

**A new species of *Asioplax* (Ephemeroptera: Leptohiphidae)
from Costa Rica and Nicaragua**

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Abstract. A new species of leptohiphid mayfly (Ephemeroptera: Leptohiphidae), *Asioplax isabelia* sp. nov., is described based upon larvae from Nicaragua and Costa Rica. The new species is distinguished from others in the genus *Asioplax* based upon differences in claw morphology, operculate gill shape, and by the presence of well-developed posteromedial projections on abdominal segment nine.

Key Words. Ephemeroptera, Leptohiphidae, new species, *Asioplax*, Central America.

INTRODUCTION

Asioplax was erected by Wiersema & McCafferty (2000) for a distinct group of species in the subfamily Tricorythodinae (family Leptohiphidae). The genus has included four North American species [*A. dolani* (Allen), *A. edmundsi* (Allen), *A. numinuh* Wiersema, McCafferty & Baumgardner, *A. texana* (Traver)], one Central American species [*A. curiosa* (Lugo-Ortiz & McCafferty)], two Caribbean species [*A. sacculobranchis* (Kluge & Naranjo), and *A. sierramaestrae* (Kluge & Naranjo)], and three South American species [*A. nicholsae* (Wang, Sites & McCafferty), *A. santarita* (Traver), and *A. zunigae* (Molineri)]. Molineri (2002) has supported this grouping as a distinct clade, but has chosen to maintain it within an all-inclusive and thus less informative concept of *Tricorythodes* Ulmer. A review of the genus *Asioplax* and key to its species were given by Wiersema & McCafferty (2005). It became clear to us, based on the latter work, that larvae that we had recently collected independently in Costa Rica and Nicaragua represented a new species of *Asioplax*, and our purpose here is to describe and diagnose this new species.

Larvae of this new species were collected from streams using forceps and kick nets, then preserved in 70% ethyl alcohol. Legs, gills, and mouthparts were removed and mounted on slides for detailed study. Figures were drawn using a camera lucida. Where available, collection sites are given in longitude/latitude coordinates as degrees, minutes, seconds, and were determined using Garmin hand-held global positioning systems. Setal descriptive terminology follows Baumgardner & Ávila (2006). Gill formula follows Molineri (2003), and indicates the number of membranous lamellae on abdominal segments 2–7.

Collections (and their acronyms) housing materials used in this study include: Purdue University, West Lafayette, Indiana (PERC) and Texas A & M University, College Station (TAMU). In material examined summaries, larval collections are

abbreviated by the capital letter "L", preceded by the number of specimens examined.

Asioplax isabelia Baumgardner, Meyer, McCafferty sp. nov.
(Figures 1–7)

Mature Larva. Body length 3.0–3.5 mm; caudal filaments 1.5–2.0 mm. Body robust and dorsoventrally flattened. General color dark reddish brown with black maculae; very mature individuals with extensive black maculae. Head: Pale brown with variable black maculae to dark reddish brown; very small genal projections present; tubercles absent; compound eyes small and widely separated; three ocelli present; antennae pale, approximately two times length of head capsule. Mouthparts: Labrum: dorsally with highly branched acuminate and elongate setae recessed from the anterior margin; numerous filiform setae along lateral and anterior margins; ventrally with one longitudinal row of acuminate and filiform setae near mid-line. Planate (right) mandible (Fig. 1): outer incisor two lobed, mostly fused; inner incisor two lobed; prosthema present, with setae projecting towards molar region. Angulate (left) mandible (Fig. 2): outer incisor three lobed, mostly fused; inner incisor two lobed, prosthema arising at base of inner incisor, with highly branched filiform setae projecting towards molar region. Hypopharynx: lingua apically truncate; numerous filiform and acuminate setae present on anterior margin; superlinguae oval, with numerous filiform and acuminate setae along anterior and lateral margins. Maxilla (Fig. 3): palp nodule-like with elongate seta about 10× length of palp; two subapical setae on inner apical margin; cluster of filiform setae on outer apical surface; filiform and acuminate setae along base of outer margin. Labium (Fig. 4): postmentum well developed, with regularly-spaced acuminate setae along lateral margins; prementum ventrally with numerous filiform setae; labial palp three segmented with numerous filiform setae; glossa and paraglossa subequal, fused except distally, with smooth outer margins; glossa slightly recessed, rounded, and with numerous robust setae; paraglossa with numerous filiform setae. Thorax: Pale to dark reddish brown, often with extensive black maculae; pronotum with pair of small, sharp projections on anterior lateral margin; hindwing pads absent in both sexes. Femora reddish brown with extensive dorsal pale regions; tibiae and tarsi reddish brown. Foreleg (Fig. 5): dorsal surface of femur with transverse row of elongate setae; anterior and posterior margins of femur with numerous acuminate and elongate setae; femur rounded, length and width approximately equal. Tibia and tarsus: margins with numerous acuminate and filiform setae; tarsal claw (Fig. 6) with single row of four or five basal denticles, and one pair of submarginal denticles. Mid- and hindlegs: anterior and posterior margins of femur with numerous acuminate and filiform setae, becoming shorter towards apex of femur. Tibia: acuminate setae present along anterior and posterior margins. Tarsus: four to six acuminate setae along inner margin. Claw: with five or six denticles, and one pair of submarginal denticles. Abdomen: Reddish brown; some individuals with extensive black maculae; terga 1–6 with pale lateral margins; terga 7–10 with pale median line and lateral margins; numerous filiform setae present along lateral margins of terga; postero-lateral margins of abdominal segments 7–9 greatly expanded; segments 7 and 8 reaching approximately mid-point of next segment; segment 9 projecting beyond posterior margin of segment 10. Dorsal lamella of operculate gill (Fig. 7) on abdominal segment two ovate, pale with extensive black maculae, mostly near base



Figures 1-7. *Asioplax isabelia*, larva. 1. Planate mandible (d.v.). 2. Angulate mandible (v.v.). 3. Maxilla (d.v.). 4. Labium (left v.v.; right d.v.). 5. Foreleg (d.v.). 6. Foreleg claw (ventrolateral view). 7. Operculate gill (d.v.).

and center; acuminate and filiform setae present along lateral margins; gill formula: 2/3/3/3/2. Cercus with whorls of filiform setae at each annulation.

Etymology. The specific epithet is a noun in apposition after the Cordillera Isabelai in Nicaragua.

Diagnosis. *Asioplax isabelia* larvae are most easily distinguished from larvae of *A. curiosa*, the only other species of *Asioplax* known from Central America, by the presence of well-developed posterolateral projections on abdominal segment 9 [very poorly developed in *A. curiosa*, see Fig. 10, Lugo-Ortiz & McCafferty (1995)], and by the rounder operculate gill (Fig. 7) [more elongate-oval in *A. curiosa*, see Fig. 10, Lugo-Ortiz & McCafferty (1995)].

Discussion. Overall, *A. isabelia* larvae are most similar to those of the western and southwestern North American species *A. edmundsi* and *A. numinuh*, all of which have relatively well-developed posteromedial projections on abdominal segment 9 and lack posteromedial tubercles on the abdominal terga (e.g., see Fig. 1, Wiersema & McCafferty (2000)). Of these three species, *A. isabelia* and *A. edmundsi* have paired submarginal denticles on the claws (Fig. 6), whereas *A. numinuh* lacks such denticles. *Asioplax isabelia* and *A. numinuh* have very broad, rounded forefemora (Fig. 5), whereas *A. edmundsi* is less broad and rounded [see Fig. 1, Wiersema & McCafferty (2000)]. *Asioplax edmundsi* and *A. numinuh* have subtriangulate operculate gills [see Fig. 1, Wiersema & McCafferty (2000) and Fig. 1, Wiersema et al. (2001), respectively], whereas the operculate gills are round-ovate in *A. isabelia* (Fig. 7). The specific key given by Wiersema & McCafferty (2005) is most conveniently modified to include *A. isabelia* by changing couplet 6 and adding a couplet 7 as follows:

- 6a. Claws without paired submarginal denticles *A. numinuh*
 6b. Claws with paired submarginal denticles 7
 7a. Operculate gills subtriangulate; tarsi blue-black. *A. edmundsi*
 7b. Operculate gills round-ovate; tarsi reddish brown *A. isabelia*

Distribution and Biology. *Asioplax isabelia* is currently known only from low-land costal streams on the eastern side of Costa Rica and southeast Nicaragua. Larvae were collected from woody debris in the slower currents of the streams. Numerous other species of mayflies were collected in the same streams in Costa Rica as *Asioplax isabelia* including *Camelobaetidius warreni* (Traver & Edmunds) (Family Baetidae), *Thraulodes* spp., and *Farrodes* spp. (Family Leptophlebiidae), *McCaffertium mexicanum mexicanum* (Ulmer) (Family Heptageniidae), and several leptohyphids including *Leptohyphes zalope* Traver, *A. curiosa* Lugo-Ortiz & McCafferty, *Vacupernius packeri* (Allen), *Tricorythodes sordidus* Allen, and *Cabecar serratus* Baumgardner & Ávila.

HOLOTYPE: *Mature Larva* - NICARAGUA: Departamentos Río San Juan; tributary of Río Bartola N. Río San Juan confluence (N10°58; W84°20', elev. 50 meters), 05.vi.2002, Michael D. Meyer [PERC].

PARATYPES: 1L, same data as holotype [PERC]. COSTA RICA: Heredia; La Selva Biological Station, SW Puerto Viejo, Sura Creek at Río Puerto Viejo (N10°25'49"; W84°00'06", elev. 30 m), 09.vi.2001, 1L, DEB [TAMU]; same but, 1L, 08.vi.2001 [TAMU]. Limón; Unnamed creek at Hwy. 32, ca. 3 Km W. of Pocora (N10°10'38"; W83°37'03", elev. 110 m), 10.vi.2001, 1L (parts mounted on slide #DB05xi2201, DEB [TAMU]. Limón; Río Catarata at Hwy. 36, 4 Km East of

Bribri (N09°37'50"; W82°49'06", elev. 90 m), 11.vi.2001, 1L (male, parts mounted on slide #DB06iii1301), DEB [TAMU].

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