voucher specimens are deposited at the Fundación Entomológica "Torres-Sala" (Valencia, Spain).

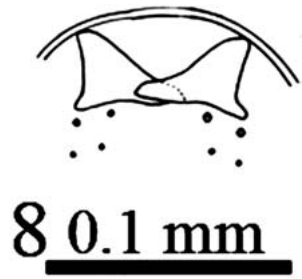
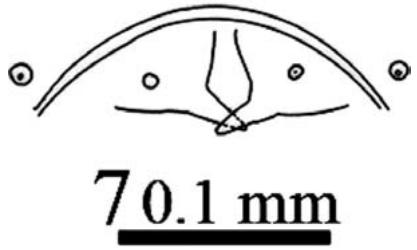
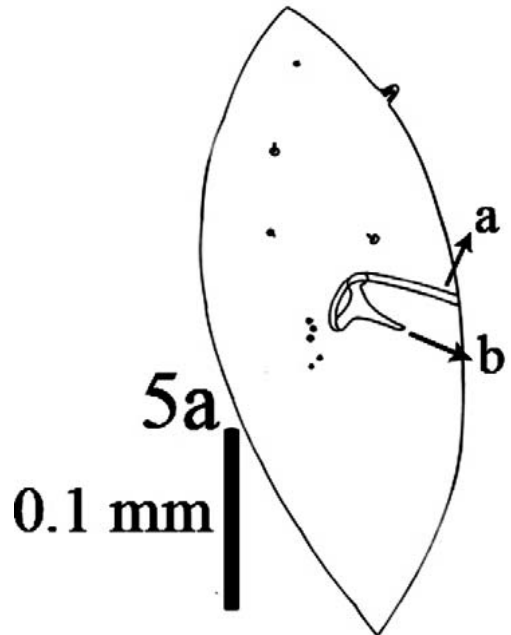
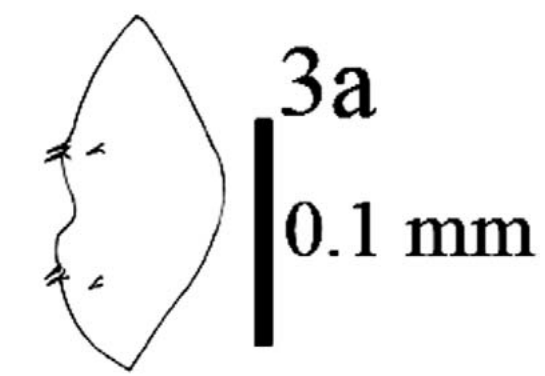
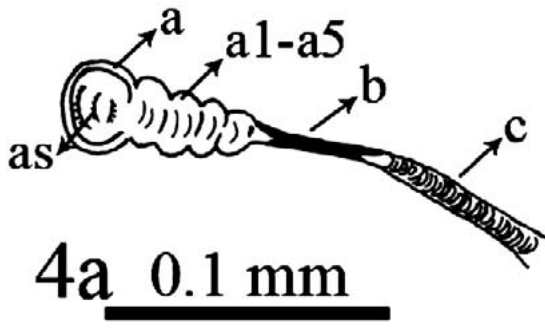
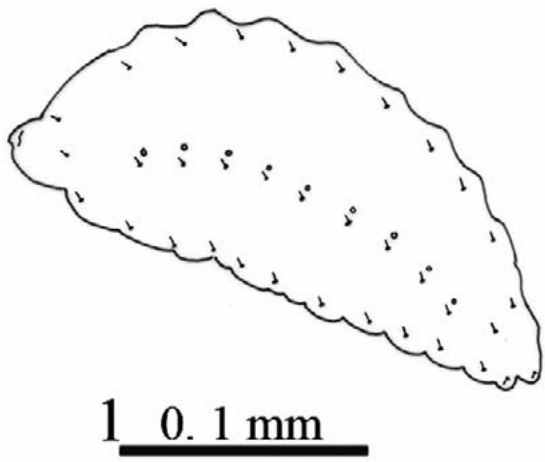
DESCRIPTION OF PREIMAGINAL STAGES

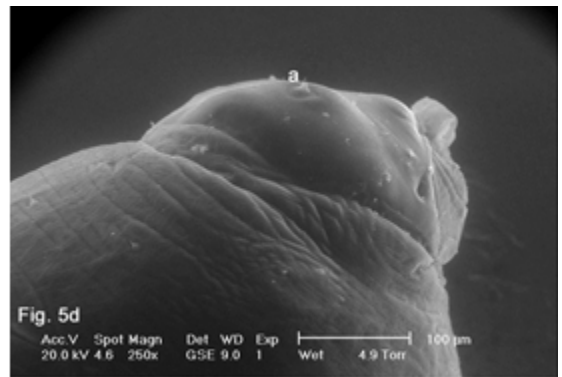
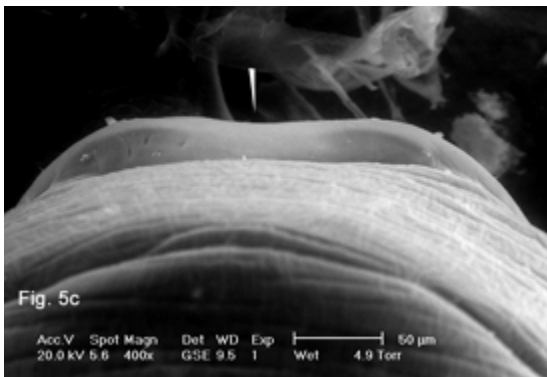
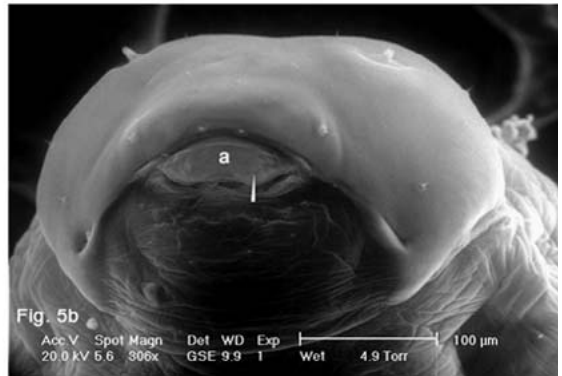
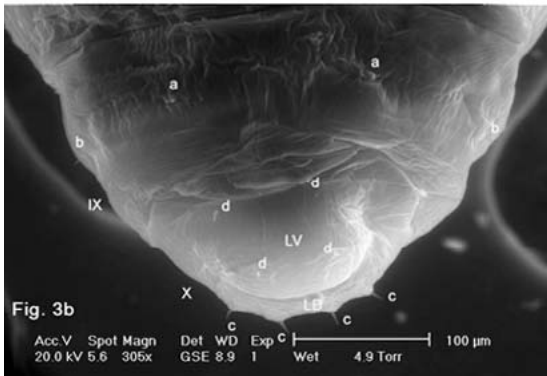
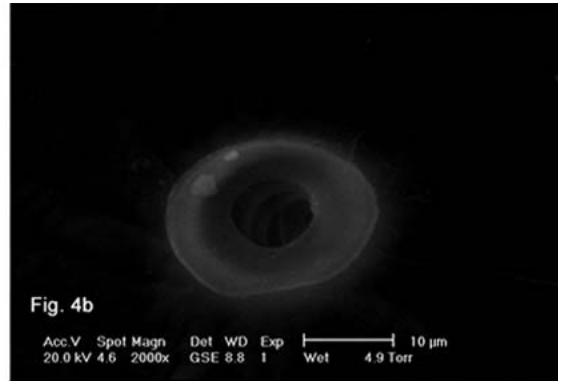
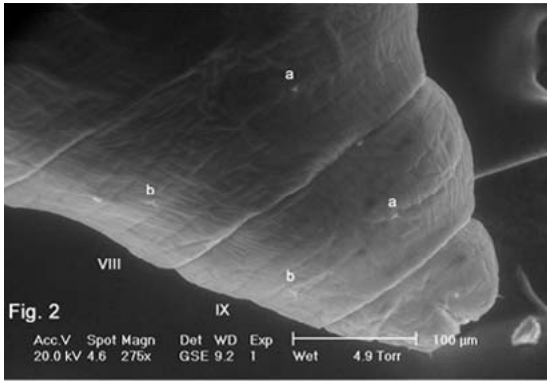
Trichomalopsis peregrina (Graham, 1969) (Figs. 1-8)

Mature Larva (Figs. 1-5)

Body (Fig. 1) (l = 1.5-2.9 mm (\bar{x} = 2.5), maximum w = 0.5-1.4 mm (\bar{x} = 1.9, n = 9) hymenopteriform, slightly broader in mid region, with a re-

duced head, with distinct segmentation, with 3 thoracic and 10 abdominal segments. Color whitish or yellowish. Weakly sclerotized. Pleural lobes not developed. Tegument with 3 pairs of setae (Figs. 2, 3b) (l = 8-10 μ m) distributed around all 3 thoracic and the first 9 abdominal segments (setose ring). Anal segment (Figs. 3a, b) notched transversely, a dorsal lobe and another ventral one being differentiated, each with 2 pairs of setae (l = 8-12 μ m). Spiracles (Figs. 4a, b) on mesothorax, metathorax and on first 7 abdominal segments; atrium (l = 74 μ m, d maximum = 37 μ m) with peritreme and asperities well differentiated, funnel-shaped, with approximately 5 chambers; closing apparatus (l = 55 μ m; w = 7 μ m) adjacent to atrium.





Figs. 1-8. 1-5: Mature larva of *Trichomalopsis peregrina* (Graham): (1) General aspect (lateral view). (2) Abdominal segments VIII-X (lateral view). Letters a-b show the distribution of the setae on segments VIII-IX. (3a) Anal segment (lateral view). Setae and notch are shown. (3b) Abdominal segments IX-X (ventral view). Note distribution of lateral (a) and ventral (b) setae on segment IX and the dorsal (DL) and ventral (LV) lobes, and the setae—dorsal lobe (c), ventral (d) of the anal segment. (4a) Spiracle (a: atrium, a1-a5: chambers of atrium, as: asperities, b: closing apparatus of spiracle, c: spiracular trachea). (4b) Metathoracic spiracle (detail). (5a) Cranium (lateral view) (a: epistoma, b: mandible). (5b) Head capsule (frontal view) Note labrum with its sensilla. (5c) Head capsule (posterior view). Note the slightly emarginate vertex. (5d) Head capsule (lateral view). Note papilliform antennae (a). 7-8: Immature larvae of *Trichomalopsis peregrina* (Graham): (7) Epistoma, mandibles, and head sensory structures of immature larva a. (8) Epistoma, mandibles, and head sensory structures of immature larva b.

Cranium (Figs. 5a, b) (w = 145 µm, h (from apex of cranium to base of mandibles = 200 µm), higher than wide, narrower than the first thoracic segment, very weakly indented dorsally along its middle line (Fig. 5c), very weakly sclerotized, with

6 pairs of setae (l = 2-3 µm) and 4 pairs of sensilla (d = 1-2 µm). Antennae markedly papilliform (Fig. 5d). Mandibles sclerotized, triangular in form, each with sharp, toothless blade. Maxillae and labium indistinguishable. Epistoma complete.

Labrum emarginate (Fig. 5b), with 4 sensilla ($d = 1\text{--}2\ \mu\text{m}$). Pleurostoma and superior and inferior mandibular processes present. Tentorium more or less visible.

Data on the Egg and Immature Larvae

Egg ($l = 230\ \mu\text{m}$, maximum $w = 73\ \mu\text{m}$) oval, more or less cylindrical, with a granulate surface.

Immature Larvae (Figs. 7, 8)

Two small larvae (a and b) were obtained: a ($l = 0.3\ \text{mm}$, maximum $w = 0.1\ \text{mm}$), b ($l = 0.6\ \text{mm}$, maximum $w = 0.2\ \text{mm}$), whose morphology was similar to that of the mature larva, although different in presenting a large head capsule in comparison with the body; in not having the setose ring well differentiated, and with the anal notch poorly differentiated. Larva a (Fig. 7) only had 2 pairs of cephalic sensilla whereas larva b (Fig. 8) displays 4 pairs.

DISCUSSION

The mature larva of *T. peregrina* share the following characters with other Chalcidoidea: (a) hymenopteriform, with a reduced head, 3 thoracic and 10 abdominal segments, and 9 pairs of spiracles; (b) cephalic structures very reduced, although mandibles are well developed, sclerotized, triangular, with a short blade without teeth: (b1) maxillae and labium completely fused, and (b2) salivary orifice absent.

Trichomalopsis peregrina shares the presence of a pleurostome and superior and inferior mandibular processes with the mature larvae of the pteromalid species *Psychophagus omnivorus* (Walker, 1835), *Tritneptis diprionis* Gahan, 1938 and *T. klugii* (Ratzeburg, 1844). However, the presence of a completely differentiated epistoma separates this larva from other known larvae of the family. It is different from those already described in the genus in the absence of tubercles upon the body segments, which are present, although attenuated, in *T. hemiptera* (Proper 1931), together with the number of sensilla of the labrum (6 pairs in *T. hemiptera*). The description of *T. americana* by Best & Simpson (1975) is extremely succinct and cannot be used for comparative purposes.

As in the case of eggs that are deposited externally, the chorion is sculptured.

The immature larvae are very similar to the mature larva, mainly differing in the size of the head capsule with respect to the body, in the number of sensory structures on the head, in the presence of setae on the tegument, and in the differentiation of the notch of the last body segment.

According to Graham (1969) the mature larva of *T. hemiptera*, described by Proper (1931), would correspond to that of *T. peregrina*, since a misidentification of this latter species was made. If this were the case, the differences mentioned above between the two preimaginal instars would have to be considered as being due to the variability of the species.

ACKNOWLEDGMENTS

We thank Michael W. Gates (National Museum of Natural History, USA) for his observations and critical reading of the manuscript. The laboratories of the Fundación Entomológica "Torres-Sala" were used to carry out this study. The research conducted was possible thanks to contributions from the "Ministerio de Educación y Ciencia de España" (project I+D BOS2002-03820 with an associate 4-year grant FPI). Financial additional support for this paper was provided by the Junta de Castilla y León project SA012A05.

REFERENCES CITED

- BEST, R. L., AND R. G. SIMPSON. 1975. Biology of *Eupteromalus americanus*: a hyperparasite of *Bathyplectes curculionis*. *Ann. Entomol. Soc. Am.* 68 (6): 1117-1120.
- CLAUSEN, C. P. 1972. *Entomophagous Insects*. Hafner Publishing Company, New York.
- FINLAYSON, T. 1987. Chalcidoidea, pp. 664-665 *In* F. W. Stehr [ed.], *Immature Insects*. Kendall/Hunt Publishing Company, Dubuque.
- GRAHAM, M. W. R. DE V. 1969. The Pteromalidae of North-western Europe (Hymenoptera: Chalcidoidea). *Bull. British Mus. (Natural History) (Entomology) Supplement* 16: 908 pp., 686 figs.
- NOYES, J. S. 2003. Universal Chalcidoidea Database. World Wide Web electronic publication. www.nhm.ac.uk/entomology/chalcidoids/index.html [accessed 05-Sep-2003].
- PROPER, A. B. 1931. *Eupteromalus nidulans*, a parasite of the brown-tail and satin moths. *J. Agric. Res.* 43(1): 37.
- TORMOS, J., J. D. ASÍS, S. F. GAYUBO, AND M. A. MARTÍN. 2004. Descriptions of the Final instar of *Eurytoma nodularis* and *E. heriadi* (Hymenoptera: Eurytomidae). *Florida Entomol.* 87(3): 278-282.
- Fig. 6 deleted in proof.