

A NEW *STEPHACHAROPA* (GASTROPODA: PUNCTOIDEA: CHAROPIDAE) FROM PAPOSO, NORTHERN CHILE

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Abstract *Stephacharopa paposensis* n.sp. is described from shells collected in coastal areas of Paposo, Región de Antofagasta, northern Chile, associated with native bromeliads and cacti living among rocks and coarse sand. This is the second species of *Stephacharopa* found in northern Chile and one of the northernmost species of *Charopidae* found in this country.

Key words Atacama Desert, Peru, micro molluscs.

INTRODUCTION

The family Charopidae Hutton, 1884 is the most diverse terrestrial snail family present in Chile with numerous nominal genera and species, most of them needing revision, distributed from Antofagasta in the northern part of the country to Tierra del Fuego, in southern Patagonia (Stuardo & Vega 1985; Miquel & Barker 2009; Miquel & Araya 2013; Araya *et al.* 2017). All the Chilean charopids are micro-snails with shells usually under 4mm in maximum dimensions, and most of them are found exclusively in humid areas in the southern part of the country (Vargas-Almonacid 2000; Vargas-Almonacid & Stuardo 2007; Miquel & Cádiz-Lorca 2009, among others) and in the Juan Fernández Archipelago (Stuardo & Vega 1985; Stuardo & Vargas-Almonacid 2000; Miquel & Araya 2015). In contrast, there are only four charopid species present in the central and northern areas of the country, all of them found solely in coastal zones of the Chilean Coastal Range (Valdovinos & Stuardo 1989; Miquel & Araya 2013; Araya & Aliaga 2015). In this study the occurrence of a new charopid species in northern Chile is described; it represents the second record of the genus *Stephacharopa* Miquel & Araya, 2013 in northern Chile, living near Paposo (32°14' S, 71°31' W), Región de Antofagasta.

MATERIAL AND METHODS

87 specimens, all of them empty shells, were hand-collected at the type locality. The holotype and paratypes are deposited in the collections of the Museo Nacional de Historia Natural (MNHNCI, Santiago) and of the Museo Paleontológico de Caldera (MPCCL, Caldera), both in Chile, and in the Invertebrate Collection of the Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" (MACN, Buenos Aires), in Argentina. The measurements of the shells were obtained from Light Microscopy with a calibrated eyepiece (in MPCCL) and from Scanning Electron Microscopy (in MACN). Other abbreviations are: H—shell height; W—shell width; AH—aperture height; AW—aperture width; NW—number of whorls. Number of whorls follows Araya & Breure (2017).

SYSTEMATICS

Charopidae Hutton, 1884

Stephacharopa Miquel and Araya, 2013

Type species: *Stephacharopa calderaensis* Miquel and Araya, 2013, by original designation.

Stephacharopa paposensis new species
Figs 1A–C

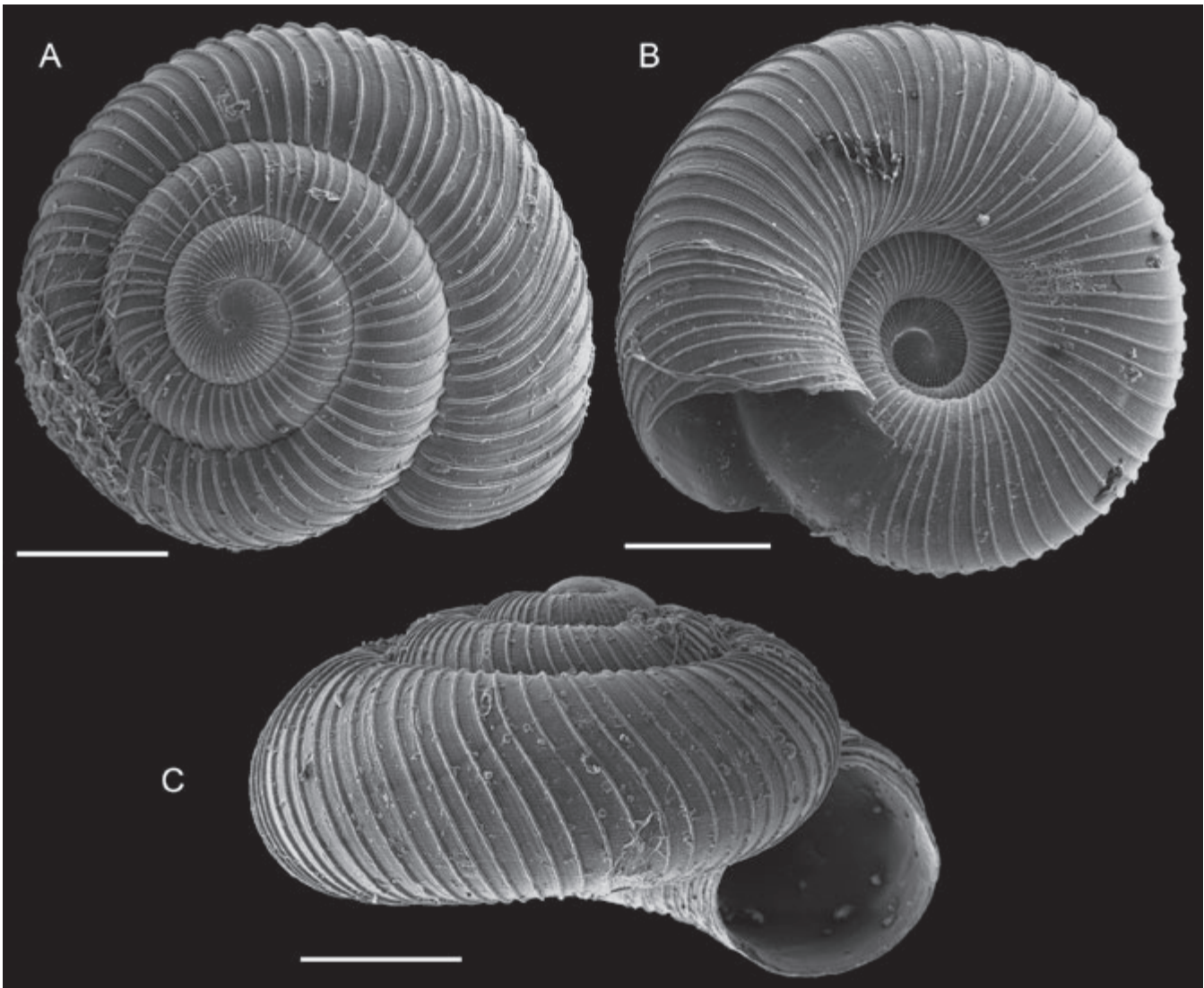


Figure 1 *Stephacharopa paposensis* n. sp. A: apical view holotype (MNHNCL 203448). B: umbilical view paratype 1 (MACN-In.40727); C: apertural view paratype 1 (MACN-In.40727). Scale bars are 500 μ m.

Diagnosis Shell small, orbicular and slightly high-spired, with four convex whorls; protoconch and teleoconch with different sculpture. Protoconch of 1.5 whorls with 53–55 closely-spaced fine axial riblets and smooth interspaces; teleoconch with 120–125 stronger and more widely-spaced prosocline axial ribs, interstices with fine axial riblets and spiral lirae; aperture circular; umbilicus ample, about one third of shell width.

Description Shell minute, orbicular, up to 2.1mm in maximum diameter, moderately thick-shelled, with up to 4 whorls (average of 3.75, n=25), umbilicate, spire slightly elevated. Shell colour uniform cream-yellow. Protoconch of 1.5 whorls

with 53–55 ribblets and smooth interspaces; teleoconch of 2.25 convex whorls, sculptured with 120–125 prosocline strong axial ribs (about 13 μ m in width), 56–57 ribs in last whorl, interstices with a variable number of radial riblets, depending of the distance between those (10 to 13); ribs and ribblets crossed by spiral threads or incisurae, producing fine nodules at intersections; these are more noticeable towards the periphery of the shell and in the last whorl. Suture deep and well-marked; aperture rounded oblique, about a third of shell width and about a half of shell height; peristome continuous, lip simple; umbilicus ample, deep, about 1/3 of shell width; callus a mere glaze; periostracum thin and yellowish, shiny. Soft parts unknown.

Type material Holotype: MNHNCL 203448 (H: 1.45, W: 2.34, AH: 0.80, AW: 0.65, NW: 4.25); Paratype 1: MACN-In.40727 (H: 1.30, W: 2.10, AH: 0.80, AW: 0.80, NW: 3.75); Paratype 2: MACN-In.40727 (H: 1.30, W: 2.35, AH: 0.65, AW: 0.80, NW: 4.00); Paratype 3: MACN-In.40727 (H: 1.30, W: 2.20, AH: 0.65, AW: 0.80, NW: 4.00); Paratype 4: MACN-In.40727 (H: 1.45, W: 2.35, AH: 0.65, AW: 0.80, NW: 4.00); Paratypes 5–7: MACN-In.40727 (lot); Paratypes 8–12: MPCCL.1482018 (lot). Coll. M. E. Araya and J. F. Araya, 17 Jan. 2016.

Type locality La Rinconada (32°14' S, 71°31' W, 31m), Paposo, Región de Antofagasta, Chile.

Distribution and habitat Only known from the type locality; the shells were found buried in coarse sand and under native bromeliads and cacti (Fig. 2).

Etymology The species has been named after the type location, Paposo.

Remarks The genus *Stephacharopa* Miquel & Araya, 2013 was established to incorporate two species that were formerly included in the genus *Stephadiscus* Hylton Scott, 1981, but which have different protoconch and teleoconch sculpture. *Stephacharopa* is currently represented by four species: its type species *Stephacharopa calderaensis* Miquel & Araya, 2013, found from Antofagasta (20°S) to Caldera (27°S), in Chile (Araya *et al.* 2017); *Stephacharopa distincta* (Hylton Scott 1970) and *Stephacharopa testalba* (Hylton Scott 1970), both species from Río Negro, Argentina, and the new species herein described. Unfortunately all of the species within the genus are known from shells only. *Stephacharopa paposensis* n. sp. differs from congeners in the lower number of axial ribs in the last whorl (56–57 *vs.* 80–150), and in having a slightly elevated spire. In other species of *Stephacharopa* the spire is almost flat. From *Stephacharopa calderaensis* the new species differs in its smaller size (maximum size up to 2.4 *vs.* 3.2mm in *S. calderaensis*), higher spire, final whorl descending more rapidly, comparatively larger protoconch (0.52mm in *S. calderaensis* *vs.* 0.58mm in the new species), the more convex whorls, and lower number of ribs in the teleoconch (56–57 *vs.* 90–95). The new species also has more prominent axial ribs and stronger

spiral micro-sculpture. From *S. distincta*, the new species differs in having fewer ribs on both the protoconch and in the last whorl (150 *vs.* 56–57), in its higher spire, and in the rounded aperture, compared to a lunate aperture in *S. distincta*. *Stephacharopa testalba* differs from the new species in its larger shell, a much narrower umbilicus, and in having a higher number of axial ribs on the teleoconch, 80 in *S. testalba* (Hylton Scott 1970; Miquel & Araya 2013). *Helix paupera* Philippi, 1860, a minute land snail described from northern Chile by Philippi (1860; page 164, pl. VII, fig. 9), may be conspecific with this species (or with *S. calderaensis*) as Philippi cited *H. paupera* before its description from Paposo (Philippi 1855); however, the lack of type specimens and of a comprehensive description for *H. paupera* prevents any comparison at this point (with the exception of the absence of ribs in *H. paupera*). Most recently, we found a more closely related species to *H. paupera* in Antofagasta (Araya *et al.* 2017; figs. 7, 8); this species may not belong to Charopidae (but to Scolodontidae), however further studies are still needed. In this regard, there are a number of minute terrestrial species described by Philippi in Chilean territories which may be misidentified with *S. paposensis* n. sp., however all of them (except *H. paupera*) were described from areas near Valdivia and Pirque, in southern and central Chile respectively (Philippi 1855). For all of these species, unfortunately (as with several species described by Philippi in Chile), there is no type material and they have not been identified again in more recent papers.

The habitats of the two northern *Stephacharopa* species (*S. calderaensis* and the new species herein described) are somewhat similar, as *S. calderaensis* has been recently recorded in Parque Pan de Azúcar (26°07' S; 70°38' W) living under the roots of dry *Deuterocohnia chrysantha* bromeliads, although in higher altitudes than the new species. Shells of the new species (most of them relatively fresh shells, with sparse corroded ones) were found buried, among humus and in coarse sand under the roots of cacti (*Copiapoa haseltoniana*) or of local bromeliads (*Deuterocohnia chrysantha* and *Puya boliviensis*). Empty shells of the native snails *Plectostylus punctulifer* and of several *Bostryx* species were also found in the general area in the same habitat. The presence of these species, which may be extant at the type



Figure 2 Type locality and habitat of *Stephacharopa paposensis* n. sp., under native bromeliads and cacti, Paposo, northern Chile.

locality, is highly associated to litho-refugia in sea-facing hills of the Chilean Coastal Range, which are the only areas which sustain permanent or semi-permanent vegetation in northern Chile.

The association of the new species, restricted to the roots of bromeliad species in coarse sand and rock debris, may have been critical for the survival of these species in this very arid habitat. This area of northern Chile is characterized by the high degree of endemism in its flora and fauna, most often occurring in very narrow ranges in the area (Dillon 1991; Pizarro-Araya & Jerez 2004; Araya & Breure 2017). The surprising disjunct distribution of *Stephacharopa* is not common in the Chilean Charopidae, and it may represent an artefact of a wider past distribution fragmented by aridification processes in northern Chile since the Oligocene-Miocene (Dunai *et al.* 2005).

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REFERENCES

- ARAYA JF & ALIAGA JA 2015 A new species of *Lilloiconcha* Weyrauch, 1965 (Pulmonata: Charopidae) from central Chile. *Zootaxa*, 4007(2), 295–297.
- ARAYA JF & BREURE ASH 2017 A new terrestrial snail species (Gastropoda: Bulimulidae) from the Región de Antofagasta, northern Chile. *PeerJ*, 5:e3538.
- ARAYA JF MIQUEL SE & MARTÍNEZ E 2017 New records of terrestrial mollusks (Gastropoda: Stylommatophora) from Antofagasta, northern Chile. *Revista Mexicana de Biodiversidad*, 88, 769–772.

- CADIZ FJ & GALLARDO CS 2008 Morphological and anatomical features of *Flammulina festiva* Scott, 1970 (Stylommatophora: Charopidae) from Southern Chile, with notes on its natural history. *Gayana*, 72(1), 1–8.
- DILLON MO 1991 A new species of *Tillandsia* (Bromeliaceae) from the Atacama Desert of northern Chile. *Brittonia*, 44, 11–16.
- DUNAI TJ, GONZÁLEZ-LÓPEZ GA & JUEZ-LARRÉ J 2005 Oligocene-Miocene age of aridity in the Atacama Desert revealed by exposure dating of erosion-sensitive landforms. *Geology*, 33, 321–324.
- HYLTON SCOTT MI 1970 Endodontidos de la region austral Americana (Gastropoda-Pulm.) *Revista del Museo Argentino de Ciencias Naturales Bernardino Rivadavia*, 10(18), 267–296.
- MIQUEL SE & ARAYA JF 2013 A new Charopidae from Chile and Argentina, *Stephacharopa calderaensis* n. gen. and n. sp., with remarks on the taxonomy of the genus *Stephadiscus* Hylton Scott 1981 (Mollusca: Gastropoda Pulmonata). *Archiv für Molluskenkunde*, 142, 227–235.
- MIQUEL SE & ARAYA JF 2015 New records of terrestrial molluscs of the Juan Fernández Archipelago (Chile), with the description of a new genus and species of Charopidae (Gastropoda Stylommatophora). *Archiv für Molluskenkunde*, 144(2), 155–167.
- MIQUEL SE & BARKER GM 2009 New Charopidae from Chilean-Argentine Patagonia (Mollusca: Gastropoda: Stylommatophora). *Archiv für Molluskenkunde*, 138, 53–61.
- PHILIPPI RA 1855 Observaciones sobre las especies del género *Helix*. *Anales de la Universidad de Chile*, 1855, 213–217.
- PHILIPPI RA 1860 Viage al Desierto de Atacama, hecho de orden del Gobierno de Chile en el verano 1853–54. Halle en Sajonia.
- PIZARRO-ARAYA J & JEREZ V 2004 Distribución geográfica del género *Gyriosomus* Guérin-Méneville, 1834 (Coleoptera: Tenebrionidae): una aproximación biogeográfica. *Revista Chilena de Historia Natural*, 77, 491–500.
- STUARDO J & VEGA R 1985 Synopsis of the Land Mollusca of Chile. With Remarks on Distribution. *Studies on Neotropical Fauna and Environment*, 20(3), 125–146.

