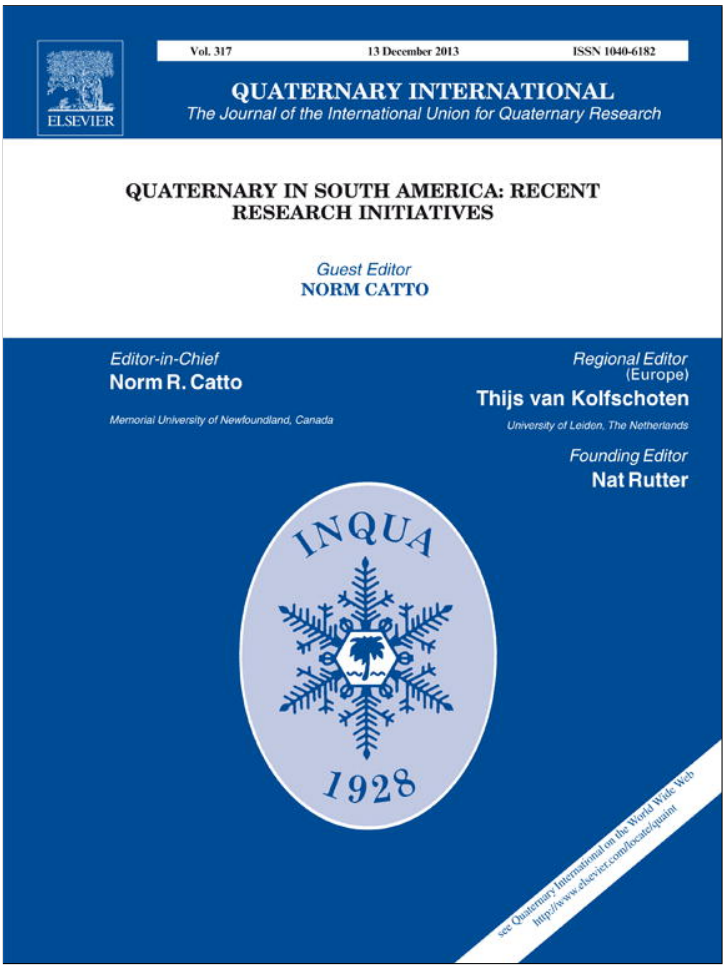

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Marine Holocene microgastropods of northeast Buenos Aires Province, Argentina

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ABSTRACT

Marine micromolluscs, especially gastropods, are found in Quaternary marine deposits on the coast of the province of Buenos Aires. In this study, the microgastropods from Holocene beach ridges of northeast Buenos Aires Province are described. Eight localities were analyzed in the SE margin of the Río de la Plata between Berisso and Cerro de la Gloria, Samborombón Bay, in which 5391 individuals of 11 species were recovered. Registration of two species of the subfamily Triphorinae Gray, 1847 not found before for the Quaternary of Argentina, is reported. The species *Parvanachis isabellei* (d'Orbigny, 1839), *Iselica anomala* (Lea, 1843), *Turbonilla paralaminata* Castellanos, 1982 and *Turbonilla farinatiae* (Pimenta and Absalão, 2004) were first recorded in Quaternary marine deposits of the study area, hence extending their geographical distribution during the Holocene. Most of the species here listed are currently living in the Atlantic Coast of the Buenos Aires Province, except for *T. farinatiae*, *I. anomala* and the Subfamily Triphorinae, which do not reach the Argentine coast. The presence of *T. farinatiae*, *I. anomala*, and the Subfamily Triphorinae, together with warm water species such as *Calliostoma carcellesi* (Clench and Aguayo, 1940), *Heleobia australis* (d'Orbigny, 1835) and *Epitonium georgettinum* (Kiener, 1838) in the Holocene deposits suggest warm paleotemperatures during the MIS 1 Interglacial in this region.

1. Introduction

During the Quaternary, sea level fluctuations resulting from several glacial and interglacial episodes generated different geomorphological features throughout the South American coast. Rostami et al. (2000) highlight the presence of marine sequences in this area, mainly originated in the Middle-Upper Quaternary. These deposits have been extensively studied from geological, geochronological, geomorphological and paleontological approaches in Brazil (e.g. Forti-Esteves, 1974; Caruso et al., 2000; Barreto et al., 2002), Uruguay (e.g. Martínez et al., 2001, 2006; Goso Aguilar, 2006), Chile (e.g. Ortlieb et al. 1994, 1996a; Paskoff, 1999; Quezada et al., 2007) and Peru (e.g. Ortlieb et al. 1990, 1995, 1996b).

In Argentina, the marine deposits originated in the last 120 ka have also been the focus of numerous multidisciplinary geological researches (e.g. Cionchi, 1987; Codignotto et al., 1988; Codignotto and Aguirre, 1993; Schellmann, 1998; Isla et al., 2000; Rostami et al., 2000; Schellmann and Radtke, 2000, 2003; Weiler, 2000; Bujalesky and Isla, 2006; Isla and Bujalesky, 2008; Rabassa et al., 2009; Pedoja et al., 2011; Fucks et al., 2012a,b; Boretto et al., 2013). Paleontological studies focused on the marine malacofauna have been performed particularly in the Buenos Aires Province (Farinati and Camacho, 1980; Farinati, 1985, 1994; Aguirre, 1990, 1993a,b,c; Chaar et al., 1992; Aguirre and Whatley, 1995; Aguirre and Farinati, 2000; Aguirre and Fucks, 2004; Aguirre et al., 2011; Charó et al., 2013). Gastropods and bivalves are the most outstanding elements, representing between 80 and 90% of the macrofauna. Micromolluscs are not as abundant as macroscopic ones (Aguirre and Farinati, 2000).

Micromolluscs are characterized by the presence of small to tiny shells of a varying height between 5 mm (Naranjo García, 2003) and 10 mm (Farinati et al., 2006). Within this group, not only small individuals can be found but also juvenile forms of macroscopic species (García Cubas, 1969). The lack of specific studies about living micromolluscs is a common problem in several countries around the world (Lygre et al., 2011), but researchers are increasingly recognizing this microfauna as an important source of information, and hence more studies are being carried out from taxonomical, ecological and genetic perspectives (e.g. Schander et al., 2003; Pimenta and Absalão, 2004a; Sasaki, 2008; Dinapoli

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et al., 2011; Lygre et al., 2011; Pimenta, 2012). In paleontological studies micromolluscs have also been underestimated. In Argentina, the studies about living marine micromolluscs have mostly been systematic, and performed mainly by Castellanos (1967a,b, 1979, 1981). The information can be found in several catalogues (e.g. Carcelles, 1944; Camacho, 1966; Castellanos, 1967a,b, Castellanos, 1990; Rios, 1994; Aguirre and Farinati, 2000; Forcelli, 2000; Scarabino et al., 2006).Quaternary micromolluscs have been mentioned in northeastern Buenos Aires (Aguirre, 1990, 1993a,b), but not as the main object of study. Farinati (1993, 1994) and Farinati et al. (2006) are the only known studies on Argentine Quaternary micromolluscs, made in Bahía Blanca, in the southern Buenos Aires Province. The aim of this study is to describe the Holocene microgastropods from the northeastern region of the Buenos Aires Province, in order to understand their importance in the assemblages of Quaternary mollusks.

2. Study area and geological background

The study area comprises the SE margin of the Río de la Plata (Samborombón Bay), between the Berisso (34°52′0″S/57°53′00″W) and Cerro de la Gloria (35°58′18.45″S/57°26′57.37″W), NE and E of the province of Buenos Aires (Fig. 1). The estuary of the Río de la Plata has been shaped by successive rising of the sea level during the Quaternary, leaving numerous records with different heights and chronologies (Schnack et al., 2005). Those correlated with MIS5 are located 8–9 m asl, older deposits are observed at lower levels (−3 m), always intercalated with the loessoid sediments of the

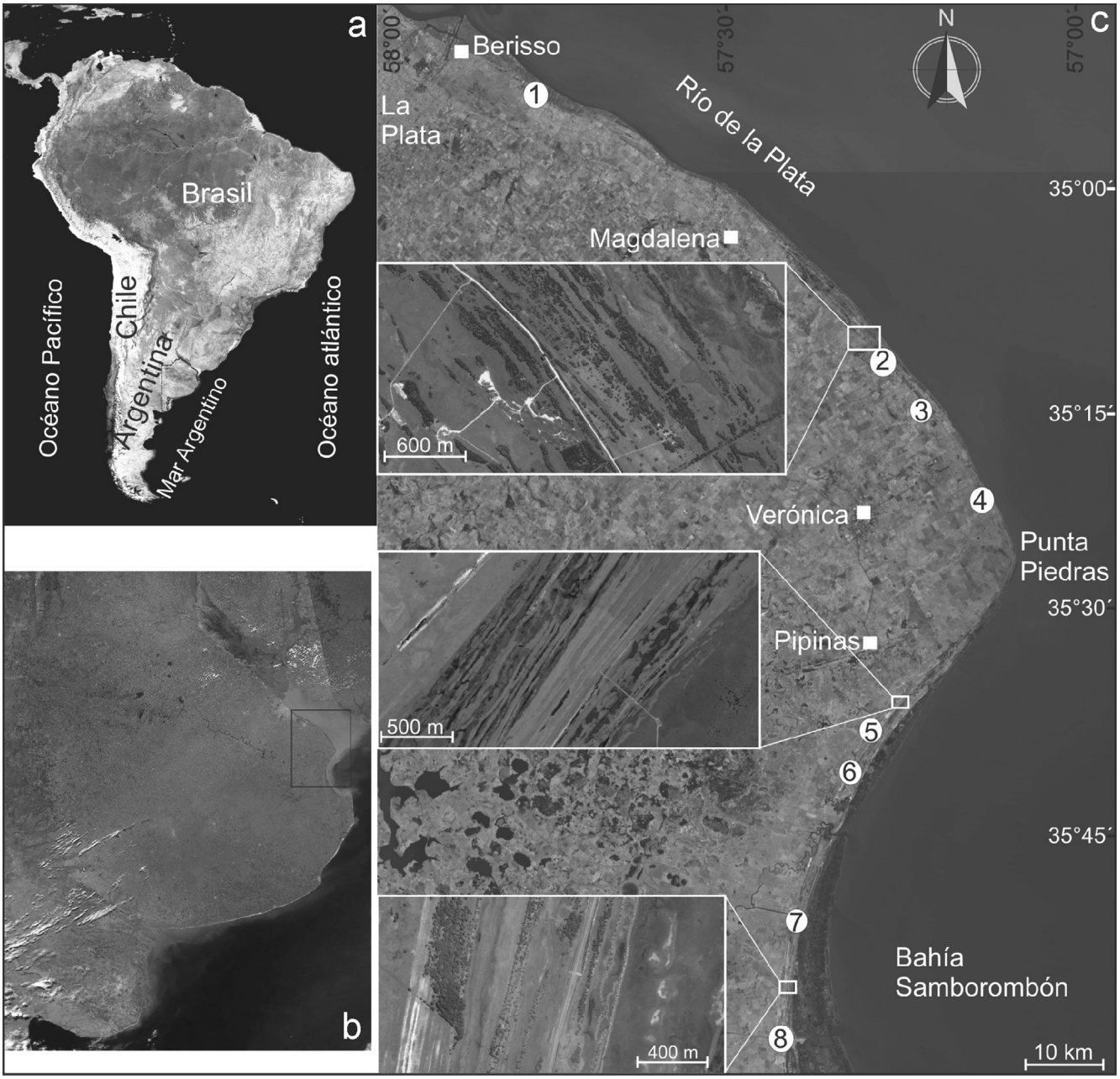

Fig. 1. Location and generalized map of South America and Argentina (a), and the northeast of Buenos Aires Province (b). Numbers refer to the localities sampled and analyzed, and details of Holocene beach ridges (c).

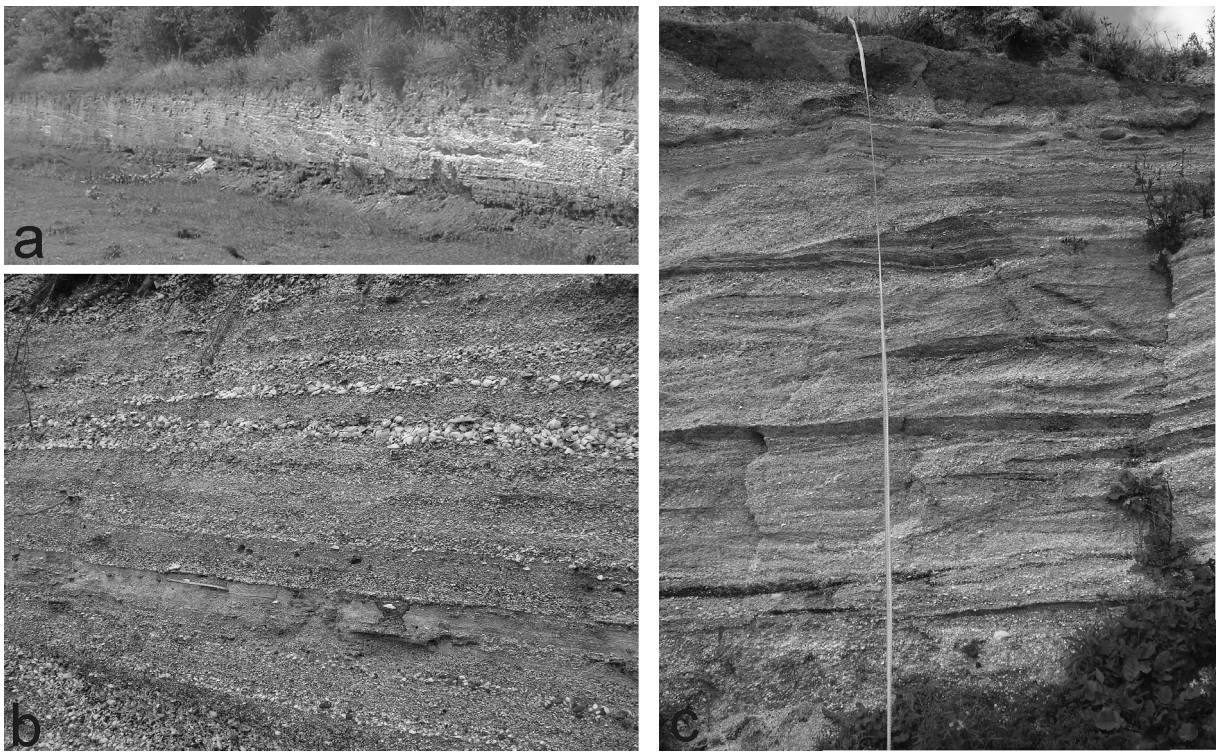

Fig. 2. View of Holocene beach ridges deposits of Cerro de la Gloria Mb. at the Punta Indio site (a) and Cerro de la Gloria Site (b and c).

Pampean Formation (González Bonorino, 1965). During the Holocene sea level rise (3 m), the water entered to the Río de la Plata and Paraná River, occupying part of the mouth of many tributary courses, generating estuaries in most of them (Fucks, 2005).

The Marine Holocene deposits have been grouped in the Canal Las Escobas Formation (Fidalgo et al., 1973; Fucks et al., 2010), with the Canal 18 and Cerro de la Gloria members, at the base and top respectively. The Canal 18 Member is composed by muddy sediments covered by coarser sediments forming beach ridges with decreasing ages that indicate the position of the coastline at different times of the Holocene (Cavallotto, 1995; Schnack et al., 2005).

The organic deposits analyzed in this paper correspond to the Cerro de la Gloria Member, which can be characterized as silty and clayey sediments that have a wider distribution and thickness (Fucks et al., 2010). The most important exposures correspond to mollusc concentrations associated with sands and gravels in varying proportions. These sediments are developed from the vicinity of Punta Lara to the south, gradually increasing its distribution and thickness, with the largest exposures in the area of the Samborombón Bay (Canal 15) (Fig. 2). Radiocarbon ages of this Member correspond to the Middle-Upper Holocene (Table 1), varying approximately between 4 and 3 ka (e.g. Cavallotto, 1995; Cavalotto et al., 2004; Fucks et al., 2010).

Table 1
Description of sampled localities.

Locality	Latitude	Longitude	Altitude (m a.m.s.l.)	Ages C_{14}	Cite
L1	35°12′20″S	57°18′53″W	6 m	4.460	Cortelezzi and Lerman, 1971
L2	35°3′54.50″S	57°34′34.62″W	5 m		
L3	35°13′26.5″S	57°17′43.4″W	7 m		
L4	35°23′48.5″S	57°09′13″W	5 m	4.010 +/− 70 4.930 +/− 100 5.120 +/− 70	Colado et al., 1995
L5	35°38′40″S	57°18′54.1″W	3 m	7.890 +/− 343 3.762 +/− 244 4.067 +/− 224	Fidalgo et al., 1981
L6	35°40′37.7″S	57°20′18.5″W	6 m		
L7	35°50′15.6″S	57°25′24″W	7 m	3.050 +/− 150 4.920 +/− 216 5.934 +/− 222 6.056 +/− 204 7030 +/− 318	Figini et al., 1984 Fidalgo et al., 1981
L8	35°58′18.45″S	57°26′57.37″W	7 m	6150 +/− 190 6764 +/− 195	Fidalgo et al., 1981

3. Material and methods

The analyzed material was collected in shell ridges of eight localities (Fig. 1 and Table 1), a sample of 200 ml was extracted from each. They were washed with running water, using two sieves with different hole sizes (4.2 mm and 0.5 mm), and drying on paper. Microgastropods were separated from the sediment by picking using a binocular magnifying glass, and they were identified when possible to species level. The specimens are housed in the collection "Paleozoología Invertebrados" of the Museo de La Plata.

For identifications, ecological requirements and distribution of the species, we used all the literature available from catalogues, specific systematic and ecological studies both of local fauna (Farinati, 1978, 1993, 1994; Castellanos, 1981, 1982, 1990; Aguirre, 1993b,c; Aguirre and Farinati, 2000; Pastorino, 2009) and international fauna (i.e. Pimenta and Absalão, 2004b; Scarabino et al., 2006; Rosenberg, 2009; Fernandes et al., 2013). The material was compared with specimens in the collections of the Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" and Museo de La Plata. The taxonomical order in which the species are described follows the outline proposed by Bouchet and Rocroi (2005) and Poppe and Tagaro (2006). Photographs of the specimens were taken with the Scanning Electronic Microscope (SEM).

4. Results

A total of 5391 specimens of 11 species (Table 2) were recorded. Eight of them are considered exclusively as microgastropods and three represent juvenile specimens of macroscopic forms: *Epitonium georgettinum* (Kiener, 1838), *Olivella puelcha* (Duclos, 1835) and *Calliostoma carcellesi* Clench and Aguayo, 1940.

Table 2
Total number of specimens by species and locality. TNS: total number by species, TNL: total number by locality.

Microgastropods	L1	L2	L3	L4	L5	L6	L7	L8	TNS
Calliostoma carcellesi Clench and Aguayo, 1940				1					1
Heleobia australis (d'Orbigny, 1835)	172	302	155	36	2284	125	2097	99	5270
Epitonium georgettinum (Kiener, 1838)		1		2					3
Triphora sp. 1		1		1					2
Triphora sp. 2		2	1	10					13
Parvanachis isabellei (d'Orbigny, 1839)		21	7	21	5	2	15	12	83
Olivella puelcha (Duclos, 1835)		4	1	1	3				9
Turbonilla paralaminata Castellanos, 1982								1	1
Turbonilla farinatiae Pimenta and Absalao, 2004		2							2
Iselica anomala (Lea, 1843)				3					3
Cylichnella bidentata (d'Orbigny, 1841)	3			1					4
TNL	175	333	164	76	2292	127	2112	112	5391

The most abundant species is *Heleobia australis* (d'Orbigny, 1835) with 5270 specimens, which is present in all the localities, followed by *Parvanachis isabellei* (d'Orbigny, 1839) with 83 specimens. The microgastropods show different life habits (Table 3). Most of them have an independent way of living; nonetheless, parasitical species were also found: *Turbonilla paralaminata* Castellanos, 1982 and *Turbonilla farinatiae* (Pimenta and Absalão, 2004b). Carnivorous species slightly prevail over herbivorous species. Species typical of sandy bottoms are predominant, although *H. australis* and *E. georgettinum* can also inhabit rocky bottoms.

Table 3
Ecological requirements and distribution of microgastropods. MRS = max reported size; Ep = epifaunal, Ecp = ectoparasite; H = hard, S = soft; C = carnivore, PC = passive carnivore, He = herbivore; O = oligohaline (3–8‰), M = mesohaline (8–18‰); P = polyhaline (18–30‰); E = euhaline (>30–35‰).

Species	Geographic range	Salinity	Depth (m)	Life habit	Substratum	Trofic type	MRS (mm)
C. carcellesi	40°–42°S 65°–60.5°W	E	13–86	Ep	S	He	20.6
H. australis	24°–41°S 65°–46°W	O, P, M	0–60	Ep	S, H	He	7.2
E. georgettinum	23.4°–44.3°S 65°–48.5°W	E	0–101	Ep	S, H	He	33
P. isabellei	30°–54°S 68°–50°W	E	10–65	Ep	S	C	6
O. puelcha	23.7°–43°S 64.5°–42°W	E	18–140	Ep	S	C	12
T. paralaminata	39°–41.8° S 58.5°–63°W		30–65	Ecp	S	C	8.2
T. farinatiae	20°–23°S 42.7°–40°W		45–60	Ecp	S	C	6.4
I. anomala	28°–35°S 92.3°–36°W		0–550			PC	5.1
C. bidentata	39°N–35°S 97°–36°W	E	0–366	Ep	S	PC	4

Clade Vetigastropoda
Superfamily Trochoidea Rafinesque, 1815
Family Calliostomatidae Thiele, 1924
C. carcellesi Clench and Aguayo, 1940 Fig. 3.1 (Fig. 3)
Current geographical distribution: from Uruguay to Rio Negro (Argentina) (Aguirre and Farinati, 2000); according to Aguirre and Farinati (2000) *C. carcellesi* can be considered a warm water indicator species.
Stratigraphic distribution: Holocene from Buenos Aires Province (Aguirre and Farinati, 2000).
Number of recovered specimens: 1.
Locality: L7.
Material: the specimen is excellently preserved. The protoconch presents one and a half smooth whorls. The teleoconch has three whorls that form a conical shell, with four small spiral ribs with nodules that lean on each of the ribs. Axial ornamentation, although present, is very difficult to observe and consists of small sigmoid lines. The holostome aperture is subquadrangular in shape and fine striae can be observed at the base.
Clade Littorinimorpha
Superfamily Rissooidea Gray, 1847
Family Hydrobiidae Stimpson, 1865
H. australis (d'Orbigny, 1835) Fig. 3.2 (Fig. 3)

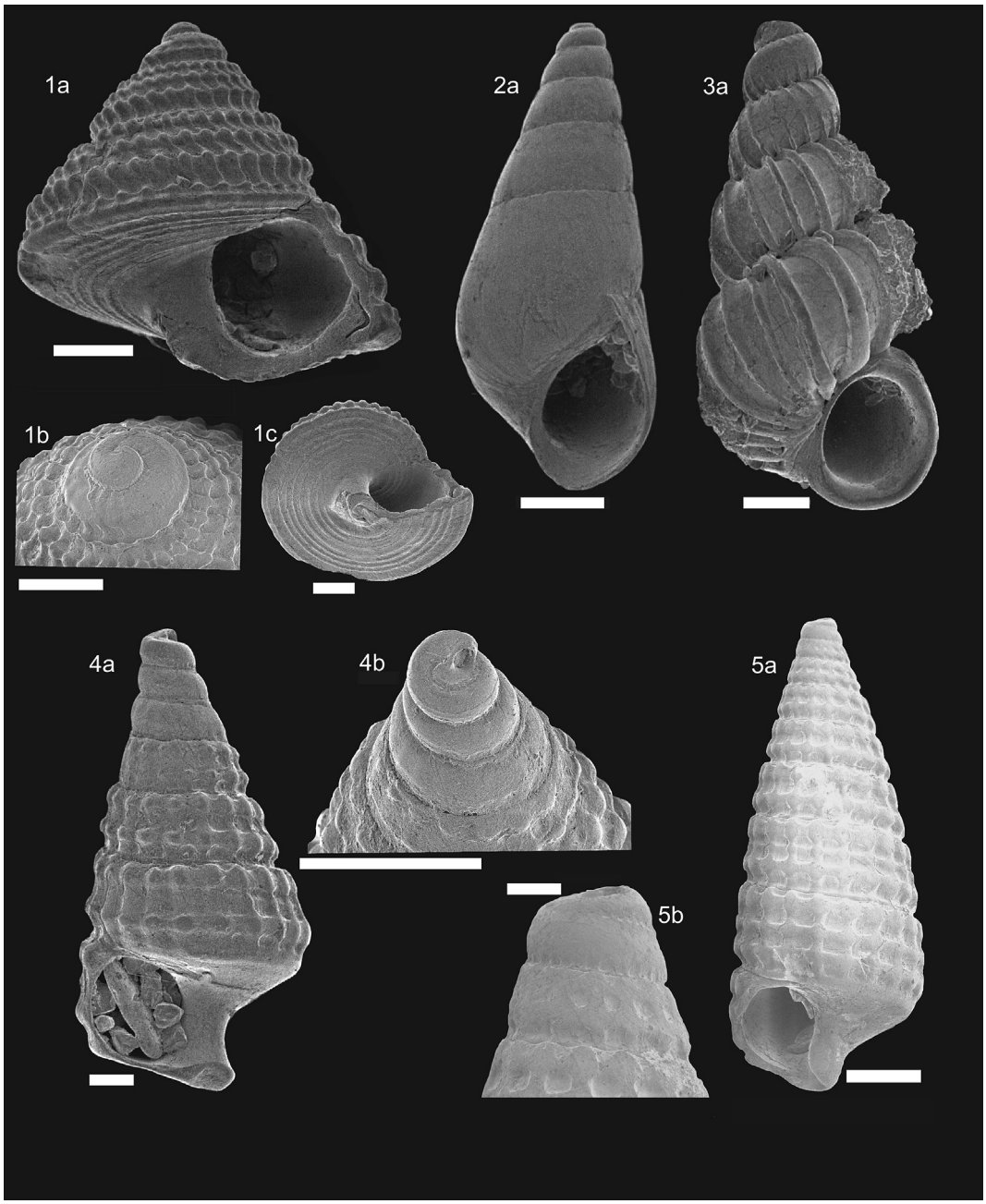

Fig. 3. Taxa of microgastropods from marine Holocene deposits of northeast Buenos Aires Province. Scale bars = 0.5 mm, *l* = length mm, *w* = width mm. a – Apertual view; b – Protoconch; c – Basal view. 1: *Calliostoma carcellesi* Clench & Aguayo (MLP: 34055, L4) (*l*: 2.2, *w*: 2.4 mm), 2: *Heleobia australis* (d'Orbigny) (MLP: 34060, L5) (*l*: 2.8, *w*: 1.1); 3: *Epitonium georgettinum* (Kiener) (MLP: 34058, L4) (*l*: 3.75, *w*: 1.85); 4: *Triphora* sp. 1 (MLP: 34056, L2) (*l*: 2.2, *w*: 1.1); 5: *Triphora* sp. 2 (MLP: 34059, L4) (*l*: 3.2, *w*: 1.3).

Current geographical distribution: from the south of Brazil to Golfo San Matías (Farinati, 1978).
Stratigraphic distribution: Quaternary of Uruguay (Clavijo et al., 2005) and Argentina (Aguirre and Farinati, 2000).
Number of recovered specimens: it is the most abundant species with 5270 specimens.
Locality: all the sampled localities.
Material: conic-shaped shell with five whorls. The protoconch presents one and a half whorls that are hardly differentiated from the teleoconch. The shell is thick, the whorls are separated by shallow sutures and is ornamented only by fine growth lines. The holostome aperture is rounded in its anterior section and more angular at its posterior end. Due to the large amount of material, different degrees of preservation can be observed.
"**Group Ptenoglossa**"
Superfamily Epitonioidea Berry, 1910 (1812)
Family Epitoniidae Berry, 1910
E. georgettinum (Kiener, 1838) Fig. 3.3 (Fig. 3)
Current geographical distribution: from Rio Grande do Sul (Brazil) to Golfo Nuevo (Argentina) (Aguirre and Farinati, 2000). Cárdenas et al. (2008) have found this species living in the south of Chile. It can be considered an indicator of warm water (Aguirre and Farinati, 2000).
Stratigraphic distribution: Quaternary of Uruguay (Clavijo et al., 2005) and Holocene of Argentina (Aguirre and Farinati, 2000).
Number of recovered specimens: 3.
Locality: L2 and L4.
Material: the material is well preserved. External ornamentation consists of strong rounded lamellae separated by interspaces where fine spiral striae can be observed. In only one of the samples the apical section is present; in this area the lamellae disappear and are replaced by slightly marked fine axial ribs. The last whorl is globose and the aperture is rounded.
Superfamily Triphoroidea Gray, 1847
Family Triphoridae Gray, 1847
Subfamily Triphorinae Gray, 1847

The absence of some important diagnostic characters such as a good and complete protoconch, intact base and color of the shell, makes it very difficult to identify these specimens at specific level (Fernandes, personal communication, 2013). But they can surely be assigned to the subfamily Triphorinae, diagnosed by its sinistral shells, with the posterior canal forming a tube (Fernandes et al., 2013). The representatives of this subfamily have not been studied in Argentina. Aguirre (1993c) mentioned the presence of *Triphora nigrocincta* in the Holocene deposits of Buenos Aires Province but the new material cannot be assigned with certainty to this species. This group is mainly distributed in tropical and temperate seas (Fernandes et al., 2013), and no living representatives are known in the Argentine coast.

Triphora sp. 1 Fig. 3.4 (Fig. 3)
Number of specimens recovered: 2.
Locality: L2 and L4.
Material: in both samples a smooth and incomplete protoconch can be observed. The most outstanding feature of its external ornamentation is the three rows of nodules aligned both in axial and spiral direction. These rows are very close in the first whorls, but as the shell grows, they separate from each other. The base is smooth, the aperture presents a short and wide siphonal canal and the labrum is sinuous due to the projection of the ornamentation granules.
Triphora sp. 2 Fig. 3.5 (Fig. 3)
Number of specimens recovered: 13.
Locality: L2, L3 and L4.
Material: the brown-reddish coloration and the characteristic ornamentation of the species is preserved in all of them. The protoconch is only seen in one specimen, but badly preserved. It presents merely two whorls and it is smooth with no ornamentation, making it easier to differentiate it from the rest of the shell. In the teleoconch the whorls are separated by deep sutures and in each whorl there are three parallel rows of tubercles. At the base, it only presents continuous and smooth cords, without tubercles. The siphonal canal of the aperture is always present.
Clade Neogastropoda
Superfamily Buccinoidea Rafinesque, 1815
Family Columbellidae Swainson, 1840
P. isabellei (d'Orbigny, 1839) Fig. 4.6 (Fig. 4)
Current geographical distribution: from the south of Brazil to Golfo San Matías (Argentina) (Farinati, 1978).
Stratigraphic distribution: Holocene of Bahia Blanca (Argentina) (Farinati, 1978) and Quaternary of Uruguay (Clavijo et al., 2005).
Number of specimens recovered: 83.
Localities: samples were recovered in all the localities except for L1.
Material: the large materials present, in general, a very poor preservation, showing fragmented shells or a very worn out external ornamentation. This is not the case for the juvenile specimens where the protoconch is clearly identifiable in the samples; it presents two whorls and it is completely smooth. The teleoconch has four whorls. It shows a reticulated ornamentation formed by thick longitudinal ribs intercepted by fine spiral ribs. In some cases, it is difficult to observe this ornamentation in the last whorl. The aperture is elongated, narrow and has a small siphonal notch.
Superfamily Olivoidea Latreille, 1825
Family Olividae Latreille, 1825
O. puelcha (Duclos, 1835) Fig. 4.7 (Fig. 4)
Current geographical distribution: from Rio Grande do Sul (Brazil) to Golfo Nuevo (Argentina) (Pastorino, 2009).
Stratigraphic distribution: Pleistocene–Holocene (Aguirre and Farinati, 2000), Quaternary of Uruguay (Clavijo et al., 2005)
Number of specimens recovered: 9.
Localities: L2, L3, L4 and L5.
Material: the shells show different degrees of preservation. Those found in L2 are the best preserved. The protoconch and the rest of the whorls are smooth. The shell presents a subquadrangular shape and is formed by four whorls without ornamentation, which are separated from one another by a grooved suture. All of these characteristics agree with those mentioned by Pastorino (2009). In the umbilical view, the presence of a smooth parietal callus surrounding the inner lip of the aperture can also be observed.
Clade Heterobranchia
Superfamily Pyramidelloidea Gray, 1840
Family Pyramidellidae Gray, 1840
T. paralaminata Castellanos, 1982 Fig. 4.8 (Fig. 4)
Current geographical distribution: Farinati (1993) reports this species from the south of Buenos Aires in Bahía Blanca and Puerto Quequén. Scarabino et al. (2006) indicate the presence of "empty" shells in the Maldonado Bay (Uruguay).
Stratigraphic distribution: Holocene of Bahía Blanca, Argentina (Farinati, 1985)
Number of specimens recovered: 1.
Localities: L8.

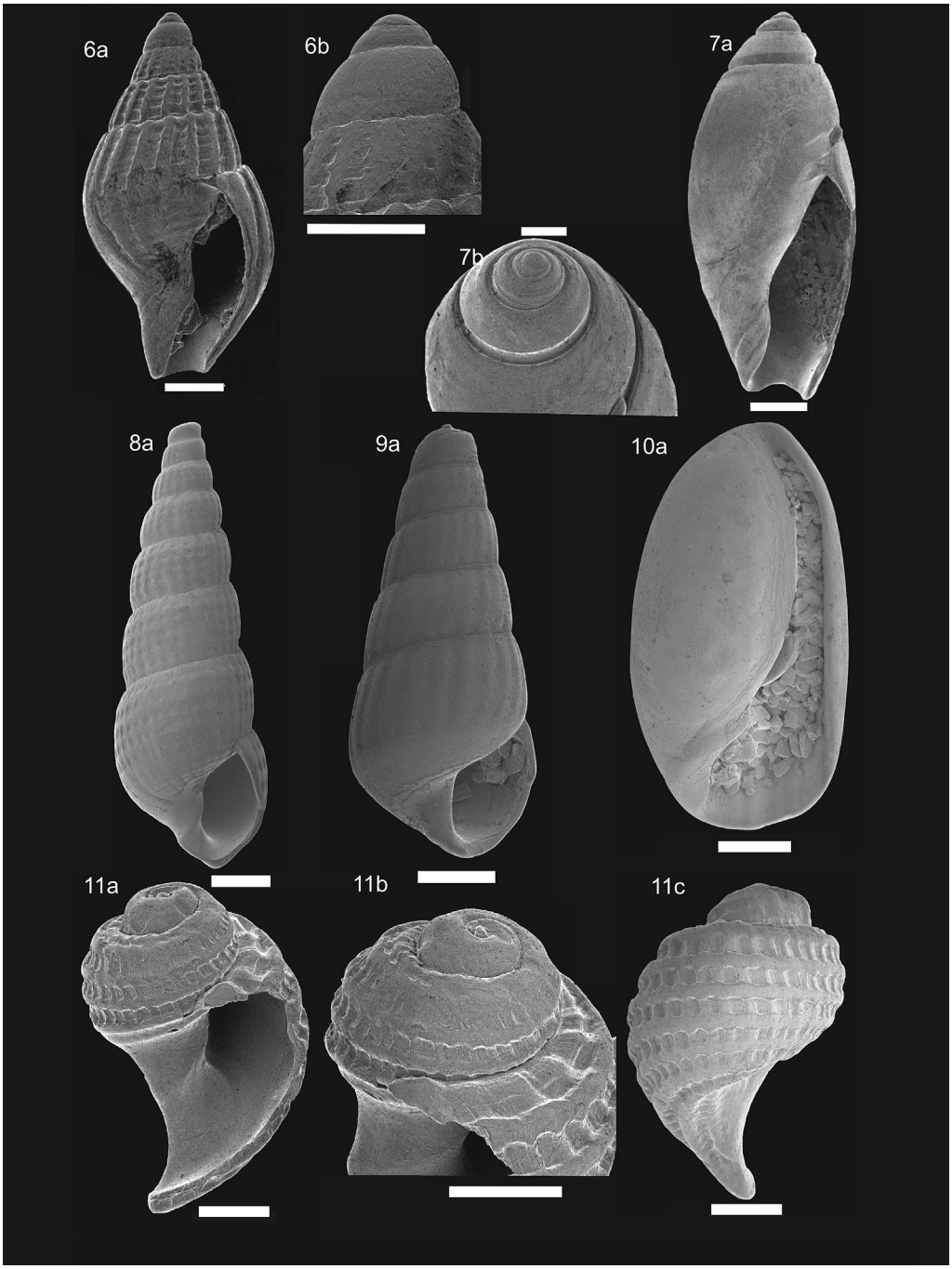

Fig. 4. Taxa of microgastropods from marine Holocene deposits of northeast Buenos Aires Province. Scale bars = 0.5 mm, *l* = length mm, *w* = width mm. a – Apertual view; b – Protoconch; c – Abapertual view; 6: *Parvanachis isabellei* (d'Orbigny) (MLP: 34063, L8) (*l*: 3.1, *w*: 1.6); 7: *Olivella puelcha* (Duclos) (MLP: 34062, L2) (*l*: 9.75, *w*: 4.2); 8: *Turbonilla paralaminata* Castellanos (MLP: 34065, L8) (*l*: 3.8, *w*: 1.3); 9: *Turbonilla farinatiae* Pimenta and Absalao (MLP: 34064, L2) (*l*: 2.8, *w*: 1.2); 10: *Cylichnella bidentata* (d'Orbigny) (MLP: 34057, L1) (*l*: 3.05, *w*: 1.6); 11: *Iselica anomala* (Lea) (MLP: 34061, L4) (*l*: 2.2, *w*: 1.6).

Material: the single specimen is in a good state of preservation but without the protoconch. The teleoconch consists of seven whorls. It presents a reticulated ornamentation, formed by the intertwining of five spiral ribs with axial ribs. In each intersection, small nodules are formed. It shows a holostome and oval aperture.

T. farinatiae Pimenta and Absalão, 2004b Fig. 4.9 (Fig. 4)

Current geographical distribution: southeast of Brazil, in the states of Espíritu Santo and Rio de Janeiro (Pimenta and Absalão, 2004b), Scarabino et al. (2006) assert that this species is found widely distributed in the coast of Uruguay.

Stratigraphic distribution: Holocene of Bahía Blanca, Argentina (Farinati, 1993; Pimenta and Absalão, 2004).

Number of specimens recovered: 2.

Localities: L2.

Material: the two shells are poorly preserved, and the protoconch is not present in any of the samples. The teleoconch is conical. The four whorls that form the teleoconch are flat, separated by well marked sutures. The ornamentation consists of round axial ribs, ill-defined and oblique opisthoclines, that do not reach the lower suture. The base is round and smooth. It has a subpiriform aperture.

Family Amathinidae Ponder, 1987
I. anomala (Lea, 1843) Fig. 4.11 (Fig. 4)
Current geographical distribution: it is a species of Antillean lineage currently found in Antillas, Brazil and Uruguay (Farinati, 1994).
Stratigraphic distribution: Quaternary of Uruguay (Clavijo et al., 2005); and Holocene of Bahía Blanca (Farinati, 1994).
Number of specimens recovered: 3.
Localities: L4.
Material: the material is of matt white color and well preserved. In accordance with Farinati's description (1994), the shells are formed by three and a half whorls, including the protoconch, which is smooth and differentiated from the rest of the shell. It presents a visible ornamentation in all the samples, and is formed by thick spiral ribs that are intercepted by axial ribs, giving the shell the overall appearance of railings. This structure projects over the outer lip of the aperture, giving it a wavy appearance.
Superfamily Philinoidea Gray, 1850 (1815)
Family Cylichnidae Adams, H. & Adams, A, 1854
C. bidentata (d'Orbigny, 1841) Fig. 4.10 (Fig. 4)
Current geographical distribution: North Carolina, Florida, Texas (EEUU); Yucatan State, Quintana Roo (Mexico); Panama, Colombia, Venezuela, Cuba, Jamaica, Puerto Rico; Bahia, Rio de Janeiro, Sao Paulo, Parana, Santa Catarina, Rio Grande do Sul (Brazil); Uruguay (Rosenberg, 2009) to Puerto Quequén (Buenos Aires, Argentina) (Aguirre, 1993c).
Stratigraphic distribution: Holocene of Buenos Aires Province (Aguirre, 1993c).
Number of specimens recovered: 4.
Localities: L1 and L4.
Material: of the four samples, three are complete and one broken in its apical portion.

The luster is matt white and no growth lines or ornamentations can be observed. In its outer surface, the sample recovered in L4 is poorly preserved, with strong signs of dissolution. The shells are oval. The aperture is elongated and extends throughout the whole length of the shell.

5. Conclusions

- Eleven species of microgastropods have been found in Holocene deposits of the Buenos Aires Province, of which *C. carcellesi*, *H. australis* and *E. georgettinum* were already known in the fossil record and are considered indicators of warm waters.
- Four species have been recorded for the first time in Quaternary marine deposits of the northeastern region of the Buenos Aires Province: *P. isabellei*, *I. anomala*, *T. paralaminata* and *T. farinatiae*, extending their geographical distribution during the Holocene to northeastern of Buenos Aires.
- The presence of two species of the Subfamily Triphorinae, is the second record for the Holocene of Argentina. The material could not be assigned to the single species known for similar deposits.
- All the species mentioned in this study are currently living in the littoral Atlantic area of the Buenos Aires Province, except for *T. farinatiae* and *I. anomala* which only reach the coast of Uruguay. The Subfamily Triphorinae has not been recorded in the Argentine coast.
- The record of gastropods such as *I. anomala*, *T. farinatiae* and the Subfamily Triphorinae in Holocene deposits of the NE of the Buenos Aires Province, which are not currently inhabiting this area suggests warm temperatures during the MIS 1 Interglacial (or Holocene) in the Argentine coasts.

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