

Subulinidae snails from northern Argentina with description of a new species of *Nannobeliscus* Weyrauch

(Gastropoda, Stylommatophora, Achatinoidea)

Sergio E. Miquel & Giselle L. Jaime

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The presence of two Subulinidae living in the tropical region of Argentina is recorded: *Nannobeliscus mariaisabelae* spec. nov. and an indetermined species of *Leptinaria*. *N. mariaisabelae* is characterized by turritid shell, radular formula 17+1+17 with tricuspid teeth, penis with verge and epiphallus (producing spermatophores); vagina long, with one medial bulb; ovoviviparous. *Leptinaria* spec. is known only for its small shell, conical, perforated, with strong axial ribs, columella not truncated, amber-yellowish.

Sergio E. Miquel, Museo Argentino de Ciencias Naturales "Bernardino Rivadavia", Consejo Nacional de Investigaciones Científicas y Tecnológicas, Av. Ángel Gallardo 470, C1405DJR, Ciudad Autónoma de Buenos Aires, Argentina; e-mail: semsnail@yahoo.com.ar

Giselle L. Jaime (corresponding author), Museo Argentino de Ciencias Naturales "Bernardino Rivadavia", Av. Ángel Gallardo 470, C1405DJR, Ciudad Autónoma de Buenos Aires, Argentina; e-mail: gise9693@gmail.com

Introduction

Subulinidae Fischer & Crosse, 1877 include gastropods of small to medium size, commonly with numerous whorls and turritid to fusiform shape. This family has about seventy genera and over 1300 described species (Naggs 1994), many of which are only known for their shell characteristics (Schileyko 1999). According to this author, the limited or non-existent anatomical information of those genera and species originates difficulties in taxa identification.

Few tropical subulinids are known from Argentina, the native *Leptinaria bacterionides* (d'Orb., 1835) and *Ischnocion birabeni* (Hylton Scott, 1946) (Fernández 1973, Hausdorf et al. 2012); *Allopeas gracile* (Hutton, 1834) and *Opeas pumilum* (Pfeiffer, 1840) live in northern and central areas of the country, but these tropical cosmopolitan species have spread through human agency and it is not clear if they are native to Argentina (Virgillito & Miquel 2013). On

the other hand, an introduced temperate-weather species, the circum-Mediterranean *Rumina decollata* (Linnaeus, 1758) has recently been introduced (Virgillito & Miquel 2013).

In this contribution, a new species of Subulininae Fischer & Crosse, 1877, *Nannobeliscus mariaisabelae*, is described from the warmest region in Argentina. Moreover, the presence of an undetermined species of *Leptinaria* Beck, 1837 is mentioned from the same area.

Material and methods

Specimens recorded here were deposited in the Invertebrate Division of Museo Argentino de Ciencias Naturales Bernardino Rivadavia (Buenos Aires, Argentina), photographs were taken using Scanning Electronic Microscope of this institution; images of *L. bacterionides*, from the Natural History Museum (London) were used for comparisons. The specimens were relaxed in water



Fig. 1. Distribution of *Nannobeliscus mariaisabelae* spec. nov. (●), *Leptinaria* spec. (×) and *L. bacterionides* (d'Orb., 1835) (▲).

and fixed in ethanol (70 %) by the collector. Glycerin alcohol and lactofenol were used as clearing agents and histological sections (1 μ m) of genital apparatus, stained with toluidine blue, were made to identify anatomical details.

The abbreviations used are: FML = Fundación e Instituto Miguel Lillo, Tucumán; MACN-In = Invertebrates Division of Museo Argentino de Ciencias Naturales "Bernardino Rivadavia"; MD = Main diameter; NHM = Natural History Museum, London; NW = Number of whorls; TI = Total length.

Systematics

Genus *Nannobeliscus* Weyrauch, 1967

Type species: *Obeliscus (Nannobeliscus) silvaevagus* Weyrauch, 1967 for *Obeliscus (Microbeliscus) silvaevagus* Weyrauch, 1964, nomen praecupatum.

Distribution of genus: Only known of its locus typicus in Central Peru (Weyrauch 1964, 1967).

Nannobeliscus mariaisabelae spec. nov.

Figs 1–6, 12–17, Table 1

Diagnosis. Shell of medium size, 16 mm, turrated, almost smooth, with 12 whorls, rimate, columella not truncate, radular formula 17 + 1 + 17 with tricuspid teeth, penis with large verge, vas deferens inserting into base of epiphallus, vagina long and fusiform with one medial bulb where the duct of the small gametolytic sac opens.

Description

Medium size shell of approximately 16 mm, turrated, thin and without ornamentation, imperforate; it has

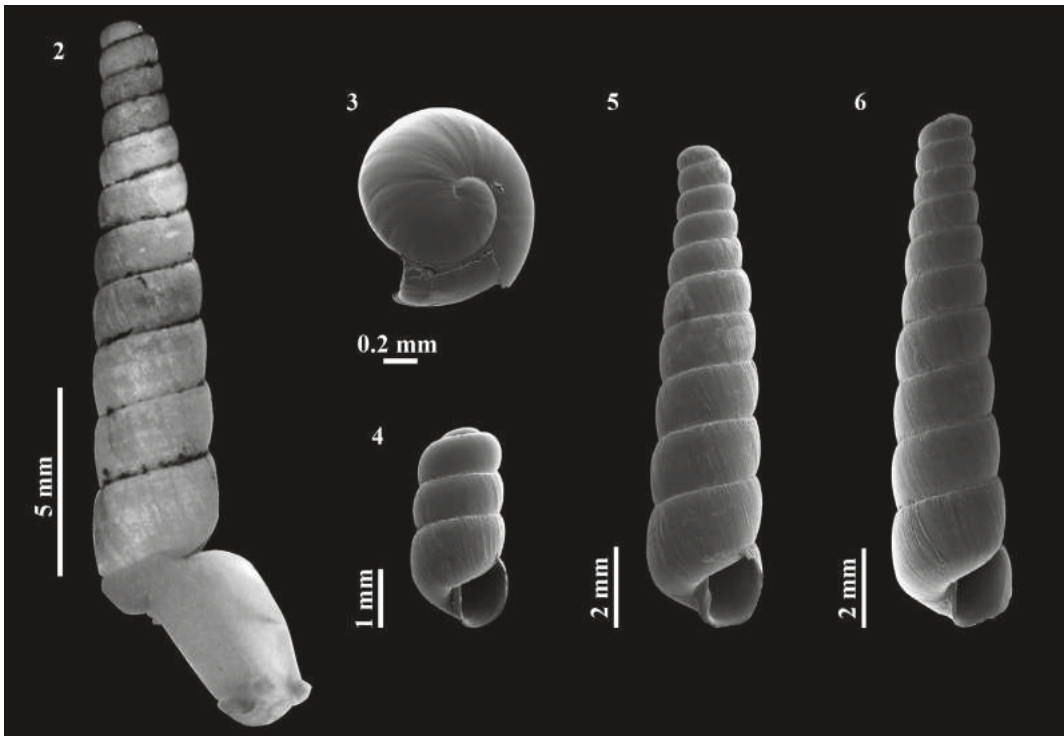


Fig. 2. *Nannobeliscus mariaisabelae* spec. nov., holotype (MACN-In 39.149, Las Capillas, Jujuy, Argentina). Figs 3–6. *Nannobeliscus mariaisabelae* spec. nov. (MACN-In 36.941, Las Capillas, Jujuy). 3. Protoconch. 4. Young specimen. 5. Adult specimen with lamella. 6. Adult specimen not showing the lamella.

10 to 12 flat-convex whorls; first whorls rounded and tapering towards fourth, last whorl presents slightly concave periphery; surface almost smooth, with weak and irregular growth lines; sutures somewhat crenulate; rimate; columella not truncate; aperture small, ovate, almost vertical, outer lip simple and thin; periostracum yellowish-brown, worn; protoconch smooth and not well differentiated from teleoconch. Odontognathous jaw. Radula: teeth tricuspid; central ones with incipient ectocones, and approximately one third the length of the lateral teeth; lateral teeth with long mesocone, lateral cones short and sharp, this asymmetry is less marked towards the marginal teeth, broader than long, with edges that can become somewhat serrated. Radular formula $7 + 10 + 1 + 10 + 7$. Penis, vagina and gametolytic sac extremely delicate, almost transparent and elongated. Penis very long and thin, with two parts well differentiated, the first has triangular and large verge, and opens into genital atrium with angle of approximately 90° ; epiphallus present, penis muscle retractor inserting at base; vas deferens runs parallel to the penis between the atrium and its base where it inserts. Vagina long and fusiform with medial bulb;

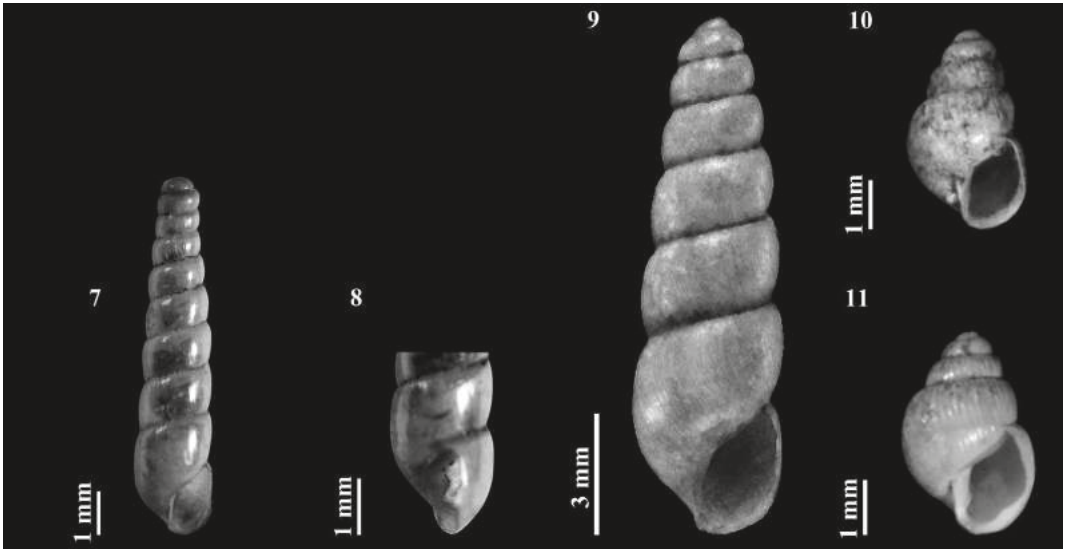
gametolytic sac small, runs parallel to the vagina and opens through large duct in the medial bulb. Spermatophore is fusiform, $800 \mu\text{m}$ in length, with three different parts, head, body and tail, found in the muscular bulb of vagina. Species ovoviviparous.

Measurements of the Holotype: $14.95 \times 3.40 \text{ mm}$; 12.00 whorls (see Table 1).

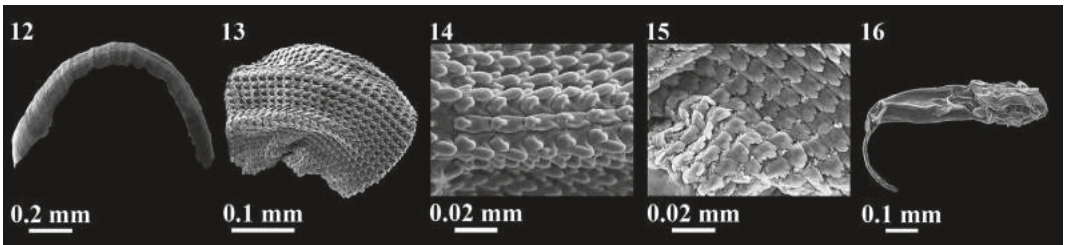
Type locality: Las Capillas, Jujuy, Argentina.

Table 1. Measurements of the type series of *Nannobeliscus mariaisabelae* spec. nov..

	Total length (mm)	Main diameter (mm)	Number of whorls
Holotype	14.95	3.40	12.00
Paratype 1	14.55	3.10	11.75
Paratype 2	16.00	3.40	12.00
Paratype 3	15.60	3.25	12.00
Paratype 4	14.95	3.10	11.75
Paratype 5	14.55	3.25	11.75
Paratype 6	15.20	3.40	11.75



Figs 7–8. *Obeliscus (Nannobeliscus) silvaevagus* Weyrauch, 1967 (FIML 1219). 7. Holotype. 8. Detail of aperture. **Figs 9–11.** *Leptinaria*. 9. *Leptinaria bacterionides* (d’Orb., 1835) (NHMUK Reg. 1854.12.4.88, Laguna, Bolivia, lectotype). 10. *Leptinaria* spec. (MACN-In 39.381, Calilegua National Park, Jujuy, Argentina). 11. *Leptinaria* spec. (MACN-In 39.380, Iguazú National Park, Misiones, Argentina).



Figs 12–15. *Nannobeliscus mariaisabelae* spec. nov. (MACN-In 36.941, Las Capillas, Jujuy, Argentina). 12. Jaw. 13. General view of the radula. 14. Detail of central and lateral teeth. 15. Detail of marginal teeth. **Fig. 16.** Spermatophore of *Nannobeliscus mariaisabelae* spec. nov. (MACN-In 36.941, Las Capillas, Jujuy, Argentina).

Repository (in alcohol): Holotype: MACN-In 39.149, Las Capillas, Jujuy; – 6 Paratypes: MACN-In 39.150, Las Capillas, Jujuy.

Other studied materials: FIML 1219, Holotype, *Obeliscus (Nannobeliscus) silvaevagus* Weyrauch, 1967, Central Peru, Leoncio Prado province, Huánaco department, right bank of Monzón River. MACN-In 36.941, Las Capillas, Jujuy. Col. M. Birabén, 4-XII-1951. 48 exs.

Etymology. Dedicated to María Isabel Hylton Scott (1889–1990), a prominent Argentinean malacologist.

Comparisons. *Nannobeliscus* was created as a new name after the nomen preoccupatum *Microbeliscus* Weyrauch, 1964, described as subgenus of *Obeliscus* Beck, 1837 (Weyrauch 1967). Schileyko (1999) included it in his monograph as a genus. Hausdorf

et al. (2012) cited it, doubtfully, in the synonymy of *Ischnocion* Pilsbry, 1907. But the genital features confirm the validity of the genus *Nannobeliscus*. Thus, the results of this research oppose the recent classification by Bank (2017).

Nannobeliscus silvaevagus has an uniform corn-yellow shell, with 9.5 whorls, and very low, broad radial plicae, parietal wall with filiform lamella, columella with low spiral lamella; 8.3 × 1.9 mm; soft parts remain unknown (Weyrauch 1964). It has less size and fewer whorls than *N. mariaisabelae* spec. nov. (16 versus 8.3 mm; 12 versus 9.5 whorls), its periostracum is brilliant while in the new species is opaque. In *N. mariaisabelae*, the shell is more fragile and the crenulation of sutures is much less marked than in *N. silvaevagus*.

Respect to the type species of *Opeas*, *Bulimus pumilum* (= *Helix goodali* Miller, 1822, homonymous of *Helix goodali* Férussac, 1821), it has different dimensions, such as number of whorls, length and width. The new species is bigger, lacks radial ornamentation (striae or wrinkles) and the outer lip is not arched forwardly (Pilsbry 1946, Virgillito 2012).

Leptinaria Beck, 1837 has a small penis, internally nearly smooth, long and slender flagellum, penial retractor attached to flagellum apically, and vagina with spiral folds internally (Schileyko 1999). Its type species, *Leptinaria unilamellata* (d'Orb., 1835) has small vagina and spermatheca, large flagellum and radular formula with marginal teeth very sharp and elongated, bicuspid (16+12+1+12+16) (Baker 1945).

Subulina Beck, 1837 shows a short and free oviduct, the vagina is rather long, the spermatheca and the penis usually are reduced (Schileyko 1999). *Subulina octona* (Bruguière, 1792), the type species of this genus, was introduced in several areas of the world by human transport. It has a flagellum, lacks epiphallus, radular formula with numerous teeth (36/30-1-30/36), and marked columellar notch (Pilsbry 1946).

Neobeliscus Pilsbry, 1896, from Brazil, lacks an epiphallus, has short ducts, and the sinuous vas deferens ends in the distal part of the penis, the penis retractor arises from the columellar muscle; the only species of this genus (*Helix calcarius* Born, 1780) is very large (95 mm in length) (Pilsbry 1907, Schileyko 1999).

Regarding *Ischnocion* Pilsbry, 1907 distributed throughout Colombia and Argentina (Hausdorf et al. 2012), the soft parts of the type species *Leptinaria (Ischnocion) triptyx* Pilsbry, 1907 are not known. The genus differs from the new species by presenting in its adult stage the following structures: two strong columellar folds and medial spiral lamella that follows the outer lip without reaching the edge (Schileyko 1999). *Ischnocion birabeni* (Hylton Scott, 1946) described for northern Argentina (Jujuy province), presents in pre-adult stages, palatal lamella not found in the adult, and a poorly developed columellar fold in mature specimens; radular formula (9+3)+5+1+5+(3+9) with multicuspoid marginal teeth; penis, long and arched forms a terminal expansion where the epiphallus is inserted, receives the vas deferens and the distal end of the retractor muscle; the duct of the spermatheca is very short and does not exceed the middle region of the uterus (Hylton Scott 1946, Hausdorf et al. 2012). *Ischnocion conica* Hausdorf et al., 2012 shows a long and ovate spermatheca not reaching the albumen gland, and a short and conical penis without epiphallus and apparently without vas deferens (Hausdorf et al. 2012).

Allopeas Baker, 1935 is an American genus with

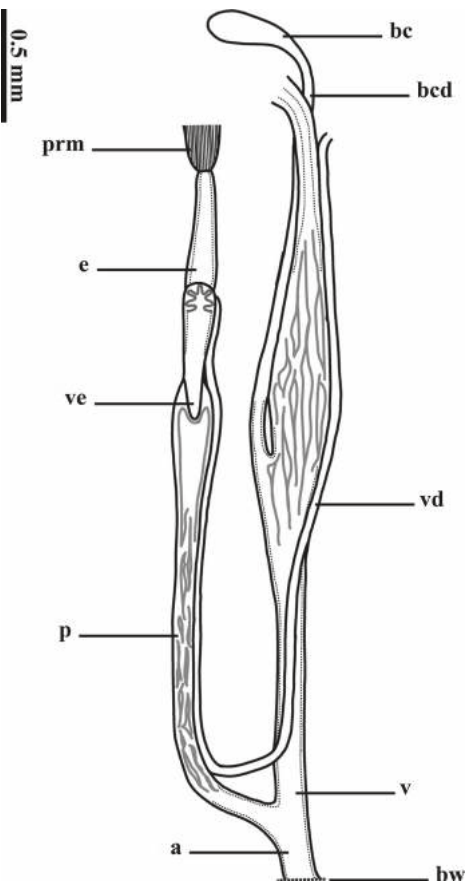


Fig. 17. Diagram of the distal portion of the genitalia of *Nannobeliscus mariaisabellae* spec. nov. (MACN-In 36.941, Las Capillas, Jujuy, Argentina). a, atrium; bc, bursa copulatrix; bcd, bursa copulatrix duct; bw, body wall; e, epiphallus; p, penis; prm, penis retractor muscle; v, vagina; vd, vas deferens; ve, verge. Inner structures of the penis and of the medial bulb of the vagina are shown in grey.

species introduced in various parts of the world by anthropic transport, such as *Allopeas gracile*. This genus has a bifid penial apex and caecum alongside the epiphallus, which is highly developed (Baker 1945).

The genus *Beckianum* Baker, 1961, from Venezuela and French Guiana, shows short and broad structures and ducts; penis with flagellum, spermathecal stalk short, and sculptured shell by strong axial ribs with umbilicus minutely open (Schileyko 1999).

This is the first record of the presence of a spermatophore for an American genus. Schileyko (1999) cites the following genera: *Paropeas* Pilsbry, 1906 from Indonesia and other countries by anthropic distribution (e. g. Hawaii) (Naggs 1994) and *Itiopiana* Preston,

1910 from Africa. In the first case this structure was described as fusiform and short ($480 \times 70 \mu\text{m}$), and consisting of solid head and porous tail (Naggs 1994, Schileyko 1999). In the second gastropod, only a posterior fusiform fragment of a spermatophore was recuperated (Schileyko 1999). In *N. mariaisabelae*, this structure shows collapsed structure of $800 \mu\text{m}$, formed by differentiated head ($225 \mu\text{m}$), longer body ($325 \mu\text{m}$) and prolonged tail ($250 \mu\text{m}$) (Fig. 16).

Genus *Leptinaria* Beck, 1837

Type species: *Helix unilamellata* d'Orb., 1835 (= *Achatina lamellata* Potiez & Michaud, 1838). Type locality: Jamaica.

Distribution of genus: Tropical areas of Central and South America, and the Caribbean islands.

Leptinaria spec.

Figs 1, 10, 11

Description

Shell small, less than 4 mm, conical, perforate, solid; shell with 5 convex whorls of rapid growth with sculpture of strong axial ribs (around 45 in last whorl), disposed in regular intervals in all whorls, somewhat separated with visible growth lines between them; last whorl occupies more than 50 % of total length; sutures marked; aperture slightly oblique and oval; outer lip thin; columella not truncate with oblique and weak fold; columellar margin reflected and turning over the small and not perspective umbilicus; yellowish periostracum; protoconch smooth of two whorls.

Measurements (in mm): MACN-In 39.380: 3.65×2.10 mm; aperture: 1.95×1.45 mm; whorls: $4\frac{1}{2}$. MACN-In 39.381: 3.80×2.20 mm; aperture: 1.80×1.30 mm; 5 whorls.

Distribution in Argentina: Jujuy and Misiones provinces.

Comparisons. Similar species to *Leptinaria* spec. have been reported in many areas of America. *Leptinaria mamorensis* Baker, 1926 from Venezuela and Brazil, differs in the lack of columellar fold and the existence of arcuated upper angle in the outer lip, weakly reflected to the aperture (Baker 1927, Simone 2006); from Honduras is known *Leptinaria mexicana utilensis* Pilsbry, 1907 differing in bigger size and sculpture of irregular and tight axial ribs. The samples MACN-In 371 and MACN-In 8.848-1 were determined by Hylton Scott – in schedula – as *Sub-*

ulina bacterionides, although published as *Leptinaria bacterionides* (Hylton Scott, 1948), species recorded in Bolivia and in the north of Argentina (Fig. 1), of similar aspect to *Nannobeliscus mariaisabelae*. *L. bacterionides* shows an internal columellar fold that gives truncate appearance, and radular formula is $14 + 6 + 1 + 6 + 14$ (Fig. 9).

Material examined (dry): ARGENTINA: MACN-In 39.380, Iguazú National Park, Misiones, Col. M. J. Ramírez, 8-15-II-1995, 1 ex.; MACN-In 39.381, Calilegua National Park, Jujuy, Leg. L. Pereira, 30-XI-1986, Col. A. Rodrigues Capítulo, 1 ex.; *L. bacterionides*: NHMUK Reg. 1854.12.4.88, Laguna, Bolivia, Lectotype (photograph).

Conclusions

This study increases the previously small number of Subulinidae species recorded in Argentina, with the description of *Nannobeliscus mariaisabelae* spec. nov. and the record of *Leptinaria* spec., both living in the northwest of the country, a humid tropical climate region. The limited information on the anatomy of the family causes difficulties in the identification and comparison of the new taxa: *N. mariaisabelae* is characterized by a radula with 35 teeth in transverse rows, and large, slim and delicate genital ducts; vas deferens runs jointed and paralleled to oviduct and penis, and it is not sinuous; penis has an epiphallus that produces spermatophores, and lacks flagellum and penial caecum. *N. mariaisabelae* spec. nov. is an ovoviviparous species.

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