

New Genus of Leptophlebiidae (Ephemeroptera) from Central and South America

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ABSTRACT The genus *Hydrosmilodon* is established for the species *Thraulius primanus* Eaton (recently placed in *Traverella*) from Central America and a new species from subtropical South America. The nymph of *H. primanus* is described for the first time, and the new species, *H. saltensis*, is described from northwestern Argentina based on male and female imago and nymphs.

KEY WORDS taxonomy, Leptophlebiidae, *Traverella*

Thraulius primanus was described by Eaton (1892) from Vera Cruz, Mexico, and later transferred by Edmunds (1950) to the genus *Traverella* Edmunds. For a long period, only a few species of this genus were known. Dominguez & Flowers (1989) revised the systematics of the *Hermanella* generic complex, describing several new taxa. As a continuation of that work, Flowers & Dominguez (1991) studied the phylogenetic relationships of most of the Neotropical genera of Leptophlebiidae, including some previously unknown taxa and newly reared material from previously known species. As a result, it was discovered that the species *T. primana* was actually more closely related to *Hermanella* Needham & Murphy, *Hylister* Dominguez & Flowers, and *Needhamella* Dominguez & Flowers than to *Traverella* sens lat. (Flowers & Dominguez 1991). Adults and nymphs of *T. primana* were associated by the senior author in Panama, and a new, closely related species was collected and reared by E. D. from northwestern Argentina. These two species, as well as others for which we do not yet have data on both adults and nymphs, represent a new genus which we describe below.

Hydrosmilodon Flowers & Dominguez, new genus (Figs. 1-34)

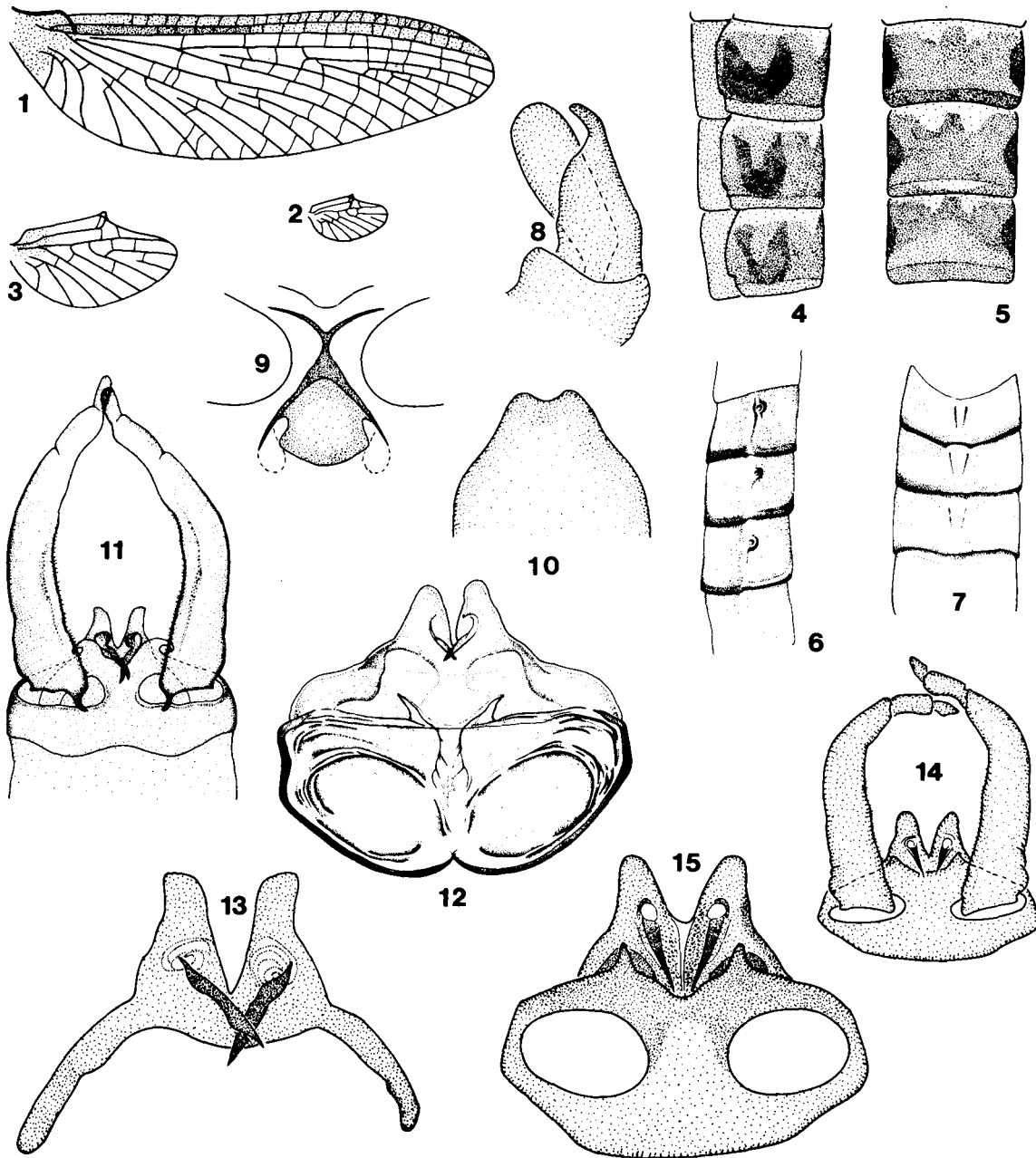
Imago. Length of male: body, 6.5-7.8 mm; forewings, 7.5-9.5 mm; hind wings, 1.2-1.8 mm. Length of female: body, 7.8-9.0 mm; fore wings, 9.0-10.1 mm; hind wings, 1.1-1.9 mm. **Head.** Eyes of male separated on meson of head by distance equal to 1.5 times width of lateral ocel-

lus, lower portion of eyes $\frac{1}{3}$ length of upper portion; eyes of female separated on meson of head by 7 times maximum width of lateral ocellus. Prothorax as in Fig. 9. **Wings** (Figs. 1-3). Maximum width of forewings $\approx \frac{1}{3}$ their maximum length; maximum width of hind wings $\approx \frac{3}{5}$ their maximum length; maximum length of hind wings $\frac{1}{6}$ - $\frac{1}{7}$ maximum length of forewings. Vein Rs of forewings forked slightly $> \frac{1}{5}$ distance from base of vein to margin (Fig. 1); vein MA forked at $\frac{1}{2}$ distance from base of vein to margin, fork asymmetrical; crossvein above fork in MA slanted, vein MA₂ strongly sagged; vein MP forked $\frac{2}{5}$ distance from base of vein to margin, fork slightly asymmetrical; vein ICu₁ attached at base to vein CuA by a crossvein; vein ICu₂ attached to ICu₁ by a crossvein. Hind wings (Figs. 2 and 3) with costal projection well developed, acute, rounded at apex; located $\frac{1}{2}$ distance from base to apex; vein MP unforked; apex of wings rounded; vein Sc slightly $> \frac{1}{2}$ distance from base to wing margin, ending in crossvein; 8-10 crossveins present. **Legs.** Ratios of segments in male forelegs, 0.65:1.00 (2.6 mm):0.06:0.25:0.15:0.11:0.07. Claws of a pair dissimilar, one apically hooked, the other blunt, padlike (Fig. 8). **Male genitalia** (Figs. 11-15). Subgenital plate with spines close to base of forceps, these spines straight or curved; segment 2 of forceps $\frac{1}{4}$ length of segment 1, $\frac{1}{4}$ length of segment 3; segment 1 strongly curved and narrowed gradually from base to apex. Basal $\frac{1}{2}$ of penes with swollen lateral margins; penes divided on apical $\frac{1}{2}$, each lobe with short median spine. Ninth sternum of female cleft apically (Fig. 10). Terminal filament longer than cerci.

Mature Nymph. **Head.** Prognathous. Antennae 2.2-2.8 times length of head. **Mouthparts** (Figs. 16-23, 25-32). Clypeus with lateral margins strongly concave, anterior margin with small anterior projection, maximum width of labrum 1.4

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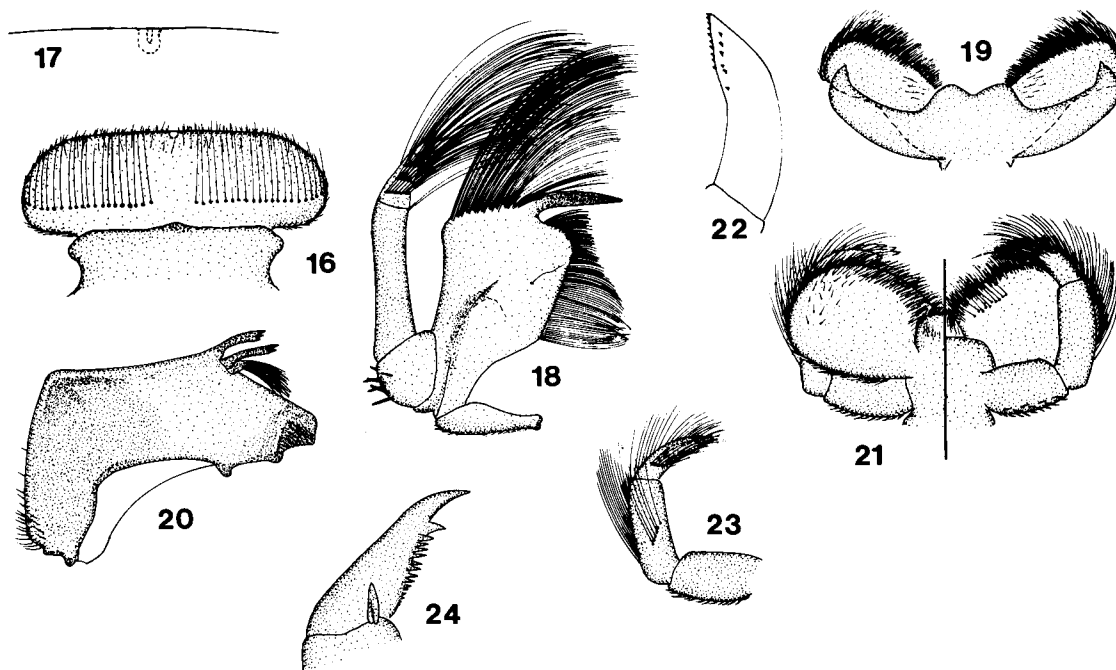
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Figs. 1-15. Imago. (1-3) *H. saltensis*, forewing, hind wing, and hind wing enlarged. (4-7) Terga and lateral view of segments 5-7; (4 and 5) *H. saltensis*. (6 and 7) *H. primanus*. (8-10) *H. saltensis*; (8) Tarsal claw of male imago. (9) Prosternum. (10) Ninth female sternite. (11-13) *H. primanus*; (11) Male genitalia. (12) Apical view. (13) Detail of penes. (14 and 15) *H. saltensis*; (14) Male genitalia. (15) Apical view.

times maximum width of clypeus; length of labrum $\approx \frac{1}{3}$ maximum width, lateral margins rounded (Figs. 16 and 25); anteromedian emargination either broad and V-shaped dorsally or lacking, deep and U-shaped ventrally (Figs. 17 and 26); divided row of long dorsal setae on basal $\frac{1}{4}$ of labrum with 21-24 setae on each side, short setae scattered on apical $\frac{1}{4}$ of labrum, lat-

eral and anterolateral margins lined with short setae. *Left mandible* (Figs. 20 and 27). Outer margin angularly curved, angle sharp with tuft of setae at basal articulation and additional setae present or absent on basal $\frac{1}{2}$ of outer margin. *Maxillae* (Figs. 18 and 28). Galea-lacinia with long thick seta on venter close to inner margin; subapical pectinate setae lacking; enormously



Figs. 16–24. *Hydrosmilodon saltensis*, mature nymph. (16) Labrum. (17) Detail of anteromedian emargination. (18) Maxilla. (19) Hypopharynx. (20) Left mandible. (21) Labium (right, ventral view; left, dorsal view). (22) Detail of third segment of apical palpus. (23) Detail, dorsal view of labial palpus. (24) Tarsal claw.

well-developed tusk on inner apical angle; inner margin of maxilla sinuate below tusk. Segment 1 of maxillary palpi $\frac{1}{2}$ length of segment 2; segment 3 $\approx \frac{1}{2}$ length of segment 2; segment 1 with thick setae on outer margin, segment 2 with two long setae on inner apical angle, segment 3 with long setae in ordered rows. Lingua of hypopharynx with well-developed lateral processes, anterior margin with broad median V-shaped cleft; superlinguae with long setae along anterior margin (Figs. 19 and 32). *Labium* (Figs. 21–23, 29–31). Segment 1 of palpi $\frac{5}{6}$ length of segment 2, segment 3 $\frac{4}{5}$ of segment 2; segment 3 curved with long setae on ventral surface and external margin, and short spines on inner margin (Figs. 22 and 31); segment 2 elbowed with dorsal row of 7–11 setae (Figs. 23 and 30); glossae straight, flat, with short setae along anterior margin; paraglossae (Figs. 21 and 29) with subapical row of long setae on ventral surface; submentum with seven lateral setae. Anterolateral margins of pronotum with three large setae. Wing pads glabrous. *Legs* (Fig. 33). Trochanters with row of setae on apicodorsal surface; anterior femora with thick, long, pointed setae along posterior margin and subapical area, and short spines along inner margin; middle and hind femora with long, fine setae and long, pointed spines along dorsal margin, remainder of dorsal surface evenly covered with short pointed spines; foretibiae with pectinate spines along inner margin and dorsal row of short spines, middle and

hind tibiae with row of long, fine setae on outer margin and short spinelike setae on inner and dorsal surfaces, tarsi with spinelike setae along inner margins. Claws hooked, narrow, ventral denticles as in Fig. 24. *Gills* (Fig. 34). Gills on segments 1–7, platelike, biramous; each gill ending in fingerlike process, fringed with small setae; dorsal and ventral portion of gills similar, main trachea along median line; gills smaller posteriorly, vestigial on segment 7. Posterolateral projections on abdominal segments 8 and 9. Terminal filament longer than cerci, small spines on posterior margin of each segment.

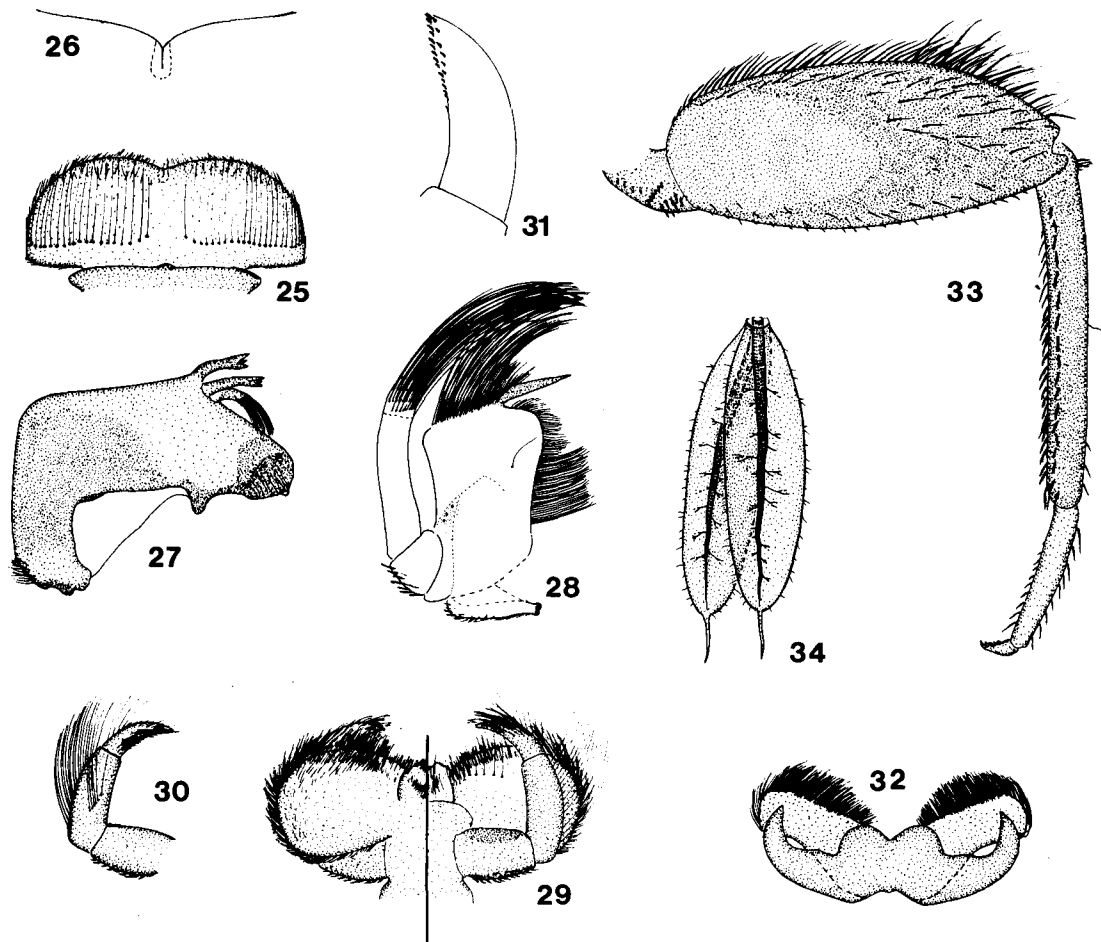
Type Species. *Thraulius primanus* Eaton.

Species Included. *Hydrosmilodon saltensis* Flowers & Dominguez, n. sp.

Etymology. *hydro*, Gr. (m), water; *Smilodon*, the scientific name of the sabre-toothed cat (m).

Distribution. Mexico and Central and South America south to northern Argentina.

Discussion. The genus *Hydrosmilodon* can be separated from the other genera of Leptophlebiidae by the following combination of characters. *Imago*. Forks of veins MA and MP of forewings asymmetrical with slanted crossvein at MA fork (Fig. 1); vein MP of hind wings unforked; costal projection of hind wings (Fig. 3) acute, rounded at apex; vein Sc of hind wings ending in crossvein near base of costal projection; penes divided on apical $\frac{1}{2}$, penes with short median spine (Figs. 11–15), an external swelling present on basal $\frac{1}{2}$ of each penis lobe; subgenital plate



Figs. 25-34. *Hydrosmilodon primanus*, mature nymph. (25) Labrum. (26) Detail of anteromedian emargination. (27) Left mandible. (28) Maxilla. (29) Labium (right, ventral view; left, dorsal view). (30) Detail, dorsal view of labial palpus. (31) Detail of third segment of labial palpus. (32) Hypopharynx. (33) Foreleg. (34) Gill IV.

bearing short and acute projections close to the base of forceps; prosternum as in Fig. 9. *Nymph*. Labrum as wide as head, bearing long setae (Figs. 16 and 25); long setae on maxillary palpi ordered in rows; maxillae with very large blade-like tusk (Figs. 18 and 28); apical denticle on tarsal claws larger than those preceding it (Fig. 24); gills (Fig. 34) on segments 1-7 platelike, each ending in single fingerlike process, and posterolateral spines present on abdominal segments 8 and 9.

The genus *Hydrosmilodon* belongs to the *Hermanella* generic complex (Flowers & Dominguez 1991) based on the following synapomorphies: subapical row of setae on paraglossae; segment 1 of labial palpi shorter than segment 2; segment 3 subequal to segment 2; long row of dorsal setae on segment 2 of labial palpi present; enlarged subapical denticle on tarsal claws; costal projection beyond basal $\frac{1}{2}$ of hind wings; spines developed on subgenital plate.

The apomorphies of the genus are: 1) vestigial gills on abdominal segment 7 and 2) denticles on outer incisors of mandibles present.

Hydrosmilodon is very closely related to *Needhamella*, from which it can be distinguished in the male imago by the shape of the prosternum (Fig. 9), by the shorter spines on the subgenital plate, and by the shape of the penes and their median spines (Figs. 11 and 14). Externally, the nymphs are very close, but the maxillary tusk of *Hydrosmilodon* is unmistakable. Also, the spines on the inner margin of the foretibiae are pectinate in *Hydrosmilodon* and simple in *Needhamella*.

In addition to the two species treated below, we have seen nymphs from Peru and southern Brazil that may represent additional species of *Hydrosmilodon*, having both the characteristic gills and maxillary tusks of this genus. However, because we have seen no adult *Hydrosmilodon*

from either of these areas, we defer naming these nymphs until their adult stages are known.

**Key to the Species of the Genus
Hydrosmilodon
Imagos**

1. General coloration light orange-brown; abdominal color pattern as in Figs. 6 and 7; apical 1/3 of forceps, segment 1, and venter of segment 2 light yellow, remainder brown
 *Hydrosmilodon primanus* (Eaton)
- General coloration brownish black, darker on dorsum of thorax; abdominal color pattern as in Figs. 4 and 5; forceps orange-brown
 *Hydrosmilodon saltensis* Flowers & Dominguez, n. sp.

Mature Nymphs

1. Mandibles with exterior setae confined to base (Fig. 27), basal segment of labial palpi with well-defined dark markings (Fig. 29)
 *Hydrosmilodon primanus* (Eaton)
- Mandibles with exterior setae extending from base toward exterior angle (Fig. 20), basal segment of labial palpi lacking well-defined markings *Hydrosmilodon saltensis* Flowers & Dominguez, n. sp.

***Hydrosmilodon saltensis* Flowers & Dominguez, new species
(Figs. 1-5, 8-10, 14-15, 16-24)**

Male Imago. In alcohol. Length: body, 7.3-7.8 mm; forewings, 9.3-9.5 mm; hind wings, 1.7-1.8 mm. General coloration brownish black, darker on dorsum of thorax. **Head.** Orange-brown tinged with black on anterior margins. Upper portion of eyes light brown, lower portion blackish. **Antennae.** Scape and pedicel brownish, flagellum light yellow. **Thorax.** Pronotum light brown with lateral and posterior margins and medial area blackish; mesonotum dark brown with margins and carinae lighter; metanotum light brown, washed with black; pleura light brown with sclerites darker; sterna dark brown with sutures whitish. **Wings** (Figs. 1-3). Membrane of forewings hyaline, costal and subcostal areas light brown, darker in the basal 1/2 of subcostal area, stigmatic area translucent; wing bases brown. Veins C, Sc, and R₁ brown, remaining longitudinal veins light brown; crossveins in costal and subcostal areas brown, remaining crossveins light brown. Membrane of hind wings hyaline, with brown spot at base; veins C, Sc, and R brown, remaining longitudinal and crossveins yellowish. **Legs.** Coxae and trochanters light brown, washed with black; femora and tibiae 1 and 3 brown, washed with

black; tibia 2 and tarsi light brown. Claws light orange. **Abdomen** (Figs. 4 and 5). Terga 1-6 and 10 light brown, 7-9 orange-brown, markings as in Fig. 4, all segments washed with black; sterna light brown, segment 8 tinged with black. **Genitalia** (Figs. 14 and 15). Subgenital plate and forceps orange-brown, penes light yellow, spines of penes orange. **Caudal filaments.** Basal 1/2 of each segment dark gray, apical 1/2 light gray, lighter toward apex of filaments.

Female Imago. In alcohol. Length: body, 7.8-8.2 mm; fore wings, 9.0-9.2 mm; hind wings, 1.1-1.3 mm. Color pattern similar to male imago except as follows: head yellow-brown with margins and central area washed with black; eyes blackish. Thorax and wings paler than in male. All legs with apex of tibiae and tarsi whitish yellow; claws grayish. Abdominal markings as in male but paler. Apex of abdominal sternum 9 heavily washed with black.

Mature Nymph. In alcohol. Body length 5.2-8.5 mm. General coloration dark orange-brown. **Head.** Dark orange-brown with white spots external to ocelli. Upper portion of eyes of male orange-brown, lower portion black. Eyes of female blackish. **Antennae.** Whitish. **Mouthparts** (Figs. 16-23). Pale yellow, base of mandibles dark orange-brown dorsally, basal segment of labial palpi faintly washed with black. Mandibles (Fig. 20) with a row of short setae on lower portion of basal outer margin. **Thorax.** Terga dark orange-brown, pleura and sterna yellowish. **Legs.** Yellowish brown, with apical 3/4 of fore femora, all of middle and hind femora, and all tibiae washed with black. Claws as in Fig. 24. **Abdomen.** Terga deep orange-brown; sterna yellowish brown, darker posteriorly. **Gills.** Grayish black, trachea darker; apical filaments light gray. **Caudal filaments** orange-brown.

Etymology. *saltensis*, Sp., from Salta Province, northwestern Argentina, where this species was first collected.

Type Material. HOLOTYPE: ♂ imago, Argentina, Salta Prov., Estancia "Jakulica," Arroyo de la Casa, 790 m, 25-II-89, E. Dominguez (IFML). ALLOTYPE: ♀ imago, same data as holotype (IFML). PARATYPES: ARGENTINA: Salta, 20 ♂♂ imagos, 18 ♀♀ imagos, 1 ♂ subimago, 1 ♀ subimago, 50 nymphs, Estancia "El Arrazayal," Arroyo de la Casa, 25-II-89, E. Dominguez (2 of 3 in IFML, 1 of 3 in FAMU); 21 nymphs, Estancia "Jakulica," Quebrada Agua Rica, 790 m, 23-II-89, E. Dominguez (15 in IFML, 6 in FAMU); 14 nymphs, Estancia "Jakulica," Quebrada "La Mirta," 750 m, 25-II-89, E. Dominguez (7 in IFML, 7 in FAMU); 40 nymphs, Estancia "Jakulica," Arroyo del Chorro, 800 m, E. Dominguez (30 in IFML, 10 in FAMU). The association of the adults and nymphs is by rearing.

Discussion. The abdominal color pattern in some of the adult males is less conspicuous than in the holotype, and in some females it is yellow-

ish brown instead of light brown. *H. saltensis* can be distinguished from *H. primanus* by the following combination of characters. *Imago*. Subgenital plate with short straight spines (Fig. 15); general coloration brownish black, darker on dorsum of thorax; abdominal color pattern as in Figs. 4 and 5; forceps orange-brown. *Nymph*. Anterior margin of labrum scarcely emarginate (Fig. 17); outer margin of mandibles with setae on basal $\frac{1}{2}$ (Fig. 20).

Biology. This species was collected in Salta Province (23°S; 64.5°W) from the subtropical mountain forest "Yungas" streams. This species is apparently highly seasonal, occurring in abundance during February, but is rare or absent at other times of the year. Previous collecting, carried out during October–December, showed *Thraulodes cochunaensis* Dominguez and *T. consortis* Dominguez as the dominant species of rock dwellers and failed to turn up any *Hydrosmilodon*; but during February, *H. saltensis* was the most numerous species, totally replacing *T. consortis* and with *T. cochunaensis* appearing only sporadically. Other species reported from this locality include *Farrodes yungaensis* Dominguez & Savage, *Tricorythodes popayanicus* Dominguez, and *Haplohyphes baritu* Dominguez. Undescribed species of *Atopophlebia* Flowers, *Terpides* Demoulin, and *Hagenolopsis* Ulmer have also been collected here.

The streams were 10–17 m wide and 35–70 cm deep with exposed bedrock bottoms. Abundant leaves and debris were deposited between the rocks. The nymphs were collected from rocks in water 40–50 cm deep. Subimagos were observed emerging at dusk and molting to the imaginal stage at sunrise. Imagos were attracted by mercury vapor light.

Hydrosmilodon primanus (Eaton), new combination
(Figs. 6 and 7, 11–13, 25–34)

Thraulodes primanus Eaton 1892: 7; Kimmins 1934: 342; Traver 1947: 149.

Traverella primana Traver 1960: 5; Allen 1973: 1292; Flowers 1992.

Traverella primanus Edmunds 1950: 551.

"*Traverella*" *primana* Flowers & Dominguez 1991: 49

Male Imago. Genitalia and one pair of wings on slide, remainder in alcohol. Length: body, 6.5–7.0 mm; fore wings, 7.5–7.8 mm; hind wings, 1.2–1.4 mm. *General coloration.* Light orange-brown. *Head.* Light brown, washed with black on anterior margin. Upper portion of eyes yellowish brown, lower portion blackish. Ocelli white, ringed basally with black. *Antennae.* Scape light brown, pedicel and flagellum yellow-white, lighter toward apex. *Thorax.* Pronotum

orange-brown, with lateral and posterior margins blackish; mesonotum light orange-brown with margins and carinae lighter; metanotum light brown washed with black; sterna orange-brown. *Wings.* Membrane hyaline, slightly tinged with brown, darker on base of costal and subcostal area; pterostigma of fore wing whitish. Longitudinal veins light brown, lighter toward hind margins. *Legs.* Leg 1 dark brown, coxae, trochanter and tarsi lighter (legs 2 and 3 broken off and missing). Claws yellowish. *Abdomen* (Figs. 6 and 7). Terga light brown with posterior margins and spiracle darker; medial area lighter; basal and apical segments darker; sterna light orange-brown, segments 1, 8, and 9 darker. *Genitalia* (Figs. 11–13). Subgenital plate light brown, with two short submedian spines that are sharply bent outward; basal $\frac{2}{3}$ of forcep segment 1 brown, apical $\frac{1}{3}$ and segment 1 and venter of segment 2 light yellow. Penes yellow white, spines of penis dark brownish. *Caudal Filaments.* Basal $\frac{1}{4}$ dark grayish, gradually lighter toward whitish apex.

Female Subimago. In alcohol. Length: body, 8.0–9.0 mm; fore wings, 9.2–10.1 mm; hind wings, 1.5–1.9 mm. Coloration similar to male imago but duller. Head whitish, heavily washed with black in central area. Eyes blackish. *Antennae.* Scape light yellow, pedicel and flagellum whitish. Legs, pronotum, and abdomen blackish instead of brown.

Mature Nymph. In alcohol. Body length 5.1–9.5 mm. General coloration dark purplish brown. *Head.* Dark brown to purple-brown with pale spots external to ocelli. Upper portion of eyes of male dark reddish brown, lower portion black. Eyes of female blackish. *Antennae.* Scape and pedicel brown, paler apically. *Mouthparts* (Figs. 25–32). Light orange, molars of mandibles and maxillary palpi darker, basal area of mandibles washed with black; anterior and often posterior margins of basal segments of labial palpi with well-defined black markings. *Thorax.* Terga purple-brown, pleura and sterna orange brown. *Legs* (Fig. 33). Yellowish brown with femora and tibiae washed with purplish black. Claws as in Fig. 24. *Abdomen.* Terga purple-brown, darker at posterior margin of each segment; sterna orange-brown, darker apically. *Gills.* Dark grayish black, trachea slightly darker; apical filaments light gray. Caudal filaments orange-brown.

Material Examined. PANAMA: Bocas del Toro, 1 ♂ imago, Miramar, Laguna de Chiriquí, 9°N; 82°15'W, sea level, 21-27-III-79, H. Wolda (FAMU); 1 ♂ imago, Coriente Grande, Río Changuinola, 9°17'30"N, 82°32'41"W, 100m, 12-18-III-80, H. Wolda (FAMU); 1 ♂ subimago, 3 ♀♀ subimagos, Zegla, Dos Ríos, 21-IV-1985, Light, R. W. Flowers (FAMU); 1 ♂ subimago, Río Teribe at Zegla, 22-IV-85, light, R. W. Flowers, A. González (FAMU); 1 nymph, Miramar, Laguna de Chiriquí, 9°N; 82°15'W, sea level, stream behind sawmill, 25°C, 2-V-85, R. W. Flowers (FAMU); 1 nymph,

mouth of Río Teribe, 20-IV-85, 26°C, R. W. Flowers (FAMU); 1 nymph, trib. of Río Guabo at Pipeline Rd. 2700', 10-V-85, 20.5°C, R. W. Flowers (FAMU). Canal Zone, 3 ♂♂ subimagos, 3 ♀♀ subimagos, 1 nymph, Pipeline Rd., Río Frijoles, 50', 24-25-XII-77, R. W. Flowers (FAMU). Chiriquí, 1 nymph, Río Chiriquí, Fortuna, 8°44'N, 82°15'W, 2-XII-77, R. W. Flowers (FAMU). Coclé, 4 nymphs, El Valle, Río Antón below falls, 19-IX-82, R. W. Flowers, D. Habeck, C. Bennett (FAMU). Darien, 5 nymphs, Río Tacarcuna, 1900', 30-V-63, W. P. Murdock (FAMU). COSTA RICA: Alajuela, 4 ♀♀ imagos, Río Sarapiquí ≈ 2 km SE Cariblanco, 10.299°N; 82.172°W, 22-VI-86, elev. 710 m, Holzenthal, Heyn, Armitage (FAMU); 2 nymphs, Río Pizote, ≈ 5 km N Dos Rios, 10.998°N; 85.271°W, elev. 470 m, 3-III-86, Holzenthal & Fasth (FAMU). Guanacaste, 2 N, Quebrada Garcia, 10.6 km ENE Quebrada Grande, 10.862°N; 85.428°W, elev. 470 m, 8-III-86, Holzenthal & Fasth (FAMU); 1 nymph, P. N. Rincón de la Vieja, Río Negro, 10.765°N; 85.313°W, elev. 810 m, 3-III-86, Holzenthal & Fasth (FAMU); 2 nymphs, Río Los Ahogados, 11.3 km ENE Quebrada Grande, 10.865°N; 85.426°W, elev. 470 m, 7-II-86, Holzenthal & Fasth (FAMU); 1 nymph, same locality and collectors, 26-VI-86 (FAMU). HONDURAS: Atlántida, 1 N, 32 km W La Ceiba, 6-VIII-77, C. W. O'Brien & G. B. Marshall (FAMU). Comayagua, 3 N, Siguatepeque, Río Calan, pine forest, 21-VII-77, C. W. O'Brien & G. B. Marshall (FAMU); 5 nymphs, Río Calan, 10 km SE Siguatepeque, 14-VII-77, C. W. O'Brien & G. B. Marshall (FAMU). Intibuca, 1 nymph, Jesus de Otoro, sm. clear stream, 15-VII-77, C. W. O'Brien & G. B. Marshall (FAMU). Olancho, 3 nymphs, small stream 45 mi E junct. Hwy 3 and Salama Rd., 6-XI-64, J. S. Packer (FAMU). El Paraíso, 1 ♂ imago reared, Río Yeguaré, Escuela Agrícola Panam., J. S. Packer (no date) (FAMU); 2 nymphs, Escuela Agrícola Panamericana, Río Yeguaré, 26-X-64, J. S. Packer (FAMU); 1 nymph, 38 km E of Zamorano on Hwy 4, 31-X-64, J. S. Packer (FAMU).

Discussion. Many of the adults are darker than the holotype, often being dark orange-brown or even purple-brown. On most specimens, all the femora and tibiae are dark purple-brown, whereas the tarsi are pale yellow-brown. Almost all nymphs have the anterior (leading) edge of the basal segment of the labial palpi dark brown; some nymphs, particularly those from Costa Rica, have the posterior (trailing) margin dark as well. *H. primanus* can be separated from *H. saltensis* by the following combination of characters: subgenital plate with two short submedian spines sharply bent outward (Figs. 11 and 12); general coloration light orange brown; abdominal color pattern as in Figs. 6 and 7, terga light brown with posterior margins darker; apical 1/3 of forceps of segment 1 and venter of segment 2 light yellow, remainder brown; mandible of nymph with setae

confined to basal angle (Fig. 27); anterior margin of labrum distinctly emarginate (Fig. 26).

Biology. Nymphs of this species are widely distributed in lower Central America but are never found in large numbers. They are found in rocky streams from low to middle elevations. Adults are attracted to light.

Acknowledgments

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