

**DESCRIPTION OF NEW NEOTROPICAL BEROSINI LARVAE: *DERALLUS*
PARANENSIS AND *HEMIOSUS DEJEANII* (COLEOPTERA: HYDROPHILIDAE)**

MIGUEL ARCHANGELSKY

CONICET – Laboratorio de Ecología Acuática
Universidad Nacional de La Patagonia San Juan Bosco
Sarmiento 849, 9200 Esquel, Chubut, ARGENTINA
hydrophilidae@hotmail.com

AND

LILIANA A. FERNÁNDEZ

División Entomología del Museo de La Plata
Paseo del Bosque, La Plata 1900, Buenos Aires, ARGENTINA
liliafer@museo.fcnym.unlp.edu.ar

Abstract

The larval stages of the Neotropical species *Derallus paranensis* Oliva, 1981 and *Hemiosus dejeanii* (Solier, 1849) are described and figured for the first time. Notes on the bionomics of these two species are included. Larvae of *D. paranensis* and *H. dejeanii* are compared to those of other *Derallus* Sharp and *Hemiosus* Sharp species. Comparative notes to differentiate larvae of two genera related to *Derallus*, *Allocotocerus* Kraatz and *Regimbartia* Zaitzev are provided.

The genera *Hemiosus* Sharp and *Derallus* Sharp belong to the tribe Berosini. With the exception of one species of *Derallus* and two of *Hemiosus*, that reach the south of the Nearctic region, both genera are endemic to the Neotropical region (Hansen 1991, 1999). The genus *Hemiosus* has 32 described species (Oliva 1991, 1994a, b; Hansen 1999) while the genus *Derallus* includes 15 species (Oliva 1981, 1983, 1995; Hansen 1999).

Larval descriptions for these genera are scarce, and most of them are quite recent. The first description of the larva of *Derallus* was published by Spangler (1966), who described the larva of *D. rudis* Sharp, 1887; more recently Archangelsky and Durand (1992) described all the preimaginal stages of *D. angustus* Sharp, 1882. In the case of the genus *Hemiosus*, the first larval description is that of *H. bruchi* Knisch, 1924, published by Archangelsky (2000); two years later a second description, that of *H. multimaculatus* (Jensen-Haarup, 1910), was published (Archangelsky 2002).

In this paper we describe and illustrate, for the first time, the larvae of two Argentine species, *Derallus paranensis* Oliva, 1981 and *Hemiosus dejeanii* (Solier, 1849). We also compare the larvae of these two species with other known larvae of the genera *Hemiosus* and *Derallus*. These descriptions also confirm that the larval diagnostic characters used till now for the two genera are consistent. Comparative notes with larvae of two genera related to *Derallus*, *Allocotocerus* Kraatz and *Regimbartia* Zaitzev, recently described by Watts (2002) are included.

Materials and Methods

Larvae and adults of *Hemiosus dejeanii* were collected from pools of water gathered at the margins of the Percey River in western Chubut province. Since this is the only *Hemiosus* known to occur in the province, there was no doubt with the larval-adult association.

Larvae and adults of *Derallus paranensis* were obtained from three collecting sites in Punta Lara (Ensenada, Buenos Aires province, Argentina), near the shore of Río de La Plata estuary. These sites were sampled regularly for two years (August 1996–June 1998) as part of an ecological study in the ecotone between subtropical forest and pamasic grassland (von Ellenrieder and Fernández 2000).

Larvae of *Hemiosus dejeanii* were fixed with boiling water, and stored in 75% alcohol. Larvae of *Derallus paranensis* were fixed directly in 70% alcohol since they were obtained from samples processed with a Berlese funnel.

Descriptions and illustrations were made using a Leitz DMLB compound scope with a camera lucida. Illustrations were scanned and plates were put together with the aid of a computer. The identification of the adults was done using the keys from Oliva (1981, 1994a).

Derallus paranensis Oliva, 1981

(Figs. 1–9)

Material Examined. ARGENTINA, Buenos Aires province: Partido de Ensenada, Punta Lara N. von Ellenrieder and L. A. Fernández coll. (44 larvae).

Description. Egg case. Attached to the lower surface of *Azolla filliculoides* Lam. leaves. Flat and round similar to the egg case of *D. angustus* (Archangelsky and Durand 1992). The only egg case reared in the laboratory contained seven eggs.

Third Instar Larva. Length: 3.8 to 5.3 mm, wider at midlength (between metathorax and second abdominal segment). Color light brown, with sclerotized parts darker; non-sclerotized integument covered by cuticular asperities, denser and rougher on dorsal side.

Head capsule subquadrate (Fig. 1); occipital foramen wide, dorsal part of cervix with two subquadrate cervical sclerites. Frontoantennal lines parallel, reaching base of head capsule widely separated; coronal line absent (in third instar larvae the ecdysial line is vestigial). Vertex of head with vestiture of small and flat, tooth-like cuticular projections pointing antieriad. Six stemmata on each anterolateral corner of head capsule, close to base of antennae.

Clypeolabrum symmetrical (Fig. 2). Nasale with several tooth-like cuticular projections and eight short setae; ventral side of nasale with short spicules. Lateral lobes of epistome rounded, not projecting farther than nasale, each with three slender setae.

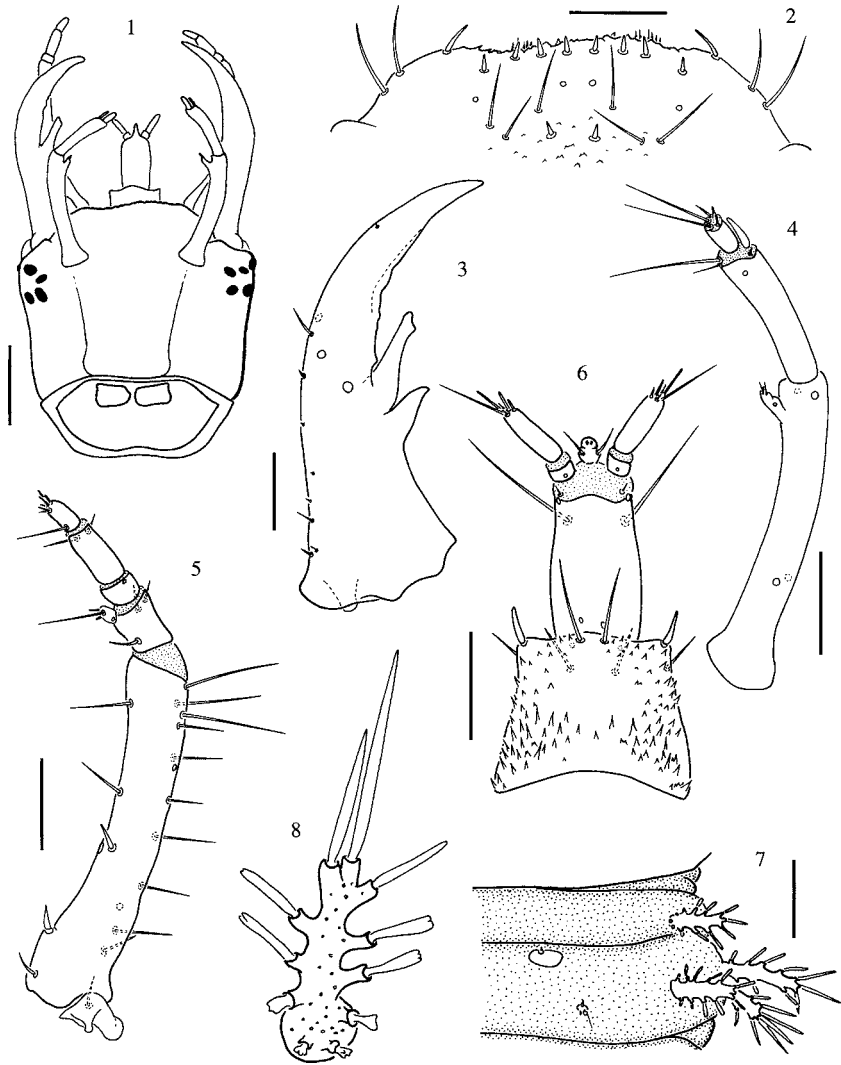
Mandibles symmetrical (Fig. 3), with two large inner teeth; distal tooth irregularly shaped, with blunt apex, basal tooth smaller, with sharper apex.

Antennae three-segmented (Fig. 4); basal segment longer than other two combined, bearing four campaniform sensilla and one inner preapical projection bearing three distal setae and one campaniform sensillum or pore. Second segment slightly slender, with three distal setae, two on inner margin, one on outer margin; distal sensory appendage present on outer apical margin, almost as long as last antennal segment. Third segment the smallest, usually with five apical setae or sensoria, two long and three short ones (in a few cases the number was four or six setae or sensoria).

Maxillae five-segmented (Fig. 5), longer than antennae; cardo small, irregularly shaped, with long outer seta. Stipes the longest segment, with row of five inner setae; outer margin with ten long setae (in some specimens the number of setae on the outer margin is lower, ranging between seven and nine). Palp four-segmented, second and fourth segments the shortest; basal segment the widest, bearing three slender setae and one short inner process with three distal setae; second segment short, lacking setae; third segment with two subapical setae on ventral side; last segment bearing one long basal seta, projecting mediad, and six short distal setae.

Labium well developed (Fig. 6). Submentum large, subpentagonal, wider than mentum. Mentum subquadrate, with strong cuticular spines at base and margins; dorsal anterior margin with two pairs of setae, ventral side with two pairs of subapical setae. Prementum rectangular, longer than wide, with two short setae close to base of palps on dorsal side, two long setae on ventral side. Ligula short, easily seen in dorsal view, with two setae at midlength; labial palpi long, two-segmented; basal segment short, bare; second segment long, bearing five apical setae.

Prothorax wider than head capsule; pronotal shield formed by two large plates separated by fine sagittal line; prosternum subpentagonal, with short incomplete sagittal line on basal part.



Figs. 1-8. *Derallus paranensis*, third instar larva, dorsal view. 1) Head capsule; 2) clypeolabrum; 3) left mandible; 4) right antenna; 5) right maxilla, dorsal view; 6) labium; 7) second abdominal segment; 8) detail of setiferous projection. Scale bars: Figures 1 and 7 = 0.2 mm, Figures 2-6 = 0.1 mm.

Mesonotum with two pairs of dorsal sclerites, anterior pair small and subtriangular, posterior pair large, subtriangular; metanotum with two pairs of subrectangular sclerites, anterior pair larger. Pleural areas membranous, those of meso- and metathorax with setiferous projections, three on each pleura. Legs, five-segmented, visible in dorsal view; all three pairs similar in shape, coxae subtriangular, widely separated and elongate, trochanter short, femur as long as coxa but slender, tibiotarsus shorter and slightly slender than femur, pretarsal claw half the length of tibia, with small basal toothlet.

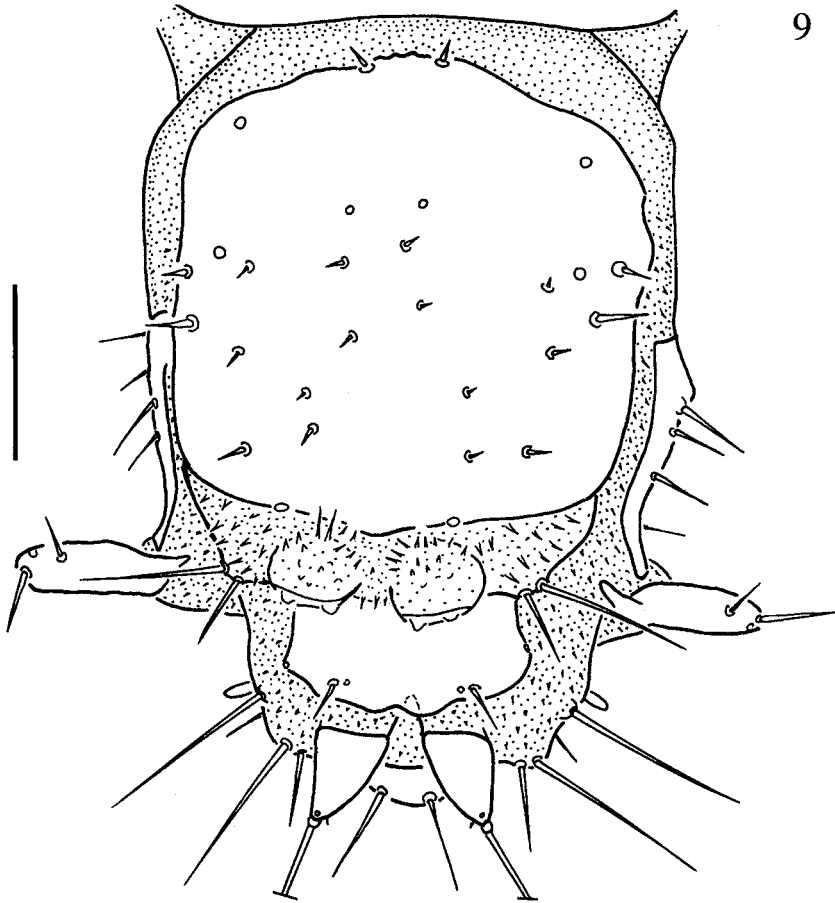


Fig. 9. *Derallus paranensis*, third instar larva, spiracular atrium (abdominal segments VIII and IX). Scale bar = 0.1 mm.

Abdomen ten-segmented, tapering towards posterior end, segments VIII and IX forming spiracular atrium (Fig. 9), segment X reduced. Segments I to VII similar in size and shape, each with one pair of small sclerites and one small sensorium-bearing plate posterior to sclerite; segments II to VIII subdivided by one transverse fold. Segment I with three pairs of lateral setiferous projections; segments II to VII with four pairs of setiferous projections, one on anterior fold, three on posterior fold (Figs. 7–8). Segment VIII (Fig. 9) with large dorsal subquadrangular plate and a pair of short, one-segmented lateral appendages (paracerci); posterior to tergal plate two pairs of tubercles, inner pair spinose, outer pair with two long setae. Segment IX trilobed, partially covered by eighth, with a pair of short, one-segmented, strongly sclerotized urogomphi.

Nine pairs of spiracles, one on mesothorax and eight abdominal. Thoracic and first seven abdominal pairs of spiracles non-functional. Last abdominal pair enclosed within spiracular atrium.

Comparative Notes with First and Second Instar Larvae. First instar larvae show several differences, besides the size (Table 1), with third instars: 1) nasale without tooth-like cuticular projections; 2) antennae with basal segment shorter than other two

Table 1. Descriptive statistics of measured variables (in mm) of *Derallus paranensis* stages.

Variable	Instars					
	Instar I (n = 4)		Instar II (n = 12)		Instar III (n = 13)	
	Mean (SD)	Min.–Max.	Mean (SD)	Min.–Max.	Mean (SD)	Min.–Max.
Length of body	2.21 (0.08)	2.12–2.30	2.69 (0.36)	2.16–3.34	4.47 (0.42)	3.80–5.34
Width pronotum	0.39 (0.02)	0.36–0.41	0.53 (0.03)	0.49–0.59	0.82 (0.02)	0.81–0.86
Length of head	0.18 (0.01)	0.18–0.20	0.26 (0.01)	0.25–0.29	0.38 (0.01)	0.36–0.41
Width of head	0.27 (0.01)	0.27–0.29	0.39 (0.01)	0.36–0.41	0.56 (0.02)	0.52–0.59

combined; 3) mentum with strong cuticular spines, but without the two pairs of setae on anterior margin and the two pairs of subapical setae on ventral side; 4) anterior margin of pronotum without setae; 5) setiferous projections shorter, in relation to body.

Second instar larvae similar to third instar; the main difference between them is the size (Table 1).

Bionomical Notes. One egg case of *D. paranensis* was collected and carried to the laboratory. It contained seven eggs; larvae emerged from all of them. They were fed with cladocerans and copepods. Duration of the first instar ranged between 11 and 12 days, that of the second instar between 11 and 17 days; all died as third instars.

Larvae and adults of *D. paranensis* were collected in three different stations, all three of them covered by floating vegetation composed by *Lemna* sp., *Wolffiella* sp., *Azolla filliculoides* Lam., *Hydrocotyle ranunculoides* L., *Alternanthera* sp.; littoral vegetation was represented in one collecting site by *Iris pseudacorus* L., and in the two others by *Scirpus giganteus* Kunth. Together with *D. paranensis*, sporadically two other species of *Derallus* were present (only as adults): *D. argentinensis*, common more to the north, in the Paraná Delta, and *D. angustus*, characteristic of permanent environments of the gallery forest along the shore of the Río de La Plata estuary (usually found on the aquatic fern *Salvinia* sp.). The aquatic Coleoptera community at the collecting sites is described in detail in von Ellenrieder and Fernández (2000).

Considering the three sampling stations, adults and larvae were present all year round. First instar larvae were collected between November and March, second instar larvae between November and June, those of third instar were collected all year round. Two of the collecting sites were not permanent (von Ellenrieder and Fernández 2000). One of the collecting sites dried up during the summer of 1997 (between January and April); no adults were collected until October (1997), and larvae did not appear until November of that year. The second sampling station dried up during the months of January and February 1997; adults did not recolonize it until August of that year, and larvae did not appear until November. Finally, the third station dried briefly in January 1997, but the bottom remained moist and larvae were present all year round (although a decay in density was observed during the dry season). In 1998 none of the stations dried up since the “El Niño” phenomenon generated abundant rains all through the summer. In all three sites adults were most numerous between December and March.

Comparative Notes with Other *Derallus* Larvae, and Larvae of Related Genera. The larvae of two other *Derallus* species have been described, *D. rudis* and *D. angustus* (Spangler 1966; Archangelsky and Durand 1992; Archangelsky 1997). There are several differences between the larvae of the three species, mostly related to the head capsule and mouthparts (Table 2). These differences will allow the identification of the larvae of the three species.

As for differences between *Derallus* and the related genera *Allocotocerus* and *Regimbartia*, very few could be found (Table 3). These three genera are very distinctive

Table 2. Comparison among larvae of three species of the genus *Derallus*.

	<i>D. paranensis</i>	<i>D. angustus</i>	<i>D. rudis</i>
Distribution	South America	S. A. and Guatemala	Mexico, Cuba and Antilles
Head capsule	Vertex with small cuticular spines	Vertex smooth	Not evident from original description
Nasale	Nasale with small teeth on anterior margin	Nasale with large teeth on anterior margin	Not evident from original description
Mandibles	Not serrated, basal retinaculum large, distal retinaculum wide at apex	Irregularly serrated, basal retinaculum small, distal retinaculum pointed	Not serrated, basal retinaculum large, distal retinaculum wide at apex
Ligula	Ligula less than half the length of palpomere 2	Ligula subequal in length to palpomere 2	Ligula half the length of palpomere 2
Mentum	Spines covering most of mentum (except disc)	Spines on mentum restricted to midthird	Area covered by spines not mentioned in original description
Setiferous projections	4 short, 1 anterior and 3 posterior in a row	4 long in a transverse row	4 short, 1 anterior and 3 posterior in a row
Abdominal tergite VIII	Subquadrangular	Semicircular	Subquadrangular

and share many characters that clearly separate them from the other known Berosini genera, *Hemiosus* and *Berosus*. Watts (2002) reached a similar conclusion when he described the larvae of the Australian *Allocotocerus* and *Regimbartia*. Other researchers, either based on larval or adult morphology, have also concluded that these three genera form a uniform clade, clearly distinct from *Berosus* and *Hemiosus* (Spangler 1966; Bertrand 1972; Oliva 1992).

Hemiosus dejeanii (Solier, 1849)

(Figs. 10–16)

Material Examined. ARGENTINA, Chubut province: Percey River and Trevelin, pools by the side of the river, 400 m, 43°05'28"S, 71°28'18"W, 9.II.2003, M. Archangelsky coll. (63 larvae).

Description. Third instar larva. Length: 5.1 to 7.9 mm. Color whitish, with sclerotized parts brown; non-sclerotized integument covered by microscopic spines, denser and rougher on dorsal side.

Head capsule subquadrate (Fig. 10), dorsal surface brown, ocular areas and ventral surface lighter; occipital foramen wide, dorsal part of cervix with two small subtriangular cervical sclerites. Frontoantennal sutures vestigial, subparallel, coronal suture absent. Six stemmata on each side of head close to base of antennae.

Clypeolabrum asymmetrical (Figs. 10–11); nasale convex, with five or six small teeth pointing to right side, and six short setae present along outer margin. Right epistomal lobe with tuft of short and fine spines (pubescence); left epistomal lobe large, covering basal third of mandible, with nine stout setae on inner margin, outer margin pubescent.

Antennae three-segmented (Fig. 14). First segment as long as other two combined, with strong subapical hyaline seta on inner margin; second segment with two outer setae and one inner seta, also bearing a small outer sensorium; third segment the smallest, carrying five apical setae or sensoria, two long and three short.

Table 3. Comparison among larvae of the genera *Derallus*, *Regimbartia**, and *Allocotocerus**.

	<i>Derallus</i>	<i>Regimbartia</i>	<i>Allocotocerus</i>
Distribution	Neotropical and southern Nearctic	Afrotropical, Australian, Oriental and Palaearctic	Afrotropical, Australian and Oriental
Antenna	Projection of 1 st segment subapical 2 nd segment not projected apically	Projection of 1 st segment subapical 2 nd segment slightly projected apically	Projection of 1 st segment far from apex 2 nd segment strongly projected apically
Labium	Mentum subrectangular, sides almost straight Cuticular spines on mentum numerous	Mentum subglobular, sides convex Cuticular spines on mentum numerous	Mentum subglobular, sides convex Few cuticular spines on mentum restricted to sides
Head capsule	Coronal sulcus absent	Coronal sulcus present, long	Coronal sulcus absent
Abdomen	4 pairs of setiferous projections	5 pairs of setiferous projections	4 pairs of setiferous projections

* Characters taken from Watts (2002).

Maxillae longer than antennae (Figs. 10 and 15). Cardo small, irregularly shaped; stipes the longest segment, with a row of five slender setae on inner margin and five long setae on outer margin; outer margin with three short cuticular projections on basal third. Palp four-segmented; first segment short, with three setae and a small inner appendage with two short sensoria and one long seta; second segment short, bare; third segment the longest, with two preapical setae; fourth segment with one long seta at base on inner margin, and several short setae and sensoria on apex.

Mandibles asymmetrical (Figs. 12–13). Right mandible lightly serrated on distal margin, with two hooked inner teeth, distal one largest; base of mandible with sharp spine on inner margin, pointing forward. Left mandible serrated on distal half, with three inner teeth or projections; distal tooth with strong spines on inner margin, middle projection with four or five points on apex, basal tooth subtriangular, with several sharp inner toothlets; base of mandible with sharp spine on inner margin, pointing forward.

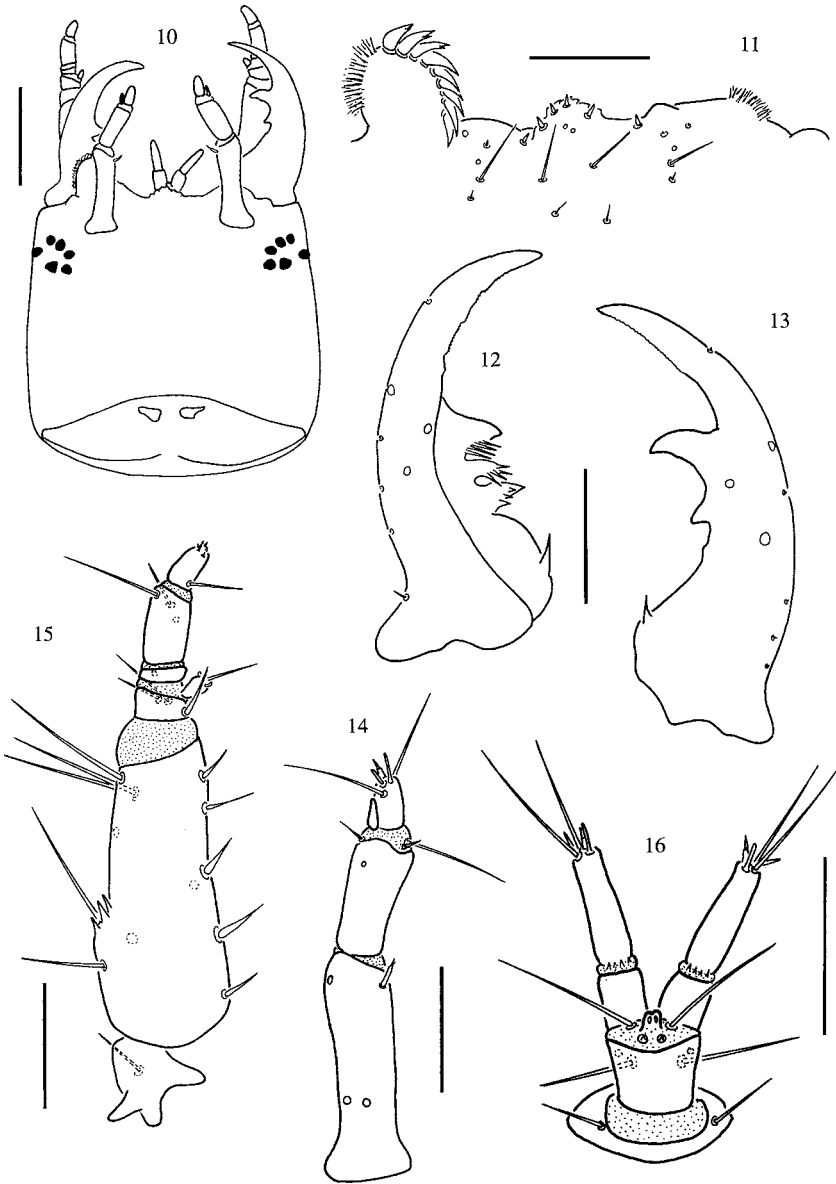
Labium small (Fig. 16). Submentum large, subpentagonal; mentum small, as a short ring, with two lateral setae; prementum subquadrate, with four spines, two on ventral face and two apical ones. Ligula short but easily differentiated. Palp two-segmented, first segment short, bare, second segment longer, with five apical setae and sensoria; intersegmental membrane with few short cuticular spines.

Prothorax slightly wider than head capsule. Pronotum with two large plates separated by a fine sagittal line; prosternum subrectangular, with incomplete sagittal line on posterior half. Mesonotum with two pairs of transverse subtriangular sclerites, anterior pair smaller and narrow, posterior pair large; metanotum lacking sclerites. Legs five segmented, moderately long and visible in dorsal view.

Abdomen ten-segmented, tapering towards distal end, membranous areas covered by dense pubescence. Segments I to VII similar in shape, each subdivided by transverse fold; segment VIII smaller, with two small and narrow, lightly sclerotized tergites; segment IX partially covered by preceding segment, with two small and irregular tergites and small circular sternite; segment X strongly reduced. Segments VIII and IX each with short pair of lateroposterior lobes. Pleural areas slightly lobed. Urogomphi reduced.

Nine pairs of spiracles, one on mesothorax and eight abdominal. Thoracic and first seven abdominal pairs of spiracles non-functional. Last abdominal pair with closing apparatus, enclosed within poorly developed spiracular atrium.

Comparative Notes with Second Instar Larvae. Besides the size (length of larvae II: 3.7 to 4.7 mm), only two differences could be found between larvae II and III. Larvae II have the ecdysial line (frontal arms) functional, extending from the base of the head to the base of the antennae; the second difference is the width of the first and second antennomeres, wider in larvae II than in larvae III. Since only two instars of this species are known, no comparative table of measures between both instars was prepared.



Figs. 10–16. *Hemiosus dejeanii*, third instar larva, dorsal view. **10)** head capsule; **11)** clypeolabrum; **12)** left mandible; **13)** right mandible; **14)** right antenna; **15)** right maxilla; **16)** labium. Scale bars: Figures 10 = 0.2 mm, Figures 11–16 = 0.1 mm.

Table 4. Comparison among larvae of three species of the genus *Hemiosus*.

	<i>H. bruchi</i>	<i>H. multimaculatus</i>	<i>H. dejeanii</i>
Right epistomal lobe	Bare	With patch of pubescence	With patch of pubescence
Left epistomal lobe	With 12 spines and without pubescence	With 9 spines and pubescence	With 9 spines and pubescence
Mandibles	Without basal spine	With sharp basal spine pointing forward	With sharp basal spine pointing forward
Clypeolabrum	Without lobe on right side	Without lobe on right side	With small lobe on right side
Stipes	Without outer cuticular spines	Without outer cuticular spines	With 3 stout outer cuticular spines
Lobes of abd. segments VIII and IX	Absent	Present, as long as corresponding segment or longer	Present, shorter than corresponding segment

Bionomical Notes. Adults and larvae were collected from marginal pools at the sides of Percey River, and also at the margins of the river in places with algae, where the water ran slower. Adults are active swimmers among aquatic plants, algae, and rocks; larvae, in contrast, are sluggish and are associated with the bottom substrate. The aquatic Coleoptera community at the collecting sites included adults and larvae of the genera *Andogyrus* (Gyrinidae), *Rhantus*, *Lancetes*, *Laccophilus* and *Liodessus* (Dytiscidae), *Tropisternus* and *Enochrus* (Hydrophilidae), *Gymnochthebius* (Hydraenidae), and *Heterocerus* (Heteroceridae). During the months of February and March only second and third instar larvae were collected; first instar larvae are probably present earlier, between November and January.

Comparative Notes with Other *Hemiosus* Larvae. The larvae of two other *Hemiosus* species are known, *H. bruchi* and *H. multimaculatus*. Following Orchymont (1940) and based on adult characters Oliva (1994), in her generic revision of *Hemiosus* for South America, mentions two species groups: one with pronotum entirely melanic (*maculatus*-group) and the other with pronotum testaceous at least on posterior edge and angles (*dejeanii*-group). *H. bruchi* belongs to the *maculatus*-group, while *H. multimaculatus* and *H. dejeanii* belong to the *dejeanii*-group. A morphological comparison among the three known *Hemiosus* larvae shows that the larva of *H. dejeanii* is closer to that of *H. multimaculatus* than to the larva of *H. bruchi*. Similarities and differences between all three larvae are listed in Table 4.

Within *Hemiosus*, differences in larval morphology agree thus far with the subdivision of *Hemiosus* in two species groups, albeit the number of known species is low. We believe that as more larvae of this genus are described, larval characters could serve to subdivide the genus into well-defined species-groups or subgenera.

Acknowledgments

This study was partially supported by the Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET—PIP n° 700/98).

Literature Cited

- Archangelsky, M. 1997. Studies on the Biology, Ecology, and Systematics of the Immature Stages of New World Hydrophiloidea (Coleoptera: Staphyliniformia). Bulletin of the Ohio Biological Survey (New Series) 12(1):ix + 207.

- Archangelsky, M. 2000.** Immature stages of Neotropical Hydrophilidae (Coleoptera): *Hydamara argentina* (Knisch, 1925) and *Hemiosus bruchi* Knisch, 1924. Proceedings of the Entomological Society of Washington 102:280–291.
- Archangelsky, M. 2002.** Nuevas larvas de Hydrophilidae (Coleoptera: Hydrophiloidea): *Hemiosus multimaculatus* y *Chaetarthria bruchi*. Revista de la Sociedad Entomológica Argentina 61(3–4):89–97.
- Archangelsky, M., and M. E. Durand. 1992.** Description of the preimaginal stages of *Derallus angustus* Sharp, 1882 (Coleoptera: Hydrophilidae, Berosinae). Aquatic Insects 14(3): 169–178.
- Bertrand, H. 1972.** Larves et Nymphes des Coléoptères Aquatiques du Globe. F. Paillart, Abbeville, France. 804 pp.
- von Ellenrieder, N., and L. A. Fernández. 2000.** Aquatic Coleoptera in the subtropical-pampasic ecotone (Argentina, Buenos Aires): species composition and temporal changes. Coleopterists Bulletin 54:23–35.
- Fernández, L. A., and A. O. Bachmann. 1998.** Hydrophiloidea [pp. 218–226]. In: Biodiversidad de artrópodos Argentinos (J. J. Morrone and S. Coscarón, editors). Ediciones Sur, La Plata, Argentina. vii + 599 pp.
- Hansen, M. 1991.** The hydrophiloid beetles: phylogeny, classification and a revision of the genera (Coleoptera, Hydrophiloidea). Biologiske Skrifter, Kongelige Danske Videnskabernes Selskab 40:1–367.
- Hansen, M. 1999.** World Catalogue of Insects. 2. Hydrophiloidea (Coleoptera). Apollo Books, Steenstrup, Denmark. 416 pp.
- Oliva, A. 1981.** El género *Derallus* Sharp en la Argentina (Coleoptera, Hydrophilidae). Revista de la Sociedad Entomológica Argentina 40:285–296.
- Oliva, A. 1983.** *Derallus* de la cuenca del Amazonas (Coleoptera, Hydrophilidae). Revista de la Sociedad Entomológica Argentina 42:343–351.
- Oliva, A. 1995.** Novedades sobre *Derallus* (Coleoptera, Hydrophilidae). Physis (Buenos Aires) Secc. B, 50(118–119) (1992):1–3.
- Oliva, A. 1991.** The types of *Hemiosus* Sharp, 1882 (Coleoptera, Hydrophilidae) in the Orchymont and Mouchamps collections. Bulletin de l'Institut Royal des Sciences Naturelles de Belgique, Entomologie 61:167–181.
- Oliva, A. 1992.** Cuticular microstructure in some genera of Hydrophilidae (Coleoptera) and their phylogenetic significance. Bulletin de l'Institut Royal des Sciences Naturelles de Belgique, Entomologie 62:33–56.
- Oliva, A. 1994a.** A revision of the genus *Hemiosus* Sharp, 1882 in South America (Coleoptera: Hydrophilidae). Bulletin and Annales de la Société, Royal Belge, Entomologie 130(1994): 267–303.
- Oliva, A. 1994b.** Una nueva especie de *Hemiosus* Sharp (Coleoptera: Hydrophilidae) de Venezuela. Revista de la Sociedad Entomológica Argentina 53(1–4):75–77.
- Orchymont, A. 1940.** Contribution a l'étude des Palpicornia. XIV. Bulletin and Annales de la Société Entomologique Belge 80:157–197.
- Spangler, P. J. 1966.** A description of the larva of *Derallus rudis* Sharp (Coleoptera: Hydrophilidae). The Coleopterists Bulletin 20:97–103.
- Watts, C. H. S. 2002.** The larvae of some Australian aquatic Hydrophilidae (Coleoptera: Insecta). Records of the South Australian Museum 35(2):105–138.

(Received 15 April 2004; accepted 31 August 2004. Publication date 1 August 2005.)