

CHECKLIST OF THE PLEISTOCENE MARINE MOLLUSCS
OF PRAÍNSHA AND LAGOÍNSHAS (SANTAMARIA ISLAND, AZORES)

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ABSTRACT

A critical review of the reported Pleistocene species of Praia Formosa and Lagoinhas (Santa Maria Island, Azores) is provided, new data increasing the marine molluscan fauna to 95 taxa (80 Gastropoda and 15 Bivalvia). Six of the reported taxa are considered dubious records (5 Gastropoda, 1 Bivalvia).

The stratigraphic sequence of Praia Formosa is composed of two main units, about 2-4 meters above present-day sea level. In the lower unit, *Patella ulyssiponensis* dominates the fossil assemblage of the basal calcareous conglomerate while *Myoforceps aristatus* (Dillwyn, 1817) dominates the assemblage associated to a calcareous algae mat. Above a non-depositional hiatus surface, a sandy beach deposit mainly composes the upper unit. Its fossil assemblages are dominated by large amounts of *Eruilin castanea* (Montagu, 1803) and, in a less extent, *Lucinella diwricntn* (Linnaeus, 1758) and *Ensis minor* (Chenu, 1843).

The stratigraphic sequence of Lagoinhas, located 7.4 m above present-day sea level, is also composed of two units. A basal conglomerate is fossilized by or passes laterally to a calcareous algae mat, dominated by *Myoforceps aristatus* and with abundant *Calliostoma* specimens. As at Prainha, these lower units are covered by a highly fossiliferous sandy beach deposit, though thinner, in which *Eruilin castanea* is the dominant species.

Some species with Caribbean or West African affinities, the "*Strombus bubonius* accompanying fauna" (Garcia-Talavera, 1990), were found in the lower layers. The upper layer malacofauna is mainly related to the Mediterranean faunas, similarly to what happens nowadays (Ávila, 2000).

RESUMO

Neste trabalho é apresentada a revisão crítica da fauna malacológica Pleistocénica recolhida nas jazidas da Praia Formosa e das Lagoinhas (ilha de Santa Maria, Açores). Os novos registos e a revisão da bibliografia aumentam a fauna de moluscos marinhos para 95 taxa (80 Gastropoda e 15 Bivalvia), dos quais 6 são considerados registos duvidosos (5 Gastropoda, 1 Bivalvia).

A sequência estratigráfica da Praia Formosa é formada por duas unidades principais e inicia-se entre 2-4 m acima do actual nível médio das águas do mar. Na unidade inferior, a lapa *Patella ulyssiponensis* domina a comunidade fóssil de um conglomerado basal calcário, ao passo que *Myoforceps aristatus* (Dillwyn, 1817) domina a comunidade associada a uma crosta de algas calcárias rodófitas. Sobre uma superfície endurecida por não sedi-

mentação (hiato) sobrepõem-se areias de praia, que constituem a unidade superior. As comunidades fósseis aqui existentes são dominadas por grandes quantidades de valvas desarticuladas de *Ervilin castanea* (Montagu, 1803) e, em menor quantidade, de *Lucinella divaricata* (Linnaeus, 1758) e *Ensis minor* (Chenu, 1843).

A sequência estratigráfica das Lagoinhas, localizada 7,4 m acima do zero hidrográfico, é também constituída por duas unidades. O conglomerado basal é fossilizado ou passa lateralmente a uma crosta algal calcária, dominada por *Myoforceps aristatus* e com abundância de exemplares do troquideo endémico *Calliostoma* sp. Tal como na Prainha, estas unidades basais estão recobertas por areias de praia muito fossilíferas, embora de menor espessura, nas quais *Ervilin castanea* é a espécie dominante.

Nas unidades basais foram encontradas espécies originárias das Caraibas ou costa Oeste-Africana, formando a vulgarmente designada "fauna acompanhante do *Strombus bubonius*" (Garcia-Talavera, 1990). A exemplo do que sucede actualmente do ponto de vista biogeográfico (Ávila, 2000), as espécies de moluscos fósseis da camada superior de areias são, na sua grande maioria, de origem Mediterrânea e/ou das costas Atlânticas Europeias.

INTRODUCTION

Santa Maria is the oldest island of the Azores (Abdel-Monem *et al.*, 1975; Ferraud *et al.*, 1980) and the only with marine fossiliferous sediments. It is located in the eastern group of islands (São Miguel, Santa Maria and the Formigas Islets), being also the southernmost island of the archipelago (see Fig. 1A). Its stratigraphy and geochronology were established by Serralheiro & Madeira (1990) and complemented by Salgueiro (1991). Feteiras Formation was produced by the last eruptive phase recorded in Santa Maria, during the Pliocene (-5 to -2 My). Large quantities of ashes were emitted from three subaerial spatter cones and covered the island almost completely (Madeira, 1986). After this period, important sea level oscillations have provided extensive wave cut platforms at 5-10 m, 15-40 m, 50-70 m, 80-120 m and 140-160 m (Zbyszewski & Ferreira, 1962;

Madeira, 1981; Serralheiro & Madeira, 1990). After Serralheiro & Madeira (1990), during the Quaternary, Santa Maria has risen relative to sea level by at least 180 m.

The marine fossils of Santa Maria have been the subject of study of several authors: Bronn (in Hartung, 1860; *in* Reiss, 1862), Mayer (1864), Cotter (1888-1892), Friedlander (1929), Agostinho (1937), Berthois (1950, 1951, 1953), Ferreira (1952, 1955), Krejci-Graff *et al.* (1958), Zbyszewski *et al.* (1961) and Zbyszewski & Ferreira (1961, 1962). The majority of these papers have dealt mainly with the upper-Miocene late-Pliocene fossils of this island but, in the last decade, two papers entirely devoted to the late Quaternary fossils of Santa Maria were published (Garcia-Talavera, 1990; Callapez & Soares, 2000).

The outcrop of Prainha is located near the beach of Praia Formosa, about 5 km to the east of Vila do Porto, near the locality of Praia. The

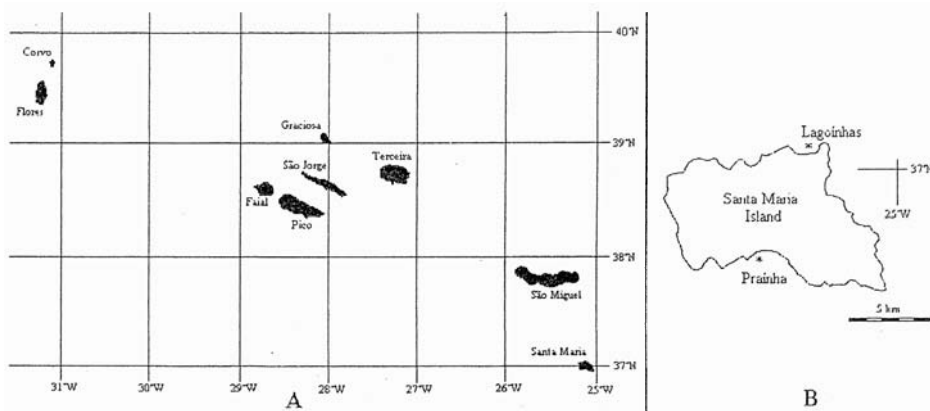


FIGURE 1. Geographical location of Santa Maria Island in the Azores archipelago (A) and location of the sampling sites, Prainha and Lagoínhas (B).

fossiliferous layers extend for some 800m along the seashore at the present height of +2 to +4 m. Lagoínhas outcrop is located on the north coast of Santa Maria Island at +7.4 m above present sea-level and has an extension of less than 100m (Fig. 1B). Recent studies on the fossiliferous sediments of Prainha and Lagoínhas provided new data on marine molluscs, here reported, and on the stratigraphic interpretation of these deposits. A comprehensive review of the literature was also made.

MATERIALS AND METHODS

The stratigraphic succession was studied along thirteen vertical profiles along the marine terrace of Prainha and four vertical profiles at Lagoínhas. One hundred and three samples were collected at Prainha and 2 samples at Lagoínhas. All samples were labelled in the field. In the

laboratory, the sand samples were washed several times with water and the shells were removed by pouring the washing water through a 0.5 mm mesh sieve. All molluscs found were sorted and identified. All the material is deposited at the Department of Biology of the University of the Azores (DBUA) under the fossil Reference Collection numbers DBUA-F 1-82, 84, 86-89, 91, 94, 125-128, 131, 134, 136, 137, 139-143 and 145 (Prainha) and DBUA-F 138 and 144 (Lagoínhas) (Table 1). SEM images were obtained for most of the micro-molluscs. Particular attention was drawn to the protoconch of the Prosobranchia, especially to the members of the Rissoidae.

Since the stratigraphic interpretation of the Prainha and Lagoínhas sections (Fig. 2) consider the possible existence of a more or less pronounced hiatus, taxa are referred to as being collected below or above this hiatus (see Table 2).

Species determination, synonymy and the ordination of families follow the CLEMAM database (<http://www.mnhn.fr/base/malaco.html>).

Abbreviation used in text: DBUA-F – fossil reference collection of the Department of Biology of the University of the Azores (Ponta Delgada, São Miguel Island, Azores).

RESULTS

Stratigraphy (Prainha)

The base of the stratigraphic sequence contacts directly the ankaramitic basalts and dykes of the Anjos Complex (Serralheiro *et al.*, 1987) through an irregular wave-cut platform. Directly overlaying this

TABLE 1. Number of the sampling sites in the Fossil Reference Collection of the Department of the Biology of the University of the Azores (DBUA-F), date of collection and stratigraphic level (A1 - strongly cemented calcareous fossiliferous basal-conglomerate; A2 - calcareous algae [biostromatic crust] mat; B - bioclastic white sands). Sampling sites 138 and 144 are from Lagoinhas; all others are from Prainha.

<i>DBUA-F</i>	<i>Date</i>	<i>Stratigraphic level</i>	<i>DBUA-F</i>	<i>Date</i>	<i>Stratigraphic level</i>
1	17-Feb-2000	A2	74-76	13-Jun-2000	B
2	17-Feb-2000	B	77	14-Jun-2000	A1
3	17-Feb-2000	A1, A2	78	14-Jun-2000	A2
4, 5	17-Feb-2000	A2, B	79	15-Jan-2000	A2
6	17-Feb-2000	B	80	14-Jun-2000	B
7-9	17-Feb-2000	A2, B	81, 82	14-Jun-2000	A2
10	17-Feb-2000	A2, B	83	25-Jul-2001	B
11-18	17-Feb-2000	B	84	25-Jul-2001	A2
19-24	17-Feb-2000	A2	86	26-Jul-2001	A1
25	17-Feb-2000	B	87	26-Jul-2001	A2
26-31	17-Feb-2000	A2	88, 89	26-Jul-2001	B
32-50	17-Feb-2000	B	91	25-Jul-2001	B
51, 52	17-Feb-2000	A2	94	26-Jul-2001	B
53-55	17-Feb-2000	B	125, 126	13-Jun-2000	B
56	17-Feb-2000	A2	127	18-Jun-1990	?
57, 58	17-Feb-2000	B	128	18-Jun-1990	A1
59	17-Feb-2000	A1	131	25-Jul-2001	B
60, 61	13-Jun-2000	B	134	26-Jul-2001	B
62, 63	14-Jun-2000	A2	136	17-Feb-2000	B
64	14-Jun-2000	B	137	22-Jun-2002	B
65	28-May-2000	A2	138	25-Jun-2002	A2
66	13-Jun-2000	B	139	22-Jun-2002	B
67, 68	14-Jun-2000	A2	140	22-Jun-2002	A2
69, 70	13-Jun-2000	B	141	22-Jun-2002	A1
71	14-Jun-2000	A2	142	23-Jun-2002	B
72	13-Jun-2000	A2	143	26-Jul-2001	A1
73	14-Jun-2000	A2	144	25-Jun-2002	B
			145	22-Jun-2002	B

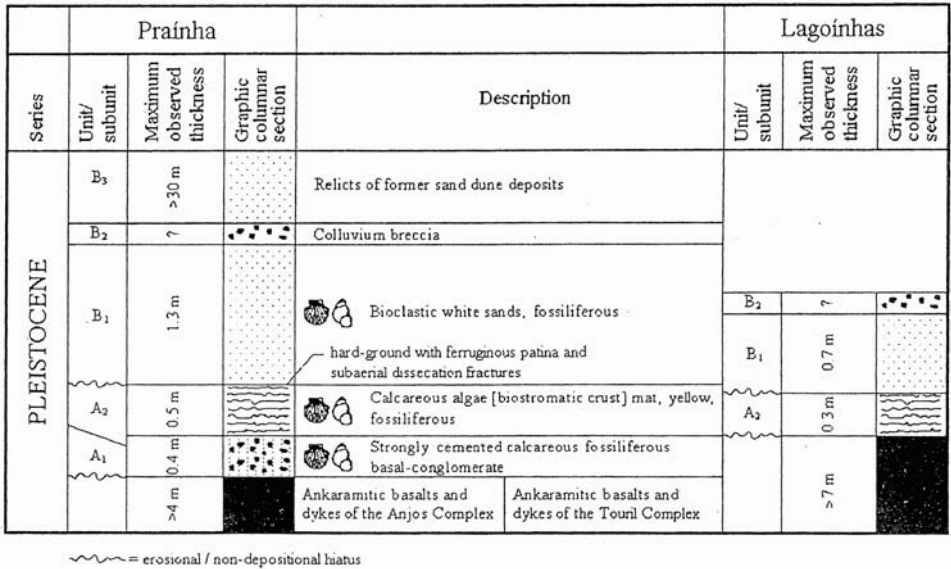


FIGURE 2. Stratigraphy of the Prainha and Lagoínhas outcrops.

unconformity there is a strongly cemented calcareous fossiliferous basal-conglomerate (unit A₁) which thickness strongly varies along the outcrop, reaching a maximum of 0.4 m. Covering the conglomerate or, locally, directly over the basaltic surface, a calcareous algae [biostromatic crust] mat is found, reaching a maximum thickness of 0.5 m (unit A₂). The upper surface of this algal mat shows *in situ* fractures due to subaerial exposure and desiccation, and a ferruginous patina evidencing an erosional hard-ground (Fig. 3).

Covering this erosional surface there is a layer of poorly consolidated bioclastic white sands (B₁) which thickness reaches 1.3 m. This unit is covered by a colluvium breccia (B₂) that may include the proximal relicts of former sand dune deposits (B₃). The sand layer shows cross-lamination and alternation of medium sized sand

grains with medium to coarse heterometric pebble gravel centimetric more fossiliferous beds. Locally, these sands are more strongly cemented, defining lens with trace fossils of marine invertebrates and/or root casts (unit B) (see Fig. 4).

Stratigraphy (Lagoínhas)

At Lagoínhas, on the northern coast of the island, the same basic stratigraphic sequence can be found. The base of the sequence contacts directly basalts and dykes of the Touril Complex (Serralheiro et al., 1987) through an irregular wave-cut platform. Directly overlaying this unconformity there is also a basal conglomerate and a calcareous algae [biostromatic crust] mat, reaching a maximum thickness of 0.3 m (unit A₂). The upper surface of this algal mat shows as well *in situ* fractures due to subaerial exposure and desiccation. Covering this ero-

sional surface there is a layer of poorly consolidated bioclastic white-yellowish sands (B1) which thickness reaches 0.7 m. This unit is covered by a colluvium breccia (B2).

TAXONOMIC LIST

Ninety-five taxa are now reported to the outcrops of Prainha and Lagoínhas (80 Gastropoda and 15 Bivalvia). Six of the reported taxa are considered dubious records, 5 Gastropoda (*Gibbula cineraria*, *Alvania canariensis*, *A. pagodula*, *Pusillina philippi* and *Rissoa similis*) and 1 Bivalvia (*Lyropecten nodosus*). A critical review of the checklist is provided below. A total of 39 new records (marked with *) are reported (34 Gastropoda and 5 Bivalvia). We were not able to find 17 of the formerly reported taxa: *Gibbula umbilicalis*, *Tricolia pullus azorica*, *Monophorus perversus*, ?*Cerithiopsis tubercularis*, *Alvania cimicoides*, *Seila trilineata*, *Zebina vitrea*, *Thylaeodus cf. rugulosus*, *Zonaria picta*, *Z. pyrum*, *Charonia variegata*, *Cymatium cutaceum*, *Mitrella broderipi*, *Bela nebula*, *Conus ventricosus*, *Mangelia costata* and *Mangelia* sp.

Phylum MOLLUSCA

Class GASTROPODA

Subclass PROSOBRANCHIA

Order ARCHAEOGASTROPODA

Family Patellidae

* *Pntelln cnndei* d'Orbigny, 1840

(Fig. 31)

Pntelln cmndei d'Orbigny, 1840. DBUA-F 3.

Pntelln ulyssiponensis Gmelin, 1791

(Fig. 32)

Patella lowei d'Orbigny, 1840. Prainha (Mayer, 1864: 54).

Pntelln athletica Bean, 1844. Prainha (Zbyszewsky *et al.*, 1961: 10). Prainha (Zbyszewsky & Ferreira, 1962: 215).

Pntelln caerulea Linnaeus, 1758. Prainha (Zbyszewsky *et al.*, 1961: 10). Prainha (Zbyszewsky & Ferreira, 1962: 215).

Prainha (Garcia-Talavera, 1990: 440).

Pntelln vulgata Linnaeus, 1758. Prainha (Zbyszewsky *et al.*, 1961: 10). Prainha (Zbyszewsky & Ferreira, 1962: 215).

Prainha (Garcia-Talavera, 1990: 440).

Patella ulyssiponensis Gmelin, 1791. Prainha (Zbyszewsky *et al.*, 1961: 10). Prainha (Garcia-Talavera, 1990: 440).

Prainha (Callapez & Soares, 2000: 314). DBUA-F 3, 9, 22, 33, 37, 46, 56, 61, 62, 64, 65, 77, 79, 81, 84, 88, 89, 125, 126, 131, 136, 137, 138, 139, 140, 142, 144, 145.

Remarks: the revision of the Patellidae was recently done by Titselaar (1998), who reported two species as occurring in the Azores: *Pntelln gomesi* Drouet, 1858 and *P. ulyssiponensis* Gmelin, 1791. Following CLEMAM's opinion, Ávila *et al.* (2000) reported two extant species as occurring in the Azores, *Pntelln cnndei* d'Orbigny, 1840 (= *P. gomesi* sensu Titselaar) and *Pntelln ulyssiponensis* Gmelin, 1791. However, Koupanou *et al.* (1999), based on partial sequences of the 12S and 16S mitochondrial genes, suggest that the Atlantic island and European mainland forms of *P. nspem* s.l. (= *P. ulyssiponensis*) may be separate species. According to these authors, *P. ulyssiponensis* should be applied to the European species, whereas all *Pntelln* in the Azores belong to a single species, *P. nspem* s.s. An integration of the morphological and genetical data is needed prior to a taxonomical decision is made. While there be no further data, we follow CLEMAM.

Family Scissurellidae

* *Sinezona cingulata* (Costa O.G., 1861)

Sinezona cingulata (Costa O.G., 1861). DBUA-F 139.

Family Haliotidae

Haliotis tuberculata coccinea Reeve, 1846

(Fig. 5)

Haliotis tuberculata Luinaeus, 1758. Prainha (Zbyszewsky & Ferreira, 1962: 215). Callapez & Soares (2000: 314).

Haliotis coccinea Reeve, 1846. Prainha (Garcia-Talavera, 1990: 440).

Haliotis tuberculata coccinea Reeve, 1846. DBUA-F 24, 65, 73, 79, 81, 127, 138, 140, 141.

Family Trochidae

* *Calliostoma* sp.

(Figs. 9-12)

Calliostoma zizyphinum (Linnaeus, 1758). Callapez & Soares (2000: 314) (misidentification).

Calliostoma sp. DBUA-F 87, 138, 140.

Gibbula cineraria (Linnaeus, 1758)*Trochus strigosus* Gmelin, 1791. Praínha (Mayer, 1864: 61).**Remarks:** we consider this a dubious record. This species was never reported again to the Azores, either as fossil or as extant.* *Gibbula delgadensis* Nordsieck, 1982

(Figs. 13-14)

Gibbula delgadensis Nordsieck, 1982. DBUA-F 45, 139.* *Gibbula magus* (Linnaeus, 1758)

(Figs. 15-16)

Gibbula magus (Linnaeus, 1758). DBUA-F 45, 91.*Gibbula umbilicalis* (da Costa, 1778)*Gibbula umbilicalis* (da Costa, 1778). Praínha (García-Talavera, 1990: 441).* *Jujubinus pseudogravinae* Nordsieck, 1973

(Figs. 17-20)

Jujubinus exasperatus (Pennant, 1777). Callapez & Soares (2000: 314) (misidentification).*Jujubinus striatus* (Linnaeus, 1758). Callapez & Soares (2000: 314) (misidentification).*Jujubinus pseudogravinae* Nordsieck, 1973. DBUA-F 2, 59, 65, 134, 139, 140.

Family Tricoliidae

Tricola pullus azorica Dautzenberg, 1889*Phasianella pullus* (Linnaeus, 1758). Praínha (Zbyszewsky et al., 1961: 10).*Tricola pullus* (Linnaeus, 1758). Praínha (García-Talavera, 1990: 441).

Order APOGASTROPODA

Family Cerithiidae

* *Bittium latreillii* (Payraudeau, 1826)

(Figs. 21-24)

Bittium reticulatum (da Costa, 1778). Praínha (Zbyszewsky & Ferreira, 1962: 215) (misidentification). Praínha (García-Talavera, 1990: 440) (misidentification). Callapez & Soares (2000: 314) (misidentification).*Bittium latreillii* (Payraudeau, 1826). DBUA-F 2, 3, 9, 44, 45, 46, 50, 55, 60, 74, 87, 91, 125, 126, 131, 134, 136, 137, 138, 139, 142, 144.

Family Fossaridae

Fossarus ambiguus (Linnaeus, 1758)

(Figs. 6-8)

Fossarus costatus. Praínha (García-Talavera, 1990: 441)*Fossarus ambiguus* (Linnaeus, 1758). Callapez & Soares (2000: 314). DBUA-F 18, 125, 142, 144.

Family Triphoridae

Triphoridae n. id.

(Figs. 88-93)

Triphoridae n. id. DBUA-F 74, 126, 134, 142.

Monophorus perversus (Linnaeus, 1758)*Cerithiopsis perversa* (Linnaeus, 1758). Praínha (Mayer, 1864: 67).*Triforis perversa* (Linnaeus, 1758). Praínha (Zbyszewsky et al., 1961: 10).*Triphora perversa* (Linnaeus, 1758). Praínha (Zbyszewsky & Ferreira, 1962: 215).*Biforina perversa*. Praínha (García-Talavera, 1990: 441).*Monophorus perversus* (Linnaeus, 1758). Callapez & Soares (2000: 315).

Family Cerithiopsidae

* *Cerithiopsis* sp.

(Figs. 94, 97)

Cerithiopsis sp. DBUA-F 2.? *Cerithiopsis tubercularis* (Montagu, 1803)*Cerithiopsis nana* Mayer, 1864. Praínha (Mayer, 1864: 66).

Praínha (García-Talavera, 1990: 441).

Remarks: according to CLEMAM, *Cerithiopsis nana* Mayer, 1864 is a dubious synonym of *Cerithiopsis tubercularis* (Montagu, 1803).*Seila trilineata* (Philippi, 1836)*Cerithiopsis trilineata* (Philippi, 1836). Praínha (Mayer, 1864: 67). Praínha (García-Talavera, 1990: 441).**Remarks:** we think this species is extinct nowadays at the Azores.

Family Epitoniiidae

* *Epitonium* sp

(Figs. 25-28)

Epitonium sp. DBUA-F 19.

Family Eulimidae

* *Vitreolina philippi* (de Rayneval & Ponzi, 1854)

(Figs. 139-140)

Vitreolina philippi (de Rayneval & Ponzi, 1854). DBUA-F 134.

Family Littorinidae

Melarhaphé neritoides (Linnaeus, 1758)

(Fig. 29)

Melarhaphé neritoides (Linnaeus, 1758). Callapez & Soares (2000: 314). DBUA-F 74, 88, 134, 137, 138, 142, 144.*Littorina striata* (King, 1832)

(Fig. 30)

Littorina striata (King, 1832). Praínha (García-Talavera, 1990: 441). DBUA-F 3, 15, 23, 28, 59, 62, 65, 66, 73, 76, 79, 81, 84, 86, 88, 127, 131, 137, 138, 139, 140, 141, 145.

TABLE 2. Stratigraphic distribution of the fossil molluscs collected in this work at Prainha ext, extinct species in the Azores; ? present occurrence in the Azores unknown.

	Miocene (Mitchell-Thomi, 1976)	Cemented c c e o conglomerate A ₁ unit	Calcareous algal reef A ₂ unit	Sand beach B unit	Present (Ávila, 2000)
<i>Aluamia angioyi</i>					
<i>Aluamia cancellata</i>					
<i>Aluamia mediolittoralis</i>					
<i>Aluamia poucheti</i>					
<i>Alvania sleursi</i>					
<i>Alvania tarsodes</i>					
<i>Anachis avaroides</i>					
<i>Arca tetragona</i>					
<i>Bittium latreillii</i>					
<i>Bursa scrobiculata</i>					
<i>Caecum</i> cf. <i>armoricum</i>					
<i>Calliostoma</i> sp.					
<i>Cantharus variegatus</i>					ext
<i>Carditu cabyclata</i>					
<i>Cerithiopsis</i> sp.					
<i>Charonia lampas lampas</i>					
<i>Cingula trifasciata</i>					
<i>Conus ambiguus</i>					ext
<i>Conus</i> cf. <i>ermineus</i>					ext
<i>Conus</i> cf. <i>miruchae</i>					ext
<i>Coralliophila meyendorffi</i>					
<i>Crassadoma pusio</i>					
<i>Crisilla postrema</i>					
<i>Cylichnina</i> sp.					?
<i>Ensis minor</i>					ext
<i>Epitonium</i> sp.					?
<i>Ervilia castanea</i>					
<i>Fossarus ambiguus</i>					
<i>Gibbula delgadensis</i>					
<i>Gibbula magus</i>					
<i>Haedropleura</i> sp.					?
<i>Haliotis tuberculata coccinea</i>					
<i>Jujubinus pseudogravinae</i>					
<i>Laevicardium crassum</i>					ext (?)
<i>Lamellaria latens</i>					

and Lagoinhas, Santa Maria Island (Azores). Present, species occurring in the Azores;

	Miocene (Mitchell-Thorn & 1976)	Cemented calcareous conglomerate A ₁ unit	Calcareous algal reef A ₂ unit	Sand beach B unit	Present (Ávila, 2000)
<i>Lima</i> cf. <i>lima</i>					
<i>Littorina striata</i>					
<i>Lucinella divaricata</i>					ext (?)
<i>Manzonina unifasciata</i>					
<i>Melarhaphe neritoides</i>					
<i>Mitra comea</i>	?				
<i>Mitromorpha azorensis</i>					
<i>Morula nodulosa</i>					ext
<i>Myosorceps aristatus</i>					ext
<i>Myosotella myosotis</i>					
<i>Naticarius dilhuyi</i>					?
<i>Neopycnodonte</i> cf. <i>cochlear</i>					
<i>Nodipecten corallinoides</i>					
<i>Ocenebrina aciculata</i>					
<i>Odostomia bernardi</i>					
<i>Odostomia</i> cf. <i>unidentata</i>					
<i>Parvicardium vroomi</i>					
<i>Patella candei</i>					
<i>Patella ulysipponensis</i>					
<i>Papillicardium papillosum</i>					
<i>Pedipes pedipes</i>					
<i>Phalium granulatum</i>					
<i>Polynices lacteus</i>					ext
<i>Retusa truncatula</i>					
<i>Rissoa guernei</i>					
<i>Setia</i> sp.					
<i>Setia subvaricosa</i>					
<i>Sinezona cingulata</i>					
<i>Skeneopsis planorbis</i>					
<i>Stramonita</i> h. <i>haemastoma</i>					
<i>Tellina incarnata</i>					
<i>Thylaeodus</i> cf. <i>rugulosus</i>	?				
Tnphoridae n. id.					
<i>Trivia pulex</i>					
<i>Vitreolina philippi</i>					

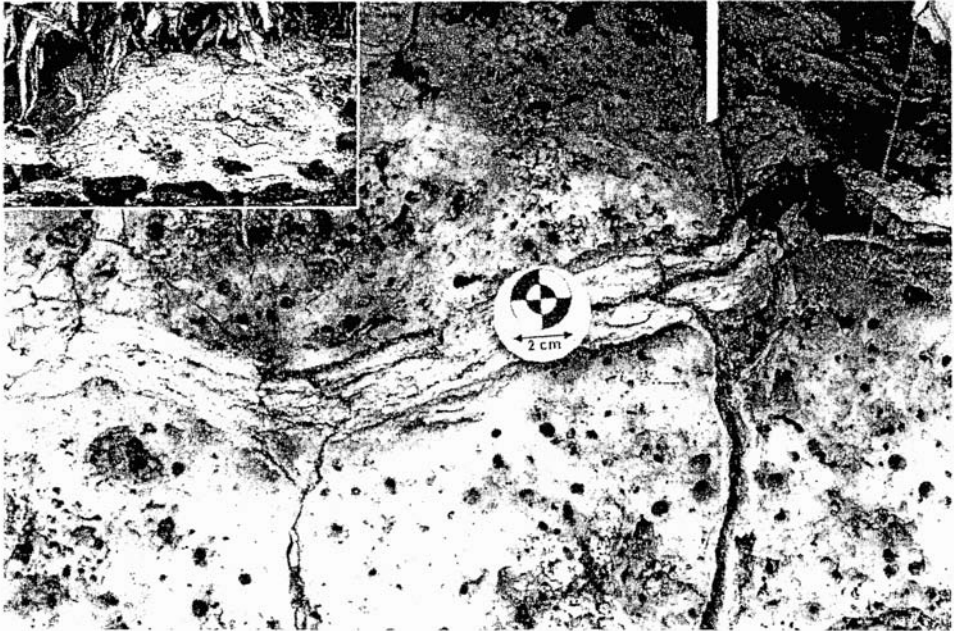


FIGURE 3. Calcareous algae with fractures filled by cemented sand.



FIGURE 4. Trace fossils of marine invertebrates.

Family Skeneopsidae

* *Skeneopsis planorbis* (O. Fabricius, 1780)

(Figs. 33-36)

Skeneopsis planorbis (OFabridus, 1780). DBUA-F2, 46, 80, 134.

Family Rissoidae

* *Risson guernei* Dautzenberg, 1889

(Figs. 37-40)

Risson guernei Dautzenberg, 1889. DBUA-F2, 9, 44, 55, 60, 81, 87, 126, 131, 134, 138, 139, 140, 142, 144.*Risson similis* Scacchi, 1836*Rissoina similis* Scacchi, 1836. Praia (Mayer, 1864: 58).
Apicularia similis. Praia (García-Talavera, 1990: 441).
Risson similis Scacchi, 1836. Callapez & Soares (2000: 314).
Remarks: we think this is a dubious record. Probably, it was misidentified as *Risson guernei*.* *Setia* sp.

(Fig. 76)

Setia sp. DBUA-F55, 81, 84* *Setia subvaricosa* Gofas, 1990

(Figs. 80, 81)

Setia subvaricosa Gofas, 1990. DBUA-F2, 3, 19, 78, 87.* *Alvania angioyi* van Aartsen, 1982

(Figs. 41-43)

Alvania angioyi van Aartsen, 1982. DBUA-F46, 60, 87, 134, 139, 142.*Alvania canariensis* (d'Orbigny, 1840)*Rissoina canariensis* (d'Orbigny, 1840). Praia (Mayer, 1864: 57).*Remarks*: we think this is a dubious record.*Alvania cancellata* (da Costa, 1778)

(Fig. 44)

Rissoina crenulata (Michaud, 1832). Praia (Mayer, 1864: 57).*Alvania cancellata* (da Costa, 1778). Callapez & Soares (2000: 314). DBUA-F2, 125, 144.*Alvania cimicoides* (Forbes, 1844)*Alvania cimicoides* (Forbes, 1844). Praia (Mayer, 1864: 58). Callapez & Soares (2000: 314).*Remarks*: this deep-water species was recently found at the Azores by Hoenselaar & Goud (*in litt.*) from 125 to 620 m depth.* *Alvania mediolittoralis* Gofas, 1989

(Figs. 45-48, 52)

Alvania mediolittoralis Gofas, 1989. DBUA-F2, 9, 134, 133, 139, 142, 144.*Alvania pagodula* (Bucquoy, Dautzenberg & Dollfus, 1884)*Alvania philippiana* Jeffreys, 1856. Praia (Mayer, 1864: 58).*Remarks*: we think this is a dubious record.* *Alvania poucheti* Dautzenberg, 1889

(Figs. 49-51, 53, 57)

Alvania poucheti Dautzenberg, 1889. DBUA-F 44, 55, 134.* *Alvania sleursi* (Amati, 1987)

(Figs. 54-56, 58-61)

Alvania sleursi (Amati, 1987). DBUA-F2, 46, 49, 55, 87, 134, 139, 144.* *Alvania tarsodes* (Watson, 1886)

(Figs. 62, 65-67)

Alvania tarsodes (Watson, 1886). DBUA-F45.*Cingula trifasciata* (J. Adams, 1800)

(Figs. 63, 73)

Cingula cingillus (Montagu, 1803). Callapez & Soares (2000: 314).*Cingula trifasciata* (J Adams, 1800). DBUA-F134, 138, 140, 144.* *Crisilla postrema* (Gofas, 1990)

(Fig. 75)

Crisilla postrema (Gofas, 1990). DBUA-F 134.*Manzonina unifasciata* Dautzenberg, 1889

(Figs. 64, 68-72, 74, 77)

Alvania costata Desh. Praia (Mayer, 1864: 58).*Manzonina costata*. Praia (García-Talavera, 1990: 441)*Manzonina unifasciata* Dautzenberg, 1889. Callapez & Soares (2000: 314). DBUA-F2, 9, 44, 45, 50, 60, 87, 126, 131, 134, 136, 137, 139, 142, 144.*Pusillina philippi* (Aradas & Maggiore, 1844)*Rissoina dolium* Nyst, 1845. Praia (Mayer, 1864: 58).*Remarks*: we think this is a dubious record.

Family Rissoinidae

Zebina vitrea A. Adams, 1854*Zebina vitrea* A. Adams, 1854. Callapez & Soares (2000: 314).

Family Caecidae

* *Caecum* cf. *armoricum* de Folin, 1869

(Figs. 78-79, 8245)

Caecum cf. *armoricum* de Folin, 1869. DBUA-F 70, 82, 134.

Family Vermetidae

- Thylaeodus* cf. *rugulosus* (Monterosato, 1878)
(?) *Vermetus* sp. Callapez & Soares (2000:314).
Thylaeodus cf. *rugulosus* (Monterosato, 1878). DBUA-F 67,
82, 89, 91.

Family Lamellariidae

- * *Lamellaria latens* (Müller O.F., 1776)
Lamellaria latens (Müller O.F., 1776). DBUA-F125.

Family Triviidae

- * *Trivia pulex* (Solander in Gray, 1827)
(Figs. 56-87)
Trivia pulex (Solander in Gray, 1827). DBUA-F 61.

Family Cypraeidae

- Zonaria picta* (Gray, 1824)
Cypraea picta (Gray, 1824). Praínha (García-Talavera, 1990:
441).

Zonaria pyrum (Gmelin, 1791)

- Cypraea pyrum* Gmelin, 1791. Praínha (Zbyszewsky *et al.*,
1961: 10). Prainha (Zbyszewsky & Ferreira, 1962: 215).

Family Naticidae

- * *Naticarius diltwynii* (Payraudeau, 1826)
(Figs. 95, 102)
Naticarius diltwynii (Payraudeau, 1826). DBUA-F 3.
Remarks: some specimens were found with bioero-
sion bore-holes (see Fig. 102).

Polynices lacteus (Guilding, 1834)

- (Fig. 96)
Polinices cf. *lacteus* (Gmelin). Praínha (Zbyszewsky *et al.*,
1961:10). Praínha (Zbyszewsky & Ferreira, 1962: 215).
Polinices lacteus (Gmelin). Praínha (García-Talavera, 1990:
441).
Polynices lacteus (Guilding, 1834) DBUA-F 35, 43, 47, 59,
61, 62, 66, 78, 80, 81, 56, 125, 131, 137, 139, 140, 142.
Remarks: Laursen (1981) reports the larvae of *Polyni-
ces lacteus* in the waters surrounding the Azores. The
adults of this species are also given to the Azores, but we
have serious doubts about this. The largest specimen col-
lected at Praínha is 1.8 x 1.4 cm. However, in more than
800 lots surveyed of the DBUA collection (recent shallow-
water marine molluscs of the Azores) not a single spec-
imen of this large species was found (Ávila *et al.*, 1998,
2000a, b). Therefore, we have strong doubts about the
actual existence of adult specimens in the Azores.

Family Cassidae

- Phalium granulatum* (Born, 1778)
(Fig. 106)
Cassis undulata Gmelin, 1791. Praínha (Zbyszewsky *et al.*,
1961: 10). Prainha (Zbyszewski & Ferreira, 1962: 215).
Phalium granulatum (Born, 1778). Prainha (García-Tala-
vera, 1990: 441). DBUA-F88, 89, 125, 139, 142.

Family Ranellidae

- Charonia lampas lampas* (Linnaeus, 1758)
(Fig. 108)
Charonia lampas (Linnaeus, 1758). Callapez & Soares (2000:
314). DBUA-F 94.

Charonia variegata (Lamarck, 1816)

- Charonia variegata* (Lamarck, 1816). Praínha (García-Tala-
vera, in litt.).

Cymatium cutaceum Linnaeus, 1758

- Cymatium cutaceum* Linnaeus, 1758. Praínha (Zbyszewsky
& Ferreira, 1962: 215).
Cabestana cutacen (Linnaeus, 1758). Prainha (García-Tala-
vera, 1990 441).

Family Bursidae

- Bursa scrobiculator* (Linnaeus, 1758)
(Figs. 98-99)
Bursa scrobiculator (Linnaeus, 1758). Praínha (García-Tala-
vera, 1990: 441). DBUA-F31, 42, 65, 138, 140.

Family Muricidae

- Morula nodulosa* (C.B. Adams, 1845)
(Figs. 100-101, 103)
Morula nodulosa (C.B. Adams, 1845). Praínha (García-
Talavera, 1990: 441). DBUA-F 3, 135, 139, 140.
Remarks: some specimens were found with bioero-
sion bore-holes (see Fig. 103).

* *Ocinebrina aciculata* (Lamarck, 1822)

- (Fig. 107)
Ocinebrina aciculata (Lamarck, 1822). DBUA-F 22, 138, 140,
141.

Stramonita haemastoma haemastoma (Linnaeus, 1766)

- (Figs. 104-105)
Purpura haemastoma Linnaeus, 1766. Prainha (Zbys-
zewsky & Ferreira, 1962: 215).
Thais haemastoma (Linnaeus, 1766). Praínha (García-
Talavera, 1990: 441). Callapez & Soares (2000: 314).
Stramonita haemastoma haemastoma (Linnaeus, 1766).
DBUA-F 3, 59, 61, 62, 65, 66, 67, 73, 81, 88, 127, 138, 139,
140, 141, 143.

Family Coralliophilidae

Coralliophila meyerendorffi (Calcara, 1845)

(Figs. 109-110)

Coralliophila meyerendorffi (Calcara, 1845). Praínha (Zbyszewsky & Ferreira, 1962: 215). Praínha (García-Talavera, 1990: 441). Callapez & Soares (2000: 314). DBUA-F 62, 65, 73, 81, 84, 127.

Family Buccinidae

Cantharus variegatus (Gray, 1839)

(Figs. 111, 115)

Cantharus (Pollia) viverratus Kiener. Praínha (Zbyszewsky & Ferreira, 1962: 215) (misidentification).
Cantharus viverratus Kiener. Praínha (García-Talavera, 1990: 441) (misidentification).
Cantharus variegatus (Gray, 1839). Callapez & Soares (2000:). DBUA-F 3, 22, 23, 42, 56, 65, 67, 73, 81, 87, 88, 89, 125, 131, 137, 138, 139, 140, 141, 142.

Remarks: some specimens were found with bio-erosion bore-holes (see Fig. 115).

Family Columbellidae

Mitrella broderipi (Sowerby G.B.I., 1844)

Mitrella broderipi (Sowerby, 1844). Callapez & Soares (2000: 314).

Family Marginellidae

Gibberula sp.

(Figs. 112-114)

Gibberula sp. Callapez & Soares (2000: 314). DBUA-F 2.
Remarks: our specimens probably belong to the *Gibberula philippi* group (S. Gofas, *in litt.*).

Family Mitridae

Mitri cornea Lamarck, 1811

(Figs. 116-118)

Mitri cornicula Linnaeus, 1758. Praínha (Zbyszewsky *et al.*, 1961: 10) (misidentification). Praínha (Zbyszewsky & Ferreira, 1962: 215) (misidentification).

Mitri nigra (Gmelin, 1791). Praínha (García-Talavera, 1990: 441) (misidentification).

Mitri cornea Lamarck, 1811. DBUA-F 2, 21, 73, 81, 84, 127, 138, 140, 144.

Remarks: *Mitri corniculum* has frequently been misidentified with small specimens of *Mitri cornea*. In living specimens, it is easy to identify both species (*M. cornea* has a white body with a yellow border along the superior margin of the foot and in the tentacles, whereas the body of *M. corniculum* is entirely white) (see Moran *et al.*, 1989; Rolán *et al.*, 1997). Presently, *Mitri corniculum* is restricted to the Mediterranean, *Mitri nigra* (Gmelin, 1791) is a species that extends from Cape Verde Islands to Angola, being present also at São Tome and *Mitri cornea* is found in the western Mediterranean, Azores, Madeira, Canary Islands, Cape Verde and also at West Africa (Rolán *et al.*, 1997). Besides, *Mitri cornea* and *M. nigra* have a

planktotrophic type of development, whereas *M. corniculum* has a non-planktotrophic type of development (Rolán *et al.*, 1997).

Family Turridae

* *Haedropleura* sp.

(Fig. 132)

Haedropleura sp. DBUA-F 142.

Family Conidae

* *Anachis avaroides* Nordsieck, 1975

(Figs. 119-120)

Anachis avaroides Nordsieck, 1975. DBUA-F 44, 46, 55, 57, 74, 125, 126, 134, 136, 137, 138, 142, 144.

Behi nebula (Montagu, 1803)

Mangelia (Raphitoma) nebula (Montagu, 1803). Praínha (Zbyszewsky *et al.*, 1961: 10). Praínha (Zbyszewsky & Ferreira, 1962: 215).

Behi nebula (Montagu, 1803). Praínha (García-Talavera, 1990: 441).

Conus ambiguus Reeve, 1844

Conus cf. *ambiguus* Reeve. Praínha (Zbyszewsky & Ferreira, 1962: 215). *Conus ambiguus* Reeve, 1844. DBUA-F 27, 79.

Conus cf. *ermineus* Born, 1778

(Figs. 128, 131)

Conus cf. *ermineus* Bönn, 1778. Praínha (García-Talavera, 1990: 441). Callapez & Soares (2000: 315). DBUA-F 20, 63, 64, 65, 78, 81, 84, 91, 127, 128.

* *Conus* cf. *miruchae* Röckel, Rolán & Monteiro, 1980

(Figs. 123-125)

Conus cf. *miruchae* Röckel, Rolán & Monteiro, 1980. DBUA-F 89.

Conus cf. *roeckeli* Rolán, 1980

(Figs. 126-127)

Conus cf. *roeckeli* Rolán, 1980. Praínha (García-Talavera, 1990: 441). DBUA-F 127.

Conus ventricosus Gmelin, 1791

Conus ventricosus Gmelin, 1791. Praínha (García-Talavera, 1990: 441).

Conus venulatus Hwass in Bruguière, 1792

(Figs. 129-130)

Conus venulatus Hwass in Bruguière, 1792. Praínha (García-Talavera, 1990: 441).

Mangelia costata (Donovan, 1804)

Mangelia costata (Donovan, 1803). Callapez & Soares (2000: 314).

Mangelia sp.

Mangelia sp. Callapez & Soares (2000:314).

* *Mitromorpha azorensis* Mifsud, 2001

(Figs. 121-122)

Mitromorpha azorensis Mifsud, 2001. DBUA-F9, 44, 139.

Order HETEROSTROPHA

Family Pyramidellidae

* *Odostomia bernardi* Aartsen, Gittenberger & Goud, 1998

(Figs. 136-137)

Odostomia bernardi Aartsen, Gittenberger & Goud, 1998. DBUA-F45, 134, 137.

* *Odostomia* cf. *unidentata* (Montagu, 1803)

(Figs. 133-135, 138)

Odostomia cf. *unidentata* (Montagu, 1803). DBUA-F 2.

Subclass OPISTHOBANCHLA

Order CEPHALASPIDEA

Family Retusidae

* *Cylichmina* sp.

(Fig. 141)

Cylichmina sp. DBUA-F 73.

* *Retusa truncatula* (Bruguière, 1792)

(Fig. 142)

Retusa truncatula (Bruguière, 1792). DBUA-F 134.

Subclass PULMONATA

Order BASOMMATOPHORA

Family Ellobiidae

Myosotelln *myosotis* (Draparnaud, 1801)

Ovatella (*Myosotella*) *myosotis* (Draparnaud, 1805) Callapez & Soares (2000:315).

Myosotella myosotis (Draparnaud, 1801) DBUA-F 144

* *Pedipes pedipes* (Gmelin, 1791)

Pedipes pedipes (Gmelin, 1791). DBUA-F2.

Class BIVALVIA

Subclass PTEROMORPHIA

Order ARCOIDA

Family Arcidae

Arca tetragona Poli, 1795

(Fig. 147)

Arca tetragona Poli, 1795. Callapez & Soares (2000:315). DBUA-F 46, 71, 73, 81, 128.

Order MYTILOIDA

Family Mytilidae

Myofoorceps aristatus (Dillwyn, 1817)

(Figs. 143-145)

Lithodomus lithophagus Linnaeus, 1758. Prainha (Zbyszewsky et al., 1961: 10) (misidentification).

Prainha (Zbyszewsky & Ferreira, 1962: 214) (misidentification).

Lithophaga lithophaga. Prainha (García-Talavera, 1990: 441) (misidentification).

Myofoorceps aristata (Dillwyn, 1817). Callapez & Soares (2000: 315).

Myofoorceps aristatus (Dillwyn, 1817). DBUA-F 23, 29, 56, 68, 73, 75, 79, 81, 84, 138, 140.

Order PTERIOIDA

Family Pectinidae

Lyropecten nodosa (Linnaeus, 1758)

Chlamys nodosa Linnaeus, 1758. Prainha (Zbyszewsky & Ferreira, 1962: 214).

Remarks: this is a western Atlantic species that ranges presently from the southeastern United States to Brazil, occurring also at Ascension Island (Abbot & Dance, 1991). It was probably misidentified with the eastern Atlantic *Nodipecten corallinoides* (d'Orbigny, 1840). Dubious record.

Nodipecten corallinoides (d'Orbigny, 1840)

Lyropecten corallinoides (d'Orbigny, 1840). Prainha (García-Talavera, 1990: 441).

Nodipecten corallinoides (d'Orbigny, 1840). DBUA-F9, 30, 65, 81, 84, 131, 139.

Crassadoma pusio (Poli, 1795)

Chlamys distorta (da Costa, 1778). Callapez & Soares (2000: 315).

Crassadoma pusio (Poli, 1795). DBUA-F46.

Family Limidae

* *Lima* cf. *lima* (Liruiæus, 1758)

(Fig. 146)

Lima cf. *lima* (Linnaeus, 1758). DBUA-F81.

Order OSTREOIDA

Family Gryphaeidae

Neopycnodonte cf. *cochlear* (Poli, 1795)

Pycnodonta cfr. (sic!) *cochlear* (Poli, 1795). Prainha (Zbyszewsky et al., 1961: 10). Prainha (Zbyszewsky & Ferreira, 1962: 214).

Neopycnodonta cf. *cochlear* (Poli, 1795). Prainha (García-Talavera, 1990: 441).

Neopycnodonte cf. *cochlear* (Poli, 1795). DBUA-F 138.

Subclass HETERODONTA

Order VENEROIDA

Family Lucinidae

Lucinella divaricata (Linnaeus, 1758)

(Figs. 150-151, 154-155)

Lucina (*Divaricella*) *divaricata* Linnaeus, 1755. Prainha (Zbyszewsky & Ferreira, 1962: 214).

Divaricella divaricata (Linnaeus, 1755). Prainha (García-Talavera, 1990: 441).

Lucinella diurnicincta (Linnaeus, 1758). DBUA-F 2, 9, 17, 36, 40, 55, 58, 61, 66, 70, 87, 88, 89, 91, 125, 126, 127, 131, 136, 137, 139, 140, 142.

Remarks: some specimens were found with bio-erosion bore-holes (see Fig. 150).

Family Carditidae

Cardita calyculata (Linnaeus, 1758)

(Figs. 148-149)

Cardita calyculata (Linnaeus, 1758). Prainha (Mayer, 1864: 32). Prainha (García-Talavera, 1990: 441). Callapez & Soares (2000:315). DBUA-F2, 9, 60, 80, 52, 86, 87, 91, 125, 134, 137, 139, 142.

Family Cardiidae

Laevicardium crassum (Gmelin, 1791)

(Fig. 152)

Cardium norvegicum Spengler var. *gibba* Jeffreys, 1864. Prainha (Zbyszewsky & Ferreira, 1962: 214).

Laevicardium crassum (Gmelin, 1791). Prainha (García-Talavera, 1990: 441). DBUA-F 32, 63, 65, 66, 88, 89, 131, 139, 140, 142, 145

* *Parvicardium vroomi* van Aartsen, Moolenbeck and Gittenberger, 1984

Parvicardium vroomi van Aartsen, Moolenbeck and Gittenberger, 1984. DBUA-F 81, 140.

* *Papillicardium papillosum* (Poli, 1795)

(Fig. 153)

Papillicardium papillosum (Poli, 1795). DBUA-F 38, 61, 126.

Family Pharidae

* *Ensis minor* (Chenu, 1843)

(Figs. 156)

Solen cf. *marginatus* Pulteney, 1799. Prainha (Zbyszewsky & Ferreira, 1962: 214) (misidentification). Prainha (García-Talavera, 1990: 442) (misidentification).

Ensis minor (Chenu, 1843). DBUA-F2, 9, 61, 62, 70, 80, 87, 89, 91, 125, 126, 131, 136, 137, 139, 145.

Remarks: the position of the adductor muscle scars, the distance between the posterior adductor muscle scar and the bifurcation of the pallial line that forms the pallial sinus, among other characters, are of the outmost importance to identify the Pharidae. The Prainha "Jack-knife" is not a *Solen* species because the impression of the anterior adductor muscle scar is longer than the ligament. The shells collected at Prainha possess a pallial line that extends frontward from the posterior adductor scar to a roundish scar that is placed over the anterior adductor scar. This excludes *Ensis ensis* and *Ensis siliqua*, both with too short a pallial line. *Ensis directus*, a northern Atlantic species originates from the American east coast and was introduced in Europe in 1978 (Poppe & Goto, 1993). The remaining extant species are *Ensis arcuatus* and *Ensis minor*. Prainha species is *Ensis minor*, because the distance between the posterior adductor muscle scar and the bifurcation of the pallial line that forms the pallial sinus is about

twice as long, a distinctive character of this species.

Family Tellinidae

* *Tellina incrinntn* Linnaeus, 1758

Tellina incarnata Linnaeus, 1758. DBUA-F9, 61, 66, 80, 89, 126, 131, 139.

Family Semelidae

Ervilia castanea (Montagu, 1803)

(Fig. 157)

Ervilia pusilla (Philippi, 1836). Prainha (Mayer, 1864: 15).

Ervilia castanea (Montagu, 1803). Prainha (Zbyszewsky & Ferreira, 1962: 214). Prainha (García-Talavera, 1990: 442). Callapez & Soares (2000: 315). DBUA-F 2, 3, 9, 25, 34, 37, 50, 53, 55, 58, 60, 61, 66, 69, 70, 74, 80, 87, 89, 91, 125, 126, 131, 134, 136, 137, 138, 139, 140, 142, 144, 145.

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FIGURES 5-157. Fossil molluscs from Santa Maria. 5, *Haliotis tuberculata coccinea* (DBUA-F 81; 1.1 cm long); 6-8, *Fossarus ambiguus* (DBUA-F48/79-1); 9-12, *Calliostoma* sp. (DBUA-F 87/132-6); 13-14, *Gibbula delgadensis* (DBUA-F 45/85-2); 15-16, *Gibbula magus* (DBUA-F 91; 1.32x0.99 cm); 17-20, *Jujubinus pseudogravinae* (17: DBUA-F 2/117-1; 18-19: DBUA-F 2/112-2; 20: DBUA-F 65); 21-24, *Bittium latreillii* (21: DBUA-F 44/81-3; 22: DBUA-F 2/113-2; 23-24: DBUA-F 87/132-1); 25-28, *Epitonium* sp. (DBUA-F 19/83-2); 29, *Melarhaphé nerifoides* (DBUA-F 88/117-1); 30, *Littorina striata* (DBUA-F 84/116-1; height = 0.73 cm); 31, *Patella cnndei* (DBUA-F/42-4); 32, *Patella ulyssiponensis* (DBUA-F/36-19; 3.56 cm long); 33-36, *Skeneopsis plnnorbis* (33: DBUA-F 2/141-2; 34, 36: DBUA-F 2/141-1; 35: DBUA-F 2/141-5); 37-40, *Risson guernei* (37-39: DBUA-F 44/81-2; 40: DBUA-F 9/137-1); 41-43, *Alvnnin angioyi* (41-42: DBUA-F 87/132-5; 43: DBUA-F 87/133-3); 44, *Alvania cancellata* (DBUA-F 2/112-1); 45-48, 52, *Alvania mediolittoralis* (45: DBUA-F 138/155-3; 46: DBUA-F 9/137-3; 47-48, 52: DBUA-F 44/82-1); 49-51, 53, 57, *Alvania poucheti* (49: DBUA-F 134/153-1; 50, 57: DBUA-F 44/81-1; 51: DBUA-F 55/103-3; 53: DBUA-F 134/153-3); 54-56, 58-61, *Alvania sleursi* (54: DBUA-F 87/132-4; 55: DBUA-F 55/103-4; 56: DBUA-F 55/103-2; 58: DBUA-F 2/141-6; 59, 61 - DBUA-F 87/133-7; 60: DBUA-F 49/79-2); 62, 65-67, *Alvania tarsodes* (DBUA-F 45/84-3); 63, 73, *Cingula trifasciata* (63: DBUA-F 138/155-4; 73: DBUA-F 138/155-2); 64, 68-72, 74, 77, *Manzonina unifasciata* (64, 68-69, 74, 77: DBUA-F 44/79-3; 70: DBUA-F 87/131-2; 71: DBUA-F 45/84-4; 72: DBUA-F 44/82-3); 75, *Crisilla postrema* (DBUA-F 134); 76, *Setia* sp. (DBUA-F 2/1Feb-4); 78-79, 82-85, *Caecum* cf. *armoricum* (78, 82-83: DBUA-F 82/134-3; 79, 84-85: DBUA-F 82/134-1); 80-81, *Setia subvaricosa* (DBUA-F 87/132-3); 86-87, *Trivia pulex* (DBUA-F 61; 0.57 cm long); 88-93, *Triphoridae* n. id. (88: DBUA-F 126/83-3; 89: DBUA-F 142/154-3; 90-92: DBUA-F 142/154-2; 93: DBUA-F 134/152-5); 94, 97, *Cerithiopsis* sp. (DBUA-F 2/141-7); 95, 102, *Naticarius dillwoyni* (DBUA-F 3; 1.05x1.01 cm); 96, *Polynices lacteus* (DBUA-F 131/36-15; 1.39x1.18 cm); 98-99, *Bursa scrobiculator* (DBUA-F 42; 5.44x3.44 cm); 100-101, 103, *Morula nodulosa* (100: DBUA-F 3; 101, 103: coll. F Garcia-Talavera; 0.95x0.58 cm); 104-105, *Stramonita haemastoma haemastoma* (104: DBUA-F 73/138-1; 105: DBUA-F 61; 1.59x1.17 cm); 106, *Phalium granulatum* (DBUA-F 88; height = 7.72 cm); 107, *Ocenebrina aciculata* (DBUA-F 22/80-1); 108, *Charonia lampas lampas* (DBUA-F 94; height = 13.47 cm); 109-110, *Cornuliohyla meyenendorffii* (DBUA-F 127; 1.45x0.98 cm); 111, 115, *Cantharus variegatus* (DBUA-F 42); 112-114, *Gibberula* sp. (112: DBUA-F 2/113-1; 113: DBUA-F 2/113-3; 114: DBUA-F 2/141-4); 116-118, *Mitra cornea* (116: coll. F Garcia-Talavera; 117: DBUA-F 127, 1.42x0.70 cm; 118: DBUA-F 2/111-1); 119-120, *Anachis avaroides* (119: DBUA-F 55/131-1; 120: DBUA-F 74; height = 0.54 cm); 121-122, *Mitromorpha azorensis* (DBUA-F 44/82-6); 123-125, *Conus* cf. *miruchae* (DBUA-F 89; 1.49x0.88 cm); 126-127, *Conus* cf. *roeckeli* (DBUA-F 127); 128, 131, *Conus* cf. *ermineus* (128: DBUA-F 27; 131: DBUA-F 127); 129-130, *Conus venulatus* (coll. F Garcia-Talavera); 132, *Haedropleura* sp. (DBUA-F 142/154-1); 133-135, 138, *Odostomin* cf. *unidentata* (133: DBUA-F 2/141-3; 134-135, 138: DBUA-F 2/141-8); 136-137, *Odostomia bernardi* (136: DBUA-F 134/152-4; 137: DBUA-F 45/85-3); 139-140, *Vitreolina philippi* (139: DBUA-F 134/152-1; 140: DBUA-F 134/152-2); 141, *Cylichnina* sp. (DBUA-F 73/135-1; 0.36 cm long); 142, *Retusa truncatula* (DBUA-F 134/152-3); 143-145, *Myoforceps aristatus* (143: DBUA-F s/n; width = 0.53 cm; 144-145: DBUA-F s/n; 1.78 cm long); 146, *Lima* cf. *lima* (DBUA-F s/n; 1.18x0.86 cm); 147, *Arca tetragona* (DBUA-F 81; 1.39x0.78 cm); 148-149, *Cardifa calyculata* (DBUA-F 80; 1.09x0.75 cm); 150-151, 154-155, *Lucinella divaricata* (150-151: DBUA-F 55/110-1; 154-155: DBUA-F 61); 152, *Laevicardium crassum* (DBUA-F s/n; 5.49x4.86 cm); 153, *Papillicardium papillosum* (DBUA-F 61; 0.82x0.90 cm); 156, *Ensis minor* (DBUA-F 9; 9.78x1.92 cm); 157, *Ervilia castanea* (DBUA-F 61).

