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The Families Carditidae and Condylocardiidae in the Magellan and Perú–Chile provinces (Bivalvia: Carditoidea)

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Abstract

Based on the study of available types and extant collections, this paper provides a systematic revision of the living species of Carditoidea occurring in the Magellan and Perú-Chile Provinces. Out of the 19 nominal species reported for the area, eight species are recognized as valid: *Cyclocardia compressa, C. spurca, C. thouarsii, C. velutina, Carditella naviformis, C. semen, C. tegulata* and *Carditopsis flabellum*. Other eight nominal species are regarded as synonyms: *Cardita magellanica* of *Cyclocardia velutina*; *Carditella pallida* of *C. tegulata*; *Cardita australis* and *Actinobolus philippi* of *Carditella naviformis*; *Cardium pygmaeum* of *Carditella semen*; *Cardita paeteliana* of *Cyclocardia spurca*; *Carditella pallida duodecimcostata* of *Carditopsis flabellum*; and *Cardita congelascens* of *Cyclocardia thouarsii*. Furthermore, *Cardita malvinae* and *Cardium parvulum* are *nomina dubia*, and the occurrence of *Carditella exulata* in Magellanic waters is doubtful.

Key words: *Cyclocardia*, *Carditella*, *Carditopsis*, Southeast Pacific, Southwest Atlantic

Introduction

The southern tip of South America, from Peninsula Valdés, Argentina (42°S) to Tierra del Fuego (56°S) in the Atlantic Ocean, and extending northwards to Chiloé, Chile (42°S) in the Pacific Ocean, represents a biogeographic unit: the Magellan Province. Towards the north, on the Pacific side, the Perú-Chile Province extends from Chiloé to Punta Aguja, Perú (05°47'S) (Boschi, 2000; Camus, 2001). Forteen out of nineteen nominal species of carditoideans reported from these provinces have been described from the Chilean coast: *Cardita spurca* Sowerby, 1833, *Cardita compressa* Reeve, 1843, *Cardita naviformis* Reeve, 1843, *Cardita semen* Reeve, 1843, *Cardita tegulata* Reeve, 1843, *Cardita flabellum* Reeve, 1843, *Cardita australis* Philippi, 1858 (subsequently renamed as *Actinobolus philippi* Tryon, 1872), *Cardium pygmaeum* Philippi, 1860, *Cardium parvulum* Dunker, 1861, *Carditella pallida* Smith, 1881, *Cardita (Actinobolus) velutinus* Smith, 1881, *Cardita paeteliana* Clessin, 1888, and *Cardita magellanica* Philippi, 1898; four other species have been described from the Malvinas/Falkland Islands: *Cardita thouarsii* d'Orbigny, 1845, *Cardita malvinae* d'Orbigny, 1845, *Carditella pallida duodecimcostata* Melvill & Standen, 1912, and *Cardita congelascens* Melvill & Standen, 1912. Another carditoidean species listed for the area is *Carditella exulata* Smith, 1885, a species originally described from Nightingale Island [37°30'S 12°30'W].

The original descriptions for most of the above-mentioned species lack relevant characters for species identification, and some of them were never (or never properly) illustrated. Under this scenario it is not strange that species have been confused and discrepant synonymies proposed. For example: *Actinobolus philippi* was either considered as a synonym of *Carditella naviformis* by Bernard (1983) or of *Carditella semen* by Coan (2003) and Huber (2012). *Carditella naviformis* and *Carditella semen* were frequently confused (*e.g.*: d'Orbigny, 1845). *Carditopsis flabellum* was wrongly reported as a synonym of *Cyclocardia compressa* by d'Orbigny (1845). *Cardita paeteliana* was regarded as a synonym of *Carditella naviformis* by Bernard (1983), even when the original figure shows that the species is a member of the genus *Cyclocardia*. In addition, the figures of "*Carditella tegulata*" by

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Soot-Ryen (1959: pl. 1, fig. 11), Marincovich (1973: fig. 9) and Cárdenas *et al.* (2008: fig. 7.91), and that of "*Carditopsis flabellum*" by Cárdenas *et al.* (2008: fig. 9), do not show correspondence with the types of these species.

Although a number of previous contributions addressed the Magellanic and Perú-Chile carditoidean species (*e.g.* Lamy, 1922; Dall, 1903; Coan, 2003), some early-described species have been largely neglected. Dell (1964) was the first to perform a critical study of some species from Patagonia and Malvinas/Falkland Islands. The present contribution broadens Dell's (1964) study by performing a systematic revision of all living Carditidae and Condylocardiidae species occurring in the Magellan Province, and reviews for the first time the carditoidean diversity from the Perú-Chile Province.

Material and methods

The main source of information for this study are the specimens collected during several field trips to the Magellan Province, and specimens previously collected in this area and the Perú-Chile Province by the R. V. *Hero*, housed at the Natural History Museum of Los Angeles County (LACM), Los Angeles. Personally-collected samples were obtained between 0 and 402 m depth, using a 2 mm mesh-size net, sorted from the sediment under a stereoscopic microscope, and deposited at the Museo de La Plata (MLP), La Plata, and Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" (MACN), Buenos Aires. Additional specimens come from the Museo Nacional de Historia Natural (MNHNCL), Santiago de Chile; the Museo de Zoología de la Universidad de Concepción (MZUC), Concepción; the Muséum National d'Histoire Naturelle (MNHN), Paris; the Zoologisches Museum der Universität Hamburg (ZMH), Hamburg; and the Museum für Naturkunde (ZMB), Berlin. These specimens were compared with all available types of the species described from the area, housed at the Natural History Museum (NHMUK), London, and the Royal Scottish Museum (RSM), Edinburgh. The material examined and other published records referred to in this study are listed in Appendices 1 to 8, indicating number of specimen(s) (sp. / sps.), articulated valve(s) (a. v. / a. vs.) and single valve(s) (v. / vs.).

Small sized species were studied and illustrated with scanning electron microscopy (SEM); larger species were studied and illustrated using a stereoscopic microscope. Shell length (L) of adult specimens refers to the maximum anterior-posterior length; shell height (H) to the maximum dorsal-ventral distance, perpendicular to L; and shell width (W) to the maximum distance across united valves. The mean, standard deviation, and number of specimens measured (n) for the ratios H/L and W/H, are given. Prodissoconch size was measured as the maximum anterior-posterior length parallel to the larval hinge.

Hinge plate terminology for *Cyclocardia* and *Carditella* species follows Lamy (1922) and Yonge (1969). The anterior cardinal tooth of the left valve in *Carditella* is here referred to as "CA2". Lamy (1922: 354) referred to it as "2a" in the text but as "2b" in the text figure he provided. In the case of *Carditopsis*, for which the hinge was not formally described before, we adopt the nomenclature used by Middelfart (2002a: fig. 1) for other Condylocardiinae.

Anatomical information was obtained from specimens decalcified in a 10% formalin and 5% acetic acid solution, dissected under stereoscopic microscope.

The diagnostic characters for Carditidae and Condylocardiidae can be found in Coan and Valentich-Scott (2012).

Systematics

Family Carditidae Férussac, 1822

Genus *Cyclocardia* Conrad, 1867

Type species. *Cardita borealis* Conrad, 1832 (SD by Stoliczka, 1871), northwest Atlantic.

***Cyclocardia compressa* (Reeve, 1843)**
Figs. 1A–M, 9A, Appendix 1

Cardita compressa Reeve, 1843: pl. 9, fig. 46.
Cardita compressa—Reeve, 1844: 194; Hupé, 1854: 319.
Cardita compressa Reeve—d'Orbigny, 1845: 580; Martínez y Saez, 1870: 47; Clessin, 1888: 11, pl. 5, figs. 14, 15; Rochebrune & Mabille, 1889: H111.
Cardita (Actinobolus) procera Gould, 1850: 276.
Cardita procera (Gould)—Gould, 1852: 416.
Actinobolus compressus [*sic*] [*recte compressa*], Reeve—Adams & Adams, 1857: 487.
Actinobolus procerus [*sic*] [*recte procera*], Gould—Adams & Adams, 1857: 487.
Cardita procera G.—Gould, 1860: pl. 36, fig. 533.
Cardita (Actinobolus) procera—Gould, 1862: 83.
Cardita (Actinobolus) compressus [*sic*] [*recte compressa*] Reeve—Smith, 1881: 42.
Venericardia (Cyclocardia) compressa Reeve, 1843—Dall, 1903: 708.
Venericardia (Cyclocardia) procera Gould, 1850—Dall, 1903: 704.
Venericardia compressa Reeve—Dall, 1909: 261.
Venericardia (Cyclocardia) compressa Reeve—Lamy, 1922: 340.
Cyclocardia compressa Reeve, 1843—Soot-Ryen, 1959: 39; Osorio & Reid, 2004: 82; Cárdenas *et al.*, 2008: 230, figs. 7.85–87.
Cyclocardia procera Gould, 1850—Soot-Ryen, 1959: 39.
Cyclocardia compressa (Reeve, 1843)—Dell, 1964: 190; Ramorino, 1968: 198, pl. 2, fig. 1, pl. 5, figs. 1, 3; Osorio & Reid, 2004: fig. 3e.

Type localities: Valparaíso, South America [Chile], 20 to 60 fathoms [36–109 m] (*Cardita compressa*); "Río Negro, Patagonia" [~ 41–42ºS] (*Cardita (Actinobolus) procera*).

Material examined: 3 syntypes of *Cardita compressa* (NHMUK 1967582); 77 lots (Appendix 1, Table 1).

Other published records: Chile (Martínez y Saez, 1870; Smith, 1881; Ramorino, 1968; Osorio & Reid, 2004; Cárdenas *et al*., 2008); Magellan Strait (Smith, 1881); Cape Horn (Dell, 1964) (Appendix 1, Table 2).

Known distribution: Valparaíso [33°S], Chile to Burdwood Bank [54°S]. Also mentioned from "Río Negro, Patagonia" (type locality of *Cardita procera*). Living specimens: 12–272 m.

Description: Shell medium in size (maximum observed L = 15.1 mm), triangular to subcircular (H/L = 0.98 ± 0.04, n = 18), flat (W/H = 0.54 ± 0.03, n = 18), solid (Figs. 1A–D, K). Anterior end slightly to moderately produced. Antero-dorsal margin short, concave, sloping, insensibly connected with anterior margin. Anterior, ventral and posterior margins evenly rounded; posterior end sometimes truncated, almost vertical. Postero-dorsal margin convex, sloping, longer than the antero-dorsal margin (Figs. 1A–H). Lunule short, wide, moderately deep; escutcheon elongated, narrow (Figs. 1K, L). Beaks pointed, subcentrally located, anteriorly directed (Figs. 1A–J). Prodissoconch small (about 240 µm in length); prodissoconch-1 (P-1) smooth, prodissoconch-2 (P-2) with commarginal lines (Fig. 1M). Shell surface white, sculptured with 11–18 wide, low, rounded in section radial ribs, which are evenly developed along all shell surface or stronger at posterior part; low and irregular growth lines crossing over radial sculpture, present; interspaces relatively wide (Figs. 1A–D). Periostracum thick, yellow to brownish, forming narrow commarginal folds, particularly evident towards the margin (Figs. 1A–D). Inner margin crenulated, coincident with outer shell sculpture (Figs. 1E–H). Inner shell surface evenly white, or with brown stains at the margins.

Hinge plate wide, solid, oblique, higher posteriorly. Right valve (Fig. 1J): anterior cardinal CA3 markedly hooked, dorsally fused with shell margin; composed by a small, extremely thin, ventrally directed anterior part (CA3a), and a prominent posterior part (CA3b), high, triangular at the base. Posterior cardinal (CP5b) long, strong, slightly arched, parallel to the nymph, with a distal cusp. Anterior and posterior lateral teeth (LAI and LPI) minute, knob-like, the posterior close to shell margin. Left valve (Fig. 1I): two solid, elongated, slightly arched, diverging cardinal teeth, dorsally fused with shell margin; anterior cardinal (CA2a) ventrally directed, one-third to one half the size of the posterior one, with subcentral cusp. Posterior cardinal (CP4b) gradually widening distally, with cusp located in anterior third. Anterior and posterior lateral teeth (LAII, LPII) minute, knob-like. Ligament completely external, located in a nymph, which extends for about one half the length of the posterior dorsal margin (Figs. 1I–L).

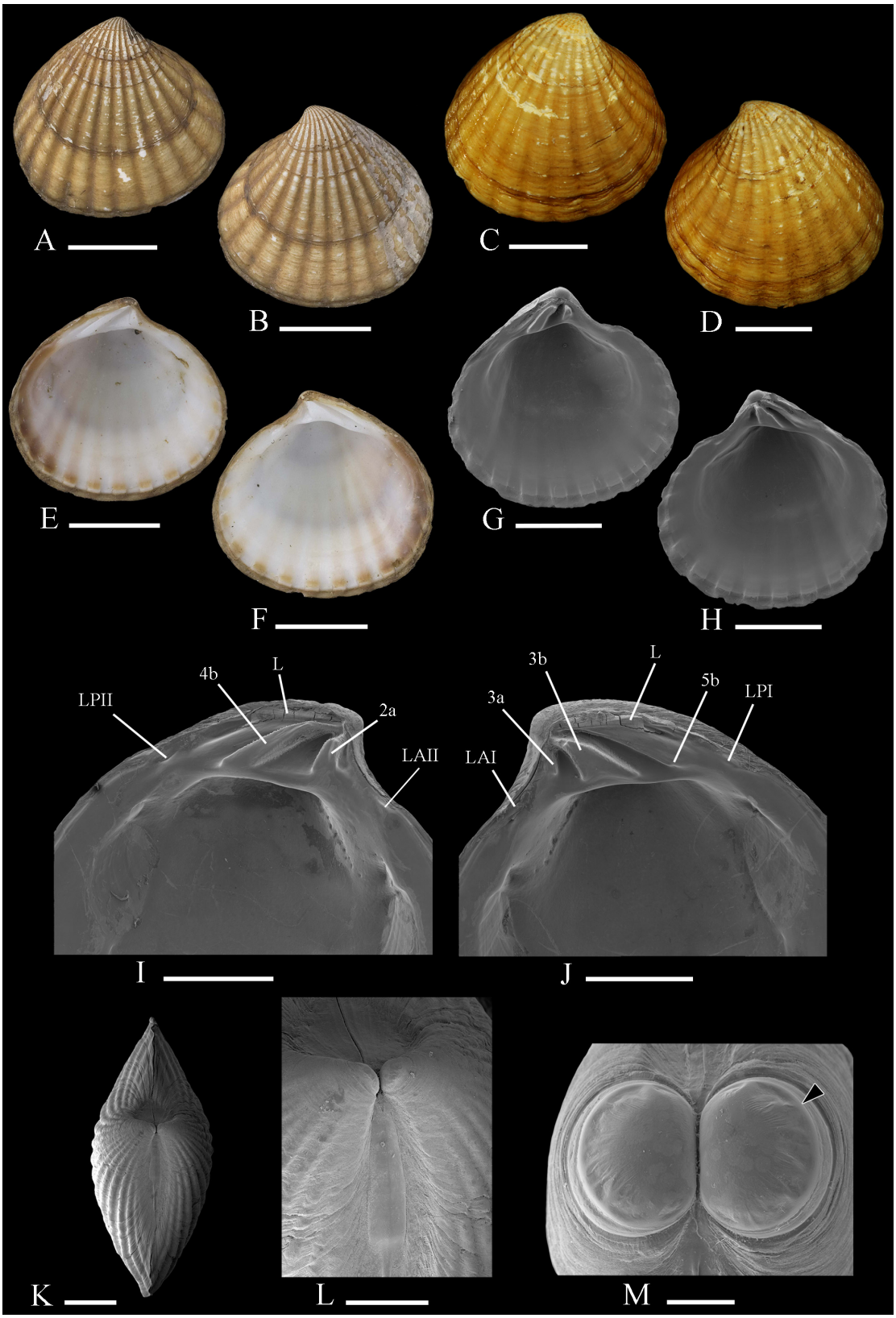

FIGURE 1. *Cyclocardia compressa*. A, B, E, F: Syntypes of *Cardita compressa*, Valparaíso, 36–109 m (NHMUK 1967582); C, D, I, J, M: Punta Segunda, 12 m (MACN-In 39050); G, H: Caleta del Rey, Chile, 20–30 m (MACN-In 39057); K, L: Punta Segunda, 27 m (MLP 12191). **A–D**: Outer views; A, C: Right valve; B, D: Left valve; **E–H**: Inner views; E, G: Left valve; F, H: Right valve; **I, J**: Detail of hinge plate; I: Left valve; J: Right valve; **K**: Dorsal view; **L**: Detail of lunule and ligament; **M**: Prodissoconch. Abbreviations: 2a, 3a, 3b, 4b, 5b = cardinal teeth; LAI, LAII = anterior lateral teeth; LPI, LPII = posterior lateral teeth; L = ligament. Arrow shows P-1/P-2 boundary. Scale bars: A–F = 5 mm; G, H = 1 cm; I, J = 2 mm; K = 1 mm; L = 500 µm; M = 100 µm.

Anatomy (Fig. 9A): Mantle margin with a large inhalant-pedal aperture, extending for about 85% mantle margin length, separated from a small posterior exhalant opening by a short suture. Transverse section of anterior adductor muscle large, reniform; transverse section of posterior muscle ovate, smaller than the anterior one. Both inner and outer demibranchs, present, posteriorly fused with each other and to mantle margin. Outer demibranch one third the size of inner one, showing up to 120 filaments in larger specimens; ascending and descending lamellae equally developed. Inner demibranch with 145 obliquely directed filaments in larger specimens; ascending lamella as high as descending lamella. Labial palps with 5 sorting ridges. Foot with posterior byssal gland.

Remarks: The molluscs from the United States Exploring Expedition are housed at the Museum of Comparative Zoology (MCZ), Harvard and in the United States National Museum, Smithsonian Institution (USNM), Washington. However, according to Johnson (1964), Baldinger, A. (*in. litt*. May, 2012), and Strong, E. (*in. litt.* June, 2012), the types of *Cardita (Actinobolus) procera* are missing. Gould (1850) described this species as having an oval-triangular shell, with subcentrally located beaks, sculptured with 15 radial ribs, and yellow periostracum. This set of characters, figured by Gould (1860), agrees with those present in *Cyclodardia compressa*; in fact Dell (1964) regarded the two species as synonymous.

Cardita (Actinobolus) procera was described from "Río Negro, Patagonia", and subsequently reported by the same author (Gould, 1852) as coming from "mouth of Río Negro, Patagonia". Pastorino (2000) reported *Cyclocardia compressa* from Quaternary raised beaches in the vicinities of this area. However, there is no published information that allows confirming that the species actually lives at present in the area.

Two specimens from Payta, Perú (MACN-In 13926) appear closely similar in shell morphology to *Cyclocardia compressa*. However, these specimens have flatter ribs with square cross section, separated by narrower interspaces, and a narrower hinge plate, with more delicate teeth. These facts, together with the absence of intermediate records between Payta and Valparaíso, suggest that these specimens could correspond to a different species. The absence of additional material, precludes describing it as new. Guzmán *et al.* (1998) reported a *Cyclocardia* cf. *compressa* from Antofagasta (northern Chile). Their illustrations show an extremely large specimen (about 5.6 cm long), with low and inflated beaks, flat radial ribs, and narrow hinge plate. The identity of this material must be further investigated.

Cyclocardia spurca (Sowerby, 1833)

Figs. 2A–I, Appendix 2

Cardita spurca Sowerby, 1833: 195.
Cardita spurca Sowerby, 1833—d'Orbigny, 1845: 581; d'Orbigny, 1847: pl. 82, fig. 13.
Cardita spurca—Reeve, 1843: pl. 7, fig. 32.
Cardita spurca Sowerby, 1832—Hanley, 1843: 146, pl. 18, fig. 16.
Actinobolus spurcus [*sic*] [*recte spurca*] Sowerby—Adams & Adams, 1857: 487.
Cardita spurca Yarell—Clessin, 1888: 37.
Cardita spurca Reeve—Clessin, 1888: pl. 13, fig. 5.
Cardita paeteliana Clessin, 1888: 20, pl. 6, figs. 7, 8.
Venericardia (Cyclocardia) spurca Sowerby, 1832—Dall, 1903: 708.
Venericardia spurca Sowerby—Dall, 1909: 261.
Venericardia paeteliana Clessin—Dall, 1909: 261.
Venericardia (Cyclocardia) spurca Sowerby—Lamy, 1922: 341.
Cyclocardia spurca (Sowerby, 1832)—Dell, 1964: 192.
Cyclocardia spurca Sowerby, 1832—Soot-Ryen, 1959: 38.
Cylcocardia paeteliana Clessin, 1888—Soot-Ryen, 1959: 39.

Type localities: Iquiqui, Perú [*sic*] [= Iquique, Chile], 6–10 fathoms [11–18 m] (*Cardita spurca*); Iquiqui [*sic*] [= Iquique, Chile] (*Cardita paeteliana*).

Material examined: 3 syntypes of *Cardita spurca* (NHMUK w/n); 2 lots (Appendix 2, Table 1).

Other published records: Perú and Chile (d'Orbigny, 1845; Lamy, 1922) (Appendix 2, Table 2).

Known distribution: Payta [05°S], Perú to Iquique [20°S], Chile. Dall (1909) and Dell (1964) reported *Cyclocardia spurca* from the Magellan Province, although no formal records from this area are known.

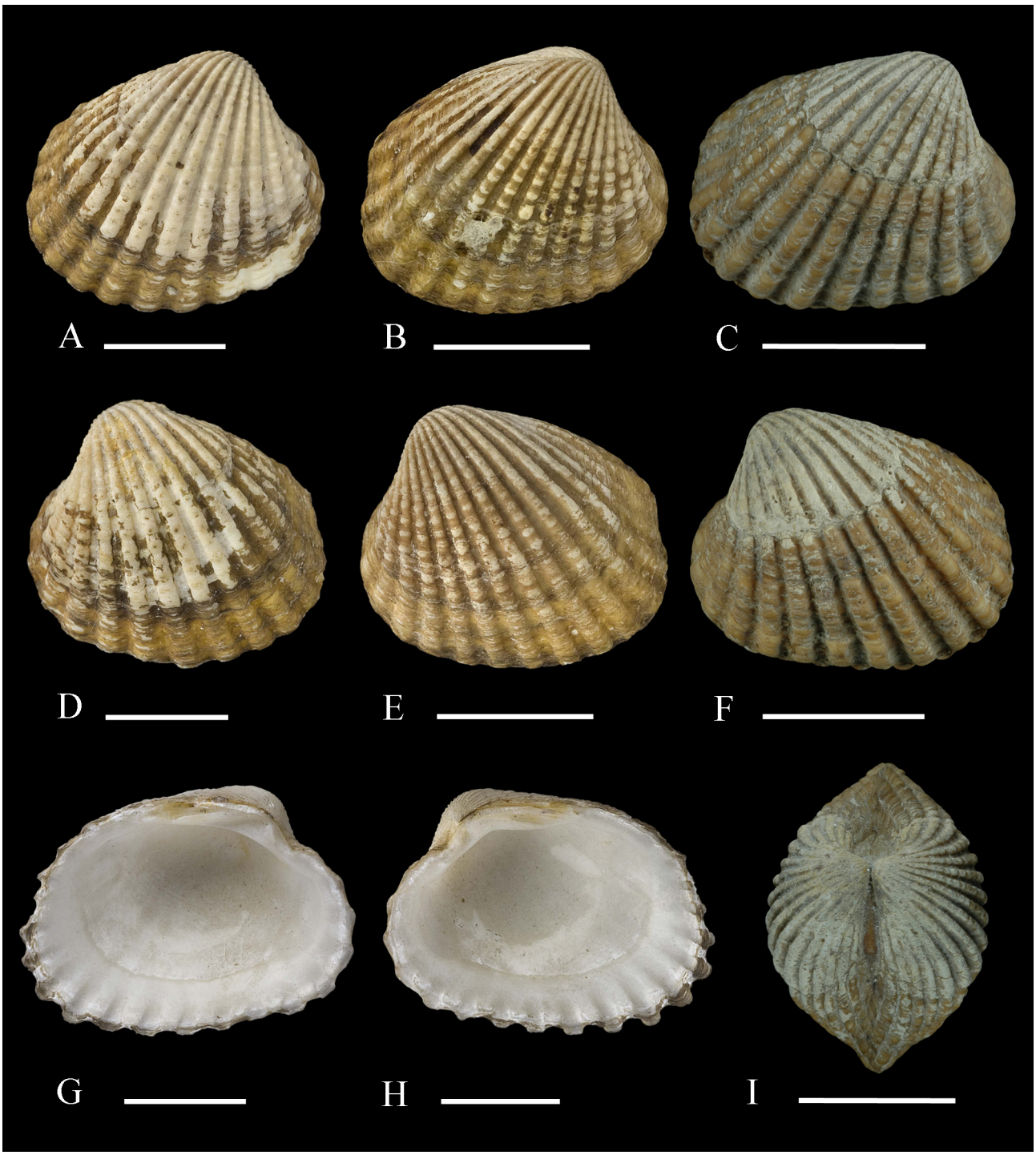

FIGURE 2. *Cyclocardia spurca*. A, B, D, E, G, H: Syntypes of *Cardita spurca*, Iquique, 11–18 m (NHMUK w/n); C, F, I: Perú (MNHN). **A–F**: Outer view; A–C: Right valve; D–F: Left valve; **G, H**: Inner view; G: Left valve; H: Right valve; **I**: Dorsal view. Scale bars: 1 cm.

Description: Shell large (maximum observed L = 24.7 mm), rectangular (H/L = 0.85 ± 0.04 mm, n = 8), inequilateral, inflated (W/H = 0.83 ± 0.02 mm, n = 8), solid (Figs. 2A–I). Anterior end slightly produced, lower than posterior end. Antero-dorsal margin markedly concave, sloping steeply. Anterior margin short, widely rounded. Ventral margin forming a wide curve. Posterior margin larger than the anterior one, almost vertical, straight to slightly curved. Postero-dorsal margin long, slightly convex, slightly sloping (Figs. 2A–H). Lunule short, wide, deep; escutcheon elongated, narrow (Fig. 2I). Beaks low, inflated, anteriorly located, anteriorly projected (Figs. 2A–I). Prodissoconch unknown (eroded in examined specimens). Shell surface sculptured with 15–18 low, wide radial ribs, paved with elongated scales; interspaces narrower than radial ribs. Periostracum thick,

dark brown (Figs. 2A–F). Inner shell surface porcellaneous; inner margin crenulated, coincident with outer shell sculpture (Figs. 2G, H). Pallial line continuous; anterior adductor muscle scar ovate; posterior adductor muscle scar reniform.

Hinge plate relatively narrow (Figs. 2G, H). Right valve (Fig. 2H): anterior cardinal tooth (CA3) hooked, with anterior part (CA3a) short and narrow, and posterior part (CA3b) with large triangular base. Posterior cardinal tooth (CP5b) long, straight, moderately solid. Anterior lateral tooth (LAI) small. Left valve (Fig. 2G): two large and straight diverging cardinal teeth, the anterior (CA2a) ventrally directed, one third the size of the posterior one (CP4b). Anterior lateral (LAII) and posterior lateral (LPII) short, relatively solid. External ligament long and narrow, located on a nymph which extends for half the length of posterior part of dorsal margin (Figs. 2G–I).

Remarks: The general shell outline of *Cyclocardia spurca* closely resembles that of larger specimens of *C. thouarsii* (Figs. 3B, E) and *C. velutina* (Figs. 4C, F). However, the former has a thicker and more inflated shell with stronger radial ribs and inflated beaks. In addition, *C. velutina* has a shorter postero-dorsal margin and *C. thouarsii* has long hair-like periostracal projections.

Although Paetel's collection is currently housed at the ZMB, the type(s) of *Cardita paeteliana* were not found there (Zorn, C. *in litt*. June 8, 2012). The original description refers to an ovate, inflated and very solid shell, with the anterior end rounded and shorter than the posterior end, strong radial sculpture, and prominent beaks. This set of characters suggests that *C. paeteliana* is a synonym of *Cyclocardia spurca*.

Cyclocardia thouarsii (d'Orbigny, 1845)

Figs. 3A–O, 9B, Appendix 3

Cardita thouarsii d'Orbigny, 1845: 579—d'Orbygny, 1847?: pl. 84, figs. 1–3.
Actinobolus thouarsii D'Orbigny, 1846—Tryon, 1872: 255.
Cardita Thouarsi [*sic*] [*recte thouarsii*] d'Orbigny—Rochebrune & Mabille, 1889: H111.
Cardita congelascens Melvill & Standen, 1912: 362, pl. 1, fig. 23.
Cyclocardia thouarsi [*sic*] [*recte thouarsii*] Orbigny, 1846—Soot-Ryen, 1959: 39.
Cyclocardia thouarsi [*sic*] [*recte thouarsii*] (Orbigny, 1846)—Dell, 1964: 189, pl. 2, fig. 9.

Type localities: Îles Malouines [Malvinas/Falkland Islands] (*Cardita thouarsii*); Burdwood Bank, 56 fathoms [102 m] (*Cardita congelascens*).

Material examined: Holotype of *Cardita thouarsii* (NHMUK 1854.12.4.760), 1 syntype of *Cardita congelascens* (RSM 1921.143.711), and 19 lots (Appendix 3, Table 1).

Other published records: Baie Orange [55º31'S 70º26'W] (Rochebrune & Mabille, 1889) (Appendix 3, Table 2).

Known distribution: Cape Horn [55°S] to Malvinas/Falkland Islands [50°S]. Living specimens: 198–903 m.

Description: Shell large (maximum observed L = 21.3 mm), transversely ovate to rectangular (H/L = 0.89 ± 0.06, n = 6), inequilateral, somewhat inflated (W/H = 0.66 ± 0.02, n = 6), solid (Figs. 3A–K). Anterior end produced, lower than posterior end. Antero-dorsal margin short, markedly concave, forming a prominent angle at the junction with anterior margin. Anterior margin short, curved, continuous with ventral margin, which is slightly expanded posteriorly. Posterior margin larger than the anterior one, forming a wide, almost vertical curve. Postero-dorsal margin long, slightly sloping (Figs. 3A–H, J, K). Lunule short, wide and moderately deep; escutcheon elongated, extremely narrow (Fig. 3I). Beaks inflated, anteriorly displaced, anteriorly directed (Figs. 3A–K). Prodissoconch small (about 225 µm in length); P-1 smooth, P-2 with low commarginal lines (Fig. 3O). Shell surface sculptured with 16–22 moderately elevated, radial ribs, closely and finely scaled; interspaces as wide as or narrower than radial ribs, with fine commarginal lamellae (Figs. 3A–C, E–G). Periostracum thick, pale buff, forming hair-like projections (Figs. 3A, B, E, L). Inner margin crenulated, coincident with outer shell sculpture. Pallial line continuous (Figs. 3H, J, K).

Hinge plate relatively narrow, anterior and posterior halves nearly equal in height (Figs. 3M, N). Right valve (Fig. 3N): anterior cardinal tooth (CA3) hooked, dorsally fused with shell margin, anterior part (CA3a), short, narrow, ventrally directed; posterior part (CA3b) large, with widely posteriorly projected triangular base. Posterior cardinal tooth (CP5b) long, straight, moderately solid, parallel to nymph. Anterior lateral tooth (LAI) short, narrow.

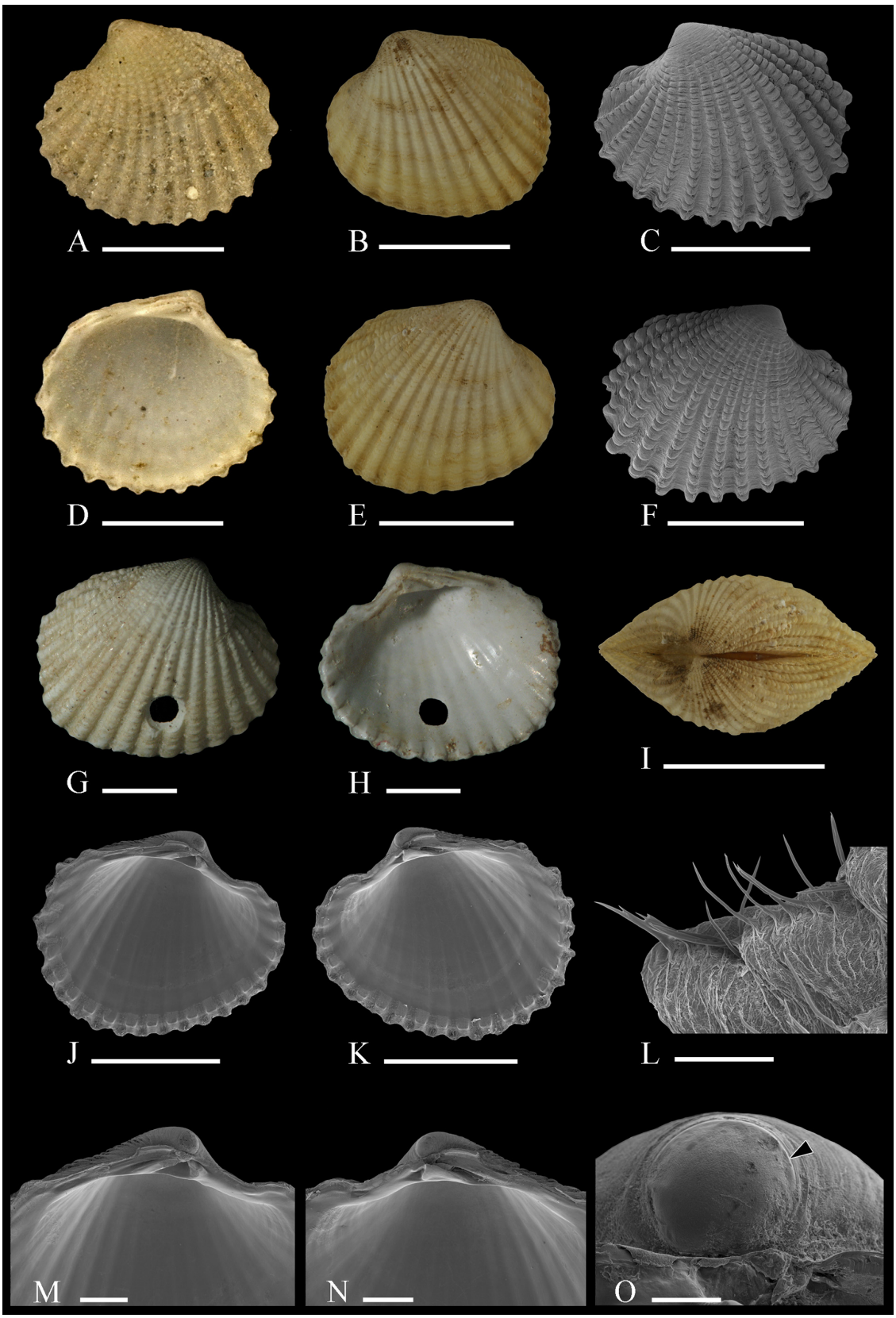

FIGURE 3. *Cyclocardia thouarsii*. A, D: Holotype of *Cardita thouarsii*, Malvinas/Falkland Islands (NHMUK 1854.12.4.760); B, E, I: Cape Horn, 780 m (ZMB 103678); C, F, L: Cape Horn, 430 m (ZMB 103538); G, H: Syntype of *Cardita congelascens*, Burdwood Bank, 102 m (RSM 1921.143.711); J, K, M–O: Burdwood Bank, 286 m (MLP 13708). **A–C, E–G**: Outer view; A–C: Left valve; E–G: Right valve; **D, H, J, K**: Inner view; D, J: Left valve; H, K: Right valve; **I**: Dorsal view; **L**: Periostracal projections; **M, N**: Detail of hinge plate; M: Left valve; N: Right valve; **O**: Prodissoconch (right valve; arrow shows P-1/P-2 boundary). Scale bars: A, C, D, F–H, J, K = 2 mm; B, E, I = 1 cm; L, O = 100 µm; M, N = 500 µm.

Posterior lateral tooth (LPI) elongated, narrow, close to dorsal margin. Left valve (Fig. 3M): two diverging cardinal teeth; the anterior (CA2a) small, triangular, ventrally directed, with subcentral cusp, one third the size of the posterior one (CP4b). Posterior cardinal nearly straight, distally widened. Anterior lateral (LAII) and posterior lateral (LPII) small. Ligament external, located on a nymph which extends for two thirds the length of postero-dorsal margin (Figs. 3I, M, N).

Anatomy (Fig. 9B): Mantle margin with a large inhalant-pedal aperture, extending for about 4/5 of mantle margin length, separated from a relatively large posterior exhalant opening by a short suture. Transverse section of anterior and posterior adductor muscles large, the former reniform, the latter ovate. Inner and outer demibranchs posteriorly fused with each other and with mantle margin. Outer demibranch two thirds the size of inner one, showing 202 filaments in a 18 mm long specimen; ascending and descending lamellae equally developed. Inner demibranch with 214 filaments; ascending lamella as high as descending lamella. Labial palps with ill defined sorting ridges. Foot with posterior byssal gland.

Remarks: Dell (1964) suggested that *Cyclocardia thouarsii* and *C. velutina* could correspond to variations of a single species. From the present study it is clear that they are two different species: *Cyclocardia thouarsii* is more laterally compressed, has a more elongated shell outline, it is sculptured with lower radial ribs, the beaks are more anteriorly placed, and the hinge plate is narrower, with more delicate teeth than *C. velutina*.
Cyclocardia thouarsii was described by d'Orbigny in the "Voyage dans l'Amerique Méridionale…" page 580, and illustrated on plate 84. According to Sherborn & Griffin (1934) and Cowie & Thiengo (2003), that page was published in 1845; however, none of these papers refer to the date of publication of plate 84, and no other reference is available to date this plate. According to the ICZN (1999), Art. 21.7, the date of publication should be regarded as the "earliest date on which the work, or part of it, is demonstrated to be in existence as a published work". Under this criterion, we consider that the date of publication for the species corresponds to the date of publication of the text.

Cyclocardia velutina (Smith, 1881)

Figs. 4A–O, 9C, Appendix 4

Cardita (Actinobolus) velutinus Smith, 1881: 42, pl. 5, fig. 8.
Cardita velutina Smith—Rochebrune & Mabille, 1889: H111; Stempell, 1899: 231.
Cardita magellanica Philippi, 1898: 89.
Venericardia (Cyclocardia) velutina Smith, 1881—Dall, 1903: 708.
Venericardia (Cyclocardia) velutina Smith—Dall, 1908: 412; Lamy, 1922: 342.
Venericardia velutina Smith—Dall, 1909: 261.
Cardita velutina—Kaspar, 1913: 548.
Cyclocardia velutina Smith, 1881—Soot-Ryen, 1959: 39.
Cyclocardia velutina (Smith, 1881)—Dell, 1964: 191; Osorio & Reid, 2004: fig. 3f.
Venericardia velutina (Smith)—Ageitos de Castellanos, 1970: 233 (in part).
Cyclocardia velutinus [*sic*] [*recte velutina*] Smith, 1881—Osorio & Reid, 2004: 83; Cárdenas *et al.*, 2008: 230, figs. 7.88–90.

Type localities: Port Rosario, 2–30 fathoms [4–55 m], Wolsey Anchorage, 17 fathoms [31 m] [*Cardita (Actinobolus) velutinus*]; "Sinu del Almirantazgo, maribus magellanicis" [= Seno Almirantazgo] (*Cardita magellanica*).

Material examined: 2 syntypes (NHMUK 1879.10.15.145-146) and 2 possible syntypes from "Patagonia" (NHMUK 1869.7.28.13) of *Cardita (Actinobolus) velutinus*, and 42 lots (Appendix 4, Table 1).

Other published records: Beagle Channel (Rochebrune & Mabille, 1889); Chile (Dall, 1908; Kaspar, 1913; Soot-Ryen, 1959; Osorio & Reid, 2004; Cárdenas *et al.*, 2008) (Appendix 4, Table 2).

Known distribution: Seno Reloncaví [41°S], Chile to Malvinas/Falkland Islands [51°S], and extending northwards in the Southwest Atlantic to off Buenos Aires Province [37°S]. Living specimens: 15–252 m.

Description: Shell large (maximum observed L = 19.4 mm), subcircular to ovate in larger specimens (H/L = 0.99 ± 0.04, n = 5), subequilateral, inflated (W/H = 0.76 ± 0.07, n = 5), solid (Figs. 4A–K). Anterior end slightly produced, lower than the posterior end. Antero-dorsal margin concave to nearly straight, forming a well marked angle at the junction with anterior margin. Anterior, ventral and posterior margins regularly curved. Postero-dorsal margin with a straight slope, longer than antero-dorsal margin (Figs. 4A–H, J, K). Lunule short, wide, and deep.

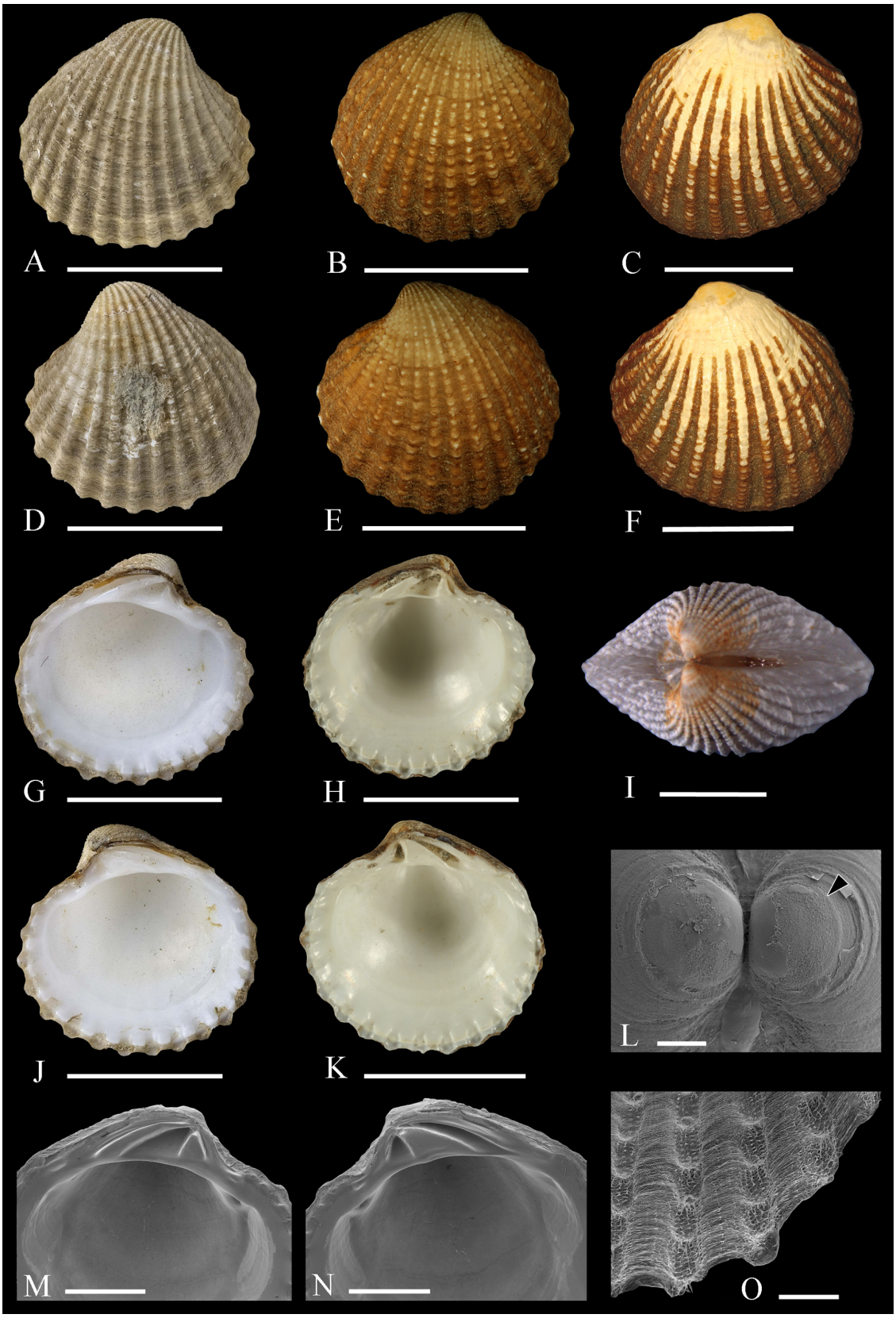

FIGURE 4. *Cyclocardia velutina*. A, D, G, J: Syntype of *Cardita (Actinobolus) velutinus*, Port Rosario, 4–55 m (NHMUK 1879.10.15.145); B, E, H, K: Puerto Parry, 35 m (MACN-In 39060); C, F, M, N: Bahía Lapataia, 120–138 m (MLP 12212); I, L: Isla Gable, 66–68 m (MLP 12207); O: Isla Lilihuapi, 80–94 m (MACN-In 39062). **A–F**: Outer views; A–C: Right valve; D–F: Left valve; **G, H, J, K**: Inner views; G, H: Left valve; J, K: Right valve; **I**: Dorsal view; **L**: Prodissoconch (arrow shows P-1/P-2 boundary); **M, N**: Detail of hinge plate; M: Left valve; N: Right valve; **O**: Shell sculpture and periostracal projections. Scale bars: A–H, J, K = 1 cm; I, M, N = 2 mm; L = 100 µm; O = 200 µm.

Escutcheon narrow, elongated (Fig. 4I). Beaks inflated, subcentral to anteriorly displaced, directed forward (Figs. 4A–K). Prodissoconch small (about 230 µm in length) (Fig. 4L). Shell surface sculptured with 15–20 strong, rounded radial ribs, bearing conspicuous tubercles; interspaces as wide as or wider than radial ribs, with fine commarginal lamellae (Figs. 4A, B, D, E, O). Periostracum thick, brown, forming short hair-like projections, and commarginal folds in interspaces (Figs. 4A–F, O). Inner margin strongly crenulated, coincident with outer shell sculpture (Figs. 4G, H, J, K). Pallial line continuous (Figs. 4G, J).

Hinge plate solid, oblique, anterior and posterior halves nearly equal in height (Figs. 4M, N). Right valve (Fig. 4N): anterior cardinal tooth (CA3) hooked, dorsally fused with shell margin; anterior part (CA3a) short, extremely thin, ventrally directed; posterior part (CA3b) high, large, with wide triangular base. Posterior cardinal tooth (CP5b) long, narrow, slightly arcuate, parallel to nymph, with distal cusp. Anterior lateral tooth (LAI) minute, knob-like. Posterior lateral tooth (LPI) short, massive, close to dorsal margin. Left valve (Fig. 4M): two solid, divergent cardinal teeth, dorsally fused with shell margin. Anterior cardinal (CA2a) high, ventrally directed, with subcentral cusp, one third the size of the posterior one (CP4b). Posterior cardinal elongated, slightly arcuate, gradually widening distally. Anterior lateral (LAII) small but distinct. Posterior lateral (LPII) small, narrow. Ligament external, located on a nymph which extends for about two thirds the length of posterior part of dorsal margin (Figs. 4I, M, N).

Anatomy (Fig. 9C): Mantle margin with a large inhalant-pedal aperture, extending for about 5/6 mantle margin length, separated from a small posterior exhalant opening by a short suture. Transverse section of anterior adductor muscle large, reniform; transverse section of posterior muscle ovate, two thirds the size of the anterior one. Inner and outer demibranchs posteriorly fused with each other and to mantle margin. Outer demibranch one half the size of inner one, showing up to 100 filaments (in the larger studied specimen); ascending and descending lamellae equally developed. Inner demibranch with 110 filaments (in the larger studied specimen); ascending lamella as high as descending lamella. Labial palps with 5–6 strong sorting ridges.

Remarks: *Cyclocardia velutina* differs from *C. compressa* in being more homogeneously rounded, more inflated and solid, in having narrower and higher ribs with nodules, and a pilose periostracum. *Cyclocardia velutina* also has a deeper lunule and escutcheon. The larger specimens of *C. velutina* resemble *C. thouarsii* and *C. spurca* in general shell outline (see remarks of those species).

The original description of *Cardita magellanica* reveals that this name is a synonym of *Cyclocardia velutina*. The species was never illustrated, and the types were not found.

Ageitos de Castellanos (1970) identified two lots from off Buenos Aires as *Cyclocardia velutina* (under *Venericardia*). However, only the lot MACN-In 25183 corresponds to this species whereas lot MACN-In 24191 actually corresponds to *Cyclocardia moniliata* Dall, 1903, a species here reported for the first time from Argentine waters.

Family Condylocardiidae Bernard, 1896

Genus *Carditella* Smith, 1881

Type species. *Carditella pallida* Smith, 1881 (SD by Dall, 1903), southern Chile.

Carditella tegulata (Reeve, 1843)

Figs. 5A–O, 9E, Appendix 5

Cardita tegulata Reeve, 1843: pl. 9, fig. 48.
Cardita tegulata—Reeve, 1844: 194; Hupé, 1854: 318.
Cardita tegulina [*sic*] [*recte tegulata*]—d'Orbigny, 1845: 581.
Actinobolus tegulatus Reeve—Adams & Adams, 1857: 487.
Carditella tegulata Reeve—Smith, 1881: 43; Lamy, 1922: 357.
Carditella pallida Smith, 1881: 43, pl. 5, figs. 9, 9b.
Cardita tegulata Reeve—Clessin, 1888: 33, pl. 12, fig. 10.
Erycinella (Carditella) pallida Smith, 1881—Dall, 1903: 702.
Carditella pallida Smith—Lamy, 1922: 355.

Carditella Pallida Smith, 1881—dell, 1964: 193.
Carditella tegulata (Reeve, 1843)—Dell, 1964: 194, texfig. 3, no. 8; Reid & Osorio, 2000: 136, fig. 7J.
Carditopsis flabellum flabellum (Reeve, 1843)—Reid & Osorio, 2000: 136 (in part) (*non* Reeve).
Carditella tegulata Reeve, 1843—Cárdenas *et al.*, 2008: 230 (in part) (not fig 7.91).
Carditopsis flabellum Reeve, 1843—Cárdenas *et al.*, 2008: 232, figs. 7.92–94 (*non* Reeve).

Type localities: Valparaíso, South America, 25 fathoms [46 m] (*Cardita tegulata*); Port Rosario, 2–30 fathoms [4–55 m] (*Carditella pallida*).

Material examined: 3 syntypes of *Cardita tegulata* (NHMUK 1967583); 2 syntypes of *Carditella pallida* (NHMUK 1879.10.15.122-4), and 15 lots (Appendix 5, Table 1).

Other published records: none.

Known distribution: Valparaíso [33°S], Chile to Beagle Channel [55°S]. Although Dall (1909) reported *C. tegulata* as distributed from "Callao [Perú] to Valparaíso", no formal records on the occurrence of this species in northern Chile or Perú are known. Living specimens: 10–50 m.

Description: Shell small in size (maximum observed L = 7.0 mm), widely triangular (H/L = 0.87 ± 0.03, n = 31), equilateral to somewhat inequilateral, flat (W/H = 0.55 ± 0.04, n = 31), solid (Figs. 5A–L, O). Posterior end equal in height or slightly higher than anterior end. Anterior end sometimes slightly produced. Antero-dorsal margin long, descent straight to somewhat concave, forming a week angle at the junction with anterior margin. Anterior, ventral and posterior margins forming a continuous wide curve; ventral margin slightly expanded and truncated posteriorly. Postero-dorsal margin straight, as long as or longer than the antero-dorsal margin, sloping at a similar angle, forming well marked angle at the junction with posterior margin (Figs. 5A–L). Lunule and escutcheon elongated and narrow; lunule one-half the length of the escutcheon (Fig. 5O). Beaks low, acute, subcentrally located, anteriorly directed (Figs. 5A–L, O). Prodissoconch eroded in studied specimens. Shell surface white, sculptured with 11–15 flat but strong radial ribs, paved with rectangular, juxtaposed scales; interspaces narrower than rib width, with fine commarginal lamellae (Figs. 5A–G, J). Periostracum thick, beige to pale-buff (Figs. 5A, B, D, E). Inner shell surface coincident with outer sculpture; inner margin crenulated (Figs. 5H, I, K, L). Pallial line continuous.

Hinge plate narrow (Figs. 5M, N). Right valve (Fig. 5N): anterior cardinal tooth (CA3) hooked, with anterior part (CA3a) narrow, merged to dorsal margin, and posterior part (CA3b) larger, triangular at the base; posterior cardinal tooth (CP5b) short and narrow, oblique, close to CA3b, parallel to nymph. Anterior lateral tooth (LAI) elongated, narrow, with distal cusp. Posterior lateral tooth (LPI) elongated, high, not clearly differentiated from shell margin. Left valve (Fig. 5M): with two small and divergent cardinal teeth, the anterior tooth (CA2) elongated, ventrally directed, the posterior one (CA4b) conical, with subcentral cusp. Anterior lateral tooth (LAII) high, with subcentral cusp, close to dorsal margin. Posterior lateral tooth (LPII) elongated, relatively narrow, with distal cusp. External ligament located on a nymph which extends for one-third the length of postero-dorsal margin (Figs. 5M–O). Internal ligament small, in a resilifer just below the beak, over the CP5b in the right valve, and behind CA4b, in the left valve (Figs. 5M, N).

Anatomy (Fig. 9E): Transverse section of anterior and posterior adductor muscles large, the anterior ovate, the posterior pyriform, slightly smaller than the anterior. Both inner and outer demibranchs, present, posteriorly fused with each other. Outer demibranch one-fifth of size of inner demibranch, with 24 filaments in the larger specimens; ascending and descending lamellae equally developed. Inner demibranch with 35 filaments in the larger specimen; ascending and descending lamellae almost equal in height. Foot with posterior byssal gland.

Remarks: *Carditella pallida* was originally differentiated from *C. tegulata* by the number of radial ribs **(**14–15 in the former, 11–12 in the latter), and the subcentrally located beaks. Reid & Osorio (2000) reported specimens from Estero Elefantes (45º55'S), with intermediate characters, suggesting that both names could refer to clinal variations of a single species. Our study of additional specimens allows us to confirm that *Carditella pallida* and *C. tegulata* are synonyms. The shell of this species varies from triangular and almost equilateral (similar to that described for *C. pallida*) to trapezoidal and inequilateral forms (corresponding to what was previously referred to as *C. tegulata*).

Examination of the specimen figured by Reid & Osorio (2000) as "*Carditopsis flabellum flabellum*" (NHMUK 20080555), reveals a well-developed external ligament, therefore corresponding to *Carditella tegulata*. However, another specimen from the same expedition and station (MNHNCL 169) actually corresponds to the species referred to by the authors.

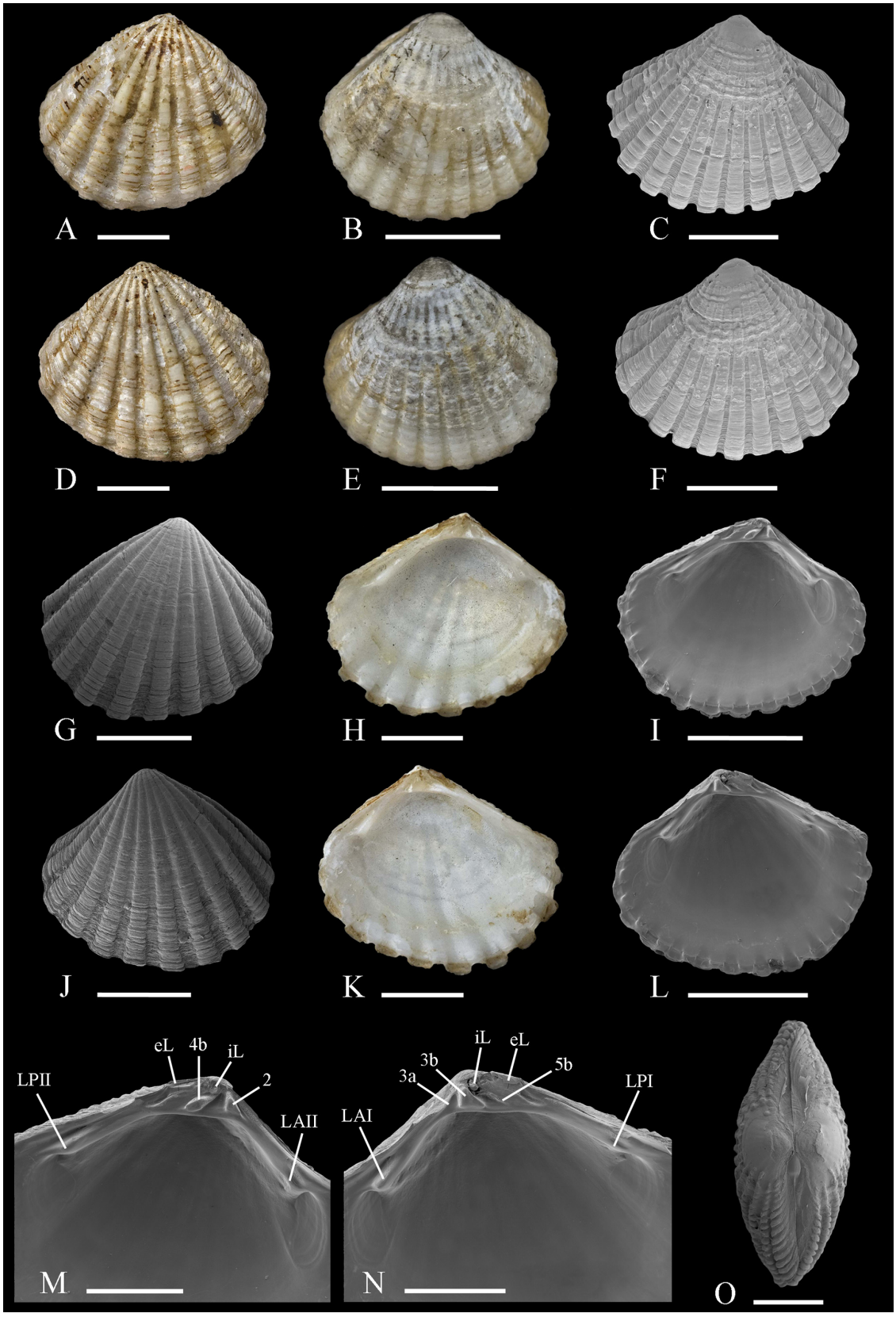

Figure 5. *Carditella tegulata*. A, D, H, K: Syntype of *Cardita tegulata*, Valparaíso, 46 m (NHMUK 1967583); B, E: Syntype of *Carditella pallida*, Port Rosario, 4–55 m (NHMUK 1879.10.15.122-124); C, F, I, L, M–O: Playa Llonco, 30–50 m (MACN-In 39064); G, J: Bahía Tom, 14 m (LACM 73-72). **A–G, J**: Outer views; A–C, G: Right valve; D–F, J: Left valve; **H, I, K, L**: Inner views; H, I: Left valve; K, L: Right valve; **M, N**: Detail of hinge plate; M: Left valve; N: Right valve; **O**: Dorsal view. Abbreviations: 2, 3a, 3b, 4b, 5b = cardinal teeth; LAI, LAII = anterior lateral teeth; LPI, LPII = posterior lateral teeth; eL = external ligament; iL = internal ligament. Scale bars: A, B, D, E, G–L = 2 mm; C, F, M–O = 1 mm.

Cárdenas *et al.* (2008) identified valves from Golfo Corcovado, Chile as *Carditopsis flabellum*. Although described as "lacking an outer ligament", the figures they provided, as well as the material they studied (MZUC 32643), actually has an external ligament. The morphological characteristics of these valves reveal that they correspond to *C. tegulata*. The specimen figured by Cárdenas *et al.* (2008) as *C. tegulata*, actually corresponds to *C. naviformis*; however, the other specimens from the same lot (MZUC 32641) do correspond to *C. tegulata*.
Melvill & Standen (1912) described *Carditella pallida duodecimcostata* from Burdwood Bank. The study of the type specimens reveals that they are not members of the genus *Carditella* but *Carditopsis* (see under *Carditopsis flabellum).*

***Carditella naviformis* (Reeve, 1843)**
Figs. 6A–M, 9D, Appendix 6

Cardita naviformis Reeve, 1843: pl. 9, fig. 45.
Cardita naviformis—Reeve, 1844: 194; Hupé, 1854: 319.
Mytilicardia (Glans) naviformis Reeve—Adams & Adams, 1857: 489.
Cardita australis Philippi, 1858: 23 (*non* Lamarck, 1819).
Actinobolus philippi Tryon, 1872: 254.
Cardita naviformis Reeve—Clessin, 1888: 34, pl. 13, fig. 10; Melvill & Standen, 1914: 130.
Cardita (Glans) naviformis Reeve, 1843—Dall, 1903: 707.
Cardita (Glans) naviformis Reeve—Lamy, 1922: 269 (in part).
Glans naviformis (Reeve) 1843 [*sic*]—Carcelles & Williamson, 1951: 334.
Carditella naviformis (Reeve, 1843)—Powell, 1960: 177; Dell, 1964: 194, texfig. 3, no 1; Ramorino, 1968: 202, pl. 2, figs. 3, 4, pl. 6, figs. 1, 4.
Carditella tegulata Reeve, 1843—Cárdenas *et al.*, 2008: 230 (in part) (only fig. 7.91) (*non* Reeve, 1843).

Type localities: Valparaíso, South America [Chile], 25 fathoms [46 m] (*Cardita naviformis*); Archipiélago de los Chonos (*Cardita australis* = *Actinobolus philippi*).

Material examined: 3 syntypes of *Cardita naviformis* (NHMUK 1967584), and 75 lots (Appendix 6, Table 1).

Other published records: Malvinas/Falkland Islands (Melvill & Standen, 1914); Magellan Strait (Lamy, 1922); Chile (Ramorino, 1968) (Appendix 6, Table 2).

Known distribution: Valparaíso [33ºS], Chile to Malvinas/Falkland Islands [51°S]. Living specimens: 0–137 m.

Description: Shell small (maximum observed L = 7.1 mm), trapezoidal (H/L = 0.74 ± 0.05, n = 42), markedly inequilateral, somewhat inflated (W/H = 0.67 ± 0.05, n = 42), solid (Figs. 6A–F, K). Anterior end shorter and lower than posterior end. Antero-dorsal margin straight, abruptly sloping, forming a well-marked angle at the junction with anterior margin. Anterior margin extremely short, continuous with ventral margin, which is obliquely straight and projecting posteriorly. Posterior margin arched, twice the height of the anterior margin, insensibly connected with ventral margin, and forming angle at the junction with dorsal margin (Figs. 6A, C, E, F). Postero-dorsal margin straight, parallel to ventral margin, slightly sloping; longer than the antero-dorsal margin in larger specimens (Figs. 6A, C); smaller specimens usually triangular, nearly equilateral, with ventral margin markedly curved (Fig. 6I). Lunule short, wide and deep; escutcheon narrow, elongated (Fig. 6K). Beaks small, low, anteriorly located, anteriorly directed (Figs. 6A–F, K). Prodissoconch large (about 520 µm in length); P-1 rough, mamillate, with central depression; P-2 separated from teleoconch by a bulging rim, somewhat enlarged posteriorly (Figs. 6L, M). Shell surface sculptured with 10–14 strong, rounded radial ribs, with rectangular, juxtaposed, flat scales; interspaces narrower than rib width, with fine commarginal lines (Figs. 6A–D, I, J). Periostracum thick, brownish (Figs. 6A, C). Inner shell surface porcelaneous, evenly white, coincident with outer shell sculpture, more evident at posterior part; inner margin crenulated (Figs. 6E, F). Pallial line continuous.

Hinge plate narrow; dorsal margin, between beaks and laterals, finely granulated (Figs. 6G, H). Right valve (Fig. 6G): anterior cardinal tooth (CA3) forming a prominent hook, with anterior (CA3a) and posterior (CA3b) parts similar in length; CA3a elongated, close to or fused with dorsal margin, CA3b massive, triangular at the base. Posterior cardinal tooth (CP5b) narrow, elongated, parallel to the nymph. Anterior lateral (LAI) relatively narrow and high, with distal cusp. Posterior lateral tooth (LPI) elongated, low, poorly differentiated from margin. Left valve (Fig. 6H): with two small, divergent cardinal teeth; the anterior (CA2) triangular at the base, ventrally

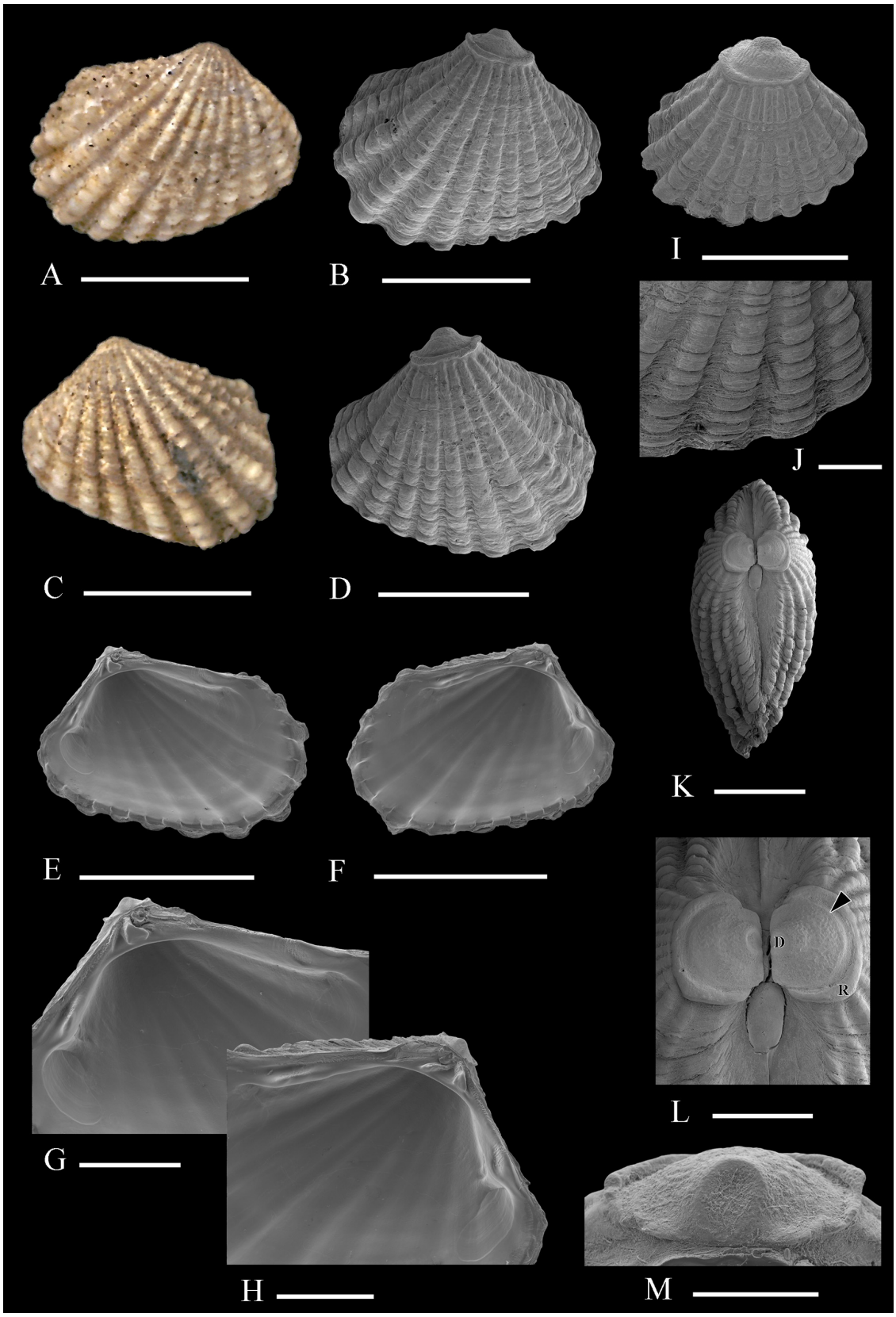

FIGURE 6. *Carditella naviformis*. A, C: Syntype of *Cardita naviformis*, Valparaíso, 46 m (NHMUK 1967584); B, D: Caleta del Rey, 20–30 m (MACN-In 39086); E–H, M: Cabo San Pío, 30–35 m (MLP 12248); I–L: Cabo San Pío, 65–80 m (MLP 12244). **A–D, I**: Outer views; A, B, I: Right valve; C, D: Left valve; **E, F**: Inner views; E: Right valve; F: Left valve; **G, H**: Detail of hinge plate; G: Right valve; H: Left valve; **J**: Shell sculpture; **K, L**: Dorsal view; K: General view; L: Prodissoconch and ligament; **M**: Prodissoconch. Abbreviations: D = central depression, R = rim. Arrow shows P-1/P-2 boundary. Scale bars: A, C, E, F = 3 mm; B, D, G–I, K = 1 mm; J, L = 500 μm; M = 250 μm.

directed, the posterior (CA4b) obliquely directed. Anterior lateral tooth (LAII) low, ill defined. Posterior lateral tooth (LPII) delicate, elongated, narrow. External ligament short and wide, located in a nymph which extends for one-third the length of postero-dorsal margin (Figs. 6E, F, L). Internal ligament small but strong, on a resilifer located in the dorsal half of hinge plate, above CA4b in left valve and behind CA3 in right valve (Figs. 6G, H).

Anatomy (Fig. 9D): Mantle margin with a large inhalant-pedal aperture, and a small posterior exhalant opening. Transverse section of anterior adductor muscle reniform; transverse section of posterior muscle ovate, larger than the anterior one. Inner and outer demibranchs fused posteriorly to each other and to mantle margin. Outer demibranch large, nearly rectangular, showing 40 filaments in a 4 mm length specimen; ascending and descending lamellae equally developed. Inner demibranch small (one-fourth the size of outer demibranch), with 52 filaments in the above mentioned specimen; ascending lamella as high as descending lamella. Labial palps small.

Remarks: *Carditella naviformis* has been frequently confused with *C. semen*. D'Orbigny (1845) first identified specimens from Arica, Chile as *C. naviformis*; the study of this material (NHMUK 1854.12.4.762) (Fig. 7C) reveals that these specimens actually correspond to *C. semen.* The specimen figured as *Carditella tegulata* by Cárdenas *et al*. (2008: fig. 7.91) proves to correspond to *C. naviformis*; however, the other specimens from that same lot (MZUC 32641) actually do correspond to *C. tegulata*.

Actinobolus philippi Tryon, 1872, is the replacement name for *Cardita australis* Philippi, 1858 (*non* Lamarck, 1819), a species described from the Archipiélago de los Chonos and erroneously reported from "Philippines" by Tryon (1872). The original description of this species is quite short and lacks illustrations; the types were not found at the MNHNCL or ZMB. Philippi (1858) described his species as having a trapezoidal shell outline, with the posterior part of the dorsal margin and the ventral margin parallel, the anterior "end" (*i.e.*: the antero-dorsal margin) obliquely truncated, and sculptured with 11–12 radial ribs, paved with strong, juxtaposed scales. According to Philippi (1858), his species differs from *C. naviformis* by having a shorter and not vertically truncated posterior end, less prominent beaks, and white color. However, we found no arguments for distinguishing these two species. The posterior end of *C. naviformis* is more or less projected in accordance with the size of the specimens (see Figs. 6A, B, I); the beaks are more or less prominent depending on the state of erosion; and the shell is actually posteriorly rounded, and whitish in color. Coan (2003) and Huber (2012) previously regarded *Actinobolus philippi* as a synonym of *Carditella semen.* Although the latter also has a trapezoidal shell outline, it lacks juxtaposed scales, and the anterior part of the dorsal margin is concave rather than "obliquely truncated", as described by Philippi (1858).

***Carditella semen* (Reeve, 1843)**

Figs. 7A–O, Appendix 7

Cardita semen Reeve, 1843: pl. 9, fig. 43.
Cardita semen—Reeve, 1844: 193.
Cardita semen Reeve—d'Orbigny, 1845: 581; Philippi, 1860: 158; Clessin, 1888: 51, pl. 5, fig. 3.
Cardita naviformis Reeve—d'Orbigny, 1845: 580 (*non* Reeve, 1843).
Actinobolus semen Reeve—Adams & Adams, 1857: 487.
Cardium pygmaeum Philippi, 1860: 158, pl.7, fig. 3a, b (*non* Donovan, 1799).
Carditella semen Reeve—Smith, 1881: 43; Lamy, 1922: 357.
Carditella semen Reeve, 1843—Soot-Ryen, 1959: 39.
Carditella tegulata Reeve, 1843—Soot-Ryen, 1959: 40, pl. 1, fig. 11.
Carditella semen (Reeve, 1843)—Dell, 1964: 194, textfig. 3, no 7.
Carditella tegulata (Reeve, 1843)—Marincovich, 1973: 10, fig. 9; Guzmán *et al*., 1998: 68 (*non* Reeve, 1843).

Type localities: Mexillones, Desert of Atacama, Bolivia [sic] [= Mejillones, Chile], 3 fathoms [5.5 m] (*Cardita semen*); Isla Blanca [Atacama] (*Cardium pygmaeum*).

Material examined: 5 syntypes of *Cardita semen* (NHMUK 1967585), and 18 lots (Appendix 7, Table 1).

Other published records: Chile (Philippi, 1860; Lamy, 1922; Soot-Ryen, 1959, as *C. tegulata*; Guzmán *et al.* 1998, as *C. tegulata*) (Appendix 7, Table 2).

Known distribution: Islas Lobos de Afuera [07°S], Perú to Isla Blanca [27°S], Chile. Living specimens: 0–12 m.

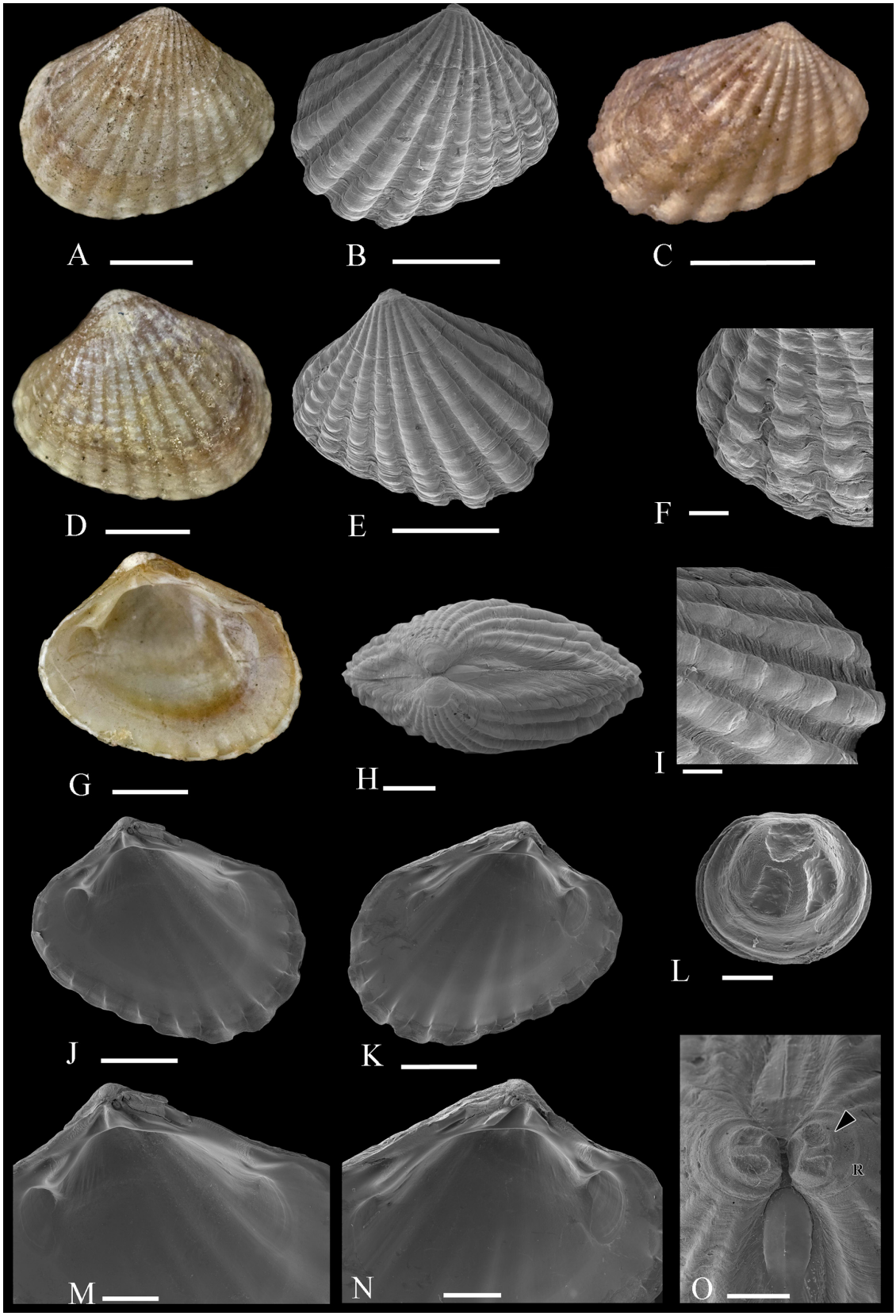

FIGURE 7. *Carditella semen*. A, D, G: Syntypes of *Carditella semen*, Mexillones, 5.5 m (NHMUK 1967585); B, E, F, H–O: Iquique, intertidal (LACM 64-16); C: Arica (NHM 1854.12.4.762). **A–E**: Outer view; A–C: Right valve; D, E: Left valve; **F, I**: Detail of shell sculpture; F: Anterior end; I: Posterior end; **G, J, K**: Inner views; G, J: Right valve; K: Left valve; **H**: Dorsal views; L: Larva removed from adult; **M, N**: Detail of hinge plate; M: Right valve; N: Left valve; **O**: Prodissoconch and ligament. Abbreviation: R = rim. Arrow shows P-1/P-2 boundary. Scale bars: A, B, D, E, G, J, K = 1 mm; C = 3 mm; F, I, O = 200 µm; H, M, N = 500 µm; L = 100 µm.

Description: Shell medium sized (maximum observed L = 11.5 mm), trapezoidal (H/L = 0.76 ± 0.04, n = 37), markedly inequilateral, somewhat inflated (W/H = 0.68 ± 0.08, n = 37), solid (Figs. 7A–E, G, H, J, K). Anterior end shorter and lower than posterior end. Antero-dorsal margin sloping, concave, forming a more or less marked angle at the junction with anterior margin. Anterior margin short, rounded, well differentiated from ventral margin, which is obliquely straight, projecting posteriorly. Posterior margin arched, sometimes obliquely truncated, twice the height of anterior margin, insensibly connected with ventral margin, and forming angulation at the junction with dorsal margin. Postero-dorsal margin straight, parallel to ventral margin, slightly sloping, longer than the antero-dorsal margin in larger specimens (Figs. 7A–E, G, J, K). Lunule short, wide, sunken; escutcheon narrow (Fig. 7H). Beaks pointed, small, low, anteriorly located, anteriorly directed (Figs. 7B, C, E, H, J, K). Prodissoconch small (about 250 µm in length); P-1 with three depressions, P-2 separated from teleoconch by a low, wide rim (Figs. 7L, O). Shell surface sculptured with 12–16 strong, wide, rounded radial ribs, usually with stout, elongated nodules on the anterior part, and projected flat scales on posterior part; interspaces narrower than ribs, with fine, commarginal growth lines (Figs. 7A–F, I). Periostracum thick, brownish (Figs. 7A, C, D). Inner shell surface porcelaneous, with the posterior part usually stained in brown, sometimes evenly whitish (Fig. 7G). Inner margin crenulated, coincident with outer shell sculpture, more evident at posterior part (Figs. 7J, K). Pallial line continuous.

Hinge plate narrow; dorsal margin between beaks and lateral teeth finely granulated (Figs. 7M, N). Right valve (Fig. 7M): anterior cardinal tooth (CA3) forming a prominent hook, with anterior part (CA3a) narrow, elongated, close to dorsal margin; and a posterior part (CA3b) wide, high with proximal cusp, triangular at the base. Posterior cardinal tooth (CP5b) elongated, narrow. Anterior lateral (LAI) strong and low, with rounded distal cusp. Posterior lateral tooth (LPI) elongated, massive, relatively high. Left valve (Fig. 7N): with two small and divergent cardinal teeth, the anterior one (CA2) triangular at the base, ventrally directed; the posterior tooth (CA4b), elongated, oblique. Anterior lateral tooth (LAII) high, with subcentral cusp, close to dorsal margin. Posterior lateral (LPII) massive, elongated. External ligament short and wide, located in a nymph that extends one-third the length of postero-dorsal margin (Figs. 7H, J, K, O). Internal ligament minute, on a resilifer located in the dorsal half of hinge plate, above CA4b in left valve, and behind CA3 in right valve (Figs. 7M, N).

Remarks: *Carditella semen* closely resembles *C. naviformis* in general shell outline and sculpture but differs in having a coarser sculpture and wider ribs (particularly the posterior ones). Additionally, the antero-dorsal margin is concave in *C. semen* (more evident in the left valve), and the anterior margin is more clearly defined. *Carditella semen* also has stronger lateral teeth, and a consistently smaller, not mammillate prodissoconch, with three distinct depressions in P-1.

The study of a large number of specimens of *Carditella semen* allowed to determine the ontogenetic variation: small specimens have an equilateral shell outline; the unequal growing of anterior and posterior ends results in larger specimens being somewhat inequilateral—such as the syntypes (Figs. 7A, D, G)—to markedly inequilateral (Fig. 7C).

The specimens reported by d'Orbigny (1845) from Arica, Chile, as *C. naviformis* (NHMUK 1854.12.4.762) actually correspond to *C. semen*.

Soot-Ryen (1959), Marincovich (1973) and Guzmán *et al.* (1998) identified specimens from northern Chile as *Carditella tegulata*. The reexamination of the specimens studied by Marincovich (1973: fig. 9, housed at LACM) reveals that they actually correspond to *C. semen.* The illustration provided by Soot-Ryen (1959: pl. 2, fig. 11) suggests that this specimen also corresponds to *C. semen* and not to *C. naviformis* as assumed by Dell (1964) and Reid & Osorio (2000). The same is valid for the record of *C. tegulata* by Guzmán *et al.* (1998: textfig.).

The types of *Cardium pygmaeum* were not found either at the MNHNCL or ZMB, where other material studied by Philippi is housed. However, the original description and illustration suggest that *C. pygmaeum* could be a senior synonym of *Carditella semen* [not of *C. tegulata*, as suggested by Coan (2003)]. *Cardium pygmaeum* Philippi, 1860, is in turn a primary homonym of *Cardium pygmaeum* Donovan, 1799.

Genus *Carditopsis* Smith, 1881

Type species. *Cardita flabellum* Reeve, 1843 (OD), southern Chile and Argentina.

***Carditopsis flabellum* (Reeve, 1843)**
Figs. 8A–P, 9F, Appendix 8

Cardita flabellum Reeve, 1843: pl. 9, fig. 47.
Cardita flabellum—Reeve, 1844: 194.
Actinobolus flabellum Reeve—Adams & Adams, 1857: 487.
Carditopsis flabellum Reeve—Smith, 1881: 43; Lamy, 1922: 360.
Cardita flabellum Reeve—Clessin, 1888: 13, pl. 3, fig. 3.
Carditopsis flabellum Reeve, 1843—Dall, 1903: 712; Soot-Ryen, 1959: 40.
Carditella pallida duodecimcostata Melvill & Standen, 1912: 361, pl. 1, figs. 19, 19a.
Carditopsis flabellum flabellum (Reeve, 1843)—Dell, 1964: 195, texfig. 3, no 2–3; Reid & Osorio, 2000: 136 (in part).
Carditopsis flabellum malvinae (Orbigny, 1846)—Dell, 1964: 195 (*non* d'Orbigny).
Carditopsis flabellum (Reeve, 1843)—Ramorino, 1968: 204, pl. 2, fig. 2, pl. 6, figs. 2, 3.

Type localities: Valparaíso, South America (*Cardita flabellum*); Burdwood Bank, 56 fathoms [102 m] (*Carditella pallida duodecimcostata*).

Material examined: syntypes of *Cardita flabellum* (NHMUK 196381), 4 syntypes of *Carditella pallida duodecimcostata* (RSM 1921.143.712), and 58 lots (Appendix 8, Table 1).

Other published records: Chile (Ramorino, 1968) (Appendix 8, Table 2).

Known distribution: Valparaíso [33ºS], Chile to Malvinas/Falkland Islands [54°S]. Lamy (1922) reported the species from Perú, although the source of this record is unknown. Living specimens: 5–292 m.

Description: Shell small (maximum observed L = 5.8 mm), trigonal (H/L = 0.88 ± 0.04, n = 17), equilateral in smaller specimens, slightly inequilateral in larger specimens, somewhat inflated (W/H = 0.60 ± 0.07, n = 17), solid (Figs. 8A–L). Anterior end obliquely projected in larger specimens. Antero-dorsal and postero-dorsal margins straight in smaller specimens, sloping steeply at similar angles; postero-dorsal margin longer than the antero-dorsal one. Postero-dorsal margin concave in larger specimens. Anterior, ventral and posterior margins forming a wide continuous curve, which insensibly connects to the postero-dorsal margin, and originates a well marked angle at the junction with the antero-dorsal margin (Figs. 8A–H, K, L). Lunule and escutcheon large, wide, and deep (Figs. 8I, J). Beaks small, low, subcentrally located, orthogyrate (Figs. 8A–L). Prodissoconch large (450 to 530 µm in length); P-1 with a central depression and strong radial ribs in well preserved specimens; P-2 separated from teleoconch by a lamellate rim, expanding in wings anterior and posteriorly (Figs. 8I, J, O). Shell surface sculptured with 11–16 strong, rounded radial ribs (up to 18 ribs *fide* Ramorino, 1968) paved with juxtaposed scales; interspaces wider than ribs, with fine commarginal lamellae (Figs. 8A–F, P). Periostracum thin, brown-yellowish (Figs. 8A–C). Inner shell surface coincident with outer sculpture; inner margin crenulated (Figs. 8K, L). Pallial line entire, ill defined.

Hinge plate narrow (Figs. 8M, N). Right valve (Fig. 8N): anterior cardinal tooth (CA3) forming a well developed hook, with anterior (CA3a) and posterior (CA3b) parts elongated, similar in length; CA3a merged with dorsal margin. Posterior cardinal tooth (CP3p) solid, elongated, straight, well separated from CA3b. Anterior lateral tooth (LAI) narrow, elongated, with distal cusp. Posterior lateral tooth (LPIII) low, ill defined. Left valve (Fig. 8M): anterior cardinal teeth (CA2 and CA4b) straight, anteriorly directed, almost parallel to each other; CA2 high, strong; CA4b lower and narrower than CA2. Posterior cardinal tooth (CP2p) hooked, with anterior part small, conical, with subcentral cusp, posteriorly directed, and posterior part elongated, close to dorsal margin. Anterior lateral (LAII) and posterior lateral (LPII) narrow, elongated; the former close to shell margin. External ligament absent. Internal ligament strong, located on a large, triangular resilifer, between anterior and posterior cardinal teeth (Figs. 8M, N).

Anatomy (Fig. 9F): Mantle margin with a large inhalant-pedal aperture, and a small posterior exhalant opening. Transverse section of anterior adductor muscle small, reniform; transverse section of posterior muscle ovate, larger than the anterior one. Only inner demibranch present. Demibranch nearly rectangular in outline, composed of up to 35 filaments. Ascending lamellae three-fourths the height of descending lamella. Labial palps small. Foot with byssal groove.

Remarks: *Carditopsis flabellum* appears as a very variable species in shell outline: from nearly equilateral in small specimens to increasingly more inequilateral in larger specimens; more or less inflated; and with a variable number of radial ribs. This intraspecific variability only becomes evident studying large series of specimens. In fact, at the same locality, specimens with 11 to 15 ribs were found. In addition, this series of specimens shows some

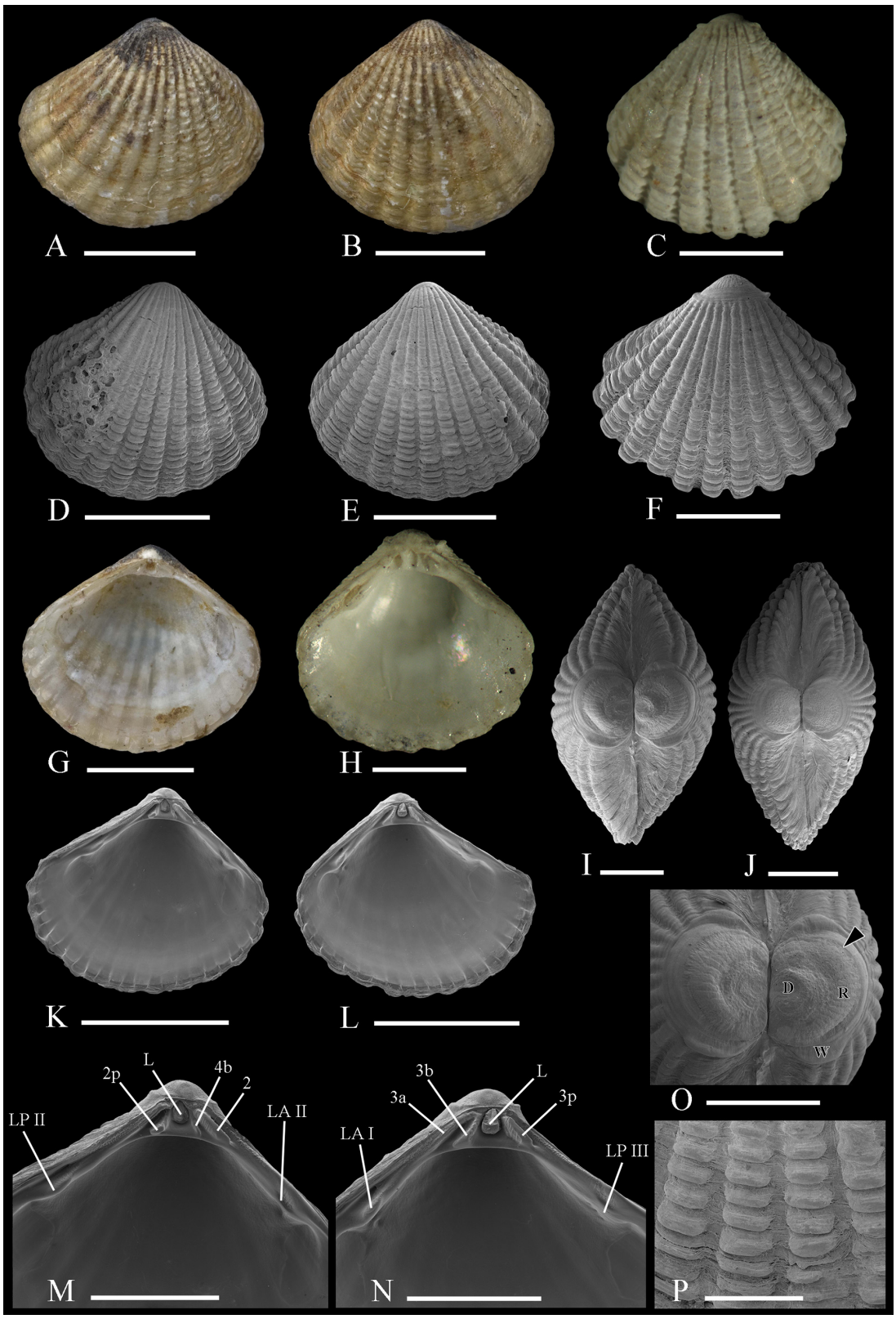

FIGURE 8. *Carditopsis flabellum*. A, B, G: Syntype of *Cardita flabellum*, Valparaíso (NHMUK 196381); C, H: Syntype of *Carditella pallida duodecimcostata*, Burdwood Bank, 102 m (RSM 1921.143.712); D–F, P: Cape Horn, 198 m (ZMB 103461); I: Cape Horn, 198 m (ZMB 103423); J, O: Cabo San Pío, 65–80 m (MLP 13717); K–N: Isla Becasses, 30–40 m (MLP 13719). **A–F**: Outer views; A, C, D, F: Right valve; B, E: Left valve; **G, H, K, L**: Inner views; G, K: Left valve; H, L: Right valve; **I, J**: Dorsal view; **M, N**: Detail of hinge plate; M: Left valve; N: Right valve; **O**: Prodissoconch; **P**: Shell sculpture. Abbreviations: 3a, 3b, 3p, 4b, 2p = cardinal teeth; LAI, LAII = anterior lateral teeth; LPII, LPIII = posterior lateral teeth; L = ligament; D = central depression; R = radial ribs; W= wing. Arrow shows P-1/P-2 boundary. Scale bars: A, B, D, E, G, K, L = 2 mm; C, F, H, J, M, N = 1 mm; I, O, P = 500 µm.

differences in the sculpture of P-2, which seem to be correlated with the state of preservation: well preserved specimens show radial ribs while others (eroded specimens?) have a mesh-like pattern; the continuity of this character is confirmed by the finding of specimens with intermediate conditions.

D'Orbigny (1845) reported *Carditopsis flabellum* as a synonym of *Cyclocardia compressa*. Hinge teeth and ligament placement reveal that they correspond to different species and genera.

Dell (1964) regarded *Cardita malvinae* d'Orbigny, 1845 as a subspecies of *Carditopsis flabellum*, and assigned to this taxa specimens collected by the R.V. *William Scoresby* at Malvinas/Falkland Islands. The study of these specimens (NHMUK 1964723) reveals that they actually correspond to *C. flabellum* and are not conspecific with d'Orbigny's species (see below).

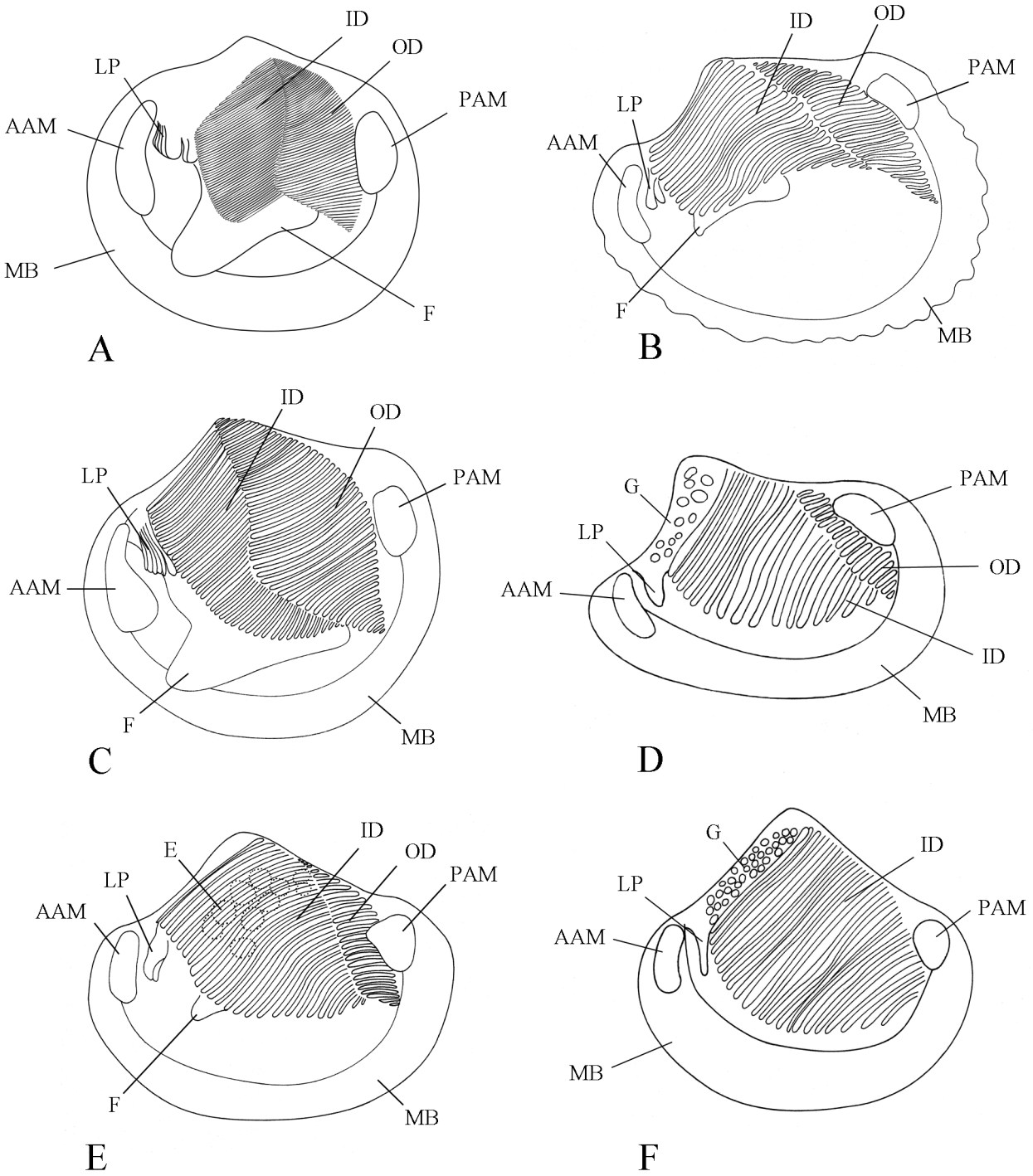

FIGURE 9. Gross anatomy. A: *Cyclocardia compressa;* B: *Cyclocardia thouarsii;* C: *Cyclocardia velutina;* D: *Carditella naviformis;* E: *Carditella tegulata;* F: *Carditopsis flabellum*. Abbreviations: AAM = anterior adductor muscle; E = embryos; F = foot; G = gonad; ID = inner demibranch; LP = labial palp; MB = mantle border; OD = outer demibranch; PAM = posterior adductor muscle.

Other species reported for the area

***Nomina dubia*:** *Cardita malvinae* d'Orbigny, 1845, originally described from "Îles Malouines" [Malvinas/Falkland Islands], was characterized as being of small size (L = 3 mm) and having 12 radial ribs. The material currently labeled as the type of *C. malvinae* (NHMUK 1874.12.4.759, Figs. 10C–F) does not correspond to the description and original illustrations provided by d'Orbigny (1845: pl. 84, figs. 4–6; reproduced herein in Figs. 10A, B). Dell (1964) regarded *C. malvinae* as a subspecies of *Carditopsis flabellum*. Although d'Orbigny's figure (pl. 84, fig. 4) resembles *C. flabellum* in general shell outline, the dorsal view (pl. 84, fig. 5) shows an external ligament, which is absent in *Carditopsis*. No other species in the study area shows this combination of characters.
Cardium parvulum Dunker, 1861, was described from "insula Chiloë et in freto Magallanico" [Chiloé Island and Magellan Strait]. Bernard (1983) placed this species under *Carditella*, and Coan (2003) regarded it as a possible synonym of *C. semen*. The original description is rather poor, the species was never figured, and the types were not found at the ZMB (Zorn, C. *in lit*., June 8, 2012). Based on Dunker's (1861) description, *Cardium parvulum* has an ovate, subelliptical shell outline, subcentrally located beaks, pale periostracum, 16–18 low radial ribs, and the right valve with three small cardinal teeth, and lateral teeth absent. This combination of characters is not present in any other Magellanic or Perú-Chile carditid or condylocardiid here studied. It is not (even) possible to determine whether *Cardium parvulum* is at all a member of the Carditoidea.

Species likely not present in the region: *Carditella exulata* Smith, 1885: Described from Nightingale Island, Tristan da Cunha [37°30'S 12°30'W], the species was reported from the Magellan Province by Stempell (1899) and Dell (1964), and subsequently included in several check-lists as of Carcelles & Williamson (1951), Soot-Ryen (1959), Bernard (1983), Valdovinos (1999) and Letelier *et al.* (2003). However, at present, there are no convincing arguments for the presence of this species in the Magellan Province.

Carditella exulata closely resembles *Carditella naviformis* and it may not be discarded that the Magellanic records of the former actually correspond to this second species. In fact, Stempell (1899) only reported *Carditella exulata* but not *Carditella naviformis*, which is a common species in the area. The syntypes of *C. exulata* studied herein (NHMUK 1887.2.9.2877-78, Figs. 11A–F) differ from *C. naviformis* in having a thinner, glossy shell, with the ventral margin widely curved and the posterior end shorter and higher, consequently having a more ovate outline. This set of characters reveals that *C. exulata* is a distinct species.

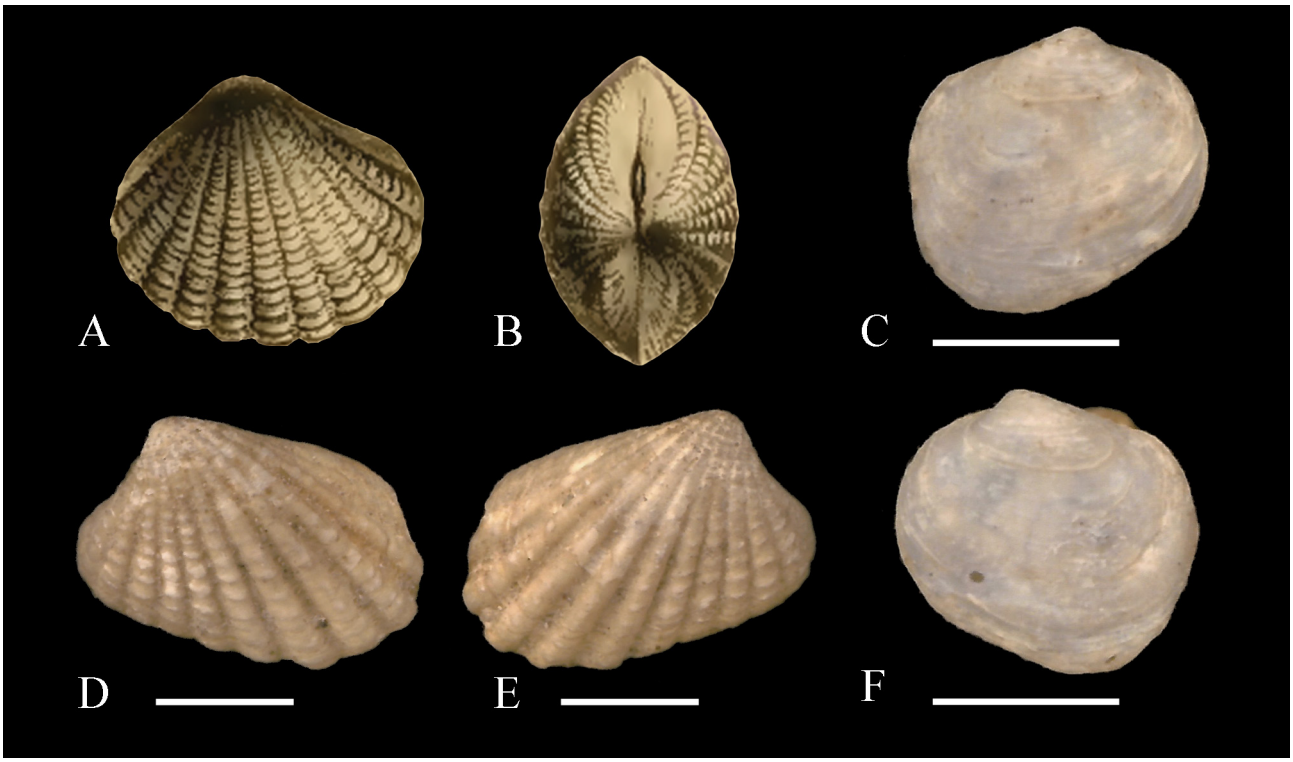

FIGURE 10. *Cardita malvinae*. A, B: Original illustrations by d'Orbigny (184-?: pl. 84); C–F: Specimens currently labeled as "Holotype of *Cardita malvinae*" (NHMUK 1854.12.4.759). Scale bars: 2 mm.

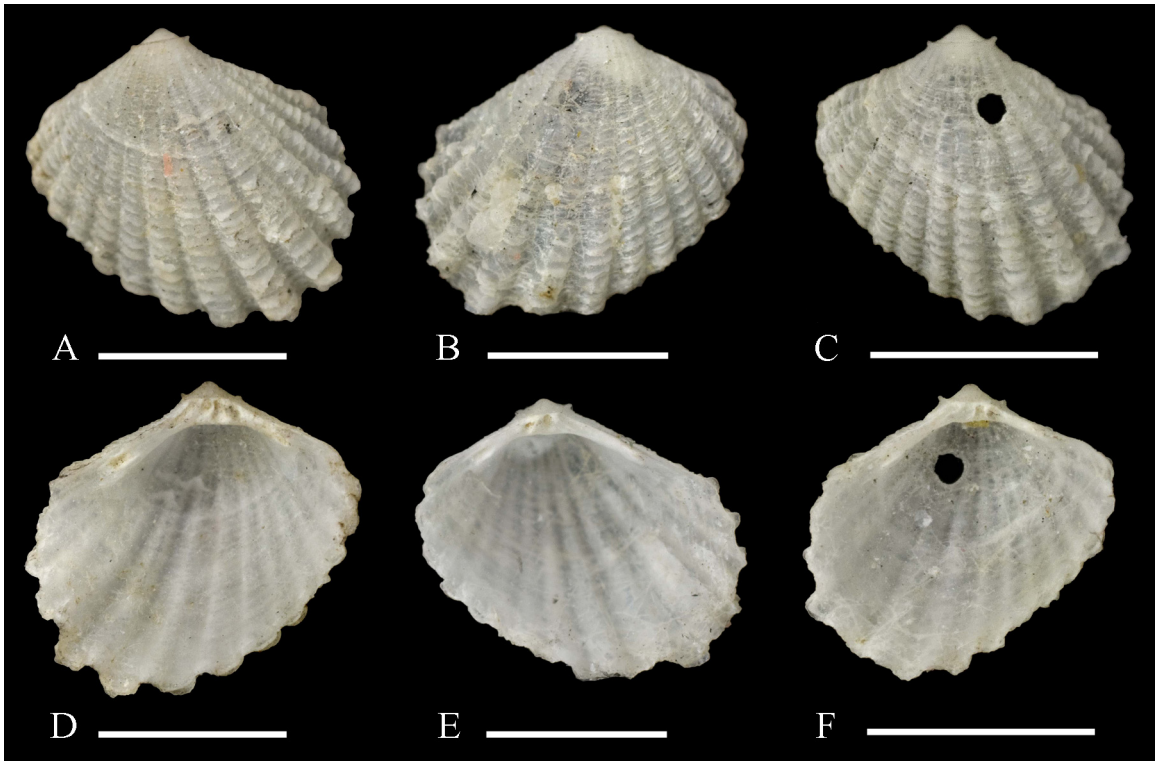

FIGURE 11. *Carditella exulata*. A–F: Syntypes, Nightingale Island (NHMUK 1887.2.9.2877-78). **A–C**: Outer views; A, C: Left valve; B: Right valve; **D–F**: Inner views; D, F: Left valve; E: Right valve. Scale bars: 2 mm.

Discussion

Current available information reveals that the Carditoidea of the Magellan and Perú-Chile Provinces are relatively well diversified and locally very abundant. Yet, the diversity of this group was previously overestimated. Only eight out of the 19 nominal species reported for the area are recognized as valid in the present study; eight other species are regarded as synonyms (*Cardita magellanica; Carditella pallida; Cardita australis; Actinobolus philippi; Cardium pygmaeum; Cardita paeteliana; Carditella pallida duodecimcostata*; and *Cardita congelascens*). In addition, the presence of *Carditella exulata* in Magellanic waters is considered as doubtful, and *Cardita malvinae* and *Cardium parvulum* are regarded as *nomina dubia*.

Out of the eight species recognized as valid, two are restricted to the Perú-Chile Province (*Cyclocardia spurca* and *Carditella semen*) and one is restricted to the Magellan Province (*Cyclocardia thouarsii*); the five remaining species (*Carditella naviformis*, *C. tegulata*, *Carditopsis flabellum*, *Cyclocardia compressa*, and *C. velutina*) are shared between the two provinces, although *C. velutina* is actually only marginal in Perú-Chile waters. None of these species presently extends northwards into the South Argentinean Province, although *Cyclocardia compressa* has been reported from Quaternary raised beaches of Río Negro (Pastorino, 2000). The northernmost record in the southwest Atlantic for the considered carditoidean species corresponds to *Cyclocardia velutina*, which appears associated to the sub-Antarctic (Magellanic) waters off Buenos Aires (37ºS).

All Magellanic and Perú-Chile carditoideans considered in this study have shells with well-developed radial sculpture. Radial cords may be nearly completely smooth (such as in *Cyclocardia compressa*) or crossed by commarginal elements that produce granules (*Cyclocardia velutina*) or scales (*Cyclocardia thouarsii*, *Cyclocardia spurca*, *Carditella naviformis*, *Carditella semen*, and *Carditopsis flabellum*). The outer surface of shells is covered by a thick periostracum which, sometimes originates species specific periostracal projections (see for instance in *Cyclocardia thouarsii* and *C. velutina*). Another character shared by the species considered in this study is the presence of an entire pallial line that lacks a pallial sinus, a fact that is correlated with the absence of siphons.

All *Cyclocardia* species here studied have relatively small (225–240 µm length), smooth, cap-shaped prodissoconchs; *Carditella* and *Carditopsis* species usually have larger (450–530 µm length) and distinctly

sculptured prodissoconchs with the exception of *Carditella semen* which, although distinctly sculptured, has a small larval shell of about 250 µm length.

The extension of ctenidia could not be correlated with the different genera considered here, but with the general shell outline: species having a triangular or rounded shell outline (such as *Cyclocardia compressa*, *Cyclocardia velutina*, *Carditella tegulata*, and *Carditopsis flabellum*) showed dorso-ventrally extended ctenidia, while species having an ovate or rectangular shell outline (such as *Cyclocardia thouarsii* and *Carditella naviformis*) have antero-posteriorly extended ctenidia. This is consistent with the previous observations by Yonge (1969) for other carditoidean species. Out of the six species anatomically studied herein, *Carditopsis flabellum* showed a single, inner demibranch at each side. The absence of an outer demibranch in *C. flabellum* may be correlated to its small size (in fact, this is the smallest species considered). A similar condition was reported for other minute Condylocardiidae, such as *Condylocardia notoaustralis* Cotton, 1930, and *Cuna concencentrica* Hedley, 1902 (Middelfart, 2002a, b, respectively). However, this condition is not diagnostic at a family level because members of the condylocardiid genus *Carditella* here studied, as well as *Cyclocardia* species (Carditidae), show both, inner and outer demibranchs. The outer demibranch is approximately half the size of the inner demibranch in *Cyclocardia compressa* and *C. velutina* but much smaller in *Cyclocardia thouarsii*, *Carditella naviformis*, and *Carditella tegulata*.

Among the morphological and anatomical characters studied herein, only the number and morphology of the hinge teeth and the position of the ligament, appear as valuable characters to separate the genera considered. The ligament is completely external in *Cyclocardia* species and completely internal in *Carditopsis* species; *Carditella* species have both internal and external ligaments. The studied species of *Cyclocardia* and *Carditella* consistently have two cardinal teeth in each valve whereas *Carditopsis* species have two cardinal teeth in the right valve and three cardinals in the left valve. In all of these genera the anterior cardinal tooth of the right valve (CA3) is arched forming a hook. However, in *Carditopsis flabellum* (the type species of the genus) the anterior and posterior parts of this tooth (CA3a and CA3b) are long and similarly solid whereas the CA3 of *Cyclocardia* and *Carditella* species is short and the posterior part (CA3b) much broader. The lateral teeth of *Cyclocardia* species are small (sometimes minute and ill defined) but elongated and well developed in *Carditella* and *Carditopsis*.

The number of hinge teeth and their arrangement in the *Cyclocardia* species studied here (*C. compressa*, *C. velutina*, *C. spurca* and *C. thouarsii*) are similar to those of *Cyclocardia borealis* (Conrad, 1832), the type species of the genus (figured by Hain, 1985: pl. 38). However, in *C. thouarsii* the hinge plate is narrow and the cardinal tooth 3b is low (Fig. 3N), whereas in the other species the hinge plate is wide and the cardinal tooth 3b is high (Figs. 1J, 4N). At the present state of knowledge, these differences do not warrant generic distinction.

The present redescription of the type species of *Carditella* and *Carditopsis* provides the baseline for a worldwide revision of the species previously attributed to these genera. In fact, the two species described by Coan (2003) under *Carditella* (*C. galapagana* and *C. marieta*) show differences in the extension and location of the resilifer when comparing with the species considered herein; and the hinge morphology of *Carditopsis flabellum* does not agree with those of "*Carditopsis*" *gofasi* Salas & Cosel, 1991, and "*Carditopsis*" *villaltai* Acuña, 1978.

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Appendix 1. *Cyclocardia compressa*

TABLE 1. Material examined.

Site of collection	Latitude / Longitude	Depth	Repository	No. Specimens and valves
Burdwood Bank	54º01’21.6’’S 62º01’19.8’’W	272 m	MLP 12210	1 sp.
Cabo Colnett, Isla de los Estados	54º29’S 64º20’W	109 m	LACM 71-314	1 v.
Isla Observatorio, Isla de los Estados	54º29’S 64º10’W	*ca*. 110 m	LACM 71-315	1 v.
	54º34’S 64º10’W	73 m	LACM 71-316	11 vs.
Cabo San Antonio, Isla de los Estados	54º34’S 64º30’W	73–76 m	LACM 71-352	1 v.
Cabo San Juan, Isla de los Estados	54º34’S 63º50’W	118 m	LACM 71-327a	1 a. v.
	54º34’S 63º50’W	118 m	LACM 71-327b	5 vs.
	54º39’06’’S 63º50’06’’W	135–137 m	LACM 71-328	2 a. vs.
Bahía Crossley, Isla de los Estados	54º34’18’’S 64º40’00’’W	84–85 m	LACM 71-348	2 vs.
	54º47’06’’S 64º42’06’’W	13–37 m	LACM 71-258	6 vs.
Puerto Basil Hall, Isla de los Estados	54º45’30’’S 64º09’42’’W	14–18 m	LACM 71-321	1 v.
Puerto Parry, Isla de los Estados	54º46’S 64º22’W	35 m	MLP 13710	1 sp.
Bahía San Antonio, Isla de los Estados	54º46’30’’S 64º23’30’’W	51 m	LACM 71-265	2 vs.
Punta Ventana, Isla de los Estados	54º54’S 63º56’W	771–903 m	LACM 71-329	3 vs.
Cabo San Bartolomé, Isla de los Estados	54º55’S 64º40’W		LACM 71-346	6 vs.
Bahía Buen Suceso, Tierra del Fuego Province	54º47’54’’S 65º14’42’’W	10 m	LACM 71-296	5 vs.
	54º49’36’’S 65º05’30’’W	106 m	LACM 71-306	1 v.
Tierra del Fuego Province	54º48’S 63º42’W	267 m	MACN-In 22758	8 a. vs., 12 vs.
Ensenada Patagones, Tierra del Fuego Province	54º52’S 65º05’W	144 m	LACM 71-305	1 v.
Bahía Valentín, Tierra del Fuego Province	54º54’S 65º29’W	8 m	LACM 71-307	1 v.
Cabo San Pío, Beagle Channel	55º05’36’’S 66º28’48’’W	65–80 m	MLP 12238	16 vs.
	55º03’S 66º37’W	30–35 m	MLP 13709	28 sps., 3 vs.
Beagle Channel	55º07’S 66º33’W		MACN-In 23948	4 vs.
Isla Picton, Beagle Channel	[55º04’31’’S 66º53’16’’W]		MACN-In 23978	5 vs.
Isla Becasses, Beagle Channel	54º57’00’’S 67º01’06’’W	30–40 m	MLP 12208	47 vs.
	54º57’00’’S 67º01’06’’W	30–40 m	MLP 12234	3 sps.
Isla Gable, Beagle Channel	54º54’36’’S 67º21’24’’W	15–20 m	MLP 12211	61 sps., 96 vs.
	54º53’S 67º42’W	66–68 m	MLP 12205	16 sps.
Remolinos, Beagle Channel	54º52’S 67º51’W	25 m	MLP 12202	11 sps.

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TABLE 1. (Continued)

Site of collection	Latitude / Longitude	Depth	Repository	No. Specimens and valves
Punta Segunda, Beagle Channel	54º51’26.1’’S 68º00’38.1’’W	20–21 m	MACN-In 39047	2 sps., 1 v.
	54º51’S 68º02’W	27 m	MLP 12191	14 sps.
	54º51’16.1’’S 68º02’08.9’’W	14 m	MACN-In 39048	2 sps., 2 a. vs.
	54º51’16.1’’S 68º02’08.9’’W	19 m	MACN-In 39049	2 sps., 1 a. v.
	54º50’53.6’’S 68º02’47.8’’W	12 m	MACN-In 39050	11 sps.
	54º51’S 68º31’W	19 m	MLP 12204	3 sps.
Punta Occidental, Beagle Channel	54º52’S 68º18’W	74–98 m	MLP 13711	1 sp.
Islas Bridges, Beagle Channel	54º52’S 68º07’W	21–23 m	MLP 12200	3 sps.
	54º52’17.7’’S 68º13’24.0’’W	40 m	MACN-In 39051	2 sps., 1 a. v., 2 vs.
	54º52’S 68º11’W	64–73 m	MLP 12206	1 v.
Puerto Carelo, Beagle Channel	54º52’S 68º13’W	12–20 m	MLP 13712	1 sp.
Bahía Ushuaia, Beagle Channel	54º50’S 68º14’W	21 m	MLP 12235	3 sps.
	54º50’S 68º15’W	18–21 m	MLP 12203	2 sps.
	54º48’S 68º16’W	27 m	MLP 12240	1 sp.
	54º50’S 68º16’W	27 m	MLP 12239	1 sp.
Isla Lucas, Beagle Channel	54º50’S 68º19’W	15 m	MACN-In 39052	1 sp.
Bahía Lapataia, Beagle Channel	54º51’S 68º29’W	20–31 m	MLP 12201	1 sp.
Monte Moat, Beagle Channel	55º02’S 68º42’W	15–20 m	MLP 13713	6 vs.
Rade de Gorée,Cape Horn	[55º20’S 69º30’W]		MNHN	1 sp.
Valparaíso,Chile	[33º03’S 71º37’W]		NHMUK 1854.12.4.758	1 sp., 1 v.
	[33º03’S 71º37’W]		LACM 168402	2 vs.
	33º22’S 71º42’W	3–8 m	LACM 75-33	21 a. vs., 5 vs.
	Approx. 33º59’S 71º38’W		LACM 65-110	3 vs.
Golfo de Ancud, Chile	42°20’06’’S 72°55’52’’W	252 m	MZUC 32637	3 vs.
Caleta del Rey, Chile	42º11’S 72º35’W	14 m	MACN-In 39053	2 vs.
	42º11’S 72º35’W	19 m	MZUC 37621, 37622, 37623, 37746	3 sps., 5 vs.
	42º11’S 72º35’W	24 m	MACN-In 39054	1 sp., 3 vs.
	42º11’S 72º35’W	26 m	MACN-In 39055	5 a. vs., 7 vs.
	42º11’S 72º35’W	29 m	MACN-In 39056	7 sps., 15 vs.
	42º11’S 72º35’W	20–30 m	MACN-In 39057	46 sps., 20 a. vs., 334 vs.
Playa Llonco, Chile	42º20’S 72º27’W	30–50 m	MACN-In 39058	1 v.

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TABLE 1. (Continued)

Site of collection	Latitude / Longitude	Depth	Repository	No. Specimens and valves
Golfo Corcovado, Chile	42º38’S 72º57’W	3–14 m	LACM 75-43	2 a. vs., 3 vs.
	42º42’S 72º52’W	intertidal	LACM 75-41	3 vs.
	43º27’57’’S 73º17’06’’W	130 m	MNHNCL 7230	1 a. v., 3 vs.
	43°27’58’’S 73°17’06’’ W	130 m	MZUC 32638	2 sps., 6 vs.
Westhoff Island, Chile	43º54’00’’S 73º43’30’’W	23 m	LACM 73-75a41	2 a. vs.
	43º54’00’’S 73º43’30’’W	23 m	LACM 73-75b41	7 a. vs., 34 vs.
Canal Moraleda, Chile	45º16’10.2’’S 73º39’58.8’’W	76 m	MNHNCL 7114	1 v.
	45º21’06’’S 73º38’52.8’’W	140 m	MNHNCL 7145	1 sp.
	45º21’06’’S 73º38’52.8’’W	140 m	MNHNCL 7151 in part	1 v.
Canal Darwin, Chile	45º27’48’’S 74º24’48’’W	8 m	LACM 73-74a41	1 a. v.
	45º27’48’’S 74º24’48’’W	8 m	LACM 73-74b41	3 vs.
Estero Elefantes, Chile	46º05’00.6’’S 73º37’49.2’’W	60 m	MNHNCL 7197	1 v.
Collingwood, Chile	51º52’00’’S 73º43’36’’W	intertidal to shallow subtidal	LACM 73-107	1 v.
Punta Dashwood, Chile	52º24’00’’S 73º39’42’’W	12 m	LACM 73-71	2 vs.
off Isla Guarello	[52º40’00’’S 73º40’59’’W]		MZUC 15463 in part	1 sp., 3 vs.
Canal Cockburn, Chile	54º22’12’’S 71º21’42’’W	15 m	LACM 73-69a	1 a. v.
	54º22’12’’S 71º21’42’’W	15 m	LACM 73-69b	1a. v., 3 vs.

TABLE 2. Other published records.

Site of collection	Latitude / Longitude	Depth	Reference
Portland Bay, St. Andrews Sound, [Chile]	[50°30’S 73°30’W]	10 fathoms [18 m]	Smith, 1881
Boija Bay, [Magellan Strait]	[53º30’S 72º20’W]	20 fathoms [36 m]	
Coquimbo, [Chile]	[29°57’S 71°20’W]		Martínez y Saez, 1870
Cape Horn	56°19’30’’S 67°09’45’’W	121 m	Dell, 1964
Bahía de Valparaíso, [Chile]	[33°S]		Ramorino, 1968
Canal Moraleda, [Chile]	45°16’10.2’’S 73°39’58.8’’W	50 m	Osorio & Reid, 2004
Estero Elefantes, [Chile]	46°19’41.4’’S 73°42’52.8’’W	12 m	
Golfo de Ancud, [Chile]	41°50’56.4’’S 73°23’52.8’’W	214 m	Cárdenas *et al*., 2008

Appendix 2. *Cyclocardia spurca*

TABLE 1. Material examined.

Site of collection	Latitude / Longitude	Depth	Repository	No. Specimens
Callao, Perú	[12º02'S 77º08'W]		NHMUK 1854.12.4.761	5 sps.
Callao, Perú	[12º02'S 77º08'W]		MNHN	4 sps.

TABLE 2. Other published records.

Site of collection	Latitude / Longitude	Depth	Reference
Callao, [Perú]	[12º02'S 77º08'W]		d'Orbigny, 1845
Arica, [Chile]	[18º29'S 70º20'W]		
Payta, [Perú]	[05º05'S 81º07'W]		Lamy, 1922
Callao, [Perú]	[12º02'S 77º08'W]		

Appendix 3. *Cyclocardia thouarsii*

TABLE 1. Material examined.

Site of collection	Latitude / Longitude	Depth	Repository	No. Specimens
Tierra del Fuego	54º00'S 64º55'65º00'W	118 m	NHMUK 1964713	3 vs.
Malvinas / Falkland Islands	50º50'S 56º58'W	229–236 m	NHMUK 1964714	7 vs.
	52º25'S 61º00'W	267–208 m	NHMUK 1964715	2 vs.
Burdwood Bank	54º30'13.2''S 56º08'12.0''W	286 m	MLP 13708	4 sps., 6 vs.
Cabo San Antonio, Isla de los Estados	54º29'00''S 64º29'12''W	122–124 m	LACM 71-351	1 v.
Puerto Vancouver, Isla de los Estados	54º46'54''S 64º04'00''W		LACM 71-333	2 vs.
Punta Fallows, Isla de los Estados	54º50'00''S 63º50'30''W	342–353 m	LACM 71-331a	1 sp.
			LACM 71-331b	4 vs.
Punta Ventana, Isla de los Estados	54º54'S 63º56'W	771–903 m	LACM 71-329a	1 sp.
			LACM 71-329b	7 vs.
Cabo Kempe, Isla de los Estados	54º54'54''S 64º19'30''W	263–285 m	LACM 71-341	6 vs.
	54º55'00''S 64º20'24''W	283–292 m	LACM 71-336	4 vs.
Isla Dampier, Isla de los Estados	54º55'06''S 64º09'30''W	493–511 m	LACM 71-335	1 v.
Cabo San Bartolomé, Isla de los Estados	55º00'00''S 64º48'42''W	438–548 m	LACM 71-342a	1 sp.
			LACM 71-342b	8 vs.
Cape Horn	55º27'S 66º06'W	780 m	ZMB 103678	1 sp.
	55º44'00''S 66º14'30''W	430 m	ZMB 103538	3 sps.
	55º44'30''S 66º17'06''W	198 m	ZMB 103422	13 sps.
	56º19'30''S 67º09'45''W	121 m	NHMUK 1964712	13 vs.

TABLE 2. Other published records.

Site of collection	Latitude / Longitude	Depth	Reference
Baie Orange	[55º31'S 70º26'W]		Rochebrune & Mabille, 1889

Appendix 4. *Cyclocardia velutina*

TABLE 1. Material examined.

Site of collection	Latitude / Longitude	Depth	Repository	No. Specimens
off Buenos Aires Province	37º08'S 55º12'W	100 m	MACN-In 25183	1 sp., 2 vs.
Santa Cruz Province	46º26'12''S 64º40'34.2''W	106 m	MACN-In 39059	2 vs.
Malvinas/Falkland Islands	51º06'S 64º30'W	141–144 m	NHMUK 1964717	3 vs.
	52º00'S 62º40'W	247–253 m	NHMUK 1964718	2 vs.
Puerto San Juan del Salvamento, Isla de los Estados	54º44'00''S 63º52'54''W	44 m	LACM 71-260	1 a. v., 5 vs.
Puerto Basil Hall, Isla de los Estados	[54º45'S 64º09'W]	85 m	MACN-In 22236	13 vs.
Puerto Parry, Isla de los Estados	54º46'S 64º22'W	35 m	MACN-In 39060	1 sp.
	[54º46'S 64º22'W]	62 m	MACN-In 21915	9 vs.
Bahía San Antonio, Isla de los Estados	54º46'06''S 64º25'06''W	36 m	LACM 71-267	1 v.
	54º46'30''S 64º23'18''W		LACM 71-357	4 vs.
	54º46'30''S 64º23'30''W	51 m	LACM 71-265	5 vs.
Tierra del Fuego Province	55º07'S 66º33'W	82 m	MACN-In 25597	1 v.
Punta Arenas, Magellan Strait	[53º10'S 70º56'W]		MACN-In w/n	2 vs.
			MACN-In 12151	1 v.
			MNHN	2 sps.
Beagle Channel			MNHN	1 sp., 2 vs.
Isla Becasses, Beagle Channel	54º57'00''S 67º01'06''W	30–40 m	MLP 12209	1 sp., 8 vs.
Isla Gable, Beagle Channel	54º53'S 67º42'W	66–68 m	MLP 12207	17 sps., 121 vs.
	54º55'S 67º21'W	15–20 m	MLP 13714	1 sp.
Punta Segunda, Beagle Channel	54º51'S 68º03'W	90–101 m	MLP 12213	3 sps.
Islas Bridges, Beagle Channel	54º52'17.7''S 68º13'24.0''W	40 m	MACN-In 39061	6 vs.
Bahía Lapataia, Beagle Channel	54º52'S 68º28'W	120–138 m	MLP 12212	6 sp.
	54º52'S 68º32'W	27–29 m	MLP 12214	1 sp.
Isla Picton, Beagle Channel	[55º04'31''S 66º53'16''W]	55–87 m	MACN-In 25596	2 vs.
Cape Horn			MACN-In 13911	3 vs.
Baie Carfort, Cape Horn	[55°20'S 71º10'W]		MNHN	1 sp.
Isla Lilihuapi, Chile	42º09'16.6''S 72º34'56.9''W	80–94 m	MACN-In 39062	1 sp.
Isla Lilihuapi, Chile	42º09'16.6''S 72º34'56.9''W	80–94 m	MZUC 37624	1 sp.
Golfo de Ancud, Chile	42º20'06''S 72º55'51''W	252 m	MNHNCL 7223	2 sps., 2 vs.
	42º20'06''S 72º55'51''W	252 m	MZUC 32639	2 sps., 2 vs.
Estero Castro, Chile	42°30'11'' S 73°45'40'' W	22 m	MZUC 32640	2 sps., 3 vs.
Isla Desertores, Chile	42º53'51''S 72º53'27''W	185 m	MNHNCL 7298	2 vs.
			MNHNCL 7325	2 vs.

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TABLE 1. (Continued)

Site of collection	Latitude / Longitude	Depth	Repository	No. Specimens
Isla Toto, Chile	44º17’43’’S 73º12’46’’W	250 m	MNHNCL 7186	2 sps.
			MNHNCL 7187	2 vs.
	44º19’43’’S 73º12’40’’W	216 m	MNHNCL 7154	1 sp.
Canal Moraleda, Chile	45º21’06’’S 73º38’52.8’’W	140 m	MNHNCL 7149	2 sps.
	45º21’06’’S 73º38’52.8’’W	140 m	MNHNCL 7151 in part	6 vs.
Estero Elefantes, Chile	46º05’00.6’’S 73º37’49.2’’W	60 m	MNHNCL 7196	1 sp.
Canal Smyth, Magellan Strait	[52°15 00’’S 73°40’00’’W]		MZUC 5779 in part	6 vs.
off Isla Guarello, Chile	[52º40’00’’S 73º40’59’’W]		MZUC 15463 in part	2 sps., 4 vs.
Londonderry Island,Chile	[55º02’S 70º50’W]		MACN-In 24047	1 v.

TABLE 2. Other published records.

Site of collection	Latitude / Longitude	Depth	Reference
au sud-est de l’île Scott	[55º17’S 70º10’W]		Rochebrune & Mabille, 1889
Murray-Narrows, canal du Beagle			
[Chile]	53°01’00’’S 73°42’30’’W	369 fathoms [672 m]	Dall, 1908
Calbuco, [Chile]			Kaspar, 1913
Punta Arenas, [Chile]			
Canal Calbuco, [Chile]	41°46’30’’S 73°06’45’’W	30 m	Soot-Ryen, 1959
	41°49’4’’S 70°08’00’’W	45 m	
Estero Reloncaví, [Chile]	41°38’34’’S 74°22’45’’W	50 m	
Seno Reloncaví, [Chile]	41°41’S 72°47’W	250 m	
	41°35’35’’S 72°53’00’’W	270 m	
Canal Moraleda, [Chile]	45°16’10.2’’S 73°39’58.8’’W	50 m	Osorio & Reid, 2004
Canal Jacaf, [Chile]	44°17’39.6’’S 73°10’46.8’’W	400 m	
Golfo de Ancud, [Chile]	41°58’30’’S 72°59’18’’W	203 m	Cárdenas *et al*., 2008
	42°08’30’’S 72°44’54’’W	353 m	
	42°30’03.6’’S 73°33’25.2’’W	72 m	
Canal Lemuy, [Chile]	42°43’40.8’’S 73°23’37.2’’W	169 m	
Golfo Corcovado, [Chile]	42°51’34.8’’S 73°21’54’’W	145 m	
Canal Queylen, [Chile]	43°27’57.6’’S 73°17’06’’W	130 m	
	43°00’00’’S 73°29’52.8’’W	79 m	
	43°41’16.8’’S 74°07’48’’W	219 m	
Boca del Guafo, [Chile]	43°39’18’’S 73°71’18’’W	270 m	

Appendix 5. *Carditella tegulata*

TABLE 1. Material examined.

Site of collection	Latitude / Longitude	Depth	Repository	No. Specimens
Isla Becasses, Beagle channel	54º57’S 67º01’W	30–40 m	MLP 13715	6 sps., 5 vs.
Chile			MNHN	2 vs.
Punta Cascada, Chile	42º18’S 72º28’W	10–15 m	MACN-In 39063	2 vs.
Playa Llonco, Chile	42º20’S 72º27’W	30–50 m	MACN-In 39064	9 sps., 1 v.
	42º20’S 72º27’W	19 m	MACN-In 39065	1 a. v.
	42º20’S 72º27’W	30 m	MACN-In 39066	1 sp.
Fiordo Comau, Chile	42º22’28.98’’S 72º25’41.58’’W	20 m	MACN-In 39067	1 sp., 1 v.
Golfo Corcovado, Chile	43°27’57’’S 73°17’06’’W	130 m	MZUC 32643	1 v.
	43°27’57’’S 73°17’06’’W	130 m	MZUC 32641 in part	1 sp., 3 vs.
Westhoff Island, Chile	43º54’S 73º43’W		LACM 73-75	2 vs.
Canal Darwin, Chile	45º27’48’’S 74º24’48’’W	7 m	LACM 73-74	2 a. vs., 10 vs.
Golfo Elefantes, Chile	45º55’13’’S 73º39’31’’W	10 m	MNHNCL 167	1 sp.
			NHMUK 20080556	1 sp.
			NHMUK 20080555	1 sp.
Bahía Tom, Chile	50º11’18’’S 74º47’54’’W	14 m	LACM 73-72	77 a. vs., 22 vs.

Appendix 6. *Carditella naviformis*

TABLE 1. Material examined.

Site of collection	Latitude / Longitude	Depth	Repository	No. Specimens
Tierra del Fuego Province	55º07’S 66º33’W	82 m	MACN-In 25597-1	1 v.
Cabo San Antonio, Isla de los Estados	54º29’00’’S 64º29’12’’W	122–124 m	LACM 71-351	5 vs.
Isla Observatorio, Isla de los Estados	54º34’S 64º10’W	73 m	LACM 71-316	1 a.v., 20 vs.
	54º34’00’’S 64º00’18’’W	84 m	LACM 71-324	1 a. v.
	54º39’30’’S 64º07’06’’W	shallow subtidal	LACM 71-310	2 vs.
Cabo Colnett, Isla de los Estados	54º39’S 64º20’W	48 m	LACM 71-312	2 vs.
Cabo San Juan, Isla de los Estados	54º34’S 63º50’W	118 m	LACM 71-327	4 vs.
	54º39’06’’S 63º50’06’’W	135–137 m	LACM 71-328a	1 a. v., 2 vs.
	54º39’06’’S 63º50’06’’W	135–137 m	LACM 71-328b	2 sps.
Puerto San Juan del Salvamento, Isla de los Estados	[54º44’00’’S 63º52’54’’W]	intertidal	LACM 71-284	1 sp.
Bahía Crossley, Isla de los Estados	54º46’12’’S 64º42’42’’W	intertidal	LACM 71-273	1 a. v.
	54º47’06’’S 64º42’06’’W	13–37 m	LACM 71-258	1 v.

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TABLE 1. (Continued)

Site of collection	Latitude / Longitude	Depth	Repository	No. Specimens
Bahía San Antonio, Isla de los Estados	54º46’30’’S 64º23’18’’W		LACM 71-357	1 v.
Bahía Capitán Cánepa, Isla de los Estados	54º49’12’’S 64º27’48’’W	intertidal	LACM 71-275	1 v.
Punta Ventana, Isla de los Estados	54º54’S 63º56’W	771–903 m	LACM 71-329	5 vs.
Cabo San Bartolomé, Isla de los Estados	54º55’S 64º40’W		LACM 71-346	2 vs.
Isla de los Estados	55º00’00’’S 64º48’42’’W	438–548 m	LACM 71-342	7 vs.
Bahía Inútil, Magellan Strait	53°30’S 69°49’W	46 m	MZUC 4739 in part	1 sp., 2 a. vs.
Bahía Inútil, Magellan Strait	53°30’S 69°49’W	46 m	MZUC 4554 in part	4 sps.
Bahía Inútil, Magellan Strait	53°30’S 69°49’W	46 m	MZUC 4549 in part	2 sps.
Isla Carlos III, Magellan Strait	53º39’24’’S 72º14’48’’W	11–12 m	LACM 73-70	4 a. vs., 1 v.
Cabo San Pío, Beagle Channel	55º05’36’’S 66º28’48’’W	65–80 m	MLP 12244	17 vs.
	55º03’S 66º37’W	30–35 m	MLP 12248	75 sps.
Isla Becasses, Beagle Channel	54º57’00’’S 67º01’06’’W	30–40 m	MLP 12242	1 sp., 63 vs.
	54º57’S 67º01’W	30–40 m	MLP 13716	2 sp., 17 vs.
Isla Gable, Beagle Channel	54º54’36’’S 67º21’24’’W	15–20 m	MLP 12255	6 sps., 42 vs.
	54º53’S 67º42’W	66–68 m	MLP 12249	17 sps., 2 vs.
Remolinos, Beagle Channel	54º52’S 67º51’W	25 m	MLP 12247	17 sps.
Punta Segunda, Beagle Channel	54º51’26.1’’S 68º00’38.1’’W	20–21 m	MACN-In 39068	3 sps., 4 a. vs.
	54º51’S 68º02’W	27 m	MLP 12256	132 sps.
	54º51’16.1’’S 68º02’08.9’’W	14 m	MACN-In 39069	2 sps., 2 a. vs., 1 v.
	54º51’16.1’’S 68º02’08.9’’W	19 m	MACN-In 39070	6 sps., 1 v.
	54º50’53.6’’S 68º02’47.8’’W	12 m	MACN-In 39071	131 sps., 1 a. v., 3 vs.
Islas Bridges, Beagle Channel	54º52’S 68º07’W	21–23 m	MLP 12233	9 sps.
	54º52’S 68º11’W	64–73 m	MLP 12254	1 sp.
	54º52’S 68º13’W	12–20 m	MLP 12241	1 sp.
	54º52’17.7’’S 68º13’24.0’’W	40 m	MACN-In 39072	2 sps., 1 v.
	54º35’S 68º14’W	53–91 m	MLP 12245	6 sps.
	54º50’S 68º15’W		MACN-In 39073	1 sp.
	54º50’00.6’’S 68º15’63’’W	30 m	MACN-In 39074	1 sp.
Bahía Ushuaia, Beagle Channel	54º50’S 68º14’W	21 m	MLP 12243	2 sps.
	54º50’S 68º15’W	18–21 m	MLP 12252	1 sp.
Punta Occidental, Beagle Channel	54º52’S 68º18’W	74–98 m	MLP 12250	6 sps.
Isla Lucas, Beagle Channel	54º50’S 68º19’W	15 m	MACN-In 39075	2 sps.

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TABLE 1. (Continued)

Site of collection	Latitude / Longitude	Depth	Repository	No. Specimens
Bahía Lapataia, Beagle Channel	54º51'S 68º29'W	20–31 m	MLP 12251	1 sp.
	54º51'S 68º31'W	19 m	MLP 12246	5 sps.
	54º52'S 68º32'W	27–29 m	MLP 12253	1 sp.
	54º51'35.7''S 68º32'43.1''W	16 m	MACN-In 39076	3 sps.
	54º51'13.2''S 68º33'06.6''W	17 m	MACN-In 39077	1 sp.
Caleta Awaiakirrh, Beagle Channel	55º00'00''S 69º02'12''W	17 m	LACM 73-68	10 a. vs., 52 vs.
Valparaíso, Chile	[33º59'S 71º38'W]		LACM 168440	2 a. vs., 2 vs.
	Approx. 33º59'S 71º38'W		LACM 65-110	1 v.
Isla Lilihuapi, Chile	42º09'S 72º35'W	12 m	MACN-In 39078	2 sps., 2 vs.
	42º09'S 72º35'W	23 m	MACN-In 39079	2 sps., 3 vs.
	42º09'S 72º35'W	30 m	MACN-In 39080	3 sps., 1 v.
	42º09'S 72º35'W	19–23 m	MACN-In 39081	1 a. v., 17 vs.
Caleta del Rey, Chile	42º11'S 72º35'W	14 m	MACN-In 39082	1 sp.
	42º11'S 72º35'W	19 m	MACN-In 39083	1 sp., 3 vs.
	42º11'S 72º35'W	24 m	MZUC 37625, 37626, 37747	2 sps., 3 vs.
	42º11'S 72º35'W	26 m	MACN-In 39084	3 sps., 11 vs.
	42º11'S 72º35'W	29 m	MACN-In 39085	10 sps., 28 vs.
	42º11'S 72º35'W	20–30 m	MACN-In 39086	3 sps., 124 vs.
Playa Llonco, Chile	42º20'S 72º27'W	30 m	MACN-In 39087	5 vs.
Golfo de Ancud, Chile	42°20'06''S 72°55'52''W	252 m	MZUC 32642 in part	3 vs.
Fiordo Comau, Chile	42º22'S 72º24'W	50 m	MACN-In 39088	1 sp.
Golfo Corcovado, Chile	42º42'S 72º52'W	intertidal	LACM 75-41	4 a. vs., 25 vs.
	43°27'57''S 73°17'06''W	130 m	MZUC 32641 in part	1 sp.
Westhoff Island, Chile	43º54'00''S 73º43'30''W	23 m	LACM 73-75	7 a. vs., 84 vs.
Canal Darwin, Chile	45º27'48''S 74º24'48''W	8 m	LACM 73-74	3 a. vs., 20 vs.
Bahía Tom, Chile	50º11'18''S 74º47'54''W	14 m	LACM 73-72a	20 a.vs., 2 vs.
	50º11'18''S 74º47'54''W	14 m	LACM 73-72b	1 a. v.
Canal Pasaje, Chile	50º27'49.2''S 75º07'41.6''W	15 m	MZUC 37627, 37748	1 sp., 6 vs.
	50º27'49.2''S 75º07'41.6''W	0–35 m	MZUC 37628	1 sp.
Canal Cockburn, Chile	54º22'12''S 71º21'42''W	15 m	LACM 73-69	1 a. v. 1 v.
Punta Dashwood, Chile	52º24'00''S 73º39'42''W	12 m	LACM 73-71	850 a. vs., 108 vs.

TABLE 2. Other published records.

Site of collection	Latitude / Longitude	Depth	Reference
"Northwest Falklands [Malvinas Islands]"			Melvill & Standen, 1914
Magellan Strait			Lamy, 1922
Bahía de Valparaíso, [Chile]	[33°59'S]		Ramorino, 1968

Appendix 7. *Carditella semen*

TABLE 1. Material examined.

Site of collection	Latitude / Longitude	Depth	Repository	No. Specimens
Islas Lobos de Afuera, Perú	06º56'S 80º43'W	27 m	LACM 38-212	5 vs.
	06º56'S 80º43'W	45 m	LACM 74-7	4 a. vs., 24 vs.
	06º57'06''S 80º42'18''W	2–9 m	LACM 74-6	45 a. vs., 44 vs.
Hormigas de Afuera, Perú	11º58'S 77º46'W	82 m	LACM 38-209	31 vs.
Callao, Perú	12º05'S 77º10'W	5 m	LACM 35-175	2 vs.
Pucusana, Perú	12º30'S 76º49'W	intertidal–11 m	LACM 72-76	36 a. vs., 2 vs.
Isla Chincha Norte, Perú	13º38'S 76º25'W	6–12 m	LACM 72-78	> 150 sps.
Islas de Chincha, Perú	13º39'S 76º22'W	33 m	LACM 35-159	4 vs.
Arica, Chile	[18º29'S 70º20'W]		ZMH w/n	2 sps.
Arica, Chile	[18º29'S 70º20'W]		NHMUK 1854.12.4.762	10 vs.
Iquique, Chile	20º13'S 70º10'W	intertidal	LACM 64-16	1114 a. vs., 158 vs.
			LACM 70-66	20 sps.
	20º15'30''S 70º08'00''W		LACM 75-12	> 100 sps.
Punta Cuartel, Bahía Mejillones	[23°02'S 70°31'W]	2-3 m	MZUC 4653 in part	8 sps.
Isla Santa María, Chile	23º25'S 70º36'W	intertidal	LACM 75-17	16 a. vs., 35 vs.
Los Colorados, Chile	23º29'S 70º22'W	intertidal–6 m	LACM 75-19	> 100 sps.
Antofagasta, Chile	23º42'S 70º27'W	intertidal	LACM 75-15	> 100 sps.
	23º42'S 70º27'W	2–5 m	LACM 75-20	> 150 sps.

TABLE 2. Other published records.

Site of collection	Latitude / Longitude	Depth	Reference
Isla Blanca, [Atacama, Chile]	[26°42'S 70°45'W]		Philippi, 1860
"Bolivia" [north of Chile?]			Lamy, 1922
Iquique, [Chile]	20°12'30''S 70°10'19''W	intertidal	Soot-Ryen, 1959 (as *Carditella tegulata*)
Antofagasta, [Chile]	[23º42'S 70º27'W]		Guzmán *et al*., 1998 (as *Carditella tegulata*)

Appendix 8. *Carditopsis flabellum*

TABLE 1. Material examined.

Site of collection	Latitude / Longitude	Depth	Repository	No. specimens
Tierra del Fuego Province			MACN-In 9236	1 v.
	52º43’19.5’’S 68º12’33.9’’W	70 m	MACN-In 39089	1 sp.
Cabo San Antonio, Isla de los Estados	54º29’00’’S 64º29’12’’W	122–124 m	LACM 71-351	27 vs.
	54º34’S 64º30’W	73–76 m	LACM 71-352	3 a. vs., 9 vs.
Isla Observatorio, Isla de los Estados	54º34’S 64º10’W	73 m	LACM 71-316	1 v.
Cabo Colnett, Isla de los Estados	54º34’S 64º20’W	91 m	LACM 71-313	1 v.
	54º43’18’’S 64º19’48’’W	14 m	LACM 71-266	1 v.
Bahía Crossley, Isla de los Estados	54º34’18’’S 64º40’00’’W		LACM 71-348	14 vs.
Puerto San Juan del Salvamento, Isla de los Estados	54º44’51’’S 63º52’54’’W	44 m	LACM 71-260a	1 v.
	54º44’51’’S 63º52’54’’W	44 m	LACM 71-260b	9 sps.
Puerto Basil Hall, Isla de los Estados	54º45’30’’S 64º09’42’’W	14–18 m	LACM 71-321	2 vs.
Bahía San Antonio, Isla de los Estados	54º46’06’’S 64º25’06’’W	36 m	LACM 71-267	2 a. vs., 8 vs.
	54º46’30’’S 64º23’18’’W		LACM 71-357	20 vs.
	54º46’30’’S 64º23’30’’W	51 m	LACM 71-265	2 a. vs., 14 vs.
Bahía Capitán Cánepa, Isla de los Estados	54º49’12’’S 64º27’48’’W	intertidal	LACM 71-275	1 v.
	54º50’12’’S 64º29’24’’W	67–71 m	LACM 71-344	1 a. v., 4 vs.
Cabo Kempe, Isla de los Estados	54º54’54’’S 64º19’30’’W	263–285 m	LACM 71-341	3 vs.
	54º55’00’’S 64º20’24’’W	283–292 m	LACM 71-336a	1 sp.
	54º55’00’’S 64º20’24’’W	283–292 m	LACM 71-336b	5 vs.
Cabo San Bartolomé, Isla de los Estados	54º55’S 64º40’W		LACM 71-346	16 vs.
	55º00’00’’S 64º48’42’’W	438–548 m	LACM 71-342	5 vs.
Malvinas / Falkland Islands	54º00’S 65º00’W–64º55’W	118 m	NHMUK 1964723	9 vs.
Isla Carlos III, Magellan Strait	53º39’24’’S 72º14’48’’W	10–12 m	LACM 73-70	1 v.
Cabo San Pío, Beagle Channel	55º05’36’’S 66º28’48’’W	65–80 m	MLP 13717	55 sps., 149 vs.
	55º03’S 66º37’W	30–35 m	MLP 13718	21 sps., 23 vs.
Isla Becasses, Beagle Channel	54º57’00’’S 67º01’06’’W	30–40 m	MLP 13719	76 sps., 166 vs.
Isla Gable, Beagle Channel	54º54’36’’S 67º21’24’’W	15–20 m	MLP 13706	1 v.
	54º53’S 67º42’W	66–68 m	MLP 13704	88 sps., 165 vs.
Punta Segunda, Beagle Channel	54º51’16.1’’S 68º02’08.9’’W	14 m	MACN-In 39090	4 sps., 2 vs.
	54º50’53.6’’S 68º02’47.8’’W	12 m	MACN-In 39091	4 sps., 1 v.
	54º51’S 68º03’W	90–101 m	MLP 13705	4 sps.
Islas Bridges, Beagle Channel	54º52’S 68º07’W	21–23 m	MLP 13720	3 sps.
	54º51’S 68º09’W	22 m	MLP 13721	2 sps.
	54º52’S 68º13’W	12–20 m	MLP 13722	2 sps.
	54º50’53’’S 68º14’40’’W	16 m	MACN-In 39092	2 sps.
	54º50’00.6’’S 68º15’63’’W		MACN-In 39093	6 sps. 2 vs.
Between Isla Lucas and Isla Willy, Beagle Channel	54º51’57.9’’S 68º10’44.4’’W	16 m	MACN-In 39094	2 sps.

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TABLE 1. (Continued)

Site of collection	Latitude / Longitude	Depth	Repository	No. specimens
Bahía Ushuaia, Beagle Channel	54º50’S 68º15’W	18–21 m	MLP 13723	11 sps.
	54º50’00.6’’S 68º15’63’’W	30 m	MACN-In 39095	3 sps.
Punta Occidental, Beagle Channel	54º52’S 68º18’W	74–98 m	MLP 13703	4 sps.
Bahía Golondrina, Beagle Channel	54º50’S 68º19’W	5 m	MLP 13726	7 sps.
	54º51’S 68º19’W	5–10 m	MLP 13725	2 vs.
	54º50’15’’S 68º20’00’’W	5 m	MLP 13724	2 sps., 1 v.
Bahía Lapataia, Beagle Channel	54º51’S 68º29’W	20–31 m	MLP 13727	2 sps.
	54º51’S 68º31’W	19 m	MLP 13728	1 sp.
	54º52’S 68º31’W	29–33 m	MLP 13707	2 sps.
	54º51’35.7’’S 68º32’43.1’’W	16 m	MACN-In 39096	8 sps., 1 v.
Monte Moat, Beagle Channel	55º02’S 68º42’W	15–20 m	MLP 13729	5 vs.
Cape Horn	55º44’09.6’’S 66º17’18’’W	198 m	ZMB 103423	8 sps.
			ZMB 103461	8 sps., 22 vs.
Valparaíso, Chile	[33º03’S 71º37’W]		LACM 168519	5 vs.
Chile	approx. 33º59’S 71º38’W		LACM 65-110a	1 a. v., 2 vs.
			LACM 65-110b	2 a. vs.
Golfo Corcovado, Chile	42º42’S 72º52’W	intertidal	LACM 75-41	3 a. vs., 1 v.
Westhoff Island, Chile	43º54’S 73º43’W		LACM 73-75	15 vs.
Canal Moraleda, Chile	45º21’10’’S 73º38’88’’W	140 m	MNHNCL 7148	2 vs.
Golfo Elefantes, Chile	45º55’13’’S 73º39’31’’W	10 m	MNHNCL 169	1 a. v.
Canal Cockburn, Chile	54º22’12’’S 71º21’42’’W	15 m	LACM 73-69	87 a. vs., 29 vs.

TABLE 2. Other published records.

Site of collection	Latitude / Longitude	Depth	Reference
Bahía de Valparaíso, [Chile]	[33°S]		Ramorino, 1968