

The larva of *Aeshna williamsoniana* (Odonata: Anisoptera: Aeshnidae)

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Abstract—The larva of *Aeshna williamsoniana* Calvert, 1905 is described in detail, illustrated, and compared with other larvae of the genus and family. It is distinguished from its congeners by its granular integument, body mostly lacking hairlike setae, cerci with a row of spiniform setae along the lateroexternal margins, and dorsomedial margin of female epiproct with a row of spiniform setae. It does not particularly resemble any other larva of *Aeshna* or related genera described to date. The larval habitat is described for the first time.

Résumé—Une description détaillée et illustrée des larves de *Aeshna williamsoniana* Calvert, 1905 a été faite. La larve de cette espèce ont été comparée avec autres larves du genre. Les principales caractéristiques des larves de *A. williamsoniana* sont tégument granuleux, corps dépourvu de grandes soies, le cerci avec une rangée latérale de soies épiniformes et l'épipectum de la femelle avec une rangée dorsale de soies épiniformes. L'habitat de la larve est décrite pour la première fois.

Introduction

Aeshna williamsoniana Calvert is an apparently rare species with very small populations, as evidenced by its scarce presence in collections. It ranges from Mexico to Panama (Garrison *et al.* 2006). In Mexico it has been recorded only from the states of Morelos (Calvert 1905; González-Soriano and Novelo-Gutiérrez 1996) and Veracruz (González-Soriano and Novelo-Gutiérrez 1996). In a cladistic analysis included in her excellent synopsis of the Neotropical species of “*Aeshna*” Fabricius, von Ellenrieder (2003) concluded that *A. williamsoniana* (and other “*Aeshna*” species) are problematic because they are interspersed at the bases of different genera, remaining at present in an uncertain position, although more closely related to *Anaciaeschna* Selys and *Andaeshna* De Marmels than to *Aeshna* (s. str.) or *Rhionaeschna* Förster. Thus, von Ellenrieder (2003) suggested that *A. williamsoniana* and other “*Aeshna*” species should be assigned to new or different genera. In this paper I describe the larva of *A. williamsoniana*, providing the first record for Michoacan State and characterizing the habitat of this species for the first time.

Comparison with other described “*Aeshna*” larvae is problematic owing to highly variable and heterogeneous descriptions. Thus, comparisons were made with larvae available at the collection of the Instituto de Ecología, A.C., Xalapa, Mexico (IEXA).

Aeshna williamsoniana Calvert

(Figs. 1–12)

Material examined

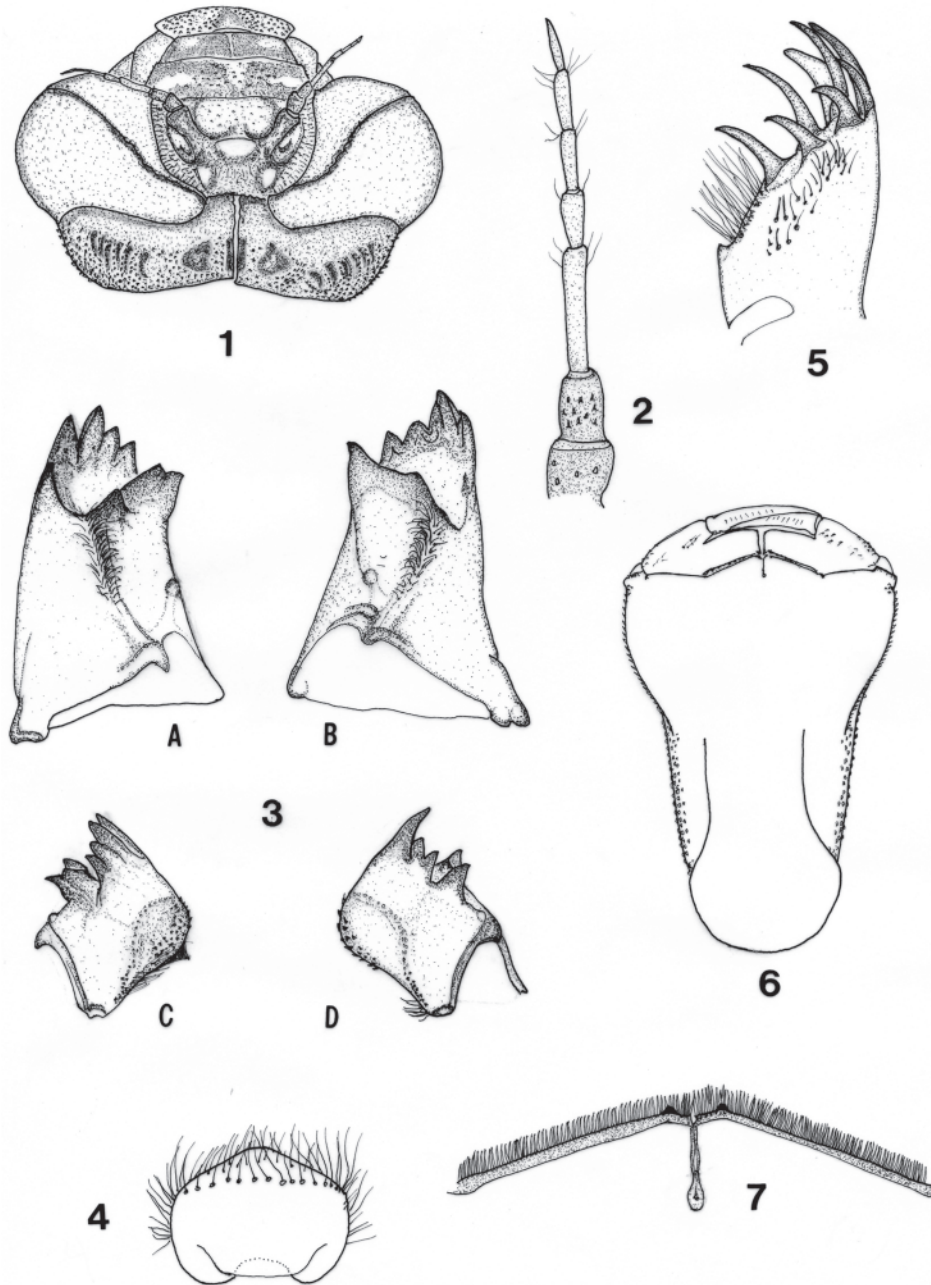
One exuviae (♀, reared), 1 antepenultimate? instar larva (♂) (both in ethanol). **MEXICO.** **Michoacán:** Municipio de Chinicuilá, La Nuez, “Cañada El Colorín” (19°00′36″N, 103°01′25″W, mountainous creek at 1050 m), 1.iv.2005, J.A. Gómez and R. Novelo leg. (1 ♀, last instar larva). **Morelos:** Municipio de Tepoztlán, Camohmila (18°58′33″N, 99°04′47″W, stream, 1550 m), 13.ii.1993, R. Novelo leg. (1 ♂, antepenultimate? instar larva). Deposited at IEXA.

Description

Exuviae light brown, last-instar larva dark brown when alive, cast skin roughly granulated and hairless. Femora ringed with pale and dark bands. Abdomen lanceolate with a complex color pattern (Fig. 10).

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Figs. 1–7. *Aeshna williamsoniana*, female exuviae, details of morphology. 1, Head, dorsal view. 2, Left antenna, lateral view. 3, Mandibles: a and b, ventrointernal view of right and left mandibles, respectively; c and d, dorsoexternal view of right and left mandibles, respectively. 4, Hypopharynx, ventral view. 5, Left galeolacinia, ventral view. 6, Prementum, dorsal view. 7, Detail of ligula, ventral view.

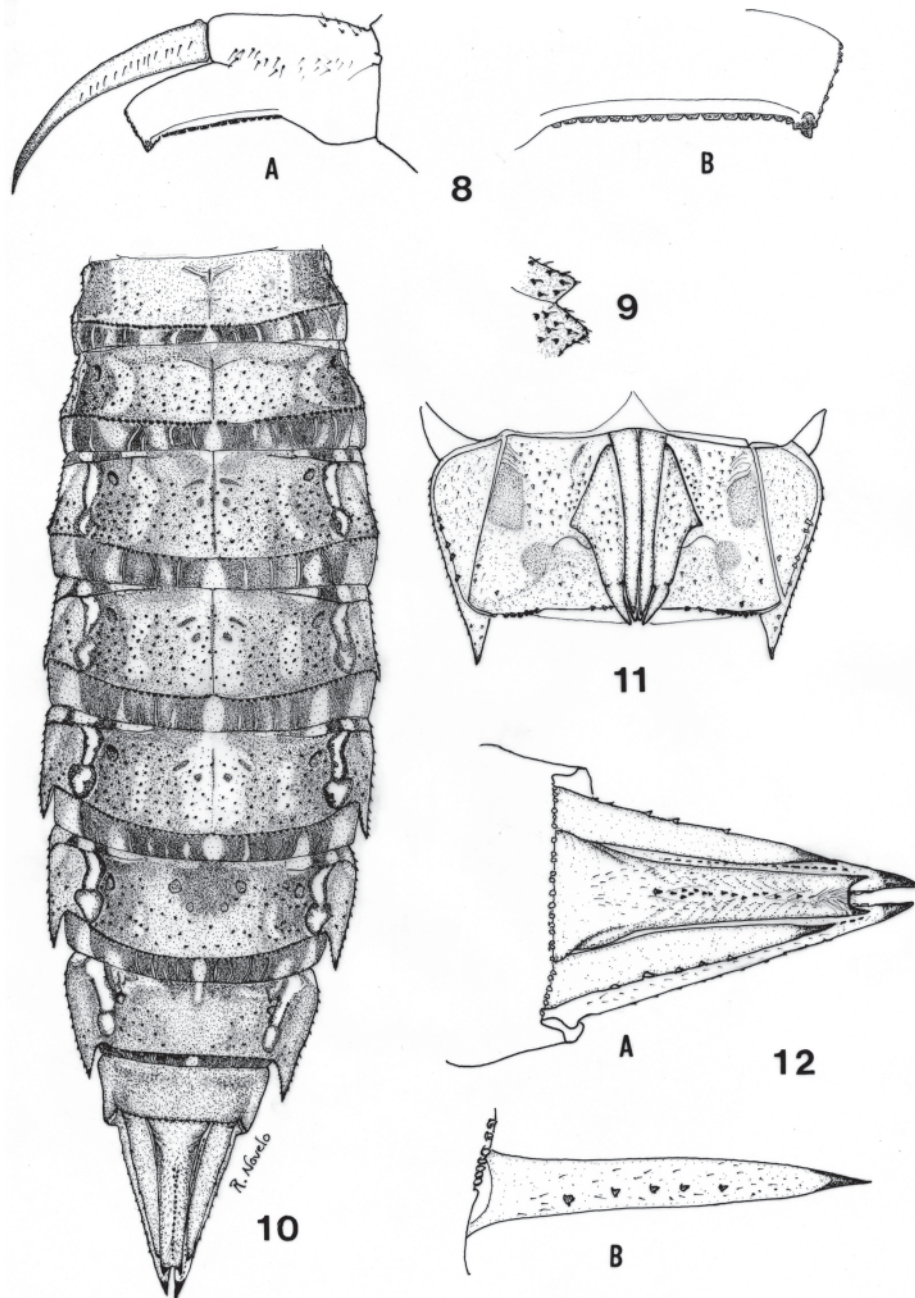


Head (Fig. 1)

Wider than long, with abundant minute spiniform setae except on anteclypeus, which is glabrous; occipital margin concave, cephalic lobes rounded with longitudinal rows of spiniform

setae. Compound eyes large. Antennae 7-segmented (Fig. 2), the third segment the longest, relative length of antennomeres 0.50, 0.50, 1.0, 0.40, 0.40, 0.40, 0.40, scape and pedicel slightly darker than flagellomeres and with

Figs. 8–12. *Aeshna williamsoniana*, female exuviae, details of morphology. 8, Right labial palp: a, dorsal view; b, detail of distal and internal borders, ventral view. 9, Right prothoracic apophyses, dorsal view. 10, Dorsal view of abdominal segments 3–10 showing the complicated color pattern. 11, Sternite 9 and gonapophyses. 12, Caudal appendages: a, dorsal view of epiproct, cerci, and paraprocts; b, lateral view of left cercus.



minute spiniform setae on dorsal surface, flagellomeres mostly bare except for some scattered hairlike setae, mainly on apices. Labrum granulose (Fig. 1), with a bare, central, oval area; inferior margin setose. **Mandibles** (Fig. 3)

with formula R 1 2 3 4 y a' b (Fig. 3a) / L 1 2 3 4 0 a (m) b (Fig. 3b) (Watson 1956); both mandibles with a dense brush of short, stout, stiff setae along the ventrointernal border (Figs. 3a, 3b), the dorsointernal border ending

basally in a small, obtuse, mound-like protuberance (Figs. 3*a*, 3*b*); basal external area with numerous short, stiff setae and spiniform setae (Figs. 3*c*, 3*d*). Ventral pad of hypopharynx subrectangular, a little wider than long, densely setose on anterior and lateral margins (Fig. 4). **Maxilla:** galeolacinia with 7 long, robust, incurved teeth (Fig. 5) and a row of long, stiff setae; palp incurved, ending in a robust spine, with numerous long, stiff setae on its internal surface; a short, basal, blunt spine at inner margin. **Labium:** prementum-postmentum articulation reaching anterior margin of metacoxae. Prementum (Fig. 6) 0.25 times longer than its widest part, lateral margins more or less straight along basal 0.55, with a granular aspect given by the basal insertions of several rows of minute spiniform setae, apical 0.45 convex with a single row of spiniform setae. Ligula moderately prominent (Fig. 6), as long as 0.20 of its width; its distal margin (Fig. 7) covered with abundant piliform setae and two small, blunt spines, one on each side of median cleft (best seen in ventral view); median cleft deep, closed. Apical lobe of palp (Figs. 8*a*, 8*b*) squarely truncate, rounded on external angle, with a stout, blunt end-spine at the internal angle; apical and internal margins serrate; a group of 15–20 setulae extending medially from near base of movable hook to near articulation of palp (Fig. 8*a*). Movable hook long, as long as palp; sharply pointed, with a row of 15–16 small, inwardly directed, stiff setae on basal 0.70 of its dorsal surface (Fig. 8*a*).

Thorax

Pronotum granulose with a transverse, elongate, bare area to each side of midline; pale, with two dark, wide bands, one to each side of middle; lateral margins rounded and with minute spiniform setae, posterior margin sinuate. Proepisterna and proepimera projected laterally, forming a V-shaped, bluntly tipped protuberance (Fig. 9); proepimeral protuberance the largest. Synthorax dark, with some irregular pale spots, densely covered by minute spiniform setae. Anterior and posterior wing sheaths parallel (when alive), the anterior ones scarcely surpassing the posterior margin of abdominal segment 3, the posterior ones almost reaching the posterior margin of segment 4. Legs yellowish brown, with abundant spiniform setae. Femora with alternating dark and pale rings, the dark ones the widest; apex of protibiae and

ventral surfaces of all tarsi with tridentate, scale-like setae; tarsal claws simple.

Abdomen

Lanceolate (Fig. 10), granulose on dorsal and ventral surfaces, reaching its maximum width on abdominal segment 6; lateral margins of segments 2–9 with small spiniform setae, lateral margins of 6–9 ending in a robust spine, largest on 8; posterior margins of tergites 1–10 and sternites 3–10 with a row of obtuse, dark serrations that increase in size gradually from front to rear. Color pattern complex (Fig. 10). Male gonapophyses indiscernible. Female gonapophyses well developed (Fig. 11), slightly surpassing posterior margin of sternite 9, lateral valvae very slightly longer than central ones, apical 0.20 convergent and sharply pointed; central valvae parallel, sharply pointed. Caudal appendages light brown with tips reddish, moderately spinulose. Male epiproct with a triangular tubercle on dorsobasal 0.38; the apical 0.70 parallel-sided, ending in two sharp points widely separated by a median U-shaped cleft; dorsal margin with a row of spiniform setae intermingled with delicate setae. Female epiproct (Fig. 12*a*) without dorsobasal tubercle; other features as in male. Cerci long (Figs. 12*a*, 12*b*), tapering caudad, sharply pointed, tips rather parallel; lateroexternal margins with a row of 5–6 small spiniform setae (Fig. 12*b*), in addition to the minute spiniform setae that cover its entire surface. Paraprocts pyramidal, dorsal and lateroexternal margins with a row of small spiniform setae, internal margin serrate, serrations low and truncate; tips red, sharply pointed, slightly convergent (Fig. 12*a*).

Measurements (mm)

Total length of female final exuviae (including appendages) 49, male 44; abdomen (ventral), female 33, male 33; maximum width of head, female 9.6, male 7.9; hind femur (dorsal), female 8.3, male 6.7. Lateral spines on abdomen: on 6, female 0.4, male 0.3; on 7, female 1.0, male 0.7; on 8, female 1.2, male 1.0; on 9, female 1.1, male 1.0. Caudal appendages (dorsal): epiproct, female 4.0, male 3.6; cerci, female 3.7, male 2.3; paraprocts, female 5.0, male 4.5. Size proportions (measured dorsally): epiproct, female 0.80, male 0.80; cerci, female 0.74, male 0.54; paraprocts, female 1.0, male 1.0.

Larval habitat

The female last-instar larva of *Aeshna williamsoniana* was found in a shaded pool (3 m wide, 60 cm deep) in a forested part of a mountainous, narrow creek with abundant big boulders, within a substrate composed mainly of fine gravel, sand, mud, and decayed leaves. The specimen, collected on 1 April 2005, was maintained alive until its emergence, which occurred in vertical position at 0140 h on 27 April 2005.

Discussion

The larva of *Aeshna williamsoniana* can be distinguished from all other known Aeshninae larvae by the following combination of features: abdominal tegument granular, including posterior margins; complete absence of hairlike setae on most of body's surface; cerci with a row of spiniform setae along the lateroexternal margins (Fig. 12); dorsomedial margin of female epiproct with a row of spiniform setae and a tuft of hairlike setae at distal end (Fig. 12); length of ligula 0.20 of its width; setae on dorsal surface of movable hook small, the basal one as long as one third or less of the basal width of movable hook (Fig. 8a); a group of setae close to insertion of movable hook approximately uniform in size.

On the other hand, the larva of *A. williamsoniana* resembles other Aeshninae larvae as follows: a mound-like protuberance below the molar crest on mandibles (*Rhionaeschna pallipes* (Fraser), as described and illustrated by von Ellenrieder and Muzón 2003); setae on dorsal surface of movable hook short, as described above (*Rhionaeschna californica* (Calvert); *Aeshna eremita* Scudder, *A. umbrosa* Walker, and *A. palmata* Hagen; *Andaeshna andresi* (Rácenis), as illustrated by De Marmels 1992); ligula moderately developed (0.18–0.20 as long as its width) (*Rhionaeschna jalapensis* (Williamson)); straight angle between prothoracic apophyses, apexes blunt (*Rhionaeschna bonariensis* (Rambur), as described by von Ellenrieder 2001); female gonapophyses surpassing posterior margin of sternite 9 (*A. palmata*, *A. umbrosa*); posterior margin of sternite 10 granulate (*A. eremita*, *Aeshna interrupta* Walker, *A. palmata*); size proportion of paraprot: epiproct:cerci (*R. jalapensis*, 1:0.8:0.7; *Rhionaeschna psilus* (Calvert), 1:0.78:0.72).

Apparently, the spiniform setae on the lateroexternal surface of the cerci are exclusive

to the larva of *A. williamsoniana* among its closest relatives, as these setae have not been described in the literature (e.g., Walker 1958; De Marmels 1982, 2001; Butler 1998; Chelmick 2001), although they are present in *Oplonaeschna* Selys, another genus of Aeshnidae (cf. González-Soriano and Novelo-Gutiérrez 1998).

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