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Article

Diversity and distribution of micromolluscs (Gastropoda and Bivalvia) from the marine Quaternary of Argentina (SW Atlantic): palaeoenvironmental, palaeoclimate, palaeoceanographical implications

by

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with 9 plates, 3 text-figures and 3 tables

Abstract

We present a thorough review of the most characteristic micromolluscs preserved in Late Quaternary (Mid-Late Pleistocene-Holocene) shell-rich assemblages from coastal deposits along Argentina (Southwestern Atlantic margin, SWA). In spite of their palaeoenvironmental-palaeoclimate-palaeoceanographical value they have been poorly known, often overlooked or undertreated. This review synthesizes their diversity, morphological range and distribution in space and across time between the Río de La Plata margin and southern Patagonia, with implications to improve estimations of molluscan richness in the SWA and adding to the still open debate about the number of valid species defining the marine realm worlwide. Microgastropods (29 species) and microbivalves (16) represent 45 % of the total molluscan content. *Littoridina*, *Turbonilla*, *Anachis*, *Olivella*, *Corbula* exhibit wide morphological variation often represented by intraspecific ecomorphs. Most taxa are exclusive for the Holocene (many for the Bonaerensian area), four (*Cochliolepis surensis*, *Teinostoma maldonadense*, *Caecum antillarum*, *Crassinella lunulata*) apparently absent in the modern adjacent littoral. Despite some taxonomic groups and areas are better known than others, overall micromoluscs are useful and reliable paleoenvironmental/palaeoceanographical markers. Several are indicative of marginal marine environments (mixo-polyeuhaline): *Littoridina australis*, *Cerithiopsis greeni, Marshallora* agg. *nigrocincta*, *Caecum antillarum*, *Carditamera guppyi*, *Abra aequalis*, *Petricola pholadiformis*, *Corbula* spp. Rounded-subelliptic shells (*Littoridina*, *Olivella*) and subcircular-subovate (*Nucula*, *Diplodonta*, *Corbula*) offer higher preservation potential and are indicative of soft bottoms within low to moderate energetic conditions, their high taphonomic loss/absence suggesting higher energetic settings. The occurrence of *Cerithiopsis greeni*, *Marshallora* agg. *nigrocincta*, *Caecum antillarum*, *Anachis obesa*, *Iselica globosa*, *Careliopsis styliformis* indicate warmer waters than present due to changes in palaeoclimate (Mid-Holocene amelioration)-palaeoceanographical (more intensified Brazilian current) patterns. *C. crispula* is the only endemic from the southern hemisphere. In spite of their small size, many shells were affected by bioerosion produced by varied trace makers, during life or postmortem, providing useful clues of otherwise unknown biotic interactions and palaeoenvironmental conditions in the Argentinean littoral during the latest sea-level episodes.

Keywords: microgastropods, microbivalves, Late Pleistocene-Holocene, Río de La Plata-Patagonia, palaeoclimates

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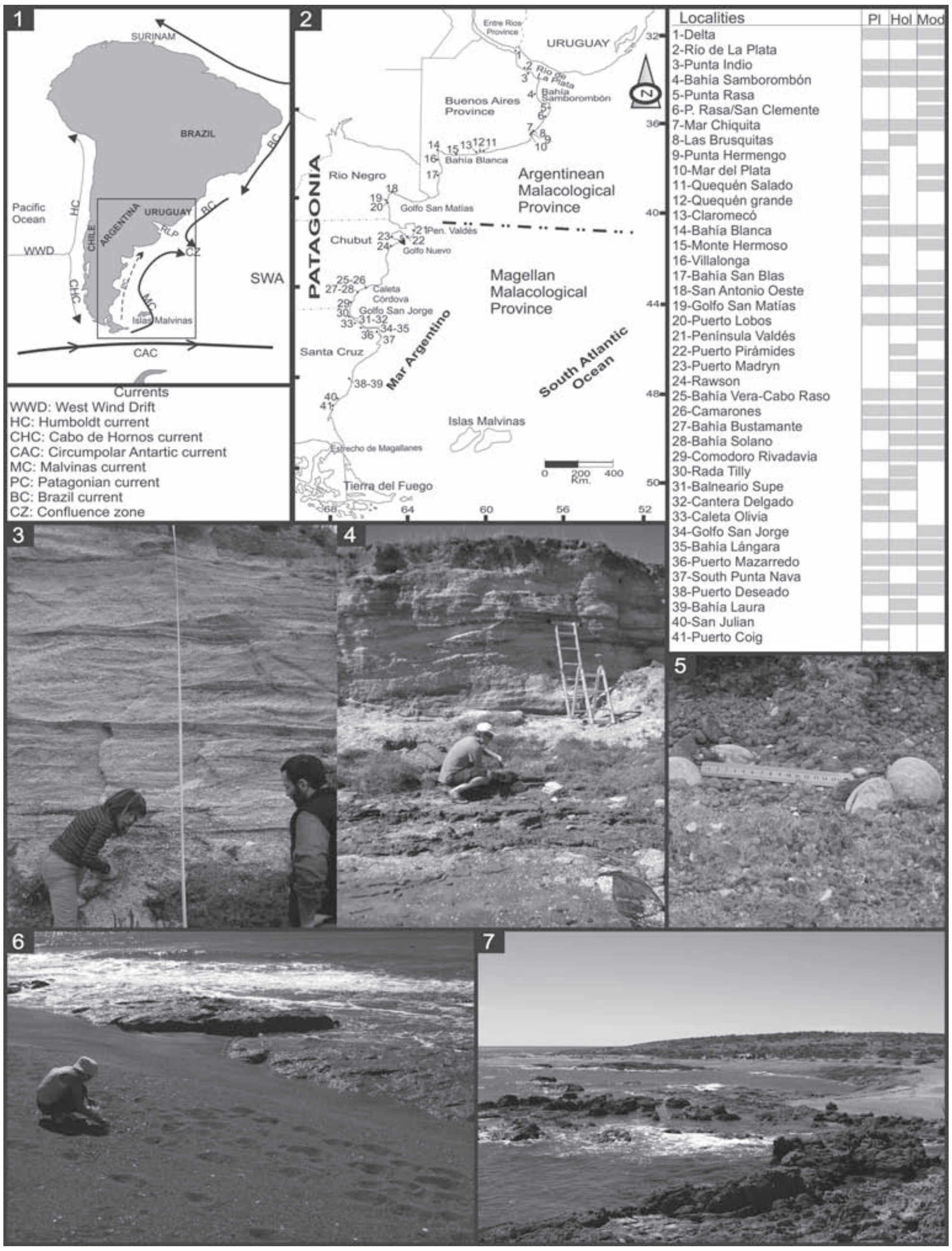
1. Introduction

Shell-rich assemblages are exceptionally well preserved within the most recent Quaternary coastal deposits exposed in Argentina, along the southernmost Southwestern Atlantic margin (SWA) (South America) (Text-fig. 1), where molluscs represent the main biogenic content (80–90 %), associated with other invertebrate groups (e.g., cnidarians, bryozoans, brachiopods, polyplacophores, scaphopods, serpulids, balanids, echinoids) (Feruglio 1950, Farinati 1985, 1989, Aguirre 1990a, Aguirre et al. 2009, Richiano et al. 2012, 2013, 2015). They were described and studied from several standpoints and following a wide range of scientific research lines (earth sciences and geochronology, palaeontology, geoarchaeology, historical biology, palaeobiogeography, geochemistry). The knowledge of Late Quaternary micromolluscs from Argentina is still poor. Compared to the very abundant and much better known macromolluscs, by contrast, micromolluscs are scarcer, less well known, often overlooked, undertreated and not as yet reviewed, although historical mis-identifications still need corrections and even when small shells represent an important feature of the shelf benthos dominated by bivalve and gastropod molluscs.

Actually, it has been estimated that micromolluscs represent 50 % of the biodiversity of living faunas, while approximately 27 % loss of the total biodiversity into the fossil record (Cherns & Wright 2011) or 50 % among infaunal bivalve genera missing from the fossil record (Valentine et al. 2006). In addition, accurate estimations of species richness are imperative for the SWA coastal area, adding to the still open debate about the number of valid species defining the marine realm worlwide, their distribution and abundance (e.g., Census of Marine Life, Boltovskoy 2007, Crame 2000, Bouchet 2006, Mikkelsen 2011, Lutaenko & Noseworthy 2012, Huang et al. 2015).

For our area and time slice considered, among a total of 161 common molluscan species so far recovered (91 gastropods and 70 bivalves, Farinati 1985, Aguirre 1993a, b, c, 2003, Aguirre et al. 2005a, b, 2006, 2011a, 2015), 45 taxa (ca. 28 %) are represented by micromolluscs: microgastropods (29 species, ca. 64 %) and microbivalves (16 species, ca. 36 %) (Tables 1a, b, 2). Moreover, in spite of the palaeoecological, palaeoenvironmental and palaeobiogeographical significance of micromolluscs (e.g., Bock & Moore 1971, Beu & Maxwell 1990, Griffin et al. 1998, Bouchet et al. 2002, Valentine et al. 2006, Signorelli et al. 2006, Cherns & Wright 2011, Griffin & Pastorino 2012), except for few novel contributions their knowledge for the marine Late Quaternary in the large area considered is poor (i.e., Farinati 1993, 1994, Farinati et al. 2006, Aguirre 1993a, b, c, 1994), They have been either unreported, not illustrated, erroneously classified or undertreated and only mentioned within taxonomic lists in the context of general geological or palaeontological studies. Consequently, they need to be reviewed and updated and their palaeoenvironmental-palaeoclimate-palaeoceanographical significance constrained.

The aim of this paper is to make the diversity and distribution of micromolluscs from the marine Quaternary of Argentina known and to assess whether any of them could be employed as reliable paleoenvironmental markers. We present a comprehensive list with illustrations of the most characteristic micromolluscan taxa so far identified, including reappraisals of their morphological variability range, based on a compilation of large and disperse bibliographic sources, examination of materials field-own-collected from the marine Quaternary between the Río de La Plata margin (Bonaerensian littoral) and southern Santa Cruz province (Patagonia), as well as from museum collections, research institutions and oceanographical expeditions performed/carried our along the Mar Argentino. It is widely known that synonymies play an



Text-fig. 1. Area of study, modern littoral and fossiliferous deposits sampled between the Río de La Plata margin and Rincón del Buque-Puerto Coig (southern Patagonia), modern biogeographical provinces, modern circulation patterns of the Mar Argentino (South Western Atlantic) and of southern South America includying the southeastern Pacific sector. **1:** Main oceanic currents (modified from Aguirre et al. 2011a, 2013). **2:** Localities of the modern littoral and fossiliferous deposits. **3–4:** Holocene, Cerro de la Gloria Mb of the Las Escobas Formation (Bahía Samborombón, Buenos Aires province). **5:** Late Pleistocene, Bahía Camarones, Patagonia. **6:** modern littoral, Cabo Raso, Patagonia. **7:** modern littoral, south of Camarones, Patagonia. Detailed information about chronostratigraphical and lithostratigraphical units available elsewhere (Aguirre et al. 2011a, b, 2013).

important role in biodiversity studies (e.g., Benton 2008), thus an essential task to complement the record of molluscan biodiversity in space and time for the marine Quaternary of Argentina and to supply evidence for the role of micromolluscs in fossil biodiversity, a topic of growing interest worldwide (see Cooper et al. 2006, Sasaki 2008, Aravind et al. 2008, Cherns & Wright 2011, Micali et al. 2015).

Table 1. Systematic lists of micromolluscan taxa recovered. **1a:** Gastropoda and **1b:** Bivalvia.

1a	
	Class Gastropoda Cuvier, 1791
	Clade Caenogastropoda Cox, 1960
	Superorder Hypsogastropoda Ponder & Lindberg, 1947
	Order Littorinimorpha Golikov & Starobogatov, 1975
	Superfamily Vanikoroidea Gray, 1840
	Genus *Megalomphalus* Brusina, 1871
1	*Megalomphalus argentina* (Castellanos, 1975)
	Sorbeoconcha Ponder & Lindberg, 1997
	Superfamily Eulimoidea Philippi, 1853
	Family Eulimidae Philippi, 1853
	Genus *Melanella* Bowdich, 1822
2	*Melanella solitaria* (E. A.Smith, 1915)
	Superfamily Triphoroidea Gray, 1847
	Family Cerithiopsidae H. Adams & A. Adams, 1853
	Genus *Cerithiella* Verrill, 1882
3	*Cerithiella burdwoodiana* (Melvill & Standen, 1912)
	Superfamily Cerithioidea Fleming, 1822
	Genus *Cerithiopsis* Forbes & Hanley, 1850
4	*Cerithiopsis greeni* (C. B. Adams, 1839)
	Family Triphoridae Gray, 1847
	Genus *Marshallora* Bouchet, 1985
5	*Marshallora agg. nigrocincta* (C. B. Adams, 1839)
	Superfamily Truncatelloidea Gray 1840
	Family Caecidae Gray, 1850
	Genus *Caecum* Fleming, 1813
6	*Caecum antillarum* Carpenter, 1858
	Family Hydrobiidae Stimpson, 1865
	Genus *Littoridina* Souleyet, 1852
7	*Littoridina australis* (d'Orbigny, 1835)
	Family Tornidae Sacco, 1896 (1884)
	Genus *Cochliolepis* Stimpson, 1858
8	*Cochliolepis surensis* Farinati, 1985
	Genus *Teinostoma* H. & A. Adams, 1853
9	*Teinostoma maldonadense* Farinati, 1985
	Clade Neogastropoda Wenz, 1938
	Family Columbellidae Swainson, 1840
	Genus *Anachis* H. Adams & A. Adams, 1853
	Subgenus *Costoanachis* Sacco, 1890
10	*Anachis* (*Costoanachis*) *avara* (Say, 1822)
	Subgenus *Parvanachis* Radwin, 1968
11	*Anachis* (*Parvanachis*) *isabellei* (d'Orbigny, 1839)
12	*Anachis* (*Parvanachis*) *obesa* (C. B. Adams, 1845)
	Superfamily Conoidea Fleming, 1822
	Family Drilliidae Olsson, 1964
	Genus *Drillia* Gray, 1838
13	*Drillia patagonica* d'Orbigny, 1841
	Family Mangeliidae P. Fischer, 1883
	Genus *Mangelia* Risso, 1826
14	? *Mangelia* cf. *purissima* (Strebel, 1908)
	Family Olividae Latreille, 1825
	Subfamily Olivellinae Troschel, 1869
	Genus *Olivella* Swainson, 1831

	Subgenus *Olivina* D'Orbigny, 1840
15	*Olivella* (*Olivina*) *plata* (Ihering, 1909)
16	*Olivella* (*Olivina*) *tehuelcha* (Duclós, 1835)
	Clade Heterobranchia
	Subclass Heterobranchia J. E.Gray, 1840
	Superfamily Mathildoidea Dall, 1889
	Family Mathildidae Dall, 1889
	Genus *Turritelopsis* G. O. Sars, 1878
17	*Turritellopsis marplatensis* Castellanos & Landoni, 1984
	Superfamily Pyramidelloidea Gray, 1840
	Family Amathinidae Ponder, 1987
	Genus *Iselica* Dall, 1918
18	*Iselica globosa* (C. H. Lea, 1845)
	Family Pyramidellidae Gray, 1840
	Genus *Carelliopsis* Mörch, 1875
19	*Careliopsis styliformis* (Mörch, 1875)
	Genus *Turbonilla* Risso, 1826
20	*Turbonilla americana* (d'Orbigny, 1840)
21	*Turbonilla fasciata* (d'Orbigny, 1840)
22	*Turbonilla interrupta* Totten, 1835
23	*Turbonilla rushii* Bush, 1899
24	*Turbonilla sanmatiensis* Castellanos, 1982
25	*Turbonilla smithi* Pfeffer, 1905
26	*Turbonilla uruguayensis* Pilsbry, 1897
	Genus *Chrysallida* Carpenter, 1856
27	*Chrysallida multituberculata* (Castellanos, 1982)
	Family Acteonidae d'Orbigny, 1843
	Genus *Actaeocina* Gray, 1847
28	*Actaeocina candei* (d'Orbigny, 1841)
	Informal Group Opistobranchia Milne Edwards, 1848
	Clade Cephalaspidea
	Family Cylichnidae H. Adams & A. Adams, 1854
	Genus *Cylichna* Lovén, 1846
29	*Cylichna crispula* Watson, 1883
	1b
	Class Bivalvia Linné, 1758
	Subclass Protobranchia Pelseneer, 1889 [= Palaeotaxodonta Korobkov, 1954
	Order Nuculida Dall, 1889
	Superfamily Nuculoidea Gray, 1824
	Family Nuculidae Gray, 1824
	Subfamily Nuculinae Gray, 1824
	Genus *Nucula* Lamarck, 1799
	Subgenus *Nucula (Nucula)* Quenstedt, 1930
1	*Nucula* (*Nucula*) *nucleus* (Linné, 1758)
2	*Nucula* (*Leionucula*) *obliqua* (Lamarck, 1819)
	Subclass Autobranchia Grobben, 1804
	Superorder Pteriomorphia Beurlen, 1944
	Order Mytilida Férussac, 1822
	Superfamily Mytiloidea Rafinesque, 1815
	Family Mytilidae Rafinesque, 1815
	Subfamily Mitylinae Rafinesque, 1815
	Genus *Musculus* Röding, 1798
3	*Musculus viator* (d'Orbigny, 1846)

	Clade Heterodonta Neumayer, 1884
	Infraclass Euheterodonta
	Order Veneroida Gray, 1854
	Superfamily Ungulinoidea Gray, 1854
	Family Ungulinidae Gray, 1854 (= Diplodontidae Carter, 1861)
	Genus *Diplodonta* Bronn, 1831
	Subgenus *Diplodonta* (*Diplodonta*) Bronn, 1831
4	*Diplodonta* (*Diplodonta*) *patagonica* (d'Orbigny, 1842)
	Subgenus *Diplodonta (Felaniella)* Dall, 1899
5	*Diplodonta* (*Felaniella*) *vilardeboana*(d'Orbigny, 1846)
	Subgenus *Diplodonta* (*Phlyctiderma*) Dall, 1899
6	*Diplodonta* (*Phlyctiderma*) *semiaspera* (Philippi, 1836)
	Infraclass Archiheterodonta Giribet in Taylor, Williams, Glover & Dyal, 2007
	Order Carditida Dall, 1889
	Superfamily Carditoidea Férrussac, 1822
	Subfamily Carditamerinae Chavan in Cox *et al*., 1969
	Genus *Carditamera* Conrad, 1838
7	*Carditamera* (*Carditamera*) *guppyi* (Dall, 1900)
	Superfamily Crassatelloidea Férrussac, 1822
	Family Crassatellidae Férrussac, 1822
	Subfamily Scambulinae Chavan, 1952
	Genus *Crassinella* Guppy, 1874
8	*Crassinella lunulata* (Conrad, 1834)
	Family Semelidae Stoliczka, 1870
	Genus *Abra* Lamarck, 1818
9	*Abra* (*Abra*) *aequalis* (Say, 1822)
	Superfamily Veneroidea Rafinesque, 1815
	Family Veneridae Rafinesque, 1815
	Subfamily Petricolinae d´Orbigny, 1840
	Genus *Petricola* Lamarck, 1801
10	*Petricola* (*Petricola*) *lapicida* (Gmelin, 1791)
	Subgenus *Petricola* (*Petricolaria*) Stolickzka, 1870
11	*Petricola (Petricolaria) pholadiformis* Lamarck, 1818
	Subfamily Gemminae Dall, 1895
	Genus *Gouldia* C.B.Adams, 1847
12	*Gouldia camachoi* Farinati, 1985
	Order Myoida Stoliczka, 1870
	Superfamily Myoidea Lamarck, 1809
	Family Myidae Lamarck, 1809
	Genus *Sphenia* Turton, 1822
13	*Sphenia hatcheri* Pilsbry, 1899
	Genus *Corbula* Bruguiére, 1797
	Subgenus *Corbula* (*Corbula*) Bruguiére, 1797
14	*Corbula (Corbula) patagonica* d'Orbigny, 1846
	Subgenus *Corbula* (*Caryocorbula*) J.Gardner, 1926
15	*Corbula* (*Caryocorbula*) *caribaea* d'Orbigny, 1846
16	*Corbula* (*Caryocorbula*) *lyoni* Pilsbry, 1897

Table 2. General characteristic micromolluscan fauna from Quaternary marine terraces along the coastal area of Argentina. Geographical and stratigraphical distribution of the taxa analyzed. **2a:** Gastropods, **2b:** Bivalves. Stratigraphical range: **OLIG:** Oligocene, **MIOC:** Miocene, **PLIOC:** Pliocene, **PL:** Pleistocene, **HOL:** Holocene. Geographical range: records within marine Quaternary deposits from the Bonaerensian (**BON**) and Patagonian (**PAT**) littoral in Argentina, other coastal areas along South America: **SUR:** Surinam, **BR:** Brazil and **ROU:** Uruguay. Information on the biogeographical distribution along the modern malacological provinces, shallow water temperature affinity and occurrence along the adjacent littoral are indicated for each taxon. Modern Zoogeographical provinces: **ANT** = Antillean Province, **BRA** = Brazilian Province, **ARG** = Argentine Province, **MAG** = Magellanean Province. **SST**: sea surface water. **W**: warm or warm-temperate affinity, typical of warm shallow water masses. **C:** cold water affinity. **A:** absent.

Distribution (Space & Time)		Stratigraphical range				Fossil records in the SWA					Modern malacological provinces					SST	
	OLIC	MIOC	PLIOC	PL	HOL	SUR	BR	ROU	BON	PAT	ANT	BR	ARG	MAG	A	W	C
2a: Class Gastropoda Cuvier, 1791																	
Megalomphalus argentina (Castellanos, 1975)					▨				▨							▨	
Melanella solitaria (E. A. Smith, 1915)					▨				▨				▨	▨			▨
Cerithiella burdwoodiana (Melvill & Standen, 1912)					▨				▨					▨			▨
Cerithiopsis greeni (C. B. Adams, 1839)					▨			▨	▨		▨	▨	▨		▨	▨	
Marshallora agg. *nigrocincta* (C. B. Adams, 1839)					▨			▨	▨		▨	▨	▨		▨	▨	
Caecum antillarum Carpenter, 1858					▨			▨	▨		▨	▨	▨		▨ ?	▨	
Littoridina australis (d'Orbigny, 1835)				▨	▨	▨ ?	▨	▨	▨	▨	▨	▨	▨		▨	▨	
Cochliolepis surensis Farinati, 1985					▨				▨				?		▨		
Teinostoma maldonadense Farinati, 1985					▨				▨				?		▨		
Anachis (*Costoanachis*) *avara* (Say, 1822)		▨		▨	▨			▨	▨	▨ ?	▨	▨	▨			▨	
Anachis (*Parvanachis*) *isabellei* (d'Orbigny, 1839)				▨	▨		▨		▨		▨	▨	▨	▨ ?			
Anachis (*Parvanachis*) *obesa* (C. B. Adams, 1845)		▨		▨	▨		▨	▨			▨	▨	▨		▨	▨	
Drillia patagonica d'Orbigny, 1841				▨	▨		▨	▨	▨	▨			▨	▨			▨
Mangelia cf. *purissima* (Strebel, 1908)				▨	▨				▨	▨			▨	▨			▨
Olivella (*Olivina*) *plata* (Ihering, 1909)					▨			▨	▨				▨ ?			▨ ?	
Olivella (*Olivina*) *tehuelcha* (Duclós, 1835)		▨		▨	▨	▨	▨	▨	▨	▨		▨	▨	?	▨	▨	
Turritellopsis marplatensis Castellanos & Landoni, 1984					▨				▨				▨ ?		?	▨	
Iselica globosa (H. C. Lea, 1845)			▨	▨	▨			▨	▨		▨	▨	▨		▨	▨	
Careliopsis styliformis (Mörch, 1875)					▨		▨	▨	▨						?	▨	
Turbonilla americana (d'Orbigny, 1840)					▨		▨		▨		▨	▨	▨			▨	
Turbonilla fasciata (d'Orbigny, 1840)					▨			▨	▨			▨	▨			▨	
Turbonilla interrupta Totten, 1835			▨	▨	▨		▨		▨		▨	▨	▨			▨	
Turbonilla rushii Bush, 1899					▨				▨			▨	▨		▨	▨	
Turbonilla sanmatiensis Castellanos, 1982					▨				▨				▨			▨	
Turbonilla smithi Pfeffer, 1905					▨				▨				▨	▨			▨
Turbonilla uruguayensis Pilsbry, 1897				▨	▨		▨	▨	▨			▨	▨			▨	
Chrysallida multituberculata (Castellanos, 1982)					▨				▨				▨	▨			?
Actaeocina candei (d'Orbigny, 1841)				▨	▨		▨		▨		▨	▨	▨		?	▨	
Cylichna crispula Watson, 1883					▨		▨		▨		▨	▨	▨			▨	
2b: Class Bivalvia Linné, 1758																	
Nucula (*Nucula*) *nucleus* (Linné, 1758)	▨	▨	▨	▨	▨	?	▨	▨	▨	?	▨	▨	▨	?		▨	
Nucula (*Leionucula*) *obliqua* (Lamarck, 1819)		▨	▨	▨	▨	?	▨	▨	▨	▨	▨	▨	▨	?		?	
Musculus viator (d'Orbigny, 1846)					▨				▨	?		?	▨	▨		▨	
Diplodonta (*Diplodonta*) *patagonica* (d'Orbigny, 1842)			▨	▨	▨			▨	▨			▨	▨	?		▨	
Diplodonta (*Felaniella*) *vilardeboana* (d'Orbigny, 1846)		▨	▨	▨	▨			▨	▨			▨	▨			▨	
Diplodonta (*Phlyctiderma*) *semiaspera* (Philippi, 1836)		?			▨		▨	▨	▨		▨	▨	▨		?	▨	
Carditamera (*Carditamera*) *guppyi* (Dall, 1900)		▨	▨	▨	▨		▨	▨	▨		▨	▨	▨			▨	
Crassinella lunulata (Conrad, 1834)					▨				▨		▨	▨	▨			▨	
Abra (*Abra*) *aequalis* (Say, 1822)		▨	▨	▨	▨	▨	▨	▨	▨	?	▨	▨	▨		▨	▨	
Petricola lapicida (Gmelin, 1791)			▨	▨	▨		▨	▨			▨	▨	▨				
Petricola (*Petricolaria*) *pholadiformis* Lamarck, 1818		▨	▨	▨	▨	▨		▨	▨		▨	▨	▨		▨	▨	
Gouldia camachoi Farinati, 1985					▨			▨			▨	▨	▨		?		
Sphenia hatcheri Pilsbry, 1899					▨		▨	▨	▨				▨	▨			▨
Corbula (*Corbula*) *patagonica* d'Orbigny, 1846		▨	▨	▨	▨	▨	▨	▨	▨		▨	▨	▨	▨ ?		▨	
Corbula (*Caryocorbula*) *caribaea* d'Orbigny, 1846		?	▨	▨	▨		▨		▨		▨	▨	▨			▨	
Corbula (*Caryocorbula*) *lyoni* Pilsbry, 1897		▨	▨	▨	▨	▨	▨	▨				▨	▨			▨	

2. Geological Setting

Area of study

The molluscan assemblages are extensively preserved along the entire Argentinean coastal area, from the modern supratidal zone up to a few kilometres inland (reaching up to ca. 30 km). The coastal deposits (beach ridges, marine terraces, tidal flats or lagoonal facies) are excellent testimonies of transgressive-regressive episodes occurred during the last climatic cycles since Marine Isotope Stage (MIS) 11 (ca. 400 ka B.P.) until MIS1 (Holocene) (Lisiecki & Raymo 2005, O'Leary et al. 2013) which left the most abundant and better preserved molluscan assemblages between the Río de La Plata and southern Santa Cruz province (Text-fig. 1: 2–7) and can be correlated with approximately synchronous shelly accumulations preserved in nearby coastal areas of the SWA (Surinam, southern Brazil and Uruguay).

Most of the fossiliferous deposits were accumulated during the Holocene (MIS1, mainly during the Mid-Holocene) and since Mid-Late Pleistocene (MIS11: ca. 400ka B.P., MIS9: 325ka B.P., MIS7: ca. 225 ka B.P., MIS5: ca. 125ka B.P.), of which the most continuous and richest belong to MIS1, 5 and 7. Complete source of information for morphostratigraphy, sedimentology, geochronological, taphonomical and palaeoecological aspects of these deposits is available elsewhere (e.g., Aguirre & Whatley 1995a, Aguirre et al. 2011a, b, Ribolini et al. 2011, Richiano et al. 2013, 2015, Aguirre et al. 2013, 2015 and other references therein).

The Bonaerensian localites sampled belong to the Late Quaternary beach ridge sections and estuarine facies at four major areas (Punta Indio-Punta Piedras, Bahía Samborombón, Mar Chiquita, Bahía Blanca) and marine terraces along Patagonia (Río Negro, Chubut and Santa Cruz provinces) (Text-fig. 1: 3–5). Detailed source of information for the deposits sampled are avilable elsewhere (Richiano et al. 2012, 2013, 2015, Aguirre et al. 2013 and other references therein). In Patagonia many marine terraces containing abundant and well preserved molluscan shells are unfortunately still undated, some reported as early Pleistocene are in fact pre-Quaternary, possibly Pliocene in age (Rovere et al. 2015), which must be confirmed by further modern geochronological studies. Therefore, emphasis was put on the Holocene landforms.

The modern oceanic littoral of Argentina (Text-fig. 1: 1) is influenced by two main shallow oceanic currents: the warm (subtropical) Brazilian Current and the cool (sub-Antarctic) Malvinas (Falkland) Current. Consequently, the so-called Mar Argentino is characterised by subtropical warm-temperate and cold sub-Antarctic water masses defining two malacological provinces: Argentine (or Argentinean) and Magellan (or Magellanean). Four salinity fronts and three thermal fronts have been described for the whole area. detailed information about the physical parameters of the Rio de la Plata and the geographical influence of its plume have been documented elsewhere (Bogazzi et al. 2005, Giberto et al. 2004, 2007, Giberto 2008, Piola et al. 2010 and other references therein).

3. Micromolluscs

According to bibliographic sources, the average size limit acknowledged for "micromolluscs" is not objectively established and appears at least clearly arbitrary, e.g., less than 10 mm (Kay 1980, Beu & Maxwell 1990), less than 5 mm (Geiger et al. 2007), less than 4.1 mm (Bouchet et al. 2002), less than 20 mm (Griffin & Pastorino 2012). Micromolluscs (Gastropoda and Bivalvia) are here defined as those specimens reaching their most common or average optimal adult size up to ca. 12–15 mm. Although in some cases (e.g., species of *Olivella*, *Musculus, Diplodonta, Abra, Corbula*) less abundant or uncommon specimens can be larger, these most likely represent extremes within the range of morphological variation of the species concerned. On the other hand, shell specimens of some gastropod genera preserved in Late Quaternary Argentinean deposits have been erroneously reported as micromolluscs (e.g., *Epitonium, Calliostoma*), when in fact they represent shells of young ontogenetic stages (juvenile specimens) which achieve a few mm, while adults can reach well over 15 mm (up to 31 mm in the SWA). Juvenile ontogentic stages, however, cannot be a basis on which to establish the status of micro or macromolluscan size condition of the taxa involved.

In relation to the term "micromollusc", it is outstanding that in the Argentinean local literature it has not been defined previously. In classical monographic studies carried out in the XIX century, Darwin (1846) spoke of "minute species" in reference to micromollluscs studied by d'Orbigny (1834–1847), who illustrated and mentioned the dimensions of the materials he collected in South America (e.g., bivalves such as *Corbula, Cardita, Nucula* and gastropods like *Olivella* and *Turbonilla*). On the other hand, for some of our species originally studied from the northern hemisphere, among others Adams & Adams (1858), Bush (1899), Dall (1889) used “small shells” or “little shells”. In the XX century, different authors continued employing ambiguous words in their descriptions to refer to micromolluscs from varied geographical areas: Dall & Bartsh (1909, 1911) used “shell minute”, Thiele (1935) “shell very small”, Pilsbry & Mc Ginty (1949) “small beautiful shells”, and Sasaki (2008) “small-size species”. García Cubas (1963), Bock & Moore (1971), Castellanos (1979a, b, 1981, 1988), Castellanos & Landoni (1984) figure among the pioneers using “micromolluscs”, later Beu & Maxwell (1990) and Griffin & Pastorino (2012) for the areas of Gulf of Mexico, Argentine continental shelf, Bahamas, New Zeland, and southern Santa Cruz province in Patagonia (Argentina).

Due to their small size, the study of microgastropods and microbivalves requires different, time consuming methodological steps following similar to micropalaeontological procedures, in contrast to macromolluscan shells: higher amounts of samples need to be taken from the field, dry sieving through different mesh sizes (generally between 0.5 to ca. 5 mm) to facilitate identification, careful washing under current water and/or ultrasonic cleaner, drying and discrimination of microspecimens by picking under binocular microscope or magnifying glasses, appropriate storage afterwards (for details on specific techniques see Beu & Maxwell 1990, Geiger et al. 2007). Conversely, marine macromolluscs from our area, exhibiting a range size greater than 20 mm (20–50 mm in average), are generally more abundantly preserved within coastal raised deposits and washed ashore along the modern beaches. Thus, they are more noticeably in the field, easier to collect as bulk samples or by hand, either by biologists, palaeontologists or geologists, resulting in their more abundant and better known records. Consequently, mainly for this reason, micromolluscs have been comparatively postponed in previous comprehensive studies for our area and time span.

4. Background for molluscan assemblages preserved in the marine Quaternary of Argentinean SWA and the lack of micromolluscan records

Most of the modern gastropod and bivalve taxa recorded from the Mar Argentino and from Neogene and Quaternary deposits preserved in Argentina (Bonaerensian and Patagonian coastal sectors) have been known since historical expeditions carried out in the course of the nineteenth and twentieth centuries, like the “Beagle”, “Challenger”, “Gazelle”, “France”, “Hassler”. Also through classical monographic contributions such as d’Orbigny (1834–1847, 1841–1842), Pilsbry (1897, 1899), Ortmann (1902), Strebel (1905, 1908, among others), Ihering (1907), Smith (1915). Especially in the XX century, several catalogues represent the main source of reference for descriptions and illustrations of the modern and/or subfossil and fossil materials from Argentina: Feruglio (1933, 1950), Carcelles (1944, 1950), Carcelles & Williamson (1951), Frenguelli (1957) and other therein), Camacho (1966), Castellanos (1967). Also, several malacological collectionists have provided compendiums and popular illustrated catalogues dealing mostly with macromolluscs from the Argentine and Magellanean malacological provinces (e.g., Ríos 1975, 1985, 1994, Núñez Cortés & Narosky 1997, Forcelli 2000).

Lists of species have also been provided from campaigns of oceanographic expeditions along the Argentine continental shelf and the SWA, during which molluscs were collected together with other invertebrate groups, among others: “Vema” (Richards & Craig 1963), “Walther Herwig” (Castellanos & Menni 1968), “Hero” and “San Luis” (Castellanos 1978), “Shinkai-Maru” (Castellanos 1982a, 1983, Bastida et al 1981, 1992, 2007), “Canepa” (Roux et al. 1988), “Oca Balda” (Roux et al. 1993), “Holmberg” (Roux & Bremec 1996). Most of these authors, however, did not focus specifically on the diversity, distribution and abundance of the micromolluscan taxa.

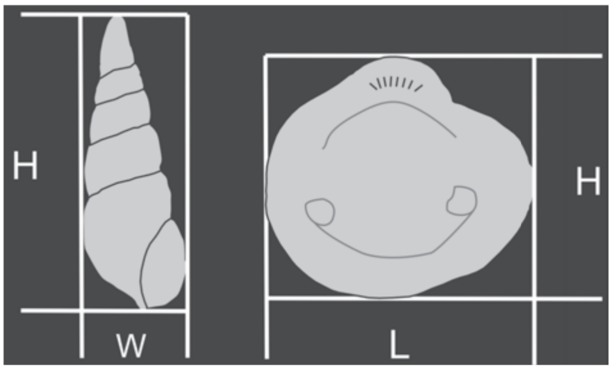
Specific contributions by Castellanos & Fernández (1965a, b), Castellanos (1969, 1975, 1979a,b, 1981, 1982a,b, 1983, 1988), Castellanos & Landoni (1982, 1984, 1990, 1993), Castellanos et al. (1987), provided the first explicit mentions, descriptions and illustrations of modern microgastropods and microbivalves from Argentina includying some of our taxa, Pastorino & Zelaya (2001) studied modern Eulimid gastropods from the Staten Island (southern SWA). On the other hand, for the marine Quaternary of Argentina, even though not unnoticed, micromolluscs have so far only briefly dealt with, especially for Bahía Blanca (southeastern Bonaerensian area) by Farinati (1978, 1985, 1993,1994) and for Punta Indio-Bahía Samborombón (northeastern

Bonaerensian area) by Aguirre (1993a, b, c, 1994) providing the first illustrations of the type material of some of those species which had been described by historical expeditionists, and analysing palaeoclimatic implications based on the palaeobiogeographical analysis for the Holocene vs. the present.

5. Materials and methodology

A total of 77 localities were considered along the Bonaerensian and Patagonian coastal sectors of Argentina down to the Magellan Strait (Text-fig. 1: 2): 48 Quaternary fossiliferous sites (25 Pleistocene, 23 Holocene) and 29 modern (supratidal and intertidal zones). The y were selected from field trips carried out between Berisso (Río de La Plata margin) and Puerto Coig to Magellan Strait (= Estrecho de Magallanes, southern Santa Cruz province). Detailed geological settings for the fossiliferous sites are available elsewhere (Aguirre et al. 2011a, b, 2013, Richiano et al. 2012, 2015, and other references therein). Selection of the fossiliferous localities was determined on the basis of accessibility and preservation of molluscan assemblages.

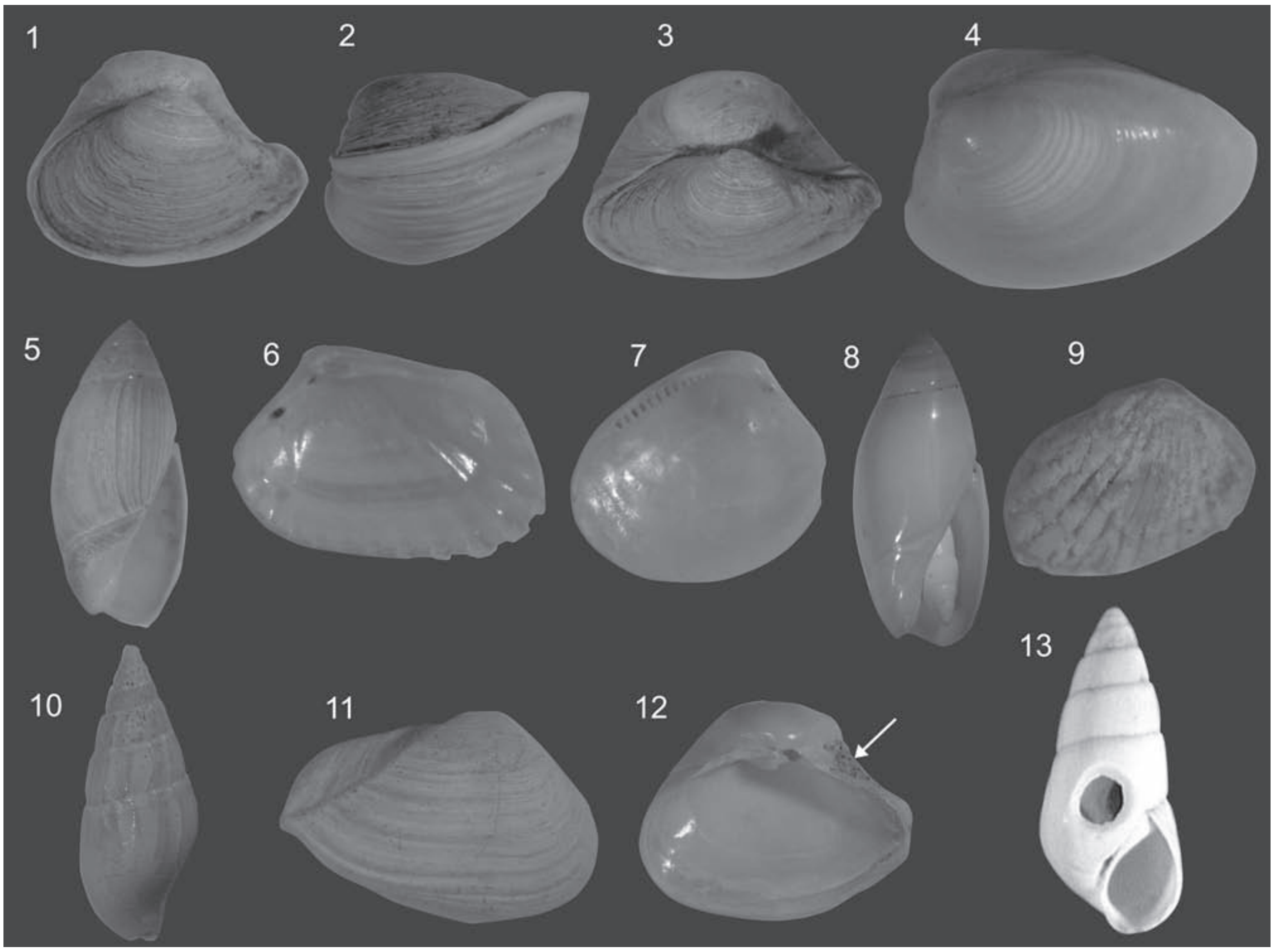
The material examined was obtained from bulk samples (ca. 400 cc of matrix + biogenic content, atop shell concentrations to 30–50 cm deep). The shells studied come from selected molluscan rich layers (4–50 cm thick) (Text-fig. 1: 2–3) with well preserved shells of high taphonomic signatures, allowing objective taxonomic identifications of the specimens recovered. Layers characterized by highly fragmented or intensively abraded shells were avoided. The samples were sieved and washed using different mesh sizes between 4.75 mm and 500 µm (ASTM 4, 14, 25, 35, 4.45 mm, 1.18 mm, 710 µm and 500 µmm, respectively), washed and air-dried. Specimens were picked following similar to micropalaeontological procedures, separated from sedimentary matrix with fine paintbrushes under binocular microscope. The best preserved shells were washed by means of an ultrasonic cleaner (Lilis 3.8) if needed and photographed using a digital camera (Nikon D3100) and a digital camera (Nikon Coolpix S10 VR) attached to a binocular loop (Nikon SMZ1000). Photographs under SEM were performed to bounce important characters for particular species. The materials were scanned with a Hewlett Packard scanjet 4670 for a preliminary evaluation of morphological variability ranges (e.g., *Littoridina, Olivella, Nucula, Corbula*) and measured with calipper and/or with microscope eyepiece reticles. The conventional dimensions considered are height (H) and diameter (D) or width (W) for gastropods and length (L) and height (H) for bivalves (Text-fig. 2).



Text-fig. 2. Schematic diagram of the gastropod and bivalve shell dimensions considered (in mm), **L** = length, **H** = height, **W** = width.

We consider micromolluscs specimens of taxa achieving in average ca. 12–15 mm. Although a few gastropod and bivalve taxa (*i.e.*, *Olivella*, *Musculus, Diplodonta, Phlyctiderma, Abra, Corbula*) can overpass this conventional size limit defined, the majority of fossil and modern adult shell specimens of the species identified are comprised within that size range.

Taxonomic identifications (Table 1a, b) and synonymy lists provided are based on the application of the morphological species concept, on comparisons of the type materials whenever possible and/or the original descriptions and illustration/s of the species dealt with, and examination of molluscan collections from institutions in Argentina and abroad. No new species are here proposed, thus shell descriptions are considered unnecessary and are not provided. For the synonymy lists and to define their distribution in space and time we considered well documented records for each species (illustrated or containing reliable information about the procedence and identity of the material). Additional information dealing with modern classifications, geographical distribution and comparisons with synonimization considered by other authors for the taxa identified was gathered mainly from, Ponder & Lindberg (1997), Bouchet & Rocroi (2005), Bieler et al (2010), Huber (2010), Strong (2011) and from molluscan mega molluscan data bases, e.g. Worms (World Register of Marine Species accessed at http://www.marinespecies.org/aphia.php), GBIF (Global Biodiversity Information Facility at http://www.gbif.org/species), Malacolog Version 4.1.1 (A Database of Western Atlantic Marine Mollusca form the Academy of Natural Sciences at http://www.malacolog.org/search.php?mode = details&waspid = 13887), EOL (Encyclopaedia of Life at http://eol.org/). Our own personal critical criteria, however, were adopted for each case species according to well documented records based on our own collections, those examined from other institutions (see above), comparisons with the type materials (whenever possible), illustrated bibliographic sources, and records available from oceanographical expeditions carried out along the Mar Argentino. The stratigraphical and geographical ranges defined are based on published illustrated records for each species (synthesis in Farinati 1985, Aguirre 1988, Aguirre & Farinati 1999a, Linse 1999, Aguirre & Farinati 2000a, Aguirre et al. 2011a, for the Late Tertiary in Del Río & Martínez 1998, Del Río 2000, Martínez & Del Río 2002, other references therein) and/or on mega databases available in the web (e.g., http//data.gbif.org, http://neogeneatlas.org/species). We use the term Holocene to refer to fossil and subfosil materials collected from fossiliferous Holocene coastal deposits, while Recent applies to modern materials collected in the modern beach and littoral zone and/or examined from museum collections from Argentinean institutions (MLP, MACN, UNS, INIDEP) and from his-



Text-fig. 3. Taphonomic signatures and Bioerosion traces identified on shells of the micromolluscan taxa studied. **1–4**: articulated valves, 1–3: *Corbula patagonica*, Holocene, Bahía Blanca (PI-UNS), 4: *Nucula nucleus*, Holocene, Mar Chiquita area (MLP-PI 26441). **5–8:** original colour and luster, 5: *Olivella tehuelcha*, Holocene, 6: *Carditamera guppyi*, Holocene, Baterías (PI-UNS), 7: *Nucula obliqua*, Holocene, Mar Chiquita area (MLP-PI 26271), 8: *Olivella tehuelcha*, Holocene, Canal de Las Escobas, Bahía Samborombón. **9:** recristallization, *Carditamera guppyi*, Holocene, Mar Chiquita area (MLP-PI 26265). **10–13:** bioerosion signatures, 10: *Anachis avara*, Holocene, Baterías, Bahía Blanca area (PI-UNS), 11: *Corbula lyoni*, Holocene, Ingeniero White, Bahía Blanca area (PI-UNS), 12: encrustation, *Corbula patagonica*, Holocene, Ingeniero White, Bahía Blanca area (PI-UNS), 13: *Littoridina australis*, Holocene, Sauce Chico (PI-UNS).

torical collections (see beneath). For most micromolluscan taxa recovered in the area of study there are no ecological studies performed/available. In the case of gastropods, their life habits and habitats were inferred from those published for the closest species compared, while for bivalves their ecological requirements were gathered mainly from experimental studies carried out by Stanley (1970) for the same or similar species. Observation of taphonomic aspects (Text-fig. 3) followed our previous studies on the macromolluscan content of the same deposits (Aguirre et al. 2011b, Richiano et al. 2012, 2015.).

The abbreviations used, mostly of repositories for collections examined and compared are the following: ANSP (Academy of Natural Sciences of Philadelphia, USA), BMNH (British Museum Natural History, now Natural History Museum of London, NHM), INIDEP (Instituto Nacional de Investigación y Desarrollo Pesquero, Mar del Plata, Argentina), LMMHNP (Laboratoire de Malacologie, Muséum d'Histoire Naturelle de Paris, France, MNHNP), MACN-In (Museo Argentino de Ciencias Naturales Bernardino Rivadavia, Buenos Aires, Argentina, Invertebrates Section), MCZ (Museum of Comparative Zoology, Harvard, USA), MHNG (Museum d'Histoire Naturelle de Genève, Switzerland), MLP-ZI (Museo de Ciencias Naturales de La Plata, Argentina, Zoology Section), MLP-PI Museo de Ciencias Naturales de La Plata, Argentina, Invertebrate Palaeontology Section), MLP-DCG (Museo de Ciencias Naturales de La Plata, Argentina, Geology Section), PI-UNS (Universidad Nacional del Sur, Geology Department, Invertebrate Palaeontology), USNM (United States National Museum, Smithsonian National Museum of Natural History, Washington, USA), ZMD (Zoologisk Museum København, Denmark), SWA (Southwestern Atlantic). When type localities are unknown or broad geographical areas they are not indicated (Plates 1–9).

6. Results

Composition, biogeography, palaeoecology

Our review provided a list of 45 micromolluscan species, overall, a total of 29 microgastropods and 16 microbivalves (Table 1a, b, Plates 1–9). All the species have modern representatives in the SWA, along the Argentinean and/or Magellanean malacological provinces, controlled by the Brazilian and Malvinas currents, respectively (Text-fig. 1: 1–2). There are typical benthic elements of the littoral zone, mainly of the infralittoral. A synthesis of relevant aspects of their distribution in space and time and of their life habits and habitats is shown in Tables 2a, b, 3a, b.

7. Systematic Paleontology

Phylum Mollusca Linné, 1758

Class Gastropoda Cuvier, 1797

Clade Caenogastropoda Cox, 1960

Superorder Hypsogastropoda Ponder & Lindberg, 1947

Order Littorinimorpha Golikov & Starobogatov, 1975

Superfamily Vanikoroidea Gray, 1840
Family Vanikoridae Gray, 1840

Genus *Megalomphalus* Brusina, 1871

Type species: *Stomatia azonea* Brusina, 1865 (type by monotypy), living in the North Atlantic.

Megalomphalus argentina (Castellanos, 1975)

(Plate 1, Figs. 1–2)

1975 *Macromphalina argentina* – Castellanos, p. 135–136, fig. 1.
1980 *Macromphalina argentina* – Figueiras &Sicardi, p. 186.
1985 *Macromphalina argentina* – Farinati, p. 219.
1985 *Macromphalina argentina* – Ríos, p. 42, pl. 16, fig. 187.
1994 *Megalomphalus argentina* – Farinati, p. 306, pl. 2, figs. 4a, b.
1994 *Macromphalina argentina* – Ríos, p. 60, pl. 20, fig. 231.
2015 *Macromphalina argentina* – Rosenberg. – Bouchet, Gofas, Rosenberg, Bank & Bieler. – MolluscaBase. Accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 533005 on 2015-05-19.

Dimensions: (Syntype) H: 2.2 mm, W: 3 mm, aperture: 1.3 × 1.4 mm, umbilicus: 0.8 mm.
Material: 225 shells from the Holocene of Bahía Blanca area [PI-UNS 2694 (1–225)].
Type locality: Holocene from Ingeniero White (Bahía Blanca area, Argentina) (Farinati 1978).
Type series: not designated by Castellanos (1975), who based her description on one specimen provided by Farinati from the Holocene shell ridges of bahía Blanaca.
Stratigraphic range: Holocene-Recent.
Records in the marine Quaternary of Argentina: Holocene from Bahía Blanca area.
Records in the marine Quaternary of other areas from South America: unknown.
Modern geographic range: Brazil, Uruguay, Argentina (Mar del Plata, Bahía Blanca).

Ecological requirements: marine, free epifaunal, living on sea weeds like *Sargassum* (algae) (Ríos 1994).

Remarks: Figueiras & Sicardi (1980) mentioned the occurrence of this species in the littoral ridges from La Paloma and Bahía Maldonado (Uruguay). It occurs at present along the modern beach of Monte Hermoso (Buenos Aires province) (pers. comm. Dr. R. Lejarraga).

Sorbeoconcha Ponder & Lindberg, 1997

Superfamily Eulimoidea Philippi, 1853

Family Eulimidae Philippi, 1853

Genus *Melanella* Bowdich, 1822

Type species: *Melanella dufresnii* Bowdich, 1822 (p. 27, pl. VI, fig. 17, type by monotypy), living in the Indian Ocean.

Melanella solitaria (E. A. Smith, 1915)

(Plate 1, Fig. 3)

1915 *Eulima solitaria* Smith, p. 64, pl. 1, fig. 3.
1981 *Balcis solitaria* – Castellanos, p. 149, fig. 1.
1916 *Melanella laseroni* Hedley (fide Engl, 2012).
1990 *Balcis* cf. *solitaria* – Castellanos, p. 27, pl. 3, fig. 22.
1994 *Balcis solitaria* – Farinati, p. 310, pl. 2, fig. 8.
2000 *Balsis* cf. *solitaria* – Forcelli, p. 82, text-fig. (reproduced from Castellanos 1981).
2009 *Balcis solitaria* – Rosenberg, Database of Western Atlantic Marine Mollusca, available online at http://www.malacolog.org
2015 *Melanella solitaria* – Bouchet, MolluscaBase, accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 197277 on 2015-06-11.
2011 *Melanella solitaria* – Bouchet, Gofas, Rosenberg, Bank & Bieler. – MolluscaBase, accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 197277 on 2015-05-19.

Dimensions: H: 2.9–5.5 mm, W: 1–1.8 mm. According to Castellanos (1990) the type is 4 × 1.5 mm, 6 whorls.
Material: 25 shells from the Holocene of Bahía Blanca area [PI-UNS 2697 (1–25)]. Other material available at NHM Smithsonian Institution Nº 612988 (GBIG http://www.gbif.org/species/125197918).
Stratigraphic range: Late Holocene-Recent.
Type locality: Mc Murdo Sound (Antarctica), Station 331, off Cape Bird Peninsula, entrance to McMurdo Sound, ca. 450 m deep (according to the megadata base available on http://www.malacolog.org/search.php?mode = details&waspid = 13887).
Type series: not found.
Records in the marine Quaternary of Argentina: Holocene from Bahía Blanca area.
Records in the marine Quaternary of other areas in South America: unknown.
Modern geographic range: ca. 50.48° S to 72.82° S, 62° W to 19.48° W, southern Magellanian province, Malvinas, Antarctica: Antarctic Peninsula, Weddell Sea, Palmer archipelago and Gerlache Strait, near Cape Hallett, 72° 05.8′ S, 172° 15.2′ E, Deep Freeze III, 392 meters, Sta 23, "Atka", Jan 12 1958 (according to the megadata base of GBIF records, available at http://www.gbif.es).
Ecological requirements: marine, free epifaunal, commonly on sea weeds, reported depth: down to 152 to 535 m (http://www.malacolog.org/search.php?mode = details&waspid = 13887).

Remarks: Pastorino & Zelaya (2001) studied modern Eulimid gastropods from the Staten Island (southern SWA) and showed that few studies have been carried out on Eulimidae from the Mar Argentino. Specifically, there are no systematic studies focused on modern *Melanella solitaria* (Smith). However, according to its modern range, this species represents a palaeoclimate (cold water) indicator. Its Late Holocene geographical range was northwarths shifted in comparison to the modern distribution, suggesting colder waters than present probably after the mid-Holocene Thermal maximum when the Malvinas (Falkland) current was enhanced.

Melanella conoidea (Kurtz & Stimpson, 1851), living from Florida and Antilles southwards to Uruguay, as illustrated by Ríos (1994: 103, pl. 34, fig. 425) is similar by its general shell outline and dimensions.

Superfamily Triphoroidea GRAY, 1847

Family Cerithiopsidae H. Adams & A. Adams, 1853

Genus *Cerithiella* Verrill, 1882

Type species: *Cerithium metula* Lovén, 1846 (type by typification of replaced name), living in Scandinavia.

Cerithiella burdwoodiana (Melvill & Standen, 1912)

(Plate 1, Fig. 4)

1912 *Bittium burdwoodianum* Melvill & Standen, p. 351, pl. 1, fig. 12.
1990 *Cerithiopsilla burdwoodianus* – Castellanos, p. 12, pl. 1, fig. 7.
1994 *Cerithiopsilla burdwoodiana* – Farinati, p. 310, pl. 2, fig. 6.
2000 *Cerithiopsilla burdwoodianus* – Forcelli, p. 80, fig. 187.
2015 *Cerithiella burdwoodiana* – Bouchet – MolluscaBase (2015), accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 714037 on 2015-05-27.

Dimensions: H: 3.2–3.8 mm, W: 1.2–1.1 mm, according to Castellanos (1990) the type is 4 × 1 mm.

Material: 17 shells from the Holocene of Bahía Blanca area [PI-UNS 2700 (1–17)].
Type locality: Burdwood Bank, Station 346, at 103 m deep. Malvinas/Falkland Islands according to Castellanos & Landoni (1990: 13). 54° 25′ S., long. 57° 32′ W., 'Scotia' station 346 (MCGHIE 2008: 8).
Type series: two syntypes EE.7677 (SNAE as in original label) (MCGHIE 2008).
Stratigraphic range: Late Holocene-Recent.
Records in the marine Quaternary of Argentina: Holocene from Bahía Blanca area.
Records in the marine Quaternary of other areas in South America: unknown.
Modern geographic range: Burdwood Bank and Malvinas Islands.
Ecological requirements: marine, free epifaunal.

Remarks: this is an exclusively Magellanean element first recorded by Farinati (1994) for the Holocene of Argentina. Its Late Holocene geographical range is northwarths shifted relative to the modern occurrence. It represents a palaeoclimate (cold water) indicator. Its fossil record suggests colder waters than present.

Superfamily Cerithioidea Fleming, 1822

Genus *Cerithiopsis* Forbes & Hanley, 1850

Type species: *Cerithium tubercularis* Montagu, 1803 (by original designation), living in Europe (Figueira & Pimenta 2008).

Remarks: A detailed study on the phylogeny of Cerithioidea was provided by Strong et al. (2011).

Cerithiopsis greeni (C. B. Adams, 1839)

(Plate 1, Fig. 5)

1839 *Cerithium greeni* – C. B. Adams: 287, pl. 4, fig. 12.
1971 *Cerithiopsis greeni* – Figueiras & Sicardi, p. 105.
1985 *Cerithiopsis greeni* – Ríos, p. 50, pl. 19, fig. 225.
1994 *Cerithiopsis greeni* – Farinati, p. 310, pl. 2, fig. 7.
1994 *Cerithiopsis greeni* – Ríos, p. 93, pl. 31, fig. 369.
2005 *Cerithiopsis greeni* – Clavijo et al., p. 386.
2006 *Cerithiopsis greeni* – Martínez et al., p. 397.
? 2008 *Cerithiopsis capixaba* Figueira & Pimenta, p. 77, figs. 24–28.
2009 *Cerithiopsis greeni* – Rosenberg et al., p. 644.
2015 *Cerithium greeni* – Rosenberg – Bouchet, Gofas, Rosenberg, Bank & Bieler. – MolluscaBase, accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 160161 on 2015-05-19.

Dimensions: H: 3.5 mm, W:1.3 mm, type: H: ca. 4.5 mm, W: 1.25 mm.
Material: 200 specimens from the Holocene of Bahía Blanca area [PI-UNS 2699 (1–200)].
Type locality: Dartmouth Harbor, Massachusetts.
Type series: Lectotype ? (MCZ 156202).
Stratigraphic range: Holocene-Recent.
Records in the marine Quaternary of Argentina: Holocene from Bahía Blanca area.
Records in the marine Quaternary of other areas from South America: Quaternary of Uruguay (Clavijo et al. 2005), Holocene of Uruguay (Martínez et al. 2006).
Modern geographic range: North Carolina, Florida, Antilles, Brazil and Uruguay: 46° N to 35° S, 97.4° W to 34.9° W. Canada: Gulf of St. Lawrence. USA: Massachusetts, New York, New Jersey, North Carolina, Florida. Florida: East Florida, West Florida. USA: Texas, Mexico. Mexico: Tabasco, Veracruz, Campeche State, Yucatan State, Campeche Bank, Alacran Reef, Quintana Roo, Costa Rica, Panama, Colombia, Venezuela. Venezuela: unlocalized, Bermuda, Cuba. Cuba: North Havana Province. Virgin Islands: St. Croix. Brazil: Para, Atol das Rocas, Fernando de Noronha, Pernambuco, Alagoas, Bahia, Abrolhos Islands, Rio de Janeiro, Sao Paulo, Santa Catarina, Uruguay.
Ecologial requirements: marine, benthic, on sandy shelly botttoms or algae, free epifaunal, infralittoral, in gulfs and estuaries, carnivorous (see Rosenberg et al. 2009).

Remarks: this is a typical element of tropical, subtropical or warm temperate water masses, recorded for the first time by Farinati (1994) from the Holocene of Argentina. Its living occurrence is not as yet documented for Argentina. Its Holocene geographical range is southwarths shifted in comparison with its modern range, suggesting higher sea surface temperature (SST) than present along the Bonaerensian coastal area in Argentina, probably due to an enhanced Brazilian warm Current during the mid-Holocene Climatic Optimum/amelioration (e.g., Brinner et al. 2003). It represents a palaeoclimate (warmer) indicator.

According to Ríos (1985: 50) and Farinati (1994: 310), *Cerithiopsis virginica* Henderson & Bartsch, 1914 living in Virginia (USA), could be a posterior synonym.

Family Triphoridae Gray, 1847

Genus *Marshallora* Bouchet, 1985

Type species: *Marshallora adversa* (Montagu, 1803) (original combination *Murex adversus* Montagu, 1803), designated by Bouchet (1985), type locality of neotype: French Atlantic coasts).

Marshallora agg. *nigrocincta* (C. B. Adams, 1839)

(Plate 1, Figs. 6–13)

1839 *Cerithium nigrocinctum* – C. B. Adams, p. 286–287, pl. 4, fig. 11.
1950 *Cerithium nigrocinctum* – Clench & Turner, p. 315, pl. 38, figs. 11, 14.
1954 *Triphora nigrocincta* – Abbott, p. 159, pl. 19y.
1975 *Triphora nigrocincta* – Ríos, p. 150, pl. 13, fig. 188.
1976 *Triphora nigrocincta* – Emerson & Jacobson, p. 80, pl. 19, fig. 25.
1981 *Triphora perversa nigrocincta* – Andrews, p. 27, text fig. 1985 *Triphora* (*Triphora*) *nigrocincta* – Ríos, p. 161, pl. 53, fig. 762.
1993a *Triphora nigrocincta* – Aguirre, p. 34, pl. 2, fig. 6 (Lectotype).
1993b *Triphora nigrocincta* – Aguirre, fig. 8, Nº 6.
1993c *Triphora nigrocincta* – Aguirre, p. 17, fig. 10.
1994 *Triphora nigrocincta* – Ríos, p. 94, pl. 31, fig. 375.
2005 *Marshallora nigrocincta* – Clavijo et al., p. 386.
2006 *Marshallora nigrocincta* – Martínez et al., p. 397.
2015 *Marshallora nigrocincta* – Rosenberg – Bouchet, Gofas, Rosenberg, Bank & Bieler. – MolluscaBase, accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 160363 on 2015-05-19.

Dimensions: H: 1–8 mm, W: 0.5–2.3 mm.
Material: 2 shells from the Holocene of the northeastern coastal area (Punta Indio and Punta Piedras) (MLP-PI 25934, 26401, 34056, MLP-DCG 0007-925).
Type locality: Massachusetts, eastern USA (Clench & Turner 1950, Bouchet 1985).
Type series: Lectotype (MCZ 186157) illustrated by Aguirre (1993a, c) and in Text-fig. 4, B–C, of this study.
Stratigraphic range: Mid-Holocene-Recent.
Records in the marine Quaternary of Argentina: Holocene from Punta Indio-Bahía Samborombón coastal area (Bonaerensian sector, Argentina).
Records in the marine Quaternary of other areas from South America: "Quaternary" and Holocene from Uruguay (Clavijo et al. 2005, Martínez et al. 2006).
Modern geographic range: North Carolina to Florida (USA), Antilles, Venezuela to Sao Paulo (Brazil) and northern Uruguay: 46° N to 23° S, 90.5° W to 34.9° W. Canada: Prince Edward Island. USA: Massachusetts, New York, New Jersey, North Carolina, South Carolina, Florida. Florida: East Florida, West Florida, Mexico. Mexico: Campeche State, Yucatan State, Quintana Roo, Costa Rica, Panama, Colombia, Bermuda, Cuba. Cuba: North Havana Province. Virgin Islands: St. Croix, St. Vincent and the Grenadines: Grenada. Brazil: Ceara, Rio Grande do Norte, Pernambuco, Alagoas, Espirito Santo, Sao Paulo, Belize (http://www.marinespecies.org/aphia.php?p = taxdetails&id = 160363 on 2015-05-19).
Ecological requirements: marine, generally on fine substrates, associated with algae along Brazilian coasts, free epifaunal, mostly infralittoral in gulfs and estuaries (Ríos 1994).

Remarks: Not living in Argentina, this is a southwards shifted warm water indicator for the Holocene.

The Triphoridae are well known for their wide morphological variability (e.g., Marshall 1983), exhibiting closely similar morphotypes and including several complex-species (e.g., *Triphora perversa* complex for northern Europe) (Bouchet & Strong 2010). The species collected in the marine Quaternary of Argentina is very similar to *Marshallora adversa* (Montagu, 1803) according to illustrations of the MNHN Type collection at Paris (available in at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 141715) (see also Bouchet 1985).

Marshallora nigrocincta had been previously assigned to *Triphora* Blainville, 1828 (type species: *Triphora gemmatum* Blainville, 1828 = *Cerithium tritoma*, by monotypy, living in Mauritius) see Gardner 1948: 205. Bouchet (1985) transfered "*Triphora*" *nigrocincta* to *Marshallora*. However, what has been called "*Triphora*" *nigrocincta* in the western Atlantic is most probably a complex of species. Furthermore, there is doubt about the material from Argentina being conspecific with *T. nigrocincta*. Therefore our material should be better assigned to the species complex "*Marshallora* agg. *nigrocincta*" (P. Bouchet, personal communication, 2015). It was first recorded for Argentina by Aguirre (1990, 1993a, b, c) from the Holocene of Punta Indio area concludying that it represents a palaeoclimate (warm water) indicator. Its absence today along the Mar Argentino and its mid-Holocene southwards geographical range shift was considered an indication of warmer waters than present during a period of more enhanced Brazilian Current (Holocene Climatic Optimum) (Aguirre 1993c).

Superfamily Truncatelloidea Gray 1840
Family Caecidae Gray, 1850

Genus *Caecum* Fleming, 1813

Type species: *Dentalium trachea* Montagu, 1803 (by subsequent designation, Gray 1847: 203), living in the Atlantic coasts of Europe, the Mediterranean Sea and northwestern Africa (Vannozzi et al. 2015).

Remarks: A detailed study on the phylogeny of Caecidae was provided by Bandel (1996).

Caecum antillarum Carpenter, 1858

(Plate 1, Fig. 14)

1858 *Caecum antillarum* Carpenter, p. 418.
1980 *Caecum antillarum* – Figueiras & Sicardi, p. 190, pl. 3, fig. 14.
1985 *Caecum antillarum* – Ríos, p. 43, pl. 17, fig. 192.

1985 *Caecum antillarum* – Farinati, p. 219.
1991 *Caecum californicum* Dall,Abbott & Dance, p. 58, text-fig.
1994 *Caecum antillarum* – Farinati, p. 308, pl. 1, fig 3a,b.
1994 *Caecum antillarum* – Ríos, p. 56, pl. 18, fig. 203.
2009 *Caecum antillarum* – Rosenberg et al., p. 629.
2015 *Caecum antillarum* – Bouchet – Bouchet, Gofas, Rosenberg, Bank & Bieler. – MolluscaBase, accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 419578 on 2015-05-19.
? 2015 *Caecum maraisi* Vanozzi et al., p. 112, fig. 9A–C (Holotype).
2015 *Caecum incisum* Vannozzi et al., p. 111, fig. 8A–F (Holotype).

Dimensions: H: 3–5 mm, W: 0.6–1 mm.
Material: 180 shells from the Holocene of Bahía Blanca area [PI-UNS 2695 (1–180)].
Type locality: unknown.
Type series: unknown.
Stratigraphic range: Holocene-Recent.
Records in the marine Quaternary of Argentina: Holocene from Punta Indio-Samborombón area, Mar Chiquita, Bahía Blanca.
Records in the marine Quaternary of other areas in South America: Holocene of Uruguay.
Modern geographic range: western Florida, Bahamas, California, western Mexico. Brazil, Uruguay, with doubts in South Africa. It apparently occurs at present along the beach of Monte Hermoso (not documented, personal communication of Dr. R. Lejarraga).
Ecological requirements: benthonic, grazer, 5–100 m deep (Rosenberg et al. 2009: 269). Other close species are marine or euryhaline and live on mud, algae and grass (Ríos 1994).

Remarks: this species represents a palaeoclimate (warm water) indicator. Its Holocene geographical range was southwarths shifted relative to its modern distribution (Farinati 1994). It is an indicator of warmer waters than present due to an enhanced Brazilian Current.

Family Hydrobiidae Stimpson, 1865

Genus *Littoridina* Souleyet, 1852

Type species: *Littoridina gaudichaudii* Souleyet, 1852 (type by monotypy), living in Ecuador.
Synonyms: *Paludestrina* d'Orbigny, 1839 (objective synonym of *Hydrobia* Hartmann, 1821) (Knight et al. 1960: I319).

Remarks: Similar microgastropod taxa reported within the Rissoidea were reported by Ponder (1985).

Littoridina australis (d'Orbigny, 1835)

(Plate 2, Figs. 1–6)

1835 *Paludina australis* d'Orbigny, p. 30.
1835 *Paludina australis* d'Orbigny, 3 (4), p. 153 (no il.).
1840 *Paludestrina australis* d'Orbigny, 5 (3), p. 384, pl. 48, figs. 4–6.
1911 *Littoridina australis* – Pilsbry, p. 557, pl. 41c, figs. 3–8.
1944 *Littoridina australis* – Carcelles, p. 243 (no ill.).
1960 *Littoridina australis* – Barattini & URETA, p. 100 (no ill.).
1966 *Littoridina ustralis* – Camacho, p. 123, pl. 15, fig. 24.
1967 *Littoridina australis* – Castellanos, p. 47, pl. 4, fig. 3.
1971 *Littoridina australis* – Closs & Forti, p. 36, pl. 4, fig. 4.
1974 *Littoridina australis* – Forti Esteves, p. 143.
1975 *Littoridina australis* – Ríos, p. 37, pl. 10, fig. 129.
1976 *Littoridina australis* – Gaillard & Castellanos, p. 9, pl. 4, fig. 3.
1977 *Littoridina australis* – Scarabino, p. 83, pl. 2, fig. 10.
1978 *Littoridina australis* – Farinati, p. 228, pl. 2, fig. 39.
1983 *Heleobia australis* – Pons Da Silva & Davis, p. 137, figs. 1–4
1985 *Littoridina australis* – Ríos, p. 39, pl. 16, fig. 170.
1988 *Littoridina australis* – Aguirre, p. 70, pl. 2, figs. 1–24.
1992 *Heleobia australis* – Herschler & Thompson, p. 50 (no ill.)
1993 *Littoridina australis* – Weiler, p. 211.
1993a *Littoridina australis* – Aguirre, p. 26, pl. 1, fig. 13(Lectotype).
1993b *Littoridina australis* – Aguirre, pl. 2, figs. 1–3.
1994 *Littoridina australis* – Pastorino, p. 80, pl. 5, fig. 4a, b.
1994 *Littoridina australis* – Ríos, p. 50, pl. 16, fig. 169.
1999 *Littoridina australis* – De Francesco & Zárate, p. 297(no ill.).
2000a *Littoridina australis* – Aguirre & Farinati, 259, pl. 2, fig. 29.
2000b *Littoridina australis* – Aguirre & Farinati, p. 588, fig. 9 and others.
2002 *Littoridina australis* – Aguirre & Urrutia, p. 4, 11, pls. 1–3.
2008a *Littoridina australis* – Aguirre et. al., p. 704, fig. 3.
2008b *Littoridina australis* – Aguirre et. al., p. 300, pl. 2, fig. 22.
2007 *Heleobia australis* – De Francesco, fig. 1, table 1.
2009 *Littoridina australis* – Aguirre et al., p. 300, pl. 2, fig. 22 d.
2013a *Heleobia australis* – Charo et al., p. 139, pl. 4, fig. 1.
2013b *Heleobia australis* – Charo et al., p. 410, pl. 5, fig. 2.
2013 *Heleobia australis* – Pisano et al., p. 68, fig. 3 (2).
2015 *Heleobia australis* – Bouchet & Rosenberg. – Bouchet, Gofas, Rosenberg, Bank & Bieler. – MolluscaBase, accessed through: World Register

of Marine Species at http://marinespecies.org/aphia.php/aphia.php?p = taxdetails&id = 532899 on 2015-05-20.

2015 *Littoridina australis* – Bouchet. – MolluscaBase, accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id =725733 on 2015-05-21.

Dimensions: H: 0.25–10 mm, W: 1.2–3.24 mm.
Material: more than 3,000 shell specimens from the Bonaerensian coastal area and 50 from northern Patagonia (Río Negro province) (MLP-PI: MLP-PI 26427, 26429). Other material studied from the MLP-PI collections from the Holocene along Uruguay: 28792. Holocene from Bonaerensian marginal marine areas: **MLP-PI**: 5959 (La PLata), 10391 (Los Talas), (9375/4 Río Santiago), 159 (Magdalena to Punta Indio), 28792 (Pipinas, northern Bahía Samborombón), 5957, 25947, 25948, 25949 (Mar Chiquita),1339, 2688 (Arroyo Malacara), 10055 (Arroyo Las Brusquitas), 5962 (Miramar), 5961 (Puerto Quequén), 258, 5963 (Bahía Blanca), Holocene of northern Golfo San Matías area: 26584 (San Antonio Oeste, 26660, 26661. Modern collections at the MLP-ZI: 376 (Puerto Militar, Bahía Blanca area). 90 specimens from the Holocene of Ingeniero White (Bahía Blanca area) (PI-UNS 1389). Modern collections at the **MLP (ZI)**: 4031 (Mar Chiquita), 4027 (Península Verde), 4427 (San Antonio Oeste). Modern collections at the **MACN-In**: 28641 (Punta Carretas, Uruguay), 29233, 9345/5 (Montevideo, Uruguay), 28620 (Colonia), Bahía Samborombón area (28790), Punta Rasa, Cabo San Antonio (28883), Mar Chiquita (9543), 9368, 26284, 30888, 32799 (Puerto Quequén), 11217, 9368/36 (Puerto Militar), 22472 (Puerto Belgrano, Arroyo Parejas, Bahía Blanca area, 20283 (Bahía San Blas). Holocene material at MACN-In: 28792 (Uruguay, ("Querandinense" Stage), private modern collections studied by Pons da Silva from Brazil and by Aguirre from Mar Chiquita. Abundant materials studied in the context of a systematic review includying the palaeoenvironmental significance of this species were shown in Aguirre & Farinati (2000b).
Type locality: Montevieo (Uruguay) (restricted by Pons da Silva & Davies 1983: 137, fig. 1).
Type series: Lectotype (BMNH-NHM N 1854.12.4.342) designated by Pons da Silva & Davies (1983), the specimen described and illustrated by d'Orbigny (1846) and reillustrated by Aguirre (1994: 25–26, Pl. I, fig. 13), Aguirre & Farinati (2000b) and in Plate 2 (fig. 1) of this study. The complete type series included 11 Syntypes.
Stratigraphic range: Miocene?, Pleistocene-Recent.
Records in the marine Quaternary of Argentina: Bonaerensian sector: Pleistocene and Holocene from the northeastern and southeastern Bonaerensian coastal areas. Dominant in the Holocene: Rio de la Plata, Punta Indio-southern Samborombón Bay area, Mar Chiquita, Las Brusquitas, Quequén Salado, Quequén Grande, Bahía Blanca, Bahía San Blas-Bahía Anegada). Patagonia: Holocene from northern Golfo San Matías (San Antonio Oeste, northern Rio Negro province). Holocene from the Bonaerensian exterior continental shelf (13–57 m deep) between Punta Médanos and Faro Querandí and Pleistocene (82 m deep) from the interior continental shelf off Faro Querandí (Aguirre et al. 2008a).
Records in the marine Quaternary of other areas from South America: Pleistocene of Uruguay and Río de La Plata zone, Holocene of Surinam (?), Brazil, Uruguay.
Modern geographic range: Atlantic marginal marine areas along the SWAtlantic down to 42° S (Surinam, Brazil, Uruguay, Bahía San Blas, northern Golfo San Matías). Probably Pacific coast in southern Chile (Coquimbo), Western Europe and Africa (until the close similarity with *Hydrobia ulvae* Pennant is confirmed or rejected).
Ecological requirements: marginal marine species typical of coastal lagoons and estuarine environments. Free epifaunal, on varied substrates, preferably fine sand and muds, under stones, from the supratidal to shallow infralittoral zone, in estuaries and coastal lagoons, although it has been considered marine or euryhaline (e.g., Castellanos 1967, Scarabino 1977, Pisano et al. 2013) it is brackish (predominant in mixohaline-mixopolyhaline gradients) (Aguirre & Farinati 2000b).

Remarks: The Hydrobiidae represent a highly variable group which shell shape is strongly linked to environmental abiotic factors. This applies particularly for *Littoridina australis*, which exhibits several ecomorphs linked to varying abiotic factors. Pilsbry (1911) considered *Heleobia* Stimpson, 1865 (type species by monotypy: *Paludestrina culminea* d'Orbigny, 1840, living in Titicaca Lake, Bolivia) a posterior synonym of *Littoridina* Souleyet (type species by monotypy: *Littoridina gaudichaudii* Souleyet, 1852, living in Guayaquil, Ecuador). Later Pons da Silva & Davies (1983), Hershler & Thompson (1992) and Kabat & Hershler (1993) grouped the Southamerican Hydrobiidae species in *Heleobia* Stimpson, a position later shared by De Francesco (2007 among others). Those authors based the distinction between *Heleobia* and *Littoridina* mainly in the number and shape of papilae of the penial complex (a sexual character which does not allow to support that all individuals belong to one same species) and in the geographical distribution (a very light criterium for taxonomic discriminations), mostly on continental species which in theory belong to both genera, as well as on the close similarity between the penial complex of *L. australis* with that of *H. culminea* (however never illustrated). By contrast, Aguirre & Farinati (2000b) mantained *L. australis* in *Littoridina* considering that: 1) the comparison between the penial complexes of the type species, *L. gaudichaudii* and *L. culminea*, still needs to be illustrated and documented based on live collected material from the type localities, in order to be able to objectively change *L. australis* to *Heleobia*. 2) shell shape is clearly different between *L. culminea* (type species of *Heleobia*) and *L. gaudichaudii* (type species of *Littoridina*). 3) even when some authors attempt to apply the bilogic species concept for empty shells (e.g., De Francesco 2007) this is of course impossible by definition (sexual interbreeding individulas). 4) there is no chance of providing evidence of the penial complex in empty shells, either fossil, subfossil or modern. 5) In addition, a marked phenotypic variability characterize Hydrobiid species living in marginal marine environments. Thus, shell shape variation of *L. australis* has been successfully used as a paleosalinity indicator for the Bonaerensian coastal area linked to Pleistocene and Holocene high sea level episodes (Aguirre & Farinati 2000b, Aguirre & Urrutia 2002).

Family Tornidae Sacco, 1896 (1884)

Genus *Cochliolepis* Stimpson, 1858

Type species: *Cochliolepis parasitica* Stimpson, 1858 (type by monotypy), living along the western Atlantic from Florida down to Brazil (Worms).

Cochliolepis surensis Farinati, 1985

(Plate 2, Figs. 7–8)

1985 *Cochliolepsis surensis* Farinati, p. 213, pl. 1, figs. 1, 2.
1994 *Cochliolepsis surensis* Farinati, p. 306, pl. 1, fig. 1a, b.

Dimensions: diameter of shell: 4 mm, aperture: 3 mm (Holotype).
Material: 50 shells from the Holocene of Bahía Blanca area [PI-UNS 2692 (1–50)].
Type locality: Holocene of Punta Ancla (Bahía Blanca area) (Farinati 1985).
Type series: Holotype (PI-UNS Nº 1903).
Stratigraphic range: Holocene.
Records in the marine Quaternary of Argentina: Holocene from Bahía Blanca area.
Records in the marine Quaternary of other areas from South America: unknown.
Modern geographic range: no bibliographic sources support modern records of this species in the Mar Argentino.
Ecological requirements: probably intertidal to shallow infralittoral in soft substrates.

Remarks: shells of this species apparently occur along the modern beach at Monte Hermoso (southeastern Bonaerensian littoral) (undocumented, personal communication of Dr. R. Lejarraga).

Genus *Teinostoma* H. & A. Adams, 1853

Type species: *Teinostoma politum* A. Adams, 1853 (type by monotypy), living in the Paific of Ecuador (Keen 1971: 385).

Teinostoma maldonadense Farinati, 1985

(Plate 2, Figs. 9–10)

1985 *Teinostoma maldonadense* Farinati, p. 215, pl. 1, figs. 3, 4.
1994 *Teinostoma maldonadense* Farinati, p. 306, pl. 1, fig. 2a, b.

Dimensions: diameter of shell: 2 mm, aperture: 1.5 mm (holotype).
Material: 40 shells from the Holocene of Bahía Blanca area [PI-UNS 2693].
Type locality: Maldonado quarry (Bahía Blanca area, Argentina).
Type series: Holotype (PI-UNS Nº 2077).
Stratigraphic range: Holocene.
Records in the marine Quaternary of Argentina: Holocene from Bahía Blanca area.
Records in the marine Quaternary of other areas from South America: unknown.
Modern geographic range: no bibliographic sources support the modern distribution of this species.
Ecological requirements: probably on sandy bottoms of the infralittoral zone (similar species live at 50 m deep in Brazil, Ríos 1994).

Remarks: this species has not been recorded from the adjacent modern littoral of Bahía Blanca or along Argentina.

Clade Neogastropoda

Family Columbellidae Swainson, 1840

Genus *Anachis* H. Adams & A. Adams, 1853

Type species: *Columbella scalarina* G. B. Sowerby I, 1832 (type by subsequent designation of Tate 1868), living in the Pacific coast from mexjco to Panama (Gardner 1948: 226, Ladd 1982: 46).

Subgenus *Anachis* (*Costoanachis*) Sacco, 1890

Anachis (*Costoanachis*) *avara* (Say, 1822)

(Plate 2, Figs. 11–17)

1822 *Columbella avara* Say, p. 230.
(?) 1840 *Columbella moleculina* Duclós, p. 15, pl. 8.
(?) 1841 *Buccinum sertulariarum* d'Orbigny, p. 431, pl. 61, 13–17.
1858 *Columbella avara* – Holmes, 73, pl. 12, fig. 4.
1889 *Columbella* (*Anachis*) *avara* – Dall, p. 116, pl. 50, fig. 12.
1890 *Columbella* (*Anachis*) *avara* – Dall, p. 135.
(?) 1897 *Columbella brasiliana* Martens, p. 160.
(?) 1905 *Columbella decorata* Strebel, p. 130.
1948 *Anachis* (*Costoanachis*) *avara* – Gardner, p. 229(no ill.).
1948 *Anachis* (*Costoanachis*) *avara translirata* (Ravenel), Gardner, p. 229, pl. 30, figs. 36, 37.

1948 *Anachis* (*Costoanachis*) *avara similis* (Ravenel), Gardner, p. 229, pl. 30, figs. 35, 38.
1954 *Anachis avara* – Abbott, 221, pl. 25, fig. EE.
1960 *Columbella moleculina* – Barattini & Ureta, 121, pl. 40.
1966 *Anachis avara* – Camacho, 128, pl. 16, fig. 4a, b.
1967 *Pyrene moleculina* – Castellanos. p. 83, pl. 6, figs. 3, 4.
1969 *Anachis* (*Costoanachis*) *avara* – Forti, p. 118, pl. 8, fig. 8.
1975 *Anachis* (*Costoanachis*) *avara* – Ríos, p. 97, pl. 28, fig. 406.
1975 *Anachis* (*Costoanachis*) *moleculina* – Ríos, p. 98, pl. 28, fig. 410.
1976 *Anachis avara* – Emerson & Jacobson, p. 140, pl. 24, fig. 9.
1977 *Anachis moleculina* – Scarabino, p. 87, pl. 2, fig. 4.
1978 *Pyrene moleculina* – Farinati, p. 228, pl. 2, fig. 41.
1985 *Anachis* (*Costoanachis*) *sertulariarum* – Ríos, p. 96, pl. 34, fig. 420.
1993a *Anachis* (*Costoanachis*) *avara* – Aguirre, p. 33, pl. 1, fig. 7 (Lectotype).
1993b *Anachis* cf. *avara* – Aguirre, p. 41, figs. 8, 5a.
1994 *Anachis* (*Costoanachis*) *sertulariarum* – Ríos, p. 125, pl. 40, fig. 530.
2005 *Costoanachis sertulariarum* – Clavijo et al., p. 387.
2006 *Costoanachis sertulariarum* – Martínez et al., p. 397.
2008a *Anachis avara* – Aguirre et al., p. 704, fig. 3.
(?) 2010 *Mitrella moleculina* – Kilburn & Marais, p. 60–104.
2015 *Anachis avara* – Rosenberg & Monsecour (2015). – MolluscaBase (2015), accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 159977 on 2015-05-21.
(?) 2015 *Mitrella moleculina* – Bouchet & Monsecour. – In: MolluscaBase (2015). Accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 511534 on 2015-05-26.

Dimensions: H: 3–13 mm (Plesiotype, H: 3.72 mm, maximum diameter: 2.05 mm, aperture L: 2.10 mm according to Forti 1969: 118).
Material: 94 shells from the Holocene of the northeastern Bonaerensian coastal area (Punta Indio, central and southern Bahía Samborombón) (MLP-PI 26438, MLP-DCG 0007-926), Bahía Blanca area (PI-UNS S/N). Modern collections assigned to *Anachis moleculina* at the MLP-ZI: Miramar (1472), Monte Hermoso (1991), Punta Villarino (3524), Santa Cruz (1992–1993) (with doubts).
Type locality: Florida (original label of designated lectotype), southern coasts of USA (Say 1822 in Gardner 1948: 229).
Type series: 1 Lectotype (ANSP 16887), illustrated by Aguirre (1993) and in Plate 2 (Fig. 17) of this study.
Stratigraphic range: Miocene-Recent.
Records in the marine Quaternary of Argentina: Holocene from the Bonaerensian coastal area and from the external continental shelf (13–57 m deep, extending to Late Pleistocene) between Punta Médanos and Faro Querandí (Aguirre et al. 2008a).
Records in the marine Quaternary of other areas from South America: Holocene of southern Brazil (Forti 1969), "Quaternary" and Holocene from Uruguay (Clavijo et al. 2005, Martínez et al. 2006).
Modern geographic range: American Atlantic coast from USA to Antilles, Brazil, Uruguay. As *Anachis moleculina* (here considered as synonym) it was mentioned in the Bonaerensian littoral and in Punta Villarino (northern Rio Negro province) (subfossil material?).
Ecological requirements: benthic free epifaunal on varied substrates, sands and rocks, among barnacles, buoys, archors, other hard substrates and sandy bottoms, infralittoral (Scarabino 1977, Ríos 1994).

Remarks: this species is more abundant in (or exclusive for?) in warm water masses. Its occurrence within the coastal deposits is linked to an enhanced Brazilian warm current during the Mid-Holocene.

Castellanos & Landoni (1992) illustrated (with a drawing) a modern specimen from Santa Cruz (southern Patagonia, Magellan region) assigned to *Anachis sertulariarum* (11 mm), a synonym of *A. avara*. However, their illustration does not match with our material. According to Ríos (1994: 125), several species of *Anachis* from the SWA are synonyms of *A.sertulariarum*: *moleculina* Duclós, 1840, *brasiliana* Martens, 1897, *decorata* Strebel, 1905, *floridana* Rehder, 1939. The original illustrations and types of these species were not available for comparison, thus we can only maintain a close similarity of our material with the illustrations provided by other authors.

Subgenus *Anachis* (*Parvanachis*) Radwin, 1968

Anachis (*Parvanachis*) *isabellei* (d'Orbigny, 1839)

(Plate 2, Figs. 18–19)

1839 *Buccinum* o *Nassa* ?*isabellei* d'Orbigny, p. 433, pl. 61, figs. 18–21.
1846 *Nassa isabellei* d'Orbigny, p. 433, pl. 61, fig. 1821.
1905 *Columbella melvillei* Strebel (fide Monsecur, 2015).
(?) 1905 *Anachis paessleri* Strebel, p. 637, pl. 23, fig. 38.
1962 *Anachis isabellei* – Parodíz, p. 36.
1965b *Pyrene isabellei* – Castellanos & Fernández, p. 55.

1966 *Anachis isabellei* – Camacho, p. 128, pl. XIX, fig. 8.
1967 *Pyrene isabellei* – Castellanos, p. 85, pl. VI, fig. 8.
1969 *Anachis* aff. *isabellei* –Forti, 120, pl. 8, fig. 7.
1975 *Anachis isabellei* – Sicardi, p. 106.
1977 *Anachis isabellei* – Scarabino, p. 187, pl. 2, fig. 5.
1985 *Anachis isabellei* – Ríos, p. 86.
1992 *Anachis isabellei* – Castellanos & Landoni, p. 8, pl. II, fig. 12.
1992 *Anachis paessleri* – Castellanos & Landoni, p. 9, pl. II, fig. 13.
1994 *Anachis* (*Paravanachis*) *isabellei* – Ríos, p. 125, pl. 40, fig. 532.
2005 *Parvanachis isabellei* – Clavijo et al., p. 387.
2013 *Parvanachis isabellei* – Pisano et al., p. 9, fig. 4 (6).
2015 *Anachis isabellei* – Rosenberg & Monsecour. – MolluscaBase (2015), accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 511407 on 2015-05-21.

Dimensions: H: 4.8–9 mm, W: 2.1–5 mm (syntype: length: 5 mm, W: 2.5 mm) (plesiotype, H: 4.8 mm, maximum diamater: 2.48 mm, aperture L: 2.7 mm).
Material: one specimen from the northeastern Bonaerensian area (ML-PI 34063), 580 shells from the Holocene of Bahía Blanca area (PI-UNS 1392). Modern collections at MLP-ZI: Monte Hermoso (2990), and at MACN-In: Monte Hermoso (9209), Puerto Militar (11353), Mar del Plata (S/N).
Type locality: Bahía San Blas (southeastern Bonaerensian littoral).
Type series: unknown (probably syntypes at the NHM in London, where most of d'Orbigny's collections are housed, or at the LMMNHN in Paris).
Stratigraphic range: Pleistocene-Recent.
Records in the marine Quaternary of Argentina: Pleistocene from southeastern Bonaerensian sector (Bahía Blanca-southern Buenos Aires province), Holocene from northeastern and southeastern Bonaerensian coastal area (Punta Indio-Bahía Samborombón, Mar Chiquita, Bahía Blanca-Puerto Belgrano, Bahía San Blas areas).
Records in the marine Quaternary of other areas from South America: Holocene of southern Brazil, "Quaternary" of Uruguay.
Modern geographic range: N Carolina, Texas, Antilles, Surinam, northern Brazil, Uruguay, Bonaerensian coast at Punta Rasa, Mar Chiquita, Mar del Plata, Puerto Quequén, Monte Hermoso, Patagonia: San Antonio Oeste, Golfo San Matías, Puerto Deseado, down to Magellain Strait (Scarabino et al. 1977, Castellanos & Landoni 1992).
Ecological requirements: benthic free epifaunal, preferentially on sandy bottoms, although it can be found on varied substrates, infralittoral.

Remarks: it is very close to *Anachis obesa* (see beneath), and probably its senior synonym. However, the type materials of both species were not available for comparison and to objectively decide about the justification of two or one nominal species.

Anachis (*Parvanachis*) *obesa* (C. B. Adams, 1845)

(Plate 2, Figs. 20–28)

1845 *Buccinum obesum* C. B. Adams, p. 7 (no ill.).
1850a *Columbella obesa* C. B. Adams, p. 55 (no ill.)
1966 *Anachis obesa* – Camacho, p. 128, pl. 19, fig. 7a, b.
1969 *Anachis* (*Costoanachis*) *obesa* – Forti, p. 117, pl. 8, fig. 6.
1975 *Anachis* (*Parvanachis*) *obesa* – Ríos, p. 98, pl. 28, fig. 412.
1976 *Anachis obesa* – Emerson & Jacobson, p. 141, pl. 21, fig. 17.
1979b *Anachis cancellata* Castellanos, p. 91, fig. 6.
1981 *Anachis* (*parvanachis*) *obesa* – Andrews, p. 56, text-fig. 1993a *Anachis obesa* – Aguirre, p. 32, pl. 1, fig. 6 (Lectotype).
1994 *Anachis obesa* – Ríos, p. 125, pl. 40, fig. 533.
2005 *Parvanachis obesa*– Clavijo et al., p. 387.
2015 *Anachis obesa*– Rosenberg & Monsecour. – MolluscaBase (2015), accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 511418 on 2015-05-21.
2015 *Columbella ornata* Ravenel, 1859. – Rosenberg & Monsecour. – MolluscaBase, accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 520021 on 2015-05-26.
2015 *Columbella crassilabris* Reeve, 1859. – Rosenberg & Monsecour. – MolluscaBase (2015), accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 519804 on 2015-05-26.
2015 *Columbella ostreicola* G. B. Sowerby III. – Rosenberg & Monsecour. – MolluscaBase (2015), accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 519631 on 2015-05-26.

Dimensions: H: 4–10 mm, W: 2–3.3 mm (plesiotype: H: 4.64 mm, maximum diameter: 2.64 mm, aperture length: 2.43 mm).
Material: 50 shells from the Holocene of the northeastern Bonaerensian coastal area between Punta Indio and Mar Chiquita. Collections at the MLP (PI): 25952, 25953, 25977, 26433, 26398, 26410, MLP-DCG 0007-927, 928.
Type locality: Jamaica (Gardner 1948: 229).
Type series: 1 Lectotype (MCZ) designated by Clench & Turner (1950: 319, pl. 32, fig. 11). One Paralectotype reillustrated by Aguirre (1993b: Pl. I, fig. 6) and in Plate 2 (Fig. 20) of this study.
Stratigraphic range: Miocene?, Pleistocene-Recent.
Records in the marine Quaternary of Argentina: Holocene from the northeastern coastal area of Buenos Aires province (Punta Indio-Bahía Samborombón, Mar Chiquita).

Records in the marine Quaternary of other areas from South America: Brazil, Uruguay.
Modern geographic range: North Carolina, Texas, Antilles, Surinam, Brazil, Uruguay (?). Not living in Argentina.
Ecological requirements: carnivorous on oyster beds (Ríos 1994), hard substrates, other requirements similar to the rest.

Remarks: It is typical of warm waters, its southern geographical shift during the mid-Holocene is probably a response to an enhanced Brazilian warm current during the mid-Holocene Climatic Optimum/amelioration.

A. obesa is very similar to *A. isabellei* (see above). According to Ríos (1994: 125), several species are synonyms of *A. obesa*: *ornata* Ravenel, 1858*, crassilabris* Reeve, 1859, *ostreicola* G.B. Sowerby III, 1882. Other similar species of *Anachis* (e.g., *paessleri, rubra, bonariensis, cancellata*) have been mentioned for the SWA, either in marine Quaternary deposits or living, and could be synonyms of the same species (see also Adams 1847).

Superfamily Conoidea Fleming, 1822
Family Drilliidae Olsson, 1964

Genus *Drillia* Gray, 1838

Type species: *Drillia umbilicata* Gray, 1838 (by subsequent designation of Gray 1847), living in the western coast of Africa (Powell 1966: 72, Keen 1971: 701).

Drillia patagonica d'Orbigny, 1841

(Plate 3, Figs. 1–2)

1841 *Pleurotoma patagonica* d'Orbigny, p. 466, pl. 77, figs. 15–16.
1884 *Pleurotoma patagonica* – Tryon Pilsbry, p. 08, pl. 13.
1905 *Pleurotoma patagonica* – Strebel, p. 579, pl. 23, fig. 46a–c.
1907 *Drillia patagonica* – Iihering, p. 448.
1950 *Drillia patagonica* – Carcelles, p. 65, pl. 3, fig. 46.
1966 *Drillia patagonica* – Camacho, p. 143, pl. 61, fig. 8.
1967 *Drillia patagonica* – Castellanos, p. 133, pl. 10, fig. 13.
1969 *Drillia patagonica* – Forti, p. 127, pl. 9, fig. 14.
? 1975 *Kurtziella dorvilae* (Reeve, 1845), Ríos, p. 137, pl. 41, fig. 628.
1993 *Drillia patagonica* – Castellanos et al., p. 10, pl. 3, fig. 30a, b.
1993b *Drillia patagonica* – Aguirre, p. 41.
2000 *Spirotropsis patagonica* – Forcelli, p. 107, fig. 313.
2005 *Spirotropsis patagonica* – Clavijo et al., p. 389.

Dimensions: H: 5–10 mm, W: 2–3 mm (syntype: 9 × 5 mm according to Castellanos & Landoni 1993).
Material: 5 shells from the Holocene of the northeastern Bonaensian coastal area (Punta Indio, Mar Chiquita) (MLP-PI 26439). Modern collections at MLP (ZI): S/N (Mar del Plata), at MACN-In: 22485 (34° 40′ S, 58° 18′ W).
Type locality: Bahía San Blas (southeastern Bonaerensian littoral).
Type series: unknown probably syntypes at the NHM in London.
Stratigraphic range: Pleistocene-Recent.
Records in the marine Quaternary of Argentina: Holocene from Bahía Samborombón and Mar Chiquita (northeastern Bonaerensian coastal area).
Records in the marine Quaternary of other areas from South America: Holocene of southern Brazil and Uruguay.
Modern geographic range: southern Brazil to Golfo San Matías, Golfo San Jorge, Puerto San Julián, Tierra del Fuego.
Ecological requirements: free epifaunal, intertidal and infralittoral, soft bottoms, up to 100 m deep.

Remarks: typical of cold-temperate and cold water masses.

Family Mangeliidae P. Fischer, 1883

Genus *Mangelia* Risso, 1826

Type species: *Mangelia striolata*, Risso = *Murex attenuates*, Montagu = *Pleurotoma williersi*, Michaud, by subsequent designation of Hermannsen, 1852 (Powell 1966: 97), living in the Aegian Sea.

? *Mangelia* cf. *purissima* (Strebel, 1908)

(Plate 3, Figs. 3–4)

cf. 1908 *Bela purissima* – Strebel,vol. 6 (2), p. 17, pl. 3, fig. 31°–d.
cf. 1967 *Mangelia purissima* – Castellanos, p. 137, pl. 10, fig. 12.
1993b *Mangelia* cf. *purissima* – Aguirre, p. 41.
1993 *Typhlodaphne purissima* – Castellanos & Landoni, p. 13, pl. 3, fig. 29a, b.
2000 *Typhlodaphne purissima* – Forcelli, p. 112, fig. 334.

Dimensions: H: 9–16 mm, W: 3.7–4.8 mm.
Material: 18 shells from the Holocene of the northeastern Bonaerensian coastal area (Punta Indio, Punta Piedras, Mar Chiquita, Ingeniero White, MLP-PI 26434, 5937, PI-UNS 1308). Modern collections at the MACN-In: 25776 (37° 35′ S, 54° 55′ W), 22732 (54° S, 64° W), 22618 (54° 41′ S, 64° W).
Type locality: Shag Rock Bank (west of Southern Shetland islands).
Type series: unknown.
Stratigraphic range: Pleistocene-Recent.
Records in the marine Quaternary of Argentina: Holocene from the northeastern Bonaerensian coastal area (Punta Indio, Mar Chiquita) (MLP-PI: 26434); with doubts in the Late Pleistocene.

Records in the marine Quaternary of other areas from South America: unknown.

Modern geographic range: Puerto Deseado and Puerto San Julián, Tierra del Fuego, northwards to 36–37° S (Castellanos 1967).
Ecological requirements: free epifaunal, intertidal and infralittoral down to 60–100 m deep (can reach the circalittoral zone), on soft bottoms.

Remarks: the material recovered is assigned with doubts to this species, which is typical of cold-temperate and cold water massses, dispersing northwards along the cold Malvinas/Falkland current and the coastal cold Patagonian current.

Family Olividae Latreille, 1825
Subfamily Olivellinae Troschel, 1869

Genus *Olivella* Swainson, 1831

Type species: *Olivella purpurata* Swainson, 1831 (= *Olivella dama* Mawe, 1828, by subsequent designation of Dall 1909, living in the western coast of North America between southern California and Gulf of California (Gardner 1948:159).
Synonyms: *Oliva* Duclós, *Olivina* d'Orbigny, 1840.

Subgenus *Olivella* (*Olivina*) d'Orbigny, 1840

Type species: *Olivina puelchana* d'Orbigny, 1839 [= *Olivella tehuelcha* (Duclós, 1835)] by original designation, living in the western Atlantic (see Olsson 1956, Pastorino 2009). *Oliva dama* Mawe, 1828 by subsequent designation (Dall 1909) (Pastorino 2009).

Remarks: Pastorino (2009) described living *Olivellas* from Argentina (shell structure and soft anatomical features) and recognized three species (*Olivella tehuelcha* Duclós, *Olivella puelcha* Duclós and *Olivella plata* Ihering) with illustrations that match with the fossil and subfossil material sampled from the marine Quaternary.

Olivella (*Olivina*) *plata* (Ihering, 1909)

(Plate 3, Figs. 5–6)

1909 *Olivancillaria auricularia* plata – Ihering, p. 432.
1965a *Olivella plata* – Castellanos & Fernández, p. 101, figs. 4, 5, 12, 13.
1967 *Olivella plata* – Castellanos, p. 122.
1973 *Olivella plata* – Figueiras & SICARDI, p. 266, pl. 15, fig. 196.
1977 *Olivella plata* – Scarabino, p. 191.
1985 *Olivella plata* – Ríos, p. 113, pl. 39, fig. 504.
1994 *Olivella plata* – Ríos, p. 144, pl. 47, fig. 628.
2000 *Olivella plata* – Forcelli, p. 104.
2005 *Olivella plata* – Clavijo et al., p. 388.
2015 *Olivella plata* – Vervaet, MolluscaBase, accessed through:World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 448238 on 2015-06-02Worms.

Dimensions: H: 6–12 mm, W: 2–3 mm.
Material: 220 shells from the Holocene, Baterías, Bahía Blanca area (PI-UNS 3203, PI-UNS 2680/1–220). Material from MLP(ZI) (most probably subfossil shells): S/N (Mar del Plata), S/N (Golfo Nuevo) (Castellanos 1967). Modern material from MACN-In: 9209 (Monte Hermoso), 14173 (Puerto Quequén), 11263 (Puerto Militar), 20244 (Bahía San Blas), 9152 (San Antonio Oeste).
Type locality: Punta Piedras, Buenos Aires Province (Pastorino 2009), which does not represent an area of modern distribution but a fossil record probably from Late Quaternary marine deposits very common in the area (Aguirre 1993a, b).
Type series: not found. According to Pastorino (2009) the type material was never deposited in an institution.
Stratigraphic range: Holocene-Recent (?)
Records in the marine Quaternary of Argentina: Holocene of the southeastern Bonaerensian area (Bahía Blanca).
Records in the marine Quaternary of other areas from South America: Uruguay.
Modern geographic range: southern Brazil, Uruguay, Agentina (Bonaerensian area to Golfo Nuevo). The modern records from Argentina are maninly known through mentions by Castellanos & Fernández (1965a) and Castellanos (1967) which are most probably subfossil shells.
Ecological requirements: the same as *O. tehuelcha* (beneath), free epifaunal, intertidal to shallow infralittoral in soft bottoms, carnivorous.

Remarks: the specimens illustrated by local authors as *O. plata* are very similar to *O. tehuelcha* (Duclós), the only apparent differences being a more elongate shell shapw, well defined narrow sutures, and distinct columellar folds. All these features, however, could represent extreme morphs within a wide morphological range (see beneath)

Olivella (*Olivina*) *tehuelcha* (Duclós, 1835)

(Plate 3, Figs. 7–13)

1835 *Oliva tehuelcha* – Duclós, pl. 4bis, figs. 7–14, 21.
1835 *Olivina puelcha* – Duclós, pl. 4bis, figs. 1–6, 20.
1840 *Olivina tehuelchana* – d'Orbigny, 5 (3), p. 418, pl. 59, figs. 7–12.
1840 *Olivina puelchana* – d'Orbigny, 5 (3), p. 418, pl. 59, figs. 13–19.
? 1909 *Olivancillaria auricularia plata* – Ihering, p. 432.
1944 *Olivella puelchana* – Carcelles, p. 259.
1960 *Olivella tehuelchana* – Barattini & Ureta, p. 130.

1965a *Olivella tehuelchana* – Castellanos & Fernández, p. 101.
1966 *Olivella tehuelchana* – Camacho, p. 138, pl. 17, fig. 2a–b.
1967 *Olivella puelchana* – Castellanos, p. 122, pl. 10, fig. 6.
1967 *Olivella tehuelchana* – Castellanos, p. 122, pl. 10, fig. 5.
1969 O*livella* (*Olivina*) *tehuelchana* – Forti, p. 124, pl. 9, fig. 2.
1969 *Olivella* (*Olivina*) *puelchana* – Forti, p. 127, pl. 9, fig. 3.
1970 *Olivella tehuelchana* (Duclós, 1835) – Ríos, p. 105, pl. 30.
1971 *Olivella* (*Olivina*) *tehuelchana* – Closs & Forti, p. 40, pl. 4, fig. 14.
1974 *Olivella* (*Olivina*) *tehuelchana* – Forti-Esteves, p. 143.
1975 *Olivella puelcha* – Ríos, p. 204, pl. 65, fig. 989.
1977 *Olivella tehuelchana* (Duclós,1835) – Scarabino, p. 191, pl. 3, fig. 6.
1978 *Olivella tehuelchana* – Farinati, p. 230, pl. 2, fig. 48.
1985 *Olivella tehuelchana* – Farinati, p. 219.
1985 *Olivella* (*Olivina*) *puelcha* (Duclós, 1840)(= *O. tehuelcha* d'Orb., 1841) – Ríos, p. 114, pl. 39, fig. 505.
1985 *Olivella* (*Olivina*) *tehuelcha* (Duclós, 1840) (= *O. puelchana* d'Orb., 1841) – Ríos, p. 114, pl. 39,fig. 506.
1988 *Olivella puelchana* – Aguirre, p. 119, pl. 7, figs. 1–22.
1991 *Olivella tehuelcha* (Duclós)(= *O. Tehuelchana*) – Abbott & Dance, p. 194, il.
1993a *Olivella puelchana* – Aguirre, p. 30, pl. 1, fig. 5 (Lectotype).
1993b *Olivella puelchana* – Aguirre, pl. 2, figs. 10–11.
1994 *Olivella* (*Olivina*) *tehuelcha* – Pastorino, p. 120.
1994 *Olivella* (*Olivina*) *tehuelcha* – Ríos, p. 145, pl. 47, fig. 630.
2000a *Olivella* (*Olivina*) *tehuelcha* – Aguirre & Farinati, p. 272, pl. 7, fig. 71.
2005 *Olivella tehuelcha* – Clavijo et al., p. 388.
2006 *Olivella tehuelcha* – Martínez et al., p. 397.
2008a *Olivella tehuelcha* – Aguirre et al., p. 704, fig. 3.
2008b *Olivella* (*Olivina*) *tehuelcha* – Aguirre et al., p. 304, pl. 4, fig. 55.
2009 *Olivella tehuelcha* – Pastorino, p. 196, figs. 20–38, 42–45.
2013 *Olivella puelcha* – Pisano et al., p. 69, fig. 4 (7).
2014 *Olivella tehuelche* – Lopes et al., fig. 4, V.
2015 *Olivella tehuelcha* – Rosenberg – MolluscaBase (2015), accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 448256 on 2015-06-02Worms.
2015 *Olivella puelcha* – Rosenberg – MolluscaBase (2015), accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 448240 on 2015-06-05.

Dimensions: H: 5–12 mm, W: 4–6 mm.
Material: 430 shells from the Holocene of the northeastern Bonaerensian coastal area between Punta Indio and Mar Chiquita area (MLP-PI 25954, 25955, 26432, 26436, 5937, MLP-PI 5859, MLP 4615, 34062), 77 shells from the Holocene and Pleistocene between Magdalena-Punta Indio (MLP-PI 5937), Holocene from Bahía Samborombón (MLP-PI 5859, 4615, MLP-DCG 0007-932) and Mar Chiquita areas (MLP-DCG 0007-929, 930, 931), 270 shells from the Holocene of Bahía Blanca area (PI-UNS 1397). Modern material from MLP (ZI): MLP S/N (Mar del Plata), MLP 3598 (San Antonio Oeste), from MACN-IN: 8635 (Mar del Plata), MACN 20243 (Bahía San Blas), MACN (23580, material studied by Carcelles 1944).
Type series: There is no type material of *Olivella tehuelcha* (Duclós) or *Olivella puelcha* (Duclós) proposed on the basis of d'ORBIGNY's drawings. The Lectotype of *Olivella puelchana* (d'Orb.) (= *tehuelcha* Duclós) (BMNH 1854.12.4.409) as well as the syntypes of *O. tehuelcha* (d'Orb.) (= *puelcha* Duclós) (BMNH 1854.12.4.4.408) (Aguirre 1993a) are housed at the NHM in London. The Lectotype of *puelchana* illustrated in Plate 3 (fig. 7) of this study) (but see Pastorino 2009).
Type locality: Bahía San Blas.
Stratigraphic range: Miocene-Recent.
Records in the marine Quaternary of Argentina: Pleistocene: Bahía Samborombón, Bahía Blanca, Bahía San Blas area (Boanerensian area), Bahía Bustamante (Golfo San Jorge, central Patagonia), Holocene: Magdalena, Punta Indio, Punta Piedras, Bahia Samborombón, Mar Chiquita, Bahía Blanca (Bonaerensian area), San Antonio Oeste (northern Patagonia), Puerto Pirámides (central Patagonia). Holocene from the Bonaerensian exterior continental shelf (13–57 m deep) between Punta Médanos and Faro Querandí and Pleistocene (82 m deep) from the interior continental shelf off Faro Querandí (Aguirre et al. 2008a).
Records in the marine Quaternary of other areas from South America: Pleistocene of Surinam, Holocene of Surinam, southern Brazil, Uruguay.
Modern geographic range: Río de Janeiro (Brazil) to Golfo Nuevo (Chubut province, Patagonia), with doubts (modern material?) around Bahía Bustamante area, at Station 6 of the "Shinkai-Maru" oceanographic Expedition (off Mar del Plata, at 30–65 m deep).
Ecological requirements: benthic on varied soft substrates, preferentially muddy and sandy bottoms (Ríos 1994), intertidal to shallow infralittoral (ca. 15–50 m deep), free epifaunal but sometimes partially burried inside fine sediments. This species is typical of warm-temperate water masses and can be found in cold temperate latitudes.

Remarks: Regarding the type series, it is known that Duclós (1935) described his *Olivellas* (*tehuelchana* and *puelchana*) based on illustrations of d'Orbigny's own material which he collected from the area of Bahía San Blas (southeastern Bonaerensian area, Argentina, South America). Thus he had no type material available when he first described both species. Also, that Duclós inverted the original names written on the illustrations sent to him by d'Orbigny (d'Orbigny 1840, Klappenbach 1991, Pastorino 2009). The type material described and illustrated by d'Orbigny (1939, 1840), housed at the Natural History Museum in London (BMNH 1854.12.4. 408 and 409), is composed of several syntypes. The lectotype of *Olivella puelchana* d'Orb. (= *tehuelcha* of Duclós) was designated and illustrated by Aguirre (1993a) as it is the most representative of the morphological features and match with the original illustration. Aguirre (1993a, pl. 1, fig. 5) designated the lectotype of *Olivella puelchana* d'Orb., 1840, among 13 syntypes housed at the Natural History Museum in London (BMNH 1854.12.4.409). According to Pastorino (2009) it was an invalid designation under the provisions of Article 74.2 of the International Code of Zoological Nomenclature (1999), however, this article states that "if it is demonstrated that a specimen designated as a lectotype was not a syntype, it loses its status of lectotype". The specimen designated as lectotype is certainly a syntype of d'Orbigny's type series, making the designation formally correct. Another, independent fact, is whether *O. puelchana* d'Orb. (1840) (d'Orbigny 1840: pl. 59, figs. 13–19) had been previously described as *O. tehuelcha* by Duclós (1835).

Apart from the fact that the type series of *Olivella puelchana* and *Olivella tehuelchana* described and illustrated by d'Orbigny (1840) are nearly identical, examination of large amounts of modern, Holocene and Pleistocene shells of *Olivella* show that an objective discrimination at the species level is difficult or impossible. In our view, the shell morphological differences between *Olivella tehuelcha* (Duclós, 1835) and *Olivella puelcha* (Duclós, 1835) (= *Olivella puelchana* (d'Orb.) and *O. tehuelchana* (d'Orb.), respectively), are neither strong enough nor significative to justify a dicrimination of two different species. In addition, they share the type locality and modern distribution and the ecological niche. Specimens traditionally assigned to each "species" most likely represent extremes within the morphological range of only one species. Pastorino (2009) pointed out that the shell, sutures and columellar folds are highly variable, and that the penial structure is the most or the only reliable morphological character useful for taxonomic discriminations in contrast with the shell morphology, which he considered unreliable (except for cases of sexual dimorphism of some shells of *O. puelcha* he himself mentioned). Dealing with empty shells (either fossil, subfossil or modern), like in our case (and that of many biologists not dealing with soft morphological features), makes it impossible to identify sex and penial structures as we can base identifications on shells only.

On the other hand, *Olivella plata* (Ihering, 1909) is practically identical to *Olivella tehuelcha* and most probably a posterior synonym. However, comparison of Ihering's type material with d'Orbigny's type material was not possible, thus we maintain it as a separate "species" and provide information regarding its fossil records in Argentina (see above).

Clade Heterobranchia

or Informal Group Heterobranchia

Subclass Heterobranchia J. E. Gray, 1840

Superfamily Mathildoidea DALL, 1889

Family Mathildidae DALL, 1889

Genus *Turritelopsis* G. O. Sars, 1878

Type species: *Turritella acicula* Stimpson, 1851 (type by monotypy, unnacepted, junior homonomy of *Turritella acicula* Phillips, 1836) (= *Turritellopsis stimpsoni* Dall, 1919), living in the northwest Atlantic and northern Europe.

Turritellopsis marplatensis Castellanos & Landoni, 1984

(Plate 3, Fig. 14)

1984 *Turritelopsis marplatensis* Castellanos & Landoni, p. 293.
1994 *Turritelopsis marplatensis* – Farinati, p. 308, pl. 2, fig. 5.

Dimensions: H: 4–4.2 mm, W: 1.2–1.3 mm, aperture: 0.7 × 0.5 mm.
Material: 3 shells from the Holocene of Bahía Blanca area [PI-UNS 2696 (1–3)], MACN-In 28924.
Type locality: Chapadmalal, Mar del Plata (Buenos Aires province).
Type series: Holotype MACN-In 28924 (collection Bidart). Paratype MACN-In 31359 (collection Landoni).
Stratigraphic range: Holocene-Recent.
Records in the marine Quaternary of Argentina: Holocene of Ingeniero White, Bahía Blanca surroundings.
Records in the marine Quaternary of other areas from South America: not known.

Modern geographic range: Bonaerensian littoral.
Ecological requirements: marine, epifaunal, on sandy bottoms.

Remarks: Other species of *Turritellopsis* (e.g., *acicula*, *floridana*) are typical of cold water masses. *T. marplatensis* is close to *T. gratissima* Thiele and to *T. latior* Thiele living in Antarctica.

Superfamily Pyramidelloidea Gray, 1840
Family Amathinidae Ponder, 1987

Genus *Iselica* Dall, 1918

Type species: *Narica anomala* C. B. Adams, 1850 (type by typification of replaced name, Rosenberg et al. 2009, Worms), living in the Western Atlantic (Gulf of Mexico, Brazil).

Iselica globosa (H. C. Lea, 1845)

(Plate 3, Figs. 15–16)

? 1845 *Narica globosa* Lea, p. 248.
1850b *Narica* (*?*) *anomala* C. B. Adams. p. 109.
1971 *Iselica anomala* – Figueiras & Sicardi, p. 114, pl. 10, fig. 142.
1974 *Iselica anomala* – Abbott, p. 136, fig. 1502.
1985 *Iselica anomala* – Ríos, p. 165, pl. 54, fig. 787.
1994 *Iselica anomala* – Farinati, p. 10, pl. 3, fig. 9°–b.
1994 *Iselica anomala* – Ríos, p. 191, 62, fig. 896.
1998 *Iselica anomala* – Turgeon et al., p. 117.
2004 *Iselica anomala* – Scarabino, p. 326.
2005 *Iselica anomala* – Clavijo et al., p. 390.
2009 *Iselica globosa* – Rosenberg et al., p. 671.
2013 *Iselica anomala* – Pisano et al., p. 71, fig. 4 (11).
2015 *Iselica globosa* – Rosenberg – MolluscaBase, accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 420433 on 2015-05-27.

Dimensions: H: 3–4 mm, W: 2–3 mm (syntype of N. anomala: length of spire: 0.2 mm, total length: 5 mm, width: 3.2 mm.
Material: one specimen from the northeastern Bonaereansian littoral (MLP-PI 34061), 58 shells from the Holocene of Bahía Blanca area [PI-UNS 2690 (1–58)].
Type locality: Jamaica, Greater Antilles (of *N. anomala*).
Type series: Paratype MCZ 186035 (Museum Comparative Zoology, Harvard University) (of *Narica anomala* C. B. Adams, 1850) (GBIF).
Stratigraphic range: Late Pliocene-Recent.
Records in the marine Quaternary of Argentina: Holocene along the Bonaerensian area (northeastern and southeastern coastal sectors).
Records in the marine Quaternary of other areas from South America: Uruguay.
Modern geographic range: Antilles, Brazil, Uruguay.
Ecological requirements: intertidal, on algae, dredged offshore (Ríos 1994).

Remarks: this species represents a palaeoclimate indicator. Its Holocene geographical range is southwarths shifted in comparison with its modern range (Farinati 1994). It is an indicator of warmer waters than present along the southeastern Bonaerensian coastal area in Argentina, probably as a consequence of an enhanced Brazilian Current during the mid-Holocene Climatic Optimum/amelioration (Brinner et al. 2003, Aguirre 1993c). *Vitrinella agulhasensis* Thiele, recorded from Monte Hermoso (Castellanos 1969) could be a synonym (Farinati 1994).

Family Pyramidellidae Gray, 1840

Pyramidellids represent a most common group in modern littoral oceanic bottoms worldwide and represent the second marine gastropod family ranged according to the number of species after the Turridae. They are very well represented in Cenozoic fossiliferours deposits, suggesting that they were as important in the past as they are at present within benthonic littoral communities (Miller III 1983). They are as well very abundant within the marine Quaternary of Argentina, especially the *Turbonillas*.

Genus *Careliopsis* Mörch, 1875

Type species: *Careliopsis styliformis* (Mörch, 1875) (monotypy).

Careliopsis styliformis (Mörch, 1875)

(Plate 3, Fig. 17)

1875 *Monoptygma* (Careliopsis) styliformis Mörch, p. 169.
1889 *Careliopsis styliformis* – Dall. p. 338.
1911 *Turbonilla bermudensis* Dall & Bartsch, p. 279, pl. 35, fig. 4.
1982b *Eulimella* (*Bacteridium*) *bermudensis* – Castellanos, p. 77, fig. 13.
1989 *Eulimella bermudensis* – Zaffaroni, p. 123, fig 2.
1985 *Eulimella bermudensis* – Farinati, p. 219.
1993 *Eulimella bermudensis* – Farinati, p. 308, fig. 19.
2001b *Careliopsis styliformis* – Pimenta & Absalão, p. 46,figs. 16–18.
2004 *Careliopsis styliformis* – Scarabino, p. 326.
2009 *Careliopsis styliformis* – Rosenberg, p. 673.
2015 *Careliopsis styliformis* – Rosenberg – MolluscaBase, accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 420473 on 2015-05-30.

Dimensions: H: 1.4–12 mm, W: 0.6–4 mm (original description 9 × 4 mm).
Material: 220 shells from the Holocene of Bahía Blanca area [PI-UNS 2680 (1–220)].
Type locality: Saint Thomas (Caribbean).

Type series: not found (also not found by Pimenta & Absalão 2001a, b).
Stratigraphic range: Holocene-Recent.
Records in the marine Quaternary of Argentina: Holocene from Bahía Blanca area.
Records in the marine Quaternary of other areas from South America: Amapá, Spirito Santo, Sao Paulo (Brazil) and Maldonado (Uruguay) (Zaffaroni 1989).
Modern geographical range: eastern North America (Florida), Bermudas, Mexico, Gulf of Mexico, Caribbean, Brazil, Uruguay, in Argentina there is only one record from 41° 46′ S, 63° 13′ W at 65 m deep obtained by the "Shinkai-Maru" oceanographic expedition as described by Castellanos (1982a).
Ecological requirements: marine, benthonic, soft bottoms (Rosenberg et al. 2009).

Remarks: this species represents a palaeoclimate indicator. Its Holocene geographical range is southwarths shifted in comparison with its modern range. It is an indicator of warmer SST than present along the southeastern Bonaerensian coastal area in Argentina, probably as a consequence of an enhanced Brazilian Current during the mid-Holocene Climatic Optimum/amelioration. Although Castellanos (1982a) illustrated this species from the continental shelf ("Shinkai-Maru" expedition) and considered its occurrence in Chapadmalal-Mar del Plata area, thre are no other photographic records of this species documented by modern materials. Empty shells which apparently belong to modern specimens occur at Monte Hermoso area (pers. comm. of Dr. R. Lejarraga). Pimenta & Absalão (2001) observed that Eulimella bermudensis is a synonym of *Careliopsis styliformis*.

Genus *Turbonilla* Risso, 1826

Type species: *Turbonilla costulata* Risso, 1826 (type by subsequent designation).

Remarks: taking into account that there are no clear and uniform criteria regarding their position within different subgenera, the species of *Turbonilla* identified are mentioned beneath according to an alphabetical order. Many modern Brazilian species of Pyramidellids were described by Pimenta & Absalão (2001a, 2004) and Pimenta (2012), some of which show geographical ranges reaching southwards to the Bonaerensian and Patagonian littoral sectors of Argentina. From our point of view, among the various species described, several could be considered synonyms and represent an example of the taxonomic inflation discussed further on (discussion section).

Turbonilla americana (d'Orbigny, 1840)

(Plate 4, Fig. 1)

? 1835 *Turbonilla interrupta* Totten, p. 352–357.
1840 *Chemnitzia americana* d'Orbigny, p. 397, pl. 53, figs. 17–19.
1938 *Turbonilla americana* – Carcelles & Parodiz, p. 255.
1954 *Turbonilla* (*Pyrgiscus*) *interrupta* – Abbott, p. 288, fig. 62 b.
1967 *Turbonilla americana* – Castellanos, p. 52, pl. 4, fig. 6.
1969 *Turbonilla* (*Pyrgiscus*) *interrupta* – Forti, p. 110, pl. 8, fig. 1.
1974 *Turbonilla* (*Pyrgiscus*) *interrupta* – Forti Esteves, p. 146.
1975 *Turbonilla* (*Pyrgiscus*) *interrupta* – Ríos, p. 145, pl. 43, fig. 674.
1976 *Turbonilla* (*Pyrgiscus*) *interrupta* – Emerson & Jacobson, p. 174, pl. 26, fig. 3.
1980 *Turbonilla americana* – Farinati & Camacho, p. 260.
1981 *Turbonilla* (*Pyrgiscus*) *interrupta* – Andrews, p. 75.
1882b *Turbonilla* (*Pyrgiscus*) *interrupta* – Castellanos, p. 69, text-fig.
1985 *Turbonilla* (*Pyrgiscus*) *americana* – Ríos, p. 166, pl. 55, fig. 791.
1993a *Turbonilla americana* – Aguirre, p. 34, pl. 1, fig. 8 (Lectotype).
1993 *Turbonilla* (*Pyrgiscus*) *interrupta* – Farinati, p. 303, fig. 8.
1994 *Turbonilla* (*Pyrgiscus*) *americana* – Ríos, p. 190, pl. 62, fig. 886.
2001a *Turbonilla americana* – Pimenta & Absalão, p. 72, figs. 1–2.
2008b *Turbonilla americana* – Aguirre et al., p. 704, fig. 3.
2015 *Turbonilla americana* – Rosenberg – MolluscaBase, accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 533540 on 2015-05-21.
2015 *Turbonilla interrupta* – Bouchet – MolluscaBase, accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 160082 on 2015-06-26.

Dimensions: H: 6–9 mm, W: 1.2–1.8 mm.
Material: 3 shells from the Holocene of Mar Chiquita area. Collections at the MLP (PI) (26435). Modern collections: MLP (ZI): S/N (Monte Hermoso), 11319 (Puerto Militar).
Type locality: Río de Janeiro (Brazil).
Type series: Lectotype (BMNH 1854.12.4.365) dessignated among a total of 3 syntypes (Aguirre 1993: 25, 34, pl. 1, fig. 8), illustrated in Plate 4 (Fig. 1) of this study.

Stratigraphic range: Holocene-Recent.
Records in the marine Quaternary of Argentina: Holocene from the northeastern Bonaerensian coastal area: Bahía Samborombón, Mar Chiquita, Bahía Blanca. Holocene from the Bonaerensian exterior continental shelf (13–57 m deep) between Punta Médanos and Faro Querandí (Aguirre et al. 2008a).
Records in the marine Quaternary of other areas from South America: Holocene of Brazil.
Modern geographical range: Brazil, Bonaerensian littoral.
Ecological requirements: benthic free epifaunal on predominantly soft bottoms, sometimes partially covered with sediments, infralittoral. In Brazil it has records between 45 and 100 m.

Remarks: This species is probably a posterior synonym of *T. interrupta* (Totten, 1835). However, the type material of Totten was not avilable for comparisons. Pimenta & Absalão (2001a: 72) argued that the lectotype designated by Aguirre (1993a) for *Turbonilla americana* (d'Orb.) belongs to *Bittium michaelseni* (Strebel, 1905) (whose type locality is Punta Arenas in southernmost Chile), a species illustrated by Castellanos (1990, fasc. 5: 16, pl. 2, fig. 6, 6 mm, from Puerto Deseado, Santa Cruz in southern Patagonia). They assigned that lectotype to the genus *Eumetula* Thiele, 1912. The lectotype of *Turbonilla americana* (Aguirre, 1993a, pl. 1, fig. 8) and the type series examined in the NHM in London do not belong to *Eumetula*, do not match with *Eumetula michaelseni* (Strebel) and has no siphonal canal, but an irregular apertural contour. The differences between the various syntypes reflect an intraspecific morphological variation of this species which is most common within the genus *Turbonilla*. Moreover, that same designated lectotype is strongly similar to *Turbonilla farinatiae* Pimenta & Absalão (2004, figs. 1–5). In our opinion there is an unnecessarily oversized number of species of *Turbonilla* proposed by these and several other authors for the SWA.

Turbonilla fasciata (d'Orbigny, 1840)

(Plate 4, Figs. 2–4)

1840 *Chemnitzia fasciata* d'Orbigny, p. 397, pl. 76, figs. 4–6.
1885 *Turbonilla fasciata* – Tryon Pilsbry, p. 331, pl. 36, fig. 25.
1938 *Turbonilla fasciata* – Carcelles & Parodíz, p. 254.
1967 *Turbonilla fasciata* – Castellanos, p. 52, pl. 4, fig. 11.
1974 *Turbonilla fasciata* – Figueiras & Sicardi, p. 336, pl. 19, fig. 246.
1975 *Turbonilla fasciata* – Ríos, p. 145, pl. 43, fig. 673.
1978 *Turbonilla fasciata* – Farinati, p. 227, pl. 2, fig. 34.
1982b *Turbonilla fasciata* – Castellanos, p. 68, fig. 11.
1985 *Turbonilla fasciata* – Ríos, p. 166, pl. 55, fig. 795.
1993a *Turbonilla fasciata* – Aguirre, Table 1 (ill. type material).
1993 *Turbonilla fasciata* – Farinati, p. 227, fig. 7.
1994 *Turbonilla* (*Pyrgiscus*) *fasciata* – Ríos, pl. 62, fig. 890.
2008a *Turbonilla fasciata* – Aguirre et al., p. 704, fig. 3.
2011 *Turbonilla fasciata* – Rosenberg – accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 588596 on 2012-03-01.
2015 *Turbonilla fasciata* – Rosenberg – MolluscaBase (2015), accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 588596 on 2015-06-26.

Dimensions: H: 2.5–8 mm, W: 1.2–2 mm.
Material: 7 shells from the Holocene of the norteastern Bonaerensian coastal area (Punta Indio, Punta Piedras, Bahía Samborombón, Mar Chiquita) (MLP-PI 26391), Holocene from Bahía Blanca area (PI-UNS 2669). Modern collections at MACN-In: 11348 (Puerto Militar).
Type locality: Río de Janeiro (Brazil).
Type series: Holotype (BMNH 1854.12.4.370).
Stratigraphic range: Holocene-Recent.
Records in the marine Quaternary of Argentina: Holocene from Punta Indio, Punta Piedras, Bahía Samborombón, Mar Chiquita (northeastern Bonaerensian coastal area) and Bahía Blanca (southeastern Bonaerensian area). Holocene from the Bonaerensian exterior continental shelf (13–57 m deep) between Punta Médanos and Faro Querandí (Aguirre et al. 2008a).
Records in the marine Quaternary of other areas from South America: Holocene of Uruguay.
Modern geographical range: southern Brazil to Bahía San Blas (southeastern Bonaerensian littoral area).
Ecological requirements: same as *T. americana,* typical of sandy bottoms in the littoral zone.

Remarks: this species is practically identical to *Turbonilla americana* (d'Orbigny), and very close to *T. interrupta* (Totten, 1835) and *T. rushi* (Bush). However, as their type materials were not available for comparison we mantain their names as independent entities until we are able to establish whether they can be considered synonyms.

Turbonilla interrupta Totten, 1835

(Plate 4, Figs. 5–6)

1835 *Turbonilla interrupta* Totten, p. 352, fig. 7.
? 1840 *Chemnitzia americana* d'Orbigny, p. 397, pl. 53, figs. 17–19.
1889 *Turbonilla interrupta* – Dall, p. 336, pl. 26, fig. 2, 2b.
1969 *Turbonilla* (*Pyrgiscus*) *interrupta* – Forti, p. 110, pl. 8, fig. 1.

1974 *Turbonilla interrupta* – Figueiras & Sicardi, p. 335, pl. 19, fig. 245.
1982b *Turbonilla interrupta*– Castellanos, p. 69, fig. 7.
1985 *Turbonilla interrupta atypha* Bush, Ríos, 166, pl. 55, fig. 796.
1993 *Turbonilla* (*Pyrgiscus*) *interrupta* – Farinati, p. 303, fig. 8.
1994 *Turbonilla* (*Pyrgiscus*) *interrupta* – Ríos, p. 190, pl. 62, fig. 891.
2015 *Turbonilla interrupta* – Bouchet – MolluscaBase, accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 160082 on 2015-05-21.

Dimensions: H: 6 mm, W: 1.8 mm.
Material: 120 shells from the Holocene of Bahía Blanca area [PI-UNS 2670 (1–120)].
Type locality: Río de Janeiro (Brazil).
Type series: not found.
Stratigraphic range: Pliocene-Recent.
Records in the marine Quaternary of Argentina: Holocene from Bahía Blanca area.
Records in the marine Quaternary of other areas from South America: Holocene of Rio Grande do Sul (Brazil). Pliocene records were documented for South Carolina (Dall 1889) and Late Pleistocene for North Carolina (Miller III 1983).
Modern geographical range: Canada, N Carolina, Antilles, Brazil to Uruguay and northern Argentina.
Ecological requirements: same as *T. americana* and *T. fasciata*, typical of sandy bottoms in the littoral area.

Remarks: probably a senior synonym *of T. americana* (d'Orb.) and of *T. fasciata* (d'Orb.) (see remarks for *T. fasciata* above).

Turbonilla rushii Bush, 1899

(Plate 4, Figs. 7–8)

1899 *Turbonilla rushi* Bush, p. 160, pl. 8, fig. 11.
1899 *Turbonilla abrupta* Bush, p. 168, pl. 8, fig. 4.
1960 *Turbonilla rushi* – Barattini & Ureta, p. 112.
1974 *Turbonilla rushi* – Figueiras & Sicardi, p. 336, pl. 19, fig. 248.
1982b *Turbonilla rushi* – Castellanos, p. 67, fig. 12.
1985 *Turbonilla rushi* – Ríos, p. 166, pl. 55, fig. 797.
1985 *Turbonilla rushi* – Farinati, p. 219.
1993 *Turbonilla rushi* – Farinati, p. 302, fig. 6.
1994 *Turbonilla rushi* – Ríos, p. 190, pl. 62, fig. 892.
2001a *Turbonilla rushi* – Pimenta & Abasalão, p. 78, figs. 17–27.
2004 *Turbonilla rushi* – Scarabino, p. 326.
2015 *Turbonilla rushii* – Rosenberg – MolluscaBase, accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 532308 on 2015-06-03.

Dimensions: H: 9 mm (type material: H: 9.5 mm, W: 2.5 mm, length of aperture: ca. 2 mm).
Material: 114 shells from the Holocene of Bahía Blanca area [PI-UNS 2668 (1–114)].
Type locality: Maldonado (Uruguay).
Type series: the original description was based on one specimen only (Holotype by monotypy, ANSP 70535).
Stratigraphic range: Holocene-Recent.
Records in the marine Quaternary of Argentina: Holocene from Bahía Blanca area.
Records in the marine Quaternary of other areas from South America: unknown.
Modern geographic range: *T. rushii* occurs along the SWA in Brazil and Uruguay, not recorded living from Argentina.
Ecological requirements: in Brazil it lives on sandy bottoms of the infralittoral zone 15–85 m deep) (Ríos 1994).

Remarks: see remarks for *T. fasciata* (d'Orb.) above.

Turbonilla sanmatiensis Castellanos, 1982

(Plate 4, Figs. 9–10)

1982b *Turbonilla sammatiense* Castellanos, p. 75, fig. 6.
1993 *Turbonilla sanmatiensis* – Farinati, p. 305, fig. 14.
1993 *Turbonilla sanmatiense* – Castellanos & Landoni, p. 19, fig. 26.
2000 *Turbonilla sanmatiense* – Forcelli, p. 114, fig. 345.
2004 *Turbonilla sanmatiensis* – Scarabino, p. 326.
2015 *Turbonilla sanmatiensis* – Rosenberg – MolluscaBase, accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 533580 on 2015-07-21.

Dimensions: H: 6.2–10 mm, W: 1.5–2.3 mm (Holotype: 9.8 × 2 mm).
Material: 62 shells from the Holocene of Bahía Blanca area [PI-UNS 2676 (1–62)]. Modern collections at MACN-In: 8908/1(35° 50′ S, 55° 18′ W, 31 m deep, ARA "Patria" second expedition, M. Doello Jurado, 1914), 16183 (37° 31′ S, 56° 23′ W, 70 m, col. "UNDINE") and at MLP-ZI: 1921 (42° 28′ S, 63° 19′ W) (R. Bastida).
Type locality: Golfo San Matías (Río Negro province, northern Patagonia).
Type series: Holotype and Paratype in the MLP-In collections.
Stratigraphic range: Holocene-Recent.
Records in the marine Quaternary of Argentina: Holocene from Bahía Blanca area.
Records in the marine Quaternary of other areas from South America: not known.
Modern geographic range: Uruguay and Argentina (Bonaerensian and northern Patagonian littoral).
Ecological requirements: same as previous species of *Turbonilla*.

Remarks: see remarks for *T. fasciata* (d'Orb.) above.

Turbonilla smithi Pfeffer, 1905

(Plate 4, Figs. 11–13)

1905 *Chemnitzia smithi* Strebel (homonimy, fide Worms)
1905 *Turbonilla smithi* Pfeffer in Strebel, p. 659, pl. 23, figs. 42a–d.
1982b *Turbonilla smithi* – Castellanos, p. 66, figs. 2–3.
1985 *Turbonilla smithi* – Farinati, p. 216, fig. 6.
1993 *Turbonilla smithi* – Farinati, p. 300, fig. 3.
1993 *Turbonilla smithi* – Castellanos & Landoni, p. 18, pl. 3, fig. 24.
2000 *Turbonilla smithi* – Forcelli, p. 115, fig. 346.
2004 *Turbonilla smithi* – Scarabino, p. 326.
2015 *Turbonilla smithi* Strebel, 1905 (homonymy), Sartori – MolluscaBase (2015), accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 820565 on 2015-06-19.

Dimensions: H: 3.5–4.1 mm, W: 1.1–2 mm (type 4.1 × 1.1 mm).
Material: 45 shells from the Holocene of Bahía Blanca area [PI-UNS 2665 (1–45)].
Type locality: Le Maire Strait (southern Tierra del Fuego).
Type series: unknown.
Stratigraphic range: Holocene-Recent.
Records in the marine Quaternary of Argentina: Holocene from Bahía Blanca area.
Records in the marine Quaternary of other areas from South America: not known.
Modern geographic range: Tierra del Fuego and Burdwood Bank, Santa Cruz province (Patagonia), reaching 40° S and 37° S (Castellanos 1982b: 66, Castellanos & Landoni 1993: 19).
Ecological requirements: probably same as for previous species of *Turbonilla* recorded.

Remarks: its abundance in cold waters of the SWA and the southern Ocean allows to consider this species a a cold water indicator.

Turbonilla uruguayensis Pilsbry, 1897

(Plate 4, Figs. 14–19)

1897 *Turbonilla uruguayensis* Pilsbry, p. 296, pl. 6, figs. 8–10.
1907 *Turbonilla querandina* Ihering, p. 442, pl. 17, fig. 121.
1944 *Turbonilla uruguayensis* – Carcelles, p. 248.
1966 *Turbonilla querandina* – Camacho, p. 118, pl. 15, fig. 16 (Holotype).
1967 *Turbonilla uruguayensis* – Castellanos, p. 51, pl. 4, fig. 7.
1971 *Turbonilla* cf. *uruguayensis* – Closs & Forti, p. 37, pl. 4, fig. 8.
1974 *Turbonilla uruguayensis* – Figueiras & Sicardi, p. 334, pl. 19, fig. 243.
1977 *T. uruguayensis* – Scarabino, p. 195, pl. 3, fig. 7.
1978 *T. uruguayensis* – Farinati, p. 226, pl. 2, fig. 33.
1982b *Turbonilla uruguayensis* – Castellanos, p. 63, fig. 1a–b.
1985 *Turbonilla uruguayensis* – Farinati, p. 219.
1985 *Turbonilla uruguayensis* – Ríos, p. 166, pl. 55, fig. 790.
1987 *T. uruguayensis* – Farinati &Aliotta, p. 580, pl. 1, fig. 6.
1990b *T. uruguayensis* – Aguirre, p. 164.
1993 *Turbonilla uruguayensis* – Farinati, p. 299, fig. 1.
1993a *T. uruguayensis* – Aguirre, pl. 1, fig. 9 (Paralectotype).
1993b *T. uruguayensis* – Aguirre, pl. 2, fig. 9.
1994 *T. uruguayensis* – Ríos, p. 189, pl. 62, fig. 884.
2000a *Turbonilla uruguayensis* – Aguirre & Farinati, p. 281, pl. 8, fig. 89.
2004 *T. uruguayensis* – Scarabino, p. 326.
2005 *Turbonilla uruguayensis* – Clavijo et al., p. 390.
2006 *Turbonilla uruguayensis* – Martínez et al., p. 397.
2015 *Turbonilla uruguayensis* – Rosenberg – MolluscaBase (2015), accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 533586 on 2015-05-21.

Dimensions: H: 6–11 mm, W: 1–3 mm.
Material: 26 shells from the Holocene of the Bonaerensian coastal area (Punta Indio, Bahía Samborombón, Mar Chiquita) (MLP-PI 26428, MLP-DCG 0007-933), 80 shells from the Holocene of Bahía Blanca area [PI-UNS 2663 (1–80)]. MLP (PI): 25958 (Mar Chiquita).
Type locality: Maldonado (Uruguay).
Type series: 9 syntypes of which a Lectotype (ANSP 70546) was designated by Olsson (1961) and reillustrated by Aguirre (1993a: 34, pl. 1, fig. 12) and in Plate 4 (Figs. 18–19) of this study.
Stratigraphic range: Pleistocene-Recent.
Records in the marine Quaternary of Argentina: Holocene from Punta Indio, Bahía Samborombón, Mar Chiquita, Bahía Blanca (Bonaerensian coastal area).
Records in the marine Quaternary of other areas from South America: Holocene of southern Brazil and Uruguay.
Modern geographic range: South Brazil, Uruguay to Golfo San Matías (Argentina).
Ecological requirements: free epifaunal on soft bottoms (calcareous sands), intertidal to shallow infralittoral (0–36 m deep, Scarabino 1977, 5 m, Ríos 1994).

Remarks: *Turbonilla nivea* Stimpson, 1851, could be a senior synonym. The holotype of *Turbonilla querandina* Ihering, 1907, a posterior synonym from the "Querandinense" (Holocene) of Puerto Belgrano (Bahía Blanca area), was illustrated by Camacho (1966: pl. 15, fig. 16). See remarks for *T. fasciata* above.

Genus *Chrysallida* Carpenter, 1856

Type species: *Chemnitzia communis* C. B. Adams, 1852 (type by original designation).

Chrysallida multituberculata (Castellanos, 1982)

(Plate 5, Fig. 1)

1982b *Odostomia* (*Chrysallida*) *multituberculata* Castellanos, p. 81, fig. 17.
1985 *Odostomia multituberculata* – Farinati, p. 219.
1993 *Odostomia* (*Chrysallida*) *multituberculata* – Castellanos & Landoni, p. 20, fig. 29.
1993 *Odostomia multituberculata* – Farinati, p. 307, fig. 7.
2009 *Odostomia* (*Chrysallida*) *multituberculata* – Rosenberg – Malacolog 4.1.1, a database of Western Atlantic Marine Mollusca., available online at http://www.malacolog.org/.
2015 *Chrysallida multituberculata* – Rosenberg – MolluscaBase, accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 532611 on 2015-06-26.

Dimensions: H: 2–3.4 mm, W: 1–1.5 mm: 2.5 × 1.2 mm (MLP-ZI), 2.4 × 1.1 mm, 3.4 × 1.2 mm. Aperture: 1.1 × 0.7 mm. Type: 2.5 × 1.2 mm (according to Castellanos 1982: 81, Castellanos & Landoni 1993: 20).
Material: 126 shells from the Holocene of Bahía Blanca area [PI-UNS 2678 (1–126)]. Station 23 and 16 of the "Shinkai Maru" Expedition, collection Ricardo Bastida, 49° 29′ S, 61° 35′ W, 35 m Deep, 5 km of Las Grutas, South of San Antonio Oeste, Río Negro Province, Northern Patagonia), MLP, MACN (S/N: Chapadmalal, Mar del Plata, collection Bidart).
Type locality: 41° 46.8′ S, 63° 13.5′ W, 65 m deep.
Type series: Holotype (according to Castellanos & Landoni 1993: 28). Not found. Probably at MLP-ZI.
Stratigraphic range: Holocene-Recent.
Records in the marine Quaternary of Argentina: Holocene from Bahía Blanca area.
Records in the marine Quaternary of other areas from South America: not found.
Modern geographic range: Bonaerensian coastal area to northern Patagonia (San Antonio Oeste, Río Negro, Argentina), extending southwards to 49° S (according to Castellanos & Landoni 1993: 20).
Ecological requirements: marine, mainly on soft bottoms, infralittoral. It has preference for *Crepidula* (Mollusca, Gastropoda) as a host (Castellanos 1982b).

Remarks: *Odostomia (Chrysallida) multituberculata* was placed by other authors in *Chrysallida*, Carpenter (see Worms web page). *Odostomia (Chrysallida) seminuda* (Adams) is a close species recorded from the Quaternary of Rio Grande do Sul (Brazil) (Forti 1969: pl. 7, fig. 8).

Family Acteonidae d'Orbigny, 1843

Genus *Actaeocina* Gray, 1847

Type species: *Acteon wetherellii* Lea, from the Miocene of New jersey (USA), by original designation (Gardner 1948: 279).

Actaeocina candei (d'orbigny, 1841)

(Plate 5, Figs. 2–5)

1841 *Bulla candei* d'Orbigny, p. 128, pl. 4bis, figs. 1–4.
1944 *Actaeocina candei* – Carcelles, p. 262.
1953 *Actaeocina candei* – Olsson & Harbison, p. 160, pl. 25, figs. 7, 7a–b.
1966 *Actaeocina candei*– Camacho, p. 145, pl. 17, fig. 10.
1967 *Actaeocina candei*– Castellanos, p. 143, pl. 11, fig. 1.
1969 *Actaeocina candei*– Forti, p. 131, pl. 9.
1977 *Tornatina candei* – Scarabino, p. 194.
1985 *Actaeocina candei* – Ríos, p. 170, pl. 56, fig. 817.
1993 *Actaeocina candei* – Aguirre, pl. 2, fig. 15.
1993a *Actaeocina candei* – Aguirre, p. 35, pl. 1, fig. 9.
1994 *Actaeocina candei* – Farinati, p. 311, pl. 3, fig. 10.
1994 *Actaeocina candei* – Ríos, p. 194, pl. 64, fig. 912.
2006 *Actaeocina candei* – Martínez et al., p. 397.
2009 *Actaeocina candei*– Rosenberg, Moretzsohn & García – Gastropoda (Mollusca) of the Gulf of Mexico, p. 579–699. – Felder & Camp (eds.): Gulf of Mexico – Origins, Waters, and Biota, Texas A & M Press, College Station, Texas.

Dimensions: H: 2.9–4.2 mm, W: 1–2.1 mm.
Material: 28 shells from the Holocene of the northeastern coastal area (Punta Piedras, Bahía Samborombón, Mar Chiquita) (MLP-PI 25957, MLP-DCG 0007-934), 127 shells from the Holocene of Bahía Blanca area (PI-UNS 2698, 1–127).
Type locality: Antilles.
Type series: Lectotype (BMNH 1854.10.4.17/1) designated by Mikkelsen (1984) (BMNH 1854.10.4.17/1), reillustrated by Aguirre (1993a: 25, 35, Pl. I, fig. 9) (from 3 syntypes) and in Plate 5 (Fig. 2) of this study.
Stratigraphic range: Pleistocene-Recent.
Records in the marine Quaternary of Argentina: Pleistocene from Puerto Belgrano (Puerto Militar, Bahía Blanca area), Holocene from the northeastern (Punta Indio-Punta Piedras to Mar Chiquita) and southeastern (Bahía Blanca-Bahía San Blas) coastal area.
Records in the marine Quaternary of other areas from South America: Holocene of southern Brazil.
Modern geographic range: North Carolina to Antilles, Surinam, Brazil, Uruguay, Puerto Quequén, Golfo San Matías.
Ecological requirements: free epifaunal on sandy bottoms and oyster beds (Ríos 1994), infralittoral (12.5–41.4 m deep) (Scarabino 1977).

Remarks: According to Ríos (1994), *Tornatina liratispira* E. A. Smith, 1872 is a synonym.

Informal Group Opistobranchia Milne Edwards, 1848

Clade Cephalaspidea

Family Cylichnidae H. Adams & A. Adams, 1854

Genus *Cylichna* Lovén, 1846

Type species: *Bulla cylindracea* Pennant, 1777 (type by subsequent designation of Hermannsen, 1852), living in the

western coasts of Europe, fossil from the Pliocene and Pleistocene of Europe (Gardner 1948: 179, Addicott 1970: 139, Ríos 1985: 169).
Synonyms: *Bullinella* Newton, 1891, *Cylichnoides* Minichev, 1977, *Cylindrella* Swainson, 1840, *Eocylichna* Kuroda & Habe, 1952.

Cylichna crispula Watson, 1883

(Plate 5, Figs. 6–8)

1883 *Cylichna crispula* Watson, p. 321.
1886 *Cylichna crispula* Watson, p. 666, pl. 49.
1893 *Cylichna crispula* – Pilsbry, p. 315, pl. 30.
1938 *Cylichna crispula* – Carcelles & Parodiz, p. 158, pl. 2, fig. 11.
1944 *Cylichna crispula* – Carcelles, p. 262.
1960 *Cylichna crispula* – Barattini & Ureta, p. 137, pl. 39, fig. 279.
1967 *Cylichna crispula* – Castellanos, p. 144, pl. 11, fig. 3.
1969 *Cylichna* (*Cylichnella*) *bidentata* d'Orbigny &Forti, pl. 9, fig. 7.
1980 *Cylichna crispula* – Figueiras & Sicardi, p. 232.
1985 *Cylichna crispula* – Ríos, p. 170, pl. 56, fig. 812.
1993a *Cylichna crispula* – Aguirre, p. 35, pl. 1, fig. 11.
1994 *Cylichna* aff. *crispula* – Ríos, p. 194, pl. 63, fig. 907.

Dimensions: H: 2.9–6 mm, W: 1.5–2 mm.
Material: 14 shells from the Holocene of the northeastern Bonaerensian coastal area (Berisso, Punta Indio, Bahía Samborombón, Mar Chiquita) (MLP-PI 26431, MLP-DCG 0007-935).
Type locality: unknown.
Type series: Lectotype (BMNH 1887.2.9.2271-2275) designated by Aguirre (1993a: 25, 35, Pl. I, 11) from 5 syntypes and reillustrated in Text-fig. 11H of this study.
Stratigraphic range: Neogene-Recent.
Records in the marine Quaternary of Argentina: Holocne from the northeastern (Berisso-Mar Chiquita) and southeastern (Bahía Blanca-Bahía San Blas) Bonaerensian coastal area.
Records in the marine Quaternary of other areas from South America: Holocene from Brazil.
Modern geographic range: Australia, Fernando de Noronha, Brazil, Argentina.
Ecological requirements: this species has been mentioned living at 50 m deep in the Mar Argentino (Carcelles 1944, Castellanos 1967).

Remarks: This species has been often assigned either to *Cylichna* Lovén, 1846 (see synonymy list) or to *Retusa* T. Brown, 1877 (see Valdés 2008), which type species is *Bulla obtusa* Montagu, 1803 (type by subsequent designation, Status source ICZN (1959) (Worms, http://www.marinespecies.org/aphia.php?p = taxdetails&id = 819290, see also http://biodiversitylibrary.org/page/34655666). Our species is not similar to *Retusa obtusa* (Montagu). By contrast, it is very close to *Cylichna cylindracea* (Pennant), the type species of *Cylichna* Lovèn. Some authors (e.g., Forti 1969, Sicardi 1975, Pisano et al. 2013*)* have assigned this species to *Cylichna bidentata* (d'Orbigny, 1845), in turn very close to *Cylichnella biplicata* Lea, 1845 provided of distinct columellar folds (Gardner 1926). Unfortunately, the type materials were not available for comparison to decide about priority of eventual synonyms. The letotype of *C. crispula* is identical to our material from the Holocene of the Bonaerensian coastal area. *C. crispula* is endemic from the southern hemisphere.
Synthesis of microgastropod results: Among the 21 gastropod genera, includying 29 species, only 2 spp (7 %) are recorded in the Pleistocene, the remaining taxa (93 %) are exclusive for the Holocene. Of these, only 2 species occur along the whole Argentinean coastal area extending to Patagonia, while ca. 93 % is exclusive for the Bonaerensian coastal area. Among the latter, 14 (48 %) are exclusive from the Holocene of Bahía Blanca area.

Class Bivalvia Linné, 1758
Subclass Protobranchia Pelseneer, 1889 (= Palaeotaxodonta Korobkov, 1954)

Order Nuculida Dall, 1889

Superfamily Nuculoidea Gray, 1824
Family Nuculidae Gray, 1824
Subfamily Nuculinae Gray, 1824

Genus *Nucula* Lamarck, 1799
Subgenus *Nucula* (*Nucula*) Lamarck, 1799

Type species: *Arca nucleus* Linné, 1758, by monotypy, living in Europe (Cox et al. 1969, p. N 230–231, fig. A3, 10a, b).
Synonym: *Lembulus* Sowerby, 1842 (non *Lembulus* Risso, 1826) (Cox et al. 1969).

Nucula (*Nucula*) *nucleus* (Linné, 1758)

(Plate 6, Figs. 1–6)

1758 *Arca nucleus* Linné, p. 695.
1820 *Nucula proxima* Say (sensu Gardner, 1943).
1833 *Nucula exigua* Sowerby (sensu Schenck, 1939).
1846 *Nucula semiornata* d'Orbigny, vol. 5, p. 624, pl. 84, figs. 27–29.
1858 *Nucula nucleus* – Adams & Adams, vol. 2, p. 544, pl. 126, fig. 3a, b.
1873 *Nucula pisum* Sowerby &Reeve, pl. 4, fig. 24.
1898 *Nucula chipolana* Dall (sensu Gardner, 1926).
1902 *Nucula reticularis* Ortmann, p. 82, pl. 25, fig. 8a, b.

1913 *Nucula nucleus* – Dollfus & Dautzenberg, p. 306, pl. 33, figs. 21–26.
1928 *Nucula uruguayensis* Marshall (Schenck 1939, p. 39).
1934 *Nucula nucleus* – Thiele, p. 786, fig. 789.
1935 *Nucula nucleus* – Schenck, p. 260, fig. 1.
1939 *Nucula (Nucula) exigua* – Schenck, pl. 6, figs. 1–8.
1939 *Nucula (Nucula) marshalli* Schenck, p. 29.
1943 *Nucula proxima* – Gardner, p. 19, pl. 1, figs. 1, 2, 4, 5.
1944 *Nucula semiornata* d'Orbigny(= *N.uruguayensis* Marshall,1928),Carcelles, p. 268, pl. 6, fig. 52.
1954 *Nucula nucleus* – Allen, pl. 1, fig. 3.
1966 *Nucula semiornata* – Camacho, p. 52, pl. 8, fig. 5.
1967 *Nucula pisium* – Castellanos, p. 188, pl. 14, fig. 2.
1967 *Nucula marshalli* – Castellanos, p. 189, pl. 14, fig. 3.
1967 *Nucula semiornata* – Castellanos, p. 190, pl. 14, fig. 1
1969 *Nucula* (*Nucula*) *semiornata* – Forti, p. 63, pl. 1, fig. 1a, b.
1969 *Nucula* (*Nucula*) *nucleus*– Cox et al., p. N231, fig. A3, 10a, b.
1970 *Nucula semiornata* – Ríos, p. 146, pl. 51.
1971 *Nucula* (*Nucula*) *semiornata* – Closs & Forti, p. 23, pl. 1, fig. 1a, b.
1971 *Nucula* (*Nucula*) *exigua* – Keen, p. 86, fig. 5.
1971 *Nucula annulata* Hampson, fig. 1, pl. 1b.
1971 *Nucula proxima* – Hampson, fig. 1, pl. 1a, c.
1975 *Nucula semiornata* – Ríos, p. 187, pl. 60, fig. 915.
1976 *Nucula nucleus*– Tebble, p. 25, pl. 1, fig. e.
1976 *Nucula proxima* – Emerson & JACOBSON, p. 340, pl. 37, fig. 1.
1984 *Nucula semiornata* – Forti Esteves, p. 193, pl. 1, figs. 4–5.
1985 *Nucula semiornata* – Ríos, p. 203, pl. 74, fig. 1037.
1988 *Nucula nucleus* – Aguirre,II, p. 170, pl. 12, figs. 1–5.
1994 *Nucula nucleus* – Aguirre, p. 348, pl. 1, figs. 1, 3.
1994 *Nucula semiornata*– Farinati, p. 311, pl. 3, fig. 11.
1994 *Nucula* (*Nucula*) *semiornata* – Ríos, p. 225, pl. 78, fig. 109.
2000a *Nucula nucleus* – Aguirre & Farinati, p. 282, pl. 9, figs. 92–93.
2000 *Nucula semiornata* – Forcelli, p. 142, fig. 453.
2006 *Nucula semiornata*,Martínez et al., p. 396.
2008a *Nucula nucleus* – Aguirre et al., p. 705, fig. 2.
? 2013a *Nucula nucleus* – Charo et al., fig. 3 (1).
? 2013b *Nucula nucleus* – Charo et al., p. 411, fig. 6 (1).
2015 *Nucula nucleus* – Gofas – MolluscaBase (2015), accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 140590 on 2015-07-10.

Dimensions: L: 3.2–13 mm, H: 2.6–8.9 mm.
Material: more than 1,000 whole shells from the Holocene of the northeastern Bonaerensian coastal area at Punta Indio, Mar Chiquita (MLP-PI 25970, 26273, 26274, 26275, 26441) and laguna La Salada Grande (25971), 240 whole shells from the Holocene of the northeastern Bonaerensian area (Bahía Blanca area) (PI-UNS 2684), 2 shells from Bahía San Blas-Bahía Anegada. More than 15 specimens from the Holocene and Pleistocene of the Argentine continental shelf off Punta Médanos-Faro Querandí (Aguirre et al. 2008a). Modern collections (more than 167 specimens) at the MACN-In from Monte Hermoso-Ingeniero White area (MACN-In 6620-1, 9210, 11173, 11176-7, 11345, 14791, 30902), Bahía San Blas area (MACN-In 20204, 29482), Islas Malvinas / Falkland Islands (13977), Usuhaia (Tierra del Fuego, 10087-12), southern Brazil (Santa Catalina, 11665) and at the MLP-ZI (3870) from the Bonaerensian area.
Type series: Neotype designated by Schenck (1935: 260, Fig. 1) (a left valve from Linné's collection, Linnean Society, London).
Type locality: Europe?
Stratigraphic range: Oligocene-Recent.
Fossil records in the Quaternary of Argentina: Pleistocene: southeastern Bonaerensian area (Bahía San Blas-Bahía Anegada area), Holocene from the norteastern Bonaerensian coastal area: Punta Indio, southern Bahía Samborombón, Laguna La Salada Grande, Mar Chiquita, Holocene of the southeastern Bonaerensian sector: Bahía Blanca-Bahía San Blas-Bahía Anegada area. Records in the Argentine continental shelf: Pleistocene off Faro Querandí (82 m), Holocene off Punta Médanos-Faro Querandí area (13–57 m deep) (Aguirre et al. 2008a).
Records in the marine Quaternary of other areas in South America: Holocene of southern Brazil and Uruguay.
Modern geographic range (modern): cosmopolitan, North Sea, North Atlantic Ocean, Mediterranean, Atlantic coast of Africa (Senegal, Marruecos, Guinea, Angola), African Indian Ocean, western Atlantic from Nova Scotia to Golfo San Matías, Puerto Deseado ?, Tierra del Fuego ?, eastern Pacific along California (Aguirre 1988).
Ecological requirements: infaunal, moderatley rapid burrower (Stanley 1970), with wide geographical and bathymetric distribution, typically in fine muddy and sandy substrates rich in organic matter in fine substrates, detritivorous, commonly infralittoral, depth range from 10 to more than 1100 m deep (Ríos 1994). It prefers temperate to cold-temperate waters but can be also found in tropical and subtropical water masses where it is less abundant and lives a deeper depths. *N. nucleus* shares its habitat and life habit with *Nucula obliqua* (see beneath).

Remarks: this species was very briefly described as "*Arca nucleus*" by Linné (1758) without illustrations or type designation. The original specimens of "*Arca nucleus*" of the Linné's collection are not in Sweden as expected but were translated to London. Although the six specimens housed at the Linnean Society in London are not the original shells described, which are lost, because all their morphological features match with the original deycription they were considered the type material of the species and specimen number one designated a neotype by Schenck (1935). The uncertainty that prevailed for many years regarding the type of *N. nucleus* is most probbaly linked to the wide variability shown by most living species of the genus *Nucula*.

The Lectotype of *Nucula semiornata* (d'Orbigny, 1846) (Plate 6, Figs. 1–2 of this study, BMNH 1854.12.4, 776), a species never compared with *N. nucleus* Linné in the local molluscan literature, was designated by (Aguirre 1994: pl. 1, figs. 1–3) and is identical to the Neotype of *N. nucleus* (housed at the BMNH), thus here considered its subjective synonym.

The following species were reported as synonyms by other authors (sensu Worms worlwide database) but their type materials not as yet compared: *Glycymeris argentea* Da Costa, 1777, *Arca margaritacea* Bruguière, 1789, *Tellina adriatica* Gmelin, 1791, *Nucula pulchra* Krauss, 1848, *Nucula nitida* var. ventrosa Jeffreys, 1879, *Nucula nucleata* Locard, 1886, *Nucula tumidula* Thiele & Jaeckel, 1931.

Subgenus *Nucula* (*Leionucula*) Quenstedt, 1930

Type species: *Nucula albensis* d'Orbigny, 1844 (type by original designation)
Synonyms: *Nuculopsis* Woodring, 1925 (non *Nuculopsis* Girty, 1911), *Ennucula* Iredale, 1931.

Nucula (Leionucula) obliqua (Lamarck, 1819)

(Plate 6, Figs. 7–13)

1819 *Nucula obliqua* Lamarck, ed. 1835, VI, p. 505.
1842 *Nucula puelcha* d'Orbigny, vol. 3, p. 165.
1846 *Nucula puelcha* d'Orbigny, vol. 5, p. 24, pl. 84, figs. 24–26.
1856 *Nucula simplex* Adams (sensu Worms)
1873 *Nucula puelcha* – Reeve, vol. 18, pl. 2, fig. 7a, b.
1873 *Nucula obliqua* – Reeve, vol. 18: pl. 2, fig. 14.
1901 *Nucula puelchana* – Borchert, pl. 3, figs. 3–4.
1913 *Nucula consobrina* Adams & Angas,Hedley, p. 263, pl. 16, figs. 1–3.
1913 *Nucula simplex* Adams &Hedley, p. 263, pl. 15, figs. 4–6.
1928 *Nucula felipponei* Marshall (sensu Schenck, 1939, p. 30).
1939 *Nucula* (*Ennucula*) *puelcha* – Schenck, p. 30, pl. 8, figs. 5–8.
1944 *Nucula uruguayensis* Smith &Carcelles, p. 268.
1963 *Nucula puelcha* – Richards & CRAIG, p. 132 (not illustrated).
1966 *Eunucula puelcha* – Camacho, p. 53, pl. 8, fig. 6.
1967 *Nucula puelcha* – Castellanos, p. 189, pl. 14, fig. 5.
1969 *Nucula* (*Eunucula*) *puelcha* – Forti, p. 4, pl. 1, fig. 2a, b.
1970 *Nucula puelcha* – Ríos, p. 146, pl. 50.
1971 *Nucula* (*Eunucula*) *puelcha* – Closs & Forti, p. 23, fig. 2a, b.
1971 *Nucula* (*Leionucula*) *obliqua* – Davies & Eames, p. 178, fig. 397.
1985 *Nucula puelcha* – Ríos, p. 203, pl. 74, fig. 1040.
1988 *Nucula* (*Leionucula*) *obliqua* – Aguirre, p. 189, pl. 13, figs. 1–6.
1993 *Nucula puelcha* – Weiler, p. 211.
1994 *Nucula* (*Leionucula*) *obliqua* – Ríos, p. 225, pl. 78, fig. 1111.
1994 *Nucula* (*Leionucula*) *obliqua* – Aguirre, p. 350, pl. 2, fig. 1b (ill. of Holotype).
2000a *Nucula* (*Leionucula*) *obliqua* – Aguirre & Farinati, p. 283, pl. 9, figs. 94–95.
2000 *Nucula puelcha* – Forcelli, p. 142, fig. 452.
2000 *Nucula pisium* – Forcelli, p. 143, fig. 454.
? 2000 *Nucula grayi* (d'Orbigny) – Forcelli, p. 143, fig. 456.
2006 *Nucula puelcha* Martínez et al., p. 396.
2008 *Nucula* (*Leionucula*) *obliqua* – Aguirre et al., p. 705, fig. 1.
2013b *Ennucula grayi* – Charó et al., p. 410, fig. 6 (2).
2015 *Ennucula obliqua* – Huber – MolluscaBase (2015), accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 506604 on 2015-07-10.

Dimensions: L: 3.6–13.5 mm, H: 3–12.9 mm, commonly less than 12 mm.
Material: more than 700 whole shells from the Holocene of the northeastern Bonaerensian coastal area between Bahía Samborombón and Mar Chiquita (MLP-PI 26415, 25969, 26270, 26271, 26272, 26276), 75 whole shells from the Holocene of the northeastern Bonaerensian area (Bahía Blanca area) (PI-UNS 1354), and Bahía San Blas area. Subfossil material at the MLP-ZI collections: Punta Piedras (S/N), Puerto Militar (4503, 3870), no procedence (2500, 3869). More than 10 specimens from the Holocene of the Argentine continental shelf off Punta Médanos-Faro Querandí (13–57 m deep) (Aguirre et al. 2008a). Modern collections (more than 100 specimens) at the MACN-In from: Mar del Plata (9361-1, 16882), Puerto Quequén (10681, 15344, 13046, 18310), Necochea (12020), Playa del Barco (14792), Monte Hermoso

area (6619-1), Puerto Militar (11174, 11173, 11175), Bahía San Blas (20205), Usuahia (10060), Tierra del Fuego (20613), Islas Malvinas / Falkland Islands (10174), continental shelf off Punta del Este (15371) and off Bahía Blanca-Bahía San Blas area (15360).
Type locality: "Southern Oceans".
Type series: Holotype (LMMHNP) (Aguirre 1994: pl. 2, figs. 1a–b).
Stratigraphic range: Late Miocene-Recent.
Fossil records in the Quaternary of Argentina: Pleistocene: Bahía San Blas-Bahía Anegada area (Weiler 1993), Holocene: Bahía Samborombón, Mar Chiquita, Bahía Blanca-Bahía San Blas area.
Records in the marine Quaternary of other areas in South America: Holocene of southern Brazil, Uruguay. Also in Quaternary sediments of the continental shelf (150 cm deep) off Punta del Este (Uruguay) (Richards & Craig 1963: 132, Aguirre et al. 2008a).
Modern geographic range: coasts of North and South America, Australia (Aguirre 1988).
Ecological requirements: infaunal, moderately rapid burrower (Stanley 1970), typically in fine muddy and sandy substrates rich in organic matter, detritivorous, predominant in the infralittoral zone but can also be found in the intertidal, common range depth between 15 to 120 m deep (d'Orbigny 1846, Ríos 1994).

Remarks: this species is similar to *N. nucleus* Linné, but differs by a its larger size, external surface smooth or provided only with very fine concentric lines, and devoided of crenulations along the innner ventral margin. The Holotype of *N. obliqua* (LMMHNP, Paris, France) is reillustrated in Plate 6 (Fig. 9).

d'Orbigny (1846: 624, pl. 84, figs. 24–26) proposed his species *Nucula puelcha* based on material from Bahía San Blas (Bonaerensian carea, Argentina), which he considered an uncommon species in the are. He illustrated a unique specimen, designated lectotype by Aguirre (1994), which is identical to *N. obliqua*. We thus consider *N. puelcha* a posterior synonym. Other commonly reported synonyms elsewhere are *Nucula grayi* d'Orbigny, 1846, mentioned for the SWAtlantic and Chile, *Nucula tanneri* Dall, 1908, *Nucula savatieri* Rochebrune & Mabille, 1908 (Worms database, Forcelli 2000, see also Bouchet & Gofas 2015). However, their type material has not been available for comparison to allow confirmation of synonymies.

The Protobranchia are considered among the poorest known molluscan groups and systematic revisions of Nuculida are imperative (Sharma et al. 2013). Most likely further analyse for *Nucula* from the area of study, including phylogentic and phylogeographical approaches, could bring light into the confusing systematics of the Nuculids from Argentina, both living and fossil/subfossil preserved in Neogene and Quaternary deposits.

Subclass Autobranchia Grobben, 1804

Superorder Pteriomorphia Beurlen, 1944

Order Mytilida Férussac, 1822

Superfamily Mytiloidea Rafinesque, 1815

Family Mytilidae Rafinesque, 1815

Subfamily Mitylinae Rafinesque, 1815

Genus *Musculus* Röding, 1798

Type species: *Mytilus discors* Linné, 1767 (by subsequent designation) living in the north Atlantic and Mediterranean seas.
Synonyms: *Modiolarca* Gray, 1843, *Lanistina* Gray, 1847, *Planimodiola* Cossmann, 1887.

Musculus viator (d'Orbigny, 1846)

(Plate 6, Fig. 14)

1846 *Mytilus viator* d'Orbigny, p. 644, pl. 84, figs. 34–36.
1937 *Modiolaria viator* – Lamy, p. 22.
1944 *Modiolaria (Semimodiola) viator* – Carcelles, p. 272, pl. 6, fig. 56.
1960 *Musculus viator* – Barattini & Ureta, p. 152.
1965a *Musculus viator* – Klappenbach, p. 343.
1967 *Musculus viator* – Castellanos, p. 215, pl. 17, fig. 9.
1968 *Musculus viator* – Figueiras & Sicardi, p. 267, pl. 2, fig. 23.
1970 *Musculus viator* – Ríos, p. 159.
1977 *Musculus viator* – Scarabino, p. 201, pl. 6, fig. 8.
1978 *Musculus viator* – Farinati, p. 216, pl. 1, fig. 7.
1985 *Musculus viator* – Ríos, p. 216, pl. 78, fig. 1094.
1994 *Musculus viator* – Ríos, p. 239, pl. 83, fig. 1177.
2000a *Musculus viator* – Aguirre & Farinati, p. 289, pl. 10, fig. 109.
2000 *Musculus viator* – Forcelli, p. 150, fig. 484.
2015 *Musculus viator* – Huber – MolluscaBase, accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 506130 on 2015-07-10.

Dimensions: L: 10–17 mm, H: 6–6.5 mm, commonly less than 12 mm.
Material: 6 whole specimens from the Holocene of Bahía Blanca area (PI-UNS 1358).
Type area: coasts of Patagonia, also Cuba and Antilles mentioned in the original description.
Type series: probably one syntype housed at the NHM in London (original description based on one specimen ilustrated).
Stratigraphic range: Holocene-Recent.
Fossil records in the Quaternary of Argentina: Holocene from Ingeniero White (Bahía Blanca area) (Farinati 1978), with doubts from Tierra del Fuego.

Records in the marine Quaternary of other areas in South America: there are no illustrated Quaternary records of this species from other areas of South America.
Modern geographic range: Antilles (Castellanos 1967) and SW-Atlantic from Brazil (São Pablo, Santa Catarina) to Bahía San Blas area and Golfo San Matías (Argentina) (Scarabino 1977, Ríos 1994).
Ecological requirements: epibyssate, infralittoral, commonly between 28–40 m (for example, in Golfo San Matías, Scarabino 1977).

Clade Heterodonta Neumayer, 1884

Infraclass Euheterodonta

Order Veneroida Gray, 1854

Superfamily Ungulinoidea Gray, 1854

Family Ungulinidae Gray, 1854 (= Diplodontidae Carter, 1861)

Genus *Diplodonta* Bronn, 1831

Subgenus *Diplodonta* (*Diplodonta*) Bronn, 1831

Type species: *Venus lupinus* Brocchi, 1814 (non *Venus lupinus* Linné, 1758) (= *Tellina rotundata* Montagu, 1803), type by subsequent designation, living in the North Atlantic coasts, fossil from the Oligocene and Pliocene of Italy (Cox et al. 1969, p. N515).
Synonyms: ? *Taras* Risso, 1826, *Mysia* Leach in Bronn, 1827 (non Lamarck, 1818), *Glocomene* Leach in Gray, 1852, ? *Mittrea* Gray, 18564 (Cox et al. 1969).

Diplodonta (*Diplodonta*) *patagonica* (d'Orbigny, 1842)

(Plate 7, Figs. 1–6)

? 1822 *Amphidesma punctata* Say,p. 221–248.
1842 *Lucina patagonica* d'Orbigny, p. 161.
1846 *Lucina patagonica* d'Orbigny, p. 587, pl. 84, figs. 16–17.
1846 *Lucina guaraniana* d'Orbigny, pl. 84, figs. 10–11.
1846 *Lucina portesiana* d'Orbigny, pl. 84, figs. 12–13.
1900 *Diplodonta caloosaensis* Dall, p. 1188, pl. 44, fig. 16.
1943 *Diplodonta leana eoleana* Gardner, p. 80, pl. 14, figs. 37–38.
1963 *Taras punctata* (Say),Richards & Craig (no ill.).
1967 *Diplodonta danieli* Klein, p. 193–194, pl. 1, figs. 1–3
1977 *Diplodonta patagonica* – Scarabino, p. 206.
1985 *Diplodonta punctata* – Ríos, p. 233, pl. 83, fig. 1167.
1985 *Felaniella candeana* – Ríos, p. 234, pl. 83, fig. 1168.
1993b *Diplodonta patagonica* – Aguirre, figs. 9, 28.
1994 *Diplodonta patagonica* – Aguirre, p. 357, pl. 2, figs. 16–17.
1994 *Diplodonta patagonica* – Ríos, p. 256, pl. 88, fig. 1248.
2000a D*iplodonta patagonica* – Aguirre & Farinati, p. 293, pl. 10, figs. 116–117.
2000 *Diplodonta patagonica* – Forcelli, p. 155, fig. 505.
2005a *Diplodonta patagonica* – Aguirre et al., fig. 3, table 2.
2008a *Diplodonta patagonica* – Aguirre et al., p. 705.
2008b *Diplodonta patagonica* – Aguirre et al., p. 309, pl. 6, fig. 29.
2013a *Diplodonta patagonica* – Charó et al., p. 139, fig. 3 (12).
2013b *Diplodonta patagonica* – Charó et al., p. 410, fig. 6 (14).
2015 *Diplodonta patagonica* – Rosenberg – MolluscaBase (2015), accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 532742 on 2015-07-11.
2015 *Amphidesma punctata* – Sartori – MolluscaBase (2015), accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 732409 on 2015-07-14.

Dimensions: L: 6–15 (30) mm, H: 5–25 mm, commonly less than 12 mm.
Material: 20 shells from the Holocene of the northeastern Bonaerensian coastal area (Punta Indio-Bahía Samborombón, Mar Chiquita) (MLP-PI 25966, 26215, 26216), 5 shells from the Holocene of Puerto Lobos (MLP-DCG-0007-449). Modern shells (approximately 70 shells) from MLP-ZI collections: Puerto Militar (4493), Punta Villarino (1839), San Antonio Oeste (2680), Magellan Strait (2696), Puerto Montt (Chile, 1837, 2700), no procedence (S/N). Modern shells (approximately 60) from the MACN-In collections between Punta del Este (Uruguay) and Golfo Nuevo (Patagonia): Punta del Este (15180), La Paloma (Uruguay, 29617, 19996, 15161), Cabo Santa María (Uruguay, 23584, 15393-1), Cabo Polonio (Uruguay, 15338), Mar del Plata (17466, 9361-17, 16681, 20595, 10749, 29595, S/N), Miramar (8451-7, 29445, 29446, 16359), Puerto Quequén (23191), Necochea (12033), Puerto Militar (11178), San Antonio Oeste (9379-3, 13353-1, 9551-8), Punta Villarino (S/N), Punta Norte (Península Valdés, Patagonia, 11516), Puerto Madryn (20593), Golfo Nuevo (20594), Rastra 10 of "Atair" Expedition (15362), "Atair" with no procedence (14327), "San Luis" Expedition (20646).
Type locality: Bahía San Blas (southeastern Bonaerensian area, Argentina).
Type series: syntypes from Bahía San Blas, of which one was selected as Lectotype (LMMHNP) (Aguirre 1994: 357, pl. 2, fig. 16).
Stratigraphic range: Pliocene-Recent.

Fossil records in the marine Quateranry of Argentina: Pleistocene from Puerto Lobos, Bahía Bustamante and Camarones (Patagonia), southeastern Bonaerensian area (Bahía San Blas), Holocene from the Bonaerensian coastal area (Punta Indio-Bahía Samborombón, Mar Chiquita, Bahía Blanca-Bahía San Blas-Bahía Anegada) and Patagonia (Puerto Lobos). Also in the Pleistocene from the Argentine continental shelf (Richards & Craig 1963).
Records in the marine Quaternary of other areas in South America: Holocene from Uruguay.
Modern geographic range: Río de Janeiro (Brazil) to Golfo Nuevo (Patagonia, Argentina), with doubts southwards up to the Magellan Strait.
Ecological requirements: infaunal in soft substrates. Based on the similarity of *D. patagonica* with *D. notata* Dall & Simpson studied by Stanley (1970, pl. 15, figs. 1–5), it is a moderate burrower, common on fine sandy and muddy bottoms, infralittoral (Scarabino 1977) from 36 to 100 m deep (Castellanos 1967, Ríos 1994).

Remarks: Lectotype (LMMHNP) reillustrated in this study (Plate 7, figs. 5–6). Aguirre (1994) included with doubts *Diplodonta punctata* (Say, 1822), living along the Atlantic coasts from North America to southern Brazil (Ríos 1985: pl. 83, fig. 1167), in the synonymy list of *D. patagonica*. However, its type material was not able for comparison to confirm if it is a junior synonym. According to Aguirre (1994), the syntype of *Diplodonta guaraniana* (d'Orb., 1846) (BMNH 1854.12.4.766/1), described on the basis of modern material from Río de Janeiro (see also Sartori, 2015), and the holotype of *Diplodonta portesiana* (d'Orb., 1842) (BMNH 1854.12.4.770) (Aguirre 1994: pl. 2, fig. 17) (reillustrated in Plate 7, Figs. 13–14 of this study), described from the same locality, are identical to the lectotype of *D. patagonica*, and thus considered synonyms. According to Ríos (1994), however, *Diplodonta punctata* (Say, 1822) is a senior synonym of *Diplodonta guaraniana* (d'Orbigny, 1846), *Diplodonta venezuelensis* (Dunker, 1848) and *Diplodonta brasiliensis* (Mittré, 1850).

Subgenus *Diplodonta* (*Felaniella*) Dall, 1899

Type species: *Felaniella usta* Gould (by original designation), from the Holocene of Japan.

Diplodonta (*Felaniella*) *vilardeboana* (d'Orbigny, 1846)

(Plate 7, Figs. 7–8)

1846 *Lucina vilardeboaena* d'Orbigny, p. 587, pl. 84, figs. 14–15.
1901 *Diplodonta platensis* Borchert, p. 214, pl. 4, figs. 4–6.
1944 *Taras (Felaniella) vilardevoana* – Carcelles, p. 279, pl. 10, figs. 79–80.
1960 *Diplodonta vilardeboana* – Barattini & Ureta, p. 159, pl. 44, figs. c, e.
1963 *Taras vilardevoana* – Richards & Craig (no ill.).
1961 *Diplodonta vilardeboana* – Figueiras, p. 17, 19.
1967 *Diplodonta vilardebonana* – Castellanos, p. 243, pl. 8, figs. 7–9.
1966 *Taras* (*F.*) *vilardevoana* – Camacho, p. 79, pl. 12, fig. 6.
1969 *Diplodonta (Felaniella) vilardeboana* – Figueiras & Sicardi, p. 358, pl. 3, fig. 40.
1975 *Felaniella vilardeboaena* – Ríos, p. 218, pl. 70, fig. 1053.
1977 *Diplodonta vilardeboana* – Scarabino, p. 206.
1979 *Felaniella* (*Zemysia*) *vilardeboaena* – Figueiras & Sicardi, p. 129.
1985 *Felaniella vilardeboana* – Ríos, p. 234, pl. 83, fig. 1169.
1994 *Diplodonta* (*F.*) *vilardeboaena* – Del Río, p. 101, pl. 1, fig. 4.
1994 *Felaniella vilardeboana* – Ríos, p. 256, pl. 88, fig. 1251.
2000 *Felaniella vilardeboana* – Del Río, fig. 9, 5–6.
2000a *Diplodonta* (*F.*) *vilardeboaena* – Aguirre & Farinati, p. 294, pl. 10, figs. 118–119.

Dimensions: L: commonly 10–15 mm (some extreme shells reach 18–25 mm), H: 9–20 mm (Aguirre & Farinati 2000, Ríos 1994, EOL data base at at http://eol.org).
Material: one shell from the Holocene of Bahía Blanca area (PI-UNS 2845).
Type locality: Maldonado (Uruguay).
Type series: Lectotype (BMNH. 1854.12.4.778) selected from several syntypes (Aguirre 1994).
Stratigraphic range: Miocene-Recent.
Fossil records in the marine Quaternary of Argentina: Pleistocene: Camarones, Bustamante, Holocene from Bahía Blanca area. Also in the Pleistocene from the Argentine continental shelf (Richards & Craig 1963).
Records in the marine Quaternary of other areas in South America: Holocene from Uruguay.
Modern geographic range: Espiritu Santo (Brazil) hasta Golfo San Matías (Argentina).
Ecological requirements: infaunal on soft substrates. Based on Stanley (1970: pl. 15, figs. 1–5) this species is likely a moderate burrower, common on fine sandy and muddy bottoms, infralittoral. A bathymetric range of 27–77 m deep was considered by Ríos (1994).

Remarks: *Diplodonta platensis* Borchert, 1901, from the Miocene of Paraná (Argentina) is a posterior synonym (Ríos 1994).

Subgenus *Diplodonta* (*Phlyctiderma*) Dall, 1899

Type species: *Diplodonta semiaspera* Philippi, 1836, living in the western Atlantic.

Diplodonta (*Phlyctiderma*) *semiaspera* (Philippi, 1836)

(Plate 7, Figs. 9–12)

1836 *Lucina semiaspera* Philippi, p. 225, pl. 7, fig. 2a–d.
1840 *Lucina semireticulata* d'Orbigny, p. 585, pl. 84, fig. 7–9.
? 1889 *Diplodonta semisapera* – Dall, p. 264.
1901 *Diplodonta semiaspera* – Dall, p. 792.
1907 *D. semiaspera semireticulata* Ihering, p. 452.
1944 *Taras* (*Phlictiderma*) *semiaspera* – Carcelles, p. 279.
1948 *Taras semiaspera* – Parodiz, p. 17.
1949 *T.* (*Phlyctiderma*) *semireticulata* – Lange De Morretes, p. 32.
1966 *T.* (*Phlyctiderma*) *semiaspera* – Camacho, p. 78, pl. 2, fig. 5.
1967 *Diplodonta semiaspera* – Castellanos, p. 242, pl. 18, figs. 10–12.
1969 *D.* (*Phlyctiderma*) *semiaspera* – Figueiras & Sicardi, p. 358, pl. 3, fig. 41.
1971 *Phlyctiderma semiaspera* – Closs & Forti, p. 21.
1975 *Phlyctiderma semiaspera* – Ríos, p. 218, pl. 70, fig. 1054.
1977 *Phlyctiderma semiaspera* – Scarabino, p. 206, pl. 10, fig. 7.
1978 *Phlyctiderma semiaspera* – Farinati, p. 216, pl. 1, fig. 8.
1981 *Phlyctiderma semiaspera* – Aramayo & Farinati, p. 12, pl. 7, fig. 3.
1985 *Phlyctiderma semiaspera* – Ríos, p. 234, pl. 83, fig. 1170.
1985 *Phlyctiderma semiaspera* – Farinati, p. 220.
1985 *Diplodonta punctata* (Say) – Ríos, p. 233, pl. 83, fig. 1167.
1987 *Phyctiderma semiaspera* – Farinati & Aliotta, p. 580, pl. 2, fig. 6.
1994 *Diplodonta* (*Phlyctiderma*) *semiaspera* – Ríos, p. 256, pl. 88, fig. 1252.
2000a *Diplodonta* (*Phlyctiderma*) *semiaspera* – Aguirre & Farinati, p. 294, pl. 10, figs. 120–121.
2000 *Phlyctiderma semiaspera* – Forcelli, p. 155, fig. 504.
2006 *Phlyctiderma semiaspera* – Martínez et al., p. 396.
2015 *Phlyctiderma semiaspera* – Bouchet & Rosenberg – MolluscaBase, accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 420810 on 2015-07-11.

Dimensions: L: 13–18–20 mm, H: 12 mm, commonly less than 12 mm (maximum reported size is 13 mm according to Malacolog Version 4.1.1).
Material: 100 shells from the Holocene of Bahía Blanca area (PI-UNS 1359).
Type locality: Havana (Cuba) (Malacolog Version 4.1.1 at http://www.malacolog.org/search.php?mode = details&waspid = 13887).
Type series: not available for comparison.
Stratigraphic range: Miocene?, Holocene-Recent.
Fossil records in the Quaternary of Argentina: Holocene of Bahía Blanca.
Records in the marine Quaternary of other areas in South America: Holocene of southern Brazil and Uruguay.
Modern geographic range: North Carolina to Texas, Gulf of Mexico, Antilles, Cuba, Jamaica, Brazil to Golfo San Matías, range: 35° N to 42° S, 91° W to 35° W (Malacolog Version 4.1.1, Ríos 1994).
Ecological requirements: infaunal, moderate burrower, in soft substrates commonly sandy and muddy bottoms and on calcareous algae, infralittoral, from 5 to 100 m deep (Ríos 1994). Depth: 0 to 104 m (live 0.5 m) (Malacolog Version 4.1.1). Dall (1889) collected shells at 20 m deep off Rio de La Plata (Station 2766). According to Stanley (1970), other very close species of *Diplodonta*, like *Diplodonta notata* Dall & Stimpson, living in Puerto Rico, are slow burrowers.

Remarks: This species has been alternatively assigned to *Lucina* Bruguiére, *Taras* Risso or *Diplodonta* Bronn, 1831. According to Worms the following are synonyms: *Diplodonta semiaspera* Philippi, 1836 (original combination), *Lucina granulosa* C. B. Adams, 1845, *Lucina semireticulata* d'Orbigny, 1846, *Diplodonta turgida* Verrill, 1881, *Entodesma platensis* (Dall, 1899). According to Ríos (1994) *Diplodonta punctata* (Say, 1822) is a senior synonym of *Diplodonta guaraniana* d'Orbigny, 1846, *Diplodonta venezuelensis* Dunker, 1848 and *Diplodonta brasiliensis* Mittré, 1850. On the other hand, *Diplodonta caelata* (Reeve, 1850) and *Diplodonta granulosa* C. B. Adams could be other synonyms (according to opinion available from Gbif.org).

Infraclass Archiheterodonta Giribet in Taylor, Williams, Glover & Dyal, 2007

Order Carditida Dall, 1889

Superfamily Carditoidea Férrussac, 1822

Subfamily Carditamerinae Chavan in Cox et al., 1969

Genus *Carditamera* Conrad, 1838

Type species: not known.
Synonyms: *Byssomera* Olsson, 1961, *Lazaria* Gray, 1854 (Worms).

Carditamera (*Carditamera*) *guppyi* (Dall, 1900)

(Plate 8, Figs. 1–9)

1900 *Cardita* (*Carditamera*) *guppyi* Dall, p. 1413, pl. 56, fig. 3.

1900 *Cardita* (*Carditamera*) *catharia* Dall, p. 1416, pl. 56, fig. 1.
1907 *Cardita plata* Ihering, p. 451, pl. 18, fig. 123a, b.
1944 *Cardita* (*Carditamera*) *plata* – Carcelles, p. 278, pl. 10, fig. 86.
1960 *Cardita plata* – Barattini & Ureta, p. 158.
1966 *Cardita* (*Carditamera*) *plata* – Camacho, p. 73, pl. 11, fig. 4.
1967 *Cardita plata* – Castellanos, p. 232, pl. 16, figs. 6–8.
1969 *Carditamera* (*Carditamera*) *plata* – Forti, p. 78, pl. 3, fig. 3a, b.
1971 *Cardita* (*Carditamera*) *plata* – Penna, p. 157, pl. 2, lower text-fig. 1971 *Cardita* (*Carditamera*) *micella* Penna, 158, pl. 2, top text-fig. 1971 *Carditamera* (*Carditamera*) *plata* – Closs & Forti, p. 27, pl. 2, fig. 5a, b.
1975 *Cardita plata* – Ríos, p. 213, pl. 68, fig. 1030.
1977 *Carditamera plata* – Scarabino, p. 205, pl. 9, fig. 9.
1985 *Carditamera floridana* – Rios, p. 237, pl. 84, fig. 1184.
1985 *Carditamera micella* – Rios, p. 237, pl. 84, fig. 1186.
1985 *Carditamera plata* – Rios, p. 237, pl. 84, fig. 1186.
1988 *Carditamera* (*Carditamera*) *guppyi* – Aguirre, p. 279, pl. 26, pl. 27, figs. 1–5, pl. 43, figs. 5, 6, pl. 4).
1993 *Carditamera plata* – Weiler, p. 211.
1993b *Carditamera* (*Carditamera*) *guppyi* – Aguirre, figs. 9, 18.
1994 *Carditamera plata* Farinati, p. 312, pl. 3, fig. 12
1994 *Carditamera* (*Carditamera*) *guppyi* – Aguirre, p. 357, pl. 2, figs. 8, 12.
1994 *Carditamera plata* – Ríos, p. 258, pl. 88, fig. 1261.
1994 *Carditamera floridana* – Ríos, p. 258, pl. 88, fig. 1259.
1994 *Carditamera micella* – Ríos, p. 258, pl. 88, fig. 1260.
2000a *Carditamera* (*Carditamera*) *guppyi* – Aguirre & Farinati, p. 295, pl. 11, figs. 122–123.
2006 *Carditamera plata*,Martínez et al., p. 396.
2013a *Carditamera plata* – Charó et al., p. 139, fig. 3 (21).
2013b *Carditamer plata* – Charó et al., p. 411, fig. 6 (10).
2015 *Carditamera plata* – Huber – MolluscaBase, accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 504859 on 2015-07-02.

Dimensions: L: 2.5–17.7, H: 2–7.2 mm, commonly less than 10 mm.
Material: 240 shells from the Holocene of the northeastern Bonaerensian area (between Bahía Samborombón and Mar Chiquita (MLP-PI 25968, 26404, 26265, 26266, 26267, 26268, 26269), 650 shells from the Holocene of Bahía Blanca area (PI-UNS 2685).
Type area: Pliocene and Recent of Trinidad (Antilles).
Type series: Lectotype (USNM 115668) designated by Aguirre (1994: pl. 2, figs. 8, 12).
Stratigraphic range: Miocene-Recent.
Fossil records in the Quaternary of Argentina: Pleistocene from Bahía San Blas area (Weiler 1993), Holocene: Bahía Samborombón, Mar Chiquita, Bahía Blanca- Bahía San Blas-Bahía Anegada area.
Records in the marine Quaternary of other areas in South America: Holocene of southern Brazil, Uruguay.
Modern geographic range: West Indies to Golfo San Matías.
Ecological requirements: the habitat and life habit of *C. guppyi* are inferred from those described by Stanley (1970) based on experimental studies for a close species, *Carditamera floridana* Conrad, living in the Atlantic coasts of North America: infaunal, moderate burrower, typical of the shallow littoral as a suspensivorous. In Brazil it has been mentioned typical of sandy-shelly substrates mostly within the infralitoral, with a depth range of 17 to 70 m (Ríos 1994).

Remarks: *Cardita plata* Ihering, 1907 (p. 451, pl. 18, fig. 123a, b) was described on the basis of modern material from Monte Hermoso (southeastern Bonaerensian area). The shell outline, ornamentation and hinge features of its Holotype (MZUSP 11496), as well as the illustrations of several subsequent authors of modern shells collected between southern Brazil and Golfo San Matías (e.g., Carcelles 1944, pl. 10, Camacho 1966, pl. 11, fig. 4, Castellanos 1967, pl. 16, figs. 6–8, Forti 1969, pl. 3, figs. 3a, b, Ríos 1975, pl. 68, fig. 1030), coincide with those of *C. guppyi* of which it is considered a synonym. On the other hand, *Cardita micella* Penna, 1971 (p. 158, fig. 2), described from the modern littoral of Río de Janeiro, also shows a strong similarity with the holotype of *Cardita plata* Ihering from Monte Hermoso. We consider *C. micella* within the morphological range of *C. plata* (but see Penna 1971) and, consequently, of *C. guppyi.*

Superfamily Crassatelloidea Férrussac, 1822
Family Crassatellidae Férrussac, 1822
Subfamily Scambulinae Chavan, 1952

Genus *Crassinella* Guppy, 1874

Type species: *Crassatella martinicensis* d'Orbigny, 1853 (type by monotypy), living in the Caribbean Sea, Colombia, Costa Rica, Cuba, Gulf of Mexico, Jamaica, Venezuela, Lesser Antilles, Puerto Rico (Worms).

Crassinella lunulata (Conrad, 1834)

(Plate 8, figs. 10–11)

1834 *Astarte lunulata* Conrad, p. 133.
1969 *Crassinela lunulata* – Figueiras & Sicardi, p. 355.
1974 *Crassinella lunulata* – Abbott, p. 482, fig. 5540.
1985 *Crassinela lunulata* – Ríos, p. 239, pl. 85, fig. 1193.
1994 *Crassinela lunulata* – Farinati, p. 312, pl. 4, fig. 13.
1994 *Crassinela lunulata* – Ríos, p. 262, pl. 89, fig. 1276.
2015 *Crassinella lunulata* – Huber – MolluscaBase, accessed through: World Register of Marine Species

at http://www.marinespecies.org/aphia.php/aphia.php?p = taxdetails&id = 420843 on 2015-07-18.

Dimensions: L: 3.5–9 mm, H: 3–7 mm.
Material: 80 shells from the Holocene of Bahía Blanca area (PI-UNS 2687).
Type locality: not known.
Type series: not known.

Stratigraphic range: Holocene-Recent.
Fossil records in the marine Quaternary of Argentina: Holocene of Bahía Blanca área. Records in the marine Quaternary of other areas in South America: not known.
Modern geographic range: eastern USA, Belize, Caribbean Sea, Colombia, Costa Rica, Cuba, Gulf of Mexico, Jamaica, Antilles, Brazil to Uruguay.
Ecological requirements: infaunal, soft bottoms, sandy to muddy susbtrates, infralittoral (45–100 m deep) (other species from Brazil, Ríos 1994).

Remarks: *Crassinella lunulata* is very close to *C. maldonadoensis* (Pilsbry, 1897) but differs by the external ornamentation pattern. It is also very similar to *C. pacifica* (Adams, 1852), living in the Gulf of California, which could be a posterior synonym (Coan 1979, Farinati 1994). According to Worms (Turgeon et al. 2009), the following species assigned to the genera *Gouldia*, *Astarte* or *Crassinella* by different authors can be synonymized: *Astarte lunulata* Conrad, 1834, *Crassinella oregonensis* Keen, 1938, *Astarte mactracea* Linsley, 1845, *Thetis* parva C. B. Adams, 1845, *Astarte pfeifferi* Philippi, 1849, *Astarte bilunulata* Jay, 1850, *Crassatella guadalupensis* d'Orbigny, 1853, *Gouldia fastigiata* Gould, 1862, *Eriphyla galvestonensis* Harris, 1895.

C. lunulata is a warm water indicator, northwards displaced today relative to its Holocene records.

Family Semelidae Stoliczka, 1870

Genus *Abra* Lamarck, 1818

Type species: *Mactra tenuis* Montagu, 1818 (type by subsequent designation of Herrmannsen 1846, see Cox et al. 1969, p. Nº 637), living in England.
Synonyms: *Habra,* nom. null., *Orixa, Syndosmya* Récluz, 1843, *Dorvillea* Gray, 1852 (ex Leach, by subsequent monotypy subsiguiente) (obj., by monotypy), *Iacra* H. & A. Adams, 1856, *Lutricularia* Monterrosato, 1884, *Abrina* Habe, 1952 (Cox et al., 1969: N636). According to Worms: *Abrina* Habe, 1952, *Lutricularia* Monterosato, 1884, *Orixa* Leach in Gray, 1852, *Semele* (Abra) Lamarck, 1818, *Syndesmya* P. Fischer, 1887, *Syndosmya* Récluz, 1843.

Subgenus *Abra (Abra)* Lamarck, 1818

Abra (*Abra*) *aequalis* (Say, 1822)

(Plate 8, Figs. 12–16)

1822 *Amphidesma aequalis* Say, p. 307.
1881 *Syndosmya lioica* Dall, p. 133.
1886 *Abra lioica* Dall, p. 272, pl. 4.
1897 *Semele* (*Abra*?) *uruguayensis* Pilsbry, p. 293, pl. 7, figs. 28–30.
1907 *Abra patagonica* Ihering, p. 316–317, pl. 12, fig. 82a, b.
1926 *Abra cylicion* Gardner, p. 209, pl. 32, figs. 9–10.
1943 *Abra aequalis* – Gardner, p. 104, pl. 17, figs. 12–15.
1954 *Abra lioica* – Abbott, p. 347, pl. 30, fig. w.
1961 *Abra lioica* – Barattini & URETA, p. 165, pl. 47.
1966 *Abra lioica* – Camacho, p. 96, pl. 13, fig. 15.
1967 *Syndesmya lioica* – Castellanos, p. 224, pl. 20, figs. 3–4.
1969 *Abra aequalis* – Forti, p. 94, pl. 5, fig. 4a, b.
1969 *Abra lioica* – Figueiras & Sicardi, p. 371, pl. 4, fig. 64.
1969 *Abra uruguayensis* – Figueiras & Sicardi, p. 372, pl. 4, fig. 65.
1971 *Abra aequalis* – Altena, p. 62, pl. 10, figs. 13, 14.
1975 *Abra aequalis* – Ríos, p. 248, pl. 79, fig. 1190.
1975 *Abra lioica* – Ríos, p. 248, pl. 79, fig. 1191.
1976 *Abra aequalis* – Emerson & Jacobson, p. 421, pl. 45, fig. 1.
1978 *Abra lioica* – Farinati, p. 219, pl. 1, fig. 16.
1978 *Abra uruguayensis* – Farinati, p. 220, pl. 1, fig. 17.
1981 *Abra aequalis* – Andrews, p. 127, text-fig. 1982 *Abra* (*Abra*) *lioica* (Dall), Woodring, p. 678, pl. 115, fig. 1.
1985 *Abra aequalis* – Ríos, p. 256, pl. 91, fig. 1275.
1988 *Abra* (*Abra*) *aequalis* – Aguirre, p. 328, pl. 33, figs. 5–8, pl. 47, figs. 1–4.
1994 *Abra* (*Abra*) *aequalis* – Aguirre, p. 360, pl. 1, fig. 9, pl. 2, fig. 14.
1994 *Abra aequalis* – Ríos, p. 276, pl. 95, fig. 1353.
1995b *Abra* (*Abra*) *aequalis* – Aguirre & Whatley, p. 310, fig. 3K–O.
2000a *Abra* (*Abra*) *aequalis* – Aguirre & Farinati, p. 304, pl. 12, figs. 141–142.
2008b *Abra aequalis* – Aguirre et al., p. 311, pl. 7, 37.
2013b *Abra aequalis* – Charó et al., p. 411, fig. 6 (12).
2015 *Abra aequalis* – Rosenberg & Huber – MolluscaBase (2015), accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 293683 on 2015-07-14.

Dimensions: L: 3.3–22 mm, H: 3.1–19 mm, commonly less than 12 mm.
Material: 30 valves (24 whole valves and 6 fragmented shells) from the Holocene of the northeastern Bonaerensian coastal area between Bahía Samborombón (mostly) and Mar Chiquita (MLP-PI 26280, 26425, 26424), 8 shells from the Holocene of Bahía Blanca area (PI-UNS 1366). Modern collections from MACN-In: 160 valves from the SWA between eastern Uruguay and Bahía San Blas (southeastern Bonaerensian littoral): La Paloma, Uruguay (MACN-In 28777), Cabo

Polonio, Uruguay (15337), Mar del Plata (17413), Miramar (8451-10), Puerto Quequén (18303, 14164, 13043, Dorrego (14797), Monte Hermoso (6619), Bahía Blanca (19664), Puerto Militar (11143, 11145, 4413, S/N°), 39° 40′ S, 53° 59′ W of the "Atair" expedition (15361), Bahía San Blas (20223).

Type locality: eastern coast of North America (South Carolina).

Type series: Lectotype (ANSP 53227) designated by Aguirre (1994: pl. 1, fig. 9).

Stratigraphic range: Miocene-Recent.

Fossil records in the marine Quaternary of Argentina: Holocene of Bahía Samborombón, Mar Chiquita, Bahía Blanca, Pleistocene of Bahía Anegada.

Records in the marine Quaternary of other areas in South America: Pleistocene and Holocene of southern Brazil, Holocene of Surinam, Brazil, Uruguay.

Modern geographic range: western Atlantic from eastern USA, Texas, W.Indies, Brazil, Uruguay down to Bahía San Blas (Bonaerensian sector, Argentina).

Ecological requirements: several authors have provided ecological data for *Abra lioica* from Argentina and surrounding coastal areas (Aguirre & Whatley 1995b and references therein). It is infaunal, shallow burrower, typical of soft bottoms (fine sands and mud), intertidal to infralittoral (preferentially between 2 and 26 m, down to 50 m deep according to Ríos 1994). Based on the ecological requirements described by Stanley (1970) for similar species, it could be considered with a potential endobyssate life habit. According to experimental studies by Wikander (1980a, b) on closely related species like *A. nitida* Müller and *A. longicallus* (Scacchi), the trophic habit differs between species, but it is most common detritivorous. *A. aequalis* is typical of warm water masses, exclusive for the Argentinean Malacological province.

Remarks: the holotype of *Abra lioica* (Dall, 1881) from South Carolina (USNM 64311) (Aguirre 1994: pl. 2, fig. 14a, b) matches in its general features with the Lectotype of *A. aequalis* (Say) (ANSP 53227) (Plate 8, Figs. 15–16 of this study) from South Carolina. In turn the characteristics of the type material of *A. aequalis* are very similar to the original illustrations of *A. patagonica* Ihering (1907: pl. 12, fig. 82) from the "Tertiary" of Camarones in Patagonia (with doubts Pliocene or Mid Pleistoecene MIS11), *Semele uruguayensis* Pilsbry (1897, pl. 7, figs. 28–30) from the modern littoral of Maldonado (Uruguay) and the type of *A. cylicion* Gardner (1926: pl. 32, figs. 9–10, USNM353929) from the Tertiary of Florida. In addition, the following species could be posterior synonyms of *A. aequalis*: *Amphidesma deforme* Philippi, 1849, *Abra nuculiformis* Conrad, 1867 (Ríos 1994), but neither their original illustrations nor the type materials were available.

Superfamily Veneroidea Rafinesque, 1815
Family Veneridae Rafinesque, 1815
Subfamily Petricolinae d'Orbigny, 1840

Genus *Petricola* Lamarck, 1801
Subgenus *Petricola* (*Petricola*) Lamarck, 1801

Type species: *Petricola costata* (= *Venus lapicida* Gmelin, 1791), by subsequent designation of Schmidt, 1818 (Cox et al. 1969:N689).

Synonyms: *Naranio* Gray, 1853 (objective, by subsequent designation of Lamy 1922). Other synonyms: *Rupellaria* Fleuriau de Bellevue, 1802, *Claudiconcha* P. Fischer, 1887, *Petricolirus* Habe, 1951, *Pseudoirus* Habe, 1951 (fide Worms).

Petricola (*Petricola*) *lapicida* (Gmelin, 1791)

(Plate 9, Figs. 1–5)

1788 *Venus lapicida* (Chemnitz), vol. 10, p. 356, pl. 172, figs. 1664–1665.
1788 *Venus divaricata* (Chemnitz), vol. 10, p. 357, pl. 172, figs. 1666–1667.
1791 *Venus lapicida* Gmelin, p. 3269.
1818 *Petricola lucinalis* Lamarck, p. 504 (type illustrated by Aguirre, 1994).
1854 *Petricola divaricata* – Sowerby, p. 776, pl. 166, figs. 24, 25.
1855 *Petricola lapicida* – Sowerby, p. 776, pl. 166, fig. 26.
1858 *Choristodon divaricatum* – Adams, p. 442, pl. 110, fig. 2.
1862 *Choristodon divaricatum* – Chenu, p. 100, fig. 453.
1874 *Petricola divaricata* – Sowerby in Reeve, pl. 3, fig. 27.
1949 *Petricola* (*Naranio*) *lapicida* – Lange De Morretes, p. 39, pls. 46, 52.
1966 *Petricola* (*Naranio*) *lapicida* – Camacho, p. 85, pl. 13, fig. 2.
1967 *Naranio lapicida* (Chemnitz), Castellanos, p. 246, pl. 23, figs. 12–14.
1975 *Petricola* (*Naranio*) *lapicida* – Ríos, p. 233, pl. 74, fig. 1117.
1976 *Petricola lapicida* – Emerson & Jacobson, p. 435, pl. 46, fig. 12.
1977 *Petricola lapicida* – Scarabino, p. 209.
1985 *Petricola* (*Petricola*) *lapicida* – Ríos, p. 267, pl. 94, fig. 1322.
1988 *Petricola* (*Petricola*) *lapicida* – Aguirre, p. 375, pl. 37, figs. 6–8, pl. 48, figs. 2, 3.
1994 *Petricola lapicida* – Farinati, p. 314, pl. 4, fig. 15.
1994 *Petricola* (*Petricola*) *lucinalis* – Aguirre, p. 365, pl. 2, fig. 13.
1994 *Petricola lapicida* – Ríos, p. 290, pl. 99, fig. 1416.
2000a *Petricola* (*Petricola*) *lapicida* – Aguirre & Farinati, p. 310, pl. 13, figs. 156–157.
2005 *Petricola lapicida* – Clavijo et al., p. 401.
2006 *Petricola lapicida*, Martínez et al., p. 396.

2015 *Petricola lapicida* – Huber – MolluscaBase, accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 216533 on 2015-07-13.

Dimensions: L: 5.2–11 mm, H: 4–7.4 mm (L:7 mm, H: 4 mm, Ríos 1994).
Material: more than 20 shells from the Holocene of the northeastern Boanerensian coastal area between Punta Indio and Mar Chiquita (MLP-PI 26296, 26437), 110 shells from the Holocene of Bahía Blanca area (PI-UNS 2688). More than 100 shells from modern collections at the MACN-In from the Bonaerensian littoral: Miramar (8451-14), Puerto Quequén (14166), Necochea (12032), Playa del Barco, Dorrego (14800), Bahía San Blas (20239), Río Negro outlet (southeastern Buenos Aires province) (1989).
Type locality: Antilles.
Type series: the shell specimen originally described and illustrated by Chemnitz (1788: 356, figs. 1664–1665) and validated afterwards by Gmelin (1791) is most probably lost. The Chemnitz collection was subdivided and then sold after his death, only part of its specimens are deposited at the Zoologisk Museum of Copenhagen (Denmark), among which the type of "*Venus lapicida*" is not found (pers. coomun. of Knudsen, 1985 and Schiøtte, 1986). It is not at the LMMHNP (Bouchet, written communic.) (Aguirre 1988, 1994). The original description was obtained from http://www.animalbase.uni-goettingen.de/zooweb/servlet/AnimalBase/home/speciestaxon?id = 37832. The Holotype of a posterior synonym, *Petricola lucinalis* (Lamarck, 1818) (LMMHNP), is shown in Plate 9 (Figs. 3–4) of this study.
Stratigraphic range: Pliocene-Recent.
Fossil records in the marine Quaternary of Argentina: Pleistocene of Bahía Blanca. Holocene from the northeastern Bonaerensian coastal area: Punta Indio, Bahía Samborombón.
Records in the marine Quaternary of other areas in South America: Holocene of Brazil, Uruguay.
Modern geographic range: cosmopolitan (from South Carolina to Antilles, Brazil, Uruguay southwards to Golfo San Matías, Argentina, Indian Ocean, Red Sea, with doubts in Australia.
Ecological requirements: there are no ecological studies for *P. lapicida* from the Argentinian littoral and there is scarce information about this species worldwide. However, its habitat and life habit are likely similar to those described by Narchi (1974) for *P. typica* (Jonas), a close species living in the Atlantic between South Carolina and Brazil: infaunal, preferentially in warm temperate and tropical water masses, in varied substrates (mainly soft sandy and muddy bottoms, and also common in holes of calcareous aggregations and corals), borer or nestling (occupying the available holes of hard bottoms), suspension feeder (Gardner 1926, Stanley 1970, Ríos 1994).

Remarks: the type of "Petricola lucinalis" Lamarck, 1818 (LMMHNP) (Aguirre, 1994: pl. 2, fig. 13) is identical to *P. lapicida*. According to Ríos (1994) *Petricola divaricata* (d'Orbigny, 1842) is a synonym. Other proposed synonyms are: *Petricola* (*Choristodon*) *divergens* (Gmelin, 1791), *Petricola costata* Lamarck, 1801, *Petricola divaricata* d'Orbigny, 1853, *Choristodon serricula* Rochebrune, 1881 (sensu Worms). Note that *Petriola lapicida* Chemnitz, 1788 is an unavailable name, published in a non-binomial work.

Subgenus *Petricola* (*Petricolaria*) Stolickzka, 1870

Type species: *Petricola pholadiformis* Lamarck, 1818, by original designation, living in the Atlantic coast of North America (Cox et al. 1969, p. N689).

Petricola (Petricolaria) pholadiformis Lamarck, 1818

(Plate 9, figs. 6–7)

1818 *Petricola pholadiformis* Lamarck, p. 505.
1954 *Petricola* (*Petricolaria*) *pholadiformis* – Abbott, p. 420, fig. z, fig. 94b.
1960 *Petricola pholadiformis* – Barattini & Ureta, p. 117, pl. 52.
1970 *Petricola pholadiformis* – Stanley, 8, 88, pl. 40.
1971 *Petricola* (*Petricolaria*) *pholadiformis gracilis* Deshayes & Altena, p. 73, pl. 10, figs. 11, 12.
1974 *Petricola pholadiformis gracilis* – Narchi, p. 451–465, text-fig. 4.
1975 *Petricola pholadiformis* – Ríos, p. 233, pl. 74, fig. 1116.
1976 *Petricola* (*Petricolaria*) *pholadiformis* – Emerson & Jacobson, p. 435, pl. 46, fig. 11.
1981 *Petricola* (*Petricolaria*) *pholadiformis* – Andrews, p. 137, text-fig. 1983 *Petricola* (*Petricolaria*) *pholadiformis* – Lindner, pl. 61, fig. 20.
1985 *Petricola stellae* Narchi &Rios, 267, pl. 94, fig. 1323.
1988 *Petricola* (*Petricolaria*) *pholadiformis* – Aguirre, p. 383, pl. 38, fig. 1a, b, pl. 49, fig. 1.
1993c *Petricola pholadiformis* – Aguirre, p. 18, fig. 3.
1994 *Petricola* (*Petricolaria*) *pholadiformis* – Aguirre, p. 365.
1994 *Petricola* (*Petricolaria*) *stellae* – Ríos, p. 290, pl. 99, fig. 1417.
2000a *Petricola* (*Petricolaria*) *pholadiformis* – Aguirre & Farinati, p. 311, pl. 13, figs. 158–159.
2015 *Petricola pholadiformis* – Huber, Rosenberg & Gofas – MolluscaBase, accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 140730 on 2015-07-22.
2015 *Petricola pholadiformis gracilis* – Huber – MolluscaBase, accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 546495 on 2015-07-13.

Dimensions: L: 4.6–11.5 mm, H: 1.5–2 mm.
Material: 5 shells from the Holocene of Punta Indio area (MLP-PI 25940).
Type locality: not indicated by Lamarck (1818: 505).
Type series: Holotype by monotypy (not designated by Lamarck 1818: 505). Most probably at the LMMHNP.

Stratigraphic range: Miocene-Recent.
Fossil records in Argentina (en el Cuaternario de dónde): Holocene from Punta Indio (northeastern Bonaerensian coastal area) (Aguirre 1988, 1993c).
Records in the marine Quaternary of other areas in South America: Surinam, Uruguay.
Modern geographic range: NW Atlantic coasts, Antilles, Brazil, Uruguay, with doubts in western Africa and Mediterranean Sea. Not living in Argentina.
Ecological requirements: euryhaline (marine and polyeuhaline), can inhabit in protected coasts and open bays, found preferentially in fine bottoms generally with hard intercalated substrates, mostly sands with mud or clay and dispersed rocks or pebbles, intertidal to infralittoral, infaunal, mechanical borer in hard clay, chalk, solid mud, peat-moss, limestones. It has been reported as burrower or rocky shallow borer and suspensivorous (Stanley 1968, 1970, Narchi 1974, Emerson & Jacobson 1976, Lindner 1983).

Remarks: the first an only record of this species for Argentina belongs to the Holocene of the northeastern Bonaerensian coastal area (Aguirre 1993a, b) as a warm water indicator, reinforcing higher sea surface temperatures during the mid-Holocene than today (Aguirre 1993c, Aguirre et al. 2011).

Subfamily Gemminae Dall, 1895

Genus *Gouldia* C. B. Adams, 1847
Gouldia camachoi Farinati, 1985

(Plate 9, Figs. 8–10)

1985 *Gouldia camachoi* Farinati, p. 216, pl. 1, figs. 1–2.
1994 *Gouldia camachoi* Farinati, p. 312, pl. 4, fig. 14.

Dimensions: L: 6–7 mm, H: 5 mm.
Material: 450 shells from the Holocene of Bahía Blanca area (PI-UNS 2686, 1905).
Type locality: Bahìa Blanca (Holocene).
Type: Holotype (not designated but illustrated by Farinati 1985: Pl. I, figs. 8, 9, PI-UNS 1905 from the Holocene at Boya 24-25 in Bahía Blanca area).
Stratigraphic range: Holocene-Recent.
Fossil records in Argentina (en el Cuaternario de dónde): Holocene from Bahía Blanca area.
Records in the marine Quaternary of other areas in South America: not known.
Modern geographic range: Surinam, Brazil.
Ecological requirements: soft bottoms in shallow warm waters, probably shallow burrower. Although there are no living records documented for this species, according to Farinati (1994) modern shells could be found along the beach around Bahía Blanca area. In South America, living species of *Gouldia* have been recorded in Brasil and Surinam in shallow warm waters, sandy and muddy bottoms.

Remarks: this is a warm water indicator, northwards shifted today relatrive to its Holocene occurrence in the southeastern Bonaerensian coastal area.

Order Myoida Stoliczka, 1870

Superfamily Myoidea Lamarck, 1809
Family Myidae Lamarck, 1809

Genus *Sphenia* Turton, 1822
Sphenia hatcheri Pilsbry, 1899

(Plate 9, Figs. 11–12)

? 1854 *Tyleira fragilis* (H. Adams & A. Adams)
1899 *Sphenia hatcheri* Pilsbry, p. 128, pl. 1, figs. 5–6.
1964 *Sphenia hatcheri* – Castellanos, p. 73, pl. 1, figs. 1–8.
1967 *Sphenia hatcheri* – Castellanos, p. 278, pl. 25, figs. 9–11.
1970 *Sphenia hatcheri* – Figueiras & Sicardi, p. 2, pl. 7, fig. 103.
1978 *Sphenia hatcheri* – Farinati, p. 221, pl. 1, fig. 20.
1994 *Sphenia hatcheri* – Farinati, p. 314, pl. 4, fig. 16.
2000a *Sphenia hatcheri* – Aguirre & Farinati, p. 311, pl. 14, fig. 160.
2006 *Sphenia fragilis* – Martinez et al., p. 396.
2011 *Sphenia hatcheri* – Pastorino & Bagur, p. 434, figs. 9–19.
2015 *Sphenia hatcheri* – Huber – MolluscaBase, accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 505910 on 2015-07-13

Dimensions: L: 6–10 mm, H: 3 mm.
Material: 120 shells from the Holocene of Bahía Blanca area (PI-UNS 1370).
Type locality: not known.
Type series: not known.
Stratigraphic range: Holocene-Recent.
Fossil records in Argentina (en el Cuaternario de dónde): Holocene of Bahía Blanca.
Records in the marine Quaternary of other areas in South America: Holocene of Brazil, Uruguay (as *Sphenia fragilis*, Martínez et al. 2006).
Modern geographic range: Uruguay and Bonaerensian coasts (?), SWA from Puerto Madryn to Tierra del Fuego, Pacific from Tierra del Fuego to Chiloé (see Pastorino & Bagur 2011).
Ecological requirements: intertidal to shallow infralittoral, accordig to Farinati (1994) it is typical of rocky littoral environments, living mostly among pebbles. Infaunal in soft susbtrates. Similar species from Brazil live in worn burrows, oyster and mussel colonies (Ríos 1994) and other close species have been reported as of nestling habits.

Remarks: Pastorino & Bagur (2011) critically reviewed the genus *Sphenia* (Myidae, Bivalvia) from the modern Bonaerensian and Patagonian sectors of Argentina. According to them, the materials of *S. hatcheri* reported from the Uruguayan and Bonaerensian coasts belong to *Sphenia fragilis* (H. Adams & A. Adams, 1854) (Pastorino & Bagur 2011:

431, figs. 1–8) which type material was not available for comparison. *S. hatcheri* was first recorded from the Holocene of Bahía Blanca area by Farinati (1978, 1985). *Sphenia subequalis* Dall, 1908 is a synonym (according to Worms worlwide data base).

Order Myoida Stoliczka, 1870

Superfamily Myacea Lamarck, 1809
Family Corbulidae Lamarck, 1818
Subfamily Corbulinae Gray, 1823

Genus *Corbula* Bruguiere, 1797
Subgenus *Corbula (Corbula)* Bruguiere, 1797

Type species: *Corbula sulcata* Lamarck, 1801, by subsequent designation of Schmidt, 1818, living in the western coasts of Africa (Vokes 1945: 7, Cox et al. 1969: N692, Fig. E154,5).
Synonym: *Aloidis* Megerle von Mühlfeld, 1811 (objective synonym).

Corbula (*Corbula*) *patagonica* d'Orbigny, 1846

(Plate 9, Figs. 13–16)

? 1818 *Corbula sulcata* Lamarck, VI, p. 138.
1846 *Corbula patagonica* d'Orbigny,vol. 5, p. 570, pl. 82, figs. 17–21.
1887 *Corbula sulcata* Bruguière & Fischer, p. 1125, pl. 23, fig. 2.
1925 *Corbula querida* Maury, p. pl. 20, fig. 8.
1926 *Corbula* (*Caryocorbula*) *whitfieldi boyntoni* Gardner, p. 233, pl. 35, figs. 10–13.
1930 *Notocorbula stolata* Iredale, p. 405, pl. 45, figs. 1, 2, 7.
1941 *Corbula sulcata* – Lamy, p. 10, text-fig.
1944 *Corbula patagonica* – Carcelles, p. 291, pl. 13, fig. 103.
1945 *Corbula patagonica* – Vokes, pl. 1, figs. 1–5.
1960 *Corbula patagonica* – Barattini & Ureta, p. 181, pl. 47.
1963 *Corbula patagonica* – Richards & Craig, p. 137, pl. 2, figs. 12, 13.
1966 *Corbula (Caryocorbula) patagonica* – Camacho, p. 103, pl. 14, fig. 7.
1967 *Aloidis patagonica* – Castellanos, p. 268, pl. 25, figs. 1–3.
1969 *Corbula sulcata* – Cox et al., p. N692, fig. E154,5.
1969 *Caryocorbula* (*Hexacorbula*) sp., Forti, p. 95, pl. 6, fig. 3a, b.
1970 *Corbula patagonica* – Figueiras & Sicardi, p. 410, pl .5, fig. 76.
1970 *Corbula patagonica* – Ríos, p. 212, pl. 58.
1971 *Corbula patagonica* – Closs & Forti, p. 21.
1975 *Corbula* (*Corbula*) *patagonica* – Ríos, p. 250, pl. 80, fig. 1201.
1975 *Corbula* (*Corbula*) *tryoni* Smith & Ríos, p. 250, pl. 81, fig. 1202.
1981 *Corbula patagonica* – Aramayo & Farinati, p. 14, pl. 9, fig. 1.
1985 *Corbula* (*Corbula*) *patagonica* – Ríos, p. 269, pl. 94, fig. 1229.
1988 *Corbula* (*Corbula*) *patagonica* – Aguirre, p. 387, pl. 38, figs. 2–12, pl. 49, fig. 2.
1993 *Corbula patagonica* – Weiler, p. 211.
1994 *Corbula* (*Corbula*) *patagonica* – Aguirre, p. 366, pl. 1, fig. 4.
1994 *Corbula patagonica* – Ríos, p. 291, pl. 99, fig. 1422.
1995b *Corbula* (*Corbula*) *patagonica* – Aguirre & Whatley, p. 314, fig. 3BB–HH.
2000a *Corbula* (*Corbula*) *patagonica* – Aguirre & Farinati, p. 312, pl. 14, figs. 161–162.
2006 *Corbula patagonica* – Martinez et al., p. 396.
2008a *Corbula* (*Corbula*) *patagonica* – Aguirre et al., figs. 3, 7.
2008b *Corbula* (*Corbula*) *patagonica* – Aguirre et al., p. 313, pl. 7, fig. 49.
2013a *Corbula* (*C.*) *patagonica* – Charó et al., p. 140, fig. 3 (15).
2013b *Corbula* (*C.*) *patagonica* – Charó et al., p. 412, fig. 6 (15a, b).
2014 *Corbula patagonica* – Lopes et al., p. 1581, fig. 4G.
2014 *Corbula dietziana* – Lopes et al., p. 1581, fig. 4I.
2014 *Corbula caribaea* – Lopes et al., p. 1581, fig. 4, I.
2015 *Corbula patagonica* – Huber – MolluscaBase, accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 505845 on 2015-07-13

Dimensions: L: 5–24.6 mm, H: 3.4–18-4 mm (large speciemns can reach 17 mm, Ríos 1994), commonly less than 12 mm.
Material: 1,300 shells from the Holocene of the northeastern Bonaerensian coastal area between Berisso and Mar Chiquita (MLP-PI 25942, 26218, 26219, 26220, 26221, 26222, 26223, 26224, 26226, 26229, 26282, 26283, 26284, 26285, 26286, 26287, 26288, 26289, 26290, 26291, 26412, 26422), 420 shells from the Holocene of Bahía Blanca area (PI-UNS 1371). Quaternary collections at MLP-PI: coastal area between Magdalena and Punta Indio (3964), Bahía Blanca (6284). Modern shells from the Atlantic coasts between Uruguay and southern Santa Cruz province, collections at MACN-In: La Paloma, Uruguay (29985, 15343), Punta Médanos (14323), Mar del Plata (10326, 10751, 10750, 25370), Puerto Quequén (19543-1, 10682, 14161, 13035, 23188), Necochea (12036), Monte Hermoso (9210-11, 6619), Puerto Militar (6620-7, 11130, 1121-1), Bahía Blanca (11131, 11129, 25211), Bahía San Blas (20206), Puerto Madryn (29505, 9172-27), Comodoro Rivadavia (23509), Santa Cruz (MACN-IN, S/N), Bahía Cruz (9014-4), material collected from the continental shelf by the oceanographical ships "Ara" (20206), "San Luis" (15332-1) and "Atair" (15363).

Type locality: “Patagonian coasts”, especially in Bahía San Blas (Buenos Aires province).
Type series: Lectotype (BMNH. 1854.12.4.753/1) designated by Aguirre (1994), a complete specimen of a series of 5 syntypes.
Stratigraphic range: Miocene-Recent.
Fossil records in the Quaternary of Argentina: Pleistocene from Bahía Samborombón, Bahía Blanca, Bahía San Blas area (Weiler 1993) (Bonaerensian area) and Patagonia: Camarones, Bahía Bustamante, Caleta Olivia, Puerto Deseado. Holocene of the Bonaerensian coastal area: Punta Indio, Bahía Samborombón, Mar Chiquita, Bahía Blanca, Bahía San Blas-Bahía Anegada, Holocene of Patagonia: Camarones, Bahía Bustamante, Comodoro Rivadavia, Caleta Olivia. Also in the Pleistocene from the Argentine continental shelf (Richards & Craig 1963, Aguirre et al. 2008b).
Records in the marine Quaternary of other areas in South America: Pleistocene from southern Brazil (including records within the Penultimate Interglacial, MIS7, Lopes et al. 2014). Holocene of Surinam, Pleistocene and Holocene of southern Brazil, Holocene of Uruguay.
Modern geographic range (modern): SWA coasts between southern Brazil and Golfo Nuevo (Chubut province, Patagonia), with doubts in Comodoro Rivadavia (Chubut province, Patagonia, fossil?), Santa Cruz province (Patagonia, fossil?) and southeastern Australia (Aguirre 1988, Aguirre & Whatley 1995b).
Ecological requirements: infaunal, shallow burrower, sandy to muddy susbtrates, infralittoral (15–90 m deep, Ríos 1994). According to Stanley (1970) it is an exceedingly sluggish burrower which can secrete a byssus of 3–4 threads. Similar corbulid species, like *Corbula gibba* (Olivi), can be found in muddy detritous areas, in substrates with rich organic matter, can feed on plants and organic detritus as active suspension feeders. They can live in bays and lagoons, in brackish-polyhaline habitats.

Remarks: the Corbulidae are in general well adapted to areas (often anoxic) of intertidal and sublittoral waters, on fine sands, close to the sediment surface. Due to their particular shell structure (unusual outer crossed-lamellar layer and inner complex crossed-lamellar layer) they can tolerate waters of reduced salinity (Morton 1986).

Although *Corbula sulcata* Lamarck, 1818, as illustrated by several authors (see synonymy list above), is almost identical to to the Lectotype of *C. patagonica* and most probably its senior synonym, its type material (LMMHNP?) was not available for comparison and confirmation. However, the photographs of topotypes of *C. sulcata* from the coasts of Senegal (Africa), illustrated by Vokes (1945. 8, pl. i, figs. 1–5) and reproduced by Cox et al. (1969: fig. E154, 5) are very similar to the material of *C. patagonica* collected along Argentina and examined from several collections. *Corbula querida* Maury (1925, pl. 20, fig. 8), from the Miocene of Rìo Pirabas (Brazil), is another very similar species, but its type material was neither available for comparison.

Other close species are: *Corbula tryoni* Smith (1915: pl. 2, figs. 21–22, see also Rìos, 1975: 250, pl. 80, fig. 1202) from the eastern coast of uruguay and Brazil, *Corbula nasuta* Sowerby, 1833, from Baja California, Gulf of California and Peru (Eisenberg 1981: 173, pl. 155, fig. 17), *Caestocorbula anceps* Maxwell (1992: 210, pl. 6, figs. a, b, g, h) from the Eocene of South Canterbury (New Zealand).

On the other hand, borehole (predation) traces on Corbula patagonica and related species (see beneath) have been documented for shells from the Bonaerensian marine Quaternary (Pastorino & Ivanov 1996, Farinati et al. 2006).

Subgenus *Corbula* (*Caryocorbula*) J. Gardner, 1926

Type species: *Corbula alabamiensis* Lea from the Eocene of Alabama (Gardner, 1926, 46).
Synonym: *Serracorbula* Olsson, 1961.

Corbula (*Caryocorbula*) *caribaea* d’Orbigny, 1846

(Plate 9, Figs. 17–22)

1846 *Corbula caribaea* d’Orbigny, p. 284, pl. 27 ,figs. 5–8.
1852 *Corbula swiftiana* C. B. Adams, p. 236, pl. 48, figs. 1–2.
1966 *Corbula* (*Caryocorbula*) *caribaea* – Camacho, p. 102, pl. 14, fig. 6.
1967 *Aloidis caribaea* – Castellanos, p. 270, pl. 25, figs. 6–8.
1969 *Corbula caribaea* – Forti, p. 58.
1970 *Corbula caribaea* – Figueiras & Sicardi, p. 409, fig. 75.
1994 *Corbula caribaea* – Ríos, p. 291, pl. 99, fig. 1420.
2000 *Caryocorbula caribaea* – Del Río, figs. 9, 17–18.
2005 *Corbula caribaea* – Clavijo et al., p. 399.
2006 *Corbula caribaea* – Martinez et al., p. 396.
2012 *Corbula caribaea* – Lopes & Simone, p. 52, fig. 3B.
2015 *Corbula swiftiana* – Rosenberg & Huber – MolluscaBase, accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 156762 on 2015-07-13

Dimensions: L: 9–10 mm, H: 6–7 mm.
Material: 160 shells from the Holocene of Bahía Blanca area (PI-UNS1373). Modern shells at MACN-PI: Puerto Quequén (49543), Monte Hermoso (6619).
Type locality: Cuba, Antilles.
Type series: 12 syntypes from Cuba (BMNH. 1854.10.4.552).
Stratigraphic range: Miocene?, Holocene-Recent.
Records in the marine Quaternary of Argentina: Holocene of Bahía Blanca.
Other records in the marine Quaternary of South America: Holocene of southern Brazil (Forti 1969, Lopes & Simone 2012).

Modern geographical range: North Carolina to Florida, Texas, Antilles, Surinam, Brazil, Uruguay to Bonaerensian coasts (Bahía Blanca area) down to Golfo Nuevo according to Castellanos (1967), but no material from that area was reported nor illustrated), probably in St. Helena Islands (SW-Atlantic) (Ríos 1994: 291)
Ecological requirements: infaunal, shallow burrower, soft substrates, infralittoral. According to Stanley (1970) *C. caribaea* lives in Puerto Rico (Antilles) as an exceedingly sluggish burrower which can secrete a byssus of 3–4 threads and is a suspension feeder. Similar corbulid species, e.g., *Corbula gibba* (Olivi), can be found in muddy detritous areas, in substrates with rich organic matter, can feed on plants and organic detritus as active suspension feeders, can live in bays and lagoons, in brackish-polyhaline habitats, commonly reported as active suspension feeders and surface deposit feeders (feeding on organic detritous). The study of Maslin (1989) of *Corbula trigona* from a West Africa lagoon has shown that it seems to be best adapted to mixohaline habitats, with salinity tolerances which vary according to the geographical origin of the populations, not to their individual size. Jensen (1990) showed that *Corbula gibba*, living in the North Atlantic of Europe and the Mediterranean is highly adpated to estaurine environments with high organic content.

C. caribaea is typical element of warm water masses.

Remarks: *Caryocorbula swiftiana* (C. B. Adams, 1852) is most likely a posterior synonym, although according to Worms database it is the accepted name for *C. caribaea* d'Orb., 1853. However, its type material was not available for comparison, thus we could not corroborate whether it is a synonym or not.

Aguirre & Whatley (1995a, b) pointed out that the type material of *C. caribaea*, examined at the NHM in London, is similar to that of *C. patagonica*, the only apparent differences being the smaller dimensions and the more acuminate posterior end of *caribaea*. Further studies of the geographical variation of shell morphology (for example by means of geomtrics morphometrics) should help to establish whether or not *C. caribaea* could represent extreme speciemns within the morphological range of *C. patagonica*. According to Ríos (1994) the following species are synonyms: *C. contracta* (Say, 1822), *C. swiftiana* (C. B. Adams, 1852), *C.baratiana* (C. B. Adams, 1852), *C.kjoeriiana* (C. B. Adams, 1852), *C.uruguayensis* Marshall, 1928. Their type materials were not available for comparison. In case *C. contracta* (Say, 1822) is proved to be a synonym, it has priority over *C. caribaea* and all the remaining species (see *C. lyoni* beneath).

Corbula (Caryocorbula) lyoni Pilsbry, 1897

(Plate 9, Figs. 23–26)

? 1893 *Corbula pulchella* Philippi, p. 8, pl. 1, fig. 7.
1897 *Corbula lyoni* Pilsbry, p. 294, pl. 7, figs. 21-23.
? 1901 *Corbula striatula* Borchert, p. 43, pl. 3, figs. 9-30.
1944 *Aloidis lyoni* – Carcelles, p. 291, pl. 13, fig. 104.
1963 *Corbula lyoni* – Richards & Craig, p. 137.
1966 *Corbula striatula* – Camacho, p. 101, pl. 14, fig. 4a,b.
1966 *Corbula (Caryocorbula) lyoni* – Camacho, p. 102, pl. 14, fig. 5.
1967 *Aloidis lyoni* – Castellanos, p. 269, pl. 25, figs. 4-5.
1970a *Corbula lyoni* – Figueiras & Sicardi, p. 410, pl. 5, fig. 77.
1977 *Corbula lyoni* – Scarabino, p. 213.
1978 *Corbula pulchella* – Farinati, p. 221, pl. 1, fig. 21.
1985 *Corbula lyoni* – Farinati, p. 220.
1985 *Corbula lyoni* – Ríos, p. 269, pl. 94, fig. 1328.
1993 *Corbula lyoni* – Weiler, p. 211.
1994 *Corbula lyoni* – Ríos, p. 291, pl. 99, fig. 1421.
2000a *Corbula lyoni* – Aguirre & Farinati, p. 314, pl. 14, figs. 163-164.
2006 *Corbula lyoni* – Martinez et al., p. 396.
2008a *Corbula lyoni* – Aguirre et al., figs. 3, 8.
2013a *Corbula lyoni* – Charo et al., p. 39, pl. 3 (20).
2014 *Corbula lyoni* – Lopes et al., p. 581, fig. 4, I.
2015 *Corbula lyoni* – Huber. In: MolluscaBase. Accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p = taxdetails&id = 538938 on 2015-07-13

Dimensions: L: 10–12 mm, H: 5–7 mm.
Material: 90 shells from the Holocene of Bahía Blanca area (PI-UNS 1372).
Type locality: Maldonado Bay, Uruguay.
Type series: unknown, probably lost.
Stratigraphic range: Miocene, Pleistocene-Recent.
Fossil records in marine Quaternary of Argentina: Pleistocene from Bahía San Blas area (Weiler 1993) and from the Argentine continental shelf (Richards & Craig 1963, Aguirre et al. 2008a), Holocene from Bahía Blanca-Bahía San Blas area.
Records in the marine Quaternary of other areas in South America: Pleistocene of Surinam, Pleistocene (MIS7) of southern Brazil (Lopes et al. 2014), Holocene of Surinam, Brazil, Uruguay.
Modern geographic range: Espiritu Santo (Brazil) to Golfo Nuevo (Argentina) (Ríos 1994).
Ecological requirements: infaunal, shallow burrower, soft substrates, infralittoral. inholes of calcareous substrates, infralittoral and with records between 16 and 67 m deep (Ríos 1994). *C. lyoni* can be considered typical of warm water masses.

Remarks: According to illustration of local catalogues and monographic studies (see synonymy list above), *C. caribaea* d'Orb. could be a senior synonym of *C. lyoni* Pilsbry. On the other hand, the material of *Corbula striatula* Borchert, 1901, as illustrated by Camacho (1966) from the Late Miocene (borehole at 186–191 m deep in the Bonaerensian area and also recorded in Paraná), is very similar to *C. caribaea*. Also the illustrations of *C. pulchella* Philippi, 1903, provided by Camacho (1966, pl. XIV, figs. 3a, b) from the Late Miocene (borehole at 215–227 m deep in the Bonaerensian area and with records at Paraná and Santa Cruz province) exhibit intermediate specimens between *C. patagonica* d'Orb. and *C. striatula*, *C. lyoni* and/or *C. caribaea* (see above). According to Ríos (1994: 291), *C. pulchella* (Philippi, 1893) is a synonym. The fact that neither the type material of C. pulchella nor of *C. striatula* were available for comparisons, made us mantain *C. lyoni* Pilsbry until we can confirm or reject a possible synonymy of all these species (*striatula*, *pulchella*, *lyoni* and these with *caribaea*).

Synthesis of microbivalve results

Among the 16 microbivalves identified, only 9 species (56 %) are registered back into the Pleistocene: *Nucula nucleus, N. obliqua, Diplodonta patagonica, D. vilardeboana, Carditamera guppyi, Abra aequalis, Petricola lapicida, Corbula patagonica, C. lyoni*. The remaining taxa (7 species, 44 %) are exclusive for the Holocene. Only 3 species (19 %) were recovered both in the Bonaerensian and Patagonia sectors, but most came from the Bonaerensian area Punta Indio-Bahía Blanca, while 8 species (50 %) are exclusive for the southeastern Bonaerensian area (between Bahía Blanca and south of B. San Blas).

8. Discussion

The results of our review show three outstanding aspects. The Late Quaternary micromolluscan record from the Argentinean coastal area provide information on phenotypic variation for several species and are linked to palaeoenvironmental changes through time, as documented through the Phanerozoic for different areas worldwide (Jablonsky & Shubin 2015, other references therein). A lower number of micromolluscan species were recognized for some genera relative to those previously acknowledged in the local literature for the Mar Argentino. Concerning their distribution in space and time, the available evidence can be linked to spatial and temporal biotic responses to palaeoenvironmental changes during the most recent transgressive episodes in the coastal area.

The most characteristic taxa belong to the genera *Littoridina, Olivella*, *Anachis, Turbonilla* (Gastropoda) and *Nucula*, *Diplodonta*, *Corbula* (Bivalvia). All the species have modern representatives in the Mar Argentino or other areas of the SWA. They are euhaline, except for a few taxa (either brackish, polyhaline-polyeuhaline) which can be found in marginal marine settings: *Littoridina australis* (brackish) and *Marshallora nigrocincta*, *Abra aequalis* and *Corbula* spp. (*patagonica, lyoni, caribaea*) (Table 3a, b). Their diversity and distribution is latitudinally and chronologically unbalanced: a higher proportion of records were found in marine Quaternary deposits along the Bonaerensian coastal area, while they represent a minor component in Patagonia. Also, a greater number of records come from Holocene deposits, with comparatively fewer Pleistocene counterparts. This is most probably a result of the expected taphonomic bias increasing with age.

Microgastropods vs. microbivalves

Among microgastropods, *L. australis* is the most common and abundant species, followed by *O. tehuelcha*, which is the only occurying along the whole coastal area of Argentina, including Patagonia. At the same time, both species are the only microgastropod taxa recorded within the Pleistocene. The remaining species were documented only within the Holocene, of which 14 species (ca. 48 %) were recovered exclusively from the southeastern Bonaerensian (Bahía Blanca-Bahía San Blas area).

On the other hand, among microbivalves, *Corbula* spp are the most constantly present and abundant, followed by *Carditamera guppyi* and *Nucula* spp. of a total of 16 species, 9 (56 %) were registered since the Pleistocene: *N. nucleus, N. obliqua, D. patagonica, D. vilardeboana, C. guppyi, A. aequalis, P. lapicida, C.patagonica, C. lyoni*. The remaining 7 species (44 %) are exclusive for the Holocene. Only 3 species (19 %) were registered in Patagonia: *D. patagonica, D. vilardeboana, C. patagonica* (and *A. aequalis* in mid-Pleistocene/Latest Pliocene ? terraces). From all, a total of 8 species (50 %) were recorded in Holocene shell ridges from the southeastern Bonaerensian area.

Table 3. Ecological requirements (zonation, substrate, life mode, trophic type, salinity) compiled from studies on modern representatives of the taxa studied. **3a:** gastropods, **3b:** bivalves. Zonation: Supratidal, Intertidal, Sublittoral (Infralittoral, Circalittoral). Substrate: soft, hard. Salinity: mixohaline, polyhaline, euhaline. Life modes and trophic types for Gastropods: free epifaunal, partially burried, carnivoruos, herbivores. Life modes and trophic types for bivalves: epibyssate, endobyssate, shallow infaunal, deep infaunal, filter feeder, detritivorous. * = mechanical borer, ** = very slow burrower, ■ = based on reported habits for similar species, ■ = potential habit. ▶

Table 3a. Microgastropods

ECOLOGICAL REQUIREMENTS	ZONATION				SUBST RATE		LIFE MODE		TROPHIC TYPE		SALINITY		
MICROGASTROPODS	SUPRALITT.	INTERT.	INFRALITT.	CIRCALITT.	SOFT	HARD	FREE EPIF.	PART. BURIED	CARNIV.	HERBIV.	MIXOHAL.	POLYHAL.	EUHAL.
Megalomphalus argentina (Castellanos, 1975)		▓ ?			▓ ?		░						█
Melanella solitaria (E. A. Smith, 1915)		▓ ?			▓ ?		░						█
Cerithiella burdwoodiana (Melvill & Standen, 1912)		▓ ?			▓ ?		░						█
Cerithiopsis greeni (C. B. Adams, 1839)			░		░	░	░					█	█
Marshallora agg. *nigrocincta* (C. B. Adams, 1839)		░	░		░	░	░					█	█
Caecum antillarum Carpenter, 1858			░	░	░		░			▓ ?		█	█
Littoridina australis (d'Orbigny, 1835)	░	░	░		░	░	░			░	█	█	
Cochliolepis surensis Farinati, 1985		░	░		░								█
Teinostoma maldonadense Farinati, 1985			░		░								█
Anachis (Costoanachis) avara (Say, 1822)		░	░		░	░	░		░				█
Anachis (Parvanachis) isabellei (d'Orbigny, 1839)			░		░	░	░		?				█
Anachis (Parvanachis) obesa (C. B. Adams, 1845)		░	░		░	░	░		░				█
Drillia patagonica d'Orbigny, 1841		░	░		░		░		▓ ?				█
?Mangelia cf. *purissima* (Strebel, 1908)			░	░	░		░		?	?			█
Olivella plata (Ihering, 1909)		░	░		░		░	░	░				█
Olivella (Olivina) tehuelcha (Duclós, 1835)		░	░		░		░	░	░				█
Turritellopsis marplatensis Castellanos & Landoni, 1984		?	?		?		?		?				█
Iselica globosa (H. C. Lea, 1845)		░			░				?				█
Careliopsis styliformis (Mörch, 1875)		?	?		░				?				█
Turbonilla americana (d'Orbigny, 1840)		░	░		░		░		░				█
Turbonilla fasciata (d'Orbigny, 1840)		░	░		░		░		░				█
Turbonilla interrupta Totten, 1835		░	░		░		░		░				█
Turbonilla rushii Bush, 1899		░	░		░		░		░				█
Turbonilla sanmatiensis Castellanos, 1982		░	░		░		░		░				█
Turbonilla smithi Pfeffer, 1905		░	░		░		░		░				█
Turbonilla uruguayensis Pilsbry, 1897		░	░		░		░		░				█
Chrysallida multituberculata (Castellanos, 1982)			░		░	░			?				█
Actaeocina candei (d'Orbigny, 1841)			░		░	░	░		░				█
Cylichna crispula Watson, 1883			░		░		░		?				█

Table 3b. Microbivalves

ECOLOGICAL REQUIREMENTS	ZONATION			SUBST RATE		LIFE MODE				TROPHIC TYPE		SALINITY	
MICROGASTROPODS	INTERT.	INFRALITT.	CIRCALITT.	SOFT	HARD	EPIBYSSATE	ENDOBYSSATE	SHALLOW INF.	DEEP INF.	FILTER FEEDER	DETRITIVOROUS	POLYHAL.	EUHAL.
Nucula (*Nucula*) *nucleus* (Linné, 1758)		░	░	░				░			░		█
Nucula (*Leionucula*) *obliqua* (Lamarck, 1819)		░	░	░				░			░		█
Musculus viator (d'Orbigny, 1846)		░		?	░ ?	░	?	?					█
Diplodonta (*Diplodonta*) *patagonica* (d'Orbigny, 1842)	░ ?	░	░	░				▓ **	░	░			█
Diplodonta (*Felaniella*) *vilardeboana* (d'Orbigny, 1846)		░		░				?		░			█
Diplodonta (*Phlyctiderma*) *semiaspera* (Philippi, 1836)		░		░				?		░			█
Carditamera (*Carditamera*) *guppyi* (Dall, 1900)		░	░ ?	░	░		░			░		░ ?	█
Crassinella lunulata (Conrad, 1834)		░		░				░		░			█
Abra (*Abra*) *aequalis* (Say, 1822)			█	░			█	░			░	?	█
Petricola lapicida (Gmelin, 1791)		█	░	░	░			░		?			█
Petricola (*Petricolaria*) *pholadiformis* Lamarck, 1818		░		░	▓ *				▓ *	?		█	█
Gouldia camachoi Farinati, 1985		▓ *	▓	▓ *	▓	▓	▓	▓ *					█
Sphenia hatcheri Pilsbry, 1899	░			░	░		█	░		?			█
Corbula (*Corbula*) *patagonica* d'Orbigny, 1846	█	░		░	░		▓ ?	░		░	█	█	█
Corbula (*Caryocorbula*) *caribaea* d'Orbigny, 1846		░		░			█	░		░	░	█	█
Corbula (*Caryocorbula*) *lyoni* Pilsbry, 1897	░	░	░	░	░		?	▓				█	█

Systematic aspects

It is outstanding that, even though the importance of synonymies for biodiversity estimations and for palaeoenvironmental interpretations is widely acknowledged (e.g., Benton 2008, Jablonski & Shubin 2015, Edie et al. 2017), the lack of critical reviews of micromolluscs from the Late Quaternary of Argentina has led to a sort of taxonomic inflation. As a matter of fact, as pointed out among others by Mallet (2001, 2005, 2007) and Isaac et al (2004), the reality of species in evolution as well as in ecological and biodiversity studies over large areas often tends to be rather overestimated. For this reason, several highly variable taxa preserved in the area of our study and reported living along the SWA (e.g., Triphoridae, Olividae, Pyramidellidae, Nuculidae, Corbulidae), hold an excessively large number of species described, unnecessarily oversized, thus unmeaning for evolutionary, biogeographical or palaeoenvironmental interpretations. In our opinion, this overestimation responds to the traditional "splitter" (narrow taxonomic) criteria applied for taxonomic discriminations. By contrast, although acknowledging that species are hypothesis and that there is no best species concept (among others, Mallet 2006, De Queiroz 2007, Bickford et al. 2007, Gourbiére & Mallet 2010, Hausdorf 2011), our identifications took into account the whole (phenotypic) variability range in a case-by-case basis for each species dealt with, considering eventual "fossil populations" instead of individual differences of extreme morphotypes, and favouring the so-called "lumper" (broadly and inclussive) perspective along a large geographical area. Shell morphological features and significant intraspecific shell variability (shape and size) can most often be linked to sediment grain size, salinity gradients and energetic conditions, or to populations separated geographically/temporally, rather than to different species. The morphological differences most likely represent ecophenotypic variations of the same species.

For example, several of the problematic taxonomic groups were previously reported within the context of a collectionist/typological way of looking, generally based on unique or scarce specimens and without comparisons with the type species of genera and/or the type series of the species dealt with, according to the rules of the ICZN (International Code of Zoological Nomenclature), afterwards repeated by subsequent authors for isolated localities. For instance, *Marshallora*/*Triphora*, *Turbonilla*, *Anachis*, *Olivella*, *Corbula* include several nominal species difficult to objectively discriminate on the basis of their shell morphological features (or on soft anatomical parts when studied) (Plates 2, 3, 4, 6, 8, 9). Moreover, in most cases, nominal species not only share morphological features but also occupy the same ecological niche (multidimensional concept involving both geographical distribution and abiotic and biotic resources, Lomolino et al. 2009, Polechová & Storch 2008, Khatibi & Sheikholeslami 2016), overall leading to assume that they belong to the same ecological species (Van Valen 1976). From our point of view, at least some of them could indeed be treated as synonyms (ecomorphs). Nevertheless, further studies are needed includying multivariate, cladisitic and phylogeographical analyses of modern SWA materials in order to test our hypotheses.

Furthermore, another consequence of the lack of reviews is often to have based palaeobiogeographical patterns and palaeoenvironmental reconstructions on misidentified taxa, to have considered several species preserved in the marine Quaternary of Argentina as typically euhaline, when they are typical of marginal marine settings. Several gastropods (*Littoridina australis*, *Cerithiopsis greeni*, *Marshallora nigrocincta*, *Caecum antillarum*) and bivalves (*Carditamera guppyi*, *Abra aequalis*, *Petricola pholadiformis*, *Corbula* spp.) are mixohaline to polyeuhaline, although often reported as typically euhaline species (Camacho 1966, Castellanos 1967, Forcelli 2000). The most outstanding example is *L. australis*, characteristic, constantly present and dominant within Holocene deposits along the whole Bonaerensian coastal area. It is a reliable palaeoenvironmental tool as palaeosalinity indicator of brackish waters (Aguirre & Farinati 2000b), in contrast to traditional reports as an euhaline littoral element.

Taphonomic aspects

The micromolluscs recovered show taphonomic features which can be linked to palaeoenvironmental conditions. They are indicative of the degree of biostratinomic alteration suffered by the shells during the time of exposure in the water-sediment interphase previous to their final deposition in the coastal area. Knowing that post-mortem modification is an unavoidable fact of fossilization and that, among shelly taxa, species differ in their susceptibility to a potential preservation (Kidwell & Bosence 1991), some degree of taphonomic loss was expected for the fossil and subfossil microgastropods and microbivalves collected. The preservation degree responds to intrinsic properties of the shells (e.g., morphology, shell structure, mineralogy, thickness, organic content) and/or to extrinsic (environmental) variations (Salazar-Jiménez et al. 1982, Meldahl 2001, Kidwell 2001, Tomasových & Rothfus 2005, Wisshak et al. 2009, Aguirre et al. 2011b). For example, abiotic factors like currents, wave sorting (deduced from fragmentation degrees), selective breakage, and biologic controls like the action of predators and scavengers, depend mainly on the taxa, shell shape and thickness, habitat and life habit, as well as on palaeoenvironmental conditions (e.g., time of subaerial exposure, turbulence determined by waves, currents, physical impact by particles, biological activities) in the final depositional settings (Trewin & Welsh 1971, Aguirre & Farinati 1999b, Wisshak et al. 2009).

Interesting to note in this regard is the excellent preservation of most (80–90 %) of the micromolluscan shells recovered, even when they differ in shell microstructure, shape (outline + size) and life modes. No specimens of the taxa identified were found in living position and only a few bivalves (i.e., *Nucula*, *Corbula*, *Carditamera*) occurred with joined valves. But they all show none or low (10 %) degrees of fragmentation and abrasion (many even keeping their original colour and luster) and no dissolution was observed, with only a few bivalve shells exhibiting encrustation/recristalization (*Anachis* sp., C*arditamera guppyi*, *Corbula patagonica*, Text-fig. 3). Nevertheless, in spite of their minute size, micromolluscs can be affected by bioerosive activity of organisms, that is, different bioerosion traces produced by the same or different trace makers. Bioerosion traces are relevant as they provide useful palaeoenvironmental information, revealing the occurrence of different groups of organisms living together (in the same original communities) postmortem and/or altering the shells after their death, indicative of biotic and physical controls: biotic interactions, substrate nature, depth, sea surface temperature and energetic conditions in the final depositional environment. Traces of predation, dwelling and attached structures were more commonly observed on scarce shells of certain taxa, mostly from the Bonaerensian coastal area. Among microgastropods, on *L. australis*, *Anachis* spp., *Turbonilla uruguayensis* and *Cylichna crispula*, among microbivalves, on *Corbula patagonica*, *C. lyoni* and *Carditamera guppyi* (see also Pastorino & Ivanov 1996, Farinati et al. 2006) (Text-fig. 3).

Overall, the excellent preservation pattern observed can be linked to the young age of the shells from the coastal deposits sampled, even when acknowledging that the taphonomic condition of molluscan shells from nearshore marine settings has been demonstrated to be a poor timekeeper, with time-averaging over 100 to several 1000 years (Flessa 1993, 2001, Kidwell & Flessa 1996). Alternatively, low energetic conditions of the littoral palaeoenvironments could be argued and/or a linkage could be established with the ecological requirements and intrinsic features of the species preserved. Most of the shells come from deposits of Holocene age and from the Bonaerensian coastal sector, where a great majority of the taxa recorded is typical of soft substrates and of comparatively lower energetic conditions (relative to Patagonia) and many have infaunal life habits, altogether accounting for their high preservation degree. In addition to this, the most commonly present and abundant microgastropods preserved along the whole area (*Litttoridina*, *Olivella*) exhibit subelliptic or subcircular shell shapes which, regardless of their epifaunal life habits, could have allowed them to behave like small substrate particles or grains, avoiding strong physical alteration. The most abundant microbivalves exhibit subcircular or subovate shell shapes and their infaunal habit must have facilitated an excellent preservation with low taphonomic loss.

Diversity and distribution

Relevant to species diversity, overall it has been shown to be biased primarily by latitudinal and environmental controls (Bush & Bambach 2004, Edie et al. 2017, Jablonski et al. 2017, and other references therein). Several remarks are interesting regarding our study between the Rio de La Plata margin and Rincón del Buque (southern Santa Cruz province, Patagonia) and across time since the Late Pleistocene to present, adding useful independent evidence to previous interpretations based on the whole molluscan content (Aguirre et al. 2011a).

Firstly, a majority of microgastropods and microbivalves sampled are preserved in the Bonaerensian area. In contrast to this, much scarcer records belong to the Patagonian coastal area. Secondly, most records come from Holocene deposits against the low numbers (2 gastropods and 9 bivalves) identified from Late Pleistocene deposits (mainly from Patagonia and from MIS5 or MIS7). Lastly, a great majority are represented by sublittoral euhaline warm water taxa. In our view, even when a sampling bias cannot be ruled out, the uneven diversity pattern could be linked to palaeoenvironmental controls. For instance, it has been shown (e.g., Smith & Macgowan 2011) that fossil records are strongly linked to substrate nature and that intrinsic features, like a very small size condition of the shells, can be determinant of their preservation potential (e.g., Cherns & Wright 2011). Thus, in our case study, small shells from higher energetic palaeoenvironments in harder substrates, like along Patagonia, are expected to be much easier and quicker fragmented or completely destroyed.

Moreover, the marine Holocene along Argentina is characterized by more extensive, continuously and better preserved coastal deposits, especially along the Bonaerensian coastal area (Aguirre et al. 2011a, b, Richiano et al. 2013 and references therein), where soft substrates in warmer waters are predominant and energetic levels are lower in comparison with the Patagonian settings. The Bonaerensian palaeoenvironmental conditions clearly favour a lower taphonomic loss and a higher preservation potential of very small shells. By contrast, along Patagonia, the Pleistocene marine terraces are comparatively more extensive and continuos and, together with the Holocene landforms, are all characterized by predominance of pebbles, other varied hard and coarse sands matrixes, by higher energetic levels, in colder water masses (revealed by the total molluscan content). Consequently, in general terms, the Patagonian settings do not favour the preservation of tiny shells. Even when some taxa could have lived there during the last transgressive-regresive episodes, the shells must have been destroyed.

On the other hand, according to most studies worldwide (among others Jablonski et al. 2006, Valentine et al. 2008, Griffiths et al. 2009), a lower diversity would be expected in colder waters of high latitudes, like along the Magellanean Malacological province in Patagonia vs. warmer Bonaerensian waters. Interestingly, the marine Pleistocene along Patagonia, especially during MIS5 (Last Interglacial), was shown to have been characterized by colder waters and higher productivity than present (Aguirre et al. 2013, Richiano et al. 2015), probably during a collapse of ice sheets documented during the last interglacial (O'Leary et al. 2013), which must have brought Antarctic ice rafts debris to the Patagonian coast through the Malvinas/Falkland cold north-flowing current, enhancing a general cooling of the water masses.

Another point to be made is that, as most of our micromolluscs are aragonitic, it could be argued that their scarcity within the Patagonian Pleistocene landforms could be linked to a faster disolution of aragonitic shells with longer time exposures in comparison with the Holocene. This, however, is opposed to the large amounts of macromolluscan aragonitic taxa recovered from the same Pleistocene coastal deposits (Aguirre & Farinati 2000a, Aguirre et al. 2008b).

In summary, assuming that micromolluscs are quantitatively important in modern shell assemblages, they must have been so during the Late Pleistocene and mid-Holocene high sea-level episodes recorded along Argentina, but the small size effect in certain palaeoenvironmental conditions could have been a determinant factor responsible for the unbalanced diversity pattern observed, even more relevant than shell mineralogy or water chemistry, as shown by Cherns & Wright (2011) for other Phanerozoic contexts (see also Taylor 2008).

Concerning their distribution geographically and temporally, despite the fact that nearly all the taxa have modern representatives either in the Argentinean and/or Magellanean Malacological provinces, for some species (10 gastropods, 3 bivalves) spatial shifts of their geographical patterns relative to their modern distribution are apparent. Some have no living records in Argentina (according to collections from oceanographic expeditions in the Mar Argentino, INIDEP, Bastida et al. 2007 and other references therein). However, considering the lack of studies focused on micromolluscs from the Mar Argentino, their presence cannot be unquestionably ruled out and further, more detailed taxonomic studies for some taxa could bring light into new records and taxonomic findings (e.g., *Cochliolepis surensis* Farinati, *Teinostoma maldonadense* Farinati, *Caecum antillarum* Carpenter, *Crassinella lunulata* (Conrad)).

Palaeoenvironmental/palaeoclimate/ palaeoceanographical remarks

Even when no remarkable extinctions of microgastropods or microbivalves were identified, overall some geographical shifts were observed. These are assumed to represent palaeoenvironmental/palaeoclimate/ palaeoceanographic changes. They are indicative of physical variations linked to the last transgressive-regressive episodes during Late Quaternary which covered the Argentinian coastal area (mainly during the mid-Holocene).

As mentioned above, the fact that most of the micromolluscs revised were recovered from the Bonaerensian coastal area is linked to the occurrence soft substrates, like fine sands and silts or muddy facies, and comparatively lower environmental energetic levels, warmer waters along an area with a strong influence of the Rio de La Plata plume (lower salinity influence) along a considerable amount of the littoral extension. This contrasts with the Patagonian littoral, characterized by harder substrates (commonly coarse sands, pebbles, rocky bottoms) and higher energetic conditions in colder waters influenced by the Malvinas/Flakland and Patagonian currents.

Among microgastropods, a number of species recorded (6) are absent from the adjacent modern littoral and are indicative of warmer shallow water masses than today: *Cerithiopsis greeni*, *Marshallora nigrocincta*, *Caecum antillarum*, *Anachis obesa*, *Iselica globosa*, *Careliopsis styliformis*). In addition, other 5 species (*Melanella solitaria*, *Cerithiella burdwwodiana*, *Drillia patagonica*, *Mangelia magallanica*, *Turbonilla smithi*) are typical of cold waters. One species (*Littoridina australis*) is absent from the oceanic littoral but due to salinity changes and is a mixo-polyahaline palaeosalinity indicator. By contrast, among microbivalves, only one species (*Petricola pholadiformis*) absent from the Mar Argentino at present is indicative of warmer waters. It was recorded from the Holocene of the northeastern Bonaerensian coastal area (Punta Indio-Bahía Samborombón). The only cold water bivalve species, *Gouldia camachoi*, was recorded from the Holocene of Bahía Blanca.

The taxa which are apparently absent at present in the Mar Argentino (e.g., *Cerithiopsis greeni*, *Marshallora* agg. *nigrocincta*, *Anachis obesa*, *Petricola pholaliformis*) and/or northwards shifted are higher sea surface temperature indicators during the mid-Holocene transgressive maximum. They document an independent source of evidence concerning responses of the molluscan original communities to the Holocene Climatic Optimum/Amelioration (Brinner et al. 2006), a climatic event recorded worldwide and also based on continental records (Tonni & Fidalgo 1978, Tonni et al. 1999, Prevosti et al. 2004). Overall, these records support our previous hypotheses pointing to a different palaeocirculation pattern during the mid-Holocene caused by an enhanced and southwards shifted warm Brazilian current-South Atlantic Anticyclonic center (responsible for winds and currents along the northern Argentinean littoral, Aguirre 1993c).

On the other hand, Bahía Blanca is an interesting area in terms of palaeoceanographical conditions. It contains the highest number of micromolluscs from the Holocene of Argentina. This matches with the area of highest total molluscan diversity during the mid-Holocene. Particular local conditions in several physical features/parameters must have prevailed in the area, most probably a different mid-Holocene palaeocirculation pattern, characterized by more intense thermal and salinity fronts during an episode of higher sea surface temperature ca. 5–7 ka B.P., with a consequent displacement of the salinity gradient several kilometers inland (Aguirre et al. 2011a), also documented for Bahía Samborombón (Aguirre 1993c, Richiano et al. 2013) and for the Río de La Plata margin in the boundary between Uruguay and Argentina (Sprechmann 1978).

9. Conclusions and final remarks

Taxonomic complexities have made micromolluscs from the marine Quaternary of Argentina less dealt with than macroscopic, more abudant and popular groups of molluscs, and have been consequently less well known. Despite their presently uneven knowledge, with relatively better known taxonomic groups and areas vs. others which are still less well studied, their updated review can provide useful indicators of nearshore sedimentary environments if considered in their synecological/geological contexts. Their diversity and distribution add useful independent evidence to previous palaeoenvironmental/paleaclimate/palaeoceanographical interpretations based on the whole molluscan content.

- A different number of micromolluscan species regarding traditional catalogues for the Mar Argentino are acknowledged. Several genera (*Turbonilla*, *Anachis*, *Olivella*, *Corbula*) exhibit morphological variation includying nominal species which could represent synonyms (ecophenotypic plasticity). A fewer number of gastropod species, like *Anachis* (only 3 species), *Olivella* (only 2 species), *Turbonilla* (6 species), a fewer number of bivalve species, like *Carditamera* (1 species), *Corbula* (3 species), *Diplodonta* (3 species).
- Temporally, a higher number of species are exclusive for the Holocene.
- Geographically, most species are exclusive for the Bonaerensian coastal area and four have not as yet been recorded living in the adjacent littoral, apparently not represented today.
- In the Patagonian areas sampled, only 3 micromolluscan taxa were recovered: *Littoridina australis* (Holocene, San Antonio Oeste, Río Negro), *Olivella tehuelcha* (Pleistocene, Bahía Bustamante) and *Diplodonta patagonica* (Pleistocene and Holocene, southern Puerto Lobos).

- Overall, the micromolluscs found are reliable palaeoenvironmental tools:
- Rounded-subelliptic microgastropod shells (*Littoridina, Olivella*) and subcircular-subovate microbivalve shells (e.g., *Nucula*, *Diplodonta*, *Corbula*) offer better chances of being preserved, reducing their potential for taphonomic loss due to small specimen size. Their presence can be used as a reliable indication of past environmental features in soft bottoms of marine to marginal marine settings within low to moderate energetic conditions. By contrast, their strong/remarkable taphonomic loss – and eventually their absence – as an indication of higher energetic waters.
- Several taxa are indicators of marginal marine environments (mixohaline to polyeuhaline), not open marine settings: *Littoridina australis*, *Cerithiopsis greeni*, *Marshallora* agg. *nigrocincta*, *Caecum antillarum* (Gastropoda) and *Carditamera guppyi*, *Abra aequalis*, *Petricola pholadiformis*, *Corbula* spp. (Bivalvia).
- Some of the micromolluscs found represent palaeoclimate/palaeoceanographical indicators: *Cerithiopsis greeni*, *Marshallora* agg. *nigrocincta*, *Caecum antillarum*, *Anachis obesa*, *Iselica globosa*, *Careliopsis styliformis* are indicative of warmer waters than present, while *Melanella solitaria*, *Cerithiella burdwwodiana*, *Drillia patagonica*, *Mangelia* cf. *purissima*, *Turbonilla smith* are typical of cold waters, *Cylichna crispula* is endemic from the southern hemisphere.
- In spite of their small size, micromolluscs can be affected by bioerosion activities of different groups of trace makers simultaneously living with them in the original littoral associations or post-mortem in the taphonomically active zone. In both cases they provide information otherwise unknown regarding biotic interactions and palaeoenvironmental conditions during the late Quaternary high sea-level episodes.

In summary, micromolluscs from the marine Quaternary of Argentina represent a remarkable window into very short and rapid palaeoenvironmental-palaeclimate-palaeoceanographical and derived palaeobiogeographical changes occurred in southern South America since the latest Pleistocene and especially during the Mid-Holocene. Further, more detailed studies need to focus on taxonomic and morphological comparisons with micromolluscan faunas of Neogene deposits preserved along other areas of South America, as well as from the southern hemisphere, which could add new evidence of changes in palaeoceanographical patterns occurred during the last sea-level highstands within regional and hemispheric contexts.

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Explanation of the plates

Plates 1–5

Gastropods. Dimensions (H) in mm. When whole specimens ideal for illustration were not available among the field-collected materials, re-illustrations from FARINATI (1993, 1994, 2006), AGUIRRE (1993a, b, c, 1994), AGUIRRE & FARINATI (2000) and AGUIRRE & URRUTIA (2002) were supplied.

Plate 1

Figs. 1–2: *Megalomphalus argentina* (Castellanos, 1975), Holocene, Ingeniero White, Bahía Blanca area (H = 3) (PI-UNS 2694).

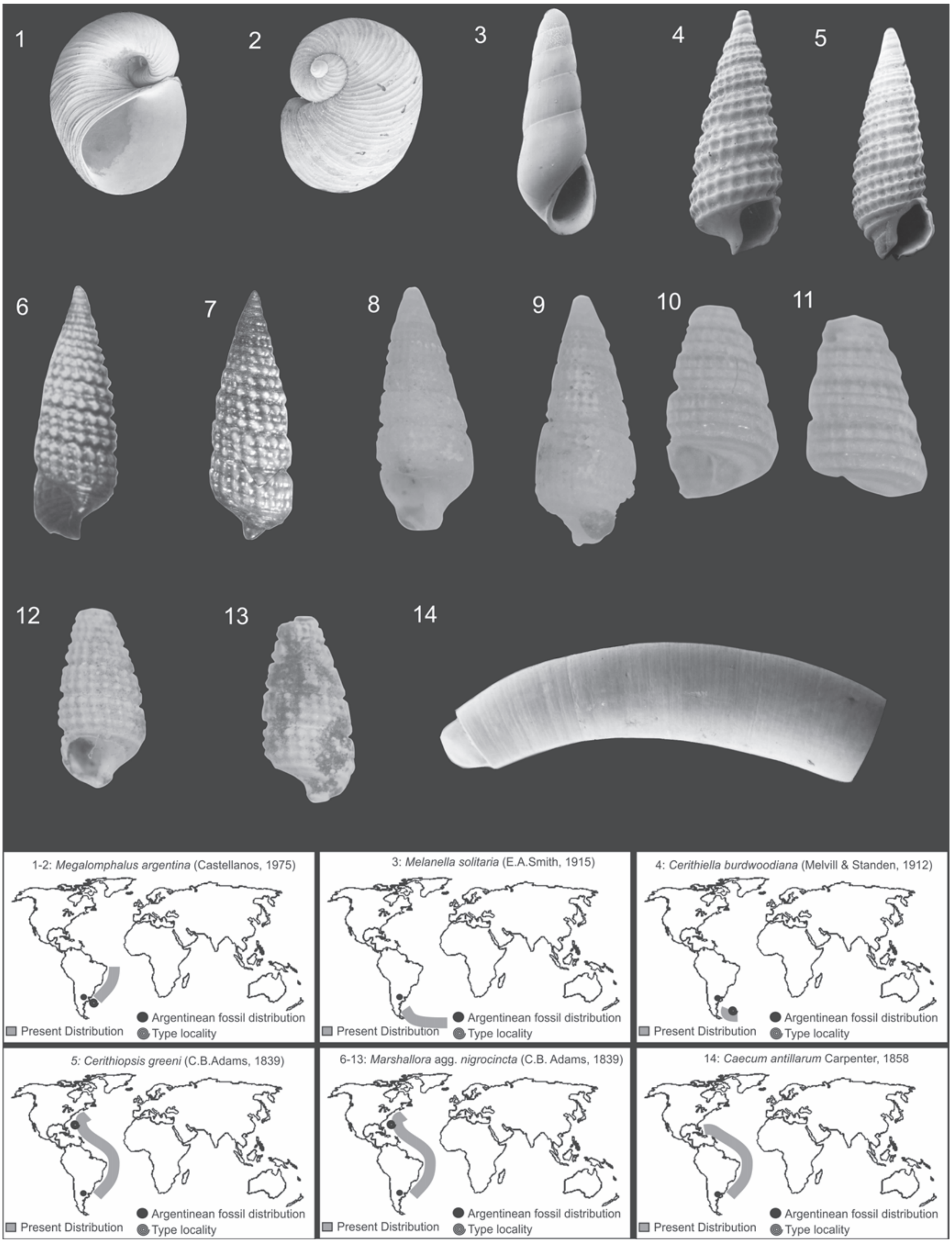
Fig. 3: *Melanella solitaria* (E. A.Smith, 1915), Holocene, Boya 24–25, Bahía Blanca area (H = 2.9) (PI-UNS 2697).

Fig. 4: *Cerithiella burdwoodiana* (Melvill & Standen, 1912), Holocene, El Puente, Bahía Blanca area (H = 3.2) (PI-UNS 2700).

Fig. 5: *Cerithiopsis greeni* (C. B.Adams, 1839), Holocene, Baterías, Bahía Blanca area (H = 3.5) (PI-UNS 2699).

Figs. 6–13: *Marshallora* agg. *nigrocincta* (C. B. Adams, 1839). 6–7: Lectotype of *Cerithium nigrocincta* (MCZ 186157), modern, Massachusetts, USA (H = 6.8). 8–9: Holocene, Punta Indio (MLP-PI 25934) (H = 5). 10–11: Holocene, Punta Indio (DCG-MLP 0007-925) (H = 2.3). 12–13: Holocene, Punta Indio (MLP-PI 26401) (H = 3.7).

Fig. 14: *Caecum antillarum* Carpenter, 1858, Holocene, Ingeniero White, Bahía Blanca area (PI-UNS 2695) (H = 3.5).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1-2: *Megalomphalus argentina* (Castellanos, 1975)
3: *Melanella solitaria* (E.A.Smith, 1915)
4: *Cerithiella burdwoodiana* (Melvill & Standen, 1912)
5: *Cerithiopsis greeni* (C.B.Adams, 1839)
6-13: *Marshallora* agg. *nigrocincta* (C.B. Adams, 1839)
14: *Caecum antillarum* Carpenter, 1858
Argentinean fossil distribution
Type locality
Present Distribution

Plate 2

Figs. 1–6: *Littoridina australis* (d'Orbigny, 1835). 1: Lectotype (BMNH. 1854.14.4.342), modern from Montevideo (Uruguay) (H = ca. 5 mm). 2: Holocene, Punta Indio (H = 4 mm). 3: Holocene from Canal de Las Escobas Formation, Bahía Samborombón (H = 2.44). 4: Holocene, Mar Chiquita (H = 8.2). 5: Holocene, El Puente, Bahía Blanca area (H = 5.1). 6: Holocene from Quequén Salado, southeastern Bonaerensian area (H = 6.7).

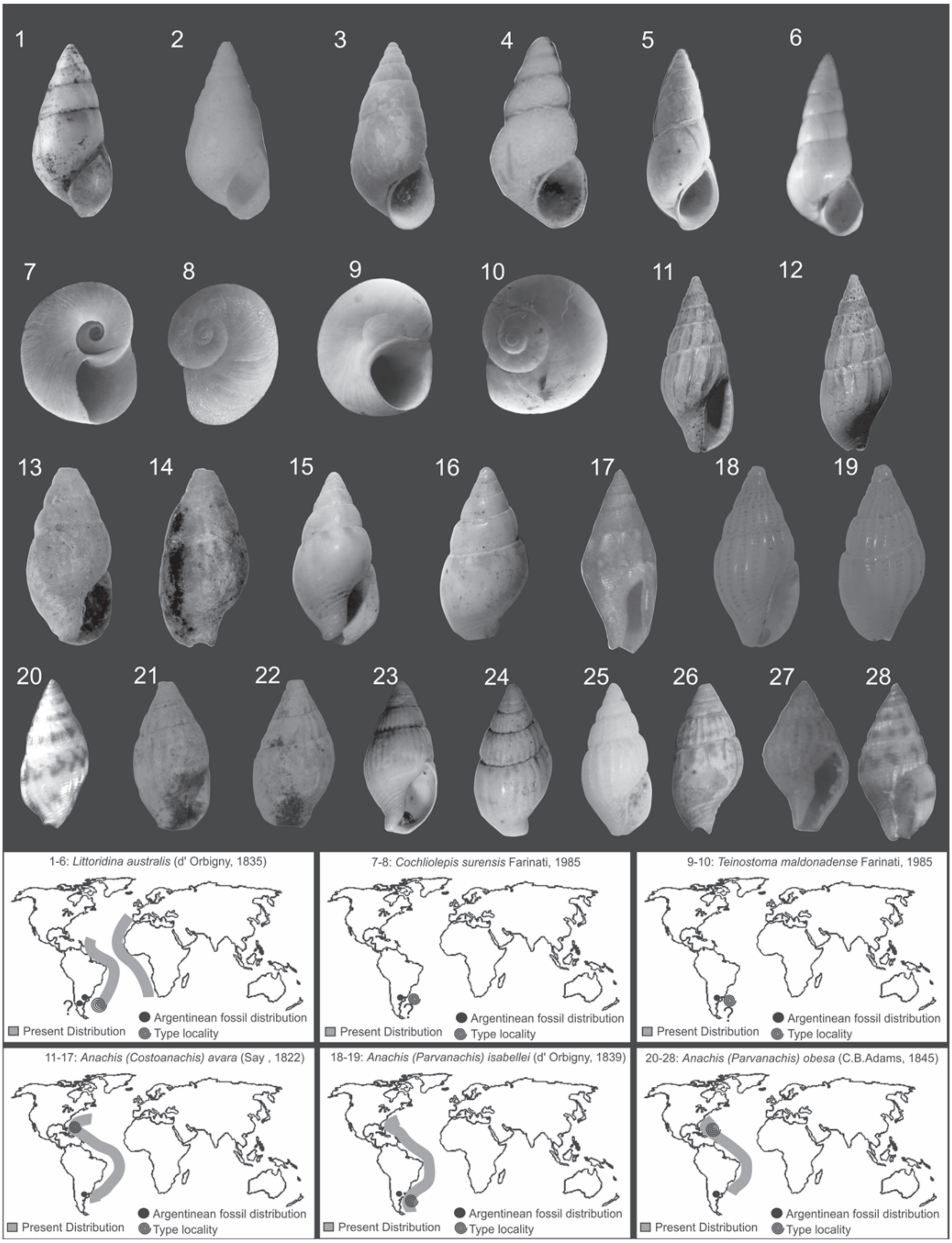
Figs. 7–8: *Cochliolepis surensis* Farinati, 1985, Holocene, Baterías, Bahía Blanca area (PI-UNS 2692) (H = 3.77).

Figs. 9–10: *Teinostoma maldonadense* Farinati, 1985, Holocene, Bahía Blanca area (PI-UNS 2693) (H = 1.88).

Figs. 11–17: *Anachis (Costoanachis) avara* (Say, 1822). 11–12: Holocene, Ingeniero White, Bahía Blanca area (PI-UNS 1391) (H = 11). 13–14: Holocene, Punta Indio (MLP-PI 26438) (H = 5.4). 15–16: Holocene, Estancia Rincón de López, Bahía Samborombón (DCG-MLP 0007-926) (H = 3.5). 17: Lectotype (ANSP 16887), modern, southern coast of USA (H = 4.77).

Figs. 18–19: *Anachis* (*Parvanachis*) *isabellei* (d'Orbigny, 1839), Holocene, Baterías (PI-UNS 1392) (H = 6.5).

Figs. 20–28: *Anachis* (*Parvanachis*) *obesa* (C. B. Adams, 1845). 20: Paralectotype (MCZ 186152), modern, Jamaica (H = 10). 21–22: Holocene, northeastern Bonaerensian area (MLP-PI 26398) (H = 4). 23–24: Holocene, Destacamento Río Salado, Bahía Samborombón (DCG-MLP 0007-926) (H = 7). 25–26: Holocene, Arroyo Grande, Mar Chiquita area (DCG-MLP 0007-928) (H = 6.5). 27–28: Holocene, Northeastern Bonaerensian area (MLP-PI 25953) (H = 4.8). 2, 3, 4: reillustrated from Aguirre & Urrutia (2002), (Pl. I, fig. 4, Pl. III, fig. 4, Pl. I, fig. 12, respectively).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1-6: *Littoridina australis* (d' Orbigny, 1835)
7-8: *Cochliolepis surensis* Farinati, 1985
9-10: *Teinostoma maldonadense* Farinati, 1985
11-17: *Anachis (Costoanachis) avara* (Say , 1822)
18-19: *Anachis (Parvanachis) isabellei* (d' Orbigny, 1839)
20-28: *Anachis (Parvanachis) obesa* (C.B.Adams, 1845)
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Present Distribution
Argentinean fossil distribution
Type locality

Plate 3

Figs. 1–2: *Drillia patagonica* d’Orbigny, 1841, Holocene, Mar Chiquita area (ML-PI 26434) (H = 7.6).

Figs. 3–4: *Mangelia* cf. *purissima* (Strebel, 1908), Holocene, Ingeniero White, Bahía Blanca area (H = 9).

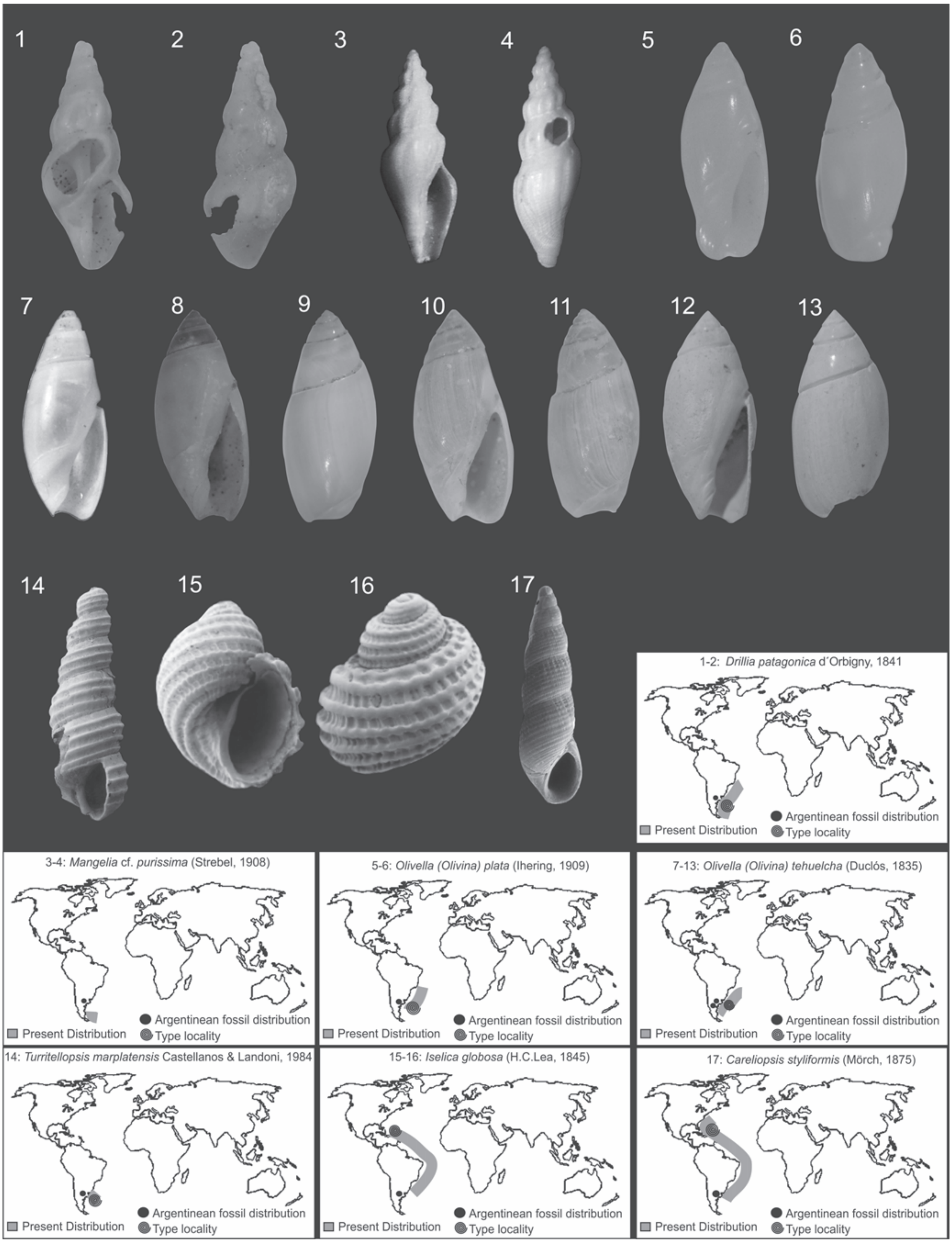
Figs. 5–6: *Olivella* (*Olivina*) *plata* (Ihering, 1909), Holocene, Baterías (PI-UNS 3203), (H = 10).

Figs. 7–13: *Olivella* (*Olivina*) *tehuelcha* (Duclós, 1835). 7: Lectotype of *O.* (*O.*) *puelchana* (BMNH. 12.4.408), modern, Bahía San Blas (H = 8.75). 8: Holocene, Mar Chiquita area (MLP-PI 26436) (H = 8.8). 9: Holocene, Canal de Las Escobas, Bahía Samborombón area (DCG-MLP 0007-932) (H = 10). 10–11: Holocene, Río Salado margin, Bahía Samborombón (MLP-PI 5859) (H = 9). 12–13: Holocene, Arroyo Los Cueros, Mar Chiquita area (DCG-MLP 0007-929) (H = 12).

Fig. 14: *Turritellopsis marplatensis* Castellanos & Landoni, 1984, Holocene, Boya 24-25 (PI-UNS 2696) (H = 4).

Figs. 15–16: *Iselica globosa* (H. C.Lea, 1845), Holocene, Baterías, Bahía Blanca area (PI-UNS 2690) (H = 4).

Fig. 17: *Careliopsis styliformis* (Mörch, 1875), Holocene, El Puente, Bahía Blanca area (PI-UNS 2680) (H = 3).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1-2: *Drillia patagonica* d´Orbigny, 1841
3-4: *Mangelia* cf. *purissima* (Strebel, 1908)
5-6: *Olivella (Olivina) plata* (Ihering, 1909)
7-13: *Olivella (Olivina) tehuelcha* (Duclós, 1835)
14: *Turritellopsis marplatensis* Castellanos & Landoni, 1984
15-16: *Iselica globosa* (H.C.Lea, 1845)
17: *Careliopsis styliformis* (Mörch, 1875)
Present Distribution
Argentinean fossil distribution
Type locality

Plate 4

Fig. 1: *Turbonilla americana* (d’Orbigny, 1840), Lectotype (BMNH 1854.12.4.365), modern Río de Janeiro (H = 5).

Figs. 2–4: *Turbonilla fasciata* (d’Orbigny, 1840). 2: Holocene, Bahía Blanca area (PI-UNS 2669) (H = 6). 3–4: Holocene, Estancia San José, Bahía Samborombón (MLP-PI 26391) (H = 4.6).

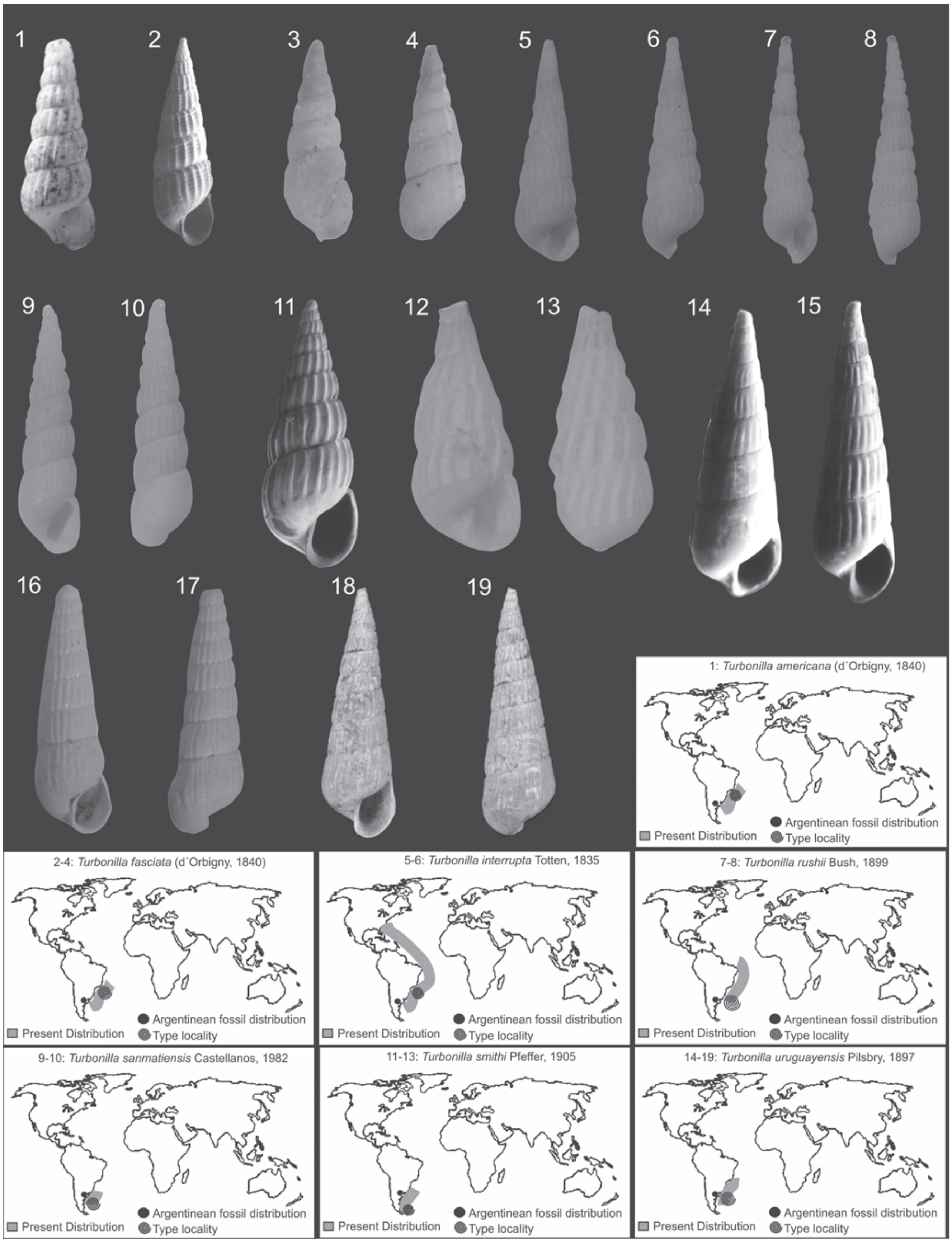
Figs. 5–6: *Turbonilla interrupta* Totten, 1835, Holocene, Ingeniero White, Bahía Blanca area (PI-UNS 2670) (H = 6).

Figs. 7–8: *Turbonilla rushii* Bush, 1899, Holocene, Baterías, Bahía Blanca area (PI-UNS 2668) (H = 9).

Figs. 9–10: *Turbonilla sanmatiensis* Castellanos, 1982, Holocene, Boya 24–25, Bahía Blanca area (PI-UNS 2676) (H = 6.2).

Figs. 11–13: *Turbonilla smithi* Pfeffer, 1905, Holocene, El Puente, Bahía Blanca area (PI-UNS 2665). 11 (H = 3.5). 12–13 (H = 11.5).

Figs. 14–19: *Turbonilla uruguayensis* Pilsbry, 1897. 14–15: Holocene, Bahía Blanca area (PI-UNS 2663) (H = 11, H = 6.2). 16–17: Holocene, Arroyo Los Cueros, Mar Chiquita area (DCG-MLP 0007-933) (H = 8.75). 18-19: Lectotype (ANSP 70546), modern, Maldonado Bay, Uruguay (H = 10).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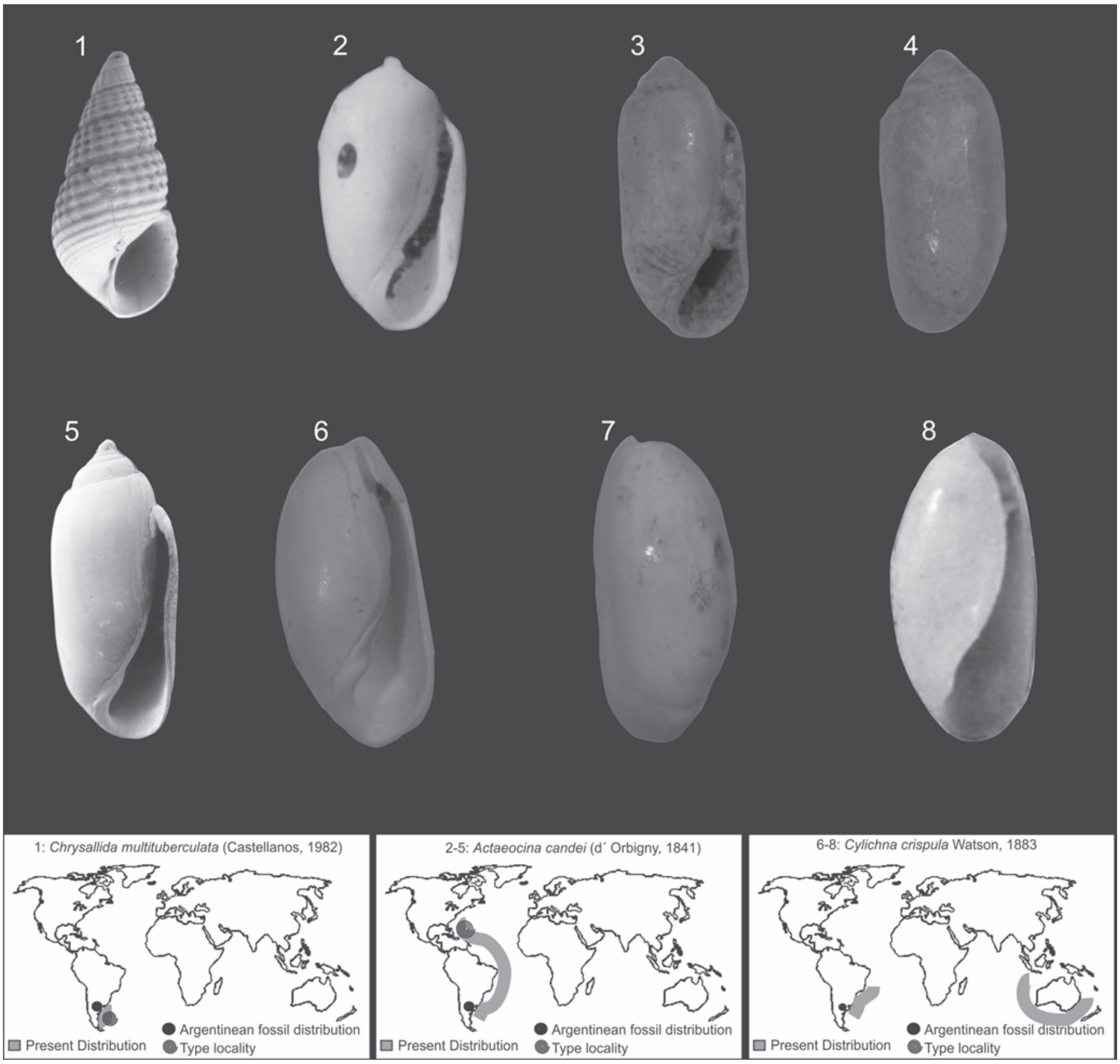
1: *Turbonilla americana* (d´Orbigny, 1840)
Present Distribution
Argentinean fossil distribution
Type locality
2-4: *Turbonilla fasciata* (d´Orbigny, 1840)
Present Distribution
Argentinean fossil distribution
Type locality
5-6: *Turbonilla interrupta* Totten, 1835
Present Distribution
Argentinean fossil distribution
Type locality
7-8: *Turbonilla rushii* Bush, 1899
Present Distribution
Argentinean fossil distribution
Type locality
9-10: *Turbonilla sanmatiensis* Castellanos, 1982
Present Distribution
Argentinean fossil distribution
Type locality
11-13: *Turbonilla smithi* Pfeffer, 1905
Present Distribution
Argentinean fossil distribution
Type locality
14-19: *Turbonilla uruguayensis* Pilsbry, 1897
Present Distribution
Argentinean fossil distribution
Type locality

Plate 5

Fig. 1: *Chrysallida multituberculata* (Castellanos, 1982), Holocene, Bahía Blanca area (PI-UNS 2678) (H = 3).

Figs. 2–5: *Actaeocina candei* (d'Orbigny, 1841), 2: Lectotype (BMNH. 1854.10.4.17/1), modern from Antilles (H = 3.75). 3–4: Holocene, Mar Chiquita area (DCG-MLP 0007-934) (H = 2.9). 5: Holocene, Bahía Blanca area (PI-UNS 2698) (H = 4).

Figs. 6–8: *Cylichna crispula* Watson, 1883. 6–7: Holocene, Punta Indio area (DCG-MLP 0007-935) (H = 3.7). 8: Lectotype (BMNH. 18772.9.2271-2275) (H = 4.5).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1: *Chrysallida multituberculata* (Castellanos, 1982)
▨ Present Distribution
● Argentinean fossil distribution
● Type locality
2-5: *Actaeocina candei* (d´ Orbigny, 1841)
▨ Present Distribution
● Argentinean fossil distribution
● Type locality
6-8: *Cylichna crispula* Watson, 1883
▨ Present Distribution
● Argentinean fossil distribution
● Type locality

Plates 6–9

Bivalves. Dimensions (L, H) in mm. When whole specimens ideal for illustration were not available among the field-collected materials, re-illustrations from Farinati (1993, 1994, 2006) and Aguirre (1993a, b, c, 1994) were supplied.

Plate 6

Figs. 1–6: *Nucula* (*Nucula*) *nucleus* (Linné, 1758). 1–2: Holocene, Mar Chiquita area (MLP-PI 26973) (L = 5.8). 3–4: Holocene, Laguna La Salada Grande, northeastern Bonaerensian littoral (MLP-PI 25971) (L = 5). 5–6: Holocene, Mar Chiquita area (MLP-PI25970) (L = 5).

Figs. 7–13: *Nucula* (*Leionucula*) *obliqua* (Lamarck, 1819). 7–8: Holocene Mar Chiquita area (MLP-PI 25969) (L = 5.1). 9: Holotype (LMMHNP) (L = 11.1). 10-11: Lectotype of *Nucula puelcha* d'Orbigny, 1842 (BMNH 1854.12.4.774) (L = 6.6). 12–13: Holocene, Mar Chiquita (MLP-PI 26272) (L = 6.7).

Fig. 14: *Musculus viator* (d'Orbigny, 1846), Holocene, Bahía Blanca area (PI-UNS 1358) (L = 10).

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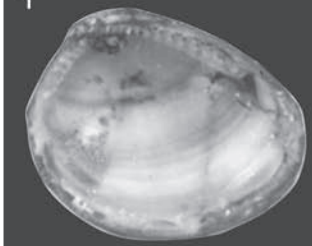

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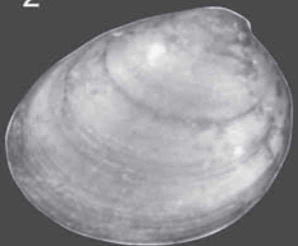

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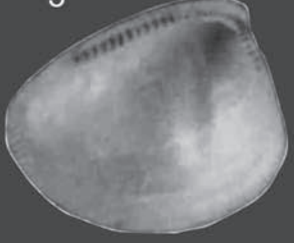

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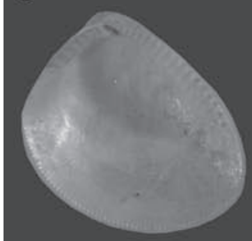

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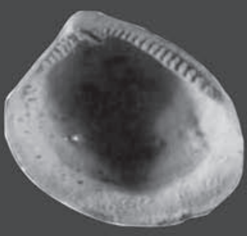

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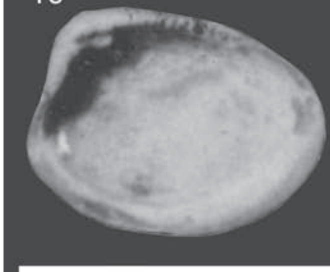

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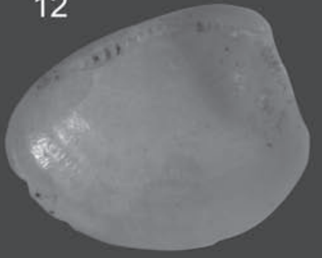

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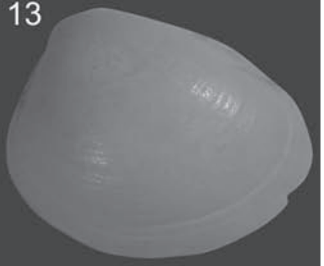
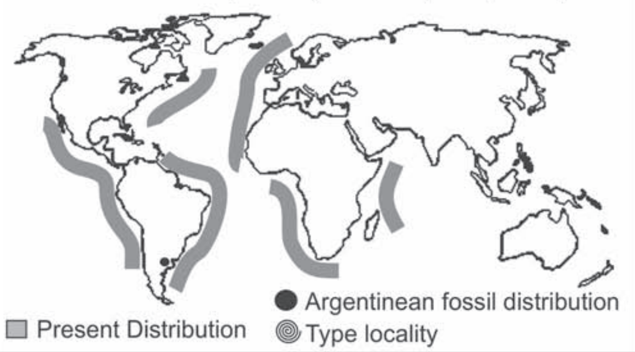


1-6: *Nucula (Nucula) nucleus* (Linné, 1758)



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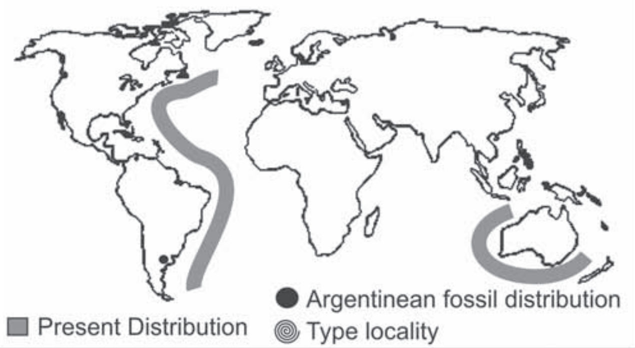
7-13: *Nucula (Leionucula) obliqua* (Lamarck, 1819)



14: *Musculus viator* (d´Orbigny, 1846)

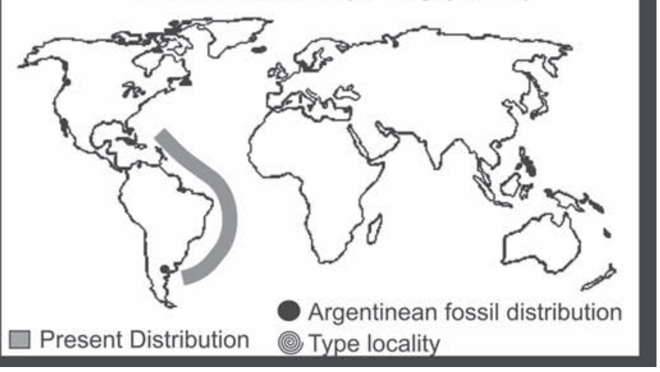


Plate 7

Figs. 1–6: *Diplodonta* (*Diplodonta*) *patagonica* (d’Orbigny, 1842). 1–2: Holocene, Mar Chiquita area (MLP-PI 26216) (L = 15). 3–4, Holocene, Mar Chiquita area (MLP-PI 26215) (L = 10.6). 5–6, Holocene, Lectotype) (LMMHNP) (L = 11.1).

Figs. 7–8: *Diplodonta* (*Felaniella*) *vilardeboana* (d’Orbigny, 1846), Holocene, Bahía Blanca area (PI-UNS 2845) (L = 18).

Figs. 9–12: *Diplodonta (Phlyctiderma) semiaspera* (Philippi, 1836), Holocene, Ingeniero White, Bahía Blanca area (PI-UNS 1359), 9–10 (L = 19). 11–12 (L = 11.5).

Figs. 13–14: Holotype of Diplodonta portesiana (d’Orbigny, 1846) (BMNH 1854.12.4.770) (L = 22).

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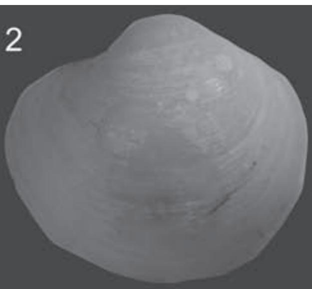

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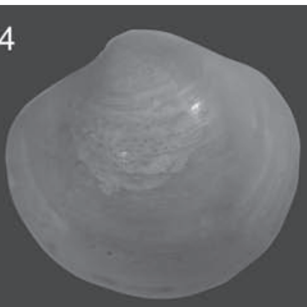

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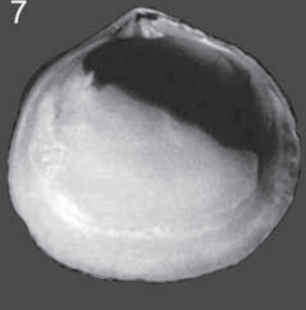

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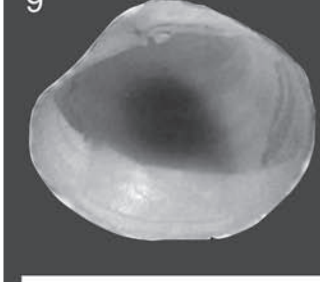

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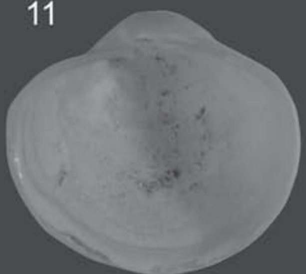

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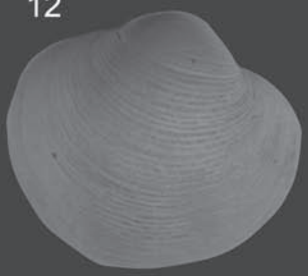
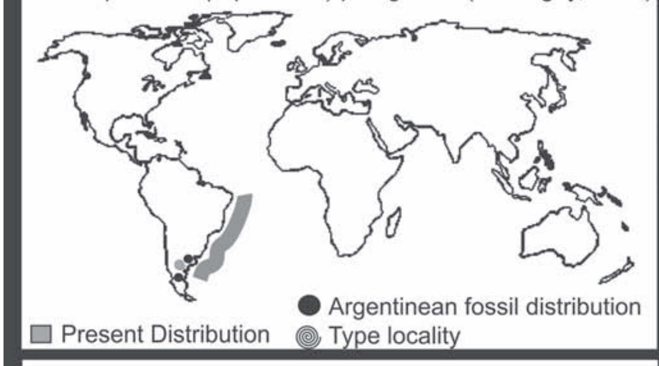


1-6: *Diplodonta (Diplodonta) patagonica* (d´Orbigny, 1842)



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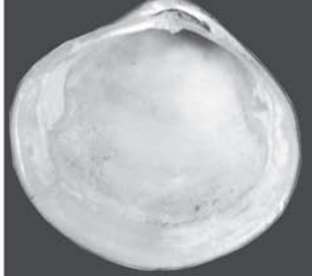

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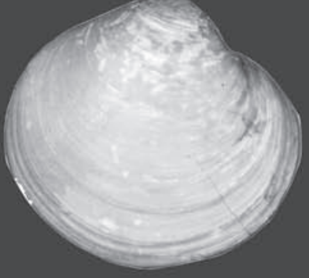
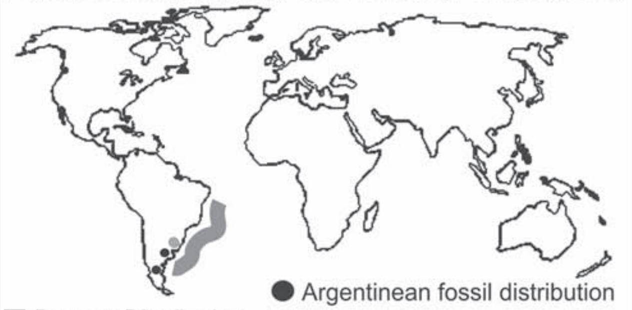


7-8: *Diplodonta (Felaniella) vilardeboana* (d´Orbigny, 1846)



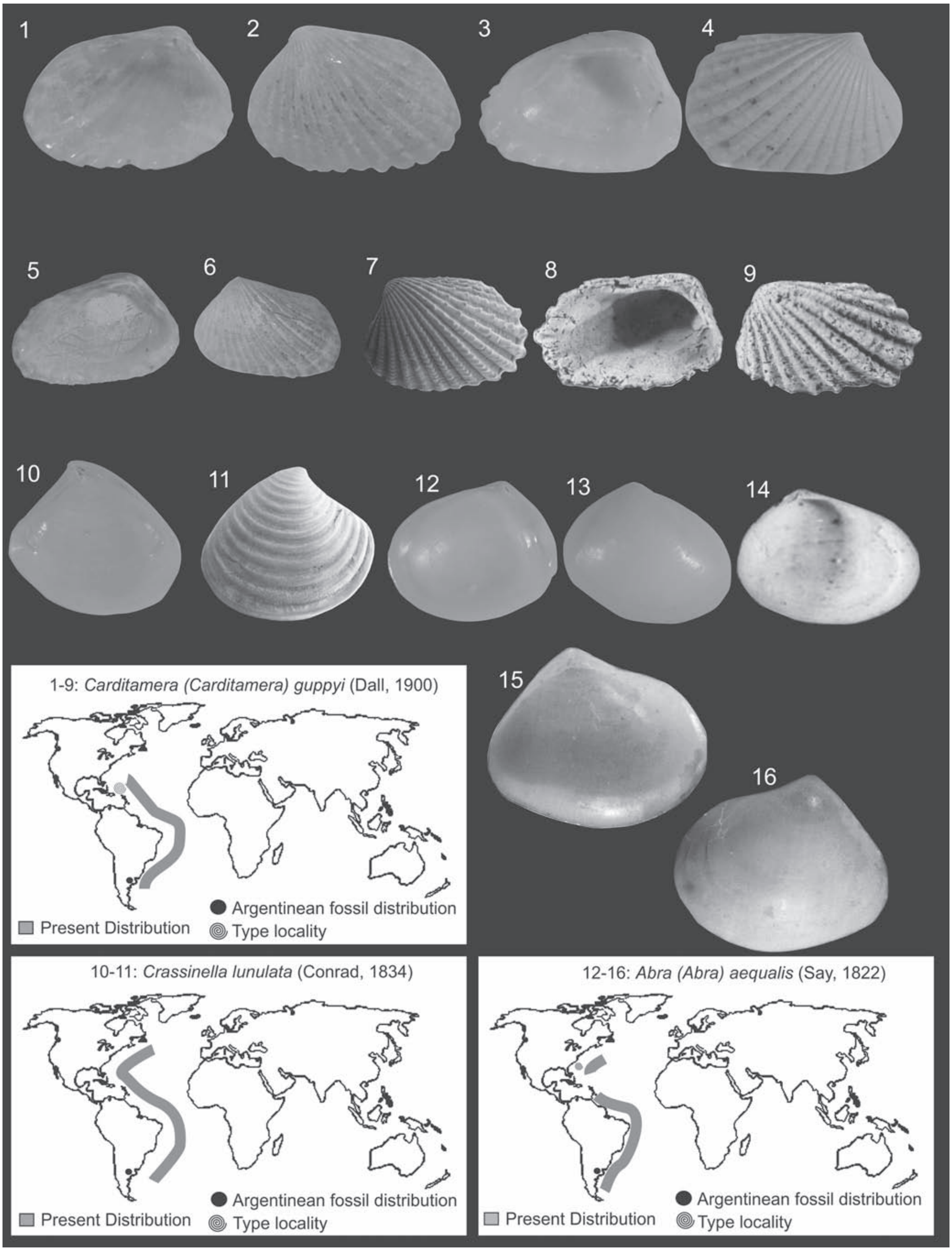
9-12: *Diplodonta (Phlyctiderma) semiaspera* (Philippi, 1836)

Plate 8

Figs. 1–9: *Carditamera (Carditamera) guppyi* (Dall, 1900), 1–2: Holocene, Mar Chiquita (MLP-PI 26404) (L = 5.3). 3–4: Holocene, Baterías, Bahía Blanca area (PI-UNS 2685) (L = 5). 5–6: Holocene, Mar Chiquita (MLP-PI 26267) (L = 7.71). 7: Holocene, Baterías, Bahías Blanca area (PI-UNS 2885) (L = 6), 8-9, Lectotype (USNM 115668) (L = 11.8).

Figs. 10–11: *Crassinella lunulata* (Conrad, 1834), Holocene, Boya 24–25, Bahía Blanca area (PI-UNS 2687) (L = 4.5).

Figs. 12–16: *Abra (Abra) aequalis* (Say, 1822). 12–13: Holocene, Baterías, Bahía Blanca area (PI-UNS 1366) (L = 9). 14: Holocene, Estancia San José, Bahía Samborombón (MLP-PI 26425) (L = 6). 15–16: Lectotype (ANSP 53227) (L = 6.8).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16
1-9: *Carditamera (Carditamera) guppyi* (Dall, 1900)
▨ Present Distribution
● Argentinean fossil distribution
◎ Type locality
10-11: *Crassinella lunulata* (Conrad, 1834)
▨ Present Distribution
● Argentinean fossil distribution
◎ Type locality
12-16: *Abra (Abra) aequalis* (Say, 1822)
▨ Present Distribution
● Argentinean fossil distribution
◎ Type locality

Plate 9

Figs. 1–5: *Petricola lapicida* (Gmelin, 1791). 1–2: Holocene, El Puente, Bahía Blanca area (PI-UNS 2688) (L = 5). 3–4: Holotype of Petricola lucinalis (Lamarck, 1818) (LMMHNP) (L = 17). 5: Holocene, Ingeniero White (PI-UNS 2688) (L = 6.2).

Figs. 6–7: *Petricola (Petricolaria) pholadiformis* Lamarck, 1818, Holocene Cantera La Elvira, Punta Indio (MLP PI-UNS 25490) (L = 10).

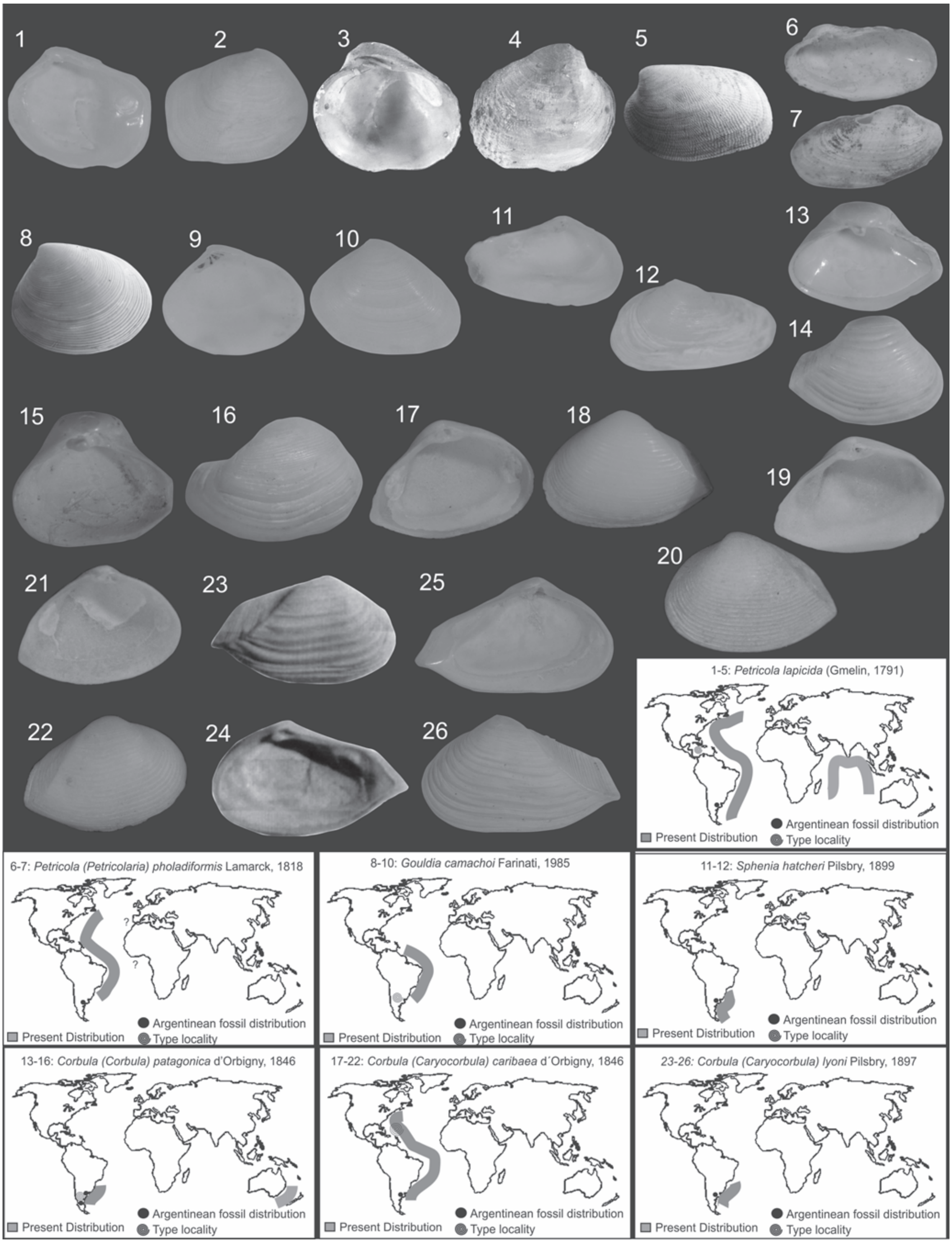
Figs. 8–10: *Gouldia camachoi* Farinati, 1985. 8: Holocene, El Puente, Bahía Blanca area (PI-UNS 2686) (L = 7). 9–10: Holocene, Ingeniero White (PI-UNS 2078) (L = 7.1).

Figs. 11–12: *Sphenia hatcheri* Pilsbry, 1899, Holocene, El Puente (PI-UNS 1370) (L = 9).

Figs. 13–16: *Corbula (Corbula) patagonica* d'Orbigny, 1846. 13–14: Holocene, Ingeniero White, Bahía Blanca area (PI-UNS 1371) (L = 11.5). 15: Holocene, Bahía Samborombón (MLP-PI 26422) (L = 10). 16: Holocene, Mar Chiquita area (MLP-PI 26229) (L = 10.67).

Figs. 17–22: *Corbula (Caryocorbula) caribaea* d'Orbigny, 1846. 17–18: Holocene, Ingeniero White (PI-UNS 1378) (L = 10). 19–20: Holocene, El Puente, Bahía Blanca area (PI-UNS 3210) (L = 10.2). 21–22: Holocene, Cerri, Bahía Blanca area (PI-UNS 3211) (L = 10).

Figs. 23–26: *Corbula (Caryocorbula) lyoni* Pilsbry, 1897. 23–24: Holocene, Ingeniero White, Bahía Blanca area (PI-UNS 1372) (L = 11). 25–26: Holocene, Sauce Chico, Bahía Blanca area (PI-UNS 3212) (L = 7).



1-5: *Petricola lapicida* (Gmelin, 1791)

6-7: *Petricola (Petricolaria) pholadiformis* Lamarck, 1818

8-10: *Gouldia camachoi* Farinati, 1985

11-12: *Sphenia hatcheri* Pilsbry, 1899

13-16: *Corbula (Corbula) patagonica* d'Orbigny, 1846

17-22: *Corbula (Caryocorbula) caribaea* d´Orbigny, 1846

23-26: Corbula (Caryocorbula) lyoni Pilsbry, 1897