



Research note

New records of terrestrial mollusks (Gastropoda: Stylommatophora) from Antofagasta, northern Chile

Nuevos registros de moluscos terrestres (Gastropoda: Stylommatophora) de Antofagasta, norte de Chile

Juan Francisco Araya^{a,b,*}, Sergio E. Miquel^c, Edmundo Martínez^d

^a Universidad de Atacama, Copayapu 485, Copiapó, Chile

^b Programa de Doctorado en Sistemática y Biodiversidad, Universidad de Concepción, Concepción, Chile

^c Consejo Nacional de Investigaciones Científicas y Técnicas, Museo Argentino de Ciencias Naturales “Bernardino Rivadavia”, Av. Ángel Gallardo 470 (1405), Ciudad Autónoma de Buenos Aires, República Argentina.

^d Antofagasta Minerals S. A. Ahumada 11, piso 12, Santiago, Chile

Received 4 January 2016; accepted 2 May 2017

Available online 16 August 2017

Abstract

New records for *Bostryx holostoma* (Pfeiffer, 1846), *Pupoides minimus* (Philippi, 1860), *Stephacharopa calderaensis* Miquel & Araya, 2013 and an unidentified charopid species are presented on the basis of specimens collected near the city of Antofagasta, in northern Chile. This is the first record for *S. calderaensis* after its description, extending its known distribution about 350 km northwards. Details on the protoconch of *B. holostoma* are presented for the first time, and this species extends its distributional range 145 km southwards. The microhabitat of these species in litho-refugia may explain the presence of these minute terrestrial mollusks in hyper arid northern Chile, further highlighting the need of additional studies of this neglected fauna.

© 2017 Universidad Nacional Autónoma de México, Instituto de Biología. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Keywords: Bulimulidae; Charopidae; Pupillidae; Land snails

Resumen

Se presentan nuevos registros para *Bostryx holostoma* (Pfeiffer, 1846), *Pupoides minimus* (Philippi, 1860), *Stephacharopa calderaensis* Miquel y Araya, 2013 y una especie no identificada de la familia Charopidae, basados en ejemplares recolectados cerca de la ciudad de Antofagasta, en el norte de Chile. Se presenta el primer registro de *S. calderaensis* desde su descripción, extendiendo su distribución conocida hacia el norte en cerca de 350 km. Se presentan además detalles de la protoconcha de *B. holostoma* que también extiende su intervalo de distribución 145 km al sur. El microhábitat de estas especies en litorrefugios podría explicar la presencia de estos pequeños moluscos terrestres en el hiperárido norte chileno, destacando asimismo la necesidad de estudios adicionales en esta fauna poca conocida.

© 2017 Universidad Nacional Autónoma de México, Instituto de Biología. Este es un artículo Open Access bajo la licencia CC BY-NC-ND (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

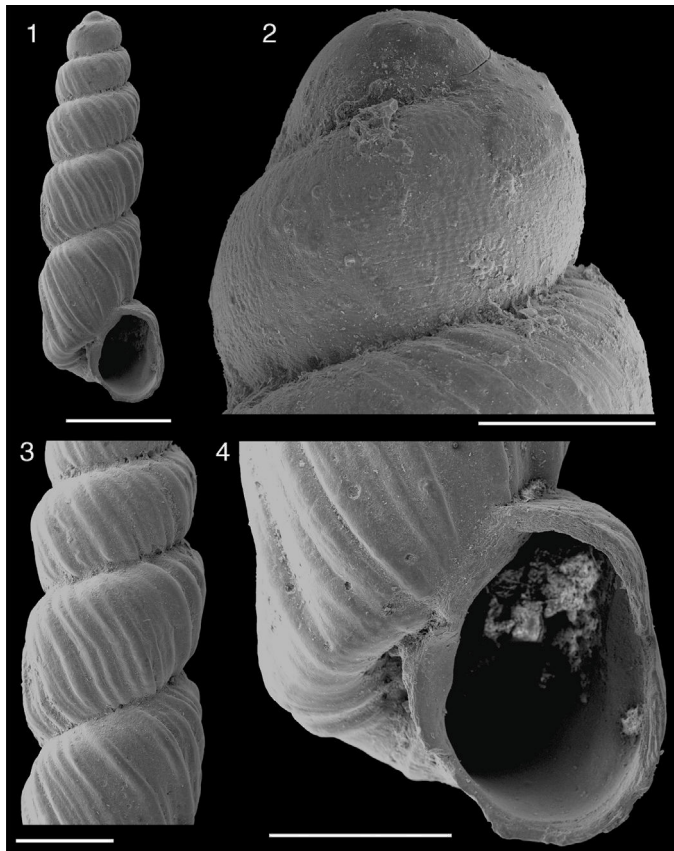
Palabras clave: Bulimulidae; Charopidae; Pupillidae; Caracoles terrestres

Most of the almost 160 species of terrestrial mollusks found in Chile are distributed in the humid central and southern areas of the country, and especially in the Juan Fernández Archipelago (Miquel & Araya, 2015; Stuardo & Vega, 1985). Studies on the species from the very arid north of Chile are scarcer and only a few recent studies have documented the unexpected diversity

* Corresponding author.

E-mail address: jfaraya@u.uchile.cl (J.F. Araya).

Peer Review under the responsibility of Universidad Nacional Autónoma de México.



Figures 1-4. *Bostryx holostoma* (Pfeiffer, 1846), Antofagasta, Chile (MACN-In 39.685); (1): apertural view; (2): detail of protoconch sculpture; (3): detail of ribs on teleoconch; (4): detail of aperture. Bar = 2 mm for 1, 0.5 mm for 2, and 1 mm for 3 and 4.

of land snails found in the area, including the description and record of new species of bulimulid and charopid snails (Araya, 2015; Araya, Madrid, & Breure, 2016). In the present work, based on a small collection of specimens from coastal areas of the very arid Región de Antofagasta, in northern Chile, we present new records of a rare bulimulid, a pupillid and 2 charopid species, one of them unidentified. Thus, the aim of this work is to contribute to the knowledge of the land snail fauna in Chile, particularly from the neglected northern part of the country. Voucher specimens were deposited at the Invertebrate Collection of the Museo Argentino de Ciencias Naturales “Bernardino Rivadavia”, Buenos Aires, Argentina (MACN-In).

Family Bulimulidae Tryon, 1867

Bostryx holostoma (Pfeiffer, 1846) (Figs. 1-4)

Material examined: foothills of Cerro Bolfín (23°49'59" S, 70°28'59" W; 620 m), Comuna de Antofagasta, Región de Antofagasta, Chile; 4 specimens, collected by E. Martínez, 1982 (MACN-In 39.685).

Distribution: this endemic species has been previously recorded only at Cobija, Región de Antofagasta (22°33' S, 70°16' W), Chile (Stuardo & Vega, 1985). This is the first record of the species since Pilsbry (1897), representing also its southernmost record.

Remarks: this is the smallest *Bostryx* species found in Chile, and it is clearly identified from other congeneric species by the

sculpture of strong axial ribs, which are irregularly present in the teleoconch and the slightly plane whorls, ending in a slightly square-shaped aperture (Pilsbry, 1897). The presence of a noticeable spiral sculpture on the protoconch is unique among the Chilean *Bostryx* species, which otherwise present a smooth protoconch (without sculpture) even under magnification (Araya, 2015).

Family Charopidae Hutton, 1884

Stephacharopa calderaensis Miquel & Araya, 2013 (Figs. 5, 6)

Material examined: foothills of Cerro Bolfín (23°49'59" S, 70°28'59" W; 620 m), Comuna de Antofagasta, Región de Antofagasta, Chile; 2 specimens, collected by E. Martínez, 1982 (MACN-In 39.800).

Distribution: this species has a patchy distribution; it has been found only in 2 locations in the hills of the Chilean Coastal Range at the vicinities of the port of Caldera, Región de Atacama, Chile (Araya & Catalán, 2014; Miquel & Araya, 2013). This is the northernmost record for the species, extending its geographical distribution by about 350 km.

Remarks: this is the northernmost charopid species found in the country.

Charopidae sp. (Figs. 7-8)

Material examined: foothills of Cerro Bolfín (23°49'59" S, 70°28'59" W; 620 m), Comuna de Antofagasta, Región de Antofagasta, Chile; 1 specimen, collected by E. Martínez, 1982 (MACN-In 39.799).

Remarks: none of the Chilean charopid species match the characteristics of the present specimen, which includes a smooth protoconch and teleoconch and a rather large size for a Chilean charopid (6 mm in diameter). A species similar to the present examined specimen is the enigmatic *Helix paupera* described by Philippi for the coast of Atacama, which has a smaller shell (Philippi, 1860: 164).

Family Pupillidae Turton, 1831

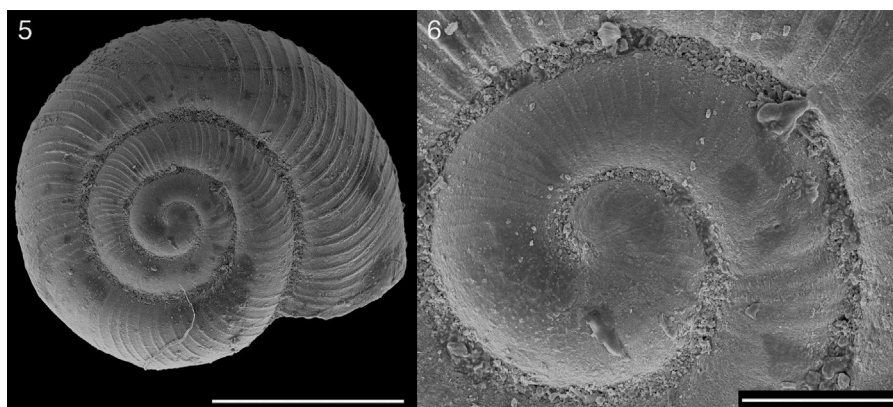
Pupoides (Ischnopupoides) minimus (Philippi, 1860) (Figure 9)

Material examined: Foothills of Cerro Bolfín (23°49'59" S, 70°28'59" W; 620 m), Comuna de Antofagasta, región de Antofagasta, Chile; 6 specimens, collected by E. Martínez, 1982 (MACN-In 39.801).

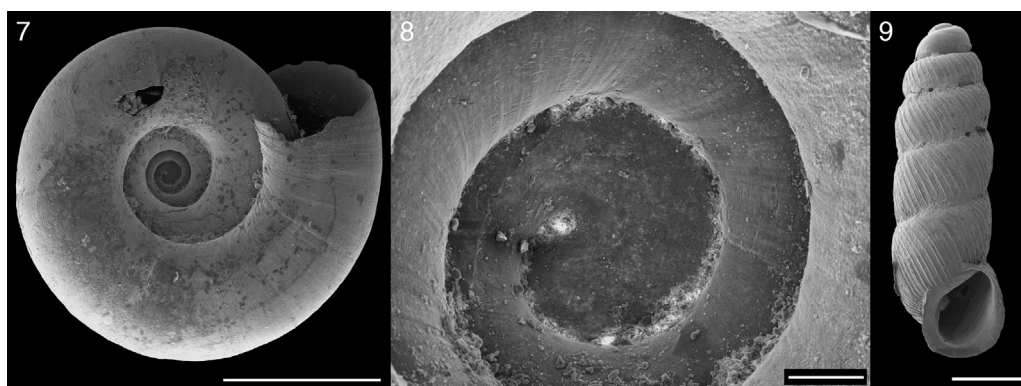
Distribution: this species, one of the 2 pupillid species found in the country, has been found from Antofagasta to La Serena, usually in coastal localities, buried in sand and humus (Stuardo & Vargas-Almonacid, 2000).

Remarks: this is the smallest elongate land snail found in the country, with minute shells rarely over 4 mm in height. Some differences between the examined material and southern material may indicate that more than one species may be present in northern Chile.

Most of the northern areas of the country have been very sparsely studied in regard to their invertebrate fauna, and terrestrial mollusks are one of the least represented groups. The present records, even when meager, add important information on the distribution of these species in the very arid Región de Antofagasta. The only zones which have permanent vegetation —most of them endemic xerophytic plants, also with



Figures 5-6. *Stephacharopa calderaensis* Miquel & Araya, 2013, Antofagasta, Chile (MACN-In 39.800); (5): apical view; (6): detail of protoconch. Bar = 1 mm for 5, and 0.2 mm for 6.



Figures 7-9. Charopidae sp., Antofagasta, Chile (MACN-In 39.799); (7): umbilical view; (8): detail of umbilicum. *Pupoides minimus* (Philippi, 1860), Antofagasta, Chile (MACN-In 39.801); (9): apertural view. Bar = 2 mm for 7, 0.1 mm for 8, and 1 mm for 9.

restricted distributions— are the coastal areas limited by the Chilean Coastal Range, which receive morning fogs from the sea. The unexpected occurrence of *Stephacharopa calderaensis*, and of an unidentified charopid species, represent the northernmost distribution in Chile of the family Charopidae, a family of terrestrial micro snails mostly found in humus in humid circumstances (Solem, 1983). Its current distribution in northern and central Chile is essentially restricted to rocky outcrops, as litho-refugia *sensu* Couper and Hoskin (2008), and it is possible that these species may represent part of a more humid relict fauna (Araya, 2016; Craig, 1985; Herm, 1970).

In summary, new records of land snails in northern Chile are presented, including the first collection of *Bostryx holostoma* since its description. Further research in northern Chile, especially of humus and sediment samples, is essential to document this neglected fauna.

We are thankful to the anonymous reviewers and the associate editor for their valuable comments and suggestions, which greatly improved this manuscript.

References

- Araya, J. F. (2015). The Bulimulidae (Mollusca: Pulmonata) from the Región de Atacama, northern Chile. *PeerJ*, 3, e1383.
- Araya, J. F. (2016). On some land snails (Mollusca: Gastropoda) of Los Molles, central Chile. *Revista Mexicana de Biodiversidad*, 87, 1365–1368.
- Araya, J. F., & Catalán, R. (2014). A review of the non-bulimulid terrestrial Mollusca from the Region of Atacama, northern Chile. *ZooKeys*, 398, 33–51.
- Araya, J. F., Madrid, M., & Breure, A. S. H. (2016). *Bostryx hennahi* (Gray 1828) the largest Chilean bulimulid (Mollusca: Pulmonata), rediscovered among *Tillandsia* communities in northern Chile. *Journal of Conchology*, 42, 1–5.
- Couper, P., & Hoskin, C. (2008). Litho-refugia: the importance of rock landscapes for the long-term persistence of Australian rainforest fauna. *Australian Zoologist*, 34, 554–560.
- Craig, A. K. (1985). Speciation and age revision of the Atacaman snail *Bostryx variabilis* Herm. *Quaternary Research*, 23, 382–387.
- Herm, D. (1970). *Bostryx variabilis* n. sp., eine Landschnecke aus dem Altpleistozän von Mejillones Nordchile. *Mitteilungender Bayerischen Staatssammlung Paläontologie und historische Geologie*, 10, 189–198.
- Miquel, S. E., & Araya, J. F. (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, S. E., & Araya, J. F. (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, 155–167.
- Philippi, R. A. (1860). *Viage [sic] al Desierto de Atacama hecho de orden del Gobierno de Chile en el verano*. pp. 1853–1854. Halle, Saale: Eduardo Anton.

- Pilsbry, H. A. (1897). *Manual of conchology: American Bulimi and Bulimuli*. Strophocheilus, Plekocheilus, Auris Bulimulus *Second Series: Pulmonata* (20) Philadelphia, Pennsylvania: Academy of Natural Sciences of Philadelphia.
- Solem, A. (1983). Endodontoid land snails from Pacific Islands (Mollusca: Pulmonata: Sigmurethra) Part II Families Punctidae and Charopidae. In *Zoogeography*. Chicago: Field Museum of Natural History.
- Stuardo, J. R., & Vargas-Almonacid, P. (2000). Moluscos terrestres de Chile. Sinonimia y problemas relacionados: 1. Familias Veronicellidae Pupillidae y Achatinellidae (Gastropoda: Pulmonata). *Gayana*, 64, 171–188.
- Stuardo, J. R., & Vega, R. (1985). Synopsis of the land Mollusca of Chile With remarks on distribution. *Studies on Neotropical Fauna and Environment*, 20, 125–146.