



The nymph of *Tortopus harrisi* Traver (Ephemeroptera: Polymitarcyidae)

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Polymitarcyidae is a family of burrowing mayflies (Ephemeroptera: Ephemeroidea) distributed throughout the world but with highest diversity in the Neotropics. *Tortopus* Needham & Murphy, with a Panamerican distribution, is known from twelve species described in the adult stage. Nymphs are only known for three species: *T. puella* (Pictet), *T. obscuripennis* Domínguez and *T. sarae* Domínguez, and present a rather homogeneous morphology (Molineri 2008). They were firstly described for *T. puella* by Scott *et al.* (1959) and later Molineri (2008) described the other two. Both studies reported that these species burrow U-shaped tunnels in clay banks of rivers and streams, thus preventing them from being sampled in most limnological studies (that use surbers, drags, or drift nets).

The aim of the present contribution is to describe and illustrate the previously unknown nymph of *Tortopus harrisi* Traver that shows important anatomical differences with the other nymphs known in the genus. This morphological differentiation suggests a different habitat use by these nymphs, sampled with drag and surber samplers in sandy substrate. New locality records are given for *T. harrisi* in Brazil.

The nymphs are preserved in alcohol, mouthparts, legs and genital rudiments were mounted in microscope slides with Canada Balsam. Drawings were made with a camera lucida attached to a stereo microscope. The material is deposited in CUIC (Cornell University Insect Collection, Ithaca, NY), IML (Instituto Miguel Lillo, Tucumán) and in MZSP (Museu de Zoologia da Universidade de São Paulo, São Paulo). Catalogs and bibliography were consulted at Ephemeroptera Galactica (Hubbard 2009).

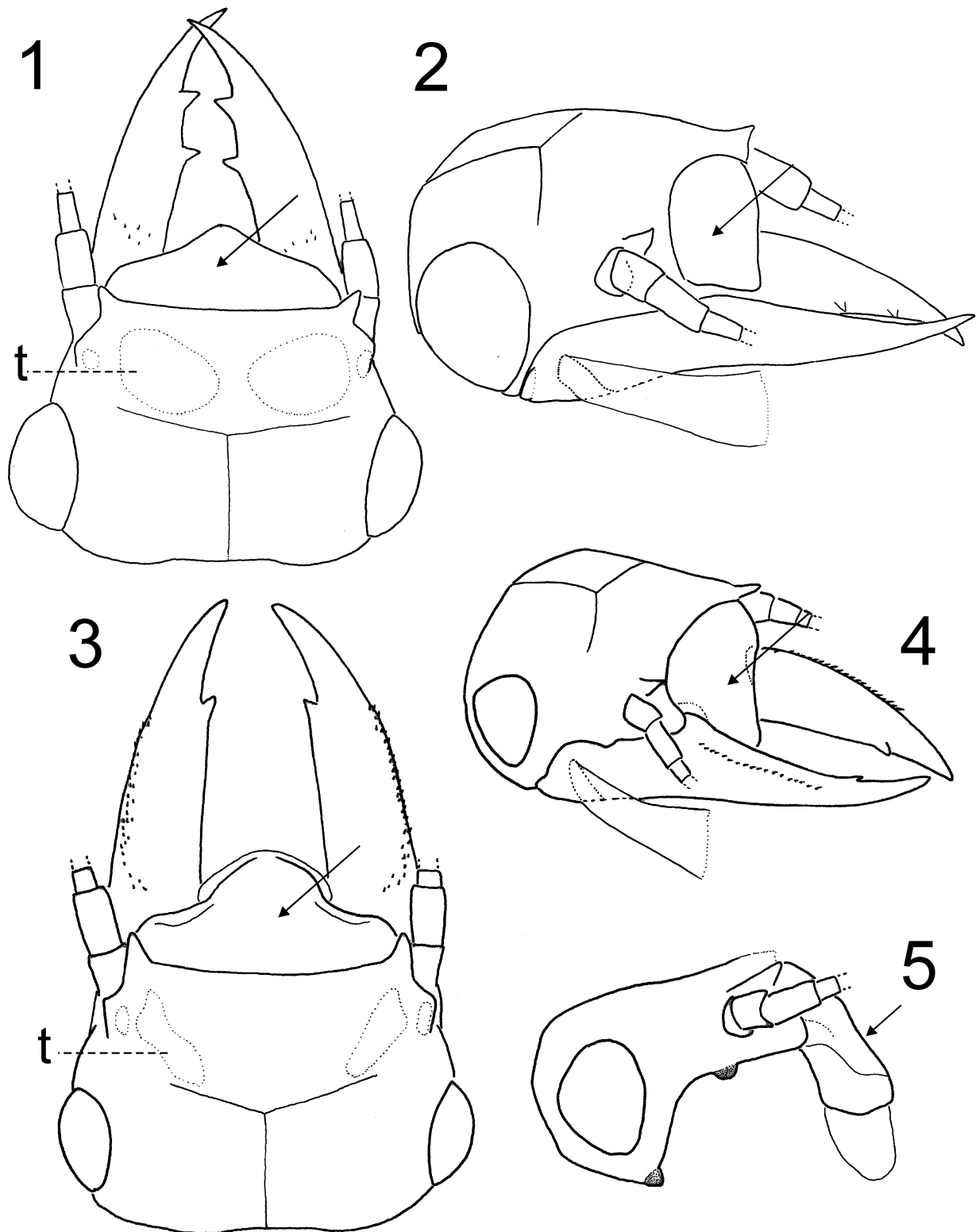
Tortopus harrisi Traver

T. harrisi Traver 1950: 604; Domínguez 1985: 69; Domínguez *et al.* 2006: 585.

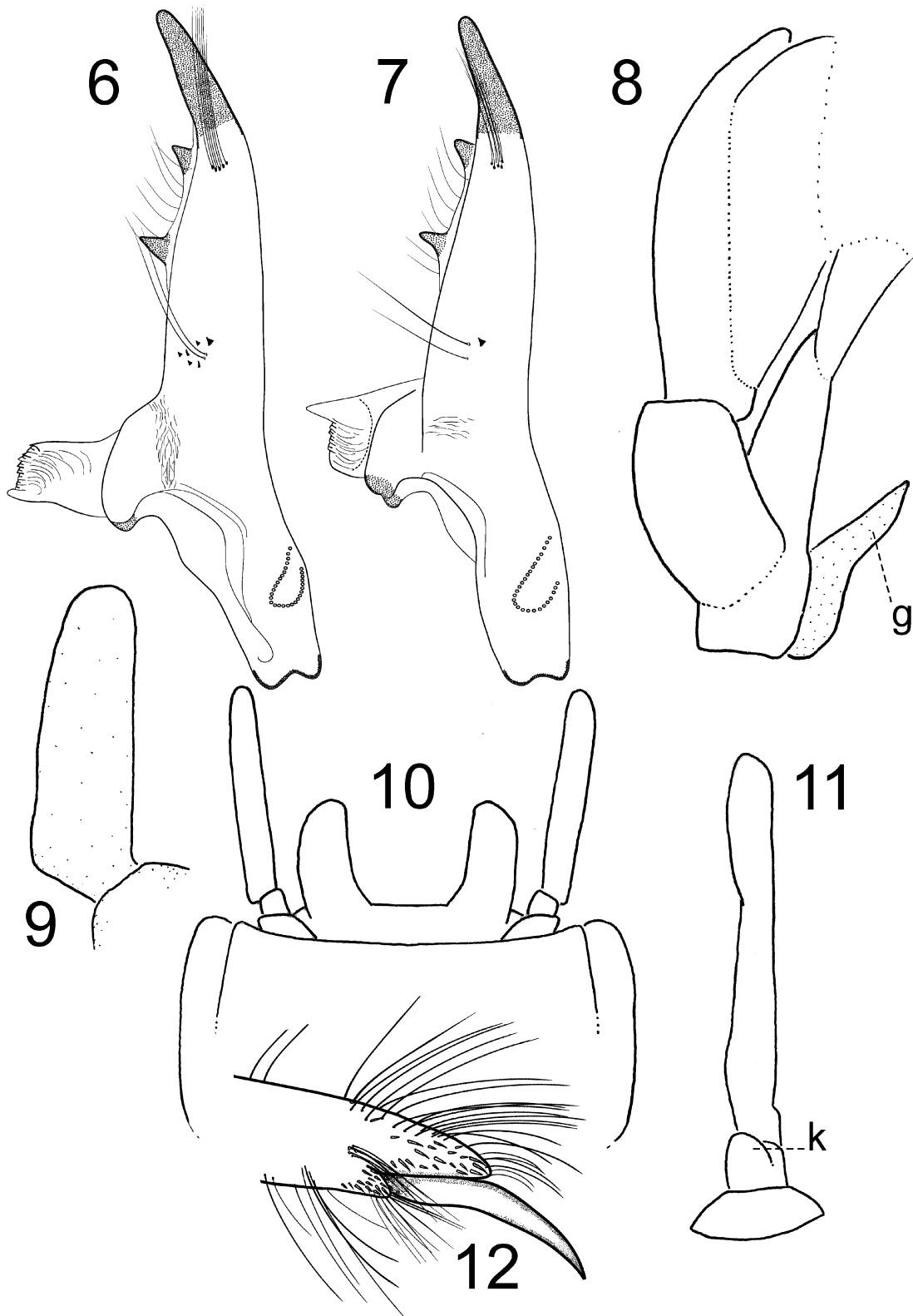
Material examined: holotype male imago (CUIC slides No. 3031) from: Brazil, Mato Grosso, 23-XII-19, R.G. Harris col. New material: 1 nymph (IML) from Brazil, Mato Grosso do Sul, Dois Irmãos river, Dois Irmãos do Buriti, 20°31'53"S, 55°34'37"W, drag, 15-IX-2006, D. S. Barbosa & D. Fassini; and 1 nymph (MZSP) same data except river Miranda, Jardim, 21°28'56"S, 56°07'13"W), surber sampler, 10-I-2006.

Mature nymph. Length. Male: body, 12.0–13.0 mm; cerci, 10.0–11.0 mm; caudal filament, 4.0 mm. Head with two large submedian oval tufts of short setae anterior to lateral ocelli (t in Fig. 1); frontal ridge relatively straight in dorsal view (Fig. 1); fronto-clipeal region straight not surpassing mandibular tusks ventrally (arrows in Figs. 1–2); mandibular tusks straight (Figs. 1–2), with very few setae dorsally, mainly restricted to a subdistal group of seven rigid setae (Figs. 6–7); inner margin with two large tubercles (subdistal and submedian, Figs. 6–7); maxillae with a relatively large ventral gill (g in Fig. 8). Thorax. Pronotum with narrow anterior ring (0.25–0.26 of total length of pronotum); antero-lateral corners acutely projected. Legs. Foreleg with tibia-tarsus strongly flattened with a small dorso-distal projection (0.35–0.40 of total length of claw) (Fig. 12), ventral surface with two long U-shaped rows of filtering setae; fore femur with anterobasal short U-shaped row of filtering setae and an immediately posterior small group of simple setae. Middle leg with long setae on anterior and posterior (functionally ventral and dorsal, respectively) margins of femur, anterior margin of tibia and tarsus; apical third of tibia and tarsus completely covered with strong setae, apex of tibia with a brush of thick setae ventrally. Hind leg with short strong setae on posterior margin, and transverse subdistal row of short setae on dorsal surface; hind tibia and tarsus with long setae on posterior margin, anterior margin covered with short and strong setae. All tarsal claws slender and curved, without denticles. Abdomen. Gill I single, small and elongated (Fig. 9), remaining

gills well developed and double. Terga II–IX with medio-longitudinal row of setae; abdominal sterna with lateral margins covered with setae, more numerous on sterna V–IX, sterna V–VI also with row of setae on posterior margin. Cerci with rows of setae at each joining, mainly on basal fourth; terminal filament much thinner and with whorls of setae almost on its entire length. Genital rudiments (Figs. 10–11): peneal buds U-shaped, forceps bisegmented basal segment with large ventral knob (k in Fig. 11).



FIGURES 1–5. *Tortopus* nymphs, head (setae omitted). *T. harrisi*: 1, dorsal view; 2, latero-dorsal view. *T. obscuripennis*: 3, dorsal view; 4, latero-dorsal view; 5, lateral view (tusks removed). Abbreviations: t= tuft; arrows indicate fronto-clypeus.



FIGURES 6–12. *Tortopus harrisi* nymph: 6, right mandible, d.v.; 7, left mandible, v.v. (filtering setae on basal outer margin omitted); 8, outline of maxilla indicating gill location; 9, abdominal gill I; 10, genital rudiments, v.v.; 11, forceps of pharate subimago; 12, apex of tibia and tarsus, nymphal foreleg. Abbreviations: g= gill; k= knob.

The association between the nymphal and adult stages was possible because both nymphs are pharate male subimagos ready to molt. Thus genital morphology could be studied and compared with the holotype male, sharing the following features: parastyli very short and pointed, large ventral knob on forceps base, and penes basally fused. Also the

body size and general coloration coincide in both nymphs and adult. Only two species of the genus present very short and pointed parastyli, *T. harrisi* and *T. bellus*, but they can be easily separated because the last species is larger and much darker than the former (Molineri submitted). Furthermore, *T. bellus* is only known from Costa Rica while all the material attributed to *T. harrisi* is restricted to the Paraguay river basin. The nymph of *Tortopus harrisi* differs from the other three species known from this stage (*T. puella*, *T. obscuripennis* and *T. sarae*) in many important features, the most remarkable being the paired tubercles on the mandibular tusks (Figs. 1, 6–7) but also in other characters treated below.

Campsurinae nymphs show tufts or patches of short thick setae tightly grouped on dorsum of head, the largest of these tufts being located anteromedially to lateral ocelli. These patches are relatively small and elongated in *T. puella*, *T. obscuripennis* and *T. sarae* (t in Fig. 3) but larger and subovate in *T. harrisi* (Fig. 1). The fronto-clypeal area, anterior to the prominent frontal ridge, is somewhat concave and very developed in the species previously described, the apex of the clypeus being directed ventrally between the mandibular tusks (Figs. 4–5). On the contrary, in *T. harrisi* the fronto-clypeal area is less developed and straight (Figs. 1–2), the apex of clypeus being distinctly marked and ending dorsally to the tusks (Fig. 2).

Mandibles not only differ in the number of median tubercles, one subdistal (Fig. 3) in the triplet *T. puella*, *T. obscuripennis* and *T. sarae* but two (subdistal and submedian, Fig. 1) in *T. harrisi*, but also on the number and arrangement of spines and setae. The distinct ridge covered with strong short spines along the outer (dorso-lateral) margin of the tusks (Fig. 3) is only present in *T. puella*, *T. obscuripennis* and *T. sarae* (the tusks of *T. harrisi* are smooth in this area, Figs. 1, 6–7). Finally, the previously known nymphs present a large number of setae directed medially on inner margin of the tusks, but they are almost absent in *T. harrisi*. The legs are very similar in all four species, not only in the shape but also in setation. The only difference is in fore tibia-tarsus, much more projected distally in *T. puella*, *T. obscuripennis* and *T. sarae* (the projection being 2/3 of the total length of the claw) than in *T. harrisi* (only 2/5 of that length, Fig. 12).

The following characters, of generic importance (Molineri 2008), are shared by all four species of *Tortopus* known as nymphs: the shape and location of the subapical tubercle on the mandibular tusk, the large finger-like gill on base of maxilla (Fig. 8), and the unilamellate gill on abdominal segment I (Fig. 9).

The differences in the setation of the tusks and the form of the fronto-clypeal area are strong indicators of differences in habitat preference in *T. harrisi*. The nymphs of *T. puella*, *T. obscuripennis* and *T. sarae* inhabit U-shaped tunnels in hard clay river banks, and they use the dorsal surface of the tusks and the fronto-clypeal region to push the burrowed sediment out of their tunnels (Molineri 2008). *Tortopus harrisi* nymphs were collected with a drag and a surber on sandy substrate, and as they lack setae directed medially on the inner margin of the tusks and they show poorly developed fronto-clypeal region, it is probable that they do not burrow in clay substrate as the other species. Nevertheless all the biological aspects of this species remain unknown.

Acknowledgements

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