

DESCRIPTION OF THE LARVA OF *MACRELMIS ISIS*
(HINTON, 1946), WITH DISTRIBUTIONAL NOTES
OF THE SPECIES (COLEOPTERA, ELMIDAE)

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The mature larva of the Neotropical elmid *Macrelmis isis* (Hinton, 1946a) is described and illustrated for the first time; it is compared to other known larvae of the genus. Distributional notes for this species increase its known range to the south, this being the first citation of the genus for Argentina. Some male and female characters, that help to tell sexes apart, are illustrated.

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Elmidae is a common and widespread family of beetles. From the Neotropical region some 35 genera and 300 species have been described. Of these, 23 genera are endemic, two are shared with the Australian region, and the remaining ten with the Nearctic region. Despite being common in lotic habitats, the knowledge of this family is poor in many parts of South America. Argentina is probably one of the most neglected areas regarding the knowledge of the elmid fauna, only seven species have been reported for this country (Hinton 1946a, 1951 and 1970; Spangler & Brown 1981). In contrast, several neighbouring countries of Argentina such as Brazil and Bolivia harbour many species, suggesting that the number of argentine species should be larger (Tremouilles et al. 1995). It is also expected that further studies on argentine elmids will result in description of new species since this is a large country, rich in biogeographical regions that range from subtropical to subantarctic areas.

Macrelmis Motschulsky, 1859, has 39 species, three of them Nearctic (Southern United States), the remaining ones are Neotropical; nearly all of them were previously assigned to a different genus, *Elsianus* Sharp 1882. Hinton (1946b) described 12 new Brazilian species within the genus *Elsianus* Sharp, including *Elsianus isus*. Almost 40 years later Brown (1984), after examining the type of *Macrelmis*, *M. dentata* Motschulsky, 1859, discovered that it is the same as

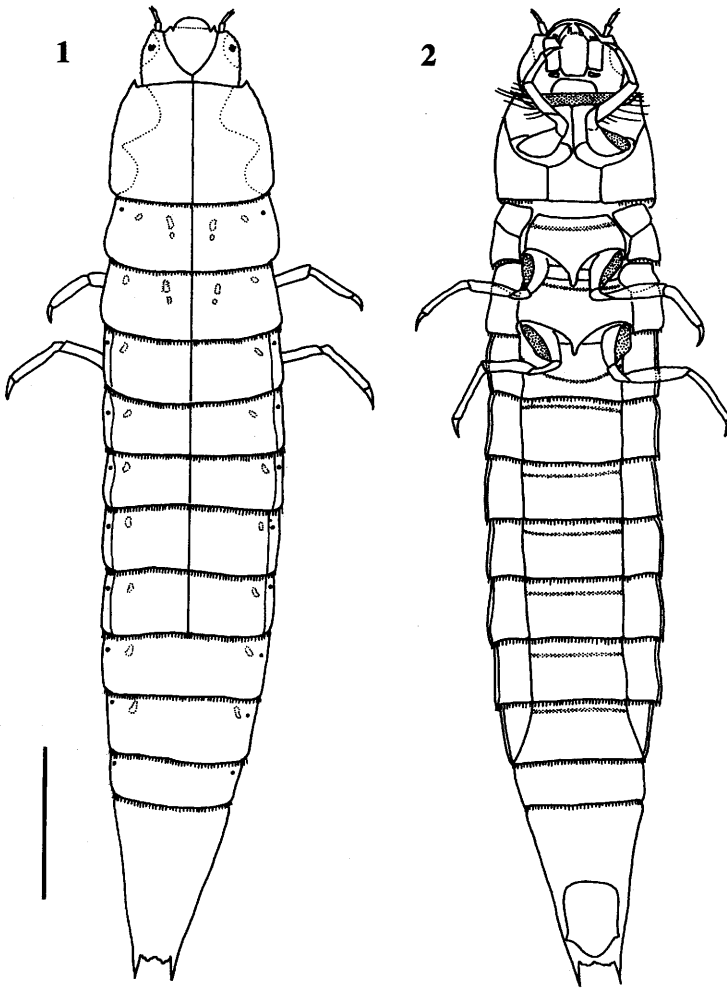
the genus *Elsianus* Sharp, 1882, this resulted in the transfer of all species previously ascribed to *Elsianus* to the genus *Macrelmis*, by Brown (1984). *Macrelmis isis* (Hinton, 1946), reported here, is the first record of this genus for Argentina.

Despite being common and easily associated with adults, preimaginal stages of Elmidae are poorly known for the Neotropical region. For the genus *Macrelmis* only two species, both of them from Mexico, have been described by Hinton (1940): *M. granigera* (Sharp, 1882) and *M. striata* (Sharp, 1882). The larvae of two other species are described by Hinton (1940) in the same paper (as *Elsianus* sp. ?), they were not assigned to any species at the time, but one of them belongs to the genus *Huleechius* Brown, 1981.

Bertrand (1956, 1972) summarizes all that is known on larval stages of this genus; based mostly on Hinton's work, Bertrand recognizes two larval groups he names *granigera*-type and *striata*-type. Finally, one Peruvian larva within this genus (also identified as *Elsianus* sp.) was described by Spangler (1966), but was not assigned to any known species.

In this paper, besides presenting a detailed description of the mature larvae of *M. isis*, we also illustrate some adult characters that we consider important in order to differentiate male and female specimens; they complement Hinton's original description of *M. isis*.

Figs. 1-2.
Macrelmis isis, larva. — 1,
Habitus, dorsal view; 2, habi-
tus, ventral view. Scale bar = 1
mm.



MATERIALS AND METHODS

The material was fixed in the field, and stored in 75% ethyl alcohol. Larvae were cleared in lactic acid, dissected and mounted on slides for observation and description; the medium used was Hoyer's. Drawings were done using a Leitz MZ12 dissecting microscope and a Leica DML compound scope, both with camera lucida. In order to be consistent with the larval morphological nomenclature, we followed Lawrence (1991).

Adult specimens were dissected in order to illustrate sexual differences in the fifth abdominal sternite as well as the male and female genitalia.

The material studied comes from eight different ar-

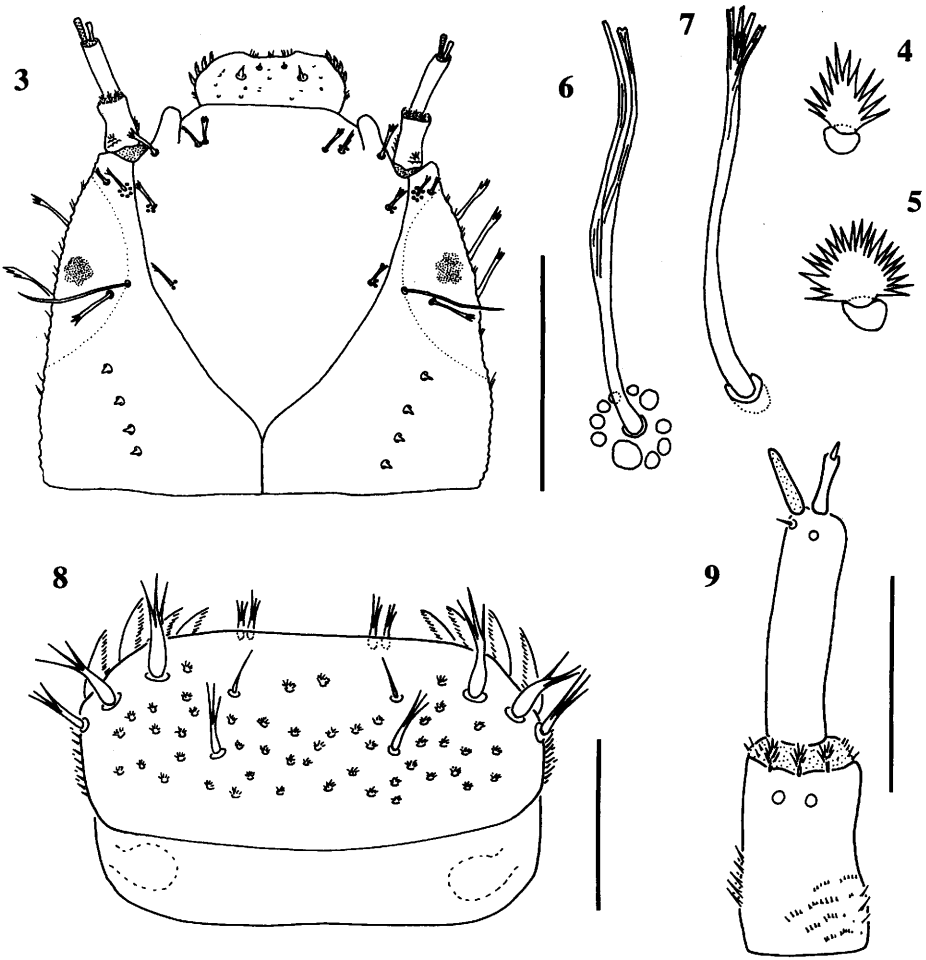
gentine provinces: Córdoba, Jujuy, La Rioja, Misiones, Salta, San Juan, San Luis, and Tucumán.

Macrelmis isis (Hinton, 1946)

Description of mature larva

Elongate (figs. 1, 2), flattened dorsoventrally, subtriangular in cross-section, sides of body subparallel. Length: 5.15-6.41 mm, width: 1.05-1.15 mm (at the base of metathorax). Cuticle shiny, dark brown, almost black in some specimens, antennae, mouthparts, distal margin of clypeus and legs lighter in colour: Ocular area yellowish, well defined within dotted line (fig. 3).

Head (fig. 3) subtrapezoidal, wider at base, 0.78

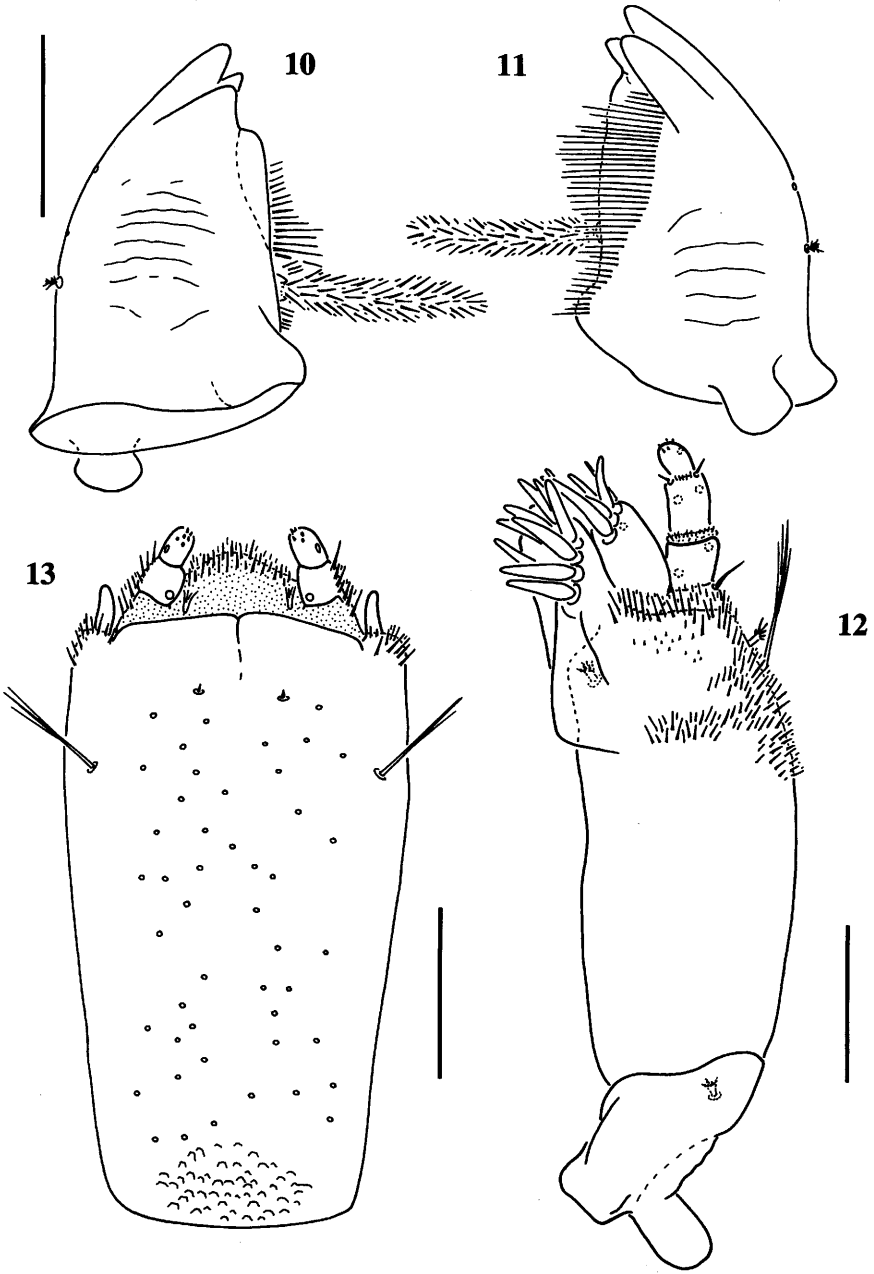


Figs. 3-9. *Macrelmis isis*, larva. — 3, Head capsule, dorsal view; 4-7, different setae from head, see text for explanation; 8, labrum, dorsal view; 9, right antenna, dorsal view. Scale bars: fig. 3 = 0.4 mm, figs. 8-9 = 0.1 mm.

mm wide, 0.77 mm long, partially retracted within thorax. Coronal suture short (0.09 mm); frontal sutures long (0.52 mm), slightly curved, extending to base of antennae; frontoclypeal suture absent. Lateral margin of clypeus, close to base of antenna, with strong, blunt tooth, bearing setiferous tubercles on external margins; anterior edge of clypeus membranous, with few tubercles. Dorsal surface of head capsule covered by evenly distributed setiferous tubercles bearing ramose setae (figs. 4, 5), space between tubercles approximately the length of setae. Frontoclypeal plate with three pairs of long, branched setae along-side frontal sutures (figs. 3, 6), two more pairs on lateral region of clypeus. Epicranial region, close to base

of antennae, with two pairs of long, branched setae, one of them surrounded by a ring of 8-10 small cuticular tubercles (figs. 3, 7); one pair of oblique rows with four short, stout setae on dorsal side of epicranial region, close to base of head capsule; margins of head capsule with several long, branched setae. Gula well developed, subtrapezoidal, length slightly less than one third of maxilla.

Labrum (fig. 8) subrectangular, transverse, with rounded angles; basal third smoother, with muscle scars on ventral side; distal two thirds with numerous short, ramose setae (as in fig. 3), four pairs of branched setae and one pair of simple setae. Underside of anterior margin with two short branched setae close to



Figs. 10-13. *Macrelmis isis*, larva. – 10, Left mandible, dorsal view; 11, left mandible, ventral view; 12, right maxilla, dorsal view; 13, labium, ventral view. Scale bars = 0.1 mm.

midline and four pairs of large, combed setae on corners; lateral margins pubescent.

Antennae (fig. 9) short, three-segmented. Basal segment stout, with several rows of short cuticular spines on basal half and inner margin; row of short, plumose setae around distal margin; membrane connecting with next segment with small cuticular spines. Second segment the longest, slender, with distal short seta and large sensory appendage on inner margin. Third segment small, as long as sensory appendage of second segment, bearing short distal seta.

Mandibles (figs. 10, 11) symmetrical, apex tridentate, retinaculum absent. Dorsal and ventral surfaces rugose, outer margin with short, plumose seta on basal half, ventral surface with comb of long spines extending from base to apex. Inner margin with long, prosthema projecting medially.

Maxillae (fig. 12) five-segmented, stout, broadly united to labium forming maxillolabial complex. Cardo irregularly shaped; stipes long, subrectangular, distal third with numerous cuticular spines on dorsal and outer surface; two branched setae on outer margin, one long and one short; ventral surface of stipes mostly smooth, with few short setae. Lacinia and galea well developed, lacinia as a strong lobe with 9-10 stout, blunted setae on mesal margin; galea one-segmented, elongated, with 5-6 strong apical setae. Palp four-segmented, basal segment short, wider than long, with one long outer seta; second segment subquadrate, lacking setae; third segment slightly longer than second, with two apical setae, one on each side; last segment shorter, rounded at apex, with several short setae and sensoria.

Labium (fig. 13) large, formed by prementum and postmentum. Postmentum large, subrectangular, longer than wide, ventral surface with rugose area at base, distal end bearing two pairs of setae, one short close to midline, one long, branched, close to lateral margin; apical corners with brush of fine cuticular spines surrounding stout fingerlike projection on each side. Prementum membranous, short, transverse, forming setose lobe between palpi, with one pair of short ramose setae at base of palpi. Palpi two-segmented, basal segment subquadrate, with cuticular spines on outer margin, second segment shorter, bearing several short setae and sensoria.

Thorax strongly sclerotized, tergal plates with sagittal line. Posterior margin of pleura and terga of three segments with row of flat, scale-like setae (figs. 14, 16). Disk of pronotum shiny, lateral margins with setiferous tubercles as those of fig. 21; meso- and metanota evenly covered by same setiferous tubercles, except for three pairs of small suboval bare areas shown in fig. 1 (dotted line). Pleural sclerites large, well developed, formed by episternum and epimeron, all covered by setiferous tubercles; proepisterna meet-

ing anteriorly at the midline. Distribution of setae as in fig. 14. Sternal plates large, subpentagonal, with tubercles more sparsely distributed; prosternum the smallest, posterior margin straight, carrying small anterior fingerlike projection originating on underside of plate; meso- and metasterna larger, anterior margin almost straight, distal margin partially serrated (fig. 14); distribution of setae as in fig. 14. Coxal cavities of prothorax closed, of meso- and metathorax opened.

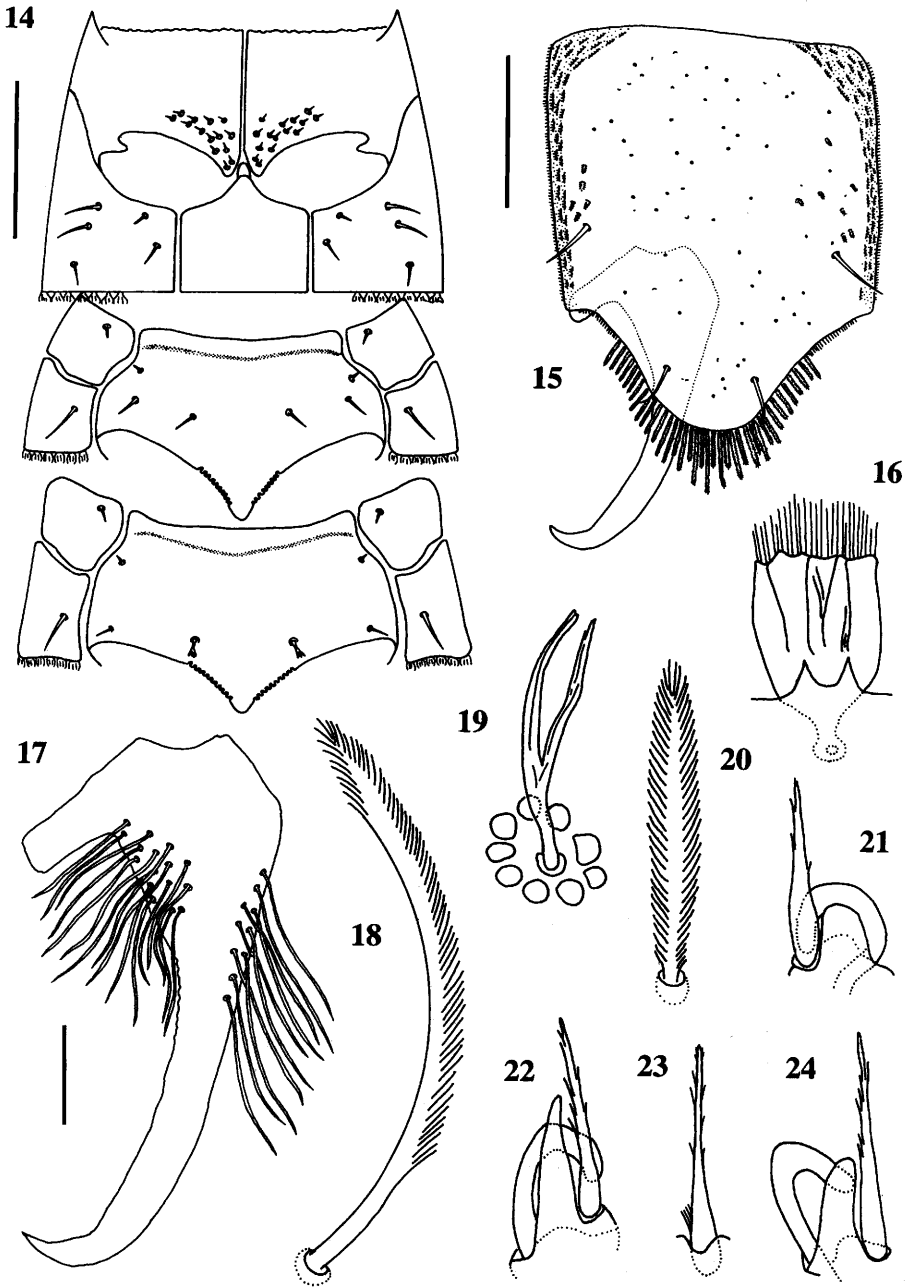
Legs (figs. 25-27) five-segmented, similar in shape, those of prothorax the shortest, those of metathorax the longest. Coxa large, subtriangular; trochanter smaller, subtriangular, with anterodorsal line of weakness; femur the longest segment, tibia long and slender, bearing strong and hooked tarsungulus. Ventral margin of femora and tibiae with spinose setae (Fig. 28); outer margin of femora with simple setae, those of forelegs much longer.

Abdomen (figs. 1, 2) nine-segmented. Terga 1-5 with sagittal line and line parallel to tergo-pleural suture, remaining segments tapering in width, lacking sagittal line; segments 1-8 similar in shape, subrectangular, posterior margin with row of scale-like setae (fig. 16), segment 9 elongate and strongly emarginate, ending in two long lateral spinous processes. Terga 1-8 covered by setiferous tubercles (fig. 21) similar to those of thorax; segment 9 with slightly different setiferous tubercles and setae (figs. 22-24); terga 1-7 with small suboval areas lacking tubercles (fig. 1, dotted line) and with one pair of long, branched setae (fig. 19) close to midline. Pleural plates of sterna 1-7 well developed, anterior margin of each pleurum smooth, rest of plate with tubercles. Sternal plate of first segment (fig. 2) with large semicircular depression, defined by low ridge, bearing transverse sclerotized ridge covered by setiferous tubercles. Sternum nine bearing gill chamber and operculum; operculum (fig. 15) subpentagonal, anterior margin straight, posterior margin with row of long plumose setae as those of fig. 20; outer surface of operculum with setae and rows of cuticular spines as in fig. 15. Opercular hooks with long setae at base (figs. 17, 18).

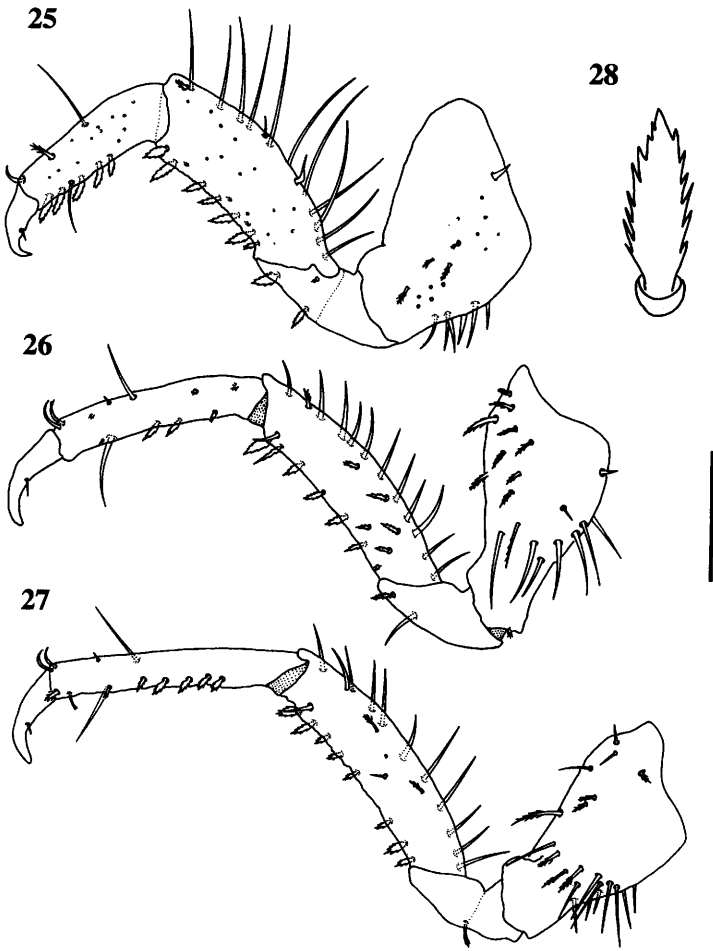
COMPARATIVE NOTES AND DISCUSSION

Larvae

Hinton (1940), in his revision of Mexican elmids, described the larvae of four *Macrelmis* (as *Elsianus*). Two of them could be associated with adults: *M. striata* and *M. granigera*. The other two larvae could not be associated, and one of them did not seem to belong to the genus *Macrelmis*, as Hinton himself pointed out based on a difference in the abdominal pleura. More recently Brown (1981) described the genus *Huleechius*, associated with larvae similar to one of those described by Hinton as "*Elsianus* (?) sp.", he



Figs. 14-24. *Macrelmis isis*, larva. – 14, Thoracic segments, ventral view; 15, operculum, dorsal view; 16, 18-24, different setae from thorax and abdomen, see text for explanation; 17 hook from gill chamber. Scale bars: fig. 14 = 0.4 mm, fig. 15 = 0.2 mm, fig. 17 = 0.1 mm.



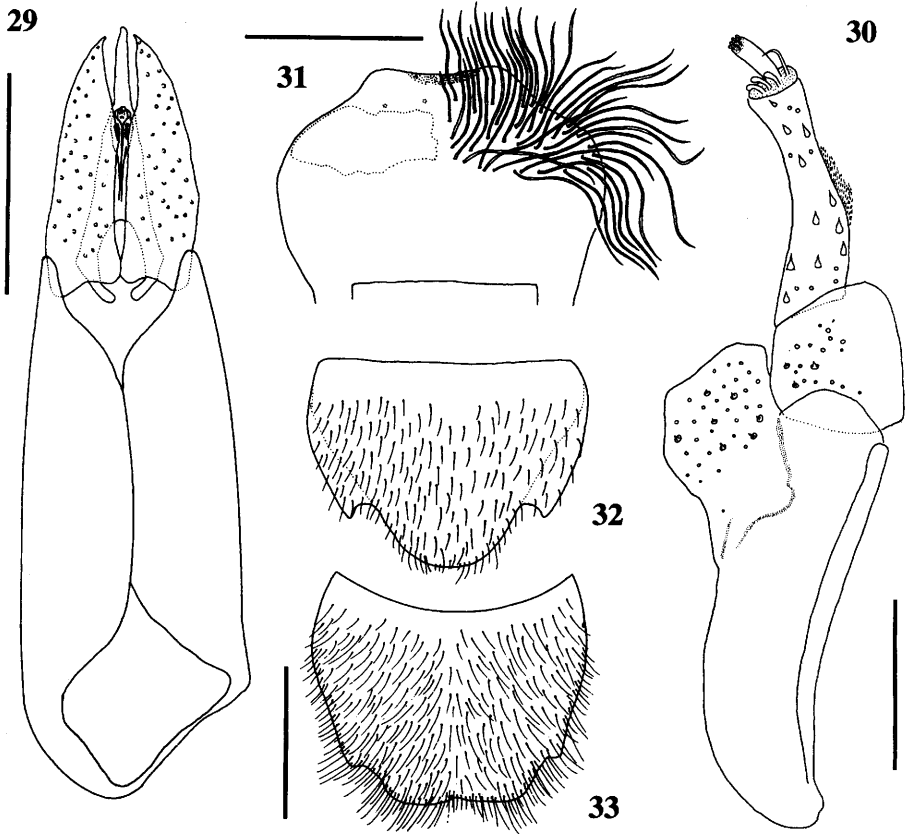
Figs. 25-28.
Macrelmis isis, larva. — 25,
 Prothoracic leg; 26, mesothoracic
 leg; 27, metathoracic leg;
 28, seta from inner margin of
 femora and tibiae. Scale bar =
 0.4 mm.

concluded that those larvae belonged to this new genus, probably *Huleechius spinipes* (Hinton, 1934). The fourth larva described by Hinton is very similar to the one unassociated larva described by Spangler (1966) from Perú; Spangler suggests that this could be the larva of *M. aeolus*. We have decided to compare the larva of *M. isis* only with those larvae that are associated with adults: *M. granigera* and *M. striata*.

Based mostly on the work of Hinton, Bertrand (1972) distinguishes two groups of larvae within *Macrelmis*: the *striata*-group and the *granigera*-group (he also treats them as *Elstianus*), and mentions three important differences. The first is the shape of the anterior corners of the pronotum, the *striata*-group with sharp corners, and *granigera*-group with anterior corners blunt; the second is the size of the emargination on segment nine, deep and with two strong teeth in *M. striata*, shallow in *M. granigera*. Finally, there is a

semicircular depression on the first ventrite bearing a short transverse carina in *M. striata*, while *M. granigera* lacks the depression and has a longitudinal carina on the first ventrite. According to these characters *M. isis* would belong in the *striata*-group, since it shares these three characters with *M. striata*.

Based on the original descriptions and drawings of the other *Macrelmis* larvae we have found some other differences that could be useful to tell them apart. The seta on the external margin of the mandible differs in length, *M. granigera* has a long seta, simple according to the illustration, in *M. striata* the seta is also simple but shorter, in *M. isis* this seta is short and branched. The postmentum in *M. granigera* is shorter than in *M. isis*. Comparing the shape of the prosternum, we found that it is wider than long in *M. striata* but it is as wide as long in *M. isis*. Another difference is the presence, in *M. granigera*, of a longitu-



Figs. 29-33. *Macrelmis isis*, adult. – 29, Male genitalia; 30, female genitalia; 31, male labrum; 32, fifth ventrite, female; 33, fifth ventrite, male. Scale bars: fig. 29, 31-33 = 0.4 mm, fig. 30 = 0.20 mm.

dinal carina on the metasternum; this is absent in the other two species. There are also some variations in the shape of the posterior thoracic and abdominal setae; these are flat and slightly divided apically in *M. granigera* and *M. striata*, while in *M. isis* they are not divided and have apical filiform projections.

Adults

Regarding the adults Hinton (1940), in his revision of the Mexican elmids, determined two groups of species based on the presence of a gibbosity at the base of the pronotum. This is present in *M. granigera* (Hinton calls this the *granigera* species-group) but not in *M. striata*. Later Hinton (1945, 1946a) described several more species belonging to *Macrelmis*, most of these lacking the gibbosity, among them is *M. isis* from Brazil.

To complete the original description of *M. isis* we

consider it important to add a few illustrations. First the male and female genitalia of *M. isis* are shown in figs. 29, 30. This is the first time the female genitalia has been illustrated, and the male genitalia is shown in more detail than in the original description. Next we show some secondary sexual characters that are useful to differentiate males from females. Among the males of *M. isis*, we have the presence of long setae on the labrum, as long or longer than the labrum (fig. 31). Also the fifth abdominal sternite of males has a different shape than that of females, and is covered by numerous golden hairs (figs. 32, 33).

Combining the information from both larval and adult characters, *M. isis* seems to belong in the *striata*-group. It is also important to mention here that within the *striata*-group there are three species that form a well defined group, *M. isis*, *M. tarsalis*, and *M. clypeata*. This group is based on the following adult charac-

ters: rounded, dehiscent elytral apices, the secondary sexual characters mentioned above, and the inner tibial spine of the metathoracic legs, larger than inner one in males.

Distributional notes

This species was thought to occur only in Brazil: Santa Catharina, Nova Teutonia (Hinton 1946a). We have collected a large amount of material (208 specimens) from different localities in Argentina, expanding the distribution of this species several thousand kilometers. Below follows a list of new records for *M. isis*.

CORDOBA PROVINCE. – Dpto. Río Cuarto: Camino de la Costa: Río Piedras Blancas (32°54'278" S 64°46'642" W), 05/X/1999, V. Manzo, 2♂, 1♀, 35 larvae; Alpa Corral: Río Las Moras (32°39'557" S 64°44'465" W) 05/X/1999, V. Manzo 2♂, 3 larvae; Río El Talita (32°39'594" S 64°44'594" W) 05/X/1999, V. Manzo, 2♂, 4♀ 7 larvae; Arroyo San Bartolomé (11Km Alpa Corral) (32°47'547" S 64°44'567" W), 05/X/1999 V. Manzo 5♂, 5♀, 38 larvae; Dpto. Punilla: Río San Esteban (32°54'278" S 64°46'642" W), 01/X/1999 V. Manzo 3♂, 21 larvae; Arroyo Las Mojarras (N Lago San Roque), 19/X/1999 M. Archangelsky 1♂, 1♀, 6 larvae; 19-22/II/1998 3♂, 2♀ M. Archangelsky; I/1996 3♂, 5♀ Black Light Trap, J. Archangelsky.

JUJUY PROVINCE. – Dpto. Valle Grande: Santa Barbara between Santa Ana & El Fuerte (1st river E), 16/IX/1998, H. Fernández 1♂, 1♀; Dpto. Capital San Salvador de Jujuy Río Yala, 29/VIII/1995 H. Fernández 1♀.

SALTA PROVINCE. – Dpto. Anta: National Park El Rey, Arroyo Aguas Negras, 22/III/1999 F. Romero 1♂, 1♀; Arroyo la Sala, 25/III/1999 E. Domínguez 2♂; Dpto. Guachipas: Río Grande de El Sauce, 15/IX/1998 E. Domínguez 3♂, 2♀, 1 larva.

TUCUMAN PROVINCE. – Dpto. Burruyacu: Arroyo Artaza (26°36'13" S 65°02'36" W), 7/VII/1999 F. Romero 1♂, 1♀, Río Medina, 14/IV/1999 H. Fernández 3♂, 2♀, 13 larvae; Dpto. Trancas: Río Trancas, 17/IX/1998 E. Domínguez 1♂; Río Choromoro (intersection Rd. 9), 1992 H. Fernández 1♀; Dpto. Taffi Viejo: El Siambón, Río Grande de La Hoyada, 8/VII/1998 C. Nieto & M. Orce 1♀.

MISIONES PROVINCE. – Aristóbulo del Valle: Río Cuñapirú, 19-20/XI/1998 E. Domínguez 1♀, 1 larva.

LA RIOJA PROVINCE. – Dpto. Sanagasta, Huaco Arriba, Arroyo Tambito (29°10'45" S 67°04'48" W) 18/XI/1998 M. Archangelsky & V. Manzo 3♂, 1 larva.

SAN LUIS PROVINCE. – Dpto. Coronel Pringles: Río Rosario 4 Km La Toma (33°04'572" S 65°39'464" W) 03/X/1999 V. Manzo 7♂, 5♀, 2 larvae.

SAN JUAN PROVINCE. – Dpto. Valle Fértil: Río Tu-

manas (30°51'882" S 67°19'400" W), 16/VI/1999 V. Manzo 3 larvae.

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REFERENCES

- Bertrand, H. P. I. 1956. Notes sur les premiers états des dryopides d'Amérique. – Annales de la Société Entomologique de France 124: 97-139.
- Bertrand, H. P. I. 1972. Larves et nymphes des Coléoptères aquatiques du globe. – Abbeville, France: F. Paillart. 804 pages.
- Brown, H. P. 1981. *Huleechius*, a new genus of riffle beetles from Mexico and Arizona (Coleoptera, Dryopoidea, Elmidae). – Pan-Pacific Entomologist 57(1): 228-244.
- Brown, H. P. 1984. Neotropical Dryopoidea. III. Major nomenclatural changes affecting *Elsianus* Sharp and *Macrelmis* Motschulsky, with checklists of species (Coleoptera: Elmidae: Elminae). – The Coleopterists Bulletin 38(2): 121-129.
- Hinton, H. E. 1934. Miscellaneous studies in the Helminae (Dryopidae, Coleoptera). – Revista de Entomología, Río de Janeiro 4: 192-201.
- Hinton, H. E. 1940. A monographic revision of the Mexican water beetles of the family Elmidae. – Novitates Zoologicae 42(2): 217-396.
- Hinton, H. E. 1945. Description of two new species of *Elsianus* Sharp, with a key to the *graniger* species group (Col., Elmidae). – Entomologist's Monthly Magazine 81: 90-92.
- Hinton, H. E. 1946a. A synopsis of the Brazilian species of *Elsianus* Sharp. – Transactions of the Royal Entomological Society of London 96: 125-149.
- Hinton, H. E. 1946b. A key to the species of *Xenelmis* Hinton, with description of three new species (Coleoptera: Elmidae). – Entomologist's Monthly Magazine 83: 237-241.
- Hinton, H. E. 1951. A new *Cylloepus* from Argentina (Coleoptera). – The Annals and Magazine of Natural History (ser. 12) 4: 820-823.
- Hinton, H. E. 1970. The zoological results of Gy. Topal's collecting in south Argentina. 21. A second species of *Stethelmis* (Coleoptera: Elminthidae). – Acta Zoologica Academiae Scientiarum Hungaricae 16(1-6): 109-113.
- Lawrence, J. F. 1991. Order Coleoptera. – In: F. W. Stehr (ed.), Immature Insects, 2. Kendall/Hunt Publishing Co., Dubuque, Iowa, 975 pp.
- Motschulsky, V. 1859. Insectes des Indes orientales, et de contrées analogues. – Etudes Entomologiques 8(2): 25-118.
- Sharp, D. 1882. Coleoptera, Heteroceridae, Parnidae, Georissidae. – Biologia Centrali-Americana 1(2): 116-141. Taylor and Francis, London.
- Spangler, P. J. 1966. The Catherwood Foundation Peruvian-Amazon Expedition XIII. Aquatic Coleoptera (Dytiscidae, Noteridae, Gyrinidae, Hydrophilidae, Dascillidae, Helodidae, Psephenidae, Elmidae). – Mono-

- graphs of the Academy of Natural Sciences of Philadelphia 14: 377-443.
- Spangler, P. J. & H. P. Brown. 1981. The discovery of *Hydora*, a hitherto Australian-New Zealand genus of riffle beetle, in Austral South America (Coleoptera: Elmidae). – Proceedings of the Entomological Society of Washington 83(4): 596-606.
- Trémouilles, E. R., Oliva, A. & A. O. Bachmann, 1995. Insecta Coleoptera. – In: E.C. Lopretto & G. Tell (eds.), Ecosistemas de Aguas Continentales. Metodologías para su estudio, 3. Ediciones Sur. La Plata. República Argentina, 1401 pp.

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