



# Article

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## Two new species of Elmidae (Coleoptera) from Argentina

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### Abstract

Two new species of riffle beetles, *Austrelmis patagonicus* sp. nov. and *Neoelmis argentinensis* sp. nov. are described and illustrated from adults of both sexes. The mature larva of *N. argentinensis* is described and illustrated, and compared to other known larvae of *Neoelmis*. The distribution of the known species of *Austrelmis* and *Neoelmis* are synopsisized and a checklist of the genera and species of Elmidae known from Argentina is given.

**Key words:** riffle beetle, Neotropics, taxonomy, Elminae, Patagonia, new species

### Introduction

Members of the family Elmidae are found widely throughout the world; however, elmids taxa are more abundant and diverse in tropical regions (Spangler, 1982). Elmids, commonly called riffle beetles, are aquatic in all their larval stages; meanwhile adults can be aquatic (subfamily Elminae) or riparian (Subfamily Larinae).

The family Elmidae presently includes 62 genera with about 430 recognized species from America (Kodada & Jäch 2005, Maier & Spangler 2011).

*Austrelmis* is endemic to the Neotropical region and exhibits an Andean distribution. This genus includes 20 species and 2 subspecies, most of them described originally in the genus *Macrelmis* Motschulsky. All the species previously included in *Macrelmis* except the type species, were transferred to the new genus *Austrelmis* by Brown (1984). The known distribution of the genus includes Ecuador, Perú, Bolivia, Chile, Argentina and Uruguay (although this last site is doubtful).

The primarily Neotropical genus *Neoelmis* was established by Musgrave in 1935. This genus currently includes 48 species and 2 subspecies. The distribution of the genus extends from the southwestern United States (1 species) throughout Central and South America, plus on the islands of Trinidad and Tobago. Argentina is rich in biogeographical regions that range from subtropical to subantarctic areas, therefore it is expected that studies of the elmids fauna will result in description of many new species (Manzo & Archangelsky 2001). Twenty one species have been recorded from Argentina, five in the subfamily Larinae and 16 in the subfamily Elminae (Table 1). However an additional 18 undescribed species have been recognized from Argentina (Manzo 2006a) and will be included in future papers.

In this paper two new species of Elminae from Argentina are described, based on adults of both sexes. *Austrelmis patagonicus* sp. nov. and *Neoelmis argentinensis* sp. nov. are the first species of these genera described from Argentina. Additionally, the mature larva of *Neoelmis argentinensis* sp. nov. is also described. For *Neoelmis* this is the first larval description associated to adults.

**TABLE 1.** Checklist of the Elmidae known from Argentina.

Family Elmidae	Provinces in Argentina	References
Larainae		
<i>Hexanchorus dimorphus</i> Spangler & Staines	Misiones	Spangler & Staines 2004
<i>Hexanchorus shannoni</i> Spangler & Staines	Misiones	Spangler & Staines 2004
<i>Hydora annectens</i> Spangler & Brown	Neuquén, Rio Negro and Chubut	Archangelsky, 2004; Archangelsky & Manzo 2006
<i>Phanocerus sharpi</i> Grouvelle	Misiones	Trémouilles et al., 1995
<i>Potamophilops cinereus</i> (Blanchard)	Corrientes	Spangler & Santiago, 1987
Elminae		
<i>Austrelmis patagonicus</i> <b>sp. nov.</b>	Neuquén	Present study
<i>Austrolimnius eris</i> Hinton	Misiones	Manzo 2007
<i>Austrolimnius formosus</i> (Sharp)	Salta	Manzo 2007
<i>Austrolimnius nyctelioides</i> (Germain)	Chubut	Manzo 2007
<i>Cylloepus vianai</i> Hinton	Córdoba, Jujuy, Salta, Tucumán, Catamarca	Hinton 1951
<i>Luchoelmis cekalolovici</i> Spangler & Staines	Mendoza, Rio Negro, Chubut and Santa Cruz	Spangler & Staines 2002 and Archangelsky & Manzo 2007
<i>Macrelmis isis</i> (Hinton)	Córdoba, Jujuy, Salta, Tucumán, Misiones, La Rioja, San Luís and San Juan	Manzo & Archangelsky 2001
<i>Macrelmis saltensis</i> Manzo	Salta	Manzo 2003
<i>Macrelmis aequalis</i> (Hinton)	Misiones	Manzo 2007
<i>Microcylloepus plaumanni</i> Hinton	Misiones	Manzo 2007
<i>Neoelmis argentinus</i> <b>sp. nov.</b>	Rio Negro	Present study
<i>Stethelmis kaszabi</i> Hinton	Rio Negro and Chubut	Hinton 1970 and Archangelsky & Manzo 2007
<i>Tolmerelmis pubipes</i> (Hinton)	Misiones	Hinton 1936 and Fernández et al., 2008
<i>Xenelmis comis</i> Hinton	Misiones	Manzo 2006a and Fernández et al., 2008
<i>Xenelmis tarsalis</i> Hinton	Misiones	Manzo 2006a and Fernández et al., 2008
<i>Xenelmis uruzuensis</i> Manzo	Misiones	Manzo 2006b

## Material and Methods

The material was fixed in the field and stored in 75% ethyl alcohol. Specimens were dissected to illustrate male genitalia. Genitalia of both species were cleared with concentrated lactic acid for several days before examination. Drawings were done with an Olympus BH-2 microscope and a Leica Wild M3Z stereomicroscope, both with camera lucida. We follow the larval morphology nomenclature of Lawrence (1991) and adult morphology nomenclature of Kodada & Jäch (2005). Larval specimens were cleared in warm lactic acid, dissected and mounted on glass slides with Hoyer's medium; observations (up to 1000x) and drawings were made using a Leica MZ6 dissecting scope and a Leica DMLB compound scope, both with camera lucida; the compound scope also had a photographic camera attached. Drawings were scanned and digitally edited; photographs were assembled using the freeware program CombineZP (Hadley, 2010). Holotypes, paratypes, and several larval specimens are deposited in the collection of Instituto—Fundación Miguel Lillo (IFML), Tucuman, Argentina and 3 paratypes in the Museo de

La Plata, Buenos Aires, Argentina; additional larval material remains in the senior author's collection. For comparative observations, adults (male and female) of *Neoelmis scissicollis* (Germain) were borrowed from IFML.

## Results

### *Austrelmis patagonicus* sp. nov.

(Figs 1–3)

### Diagnosis

This new species may be distinguished from all the other known *Austrelmis* species by the following combination of characters: 1) metatibia strongly widened in the middle and 2) unique characters of the male genitalia.

*Holotype*: male. Body robust, subovate, moderately convex. Length: 3.50 mm; greatest width 1.45 mm (at midlength of elytra).

*Color*: cuticle dark; mouthparts, antennae and tarsi mostly reddish brown.

*Plastron*: covers genae, sides of prosternum, meso- and metaventrite, all femora, epipleura and sides of all ventrites.

*Head*: partially retractable, surface densely punctuate with sparse golden setae; punctures larger than facets of eyes, separated by  $\frac{1}{2}$  time their diameters or less; Fronto-clypeal suture straight and deep; clypeus broad, surface with punctures like those on head; labrum subrectangular, surface smooth, with sparse small punctures and golden setae. Antennae shorter than pronotum, with 11 antennomeres, apical segment longest.

*Thorax*: pronotum broader than long (1.02 mm and 0.75 mm), moderately convex, lateral margins subparallel, with acute apical apex. Sublateral carinae present on apical third and arcuate outwardly; weakly oblique lateral impressions on basal third. Base trisinuate. Disc without impressions; surface shiny, densely punctuate, punctures larger than facets of eyes, separated by 1 times their diameter or less, surface between punctures smooth with golden dispersed setae. Surface of lateral area, between carinae and lateral margin microreticulate and densely punctuate. Disc of prosternum without lateral carinae, as wide as procoxa; surface with disperse short setae and small punctures separated by 3–4 times their diameter and with dispersed short setae; prosternal process almost as wide as long, subquadrate, rounded apically. Hypomeron: surface rugose, without plastron. Mesoventrite with groove for reception of prosternal process. Metaventrite surface with disperse short setae and small punctures separated by 3–4 times their diameter; disc convex, without sublateral carinae; with complete median longitudinal line extending to anterior margin.

*Legs*: elongate, those of prothorax shortest. Pro- and mesocoxa globular; metacoxa transverse and subtriangular; trochanter, subtriangular; femora shorter than tibiae. All tibiae densely setose, with long golden setae; protibia slender; mesotibia slightly widened in the middle; pro- and mesotibiae with large apicolateral and small lateroventral cleaning fringes (occupying apical  $\frac{2}{3}$  and  $\frac{1}{3}$  respectively); metatibia strongly widened in the middle, with a single large apicolateral cleaning fringe. All tarsi have five tarsomeres with long golden setae, fifth tarsomere longest; tarsal claws long, not modified.

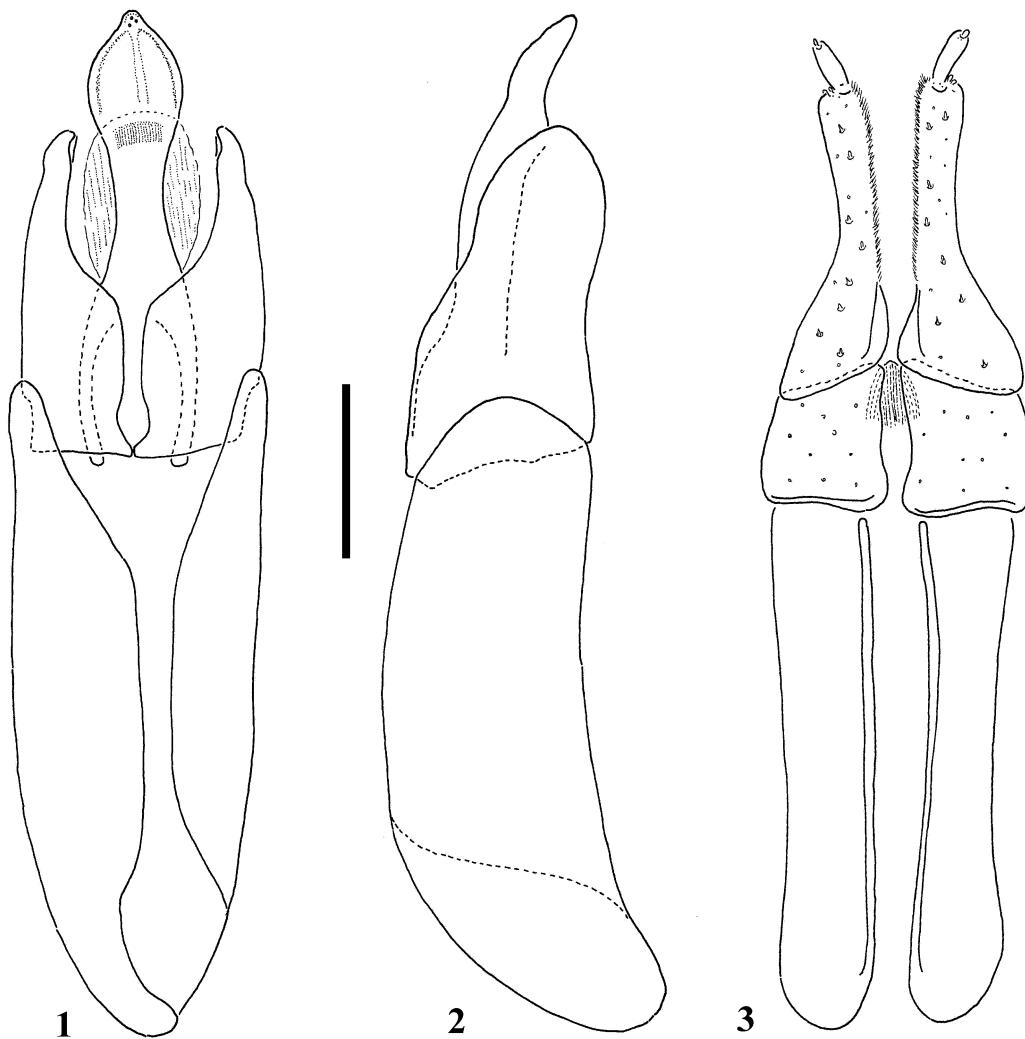
*Elytra*: more than twice as long as pronotum (2.20 mm), apices moderately protruded; surface punctuate, punctures very small, separated by 3–4 times their diameter; eight punctuate striae formed by punctures separated by one time their diameter; intervals flat; eighth interval with a longitudinal row of oval granules extending from the base to almost the elytral apex. Scutellum subtriangular, surface as punctuate as elytra.

*Abdomen*: ventrites convex; surface with small punctures like those on metaventrite; disc of ventrite I with complete lateral carinae; ventrite V with lateral margin produced as prominent tooth; apex rounded.

*Male genitalia*: aedeagus (Figs 1–2) long and moderately broad. Penis elongate, constricted medially, with apex rounded; fibula absent and corona present; ventral sac well developed; basolateral apophyses long. Parameres subtriangulate, distinctly shorter than penis. Phallobasis moderately large, longer than penis, entire dorsally and open.

*Female*: externally similar to male except for elytra which are reddish brown.

*Female genitalia*: as illustrated in Fig. 3.



**FIGURES 1–3.** *Austrelmis patagonicus* sp. n. (holotype): 1, male genitalia, dorsal view; 2, lateral view of same; 3, female genitalia, ventral view. Scale bars: 0.20 mm.

Holotype ♂: ARGENTINA: Neuquén: NE Junín de Los Andes y Ruta 40, S 39°59'12" W 70°52'53", 750 msnm, 29/X/2000, M. Archangelsky coll. (IFML). Paratypes: 1♂ and 1♀ with same data as holotype, 12 adults: ARGENTINA: Neuquén, Ruta 26 (a Copahue), S 37°57'37" W 70°47'49", 1345 msnm, 30/X/2000, M. Archangelsky coll.

*Etymology*: named *patagonicus* for the region (Patagonia) from which the type specimens were collected.

### Comparative notes

*Austrelmis* includes 20 species and 2 subspecies (Table 2). Most of the known species of *Austrelmis* were originally included in *Macrelmis* Motschulsky. While examining the types of *Macrelmis* Motschulsky, 1859 and *Elsianus* Sharp, 1882, Brown (1984) found out that *Elsianus* was a synonym of *Macrelmis*; consequently Brown transferred all the species included in *Elsianus* to *Macrelmis*. At the same time Brown (1984) transferred all the species originally included in *Macrelmis* (except for the type species) to a new genus, *Austrelmis*, and he provided a list of all known species of the new genus. Since 1984 only one new species from Peru has been described within *Austrelmis* by Więźlak (1987); in that same paper Więźlak also transferred two species described by Grouvelle (1896, 1897) within the genus *Elmis* to *Austrelmis*: *A. tibialis* and *A. flavitarsis*.

**TABLE 2.** Checklist of species of *Austrelmis* known from South America.

Species	Distribution	Reference
<i>A. anthracina</i> (Germain)	Chile	Brown 1984
<i>A. chilensis</i> (Germain)	Chile	Germain 1854 and Brown 1984
<i>A. condimentaria</i> (Philippi)	Peru	Brown 1984
<i>A. confluenta</i> (Hinton)	Peru	Hinton 1940a
<i>A. confusa</i> (Hinton)	Peru	Hinton 1940a
<i>A. consors</i> (Hinton)	Peru and Bolivia	Hinton 1940a
<i>A. consors mooni</i> (Hinton)	Bolivia	Hinton 1940a
<i>A. costulata</i> (Janssens)	Chile	Janssens 1957 and Brown 1984
<i>A. dorotae</i> Więźlak	Peru	Więźlak 1987
<i>A. elegans</i> (Janssens)	Chile	Janssens 1957 and Brown 1984
<i>A. flavitarsis</i> (Grouvelle)	Uruguay	Grouvelle 1897 and Więźlak 1987
<i>A. gardineri</i> (Hinton)	Bolivia	Hinton 1940a
<i>A. gilsoni</i> (Hinton)	Peru and Bolivia	Hinton 1940a
<i>A. glabra</i> (Hinton)	Peru	Hinton 1940a
<i>A. lata</i> (Hinton)	Peru	Hinton 1940a
<i>A. leleupi</i> Deléve	Ecuador	Deléve 1968 and Brown 1984
<i>A. patagonicus</i> <b>sp. nov.</b>	Argentina	Present study
<i>A. peruana</i> (Hinton)	Peru and Bolivia	Hinton 1937 and 1940a
<i>A. steineri</i> (Spangler)	Peru	Spangler 1980
<i>A. thermarum</i> (Hinton)	Bolivia	Hinton 1940a
<i>A. tibialis</i> (Grouvelle)	Bolivia	Grouvelle 1896 and Więźlak 1987
<i>A. woytkowskii</i> (Hinton)	Peru, Chile and Bolivia	Hinton 1937, 1940a; Janssens 1957
<i>A. woytkowskii bicolor</i> (Janssens)	Bolivia	Janssens 1957

*Austrelmis patagonicus* has been compared to original descriptions and illustrations. It can be easily differentiated from *A. confusa*, *A. confluenta*, *A. lata*, *A. woytkowskii*, *A. consors*, *A. thermarum*, *A. peruana*, *A. glabra*, *A. gilsoni*, *A. gardineri*, *A. elegans*, *A. costulata*, *A. leleupi*, *A. steineri* and *A. dorotate* by the unique characters of the male genitalia and also by the strongly widened hind tibiae.

*A. chilensis* (Germain), *A. anthracina* (Germain) and *A. condimentaria* (Philippi) were originally described within the genus *Elmis*, and later transferred to *Austrelmis* (Hinton 1940a; Brown, 1984). No redescrptions were made of these species, and no illustrations of the male genitalia have been published. Nonetheless Brown (1984) mentions some characters that serve to differentiate *A. patagonicus* from these three species. *A. patagonicus* differs from *A. condimentaria* by having: 1) a pronotum with lateral carinae; 2) the eighth elytral interval with a row of granules; 3) the first abdominal ventrite with lateral carinae. From *A. anthracina*, *A. patagonicus* **sp. nov.** can be separated by having: 1) the eighth elytral interval with a row of granules; and 2) metatibiae strongly widened in the middle. *A. chilensis* has a transverse depression on each side of the disc of the pronotum, which is missing in *A. patagonicus*.

No recent descriptions or illustrations of the male genitalia of *A. flavitarsis* (Grouvelle 1897) and *A. tibialis* (Grouvelle 1896) are available, but the original descriptions do not mention a very distinctive character such as the strongly widened metatibiae. Additionally, *A. tibialis* is a very small species (2 mm) while *A. patagonicus* is much larger (3.50 mm); other characters in which these two species differ are: 1) the oblique lateral depressions on the prothorax of *A. tibialis* (absent in *A. patagonicus*); and 2) a prothorax as long as wide in *A. tibialis* (wider than long in *A. patagonicus*).

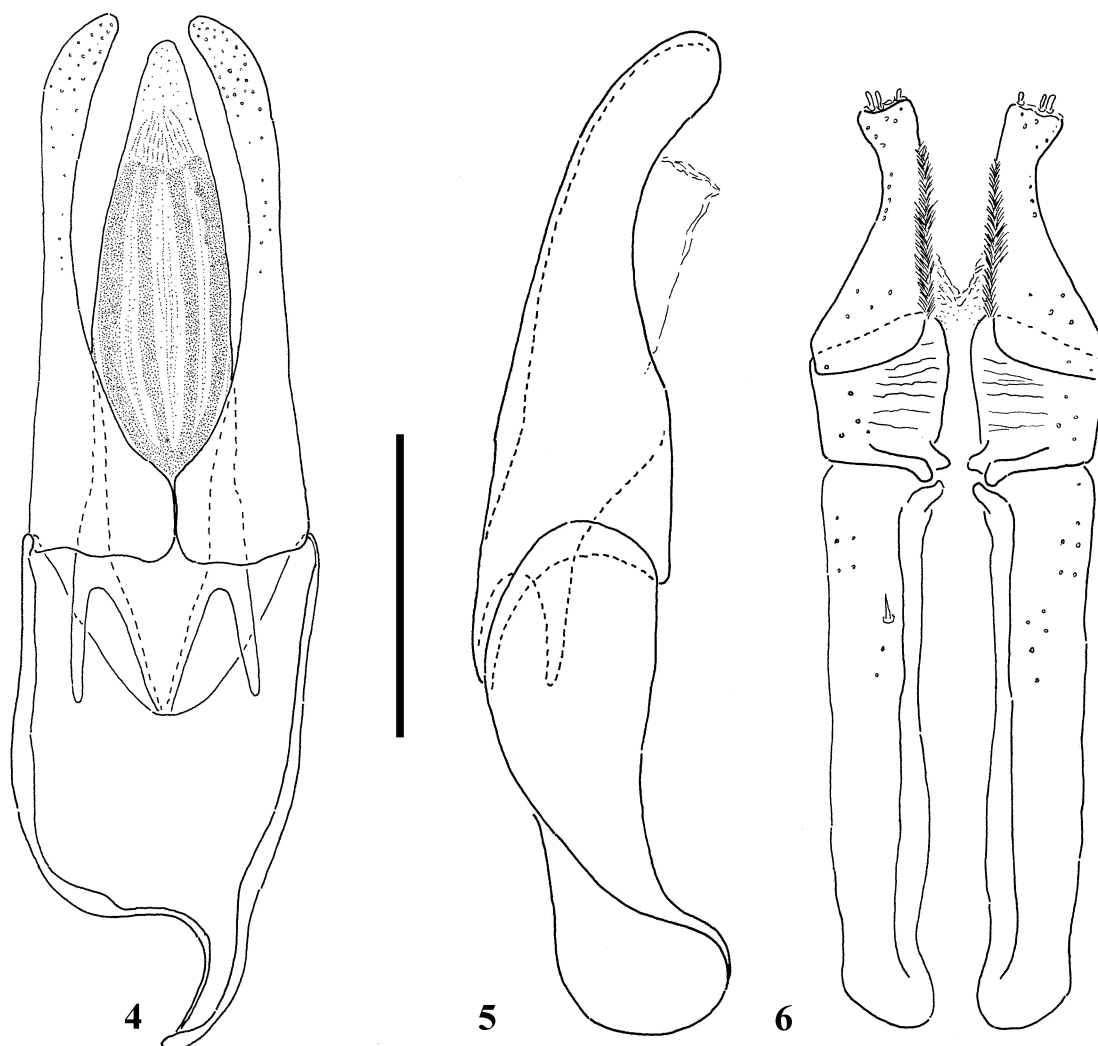
Lastly, in the original description of *A. flavitarsis*, the type locality says: Uruguay, and not Bolivia (Cochabamba) as Więźlak (1987) mentions while transferring this species to the genus *Austrelmis*. Therefore this would be the only known species of the genus in that country (Uruguay). Considering that all known species of *Austrelmis* have Andean distribution, it is probable that this species could belong to another genus.

***Neelmis argentinensis* sp. nov.**

(Figs 4–6)

**Diagnosis**

This new species may be distinguished from all the other known *Neelmis* species by the following combination of characters: 1) Large size, over 3.0 mm; 2) anterior margin of prosternum without teeth; 2) scutellum flattened, subpentagonal; 3) metaventrite flat, without depression; 4) abdominal ventrite I without lateral carinae and 5) unique characters from the male genitalia.



**FIGURES 4–6.** *Neelmis argentinensis* sp. n. (holotype): 4, male genitalia, dorsal view; 5, lateral view of same; 6, female genitalia, ventral view. Scale bars: 0.20 mm.

*Holotype*: male. Body form and size: subparallel, long and narrow. Length: 3.15 mm; greatest width 1.15 mm (at midlength of elytra).

*Color*: cuticle dark reddish; mouthparts, antennae and tarsi lighter in color.

*Plastron*: covers genae, epipleura, sides of mesosternum and metasternum, abdominal ventrites except disc of ventrite I; coxae, trochanters and femora.

*Head*: surface with small granules, granules rounded separated by 2–3 times their diameters. Fronto-clypeal suture straight. Labrum subrectangular, transverse, anterior angles rounded. Antenna with 11 antennomeres, antennomeres one, two and eleven longest.

*Thorax*: pronotum almost as wide as long (0.83 mm and 0.85 mm), sides subparallel with acute apex. Lateral margin crenulate and granulate; base trisinate. Surface microreticulate and densely granulate, granules rounded, separated by 3–4 times their diameters, with dispersed golden setae, basal area smooth, without granules. Sublateral carina on each side moderately elevated, extending from base to apex. Disc of pronotum with deep, complete transverse impression. Hypomeron microreticulate with sparse oblong granules, granules larger than head. Disc of prosternum twice as broad as procoxae, with short basal sublateral carinae, formed by a row of rounded granules; prosternal process long, apex subtriangular. Mesoventrite with a groove for reception of prosternal process. Metaventrite: surface granulate, granules rounded, separated by 4–5 times their diameter; disc without sublateral carina, with complete median longitudinal line extending to anterior margin. Legs: all with sparse oval and flatted granules. Pro- and mesocoxae globular, metacoxae transverse, trochanters subtriangular. Profemora as long as tibiae; protibia with a single apicolateral cleaning fringe (occupying apical 2/3); meso- and metafemora shorter than tibiae; mesotibiae with apicolateral and lateroventral cleaning fringes (occupying 2/3 and 1/3 respectively); tibial apices with a pair of short inner spurs. Metatibiae with a single apicolateral cleaning fringe (occupying apical 2/3). All tarsi five-segmented, last tarsomere the longest; tarsal claws slender, without inner teeth.

Elytra: length: 1.95 mm; greatest width: 1.15 mm at midlength. Each elytron with seven coarse striae formed by deep, round punctures separated by 1–2 times their diameters; with one sublateral carina on sixth interval. Epipleura microreticulate, without granules. Scutellum subpentagonal, flat, microreticulate.

*Abdomen*: surface of all ventrites smooth; ventrites IV and V with lateral margin produced as prominent tooth. Disc of ventrite I weakly depressed, surface shiny and punctuated, punctures larger than facets of eyes separated by 2–3 times their diameters. Apex of ventrite V rounded.

*Male genitalia*: aedeagus (Figs 4–5) short and moderately broad. Penis long, slender apically (narrower towards apex); ventral sac well developed; fibula absent and corona present. Parameres longer than penis, with apices rounded. Phallobasis shorter than parameres, open dorsally.

*Female*: externally similar to male. Four females were measured and their length ranged between 3.04 mm and 3.27 mm; their width ranged between 1.02 mm and 1.12 mm.

*Female genitalia*: as illustrated in Fig. 6.

Holotype ♂: ARGENTINA: Rio Negro Province, PN Nahuel Huapi, A° Botella, 41°16'S 71°12'W, 20/I/2007, M. Archangelsky coll. (IFML). Paratype: 11 ♀ and same data as holotype and 1 ♀ from ARGENTINA: Rio Negro Province, L. Mascardi, A° Llum, 23/II/2007, 41°17'S 71°30'W, M. Archangelsky coll.

*Etymology*: named *argentinensis* for the country from which the type specimens were collected.

### Additional material examined

*Neoelmis scissicollis* (Germain): CHILE, Region IX, PN Nahuelbuta, 5/I/2007, 3616', unnamed stream. William D. Shepard leg., 1 ♂; 1 ♀ from CHILE: Region IX, PN Nahuel. 12/I/2002, 2850 fit, Rio Piculguen, William D. Shepard leg.

### Comparative notes

*Neoelmis* includes 48 species and 2 subspecies (Table 3). One distinctive character of most *Neoelmis* species is their small size since most species are less than 3.0 mm long. Besides *N. argentinensis* only three species, *N. scissicollis* (Germain) from Chile, *N. prosternalis* Hinton and *N. giga* Hinton from Brazil are more than 3.0 mm long. Therefore size will serve as a good character to separate *N. argentinensis* from most known species within the genus. Based on the original descriptions by Hinton (1939a, 1940b) *N. argentinensis* can be distinguished from *N. prosternalis* and *N. giga* by: 1) anterior margin of prosternum without teeth; 2) scutellum flattened, subpentagonal; 3) metaventrite flat, without depression; 4) ventrite I without lateral carina; and 5) aedeagus with penis broader than parameres, slender apically (narrower towards apex) and parameres longer than penis. The new species can be distinguished from *Neoelmis scissicollis* by: 1) surface of prothorax densely granulate, except on basal area (all surface punctuate in *N. scissicollis*); 2) metatibiae with a single apicolateral cleaning fringe (two apicolateral fringes in *N. scissicollis*); and 3) base of third elytral interval flat (strongly convex in *N. scissicollis*).

**TABLE 3.** Checklist of species of *Neelmis* known from America.

Species	Distribution	Reference
<i>N. abdominalis</i> Hinton	Colombia	Hinton 1939b
<i>N. alcine</i> Hinton	Brazil	Hinton 1972 a
<i>N. ampla</i> Hinton	Brazil	Hinton 1940b
<i>N. anytis</i> Hinton	Ecuador	Hinton 1972 a
<i>N. apicalis</i> (Sharp)	Mexico and Guatemala	Musgrave 1935 and Hinton 1940c
<i>N. apicalis angusta</i> Hinton	Peru and Bolivia	Hinton 1939b and Hinton 1971
<i>N. apicalis apicalis</i> (Sharp)	Mexico and Guatemala	Sharp 1882 and Hinton 1971
<i>N. aragua</i> Hinton	Venezuela	Hinton 1972 b
<i>N. argentinensis</i> <b>sp. nov.</b>	Argentina	Present study
<i>N. aspera</i> Hinton	Mexico	Hinton 1940c
<i>N. atys</i> Hinton	Brazil	Hinton 1972 a
<i>N. azteca</i> Hinton	Mexico	Hinton 1940 c
<i>N. caesa</i> (LeConte)	USA	Musgrave 1935
<i>N. ceto</i> Hinton	Venezuela	Hinton 1972 b
<i>N. crino</i> Hinton	Venezuela	Hinton 1972 b
<i>N. fossa</i> Hinton	Brazil	Hinton 1940b
<i>N. giga</i> Hinton	Brazil	Hinton 1939a and 1940b
<i>N. gracilis</i> Musgrave	Puerto Rico	Musgrave 1935
<i>N. grossa</i> Hinton	Bolivia	Hinton 1939b
<i>N. grossepunctata</i> Delève	Ecuador	Delève 1968
<i>N. limosa</i> (Grouvelle)	Brazil, French Guiana	Hinton 1940b and Delève 1970
<i>N. longula</i> Hinton	Mexico	Hinton 1940c
<i>N. lobata</i> Hinton	Brazil	Hinton 1939a and 1940b
<i>N. maculata</i> Hinton	Brazil	Hinton 1940b
<i>N. mamorata</i> Hinton	Brazil	Hinton 1940b
<i>N. maro</i> Hinton	Brazil	Hinton 1972 a
<i>N. mila</i> Hinton	Brazil	Hinton 1972 a
<i>N. minima</i> (Darlington)	Cuba	Musgrave 1935 and Spangler 1981
<i>N. morador</i> Hinton	Venezuela	Hinton 1972 b
<i>N. mormo</i> Hinton	Brazil	Hinton 1972 a
<i>N. musgravei</i> Hinton	Brazil	Hinton 1940b
<i>N. nana</i> Hinton	Brazil	Hinton 1940b
<i>N. nelo</i> Hinton	Brazil	Hinton 1972 a
<i>N. nicon</i> Hinton	Brazil	Hinton 1972 a
<i>N. olenus</i> Hinton	Venezuela	Hinton 1972 b
<i>N. opis</i> Hinton	Brazil	Hinton 1972 a
<i>N. plaumanni</i> Hinton	Brazil	Hinton 1940b
<i>N. porrecta</i> Delève	Ecuador	Delève 1968
<i>N. prosternalis</i> Hinton	Brazil	Hinton 1939a and 1940b
<i>N. pusio</i> (Hinton)	Trinidad & Tobago	Hinton 1971
<i>N. reichardtii</i> Hinton	Brazil	Hinton 1972 a
<i>N. resa</i> Hinton	Venezuela	Hinton 1972 b
<i>N. saon</i> Hinton	Venezuela	Hinton 1972 b
<i>N. scissicollis</i> (Germain)	Chile	Blackwelder 1944; Shepard pers. com.
<i>N. simoni</i> (Grouvelle)	Venezuela	Grouvelle 1889 and Hinton 1936
<i>N. sketi</i> Spangler	Ecuador	Spangler 1996
<i>N. sul</i> Hinton	Brazil	Hinton 1972 a
<i>N. thyas</i> Hinton	Brazil	Hinton 1972 a
<i>N. thoracica</i> (Grouvelle)	Bolivia	Hinton 1936 and Delève 1970
<i>N. tibialis</i> Delève	Ecuador	Delève 1968
<i>N. tocuquito</i> Hinton	Venezuela	Hinton 1972 b



## *Neoelmis argentinensis* sp. nov., mature larva

(Figs 7–25)

Length: last instar length 6.1 to 6.9 mm; maximum width 0.6 to 0.7 mm. Body elongate (Figs 7–8), parallel sided, subcylindrical in cross-section; color brown to reddish brown.

Head capsule: Subquadrate, prognathous, not concealed by pronotum; surface covered by granules, smaller on basal 1/5 (Fig. 9). Ocular areas light brown, stemmata closely aggregated forming an ocular-spot. Coronal suture short, frontal sutures long, extending to base of antennae on anterolateral corners of head capsule; frontoclypeal suture weakly insinuate. Anterior margin of clypeus serrate, with small tooth on each lateral margin close to antennal base (Fig. 10). Gula well demarcated, subtrapezoidal, basal margin wider than distal (Fig. 16).

Labrum: Subrectangular, with anterolateral corners rounded (Figs. 11–12); midline with transverse row of setae, anterolateral corners with four strong setae each. Ventral surface of labrum (epipharynx) pubescent (Fig. 12).

Antenna: Short, as long as mandible, with 3 antennomeres (Fig. 13). Basal antennomere stout, with several distal setae and pores, inner margin with short cuticular spines; second antennomere longest, bearing a slender apical sensorium on outer margin; third antennomere shortest, slightly shorter than sensorium, bearing short distal seta.

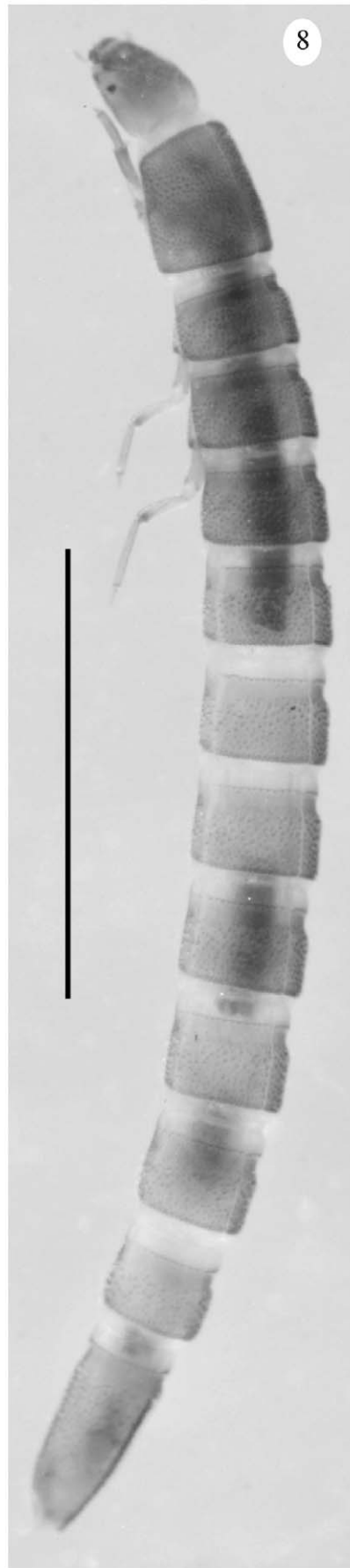
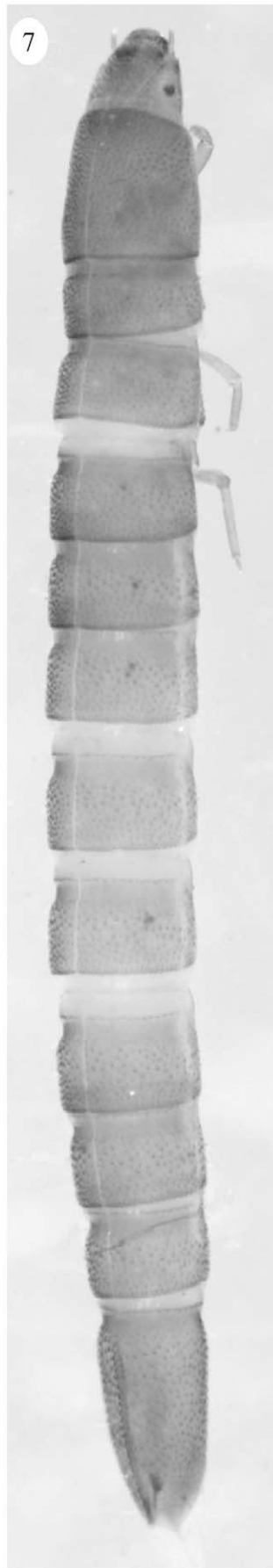
Mandibles: Symmetrical, grooved, apex tridentate (Figs 14–15), with one distal tooth and two subapical teeth, one dorsal and one ventral; an additional small inner retinaculum on dorsal margin. Inner margin of groove with comb of setae projecting medially. Dorsal inner margin with long setose articulated process projecting medially (prostheca); outer margin of mandible with two stout, hyaline ramose setae.

Maxilla: Cardo short, subtriangular (Fig. 16), bearing one fringed seta. Stipes long, subrectangular (Fig. 16), bearing several small fringed setae on basal third and outer margin; one long and stout subapical seta on outer margin and one large pore mediad of that seta. Lacinia and galea well developed (Fig. 17); lacinia with a strong lobe with five strong setae on mesal margin, projecting dorsally; galea one-segmented, with serrated distal margin and 4 apical setae. Palp with 4 palpomeres (Fig. 17), first palpomere shortest, with one outer branched seta; remaining palpomeres subequal in length, second palpomere with two ventral pores, third palpomere with two ventral pores and two short dorsal apical setae; fourth palpomere the narrowest, with several distal sensilla.

Labium: Large, formed by prementum and postmentum (Fig. 17). Postmentum large, subrectangular, longer than wide, basal third with several short fringed setae; distal third with one stout long seta on each outer margin and one pair of large pores close to midline; lateroapical margins each with a long, blunt, articulated porose sensillum. Prementum short, subtrapezoidal, less sclerotized, each anterolateral corner with a fringed seta. Palpi with two palpomeres (Fig. 17), palpomeres subequal in length, basal one stouter, with one ventral apical pore and several cuticular spines on outer and distal margins; second palpomere with several short sensilla. Ligula as a short lobe, bearing a transverse row of short setae and covered by numerous short, cuticular spines.

Thorax: Strongly sclerotized, all sclerites covered by setiferous tubercles densely distributed, those on dorsal and lateral areas conical (Fig. 18), those on ventral areas shorter and distally concave (Fig. 19); tergal plates with sagittal lines. Prothorax as long as meso- and metathorax combined (ca. 0.65 mm, Figs. 7–8), subquadrate in dorsal view; anterior margin of pronotum with row of tubercles bearing long feather-like setae; venter of prothorax with five sclerites (Fig. 20): two anterior, subrectangular, two lateral and one posteromedial, subpentagonal; procoxal cavities closed. Meso- and metathorax shorter, subequal in length, wider than long, subrectangular in dorsal view. Venter of meso- and metathorax each with five sclerites (Fig. 21), one large, subpentagonal, anterior to coxae, two small ones on each lateral margin; coxal cavities open; mesothorax with one pair of lateroventral spiracles. Legs similar in shape (Fig. 22), those of prothorax shortest. Coxa large, subtriangular; trochanter small, subtriangular; femur long, wider distally; tibia long, narrower than femur, bearing hooked tarsungulus.

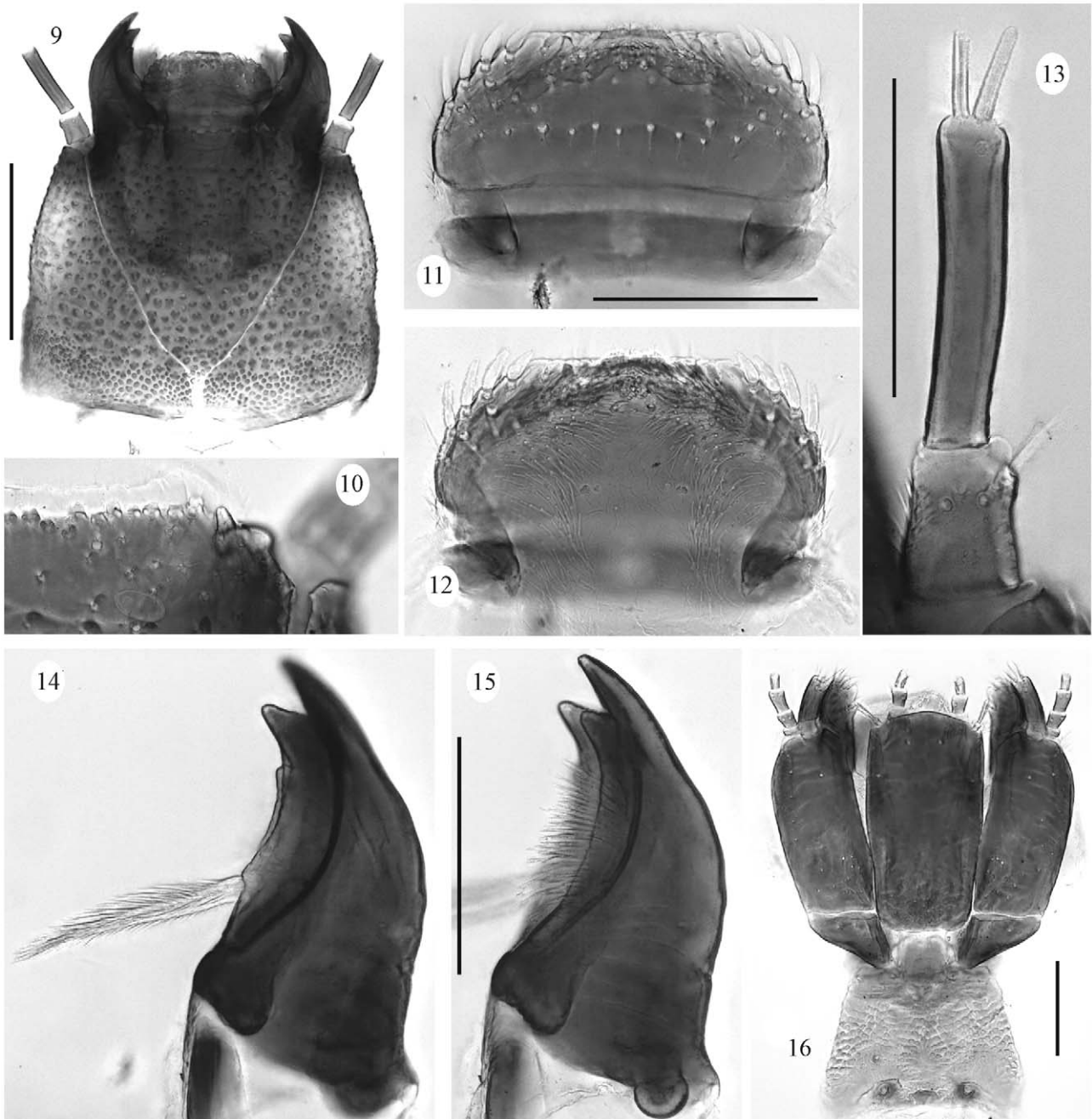
Abdomen: Long, tapering towards distal end, nine-segmented; segments I–VIII subequal in length, slightly wider basally than distally. Terga I–VIII with sagittal line (Fig. 7). Pleural sclerites present on segments I–VII (Fig. 24); sternal sclerites of these segments subquadrate (Fig. 24); sternum of segment I with a short carina on anterior third (Fig. 23). Segment VIII entire, ring-like. Segment IX elongate, 2.5 times longer than previous segment, bearing a feeble dorsal keel (Fig. 7); sternal area with apical gill chamber, operculum subpentagonal, covering a pair of strong distal hooks (Fig. 25). Spiracles present laterally on segments I–VIII.



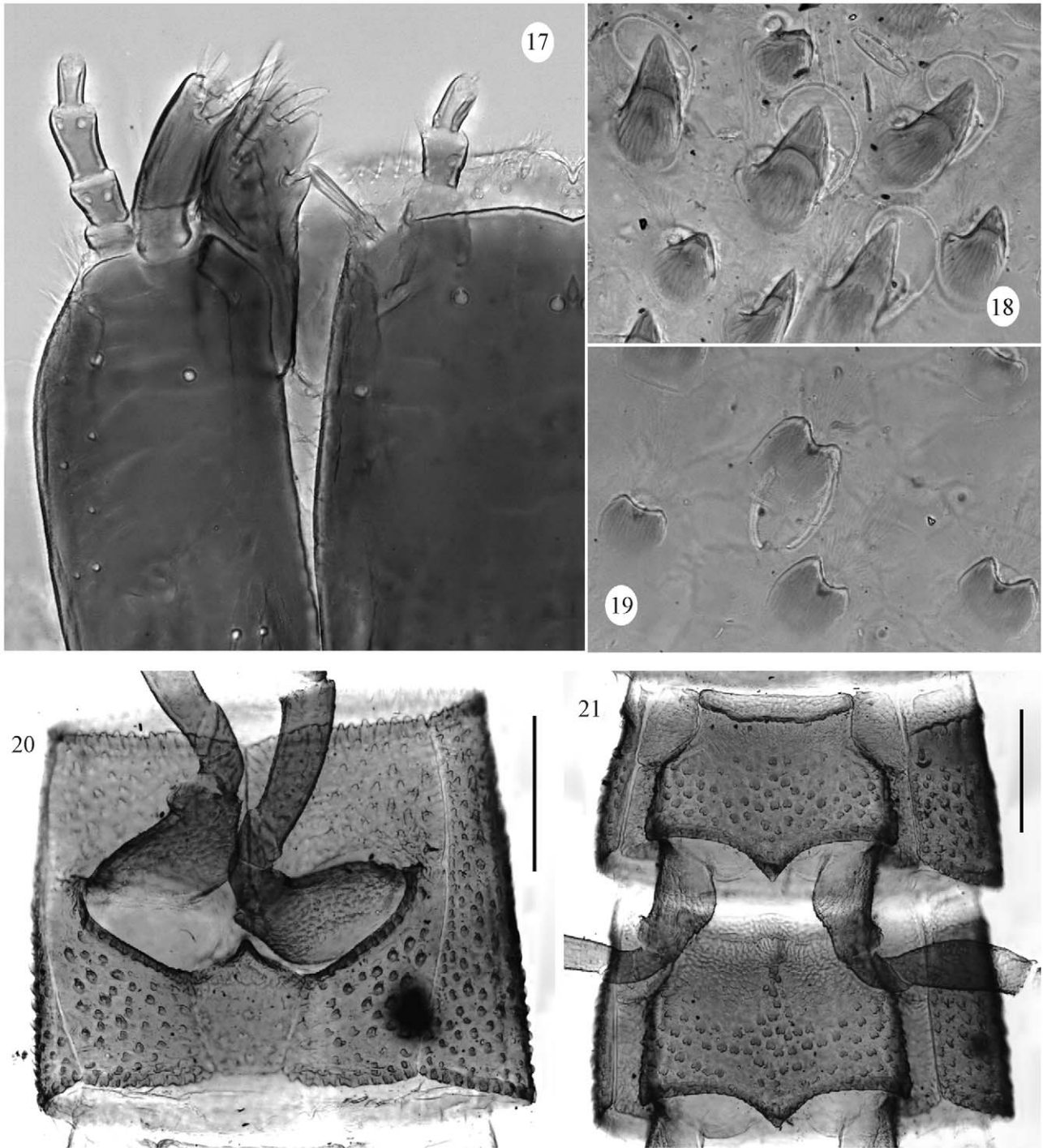
**FIGURES 7–8.** *Neoelmis argentinensis* sp. n. mature larva: 7, habitus, dorsolateral view; 8, habitus, lateral view. Scale bars: 2 mm.

### Comparative notes

It is difficult to compare the larva of *N. argentinensis* to the other published descriptions. Even though the genus *Neoelmis* is quite speciose (47 species), only two larval descriptions are available (Spangler 1966), but the level of detail of these descriptions is not too deep. Spangler (1966) described two elmid larvae as “*Neoelmis* sp. larva 1” and “*Neoelmis* sp. larva 2”, without assigning them to any known species. The size of the mature larva of *N. argentinensis* is larger than those described by Spangler (1966); all three larvae have in common the stemmata fused forming an ocular spot, pleural sclerites on abdominal segments I–VII, and abdominal segment IX at least 2 times longer than VIII. *N. argentinensis* and *N. sp.1* have in common mandibles with a tridentate apex (that of *N. sp. 2* has a tetradentate apex) and a longer prothorax, about as long as meso- and metathorax combined (*N. sp. 2* has a shorter prothorax).



**FIGURES 9–16.** *Neoelmis argentinensis* sp. n. mature larva: 9, head capsule, dorsal view; 10, detail of tooth between clypeus and base of antenna; 11, labrum, dorsal view; 12, labrum, ventral view; 13, antenna, dorsal view; 14, mandible, ventral view; 15, mandible, dorsal view; 16, maxillolabial complex and gula, ventral view. Scale bars, Fig. 9: 0.25 mm; Figs 11–16: 0.1 mm.

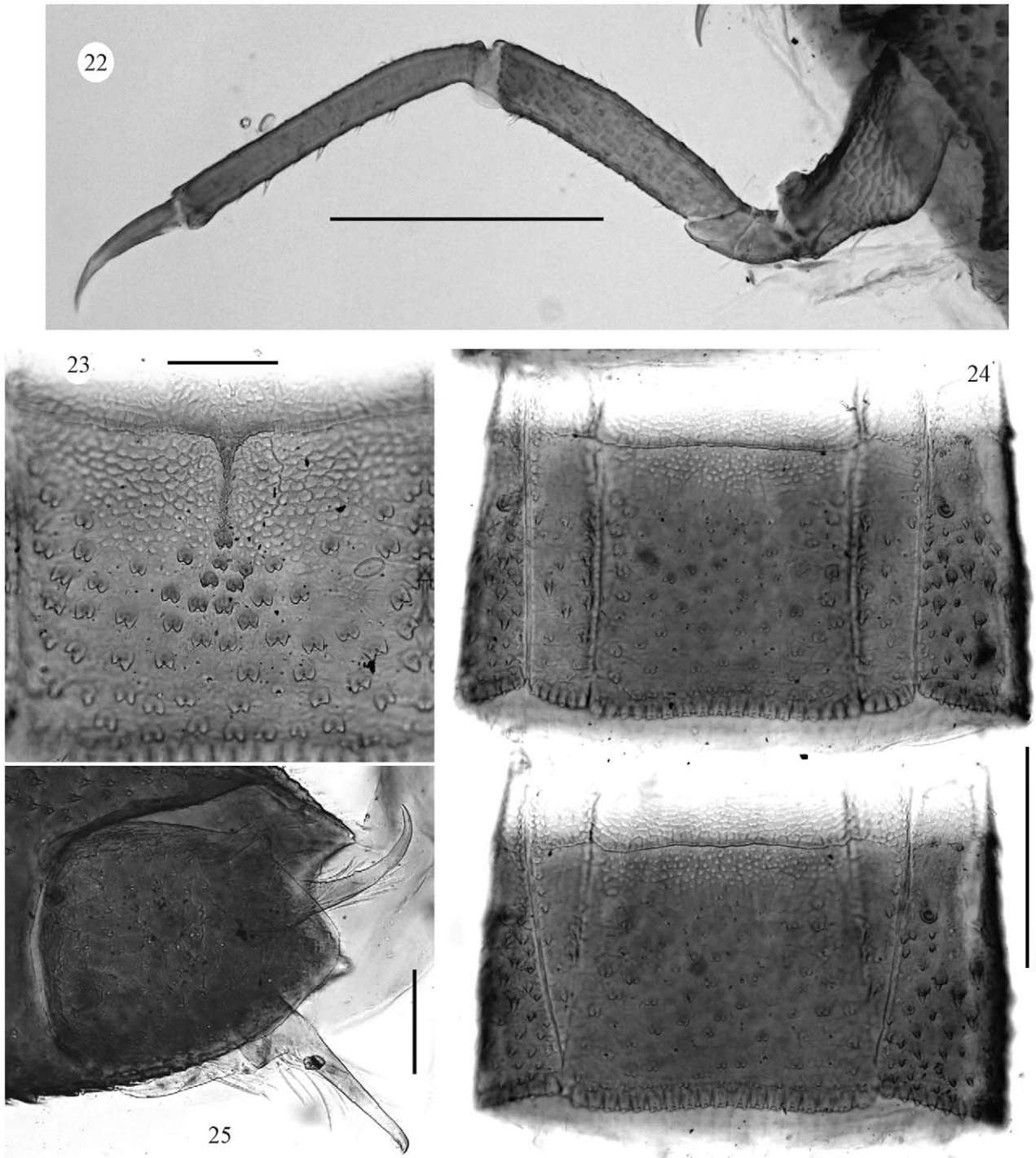


**FIGURES 17–21.** *Neoelmis argentinensis* sp. n. mature larva: 17, detail of apex of maxilla and labium; 18, tubercles on dorsal and lateral areas of thorax; 19, tubercles on ventral areas of thorax; 20, prothorax, ventral view; 21, meso- and metathorax, ventral view. Scale bars, Figs 20–21: 0.2 mm.

One interesting character observed in the larva of *N. argentinensis* is that the anterior margin of the clypeus bears a small tooth on each lateral margin, close to the antennal base (Fig. 10). This character is problematic since in Hinton's key to the larvae of Mexican genera of Elmidae (Hinton 1940), *Neoelmis* is cited as lacking a tooth on the lateral margins, but in the description Hinton mentions a blunt tooth on each side of the clypeus. Sanderson (1953, 1954) is the first to mention this incongruence in Hinton's (1940c) monograph, and in the larval key Sanderson considers the clypeus of *Neoelmis* as having a lateral tooth on each side. More recent generic keys for elmid larvae incorrectly mention the larva of *Neoelmis* as lacking this tooth (Manzo & Archangelsky 2008; White & Roughley 2008; Archangelsky *et al.* 2009). Based on the above information and on the description of *N.*

*argentinensis*, we consider that the larva of *Neoelmis* has a small lateral tooth between the clypeus and the base of the antennae.

Diagnostic characters for the genus are difficult to provide, but the following characters are shared by the few known larvae: 1) pleural sclerites on abdominal segments I–VII; 2) abdominal segment IX at least twice as long as preceding segment; 3) procoxal cavities closed; 4) venter of pro-, meso- and metathorax each with five sclerites; and 5) a small tooth between the clypeus and the base of the antennae.



**FIGURES 22–25.** *Neoelmis argentinensis* sp. n. mature larva: 22, mesothoracic leg, ventral view; 23, abdominal sternite I; 24, abdominal sternites and pleural sclerites of abdominal segments VI and VII; 25, detail of operculum and hooks on abdominal segment IX, ventral view. Scale bars, Figs 22 and 24: 0.25 mm; Figs 23 and 25: 0.1 mm.

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