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New records of terrestrial molluscs of the Juan Fernández Archipelago (Chile), with the description of a new genus and species of Charopidae

(Gastropoda: Stylommatophora)

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Abstract

New additions to the land mollusk fauna of the Juan Fernández Archipelago (Chile) are presented for the first time since Odhner (1922). The specimens were collected incidental to arthropod species obtained by the Berlese method in Robinson Crusoe Island in 2011. A new Charopidae *Neoparyphantopsis crusoeana* gen. and sp. n. is described. A new name is established for the achatinellid *Tornatellina aperta* Odhner 1922 (non *Tornatellina aperta* Pease 1864). A new combination is proposed for *Punctum conicum* Odhner 1922, transferring this species from the genus *Punctum* Morse 1864 of family Punctidae to the genus *Sinployea* Solem 1983, of the family Charopidae; and five species belonging to the genera *Amphidoxa* Albers 1850, *Fernandezia* Hyatt & Pilsbry 1911, *Sinployea* Solem 1983 and *Tornatellina* Pfeiffer 1842 are re-described. Also, the first occurrence of a Vertiginidae species in Chile is recorded. All of the studied taxa are so far endemic to the Juan Fernández Archipelago. The present paper confirms the status of Robinson Crusoe Island as the commune with the richest fauna of terrestrial snails in Chile relative to its area.

Key words: Stylommatophora, Pulmonata, South America, Achatinellidae, Charopidae, Vertiginidae.

Resumen

Nuevas adiciones a la fauna de moluscos de tierra del Archipiélago de Juan Fernández (Chile) se presentan por primera vez desde Odhner (1922). Los ejemplares fueron colectados incidentales a especies de artrópodos obtenidas por el método Berlese en la Isla de Robinson Crusoe en 2011. Un nuevo género y especie de Charopidae es descrito: *Neoparyphantopsis crusoeana* gen. y sp. n.; se establece además un nuevo nombre para el achatinélido *Tornatellina aperta* Odhner 1922 (non *Tornatellina aperta* Pease 1864); se propone una nueva combinación para *Punctum conicum* Odhner 1922, transfiriendo esta especie desde el género *Punctum* Morse 1864 de la familia Punctidae al género *Sinployea* Solem 1983, de la familia Charopidae; y cinco especies pertenecientes a los géneros *Amphidoxa* Albers 1850, *Fernandezia* Hyatt & Pilsbry 1911, *Sinployea* Solem 1983 y *Tornatellina* Pfeiffer 1842 son re-descritas. También se registra la primera ocurrencia de una especie de molusco Vertiginidae en Chile. Todas las especies estudiadas son, hasta el momento, endémicas al Archipiélago de Juan Fernández. El presente trabajo confirma el status de la Isla Robinson Crusoe como la comuna con la mayor riqueza de moluscos terrestres en Chile relativa a su área.

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Introduction

Robinson Crusoe Island is the easternmost island of the Juan Fernández Archipelago, a group of three islands (Robinson Crusoe, Alexander Selkirk, Santa Clara), in the Southeastern Pacific Ocean, 667 km west of continental central Chile (33°S) (Fig. 1). Robinson Crusoe is entirely volcanic, with an estimated age of 4 million years (Stuessy et al. 1984). Because of its relative remoteness from continental South America, this small island of 48 km^2 has a distinctive endemic flora and fauna, with a diversity of nine genera and almost 50 species and subspecies of endemic terrestrial molluscs, making it the richest land snail fauna of Chile in relation to land area (Stuardo & Vega 1985; Valdovinos 1999). Most of these species are minute snails and all of them are ground-dwellers or humicole species. The land molluscan fauna of the Juan Fernández Archipelago has been known since the 19th century, with the first descriptions by King, Beck, Anton and Mühlfeld, published in the 1830s and 1840s (Stuardo & Vega 1985). However, the land snail fauna was not thoroughly reviewed until the works of Hyatt & Pilsbry (1911) and Odhner (1922), which described, re-described and illustrated several taxa, adding 20 new species. The only later study including land molluscs of the islands is that of Tillier (1981), who reviewed the succineid slugs of South America and the Juan Fernández Archipelago. This is the first work, in more than 90 years, to deal with the biodiversity of land snails from the Juan Fernández Archipelago.

In this paper, new taxa and new nomenclatorial changes in Punctoidea and Achatinelloidea are made and, considering the results of this work, a more thorough study, involving field sampling in all the islands and in multiple localities of the Juan Fernández Archipelago and in the Desventuradas Islands, is deemed imperative.

Materials and methods

All the examined material was obtained as incidental material collected together with entomological samples obtained using the Berlese method by M. Ramírez, E. Soto and J. Pizarro (Museo Argentino de Ciencias Naturales "Bernardino Rivadavia", Buenos Aires, Argentina) at two locations in Robinson Crusoe Island on February 20, 2011 (Fig. 1). Some specimens were measured under a stereoscopic microscope and imaged by scanning electronic microscopy (SEM).

Abbreviations used are: D = diameter; H = height; spm = specimen; sppm = specimens. MACN-In = Invertebrate Division of the Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" (Buenos Aires, Argentina); MNHNC = Museo Nacional de Historia Natural (Santiago, Chile) and MZUC: Museo de la Universidad de Concepción (Concepción, Chile).

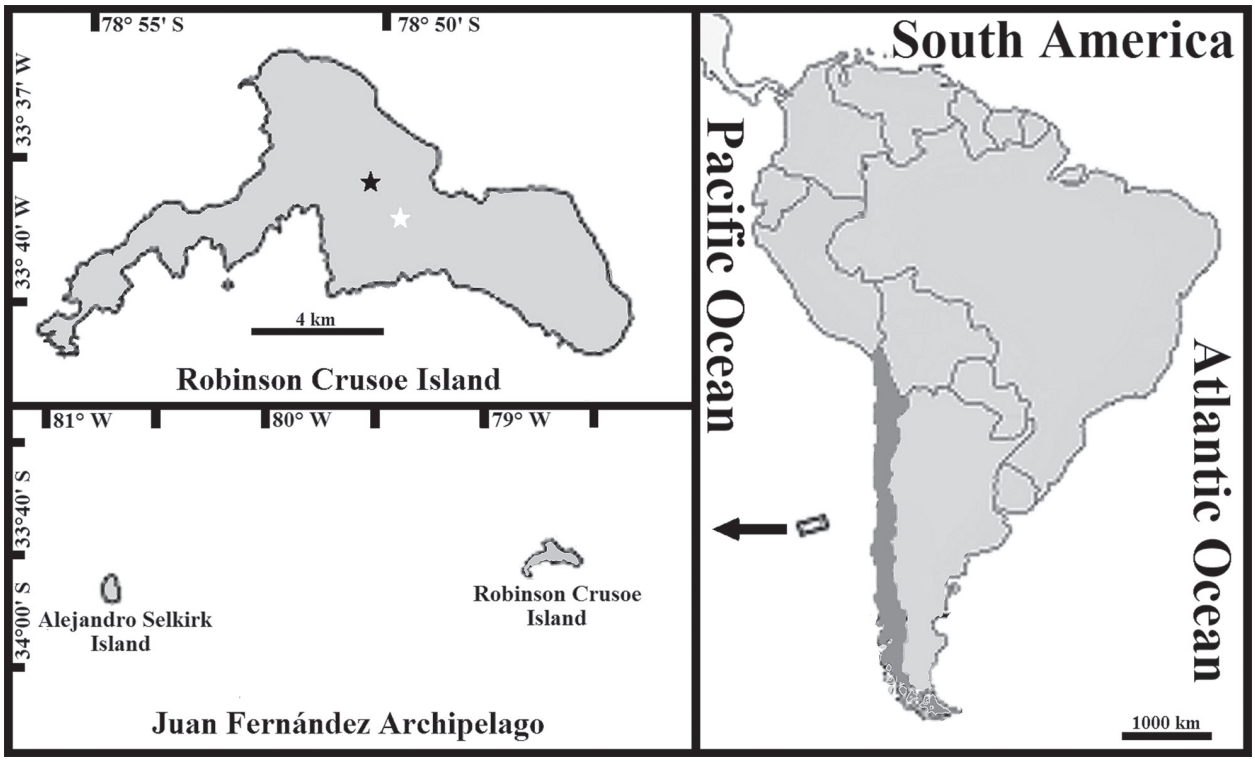


Figure 1. Sampling localities in the Juan Fernandez Archipelago, Chile, southeastern Pacific.

Systematics

Achatinelloidea Gulick 1873

Achatinellidae Gulick 1873

Tornatellininae Sykes 1900

Fernandezia Hyatt & Pilsbry 1911

Type species: *Fernandezia wilsoni* Hyatt & Pilsbry 1911, by original designation.

Fernandezia bulimoides (Pfeiffer 1847)

Figs. 2a–b

1847 *Achatina bulimoides* Pfeiffer: 116.
1911 *Fernandezia bulimoides*, – Hyatt & Pilsbry: 94, pl. 14, fig. 4.
1922 *Fernandezia bulimoides*, – Odhner: 241, pl. 9, fig. 47.
1985 *Fernandezia bulimoides*, – Stuardo & Vega: 127.
1999 *Fernandezia bulimoides*, – Valdovinos: 148.
2000 *Fernandezia bulimoides*, – Stuardo & Vargas-Almonacid: 184.

Material examined: MACN-In 39525: 1 adult spm and 6 juv. sppm (ethanol). MNHNCL 201792: 1 adult spm and 4 juv. sppm MJR-loc-05: in *Myrceugenia fernandeziana* forests.

Description: Shell of medium size (up to 8.5 mm in examined specimens), ovate-conic, with five convex whorls thin; apex acute and smooth, corneous-buff periostracum; teleoconch sculptured irregularly with prosocline growth lines; spire conic and acute; suture crenulated; last whorl swollen, occupying about three fourths of total length; aperture broad, almost oval, slightly over half the shell height; columella twisted above, very slightly truncated above the base of the aperture; parietal callus thin, peristome simple and very thin.

Measurements of illustrated specimen (MNHN-CL 201792): H: 8.5 × D: 5.0 mm; 4.25 whorls.

Previous known records: Robinson Crusoe Island (Masatierra): Rabanal, Puerto Inglés, around Portezuelo, Centinela Ridge, Masatierra and beneath Damajuana (Odhner, 1922).

New records: Chile, Region of Valparaíso, Juan Fernández Archipelago, Robinson Crusoe Island, El Yunque square (33°39'09"S 78°50'38"W, 299 m, MJR-loc-05).

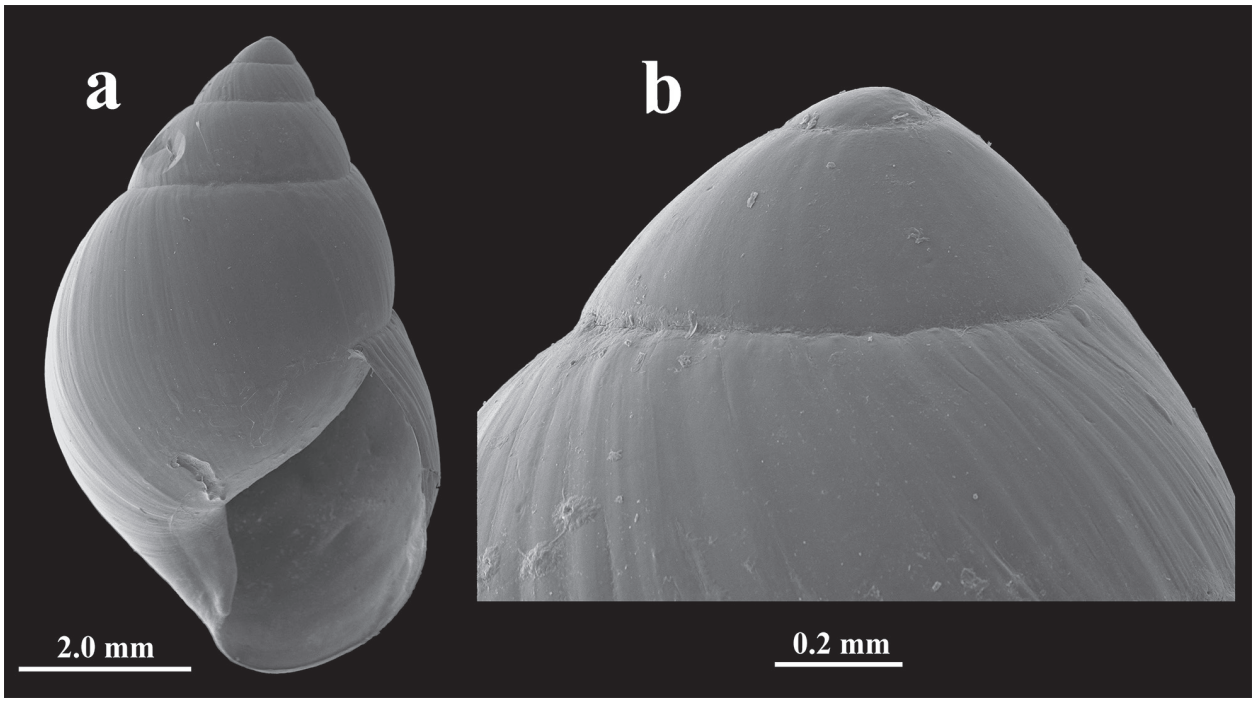
Tornatellina Pfeiffer 1842

Type species: *Tornatellina clausa* Pfeiffer, 1842, by subsequent designation (Gray 1847: 175) (ICZN 1985).

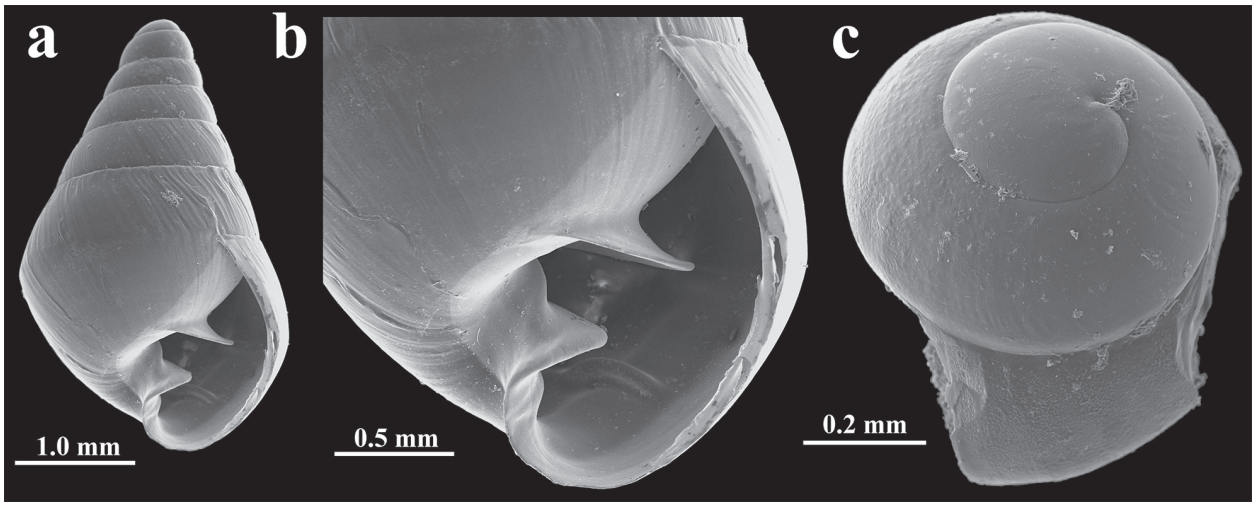
Tornatellina bilamellata (Anton 1839)

Figs. 3a–c

1839 *Clausilia* (*Strobilus*) *bilamellata* Anton 1839: 46.



Figs 2a–b. *Fernandezia bulimoides* (Pfeiffer 1847). MNHNCL 201792: Juan Fernández Archipelago, Robinson Crusoe Island, El Yunque square. a: Apertural view; b: Detail of protoconch.



Figs 3a–c. *Tornatellina bilamellata* (Anton 1839). MNHNCL 201790: Juan Fernández Archipelago, Robinson Crusoe Island, El Yunque square. a: Apertural view; b: Detail of teeth MNHNCL 201790, Juan Fernández Archipelago, Robinson Crusoe Island, trail near Mirador Selkirk, west side; c: Detail of protoconch.

1915 *Tornatellina* (*Tornatellina*) *bilamellata*, – Pilsbry & Cooke: 139, pl. 34, figs. 9–10.
1922 *Tornatellina bilamellata*, – Odhner: 235, pl. 9, fig. 36.
1959 *Strobilus (Tornatellina) bilamellata*, – Zilch: 134, Abb. 441.
1985 *Tornatellina bilamellata*, – Stuardo & Vega 1985: 127.
1999 *Tornatellina bilamellata*, – Valdovinos 1999: 148.
2000 *Tornatellina bilamellata*, – Stuardo & Vargas-Almonacid 2000: 181.

Material examined: MACN-In 39520: 7 adult sppm and 6 juv. sppm MNHNCL 201790a: 7 adult sppm and 8 juv. sppm MJR-loc-05: in *Myrceugenia fernandeziana* forests. MACN-In 39521: 6 adult sppm and 5 juv. sppm; MNHNCL 201790b: 11 adult sppm and 3 juv. sppm MJR-loc-12: in *Myrceugenia fernandeziana* and arborescent fern forests.

Description: Shell small, conic- ovate, very thin and glossy; corneous, with six to seven slightly flat whorls; the last whorl of about half the total length; protoconch with more than 2 whorls, ornamented with a very delicate irregular granulation; teleoconch sculptured only by prosocline growth wrinkles; suture slightly impressed, aperture elliptical, narrow, obstructed by a sharp sub-oblique lamella on the parietal wall, a strong transverse columellar fold and an incipient second columellar plica in the lower area of columellar wall; two delicate parallel palatal laminae; peristome acute; parietal wall glossy; outer lip simple, thin.

Measurements of illustrated specimen (MNHNCL 201790): H: 3.9 × D: 2.5 mm; 5.50 whorls.

Previous known records: Robinson Crusoe Island (Masatierra): Pangal, Centinela Ridge, Quebrada Yunque, Puerto Inglés, Rabanal, below Damajuana, and the Quebrada Portezuelo. A variety with three teeth in the aperture is found also in Centinela Ridge, Salsipuedes Ridge, Puerto Inglés, Puerto Francés and the Piedra Agujeriada Valley.

New records: Chile, Region of Valparaíso, Juan Fernández Archipelago, Robinson Crusoe Island, El Yunque square (33°39'09"S 78°50'38"W, 299 m, MJR-loc-05); trail near Mirador Selkirk, West side (33°38'16"S 78°51'10"W, 460–470 m, MJR-loc-12).

Tornatellina juanfernandeziana n. nom.

Figs. 4a–b

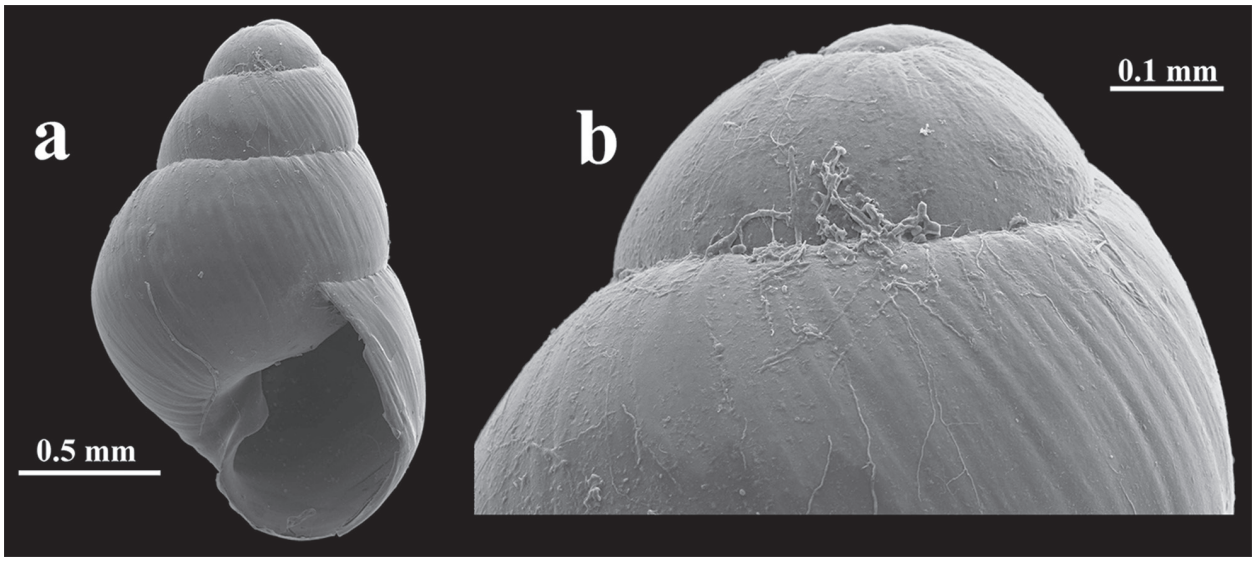
1922 *Tornatellina aperta* Odhner: 238, pl. 9, figs. 45–46 nom. pre-occupied by *Tornatellina aperta* Pease 1864 from Tahiti (Society Islands) and *Tornatellina aperta* Ancey 1903 (=*Elasmias luakahaense* Pilsbry & Cooke 1915) from Oahu.
1985 *Tornatellina aperta*, – Stuardo & Vega: 127.
1999 *Tornatellina aperta*, – Valdovinos: 147.
2000 *Tornatellina aperta*, – Stuardo & Vargas-Almonacid: 181.

Material examined: MACN-In 39522. 1 spm (ethanol); MNHNCL 201789: 1 spm MJR-loc-12: in *Myrceugenia fernandeziana* (luma) and arborescent fern forests.

Description: Shell small, ovate-conic, greyish corneous with clear bands, with four slightly convex whorls; apex smooth, with very tenuous growth lines; teleoconch with irregular and slightly marked prosocline growth wrinkles; spire elongated; suture finely crenulated; last whorl flattened above and below the middle, with a blunt angle in the periphery; aperture shorter than half of the total length, rather wide and almost rhomboidal, columella with a short, sharp and prominent fold in the middle, deeply sinuous in its lower part; peristome simple, thin.

Measurements of illustrated specimen (MACN-In 39522): H: 1.9 × D: 1.0 mm; 4 whorls.

Previous known records: Robinson Crusoe Island (Masatierra): Rabanal and Puerto Inglés.



Figs 4a–b. *Tornatellina juanfernandeziana* n.n. MACN-In 39522: Juan Fernández Archipelago, Robinson Crusoe Island, trail near Mirador Selkirk, west side. a: Apertural view; b: Detail of protoconch.

New records: Chile, Region of Valparaíso, Juan Fernández Archipelago, Robinson Crusoe Island, trail near Mirador Selkirk, west side (33°38’16"S 78°51’10"W, 460–470 m, MJR-loc-12).

Tornatellina sp. aff. ***Tornatellina plicosa*** Odhner 1922

Figs. 5a–b

aff. 1922 *Tornatellina plicosa* Odhner: 237, pl. 9, 38–42.
aff. 1985 *Tornatellina plicosa,* – Stuardo & Vega 1985: 127.
aff. 1999 *Tornatellina plicosa,* – Valdovinos 1999: 148.
aff. 2000 *Tornatellina plicosa,* – Stuardo & Vargas-Almonacid 2000: 183.

Material examined: MACN-In 39523. 3 sppm (ethanol). MNHNCL 201791a: 2 sppm MJR-loc-05: in *Myrceugenia fernandeziana* forests. MACN-In 39524. 1 spm (ethanol). MNHNCL 201791b: 1 spm MJR-loc-13: in forests of *Drymis concertifolia* “canelo”, *Aristotelia chilensis* “maqui” and *Myrceugenia fernandeziana*.

Description: Shell small, ovate-turreted, dark corneous or red-brown; protoconch sculptured by interrupted fine growth lines, the first two or three apical whorls a little produced, convex, the succeeding whorls slightly convex, with an impressed and slightly crenulated suture, the last whorl obliquely angulated; surface smooth, with prosocline growth lines; aperture about or smaller than a third of the total length, with a semi-oval shape; without lamellae on parietal and outer walls; columellar wall with one strong median fold with its edge reflected upwards; sinus below this fold, without callus.

Measurements of illustrated specimen (MNHNCL 201791): H: 3.8 × D: 1.7 mm; 5.50 whorls.

Previous known records: Robinson Crusoe Island (Masatierra): around Portezuelo, Portezuelo ravine, Centinela Ridge, Rabanal, Puerto Inglés, below Damajuana and Piedra Agujeriada Valley (Odhner 1922).

New records: Chile, Region of Valparaíso, Juan Fernández Archipelago, Robinson Crusoe Island, El Yunque square (33°39'09"S 78°50'38"W, 299 m, MJR-loc-05) and Salsipuedes sector (33°37’51"S 78°50’37"W, 482 m, MJR-loc-13).

Punctoidea Morse 1864

Charopidae Hutton 1884

Amphidoxa Albers 1850

Type species: *Helix marmorella* Pfeiffer 1846, by subsequent designation (Pilsbry 1893).

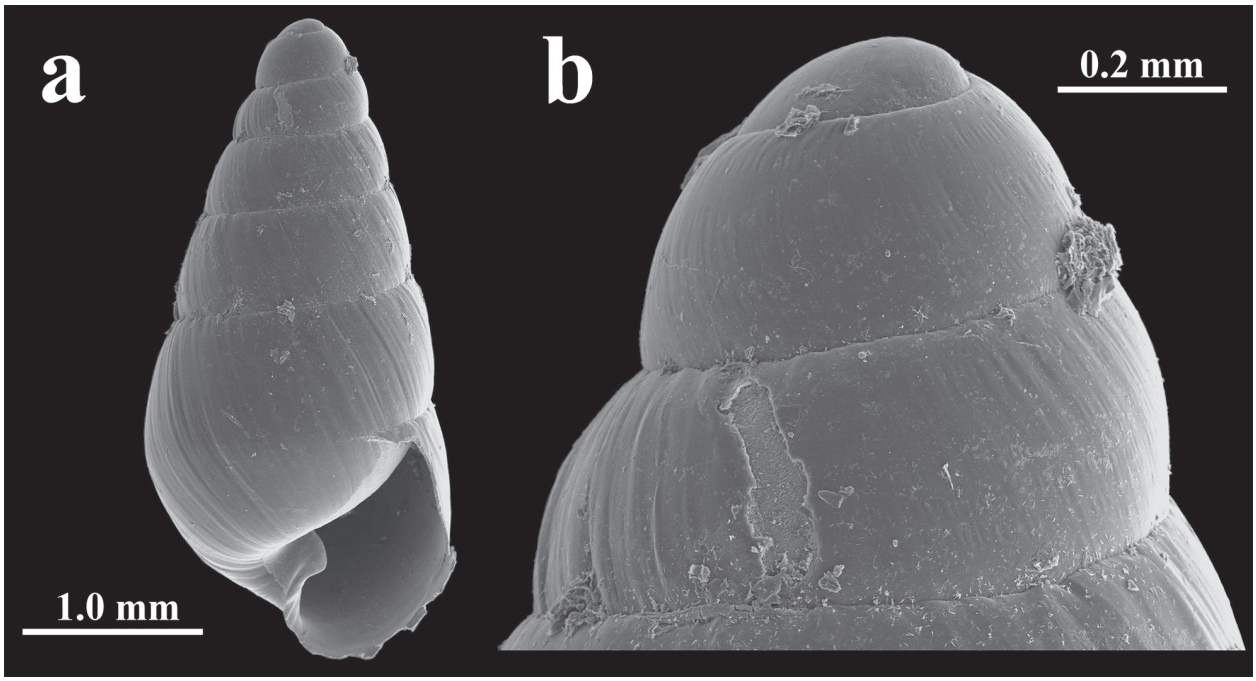
Amphidoxa marmorella (Pfeiffer 1846)

Figs. 6a–b

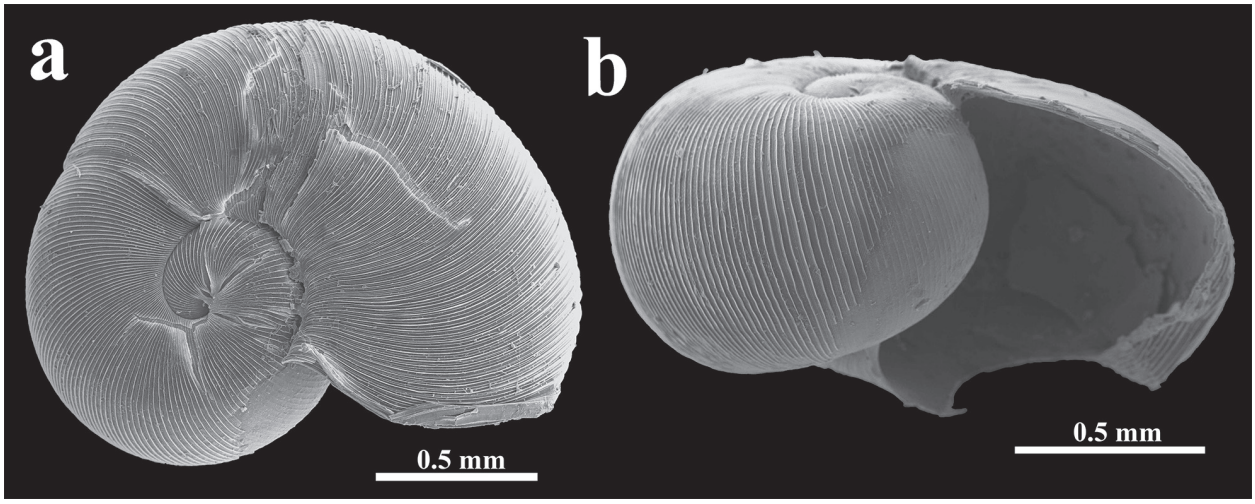
1846 *Helix marmorella* Pfeiffer: 125.
1887 *Helix (Amphidoxa) marmorella*, – Tryon: 46, pl. 20, fig. 54.
1893 *Amphidoxa (Amphidoxa) marmorella*, – Pilsbry: 39, pl. 7, figs. 10, 11, 12.
1922 *Amphidoxa marmorella,* – Odhner: 229, figs. 9 and 10.
1959 *Amphidoxa (Amphidoxa) marmorella*, – Zilch: 221, Abb. 786.
1983 *Amphidoxa marmorella,* – Solem: 63, 69, 72, fig. 30.
1985 *Amphidoxa (Amphidoxa) marmorella*, – Stuardo & Vega: 131.
1999 *Amphidoxa (Amphidoxa) marmorella*, – Valdovinos: 149.

Material examined: MACN-In 39528: 1 spm, MNHNCL 201793: 1 spm, MJR-loc-12: in *Myrceugenia fernandeziana* and arborescent fern forests.

Description: Shell small, depressed, pale yellow-whitish with very vague reddish flammulations; with three rapidly enlarging whorls, slightly flattened above; apex slightly emergent; 1.5 nepionic whorls; penultimate and last whorl flatly coiled; sculpture of protoconch and



Figs 5a–b. *Tornatellina* sp. aff. *Tornatellina plicosa* Odhner 1922. MNHNCL 201793: Juan Fernández Archipelago, Robinson Crusoe Island, Salsipuedes sector. a: Apertural view; b: Detail of protoconch.



Figs 6a–b. *Amphidoxa marmorella* (Pfeiffer 1846). MNHNCL 201793: Juan Fernández Archipelago, Robinson Crusoe Island, west side of trail near Mirador Selkirk. a: Apical view; b: Apertural view.

teleoconch almost similar, a delicate callus marks the origin of the teleoconch, sculpture of numerous radial prosocline ribs, with interspaces filled with three up to five small axial riblets; suture deep; whorls rather flatly rounded above and evenly rounded at the periphery and base; umbilicus narrow, V-shaped, regularly decoiling; umbilicus width about 1/8 of width of shell; aperture large, subcircular, slightly flattened laterally above periphery, a bit inclined from shell axis.

Measurements of illustrated specimen (MNHNCL 201793): H: 1.7 × D: 1.0 mm, 2.25 whorls.

Previous known records: Robinson Crusoe Island (Masatierra): Rabanal, Piedra Agujeriada Valley, Pangal, the Portezuelo quebrada, Centinela Ridge, Salsipuedes Ridge, beneath Damajuana and Puerto Inglés (Odhner 1922).

New records: Chile, Region of Valparaíso, Juan Fernández Archipelago, Robinson Crusoe Island, west side of trail near Mirador Selkirk, (33°38’16"S 78°51’10"W, 460–470 m, MJR-loc-12).

Neoparyphantopsis n. gen.

Type species: *Neoparyphantopsis crusoeana* n. gen. and sp.

Diagnosis: Shell depressed, with few and rapidly expanding whorls, sculptured with sparse and strong axial ribs; aperture angulate, sub-trigonal.

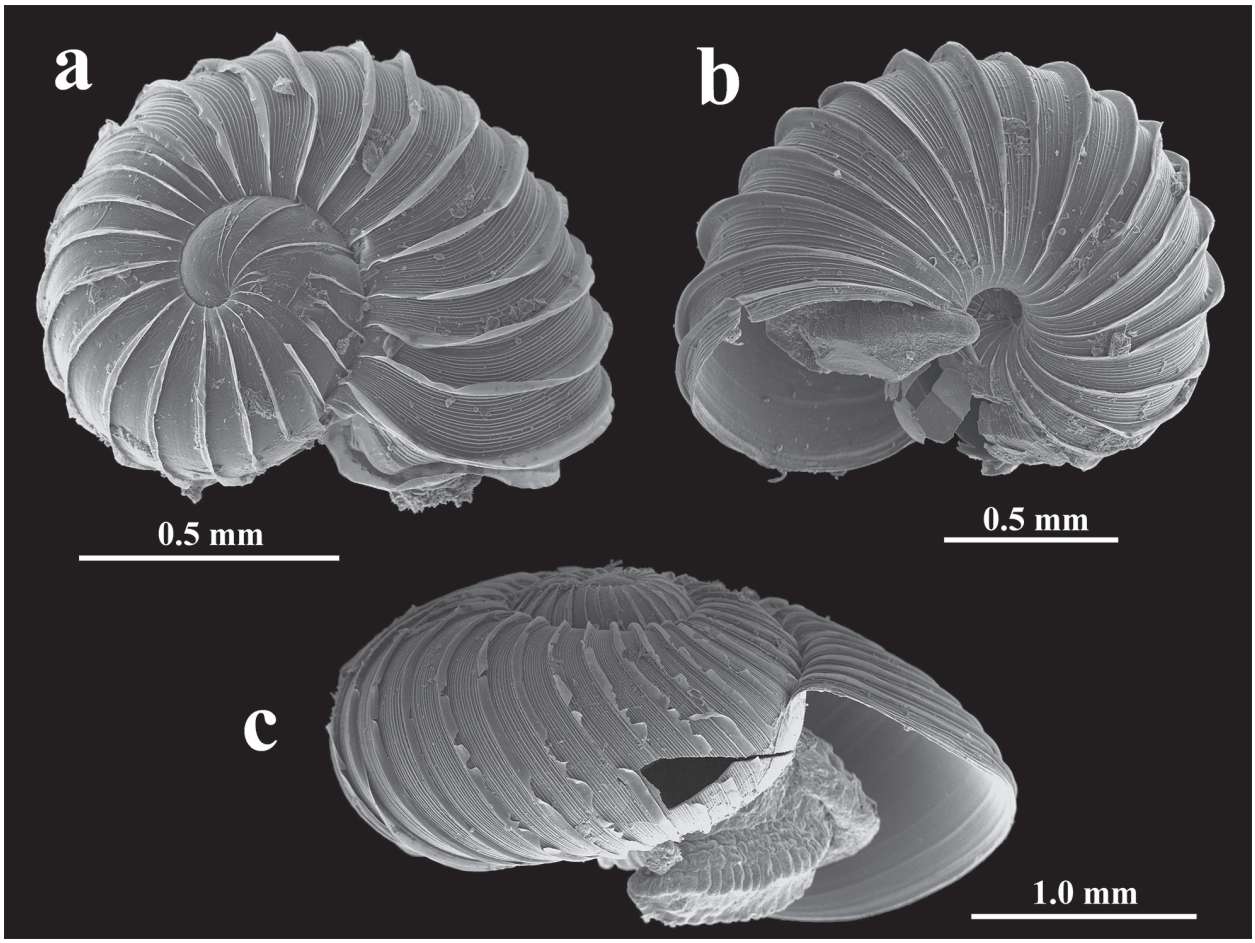


Figure 7a–c. *Neoparyphantopsis crusoeana* n. gen. and sp. Holotype. MNHNCL 201794. Juan Fernández Archipelago, Robinson Crusoe Island, trail near Mirador Selkirk, west side. a: Apical view; b: Umbilical view MACN-In 39527; c: Umbilical view, paratype. MACN-In 39526.

D e s c r i p t i o n : Shell small, depressed and slightly angular, with three or more convex and rapidly expanding whorls, slightly flattened above; apex slightly emergent, protoconch with one and a half whorls sculptured by strong axial ribs; the interstices between such ribs are covered with irregular and minute irregular threads; teleoconch with ribs similar to protoconch but with small, continuous and irregular axial riblets between the ribs; periostracum lamellar and expanding over the major ribs; suture canaliculated, umbilicus very narrow, shallow and perspective; aperture large, markedly angulate, sub-trigonal; outer lip simple and thin.

O c c u r r e n c e : Robinson Crusoe Island, Juan Fernández Archipelago, Chile.

E t y m o l o g y : "*Paryphantopsis*" proper to *Neo*tropical Region.

C o m p a r i s o n s : The characteristic axial sculpture with strong ribs and riblets in intercostal spaces allow the inclusion of *Neoparyphantopsis* n. gen. in the family Charopidae sensu Solem (1983). Solem (1983: 172, 214) and Slapcinsky (2005, 2006) include a genus apparently related, the Polynesian *Paryphantopsis* Thiele 1928, within this family; however the particular affinities of *Paryphantopsis* with the new genus would be only settled with the collection and examination of additional specimens of the Juan Fernández Archipelago species, in particular of their soft parts. *Neoparyphantopsis* n. gen. has a strong and characteristic axial sculpture that differs from all other Punctoidea found in the Juan Fernández Archipelago or in continental South America; most of these genera differ in having more depressed shells (*Austrodiscus* Parodiz 1954, *Rotadiscus* Pilsbry 1926, *Stephacharopa* Miquel & Araya 2013, *Stephadiscus* Hylton Scott 1981, *Stephanoda* Albers 1860, *Zilchogyra* Weyrauch 1965) in presenting a smooth or almost smooth protoconch (*Lilloiconcha* Weyrauch 1965, *Payenia* Mabille & Rochebrune 1889) or in having a protoconch with spiral sculpture (*Araucocharopa* Miquel & Cádiz Lorca 2008, *Sinployea* Solem 1983). Most of the other charopid genera distributed in the South Pacific Islands and Archipelagos differ from the new genus by presenting aperture barriers (i.e. palatal teeth, parietal plica) or in having protoconchs with spiral sculpture (e.g. genera *Ba* Solem 1983, *Himeroconcha* Solem 1983, *Maafu* Solem 1983, *Microcharopa* Solem 1983, *Tuimalila* Solem 1983, among others). The genera *Kubaryellus*

Solem 1983, *Palikirus* Solem 1983 and *Trukcharopa* Solem 1983 from the Caroline Islands are somewhat comparable with the new genus in morphological terms (Solem 1983), however they differ from *Neoparyphantopsis* n. gen. in having a greater number of axial ribs and in presenting flatter spires, with some *Palikurus* species often presenting a medial bladelike barrier (Solem 1983) absent in the new genus.

So far, the new genus only contains its type species *Neoparyphantopsis crusoeana* n. sp., described as follows.

Neoparyphantopsis crusoeana n. sp.

Figs. 7a–c

Type material: Holotype: MNHNCL 201794. MJR-loc-12: Chile, Region of Valparaíso, Juan Fernández Archipelago, Robinson Crusoe Island, trail near Mirador Selkirk, west side (33.63790°S 78.85302°W, 460–470 m, in *Myrceugenia fernandeziana* and arborescent fern forests. Paratypes: MACN-In 39526: 1 spm. MACN-In 39527: 1 spm fragment MJR-loc-05: Chile, Region of Valparaíso, Juan Fernández Archipelago, Robinson Crusoe Island, El Yunque square (33°39'09"S 78°50'38"W, 299 m, in *Myrceugenia fernandeziana* forests.

Diagnosis: Shell small, depressed, with three to four rapidly expanding whorls, sculptured with strong axial ribs and an expanded periostracum; aperture large and angulate, sub-trigonal, umbilicus narrow and perspective.

Description: Shell small, depressed and slightly angular, with 3.75 convex and rapidly expanding whorls; apex slightly emergent, low; embryonic and adult whorls angulated, very marked in last whorl; protoconch with one and a half convex whorls, ornamented with 18–20 strong, slightly sigmoidal prosocline ribs, with numerous irregular, minute threads among them; teleoconch with ribs similar to those in the protoconch, but with small, continuous and irregular axial riblets between the ribs, the major ribs are expanded into the extended periostracum; suture canaliculated, deeply impressed; umbilicus very narrow, shallow and perspective; aperture comparatively large, angulate, sub-trigonal, upper part almost plane, lower part very convex, parietal callus slightly thickened; peristome simple, thin.

Measurements of illustrated type specimens: holotype: H: 3.2 × D: 2.6 mm, 3.25 whorls; paratype MACN-In 39526: H: 1.55 × D: 1.30 mm, 2.25 whorls.

Distribution: Chile, Region of Valparaíso, Juan Fernández Archipelago, Robinson Crusoe Island, El Yunque square (33°39'09"S 78°50'38"W, 299 m, MJR-loc-05) and trail near Mirador Selkirk, West side (33°38'16"S 78°51'10"W, 460–470 m, MJR-loc-12).

Derivation of name: After Robinson Crusoe Island, the type locality for this species.

Comparisons: Among the Charopid species distributed in the southeastern Pacific, only *Paryphantopsis matawanensis* Slapcinsky 2005, from Milne Bay Province, Papua New Guinea, shows similar features on protoconch and teleoconch (strong axial sculpture on the protoconch and periostracal extensions with marginal processes on the growth lines of the teleoconch), differing from most other species of *Paryphantopsis* that have a sculpture of spiral rows of pits that fuse to form incised spiral striae, and which do not bear periostracal extensions (Slapcinsky 2006), however, the examination of additional specimens are essential in order to establish relations between these two species or among related molluscan faunas.

Sinployea Solem 1983

Type species: *Sinployea peasei* Solem 1983, by original designation.

Sinployea conica conica (Odhner 1922) n. comb.

Figs. 8a–c

1922 *Punctum conicum* var. *conicum* Odhner: 227, pl. 8, figs. 18–23.
1985 *Punctum conicum*, – Stuardo & Vega: 129.
1999 *Punctum conicum*, – Valdovinos: 149.

Material examined: MACN-In 39491: 2 juv. sppm; MJR-loc-05: in *Myrceugenia fernandeziana* forests. MNHNCL 201795: 1 spm. MJR-loc-12: in *Myrceugenia fernandeziana* and arborescent fern forests.

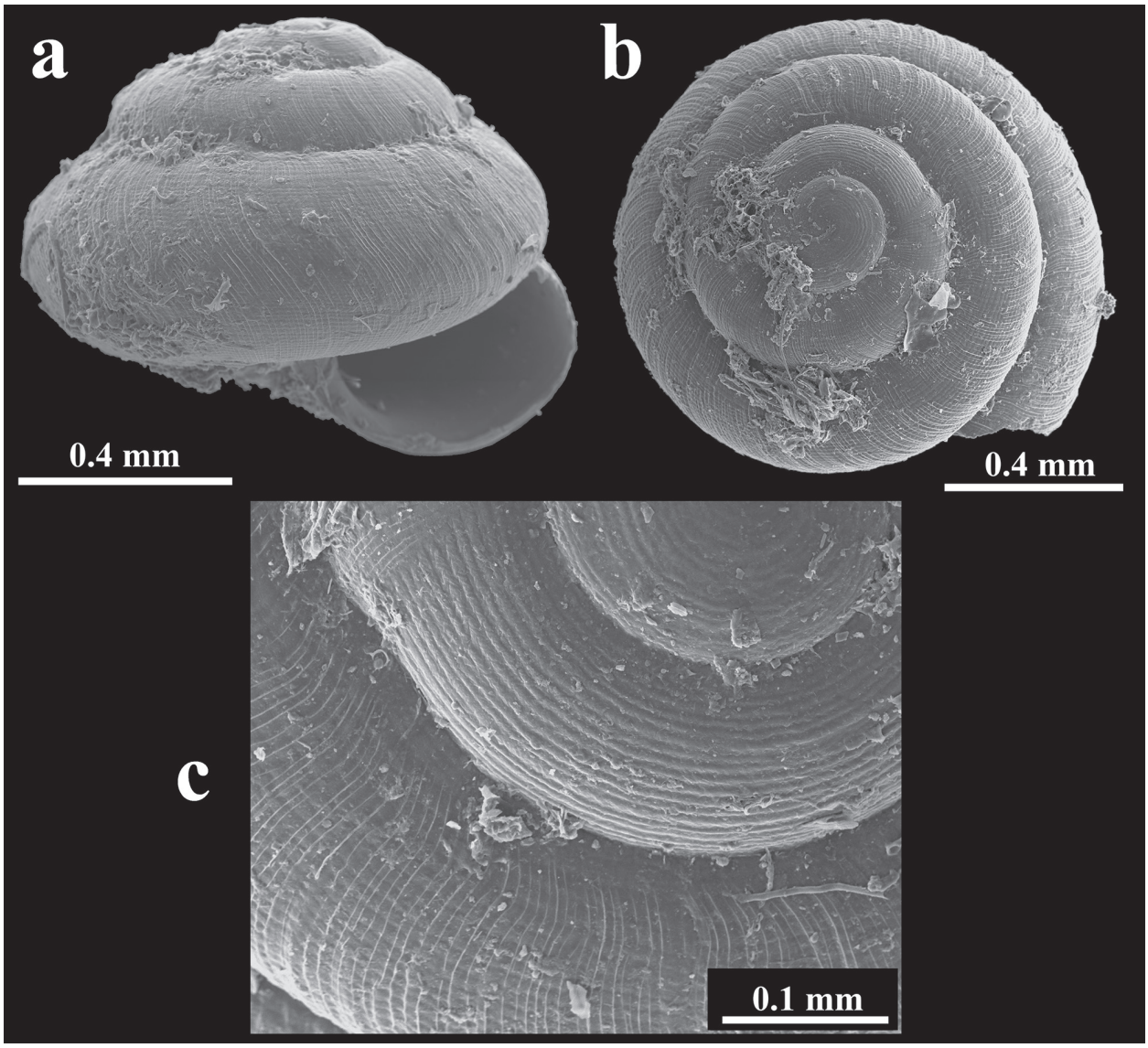
Description: Shell small, depressed, heliciform, straw-yellow, spire low, with four convex whorls regularly increasing; protoconch with almost two whorls bearing about 15–17 spiral costulae; sculpture consisting of about 200 irregular fine and tenuous axial ribs, last whorl occupying about three fourths of total length; periostracum shiny; well-marked suture; base slightly convex with a narrow umbilicus; aperture about half the height of shell length, ovate, with acute simple lip and a thicker, acute and reflected columellar margin.

Measurements of illustrated specimen (MNHNCL 201795): H: 1.9 × D: 2.6 mm; 4.25 whorls.

Previous known records: Robinson Crusoe Island (Masatierra): Centinela Ridge, Puerto Inglés, Salsipuedes Ridge and Piedra Agujeriada Valley (Odhner 1922).

New records: Chile, Region of Valparaíso, Juan Fernández Archipelago, Robinson Crusoe Island, near El Yunque square (33°39'09"S 78°50'38"W, 299 m, MJR-loc-05) and West side of trail near Mirador Selkirk, (33°38'16"S 78°51'10"W, 460–470 m, MJR-loc-12).

Remarks: This species is herein transferred from the genus *Punctum* Morse 1864 to the genus *Sinployea* Solem, 1983 because of the structural similarity of its shell characters to those of that genus distributed in the Pacific Ocean, the most prominent character being the sculptured protoconch (Solem 1983). So far, species of



Figs 8a–c. *Sinployea conica conica* (Odhner 1922). MNHNCL 201795: Juan Fernández Archipelago, Robinson Crusoe Island, near El Yunque square. a: Apertural view; b: Apical view; c: Detail of protoconch and early whorls.

genus *Punctum* Morse 1864 present a mostly holarctic distribution and they are only marginally found in some Pacific islands, including the Hawaiian Archipelago, Tahiti and the Austral Islands (Solem 1983). The smooth protoconch described by Odhner (1922) for this species is herein considered inexact, as it is clearly sculptured (Figs. 6b and 6c), concurring with the change of genus.

Sinployea sp. aff. ***Punctum conicum dilatatum*** Odhner 1922

Figs. 9a–b

aff. 1922 *Punctum conicum* var. *dilatatum* Odhner: 228, Pl. 8, figs. 21–23.

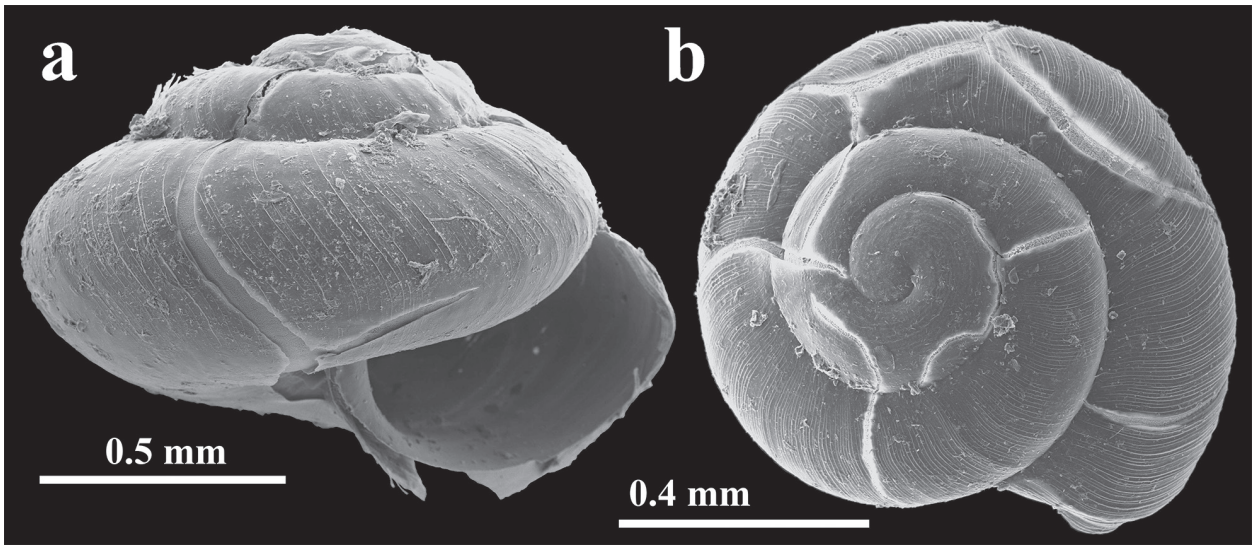
Material examined: MACN-In 39492: 1 spm (ethanol); MNHNCL 201796: 1 spm. MJR-loc-12: in *Myrceugenia fernandeziana* and arborescent fern forests.

Description: Shell small, depressed, helicoid, straw-yellow to corneous, spire low, with more than 3 convex whorls that slowly increase; protoconch with 10 spiral costulae; last whorl with more than 250 radial ribs, irregular in size and distribution; periostracum shiny; suture impressed, wide and perspective umbilicus; its breadth almost half of shell width; aperture subcircular, about half the height of shell, with an angle in the upper area. Outer lip sharp, simple, thin.

Measurements of illustrated specimen (MNHNCL 201796): H: 1.2 × D: 0.9 mm; 3.25 whorls.

Previous known records: Robinson Crusoe Island (Masatierra): The Portezuelo quebrada, Puerto Inglés, Puerto Francés, Rabanal, Pangal, The Yunque quebrada.

New records: Chile, Region of Valparaíso, Juan Fernández Archipelago, Robinson Crusoe Island, west side



Figs 9a–b. *Sinployea* sp. aff. *Punctum conicum dilatatum* Odhner 1922. MNHNCL 201796: Juan Fernández Archipelago, Robinson Crusoe Island, west side of trail near Mirador Selkirk. 5d. Apertural view. 5e. Apical view.

of trail near Mirador Selkirk (33°38'16"S 78°51'10"W, 460–470 m, MJR-loc-12).

Remarks: This species is herein identified into the genus *Sinployea*, following the same reasons given for *S. conica conica*. Unfortunately, a specific allocation or description is difficult, as the examined material only consists of pre-adult specimens.

Pupilloidea Turton 1831

Vertiginidae Fitzinger 1833

Nesopupinae Steenberg 1925

Pronesopupa Iredale 1913

Type species: *Pronesopupa senex* Iredale 1913, by original designation.

Pronesopupa*?* sp.

Figs. 10a–b

Material examined: MACN-In 39798. 1 spm. MJR-loc-05: *Myrceugenia fernandeziana* forests.

Description: Shell very small, pupoid, with four and a half very convex whorls, protoconch smooth; teleoconch ornamented with decayed axial ribs and growth lines; sutures deep; parietal callus thickened; aperture semilunar, narrow, columella with a weak fold, no umbilicus present; external lip sharp.

Measurements of illustrated specimen: H: 1.3 × D: 0.9 mm; 4.50 whorls.

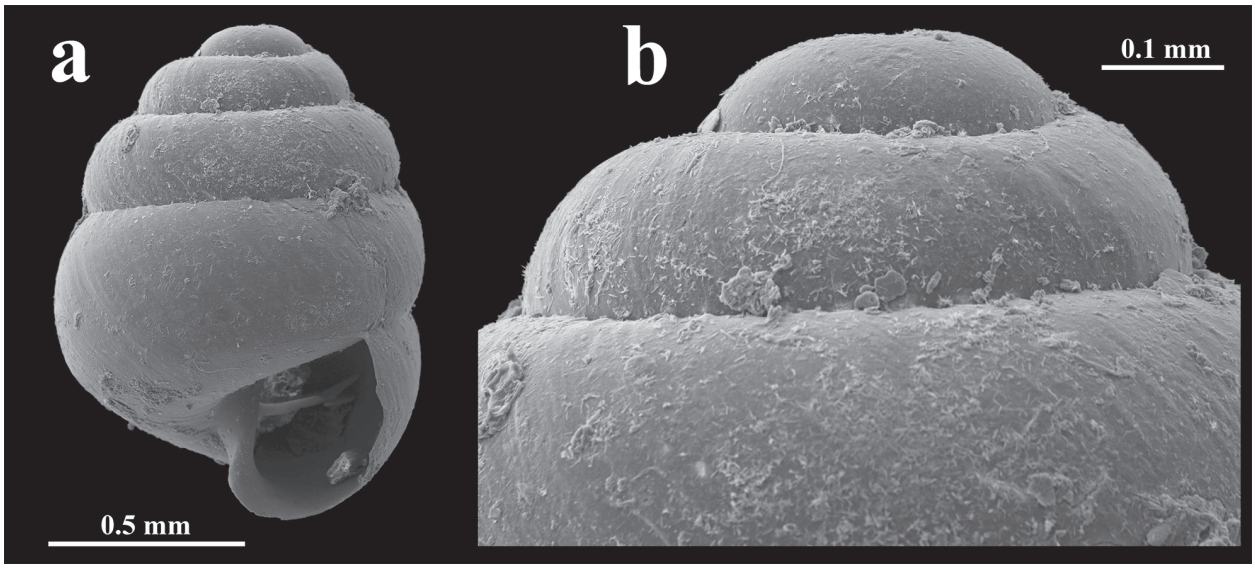
Distribution: Chile, Region of Valparaíso, Juan Fernández Archipelago, Robinson Crusoe Island, near El Yunque square (33°39'09"S 78°50'38"W, 299 m).

Remarks: No other Vertiginidae species are known from the Juan Fernández Archipelago or from continental Chile, with the only exception of the non-indigenous species *Gastrocopta pediculus* (Shuttleworth, 1852) and *Gastrocopta servilis* (Gould, 1843); both species with spare records in Easter Island (Araya 2015). It is probable that the specimen here examined could represent a new austral genus or subgenus of Nesopupinae, different from the Hawaiian *Pronesopupa*. This specimen is clearly distinguishable from most species of *Pronesopupa* in having a smooth protoconch and teleoconch.

Discussion

All of the taxa studied are endemic to the Juan Fernández Archipelago. Despite the relatively small number of specimens collected, this diversity, including a new genus, is surprising. This can be explained by the lack of scientific sampling in the islands, especially of invertebrate species, and by the scarce specimens housed in Chilean and foreign institutions (S. Letelier, curator of MNHNCL, pers. comm.). This, combined with the very small size of most of these molluscs, make this fauna a promising field for the discovery of new taxa, akin to the similar recent studies recording invertebrates in continental central and northern Chile (Miquel & Barker 2009; Miquel & Cádiz-Lorca 2009; Araya 2013, Miquel & Araya 2013, Araya & Catalán 2014, Reiswig & Araya 2014, Araya & Araya 2015a, 2015b, Araya & Aliaga 2015) or, for example, in the Galápagos Archipelago (Miquel & Herrera 2014).

A preliminary biogeographical analysis of this fauna, based on the total of native land terrestrial species



Figs 10a–b. *Pronesopupa?* sp. MACN-In 39798: Juan Fernández Archipelago, Robinson Crusoe Island, near El Yunque square. a: Apertural view; b: Detail of protoconch.

present in the islands according to Valdovinos (1999), allow the identification of two large groups, represented by components of Polynesian distribution (*e.g., Fernandezia*, *Sinployea*, *Tornatellina*), with numerous species distributed over the Pacific Ocean (Pilsbry & Cooke 1915; Solem 1976, 1983), and by American components (*Amphidoxa*, *Stephanoda* Albers 1860), of an almost exclusive Patagonian distribution. The Achatinellidae *Fernandezia*, *Tornatellina* and *Strobilus* Anton 1839 are endemic to the Juan Fernández Archipelago, however there are some species included in *nomina inquirenda* by Stuardo & Vega (1985) that must be revised by examination of their type specimens and/or by collecting new samples; so, probably, new generic endemisms and new affinities for this archipelagic fauna could be discovered, for example in the case of the *Pronesopupa*? species here described. The present paper confirms the status of Robinson Crusoe Island as having the richest fauna of land snails in Chile in relation to its area (Valdovinos 1999). Further studies involving locations in all the islands of the Juan Fernández Archipelago and in the Desventuradas Islands are thus essential to assess their true diversity and to propose future conservation plans for this endangered and special fauna.

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References

Albers, J. C. (1850): Die Heliceen, nach natürlicher Verwandtschaft systematisch geordnet von Johann Christian Albers. 1–262; Berlin.

Ancey, M. C. F. (1903): Additions aux espéces déjà signalées comme appartenant au genre *Tornatellina*. — Journal de Conchyliologie, **51**: 295–307.

Anton, H. E. (1839): Verzeichniss der Conchylien welche sich in der Sammlung von Hermann Eduard Anton befinden. 1–110 pp; Halle.

Araya, J. F. (2015): A new species of *Aeneator* Finlay, 1926 (Mollusca, Gastropoda, Buccinidae) from northern Chile, with comments on the genus and a key to the Chilean species. — ZooKeys, **257**: 89–101.

Araya, J. F. (2015): Current status of the non-indigenous molluscs of Chile, with the first record of *Otala punctata* (Müller, 1774) (Gastropoda: Helicidae) in the country and new records for *Cornu aspersum* (Müller, 1774) and *Deroceras laeve* (Müller, 1774). — Journal of Natural History, **49** (29–30): 1731–1761.

Araya, J. F. & Aliaga, J. A. (2015): A new species of *Lilloiconcha* Weyrauch, 1965 (Pulmonata: Charopidae) from central Chile. — Zootaxa, **4007** (2): 295–297.

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. & Araya, M. E. (2015a): The shallow-water chitons (Mollusca, Polyplacophora) of Caldera, Region of Atacama, northern Chile. — Zoosystematics and Evolution, **91**: 45–58.

Araya, J. F. & Araya, M. E. (2015b): The southernmost record of the amphipod *Hyperia curticephala* (Crustacea: Amphipoda: Hyperiidae) in the Pacific Ocean. Marine Biodiversity Records, 8: e40.

Gray, J. E. (1847): A list of the genera of recent mollusca, their synonyma and types. — Proceeding of the zoological Society of London, **15**: 129–219.

Hyatt, A. & Pilsbry, H. A. (1911): Achatinellidae. — Manual of Conchology (2) **21**: 1–387; Philadelphia.

Hylton Scott, M. I. (1970): Endodontidos de la region austral Americana. — Revista del Museo argentino de Ciencias naturales ‘‘Bernardino Rivadavia’’ Zoología, **10**: 267–296.

Hylton Scott, M. I. (1981): Referencia al género *Stephanoda* Albers, 1860 y la creación del género *Stephadiscus* n. gen. (Mollusca Endodontidae). — Neotropica, **27** (78): 123–126.

ICZN (International commission on zoological nomenclature) 1985. *Tornatellina* Pfeiffer, 1842 (Mollusca, Gastropoda): Proposed Direction to complete a ruling in Opinion 119. — Bulletin of zoological Nomenclature, **42** (2): 199.

Iredale, T. (1913): The land Mollusca of the Kermadec Islands. — Proceedings of the Malacological Society of London, **10** (6): 364–388.

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** (2): 227–235.

Miquel, S. E. & Barker, G. M. (2009): New Charopidae from Chilean—Argentine Patagonia (Mollusca: Gastropoda: Stylommatophora). — Archiv für Molluskenkunde, **138** (1): 53–61.

Miquel S. E. & Cádiz-Lorca, F. J. (2009): *Araucocharopa gallardoi* gen. et sp. n. de Charopidae (Mollusca: Gastropoda: Stylommatophora) del sur de Chile. — Revista Museo Argentino Ciencias Naturales, n.s., **10** (2): 329–340.

Miquel, S. E. & Herrera, H. W. (2014): Catalogue of terrestrial gastropods from Galápagos (except Bulimulidae and Succineidae) with description of a new species of *Ambrosiella* Odhner (Achatinellidae). — Archiv für Molluskenkunde, **143** (2): 107–133.

Morse, E. S. (1864): Observations on the terrestrial Pulmonifera of Maine, including a catalog of all the species of terrestrial and fluviatile Mollusca known to inhabit the State. — Journal of the Portland Society of Natural History, **1**: 1–63, 10 pls.

Odhner, N. H. J. (1922): Mollusca from Juan Fernandez and Easter Island. — In: Skottsberg, C. (Ed.). — The Natural History of Juan Fernandez and Easter Island, **3**: 219–254, pls. 8–9. Uppsala.

Parodiz, J. J. (1957): Catalogue of the Land Mollusca of Argentina. — Nautilus, **70** (4): 128–135.

Pease, W. H. (1864): Descriptions of new species of Land Shells from the Islands of the Central Pacific. — Proceeding of the Zoological Society of London, **1864**: 668–676.

Pfeiffer, L. (1842): Symbolae ad Historiam Heliceorum. **2**. — 47 pp. Casellis.

Pfeiffer, L. (1846): Descriptions of fourteen new species of *Helix*, belonging to the collection of H. Cuming, Esq. — Proceedings of the Zoological Society of London, **1845**: 123–125.

Pfeiffer, L. (1847): Descriptions of thirty-eight new species of land-shells, in the collection of H. Cuming, Esq. — Proceedings of the Zoological Society of London, **1846**: 109–116.

Pilsbry, H.A. (1893–95): Helicidae. 7. — Manual of Conchology, (2) **9**: 1–48, pls 1–14 (1893); 49–160, pls 15–40 (1894); 161–336, pls 41–71 (1895). Philadelphia.

Pilsbry, H.A. & Cooke, C.M. (1914–1916): Appendix to Amastridae. Tornatellidae. Index, Vols. XXI–XXIII. — Manual of Conchology, (2) **23**: 1–48, pls 1–13 (1914); 49–256, pls 14–38 (1915); 257–302, pls 39–55 (1916). Philadelphia.

Pilsbry, H. A. (1926): Costa Rican Land Shells collected by A.A. Olsson. — Proceedings of the Academy of Natural Sciences of Philadelphia, **78**: 127–133.

Reiswig, H. & Araya, J. F. (2014): A review of the Hexactinellida (Porifera) of Chile, with the first record of *Caulophacus* Schulze, 1885 (Lyssacinosida: Rossellidae) from the Southeastern Pacific Ocean. — Zootaxa, **3889** (3): 414–428.

Rochebrune, A. T. & Mabille, J. (1889): Mollusques. Mission Scientifique du Cap Horn 1882–1883, **6** (2): 1–129.

Slapcinsky, J. (2005): Six new species of *Paryphantopsis* (Gastropoda: Pulmonata: Charopidae) from the Papuan Peninsula of New Guinea. — Nautilus, **119** (1):27–42.

Slapcinsky, J. (2006): *Paryphantopsis* (Gastropoda: Pulmonata: Charopidae) from the Louisiade Archipelago of New Guinea. — Nautilus, **120** (4): 119–130.

Solem, A. (1976): Endodontoid land snails from Pacific islands (Mollusca: Pulmonata: Sigmurethra). — 1. Family Endodontidae. Field Museum of Natural History (Ed.). 508 pp. Chicago.

Solem, A. (1983): Endodontoid land snails from Pacific Islands (Mollusca: Pulmonata: Sigmurethra). — 2. Families Punctidae and Charopidae, Zoogeography. Field Museum of Natural History (Ed.). 336 pp. Chicago.

Stuardo, J. R. & Vargas-Almonacid, P. (2000): Moluscos terrestres de Chile. Sinonimia y problemas relacio-

nados: 1. Familias Veronicellidae, Pipillidae (sic) y Achatinellidae (Gastropoda: Pulmonata). — Gayana, **64** (2): 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** (3): 125–146.

Stuessy, T. F., Foland, K. A., Sutter, J. F., Sanders, R. W. & Silva, M. 1984. Botanical and geological significance of potassium-argon dates from the Juan Fernandez Islands. — Science, **225** (4657): 49–51.

Thiele, J. (1928): Mollusken vom Bismarck-Archipel, von Neu-Guinea und Nachbar-Inseln. — Zoologische Jahrbücher (Systematik), **55**: 119–146, Taf. 5.

Tillier, S. (1981): South American and Juan Fernandez succineid slugs (Pulmonata). — Journal of Molluscan Studies, **47**: 125–146.

Tryon, G. W. (1887): Helicidae. — Manual of Conchology (2) **3** (1): 1–313, pls. 63. Philadelphia.

Valdovinos, C. (1999): Biodiversidad de moluscos chilenos: base de datos taxonómica y distribucional. — Gayana, **63** (2): 111–164.

Weyrauch, W. K. (1965): Neue und verkannte Endodontiden aus Südamerika. — Archiv für Molluskenkunde, **94**: 121–134.

Zilch, A. (1959–1960): Euthyneura. — In: Schindewolf, O.H. (Ed.): Handbuch der Paläozoologie. 6. Gastropoda. **2**: 1–400 (1959); 401–835 (1960). Berlin-Nikolassee (Bornträger).

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