The nymph of *Paramaka* SAVAGE & DOMÍNGUEZ (Ephemeroptera: Leptophlebiidae: Atalophlebiinae)

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Abstract

The nymph described as "*Hermanella* sp. 2" from Surinam by Demoulin (1966) was reared to *Paramaka convexa* from nymphs collected in the Caroní River Basin (Venezuela). A full generic description of the nymph of *Paramaka* is given based on these specimens and additional material from the Sinnamary River system (French Guiana). Variability within *P. convexa* is discussed.

Keywords: *Paramaka*, Caroní River, Sinnamary River, Venezuela, French Guiana.

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Introduction

In 1966, Demoulin described *Hermanella* sp. 2 based on 10 nymphs found in five stations on the Gran Río in Awerradam, Surinam. These stations were located on rapids where Podostemaceae usually grow. Physico-chemical measures of pH, conductivity and temperature (Leentvaar, 1975) were similar to those found in the Caroní River, a Venezuelan blackwater river being studied by Vásquez (1984) and the senior author (Blanco-Belmonte, 2001).

We reared several nymphs of *Hermanella* sp. 2 collected in Venezuela to adults which proved to be *Paramaka convexa* (SPIETH, 1943). This species was originally described as *Thraulus convexus* by Spieth (1943) from two males from Surinam and later transferred to *Paramaka* by Savage and Domínguez (1992) as the type species of the genus. Savage and Domínguez (1992) placed *Paramaka* in the *Hermanella* generic complex although the association of the nymph and adult was unknown at that time.

Extensive studies are also in progress on the aquatic fauna of French Guiana (Orth *et al.*, 2001). An original series of specimens collected in 1992-1993 by V. Horeau on the Sinnamary River System in French Guiana contained nymphs of *Hermanella* sp. 2 which were associated with adults of *Paramaka convexa* from the same localities by developing color pattern. From both series of specimens, we redescribe the nymph of *Paramaka* and discuss variation across its presently known geographic range.

Specimens are deposited in the Estación de Investigaciones Hidrobiológicas de Guayana (Venezuela), the Laboratoire de Petit Saut-HYDRECO (Fr. Guiana), Florida A&M University (USA), and the Laboratoire d'Hydrobiologie, Université Paul Sabatier (France).

Paramaka SAVAGE & DOMÍNGUEZ

Thraulus (partim); Spieth 1943:10
Hermanella (partim); Demoulin 1966:12.
Paramaka Savage and Domínguez 1992:244.

Imago. Male described by Savage and Domínguez (1992). Female unknown but mature female nymph with apex of 9th sternum shallowly concave (character which should persist in imago).

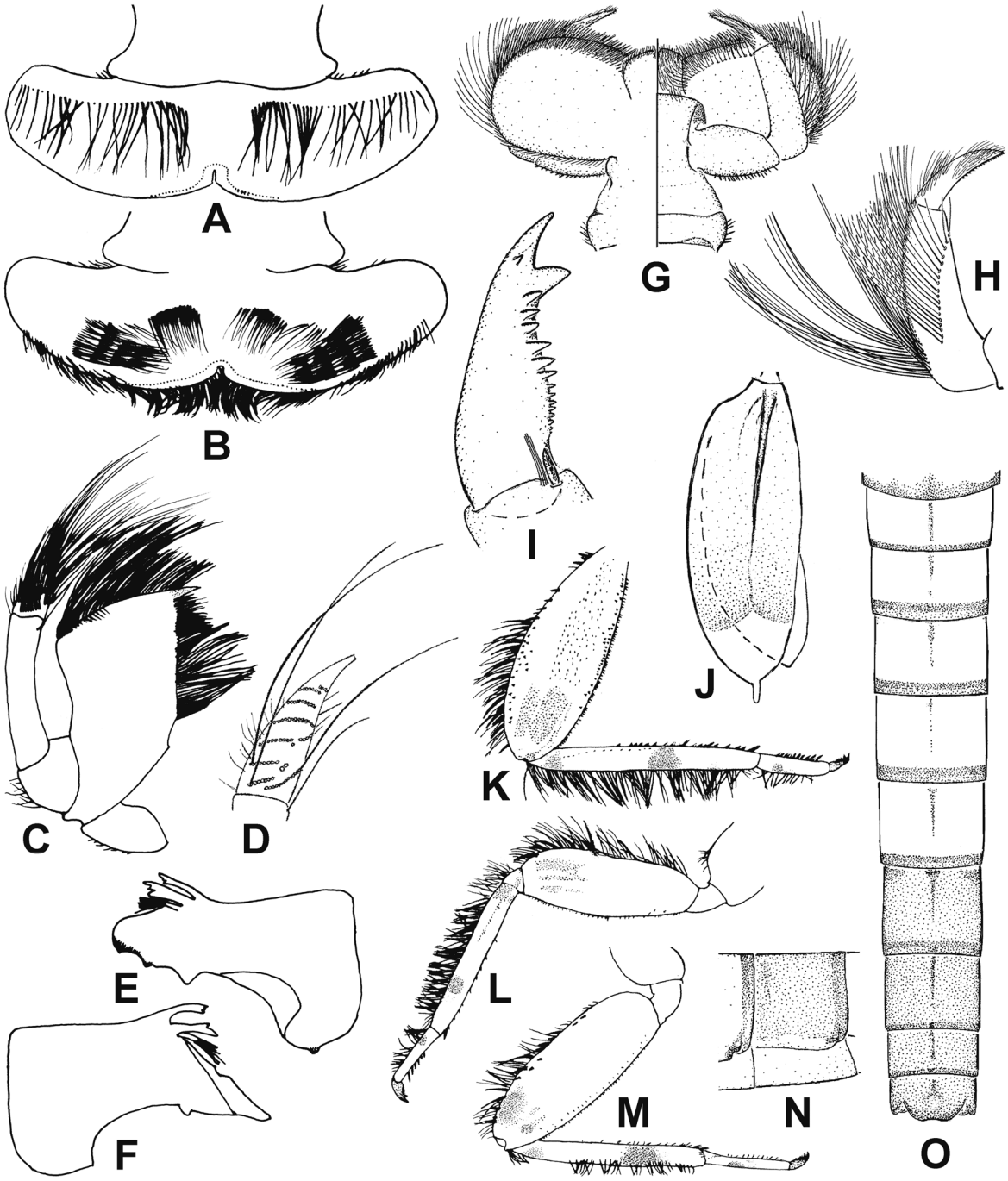

Fig. 1 - *Paramaka convexa*. A-M, nymph: A-B, dorsal and ventral view of labrum; C-D, maxilla (D, detail of segment 3 with most hair removed); E-F, left and right mandible; G, labium (venter on right, dorsum on left); H, dorsal detail of labial palp segments 2-3; I, foreclaw; J, gill 4; K, L, M , fore, middle and hind legs. N-O, abdominal segments of male imago: N, lateral view segment 7; O, terga 1-10.

Mature nymph (in alcohol). Body length: 6.5-7.5 mm. Head prognathous. Antennae 1½-2 X maximum width of head. Mouthparts (Fig. 1A-H): clypeus with lateral margins strongly concave. Labrum (Fig. 1A-B): maximum width 1.7-1.9 X maximum width of clypeus and ≥width of head capsule; lateral margins greatly expanded laterally; anteromedian emargination U-shaped; divided row of long dorsal setae sinuously aligned along basal 1/10 with 28-38 setae on each side, other scattered setae on dorsal surface; abundant long ventral setae on apical ½ of labrum; lateral

and anterolateral margins lined with short and abundant setae. Mandibles (Fig. 1E-F) with outer margin strongly angled. Maxillae (Fig. 1C-D): tusk on inner apical angle, crown with long setae; segment 1 of palpi ½ length of segment 2, joined laterally to maxilla; segment 3 a little more than ½ length of segment 2; segment 1 with thick setae on outer margin, segment 2 with few setae on outer margin, segment 3 with long setae ordered in rows. Lingua of hypopharynx with well-developed lateral processes, anterior margin curved with deep anteromedian cleft; superlinguae with long setae along anterior margin. Labium as in Fig. 1G-H; segment 2 of palpi a little more than 1-1/2 X length of segment 1; segment 3 of palpi approximately ½ length of segment 2; segment 2 with row of long setae on dorsal surface (Fig. 1H), segment 3 as in Fig. 1H; paraglossae broad, ventral to glossae; submentum reduced with few lateral setae. Legs (Fig. 1K-L): all femora with a row of long setae and long pointed spines along the outer margin and short pointed spines along the inner margin. Claws hooked, narrow, with apical denticle much larger than others, 6-8 median denticles subequal in size, several smaller denticles at base of claw; apex of claw with very small accessory denticle (Fig. 1I). Anterolateral margins of pronotum with a few strong setae; posterior margins of all abdominal terga with heavy spines (spinules) interspersed with long setae. Gills (Fig. 1J): gills on abdominal segments 1–6 platelike, biramous, with dorsal portion of gills 3-6 frequently terminating in a small finger-like filament; main trunk of tracheae forked at base, each branch along middle of plate and lateral tracheae obscured by pigmentation; gills on abdominal segment 7 vestigial. Posterolateral spines on abdominal segments 8-9. Terminal filament longer than cerci (about 1-1/3 X length of cerci).

Discussion. Of 22 mature nymphs measured from Venezuela, the short distal filament described by Demoulin (1966) was present on gills 3-6. Of 35 nymphs of differing sizes examined from French Guiana, all had the distal filament on some gills, frequently on gills 3-5 and never on gill 1. The number of setae on the labrum and other details of setation varied within populations and within individual specimens (left or right side of body).

Although no nymphs were associated, the genus *Paramaka* was correctly assigned to the *Hermanella* generic complex by Savage and Domínguez (1992). To the many derived characters of this complex discussed previously (Domínguez and Flowers 1989, Flowers and Domínguez 1992, Dominguez *et al.* 2001), we would add the lateral connection of the first maxillary palpal segment with the maxilla which does not reoccur in other Leptophlebiidae. Some characters listed previously represent mouthpart ratios which seem to be generic characters rather than characters of the entire complex, but the lack of pectinate spines on the maxillae, the apparent lack of denticles on the labrum, and setae in ordered rows on the third segment of the maxillary palp are clearly derived characters of the *Hermanella* generic complex.

The following combination of characters will distinguish nymphs of *Paramaka* from other genera of the *Hermanella* generic complex: 1) gills platelike, biramous on abdominal segments 1-6 (Fig. 1J) and vestigial on abdominal segment 7; 2) labrum greatly expanded laterally, 1.7-1.9 X maximum width of clypeus and ≥width of head capsule (Fig. 1A-B); 3) posterolateral spines on abdominal segments 8 and 9.

Species included. *Paramaka convexa*.

***Paramaka convexa* (SPIETH, 1943)**

Thraulus convexus Spieth 1943:10.
Homothraulus convexus; Traver 1960:73; Hubbard 1982:265.
Hermanella sp. 2. Demoulin 1966:12.
Paramaka convexa; Savage and Domínguez 1992:244.

Male imago. See Spieth (1943) and Savage and Domínguez (1992).

Nymph. Head and thorax brown. Legs light brown, femora with blackish mark apically, tibiae with blackish bands near base and in apical third, tarsus with single dark blackish band (Fig. 1K-M). Abdominal terga brown, a darker mark on posterolateral corners of terga 2-7; sterna a lighter brown. Gills basally light brown to light gray, progressively darker distally to about 3/4 of distance from base, pale apically; median tracheal trunk blackish (Fig. 1J). Caudal filaments yellow-brown, median annulations with darker ring on every fourth annulation.

Variation. The species description of the nymph differs from that of Demoulin (1966) only in detail of gill color and cerci. The developing color pattern is visible in young nymphs and

becomes obscured by the heavy, brown exoskeleton as nymphs mature. The dark brown color persists to shortly before emergence when the imaginal coloration of males begins to reappear in the middle of tergal segments. The banding on the legs also becomes more distinct as nymphs mature, and the dark band at the apex of the femora is distinct in older nymphs.

The cross veins in the cubital area of the wings of male imagos are very weak, but sometimes more numerous than those illustrated by Savage and Domínguez (1992).

Of the 5 male imagos presently known, Spieth (1943) describes a "purplish cast" on the posterior abdominal terga of the 2 males from Surinam caused by cyanide fumes; all other specimens are lighter in color and preserved in alcohol. Terga 7-10 of the male from Rio Caroní (Venezuela) were originally a brilliant chocolate brown in life but faded to a lighter brown after preservation. The pattern illustrated by Savage and Dominguez (1992) came from the male imago from Pará State, Brazil. Terga 7-10 on the male from French Guiana are yellow-brown, and the anteromedian mark of tergum 6 extends into a dark, narrow, interrupted median line on all terga (Fig. 1N-O). Two male subimagos from Saut Aïmara (French Guiana) lack a median line on tergum 6 and have only a short median line on tergum 7. Variations in intensity of color are common in Leptophlebiidae, and variations between short anteromedian lines and median lines of differing lengths occur on younger nymphs within localities in French Guiana. Lacking longer series of imagos, we believe that such marks represent intraspecific variation, but more study from a longer series of imagos is clearly needed.

Distribution. Surinam, Brazil, French Guiana, Venezuela. (presumably also in Guyana, but no published records)

Material. Venezuela, Bolivar State, Colibrí Creek, La Llovizna National Park, Caroní River Basin, 25.III.2000, V. Ruaise and L. Blanco. French Guiana, Sinnamary River (V. Horeau): Crique Vénus, 27.VI.1992; Saut Gérard, 7.XI.1992, Takari-Tanté, 13.I.1992, 17.XII.1992, 24.V.1992, 28.X.1992; Saut Aïmara, 14.VI.1994; Saut Maïpouri, 14/26.V.1993; Saut Deux Roros, 1.XI.1992; Saut l'Autel, 26.X.1992; Saut Vata, 23.X.1992; Saut Parasol, 4.XI.1992; Saut Patawa, 24.X.1992. Surinam: Coppename [Riv], Upper Lejt, South Creek Rapid, Base Camp 1. 15.VIII.1943, Geijskes.

Biology. Nymphs of *Paramaka* were collected from sticks and leaves along the sides of Colibrí Creek, a small creek 2-2.5 m wide and 30-100 cm deep. Where found, they were abundant and associated with an unidentified species of Leptophlebiidae, *Callibaetis* spp., *Hydrachantus* sp., *Phanocerus* spp, and various Trichoptera species. Imagos were reared in the laboratory in small aquaria with water, leaves and sticks from the Caroní river. Imagos and subimagos from French Guiana were collected at light.

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