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Description of the larva of *Simulium lobatoi* Luna Dias, Hernández, Maia-Herzog & Shelley (Diptera: Simuliidae) from Brazil.

LUIS MIGUEL HERNÁNDEZ[1], NEUSA HAMADA[2], MATEUS PEPINELLI[3] & REGINA MAYUMI KIKUCHI[3]

[1] *Diptera Division, Department of Entomology, The Natural History Museum, Cromwell Road, London SW7 5BD, UK; email: luih@nhm.ac.uk*
[2] *Coordenação de Pesquisas em Entomologia, Instituto Nacional de Pesquisas da Amazônia, Caixa Postal 478, 69011-970, Manaus, AM, Brasil*
[3] *Laboratorio de Entomologia Aquática, Departamento de Hidrobiologia, Universidad Federal de São Carlos, Estrada Washington Luis, Km 235, 13565-905, C. Postal 676, São Carlos, S.P., Brasil*

Abstract

In this paper the larva of *Simulium lobatoi* is described for the first time based on specimens collected in Goiás State, Brazil. The main taxonomic characters are fully illustrated and comparisons with closely related species are given. The larva of *S. lobatoi* is externally similar to *S. rubrithorax* Lutz from which it can be readily distinguished by the apically pointed filaments of the gill histoblast, the teeth of the hypostomium protruding forward in central region, and the presence of approximately 14 hypostomial setae parallel to the lateral margin of hypostomium. In *S. rubrithorax* the filaments of the gill histoblast are rounded apically, the teeth of the hypostomium do not protrude forward in central region, and there are only nine hypostomial setae parallel to the lateral margin of hypostomium.

Key words. *Simulium lobatoi* — Simuliidae — Neotropical Region — blackflies — larva — Brazil.

Introduction

Simulium lobatoi was described by Luna Dias *et al.* (2004) based on several males, females and pupal exuviae collected in the states of Mato Grosso and Goiás, Brazil. The larva was not described and, at this time, the authors stated that the adults and pupa of *S. lobatoi* were morphologically related to species within *Hemicnetha* Enderlein and *Trichodagmia* Enderlein. However, they refrained from assigning this species to any known subgenus because of the current instability of the subgeneric classification of Neotropical Simuliidae.

In recent studies on the ecology of aquatic invertebrates in Brazil carried out by Neusa Hamada and collaborators at the Instituto Nacional de Pesquisas da Amâzonia (INPA), the larva of *S. lobatoi* was found, which is described in this paper.

Material & Methods

The techniques for collection, rearing, dissection, measurement of specimens and terminology used are those detailed in Adler *et al*. (2004), Shelley *et al.* (1997) and Pepinelli *et al.* (2006). All images illustrating the morphology were taken by Luis Hernández directly from specimens using a Synoptics Digital Imaging Analysis System at The Natural History Museum (BMNH) as detailed in Hernández & Shelley (2005) and Hernández *et al.* (2005). We followed the classification of Luna Dias *et al.* (2004) for the placement of *S. lobatoi* within the subgenus *Simulium* Latreille *s.l.* Voucher specimens are deposited in the Instituto Nacional de Pesquisas da Amâzonia (INPA), Manaus, Brazil and the Entomology Department, The Natural History Museum (BMNH), London, United Kingdom.

Simulium lobatoi Luna Dias, Hernández, Maia-Herzog & Shelley

(Figs. XXX)

Simulium lobatoi Luna Dias, Hernández, Maia Herzog & Shelley, 2004: 37. HOLOTYPE f# (reared), BRAZIL: Mato Grosso State, Tangará da Serra, Estância Primavera, Cachoeira I, (site 1053); 26.v.1995, (*A.P.A. Luna Dias, P.R. Garritano, M.M. Elázaro & M. Leila*) (IOC) [Examined.]

Mature larva. Body length 8.7-10.6 mm (n=4); length of head capsule 0.9-1.0 mm (n=4); width of head capsule 0.7-0.8 (n=4).Body colour dark grey dorso-laterally, whitish ventrally (specimens preserved in Carnoy's solution and/or alcohol). General body form as in Fig. 1.

Head— mainly dark brown, anterior region of cephalic apotome yellowish. Numerous small setae present on all surfaces and head capsule slightly wrinkled. Head pattern positive (Fig. 2). Cervical sclerites small, elliptical, free in membrane, each with thin elongated sclerite on its anterior region (Fig. 3). Postgenal bridge deep, bell-shaped, sub-triangular apically; postgenal bridge nearly as long as hypostomium (Fig. 4). Hypostomium strongly pigmented on anterior margin, with approximately nine apical teeth distinctly protruding in central region; median tooth sharp, well-developed and most prominent; 3+3 sub-lateral teeth, with the pair adjacent to base of median tooth longer than remainder; 1+1 lateral tooth, longer than basal sub-lateral tooth; 2+2

small, lateral serrations; 1+1 lines of approximately fourteen hypostomial setae parallel to lateral margin; 1+1 long, simple setae in posterior half of hypostomium (Figs. 4-5). Sub-esophageal ganglion lightly pigmented (Fig. 6). Antenna longer than head fan stalk, segment I, apex of segment II and segment III dark brown, two thirds of segment II pale whitish (Fig. 7), length of antennal segments I-III excluding the sensillum 0.1:0.1-0.2:0.1 (n=6). Mandible with three apical teeth, first one longer than second and third apical teeth; mandibular comb with approximately eleven teeth, first fourteen more prominent than remainder, third, fourth and fifth comb teeth longer and more prominent than first, and sixth to eleventh mandibular comb teeth; two mandibular serrations, anterior more prominent and longer than posterior (Fig. 8). Lateral mandibular process not seen. Maxillary palps heavily pigmented; one and a half times as long as wide at base. Cephalic fan with more 49 rays with fine, single line of spines in a row.

Thorax — grey dorsally and whitish ventrally. Cuticle without setae. Proleg with plate heavily sclerotised with band of approximately 41-50 processes (n=4). Pupal respiratory gill histoblast dark brown; dissected gill histoblast with 8 filaments, all branching from a common trunk and pointed apically (Fig. 9).

Abdomen — usually grey dorsally, progressively paler ventrally, especially towards posterior where last segments white. Ventral nerve cord greyish. Ventral papillae absent. Cuticle lacking setae except area around anal sclerite and anal gills. Anal sclerite well sclerotised with anterior arms extending one third of diameter of posterior circlet anteriorly; no sclerotised areas between arms (Fig. 10). Posterior circlet with 251-290 rows of 45-46 simple hooks (n= 3). Anal gills with two lobes of approximately 24 small, finger-like lobes (n=1).

Taxonomic Discussion

Luna Dias *et al.* (2004) did not attempt to place *S. lobatoi* in any known subgenus of Simuliidae because of the morphological resemblance of adults and pupal exuviae of this species to taxa allotted in the subgenera *Hemicnetha* and *Trichodagmia*. Therefore, we are here comparing the larva of *S. lobatoi* with the larvae of known species currently placed in the latter two subgenera.

The larva of *S. lobatoi* can be readily distinguished from other species of *Trichodagmia* and *Hemicnetha* occurring in Brazil by the gill histoblast having eight filaments, all branching basally (Fig. 9). In this respect, *S. lobatoi* is very similar to *S. rubrithorax*, but in the latter species the gill histoblast filaments are rounded apically (Simuliidae Digital Image Archives, BMNH; Shelley *et al.*, 1997), while in *S. lobatoi* they are pointed (Fig. 9). The best character that distinguishes the larva of *S. lobatoi* from that of *S. rubrithorax* is the structure of the hypostomial teeth. In *S. lobatoi* the teeth of the hypostomium are forwardly protruding in the central region, with the median tooth

longer than the remaining teeth, only three sub-lateral teeth and 1+1 lateral teeth that are slightly longer than the posterior sub-lateral tooth; the hypostomium has approximately 14 hypostomial setae (Fig. 5). The hypostomium of *S. rubrithorax* has all teeth at the same level, except that the median tooth is longer, and there are only 2+2 sub-lateral teeth and 1+1 lateral teeth all nearly at the same level in central region; the hypostomium only has approximately nine hypostomial setae (Shelley *et al*., 1997).

The general morphology of the hypostomium of *S. lobatoi* does not agree with the variation found in species of *Trichodagmia* and *Hemicnetha*. Therefore, we prefer at this juncture to agree with Luna Dias *et al.* (2004) and placed *S. lobatoi* as "unassigned species to subgenus" within *Simulium*.

Bionomics

Larvae and pupae of *S. lobatoi* were collected in the municipality of Formosa, Goiás state, below the waterfall named Salto do Itiquira in a stream of approximately 10 m wide with a bed of boulders and sand. The water temperature of this stream was 17^{o}C, the pH was 7.9 and electrical conductivity below 30 µS/cm. All larvae were collected in large numbers mainly on stones, where the water current was very fast.

References

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Figure Captions

FIGURES 1-5. *Simulium lobatoi* (Diptera: Simuliidae) larva. 1. Larva, lateral view; 2. Head (dorsal view); 3. Head showing cervical sclerites (dorsal view), arrow indicate position of the cervical sclerite; 4. Head showing postgenal cleft (ventral view). 5. Hypostomium (ventral view).

FIGURES 6-10. *Simulium lobatoi* (Diptera: Simuliidae) larva. 6. Head (ventral view), arrow indicate the sub-esophageal ganglion. 7. Antennal segments; 8. Mandible (lateral view); inset higher magnification of mandibular apical teeth, comb teeth and mandibular serrations. 9. Filaments of gill histoblast; 10. Anal sclerite and posterior circlet.

Material Examined

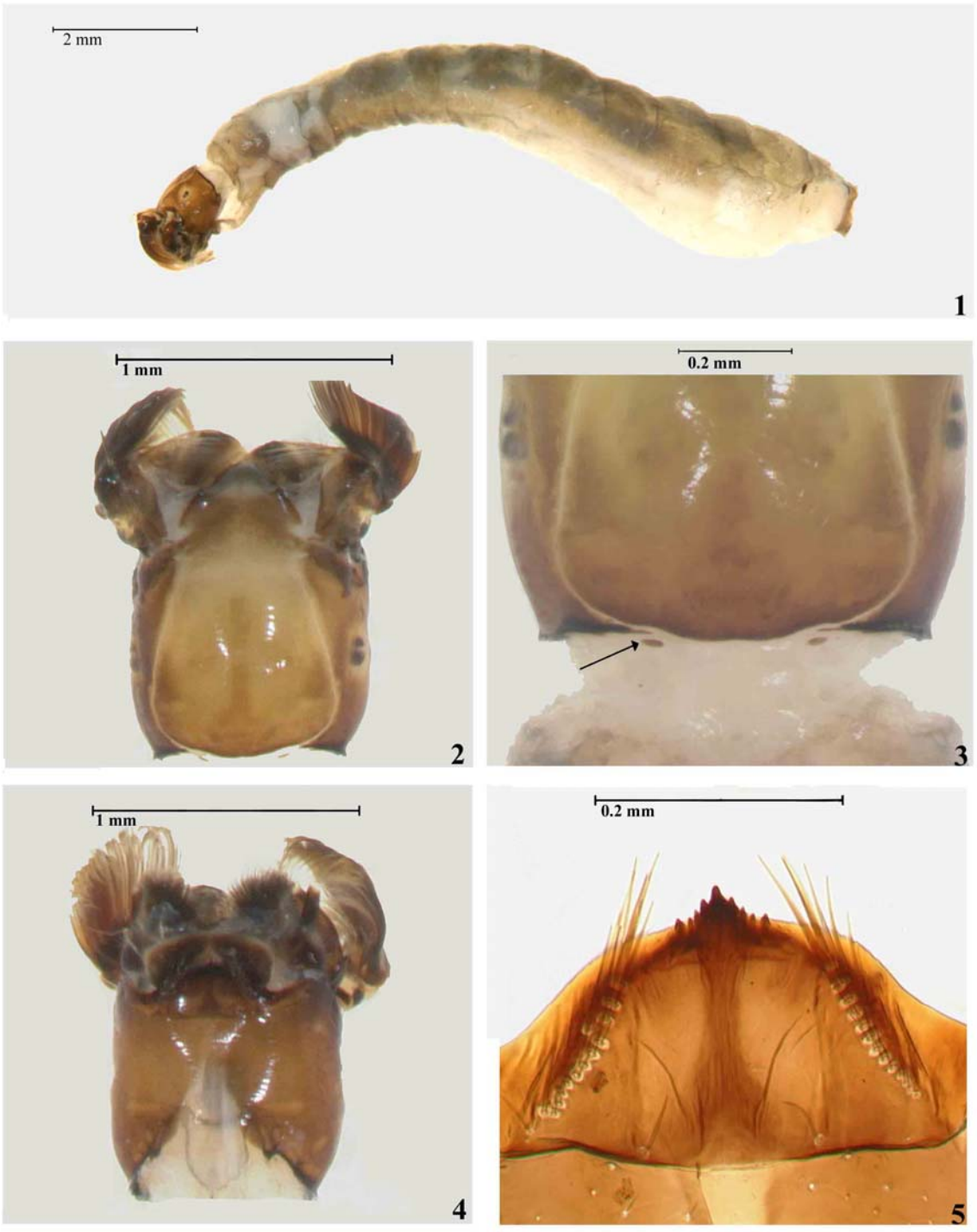
BRAZIL, Goiás State

Formosa, Salto do Itiquira, 15°22’3.6’’S47°27’45’’W, (# 11); 1.vii.2003, (*Hamada, N. & Silva, J.*) — four mature larvae, one immature larva (INPA) [CARNOY’S]; four mature larvae (BMNH) [SLIDES].

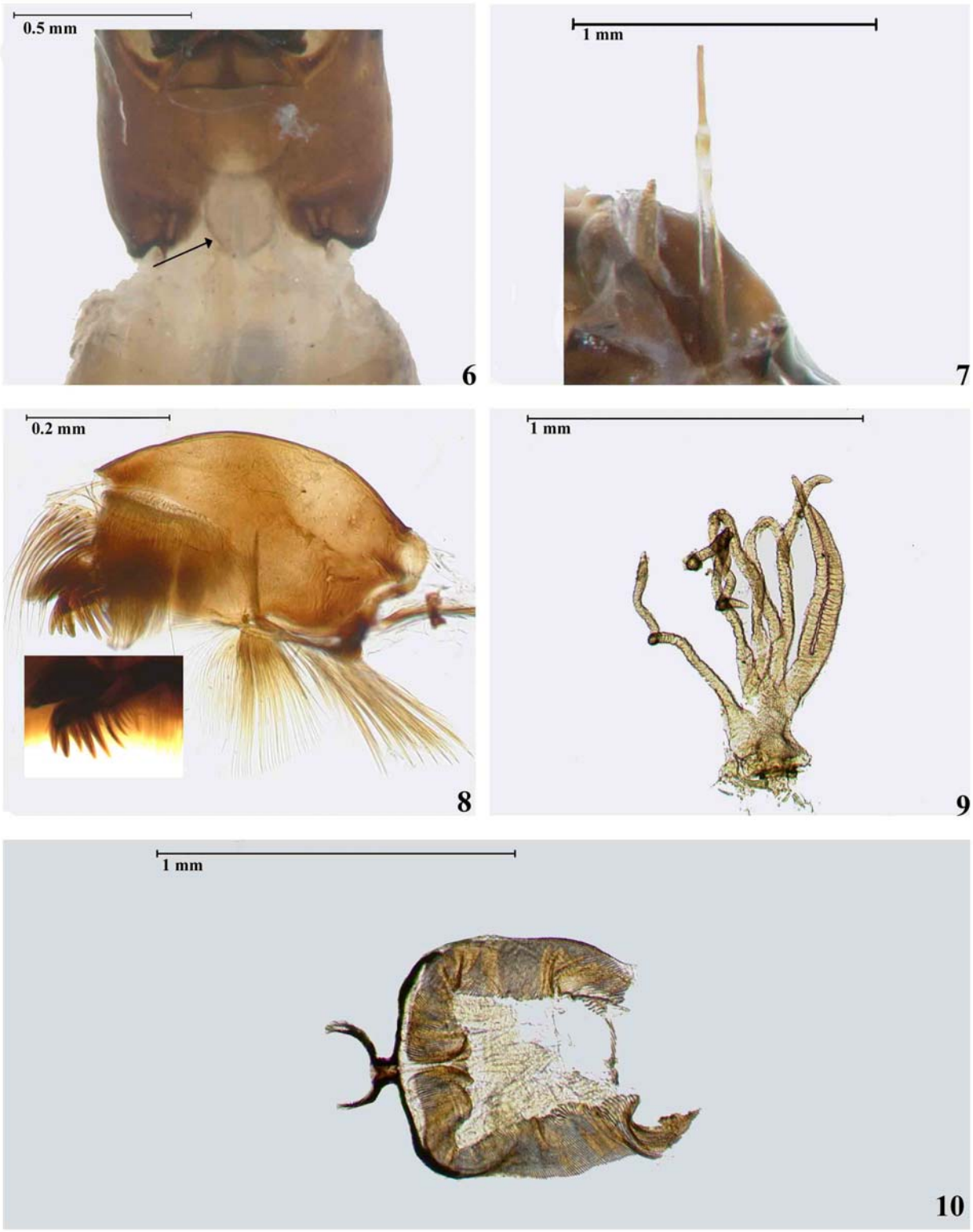
Other material examined

***Simulium (Hemicnetha) rubrithorax* Lutz**

BRAZIL, Goiás State, Belém-Brasília Rd, Km 146, córrego, (site 211); 26.v.1976, (*A.J.Shelley*) — 3 larvae (BMNH) [SLIDES].



FIGURES 1-5. *Simulium lobatoi* (Diptera: Simuliidae) larva. 1. Larva, lateral view; 2. Head (dorsal view); 3. Head showing cervical sclerites (dorsal view), arrow indicate position of the cervical sclerite; 4. Head showing postgenal cleft (ventral view). 5. Hypostomium (ventral view).



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