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Association of immature stages of some caddisfly species from northwestern Argentina with description of a new species of *Helicopsyche* (Trichoptera: Helicopsychidae)

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Abstract

The adult, larva, and pupa of *Helicopsyche obscura* **sp. nov.** from northwestern Argentina are described and illustrated. Descriptions and illustrations of adults and associated pupae and larvae of *Helicopsyche turbida* Navás and *Leptonema boliviense boliviense* Mosely are included. The associations of immature stages were made using the metamorphotype method. *Helicopsyche turbida* is newly recorded from Tucumán province. The adult males of *H. obscura* **sp. nov.** and *H. turbida* have similar structure in the genital segments, however, the most clear differences are in the general color and size of the adult, and in the color, size, and morphology of the metanota in the larval stages as well as the shapes of mandibles, hook plates, and terminal segments of the pupal stages. The larva and pupa of *L. boliviense boliviense* are compared with those of *L. columbianum* and other previously described species, providing differences in color, chaetotaxy, and morphology.

Key words: Hydropsychidae, *Leptonema*, metamorphotype, new records

Introduction

Holometabolous aquatic insects of the order Trichoptera are considered good indicators for water quality, especially because of their low tolerance to changes in habitat conditions (Ward 1992). Trichoptera larvae are important participants in energy flow and nutrient dynamics in the aquatic environment (Wiggins 2004).

The northwestern Argentinean mountain forest is in an area with subtropical climate, including a dry season in the winter. The area studied in this paper corresponds to the biogeographic province known as Las Yungas or Bosque Tucumano–Boliviano (Cabrera & Willink 1973; Morrone 2001). The Yungas Forest has ecologically important altitudinal variation, ranging from 400 m a.s.l. to 3000 m a.s.l. This is a N-S longitudinal belt that can be recognized from the Andes of Venezuela to the northwestern mountains in Argentina.

The Trichoptera fauna of this area has been studied by several authors (Flint 1983; Flint et al. 1987; Angrisano 1984, 1995; Valverde 1996; Angrisano & Sganga 2005; Rueda Martín 2005a, 2005b, 2006, 2008; Rueda Martín & Gibon 2008; Rueda Martín et al. 2011; Sganga 2006; Sganga & Fontanarrosa 2006; Valverde & Abelando 2006). There are about 112 species of Trichoptera in this Forest from among which only 31 have been associated with their immature stages (Valverde & Abelando 2006; Rueda Martín 2005a, 2005b, 2006; Flint 1974; Rueda Martín 2008, 2011; Angrisano & Sganga 2005; Angrisano 1995; Roback 1966; Marlier 1964; Holzenthal 1988; Smith & Lehmkuhl 1980; Ross 1944; Flint 1982, 1983; Wiggins 1996; Wallace & Merritt 1980; Sganga & Fontanarrosa 2006; Ulmer 1909; Flint 1980; Valverde 1996).

Caddisfly larvae are an important and representative group of benthic macroinvertebrates in the rivers of northwestern Argentina. They are used in ecological studies, mainly as part of a biotic index and as contributors to biodiversity and richness (Mesa & Fernández 2007; Mesa et al. 2008; Fernández et al. 2008). The larval stages of

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the different species show wide variability in feeding habits, but functional feeding groups are analyzed at the generic level in the study area because of the lack of associations and descriptions at the species level (Reynaga 2009).

Helicopsychidae are cosmopolitan and their larvae are very distinctive because of the shape of the cases they build. The cases of *Helicopsyche* larvae are made with sand grains and are helicoidal in shape, resembling gastropod shells. Two species are known in northwestern Argentina: *Helicopsyche muelleri* Banks 1920 and *Helicopsyche turbida* Navás 1923. These species were synonymized by Flint (1967) and later considered as two separate species by the same author (Flint 1982). The genital segments of the two species are very similar. The larva of *H. muelleri* was associated with the identifiable adults of this species and described by Marlier (1964), but the larva of *H. turbida* remains unknown.

Hydropsychidae are cosmopolitan, too, and the family is one of the most speciose in the order. In South America it is represented by two subfamilies: Macronematinae and Smicrideinae (Schefter 1996). The genus *Leptonema* (Macronematinae) is distributed in South and Central America and southwestern North America and was reviewed by Flint et al. (1987). *Leptonema boliviense* Mosely 1933 has been recorded in northwestern Argentina with two subspecies: *L. b. boliviense* Flint et al. 1987 and *L. b. plumosum* Flint et al. 1987. With more than 100 species in the genus, larvae of only a few *Leptonema* species have been described by different authors (Müller 1921; Flint 1964; 1968; Flint & Wallace 1980, Botosaneanu, 1994, Nessimian & Dumas 2010).

In this paper we describe the adult, larva and pupa of a new species of *Helicopsyche* from northwestern Argentina, named *H. obscura* **sp. nov.** Figures of the male genitalia of *H. turbida* and the immature stages of this species are included and described. *Helicopsyche turbida* is recorded for the first time in Tucumán Province. This work includes the association of the larva and pupa of *Leptonema boliviense boliviense* with description and illustrations which facilitate the identification of all stages.

Material and methods

Adults of *Helicopsyche* were collected with aerial nets during the day from exposed rocks in the river. Hydropsychid adults were collected using a mercury vapor light trap with electric generator during 4 hours from late afternoon to early night. All material was collected and preserved in 96% ethyl alcohol.

The abdominal segments of adult males were dissected and cleared in 10% NaOH at about 25°C, during 8 to 12 hours. After that, each abdomen was neutralized with lactic acid, the soft parts were removed, and then the cuticle was washed with water. The cleared abdomens were preserved in 96% alcohol with the remaining parts of each individual. Glycerin was used as the mounting media to secure the different views of the genital segments and to recover the abdomen. The structures were observed under an optical microscope Olympus BX 51 equipped with a camera lucida (40X).

The immature stages were collected from rivers in northwestern Argentina, using different methods: Surber nets, D nets, and by visual inspection of substrates. Larvae and pupae were fixed and preserved in 75% ethyl alcohol.

All associations were made using the metamorphotype method (Vorhies 1909; Milne 1938). Mature pupae obtained from the field were reviewed and males with genitalic segments sclerotized were used to identify the species; the shed sclerites of the larva that were still in the pupal shelter were used to make the association.

Microscopical details were illustrated using the camera lucida. The figures were made manually, preparing templates with pencil and then finishing the line drawings with pen and ink. The adult habitus illustrations were made with a grid technique under a microscope and shaded with graphite.

The identification of *H. turbida* was made by comparing adults with literature descriptions and illustrations and with material of *H. muelleri* from the U.S. National Museum of Natural History, Washington, District of Columbia, USA (NMNH). The material of *Leptonema boliviense boliviense* was identified by comparing adults with literature descriptions and illustrations and with material identified by Dr. O. S. Flint, Jr., from the NMNH. All material collected is deposited in the collection of the Instituto de Biodiverdidad Neotropical (IBN) of the Facultad de Ciencias Naturales e Instituto Miguel Lillo, Tucumán, Argentina.

Taxonomy

***Helicopsyche obscura* sp. nov.**
(Figs 1–3)

Helicopsyche obscura **sp. nov.** resembles *Helicopsyche turbida*. The new species is recognizable mainly by the general coloration of body and wings (dark grey in *H. obscura* **sp. nov.**, and medium brown in *H. turbida*). Another important character is size, *H. obscura* **sp. nov.** is remarkably larger than *H. turbida* (mean length of each forewing is 9.5 mm in *H. obscura* **sp. nov.**, 6–7 mm in *H. turbida*). The genital segments of the two species are similar, but the differences in the general habitus provide a good way to separate the species. However, some characters of the larva and pupa are the strongest means to differentiate the two species. The larval head of *H. obscura* **sp. nov.** is darker than that of *H. turbida*; each metanotal plate is divided in four sclerites in the new species, whereas in *H. turbida* each plate of metanotum consists of two sclerites only. The pupal stage differs in the two species by the shape of the mandibles that are straighter in *H. obscura* **sp. nov.**; the posterior hook plates of *H. obscura* **sp. nov.** are asymmetrical whereas in *H. turbida* they are symmetrical; the terminal segment in both species bears a pair of processes but in *H. turbida* they are more divergent.

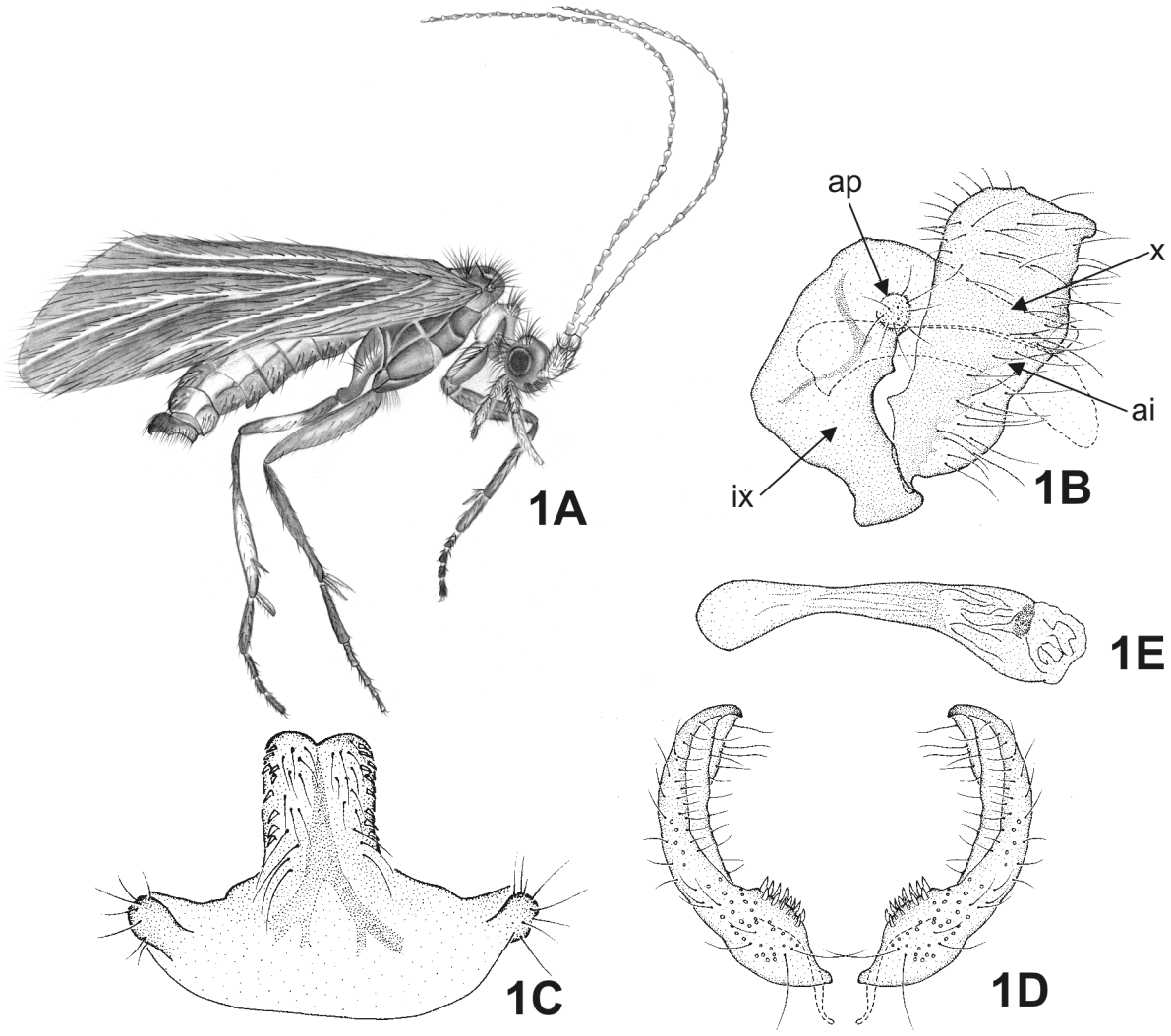

FIGURE 1. *Helicopsyche obscura* **sp. nov.**, adult male: 1A, habitus of adult, left lateral; 1B, genitalia, left lateral; 1C, genitalia, dorsal; 1D, inferior appendages, ventral; 1E, phallic apparatus, left lateral. ix=segment IX; x=tergum X; ap=preanal appendages; ai=inferior appendages.

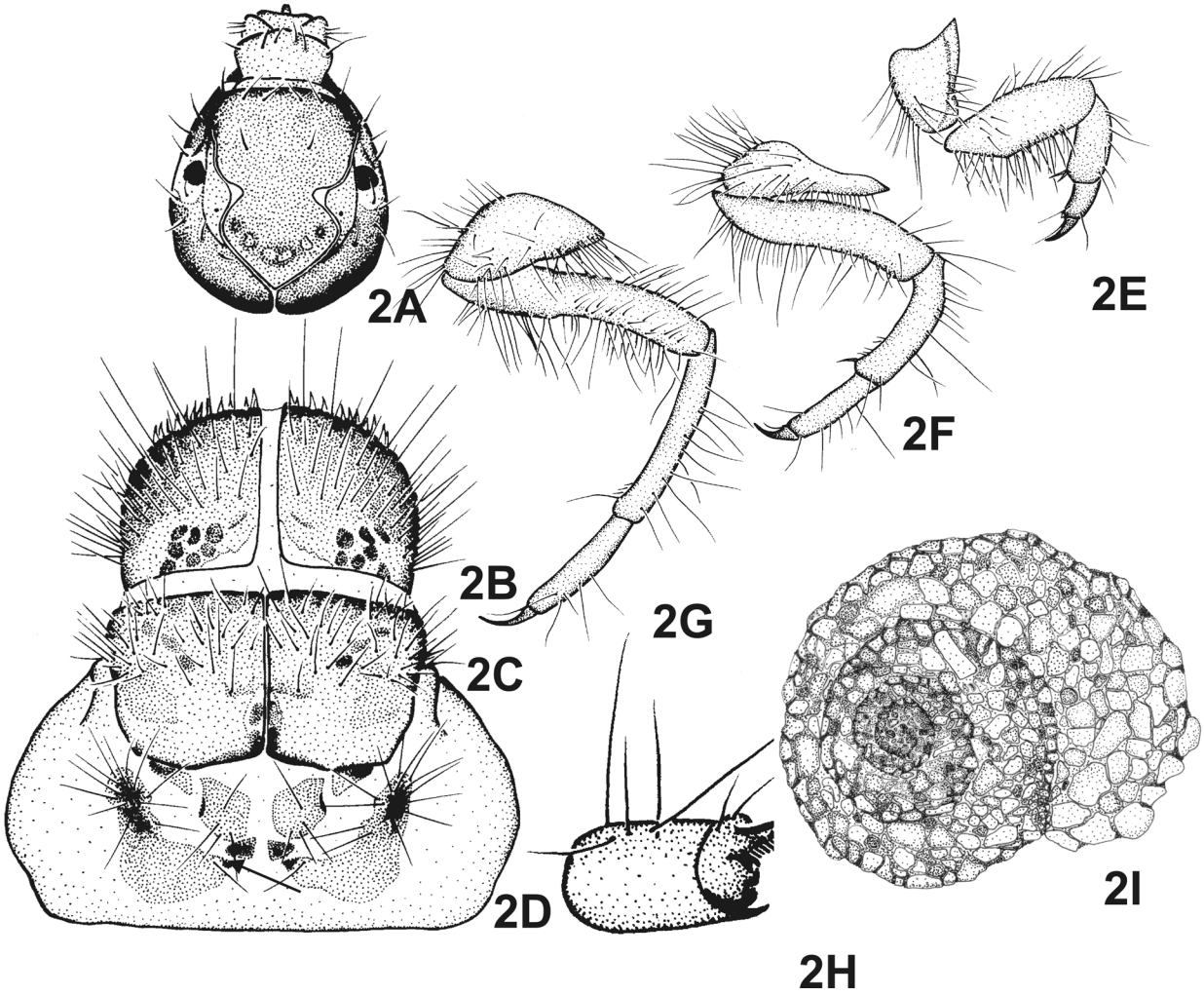

FIGURE 2. *Helicopsyche obscura* **sp. nov.**, larva: 2A, head, dorsal; 2B, pronotum, dorsal; 2C, mesonotum, dorsal; 2D, metanotum, dorsal; 2E, right foreleg, right lateral-posterior; 2F, right mid leg, right lateral-posterior; 2G, right hind leg, right lateral-posterior; 2H, anal proleg, right lateral; I, larval case.

The larva of *H. murina* was associated by Marlier (1964). The illustrated head coloration pattern seems to be similar that of *H. obscura* **sp. nov.**, but in the description, the metanotum has a central sclerite whereas in *H. obscura* **sp. nov.** and *H. turbida* the metanotal sclerites are distributed symmetrically on either side of a median suture and are without a central plate.

Adult male (Fig.1). Mean length of each forewing 9.5 mm (9.4–9.6, n=5). Forewings with light spots arranged transversally. Maxillary palps of male each two-segmented. General coloration dark grey, with pleural areas yellowish (Fig. 1A). Reticulate pattern on sternites III–V. Sternite VI with ventral lobe absent.

Male genitalia (Fig.1). Segment IX annular, with anterior margin straight; posterior margin widened in middle in lateral view (Fig. 1B: ix). Tergum X with truncate apex in lateral view (Fig. 1B: x); apex of tergum X slightly bifid in dorsal view, bearing strong lateral setae and long setae in dorsal area with sclerotized Y-shaped reinforcement with anterior branches (Fig. 1C). Preanal appendages setose, small and rounded (Fig. 1B: ap). Inferior appendages widened in lateral view, posterior and dorsal margins of inferior appendages serrate bearing setae (Fig. 1B: ai); inferior appendages curved in ventral view (Fig. 1D), with internal margins concave, each bearing round basomesal process with short and strong spines, apices of inferior appendages curved mesad and acute. In non-cleared males, inferior appendages mostly dark grey, but light yellowish in posterior marginal area. Phallic apparatus slightly curved with apical area membranous; internal sclerite oval (Fig. 1E).

5th instar larva (Fig. 2). Mean total length 7 mm (n=3). Head round in dorsal view, frontoclypeus and adjacent parietal areas nearly flat and margined with semicircular carina; generally dark brown with light brown muscular scars in posterior area of fronclypeus (Fig. 2A). Pronotum dark brown, with brown muscle scars, internal

posterior angles clear, without coloration, anterior margin with yellowish spines and anterior area of pronotum bearing long setae (Fig. 2B). Mesonotum brown, with muscle scars in different degrees of light brown; posterior internal margins angulate and strongly sclerotized (Fig. 2C). Metanotum with 4 pairs of sclerites, 3 pairs of anteromesal (*sa*1) sclerites small and irregular among which largest each bearing 4 setae and 1 pair of posterior subtriangular sclerites (fused *sa*2 and *sa*3 sclerites) each bearing single seta posteromesally (*sa*2) and several setae anterolaterally (*sa*3) (Fig. 2D). Thoracic legs with chaetotaxy as in Figures 2E–G. Anal prolegs each with lateral sclerite curved; anal claw elongate with accessory parallel teeth pectinate, arranged like comb (Fig. 2H).

Larval case (Fig. 2). Mean anterior diameter: 5 mm (n=3). Made with sand grains attached forming snail–like, helical case (Fig. 2I).

Pupa (Fig. 3). Mean body length: 5 mm (4.9–5.1, n=5). Generally dark brown, almost black, with yellowish abdomen. Mandibles curved with wide bases, each with length 2.5 times basal width, apex pointed and internal margin smooth (Fig. 3A). Paired anterior dorsal hook plates on segments II–V, pair of posterior dorsal hook plates on segment IV asymmetrical; general morphology of dorsal hook plates as in Fig. 3B. Terminal abdominal segment rounded, with two divergent digitate processes, each process bearing 1 subapical and 3 apical setae (Fig. 3C).

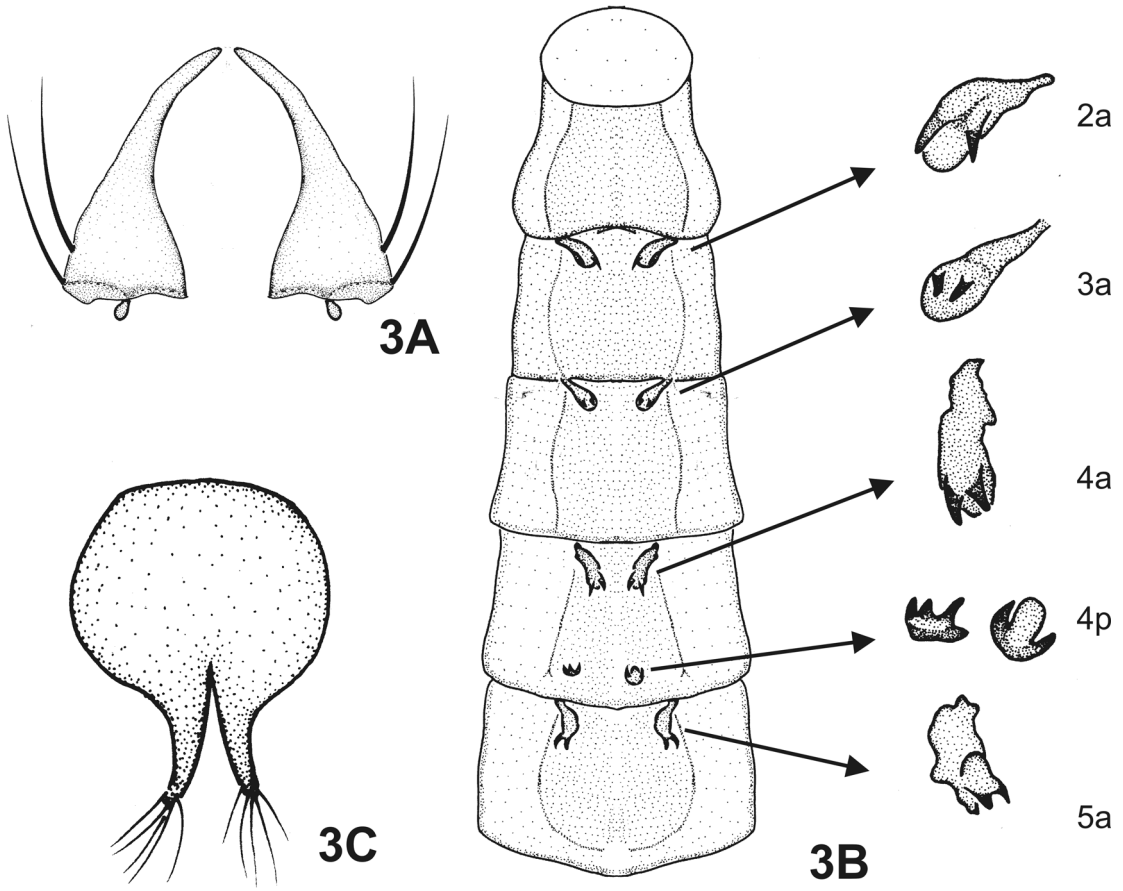

FIGURE. 3. *Helicopsyche obscura* **sp. nov.,** pupa: 3A, mandible, ventral; 3B, abdominal segments I–V, dorsal, with details of dorsal hook plates; 3C, terminal abdominal segment, dorsal. 2a–5a=anterior dorsal hook plates of abdominal segments II–V; 4p=posterior dorsal hook plates of abdominal segment IV.

Biological notes. Larvae of this species were collected in slowly running water in mountain rivers. They are associated with rocks and vegetation. The adults were collected mainly during the day, among rocks near the margins of the river. Males and females were seen in copula in August and September. The adults with folded wings were observed on tops of rocks in groups of 5 or 7 individuals making random movements, possibly exhibiting precopulatory behavior.

Etymology. The name of this new species refers to the generally dark color of the adults and larva and the obscure relationship with *H. turbida*.

Distribution: Argentina (Tucumán).

Material examined. Male holotype: **ARGENTINA: Tucumán:** Anfama, 2645’08,9 S, 06531’22 W, 1169 m, 12.ix.2006, 1 male (IBN).

Paratypes: **ARGENTINA: Tucumán:** Same data as holotype, 4 males (IBN); Río La Hoyada, Garabatal, 2642’4.6 S, 06531’29.1”W, 1270 m, 12.ix.2006, Domínguez et al. cols., 1 metamorphotype male, 3 larvae, 3 pupae (IBN).

Helicopsyche turbida Navás

(Figs 4–6)

Helicopsyche turbida Navás 1923: 200 [Type locality: Argentina, Alta Gracia; MZBS; female]. Schmid 1949: 419 [male, female; redescription]. Flint 1967 [as synonym of *H. muelleri*]; 1982 [as valid species].

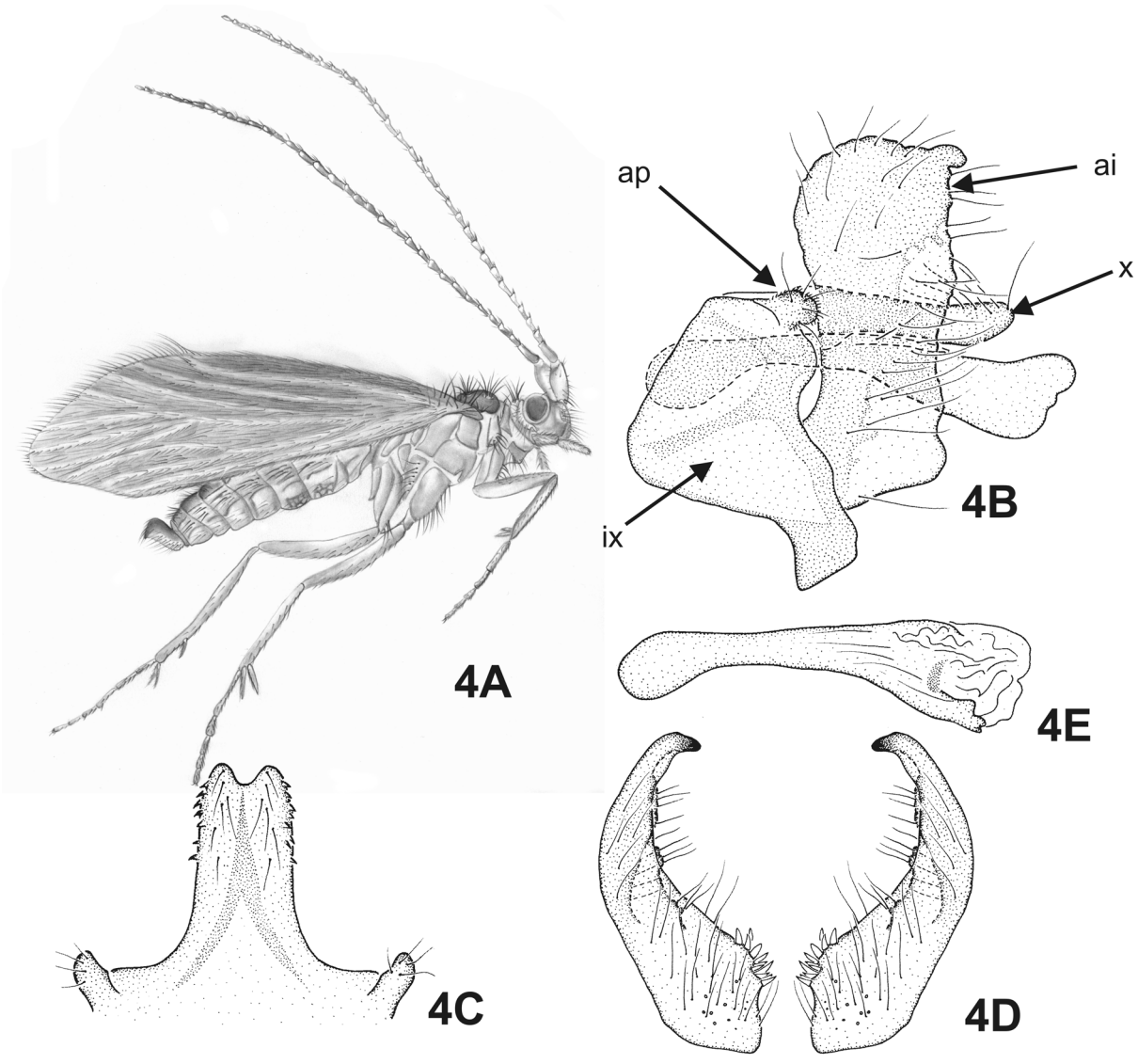

FIGURE. 4. *Helicopsyche turbida* Navás 1923, adult male: 4A, habitus, left lateral; 4B, genitalia, left lateral; 4C, genitalia, dorsal.; 4D, inferior appendages, ventral; 4E, phallic apparatus, left lateral. ix=segment IX; x=segment X; ap=preanal appendages; ai=inferior appendages.

The female of this species was described by Navás (1923). The redescription made by Schmid (1949) does not include characters of the male phallic apparatus. Flint (1967) considered this species as a synonym of *H. muelleri*, a species that is also recorded for the study area, but later the same author (Flint 1982) separated the species again.

Helicopsyche turbida is recognizable by the basomesal lobe of the inferior appendage which is round and fused with the internal margin of the inferior appendage, whereas in *H. muelleri* the lobe is longer and is not fused with the internal margin of the inferior appendage.

Adult (Fig.4). Mean length of each forewing: 6.5 mm (6–7, n=12).

Maxillary palps each two-segmented in male and female. Generally light brown with yellowish spots on legs. Abdominal sternites III–IV with reticulate pattern (Fig. 4A). Lobe of sternite VI absent.

Male genitalia (Fig. 4). Segment IX annular, with posterior margin slightly sinuous; anterior margin broadened medially in lateral view (Fig. 4B: ix). Tergum X with apex slightly broadened and round in lateral view (Fig. 4B: x); with short subapicolateral spines and long subapicodorsal setae and with shallow U–shaped apical excision and Y–shaped re-inforcing sclerotization in dorsal view (Fig. 4C). Preanal appendages small and round (Fig. 4B: ap). Inferior appendages large, apicodorsally broadened with serrate posteroventral margin bearing setae in lateral view (Fig. 4B: ai). In ventral view (Fig. 4D), inferior appendages curved, each with internal margin concave, basal process round and bearing short and strong spines, apex curved mesad and blunt. Phallic apparatus slightly curved, with dorsal apex membranous and internal sclerite oval (Fig. 4E).

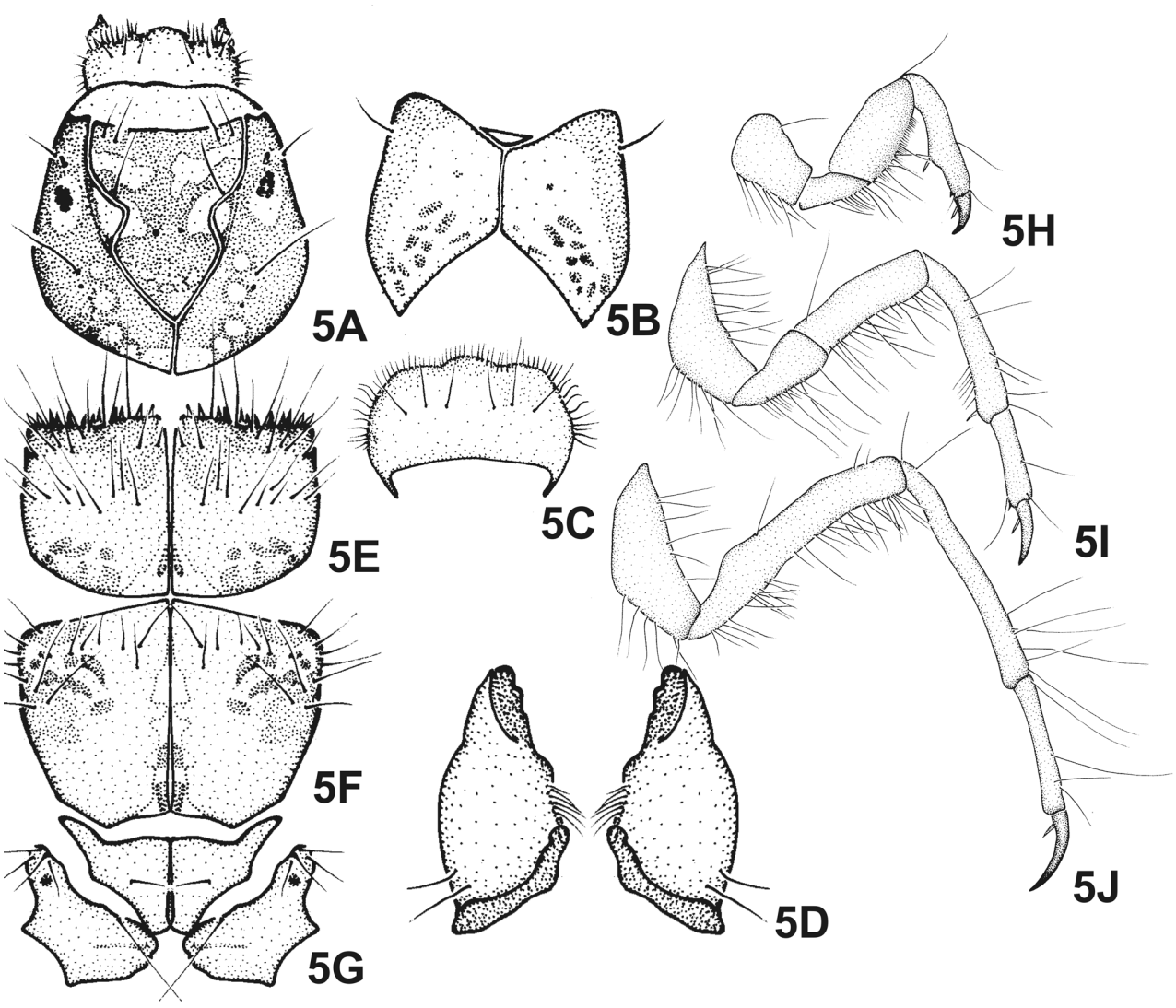

FIGURE. 5. *Helicopsyche turbida* Navás 1923, larva: 5A, head, dorsal.; 5B, head, ventral; 5C, labrum, dorsal; 5D, mandibles, ventral; 5E, pronotum, dorsal; 5F, mesonotum, dorsal; 5G, metanotum, dorsal; 5H, right foreleg, right posterolateral; 5I, right midleg, right posterolateral; 5J, right hind leg, right posterolateral.

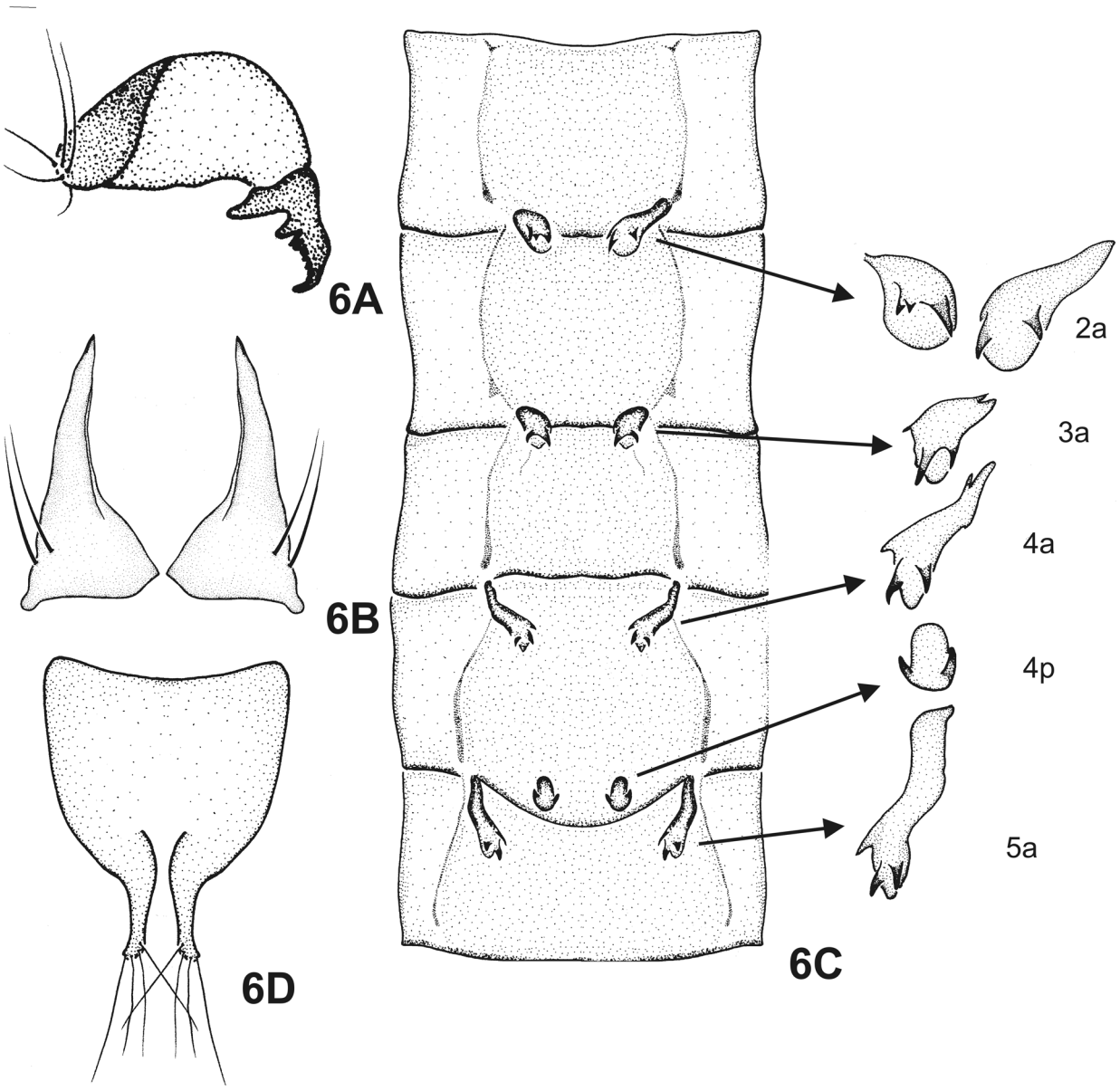

FIGURE 6. *Helicopsyche turbida* Navás 1923: 6A, larval right anal proleg, right lateral. 6B–D, pupa: 6B, mandibles, ventral; 6C, abdominal segments I–V, dorsal, with details of dorsal hook plates; 6D, terminal abdominal segment, dorsal. 2a–5a=one each of paired anterior dorsal hook plates of abdominal segments II–V; 4p=one posterior dorsal hook plate of abdominal segment IV.

5th instar larva (Figs. 5–6). Mean total length: 8.0 mm (7.9–8.1, n=10). Head round in dorsal view with frontoclypeus and adjoining parietal areas nearly flat and margined with semicircular carina (Fig. 5A). Head generally light brown with pale spots on anterior area of frontoclypeus, around stemmata, and around frontoclypeal excision; posterior area of frontoclypeus and lateral sclerites of head with light brown muscle scars (Fig. 5A). Head in ventral view (Fig. 5B) lighter than dorsal area, bearing brown muscle scars (Fig. 5B). Mandibles as in Fig. 5D. Labrum translucent, with many short setae on anterior margin and 6 longer setae on mesodorsal area (Fig. 5C). Pronotum light brown with dark muscle scars and postero–internal angles uncolored; spines of anterior margin yellowish; bearing scarce short setae on anterior area of each pronotal plate (Fig. 5E). Mesonotum lighter than pronotum with muscle scars in various brown shades; posterior margins angulate (Fig. 5F). Metanotum with 2 pairs of sclerites, anteromesal one (*sa*1) subtriangular and not subdivided, and posterolateral sclerite (fused *sa*2 and *sa*3 sclerites) irregular and larger than anteromesal one (Fig. 5G). Thoracic legs with chaetotaxy as in Figs 5H–J. Anal prolegs each with lateral sclerite curved; anal claw elongate with accessory parallel teeth pectinate, arranged as comb; basal tooth bigger than apical ones (Fig. 6A).

Larval case. Mean anterior diameter: 5.0 mm (n=10). Similar that of *H. obscura* **sp. nov.**

Pupa (Fig. 6). Mean body length: 5.0 mm (4.9–5.1, n=10). Generally light brown. Mandibles with wide bases, each twice as long as basal width, with internal margin serrate (Fig. 6B). Abdominal tergites II–V each with pair of anterior dorsal hook plates; tergite IV with paired anterior and posterior hook plates. Hook plates of abdominal segment II asymmetrical. Detail of dorsal hook plates in Fig. 6C. Terminal segment bearing two divergent, digitate processes with wide bases, each process bearing 1 subapical and 3 apical setae (Fig. 6D).

Biological notes. The larvae of *H. turbida* were collected in environments similar to those of *H. obscura* **sp. nov.** The adults were collected during the day, especially at midday when the sun was high.

Distribution. Argentina.

Material examined. Male Holotype**: ARGENTINA: Catamarca:** Arroyo El Pintado, Cerca de La Viña, 18.x.1973, O. S. Flint Jr. col., 1 male (NMNH). **Cordoba**: Alta Gracia, Sierras de Córdoba, 28.i.1927, C. Briuch col., 1 male (NMNH). **Salta:** Metán, Río Las Conchas, 2528'05"S, 06503'00" W, 935 m, 9.xi.2005, Molineri col., 1 male (IBN). **Tucumán**: Río La Hoyada (Garabatal), 2642'04"S, 06531'29"W, 1270 m, 12.ix.2006. E. Domínguez et al. cols., 1 male (IBN); Río Grande, 20.x.05, 15 males (IBN); Río San Javier, 21.iv.2004, Rueda Martín col., 2 males, 9 larvae (IBN); Río Los Noques, 21.iv.2009, Rueda Martín col., 2 male metamorphotypes, 29 larvae, 24 pupae (IBN).

Compared material. *H. muelleri*: **BRASIL: Santa Catarina:** N 18, F. Müller col., 1 male (NMNH).

Leptonema boliviense boliviense Mosely

(Figs. 7–8)

Leptonema boliviense boliviense Mosely 1933: 36 [original description]. Flint et al. 1987: 47 [male redescription, distribution].

This subspecies belongs to the *L. stigmosum* Group. The male of *L. boliviense boliviense* is recognizable by characters of the male genitalia: The shapes of the dorsal excision of tergum X, the two lateral lobes, and the two pairs of dorsal setal warts. The basal segment of each inferior appendage is slightly wider in the mesal area. The phallic apparatus bears an apical setose lobe, a pair of dorsolateral processes directed posterad and a pair of ventrolateral processes directed anterad, both with apical setae. *Leptonema boliviense boliviense* is close to the subspecies *L. b. plumosum* from which it can be differentiated by structures of the phallic apparatus.

Several Neotropical *Leptonema* species had been associated with their immature stages: *L. albovirens* (Walker 1852) (Flint 1968); *L. archboldi* Flint 1968 (Flint 1968), *L. eugnathum* (Müller 1921) (Ulmer 1957), *L. columbianum* Ulmer 1905 (Flint & Wallace 1980), *L. insulanum* Banks 1924 (Flint 1964), *L. poeyi* Banks 1938 (Botosaneanu 1994) and *L. tridens* Mosely 1933 (Nessimian & Dumas 2010).

The descriptions of larvae of *L. poeyi*, *L. alborivens*, *L. archboldi*, and *L. eugnathum* are rather incomplete, so that only a few larval characters can be compared. The larva of *L. boliviense boliviense* is the second largest larva of *Leptonema* described at the moment, with 29 mm (*L. tridens* = 31–40mm). The shape of the head of *L. boliviense boliviense* is similar that of *L. columbianum*, in dorsal view; *L. columbianum* is more setose in the labrum and in the anterior area of the head. In *L. insulanum* the head is long and more nearly rectangular in dorsal view and in *L. tridens*, the head, in lateral view is sharply narrowed anteriorly whereas in *L. boliviense boliviense* it is gradually narrowed from the posterior to the anterior area. The mandibles are asymmetrical, but in *L. columbianum*, *L insulanum*, and *L. tridens* the teeth are more prominent and sharper whereas in *L. boliviense boliviense* the teeth are blunt and the mandibles are shorter and widener. The shape of the mesonotal plates in dorsal view is different: *L. boliviense boliviense* shows posterolateral margins broad and extended and the coloration in the posterior area is discontinuous mesally whereas *L. columbianum* and *L. tridens* have a dark sclerotized area making a complete curve posteriorly. The metanotum in *L. boliviense boliviense* has its posterior margin stronger and darker. The prosternal sclerite is broad in *L. boliviense boliviense*, similar to that of *L. tridens* and *L. columbianun*. The thoracic legs of *L. boliviense boliviense* have fewer and shorter setae than those of *L. columbianum*. The forefemur of *L. boliviense boliviense* is broader than in *L. columbianum* and *L. tridens*, but the forefemur of *L. insulanum* is even broader than the others. Abdominal gills in *L. boliviense boliviense* have a central axis surrounded by regular digitate projections, in *L. columbianum* and in most species of *Leptonema*, the shape is the same but in *L. tridens* the gills are rather irregular. The sclerites of abdominal sternum IX are triangular

in *L. boliviense boliviense*, but in *L. columbianum* and *L. tridens* the sclerites have rounded angles. Pupal characters are different, too. The mandibles of *L. boliviense boliviense* are sharper, longer and with smaller teeth than in *L. columbianum*; in *L tridens*, the pupal mandibles are asymmetrical. The hook plates are distributed on the same segments in *L. columbianum* and *L. boliviense*, but the shape of each plate is different. *Leptonema tridens* has a pair of dorsal hook plates on abdominal segment II that are absent in other species, however the shape of the rest of the dorsal plates are very similar those of *L. boliviense boliviense*. The terminal segment of the *L. boliviense boliviense* pupa is less setose than that of *L. columbianum*.

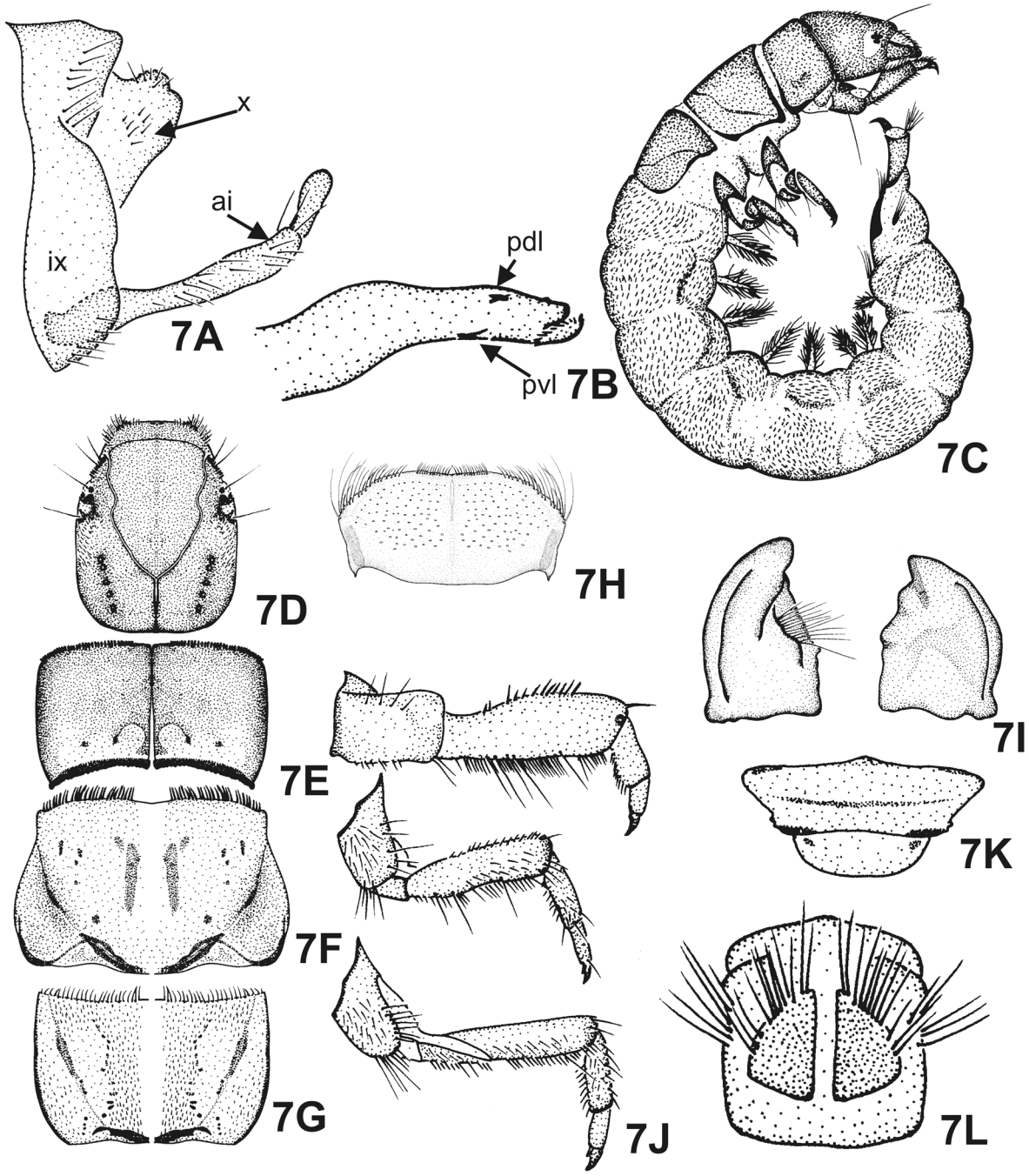

FIGURE. 7. *Leptonema boliviense boliviense* Mosely 1933: 7A–B, adult male: 7A, genitalia, left lateral; 7B, phallic apparatus, left lateral. 7C–L, larva: 7C, habitus of larva; 7D, head, dorsal; 7E, pronotum, dorsal; 7F, mesonotum, dorsal; 7G, metanotum, dorsal; 7H, labrum, dorsal; 7I, mandibles, ventral; 7J, thoracic legs; 7K, prosternal plate; 7L, ventral plates of abdominal segment IX. ix=segment IX; x=tergum X; ai=inferior appendages; pdl=dorsolateral process; pvl=ventrolateral process.

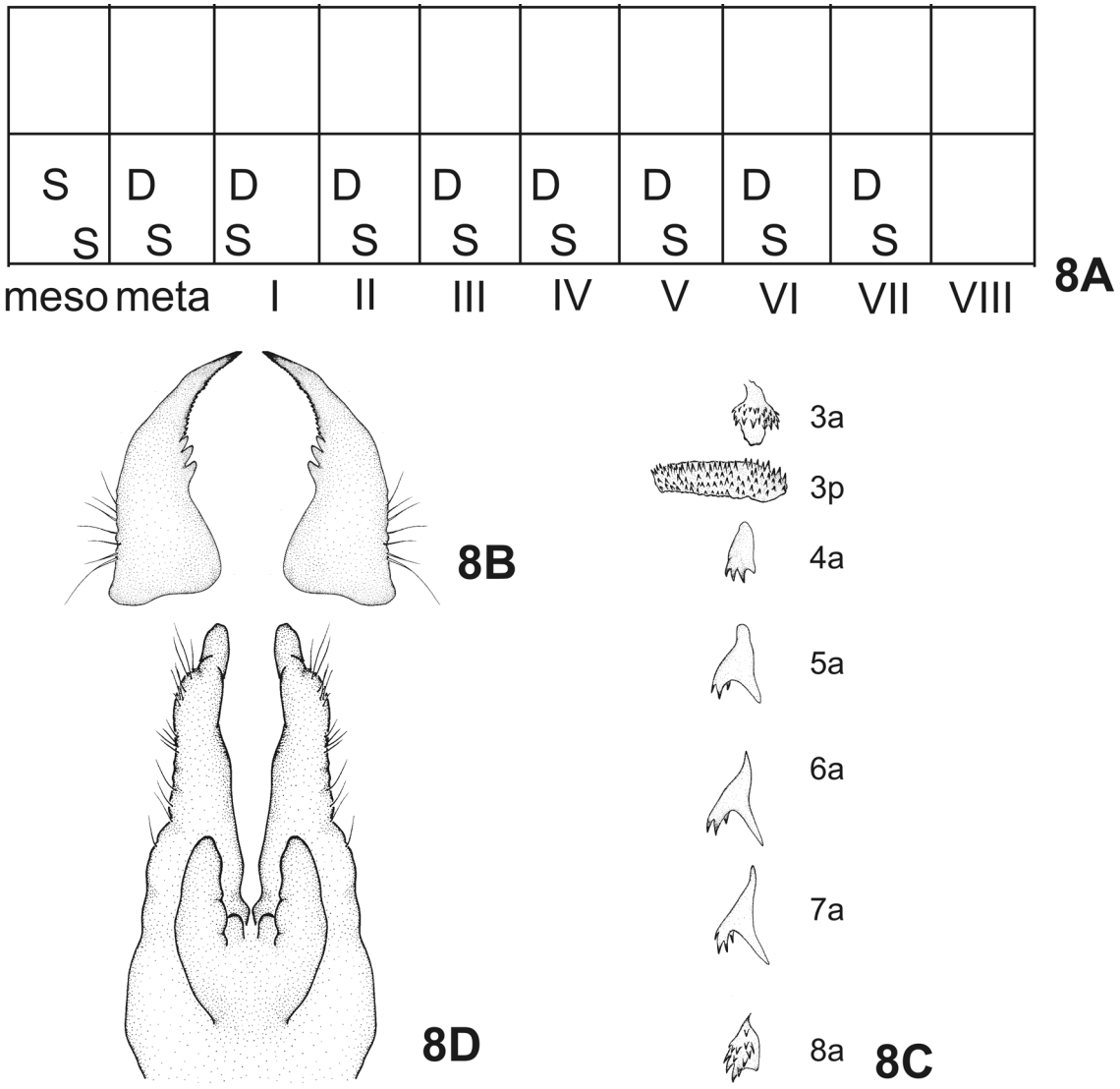

FIGURE 8. *Leptonema boliviense boliviense* Mosely 1933: 8A, pattern of larval abdominal gills. 8B–D, pupa: 8B, mandibles, ventral; 8C, abdominal dorsal hook plates, dorsal; 8D, terminal abdominal segment, dorsal. S=simple; D=double; 3a–8a=one each of paired anterior dorsal hook plates of abdominal segments III–VIII; 3p=one posterior dorsal hook plate of abdominal segment III.

Adult. Mean length of each forewing: 17 mm (Flint *et al.* 1987). General coloration yellowish without scales on wings and body.

Male genitalia (Fig. 7). Segment IX annular, dorsally broader and with medial carina (Fig. 7A:ix). Tergum X with mesal excision U–shaped in dorsal view; lateral lobe bilobed with two dorsal setal warts (Fig. 7A: x). Inferior appendages long and slender, with basal segment broader near middle; apical segment 1/3 as long as basal segment, curved to midline. Phallic apparatus tubular with membranous apical lobe directed posterad and bearing setae; dorsolateral process of phallic apparatus short, directed posterad with short apical setae (Fig. 7B: pdl); ventrolateral process of phallic apparatus short, directed posterad and bearing short apical setae (Fig. 7B: pvl).

5th instar larva (Fig. 7–8). Mean total length: 29 mm (27–30, n=15). General color brown. Head dark brown, clear around stemmata (Fig. 7C); head almost square posteriorly in dorsal view, nearly round on anterior margin; anterolateral area of head bearing short modified yellowish setae with truncate apices, parietal sclerites each with dorsal longitudinal line of short, strong, gold setae (Fig. 7D). Ventrolateral regions of head with pair of areas with transverse stridulatory lines. Labrum with brush of long, curved, yellowish setae on anterolateral margin; mesal anterior margin of labrum with short setae (Fig. 7H). Mandibles asymmetrical, right mandible with concave area bearing yellowish setae; left mandible with lateral margin strongly sclerotized and with three mesal teeth (Fig. 7I).

Pronotum dark brown with short and truncate setae on anterior margin; posterior margin of pronotum black, strongly sclerotized; each pronotal plate bearing semicircular groove and two small dark spots (Fig. 7E). Mesonotum and metanotum with curved setae in anterior margins; surfaces recovered with dark setae; muscle scar patterns as in Figs 7 F–G. Prosternum irregular, subtriangular, broader anteriorly with short, broad anteromesal projection; posteriorly rounded, coloration pattern as in Fig. 7K. Chaetotaxy of thoracic legs as in Fig. 7J. Forefemur wider in distal 2/3rds, with pointed dorsal process probably associated with stridulation function. Abdomen with pattern of abdominal gills as in Fig. 8A, lateral line vague. Segment IX with pair of ventral subtriangular plates bearing posterior setae (Fig. 7L). Anal prolegs each with brush of long setae on posterior margin of each lateral plate.

Pupa (Fig. 8). Mean body length: 14 mm (n=3). General color in alcohol yellowish. Mandibles each 2.5 times as long as basal width, curved, pointed, bearing serrated internal margins (Fig. 8B). Abdominal tergites III–VIII bearing anterior dorsal hook plates; abdominal tergite III bearing also posterior pair of hook plates (Fig. 8C). Terminal segment elongate with two digitate projections bearing lateral setae (Fig. 8D).

Biology. Larvae of *L. boliviense boliviense* were collected in rivers with much marginal vegetation. These rivers and springs have stony bottoms and abundant allochthonous organic debris from the riparian vegetation. The larva builds a retreat, with sand and bigger stone pieces between stones in small waterfall areas. In the stomachs of some larvae we found coarse particulate organic matter, mainly pieces of leaves. The second most commonly found items were algae and some arthropod sclerites.

Distribution. Argentina, Bolivia, Peru.

Material examined. ARGENTINA: Jujuy: Camino a Tiraxi, Arroyo Hondo Bajo Puente, 2400’25”S, 06522’9 W, 1700 m, Romero & Molineri cols, 2 larvae (IBN); Río Yala, 20.vi.2009, 7 larvae (IBN); **Salta:** Santa Victoria, Río Los Naranjos, 2225’47”S, 06444’20"W, 1109 m, 13.xi.2004, P. Rueda Martín col., 5 larvae, 1 pupa, 20 males (IBN); Los Toldos, Río Huaico Grande, 2216’44”S, 06442’39”W, 1645 m,, 26.x.1999, 3 males (IBN); Río Huaico Grande, 2216’44”S, 06442’39”W, 1645 m, 11.xi.2004, P. Rueda Martín col., 3 pupae, 2 metamorphotype males (IBN); **Tucumán:** Afluente Río Raco, Manantial, 3.iii.2009,1 larva, 1 metamorphotype male (IBN); Arroyo Calimayo, antes de la papelera, 265533”S, 0652319”W, 493 m, 28.vii.2006, Rueda Martín col., 6 larvae (IBN).

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