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FIRST LARVAL DESCRIPTIONS OF TWO SPECIES OF *PARALEPTOPHLEBIA* (EPHEMEROPTERA: LEPTOPHLEBIIDAE)[1]

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ABSTRACT: The larval stages of *Paraleptophlebia assimilis* and *P. jeanae* are described for the first time from specimens associated by rearing male adults. Both species are distinctive as larvae, and mouthpart structure is useful for differentiating them from similar species. Materials examined of *P. assimilis* in Maryland and *P. jeanae* in Indiana extend the known range of both species.

The larval stage of mayfly species is critical not only because it is the life stage most sampled by aquatic biologists, but also because it is often of vital importance to understanding the systematics of mayflies (e.g., McCafferty and Edmunds 1979). Of the 37 species of *Paraleptophlebia* now recognized in North America (McCafferty 1996), three have remained unknown in the larval stage. Based on reared adult-larval associations of two of these latter species present in the Purdue Entomological Research Collection, we are able to provide the first larval descriptions and diagnoses of *P. assimilis* (Banks) and *P. jeanae* Berner.

Paraleptophlebia assimilis (Banks)

Larva. (in alcohol, from last instar exuviae). Body length 7.0-8.0 mm.

Head capsule brown with small, oval, pale medial spot between antennal bases. Antennae brown; pedicel dark brown; articulations with sparse, encircling hairlike setae (articulations in some specimens darker brown). Labrum (Fig. 1) with scattered, long, hairlike setae dorsally; anterior margin densely covered with shorter hairlike setae. Mandibles (Figs. 2, 3) without tusks (apices not extending beyond head margin); one-third of body of mandibles extending beyond lateral margins of head capsule and visible dorsally; incisors of left mandible (Fig. 3) directed medially, at about 45° angle with distal plane. Maxillary palpi (Fig. 4) about as long as galealacinae with segments 2 and 3 together 2.5 times as long as segment 1; segment 3 about 2.0 times as long as segment 2; segments 1 and 2 with very few setae; segment 3 with numerous, long, hairlike setae. Lingua of hypopharynx (Fig. 5) short, about one-half length of superlinguae, only gradually and slightly emarginate apically, slightly rounded laterally. Labium (Fig. 6) with broad basal palpal segments, strongly produced and convex along medial margin; palpal segment 2 less than one-fourth length of segment 3; paraglossae more or less triangular, and setate in apical third.

Thorax brown with pair of pale, circular spots medially on mesonotum anterior to forewingpad bases. Legs brown; femora pale apically and with scattered, long, bristlelike setae dorsally and short, spinelike setae ventrally; fore- and midfemora with pale medial patch dorsally; tibiae and tarsi with row of spinelike setae ventrally (more setae on forelegs than mid- and hindlegs); foreclaws with 13-17 denticles, increasing in size apically.

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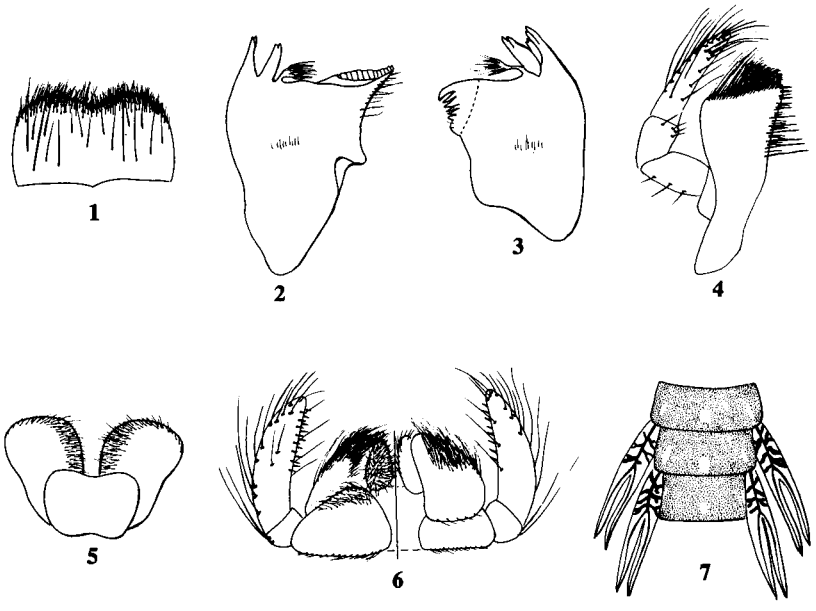
Abdominal terga (Fig. 7) brown with pale, oval area sublaterally on terga 2-8, and with white, oval spot medially within posterior third to one-half and sometimes extending anteriorly on terga 2-8 or 2-9; posterolateral corners of segments 8 and 9 extended into sharp projections. Sterna uniformly brown. Gills on abdominal segment 1 smaller than gills 2-7; all gills (Fig. 7) forked in distal two-thirds or less of length; middle trachea with dark lateral branches. Caudal filaments brown with sparse, hairlike setae at articulations.

Material Examined. Twelve reared specimens (adults with larval exuviae), Maryland, Baltimore Co., tributary to the north-east corner of Loch Raven Reservoir, IV-9, 12, 21-27-1970, R. W. Koss.



Figs. 1-7. *Paraleptophlebia assimilis,* larva: 1. Labrum. 2. Right mandible. 3. Left mandible. 4. Left maxilla. 5. Hypopharynx. 6. Labium (left ventral, right dorsal). 7. Abdominal terga 4-6 and gills 4-5.

DISCUSSION

In present keys to the larvae of *Paraleptophlebia, P. assimilis* will key to couplet 5 of Traver (1935: 515) and couplet 2 of Burks (1953: 90), where *P. adoptiva* (McDunnough) and *P. mollis* (Eaton) are now keyed. This is because of the similarity in gill structure and tracheation (see Fig.7). Larvae of *P. assimilis,* however, can easily be separated from those species because they have posterolateral projections on both abdominal segments 8 and 9. *Paraleptophlebia mollis* and *P. adoptiva* have such projections only on segment 9. On the basis of their gill and terminal abdominal segment characteristics, *P. assimilis* larvae are similar to the larvae of the western species *P. memorialis* (Eaton), which were described

by Kilgore and Allen (1973). Abdominal coloration [compare Figs. 10 and 11 of Kilgore and Allen (1973) with Fig. 7, herein] and differences in mouthpart structure, however, easily separate the two species. Based on our study of the previously undescribed mouthparts of *P. memorialis,* we have found that labial palp segments 2 and 3 are subequal in length. In *P. assimilis,* segment 3 is much longer than segment 2 (Fig. 6). Also, the paraglossae and basal palpal segments of the labium of *P. memorialis* are not convex medially as in *P. assimilis.*

Banks (1914) first described the adults of *P. assimilis* (as *Leptophlebia)* from the North Fork of the Swannanoa River, North Carolina. The species has since been collected in South Carolina and Georgia (Berner 1977). The reared specimens reported here from Maryland extend the known range of *P. assimilis* northward, but still within the southeastern region of North America as recognized by McCafferty and Waltz (1990).

Paraleptophlebia jeanae Berner

Larva. (in alcohol, from whole larvae and last instar larval exuviae). Body length 6.0-8.0 mm. Caudal filaments 5.0-7.0 mm.

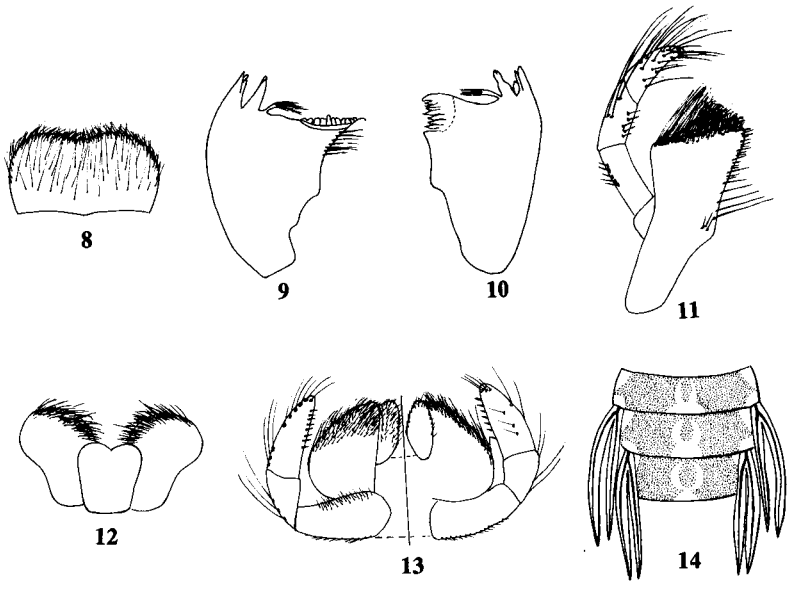
Head capsule brown dorsally, with pale, oval medial spot between antennal bases; black streak between each eye and antennal base; and pale patch posterior to black streak between each lateral ocellus and eye. Eyes of males with upper two-thirds brown and lower third black. Antennae pale; articulations with sparse, encircling, hairlike setae. Labrum (Fig. 8) dorsal surface with scattered, long hairlike setae; anterior margin also densely covered with shorter hairlike setae. Mandibles without tusks (Figs. 9, 10) (apices not extending beyond head margin); one-half of body of mandible extending beyond lateral margin of head capsule and visible dorsally. Maxillary palpi (Fig. 11) about as long as galealacinae; segments 2 and 3 subequal in length, together about 1.33 times as long as segment 1; segment 1 with row of four to six setae on outer margin; segments 2 and 3 with numerous, long, hairlike setae. Lingua of hypopharynx (Fig. 12) about one-half length of superlinguae, with distinct medioapical cleft. Labium (Fig. 13) with basal palpal segments more or less rectangular; palpal segment 2 at least one-half as long as palpal segment 3; segment 3 with numerous scattered, long, hairlike setae, and row of short, stout setae sublaterally.

Thorax with widely scattered black spots, more dense laterally; prothorax with paired, sublateral black streaks extending from posterolateral corner to anterior margin. Legs pale with distinct brown bands basally on tarsus, at articulation of femur and tibia, and in distal half of both femur and tibia; femora and tibiae with scattered, spinelike and hairlike setae dorsally; tibiae and tarsi with scattered, spinelike setae ventrally. Foreclaw with 18-25 denticles, increasing in size apically.

Abdominal coloration variable: abdominal tergum 1 brown; terga 2-9 (Fig. 14) often with paired crescent-shaped pale markings submedially on each tergum; submedial tergal markings less often coalescing, forming larger pale area in posterior area of terga; submedial tergal markings also less often appearing as pair of submedial streaks along entire dorsum of abdomen; lateral margins of abdominal terga 2-9 pale; tergum 10 brown, pale medially. Posterolateral corners of segments 8 and 9 extended into sharp projections. Sterna pale. Gills on abdominal segment 1 smaller than gills 2-7 (Fig. 14); all gills forked at base; trachea without dark lateral branches. Caudal filaments brown with articulations dark brown; each articulation with short, spinelike setae and long, hairlike setae; cerci and median caudal filaments subequal in length.

Material examined. 50 reared specimens (adults with larval exuviae) and 26 larvae, Indiana, Crawford Co., tributary of the Little Blue River, 1 mi. north of English at Hwy. 37, IV-25-1976, A. V. Provonsha and M. Minno; Crawford Co., Stinking Fork Blue River at St. Rd. 66, 1.5 mi. south of Sulfur Springs, V-19, 20-1977, M. Minno and S. Yocum; Harrison Co., Little Indian Creek 3 mi.

east of Corydon, V-10-1973 (one adult male was also collected), V-7-1974, A. V. Provonsha and K. Black; Jennings Co., Green Brook at Crosley St. Fish and Wildlife Area, V-7-1974, A. V. Provonsha and L. Dersch; Lawrence Co., Gullets Creek 1 mi. north of Needmore, IV-25-1975, A. V. Provonsha and M. Minno; Perry Co., Oil Creek approximately 2.5 mi. north of Leopold, IV-25-1976, A. V. Provonsha and M. Minno.



Figs. 8-14. *Paraleptophlebia jeanae,* larva: 8. Labrum. 9. Right mandible. 10. Left mandible. 11. Left maxilla. 12. Hypopharynx. 13. Labium (left ventral, right dorsal). 14. Abdominal terga 4-6 and gills 4-5.

DISCUSSION

In present keys to the larvae of *Paraleptophlebia, P. jeanae* will key with *P. debilis* (Walker) at couplet 9 of Traver (1935: 515) and couplet 7 of Burks (1953: 90). This is because of the similarity of gill structure (Fig. 14), posterolateral projections on abdominal segments 8 and 9, and brown banding on the legs in *P. jeanae* and *P. debilis. Paraleptophlebia debilis,* the larvae of which were first described by Ide (1930), is widespread and overlaps geographically with *P. jeanae.* Although abdominal coloration may prove to be unreliable to differentiate the larvae of these two species, mouthpart structure will consistently distinguish them. The outer margin of maxillary palp segment of *P. jeanae* (Fig. 11) has a row of setae rather than the setal patch of *P. debilis* [see Fig. 2, page 510 of Traver (1935)]. In addition, segments 2 and 3 of the labial palps of *P. jeanae* (Fig. 13) together are longer than segment 1. In *P. debilis,* labial palp segment 2 and 3 together are subequal to segment 1. Also, the inner margin of

the paraglossae (Fig. 13) is straight rather than concave as in *P. debilis.*

Since the keys of Traver and Burks appeared, larvae of *P. altana* Kilgore and Allen (1973), *P. placeri* Mayo (1939), and *P. quisquilia* Day (1952) were described from California. All three larval descriptions were incomplete, but these species do apparently have at least gills and abdominal segments 8 and 9 similar to those of *P. jeanae* and *P. debilis.* Further study of these California species will be required to properly diagnose their larvae from those of other species, including *P. jeanae.* In the meantime, their disparate distribution will provisionally differentiate them from *P. jeanae.*

Berner (1955) first described *P. jeanae* from male adults collected at Sumter Co., Alabama and Amherst Co., Virginia. Since then, adults have been reported only from South Carolina (Berner 1975). The specimens of *P. jeanae* studied here are from southern Indiana, significantly extending the range of the species northward into the extreme southeastern part of the northeast North America region of McCafferty and Waltz (1990).

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