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Immature stages of *Temenis laothoe meridionalis* Ebert (Lepidoptera, Nymphalidae, Biblidinae)

Lucy Mila Garcia Salik*, Fernando Maia Silva Dias, Eduardo Carneiro, Mirna Martins Casagrande, Olaf Hermann Hendrik Mielke

Universidade Federal do Paraná, Setor de Ciências Biológicas, Departamento de Zoologia, Curitiba, Paraná, Brazil

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ABSTRACT

The external morphology and life cycle of the immature stages of *Temenis laothoe meridionalis* Hübner, [1819] (Lepidoptera, Nymphalidae, Biblidinae), associated with *Serjania laruotteana* (Sapindaceae) in Curitiba, Paraná, Brazil, are described and illustrated with photographs and images from scanning electron microscopy. Special aspects of the external morphology are compared to the immature stages of other species of Biblidinae.

Introduction

Temenis laothoe (Cramer, 1777) is a widely distributed species in the Neotropical region. Adults of the seven subspecies of *T. laothoe* (Lamas, 2004) have a striking variation in the presence of markings, the coloration and the shape of the wings, besides differences in the genitalia, including the *hypandrium* (L.M.G. Salik, personal observation). They are found mainly in the canopy (DeVries and Walla, 2001; Ribeiro and Freitas, 2012), being restricted to forest environments from sea level until 1500 m, and their larvae are associated to species of a number of genera of Sapindaceae, such as *Allophylus*, *Cardiospermum*, *Paullinia*, *Serjania* and *Urvillea* (Santin, 2004; Beccaloni et al., 2008).

Although immature stages and adults are common and easily found (Muyshondt, 1974b), there are few studies that contain detailed information on the external morphology of the immatures of species of *Temenis* Hûbner, [1819] (Müller, 1886; Muyshondt, 1974b; D'Almeida, 1922; Muyshondt, 2005; Teshirogi, 2007) and related genera, such as *Nica* Hübner, [1826] (Teshirogi, 2007) and *Epiphile* Doubleday, [1845] (Müller, 1886; Muyshondt, 1973a; Jenkins, 1986; Muyshondt, 2005). However, from the last decades, detailed morphological studies in other Biblidinae have presented potentially informative characters for the classification and systematics of the subfamily (e.g., Muyshondt, 2005; Teshirogi, 2007; Barbosa et al., 2010; Dias et al., 2012, 2014; Leite et al., 2012a,b, 2014; Salik et al., 2015; Nieves-Uribe et al., 2015, 2016).

Due to the importance of the study of immature stages and the morphological characters to better understand the phylogenetic relationships and taxonomy in Biblidinae, the current study describes and illustrates in detail the external morphology of the immatures of *T. laothoe meridionalis* Ebert, 1965 (Figs. 1, 2).

Material and methods

Eggs of *T. laothoe meridionalis*, found on the hostplant *Serjania laruotteana* (Sapindaceae) (Fig. 3), were collected in the Parque Municipal Barigui (25°25′ S, 49°18′ W, 910 m), Curitiba, Paraná, Brazil. Immatures were reared and studied in the laboratory. To slow the foliar dehydration process, the extremities of the host plant branches were covered with moist cotton, and the eggs were kept in Petri dishes placed in plastic containers with paper towels. Humidity was maintained daily and the leaves were changed every time there were signs of dehydration. After the eclosion, the larvae were transferred to rearing cages where they were periodically observed in search for behavioral changes and exuviae.

Scanning electron microscopy of the eggs, larvae and pupa was performed on a Jeol® model JSM – 6360LV Scanning Electron Microscope in the Centro de Microscopia Eletrônica of the Universidade Federal do Paraná (CEM-UFPR). Furthermore, the eggs and first instars were photographed with a digital camera set on a stereoscopic microscope, and further instars and pupa were recorded only with a DSLR Nikon d3100 digital camera. Larvae were killed through

* Corresponding author.
E-mail: lucymilas@gmail.com (L.M. Salik).

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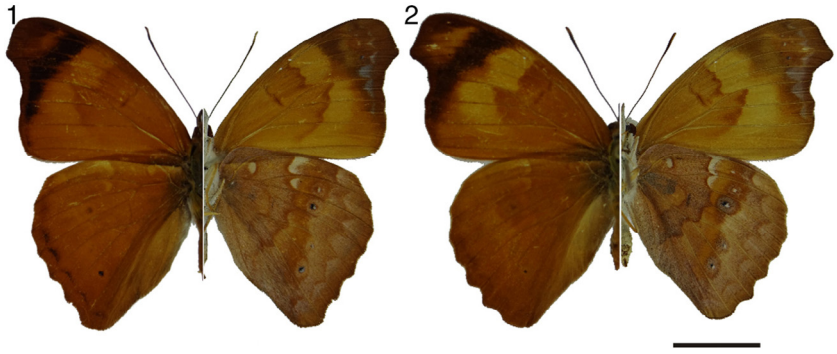

Figs. 1–2. *Temenis laothoe meridionalis.* Adult: 1, dorsal and ventral view of the male; 2, dorsal and ventral view of the female. Brasil, Paraná, Jaguariaíva, Parque Estadual do Cerrado, 800 m, 22.XI.2009. O. Mielke, E. Carneiro, F. Maia, A. Ribeiro & D. Dolibaina *leg.* DZ26760 (Male) and DZ26776 (Female). Scale = 1 cm.

immersion in hot water, fixed in Kahle-Dietrich 10% for 72 h, posteriorly preserved in ethanol 70% and then deposited in the Coleção de Imaturos de Lepidoptera da Coleção Entomológica Pe. Jesus Santiago Moure, Universidade Federal do Paraná, under batch number DZUPIL 0083.

The study of the chaetotaxy of the head capsule, thorax and abdomen of the 1st instar, the measurements and drawings of the head capsule of all instars were performed with the aid of a camera lucida set on a stereoscopic microscope with an ocular micrometer. Head capsules and pupal exuviae were kept dry and placed in glass tubes. Terminology followed Scoble (1992) for eggs, Hinton (1946), Peterson (1962), Stehr (1987), Dias (2006), and Huertas-Dionisio (2006) for larvae, and Mosher (1916), and Dias (2006) for pupae.

Host plants were identified by Dr. Jorge Bizarro (Reserva Ecológica de Guapiaçu – REGUA, Guapimirim, Rio de Janeiro State, Brazil). Immature and adult specimens were deposited in the Coleção Entomológica Pe. Jesus Santiago Moure, Universidade Federal do Paraná.

Results

Temenis laothoe meridionalis Ebert, 1965
(Figs. 1, 2, 4–41)

Egg (Figs. 4, 5, 21, 22, 25, 26)

Yellowish green, barrel-shaped, with nine vertical carinae, which are more expanded dorsally, and with dorsal aeropiles. Micropilar area concave, surrounded by a circular dorsally projected carina ("bottleneck" sensu Nieves-Uribe et al., 2015, 2016), connected to the nine vertical carinae.

Eggs oviposited singly on the underside of the folioles of *S. laruotellana.*

Average duration: 4 days ($n = 33$). Average diameter – 1.5 mm; average height – 1 mm.

Larva
First instar (Figs. 6–8, 23, 27–33)

Head capsule dark brown, round, smooth, with dark brown setae. Labrum bilobed. Mandibles strongly sclerotized. Stemmata in groups of six, located on the latero-inferior region of the epicranium, isometric, being 1–4 and 6 arranged in a semicircle and 5 positioned ventrally and close to the antennal base.

Body greenish brown with dorsal and subdorsal white markings; prothoracic plate trapezoidal; anal plate irregularly sclerotized; both dark brown. Thoracic and abdominal legs dark brown.

Larvae initially feed on the chorion, and then they moved to the apical portion of the leaves where they feed on the leaf blade. When inactive, the larvae rest on a perch constituted of silk and fecal pellets attached to the end of the midrib of a leaflet, occasionally on secondary veins. Often the pellets are adhered by the larvae to the larval body.

Average duration: 6 days ($n = 23$). Head capsule: average diameter – 1.05 mm; average height – 1.05 mm.

Head chaetotaxy (Figs. 23, 27–30)

21 pairs of primary setae on the head capsule:

Clypeal group (C): C1 smaller in relation to C2, positioned close to the latero-ventral region of the clypeus; C2 positioned close to the sagittal midline of the head.

Frontal group (F): F1 positioned close to the epicranial suture, the only one present in the frons; pore Fa latero-ventral to F1, close to the sagittal midline of the head.

Adfrontal group (AF): AF1 and AF2 of equal size, positioned in the adfrontal region, AF1 ventral to AF2; pore AFa at a small distance from AF2.

Anterior group (A): A1 longer than other setae, positioned on the latero-inferior region of the epicranium; between stemmata 4 and 5 and the clypeus; A2 dorso-lateral to A1, at level with stemma 3; A3 latero-dorsal to the stemmata region; pore Aa latero-ventral to A3.

Stemmatal group (S): S1 lateral to stemmata 2 and 3; S2 dorsal to stemma 1; S3 lateral to the semicircle of stemmata; pore Sa lateral to stemma 4 and Sb latero-dorsal to S3.

Substemmatal group (SS): SS1 lateral to SS2 and close to mouthparts; SS2 located between SS1 and SS3, and ventral to pore SSb; SS3 ventral to stemma 6 and smaller than the others.

Lateral group (L): L1 dorsal to S2; pore La latero-ventral to L1.

Postero-dorsal group (P): P1 between AF2 and P2; P2 latero-dorsal to P1 and of equal length; pore Pa close and lateral to A3; pore Pb ventral to P2.

Microdorsal group (MD): MD1 dorsal to MD2; MD2 dorsal to MD3; MD3 latero-dorsal to L1; pore MDa at the same level and between MD2 and MD1.

Microgenal group (MG): MG1 very small, close to postero-inferior margin of the epicranium and the occipital foramen; pore MGa latero-ventral to MG1 and latero-dorsal to S3.

Thorax chaetotaxy (Figs. 31, 32)

Prothorax: Ten pairs of acutely tipped setae. Dorsal Group (D): D1 and D2 positioned on the antero-dorsal margin of the pronotal

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