

**REDESCRIPTION AND RECLASSIFICATION  
OF THE SOUTH AMERICAN MAYFLY  
*MELANEMERELLA BRASILIANA*  
(EPHEMEROPTERA: LEPTOPHLEBIIDAE)<sup>1</sup>**

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**ABSTRACT:** Study of the type specimen indicates that the mayfly *Melanemerella brasiliانا* from Brazil (known only from the holotype female adult) does not belong to the family Ephemerellidae or Tricorythidae, where historically it has been placed and remained an anomaly. *Melanemerella* also does not appear to be a member of any other family of the infraorder Pannota, but based on all characters taken together, it most closely fits the family Leptophlebiidae (infraorder Lanceolata), where it is provisionally placed. A short redescription of the species is given, and important characters are illustrated. Detached marginal intercalaries and gill socket vestiges presence and position on abdominal segments, however, show *Melanemerella* to be an unusual leptophlebiid, and possibly related to the leptophlebiid genus *Massartella*.

The Ephemeroptera genus *Melanemerella* was established by Ulmer (1920) based on a single female adult collected in Espirito Santo, Brazil. The holotype of *M. brasiliانا* Ulmer remains the only known representative of the genus. Because the forewings possess detached, short marginal intercalary veins along the outer margins, Ulmer (1920) placed his genus in the family Ephemerellidae. Lestage (1925) considered *Melanemerella* to be a primitive genus compared to other Ephemerellidae, and that it was closely related to *Teloganodes* from southeast Asia. Demoulin (1955) discussed the status of *Melanemerella* and established a new subfamily for it in the family Tricorythidae. No evidence for the reclassification was given by Demoulin. Allen (1965) included Demoulin's subfamily Melanemerellinae in the family Ephemerellidae, where it has remained since (McCafferty and Edmunds 1979).

As part of our revisionary research on the pannote mayflies of the world, we obtained the single specimen of *Melanemerella* held by the Vienna Museum. We had become suspicious of the placement of this taxon in Ephemerellidae or Tricorythidae, because in the Pannota, only the family Leptohyphidae has been generally known in the Neotropics. Also, larvae collected in Colombia by one of us (WPM) and presumed for some time to represent the unassociated larval stage of *Melanemerella* is now known to belong to the little known genus *Haplohyphes* (family Leptohyphidae). Our suspicion about the familial classification of *Melanemerella* was born out by the analysis of characters associated with the specimen of *M. brasiliانا*, including adult vestiges of larval characters known to be of importance in higher classification. Below we present a redescription and revised higher classification of the genus and species.

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*Melanemerella brasiliانا* Ulmer, 1920

**Female Adult** (pinned). Body length 8 mm; forewing length 11 mm; forewing width 4 mm; hindwing length 2 mm. Body coloration generally grayish black to black; wings dark gray, except outer margin of forewings slightly translucent. Head without cephalic projections or vestiges of such. Compound eyes separated more than 6 times width of median ocellus. Thorax (Figs. 1,2) with mesonotum lacking deep transverse suture; mesoscutellum short and not tapered posteriorly; metascutellum poorly developed but fully exposed dorsally (Fig. 2). Forewing (Fig. 3) with 1-3 short, detached intercalaries in each marginal interspace; cubital area with numerous crossveins and asymmetrical in right wing (see Ulmer 1920, Fig. 32) and left wing (Fig. 3); long but detached ICuA subparallel with CuA; CuP strongly curved toward hind margin. Hindwings proportionately small (see Fig. 4 scaled to Fig. 3); costal projection submedial in position, angulate but not sharply pointed (Fig. 5). Legs with five tarsal segments but segment 1 partially fused with tibia (Figs. 6,7); each claw pair with at least one claw strongly hooked (opposite claw not clear from available dry fore- and midclaw of specimen). Foretibiae slightly longer than forefemora (Fig. 6). Abdomen (Fig. 2) with segments 1-5 distinctly shorter than distal segments. Terga 1-5 with evident gill-socket vestiges (indentations) at posterolateral extremities; hind margins of all terga smooth, without projections or tubercles, or vestiges of such. Sterna 2-6 with small anterolateral semicircular areas of thinner integument; sternum 9 deeply emarginate apically (Fig. 8). Median terminal filament well developed.

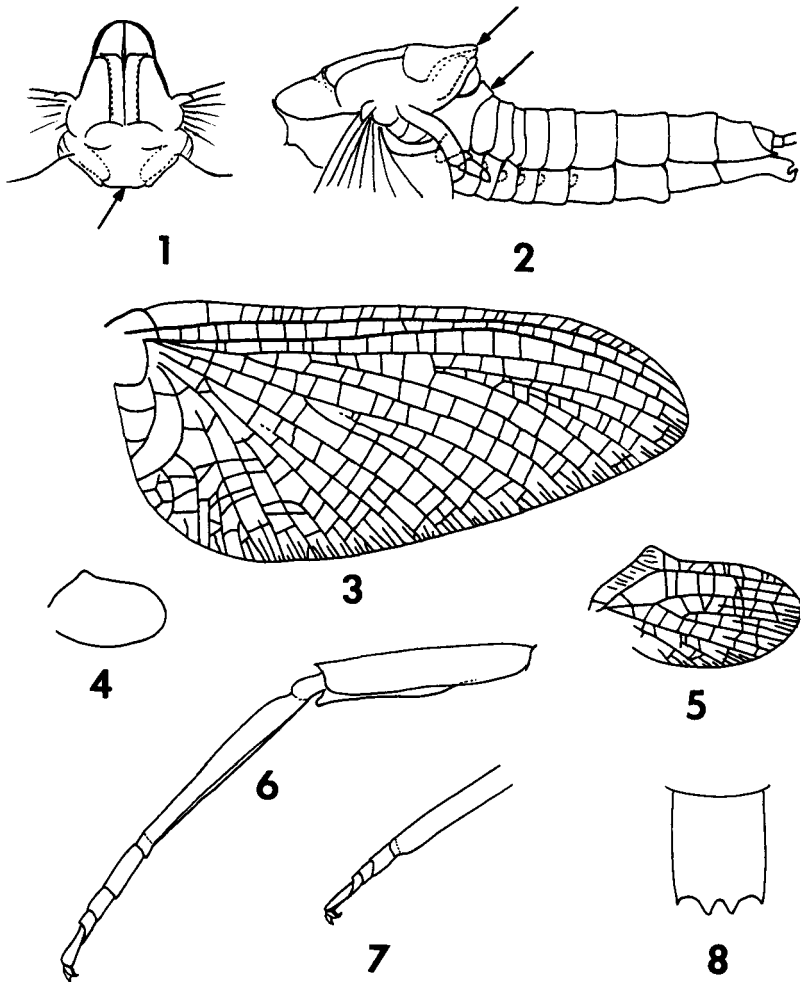
**Egg.** Observable eggs (remaining attached to abdominal sternum 7) lack polar caps.

**Material examined.** HOLOTYPE female adult (dry, pinned). Blue label: Espirito-Santo, Brasil, ex coll. Fruhstorffer. Yellow label: Coll. Nat. Mus. Wien. Pale yellow label: *Melanemerella brasilianna* Ulm., in handwriting. Right hindwing paper mounted on pin.

## CLASSIFICATION

Critical evidence for removing *Melanemerella* from the Pannota (see McCafferty 1991) is seen in the shortness and untapered nature of the mesoscutellum and the full dorsal exposure of the metathorax, both of which are typical of adult schistonote mayflies, not pannote mayflies [Figs. 1,2; also see McCafferty and Edmunds (1979), Figs. 4-7]. In fact, *Melanemerella* does not fit Ephemerellidae (or Tricorythidae) in any notable aspects, except for having short detached intercalaries in the forewings, which are typical of Holarctic and Oriental ephemerellids. However, such intercalaries occur in at least some genera of several families including both schistonote and pannote mayflies, e.g., Baetiscidae, Baetidae, Ephemerellidae, Ephemeridae, Potamanthidae, and Tricorythidae. Wang *et al.* (1995) showed this character to be subject to homoplasy in Ephemeroptera.

The presence of gill socket remnants on the posterolateral extremities of abdominal segments 1 and 2 of *Melanemerella* is also critical to our conclusion, because all ephemerellids (with the exception of the distinctive subfamily Teloganodinae in Africa and Australasia) lack gills on segment 2. Also, although small filamentous gills may be present on the first abdominal segment of pannotes, including Ephemerellidae and Tricorythidae, they are not oriented at the posterolateral extremity of segment 1 and would not leave an adult vestige in



Figs. 1-8. *Melanemerella brasiliensis*, female adult. 1. Mesonotum (pointer to mesoscutellum margin). 2. Body in part, lateral (pointers to mesoscutellum and metascutellum). 3. Left forewing. 4. left hindwing (scaled to Fig. 3.). 5. Left hindwing (enlarged and detailed). 6. Foreleg. 7. Midleg. 8. 9th Sternum.

the position or of the relatively large size that is present in *Melanemerella*. Finally, the presence of one or two polar caps on the eggs of typical Ephemerelellidae (with the exception of *Eurylophella*) and Tricorythidae (Koss and Edmunds 1974, McCafferty and Wang 1994) and the absence of polar caps in *Melanemerella* additionally reinforce our conclusions about removing *Melanemerella* from its former familial classifications.

Many characters suggest to us that *Melanemerella* may belong to the family Leptophlebiidae (infraorder Lanceolata) (see McCafferty 1991). The schistonote type of thorax, the forewing ICuA that is nearly parallel to CuA and attached to CuA only by crossveins, the tarsal segment 1 that is fused or partially fused with the tibia, the sculptured apical margin of the female abdominal sternum 9, the three developed caudal filaments, and the lack of polar caps in the eggs agree with the general characterization of Leptophlebiidae. Some of the above character states occur in various other families of Ephemeroptera, but the greatest number of matches with the characters states of *Melanemerella* are with Leptophlebiidae. Nevertheless, if indeed *Melanemerella* is a leptophlebiid, as we suggest, then it is an unusual one, but not entirely a unique one, as shown in the following.

From the examination of gill socket vestiges in the adult of *Melanemerella*, it is obvious that the larva has five or six pairs of abdominal gills, occurring on segments 1-5 or 1-6. We cannot be sure if gills exist on segment 6 because there is only a slight possible indication of a vestigial socket there. We are, however, confident that there is no gill present on the seventh abdominal segment of the larva. Although the presence of gills on abdominal segments 1-7 is a characteristic most typical of Leptophlebiidae, the South American genus *Massartella* (see Ulmer 1943, Pescador and Peters 1990) has gills on abdominal segments 1-6.

Also, although crossvenation in the cubital area of the forewing of *Melanemerella* is atypical of Leptophlebiidae, there are instances where crossvenation is well developed in this wing area in leptophlebiids. For example, it is well developed in the South American *Massartella alegrettae* Ulmer (Ulmer 1943, Fig. 38, male adult). In addition, sexual dimorphism occurs in certain Leptophlebiidae with respect to this character, e.g., in the New Caledonian *Peloricantha titan* Peters and Peters, where the venation in the cubital area is poorly developed in the male, but well developed in the female (Peters and Peters 1979-80, Figs. 16-19). Because of this, it is possible that the unknown male of *Melanemerella* may have cubital crossvenation more typical of most leptophlebiids.

Concerning the dark coloration of the female adult of *Melanemerella*, a similar situation is found in *Massartella alegrettae* (Pescador and Peters 1990, Fig. 16). Finally, one male adult of *Massartella fruhstorfferi* Ulmer (= *M. brieni* Lestage) was collected at the same locality where *Melanemerella* was taken, by the same collector (see Ulmer 1943).

It is possible that *Melanemerella brasiliiana* is an unusual leptophlebiid. Moreover, it may be related to the also unusual leptophlebiid genus *Massartella*, or, less plausibly, it may even be a species of *Massartella*. The provisional placement in the Leptophlebiidae will only be verified or refuted by the eventual study of the as yet unassociated larval stage of *Melanemerella*. Leptophlebiidae remains difficult to key out, in its entirety, from all other families on a world level in either the adult or larval stage. The inclusion of *Melanemerella* does not change this situation. It is also possible that *Melanemerella* belongs to a new family of mayflies, but again the larva would be needed to establish such.

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