

# GLORIA MARIS

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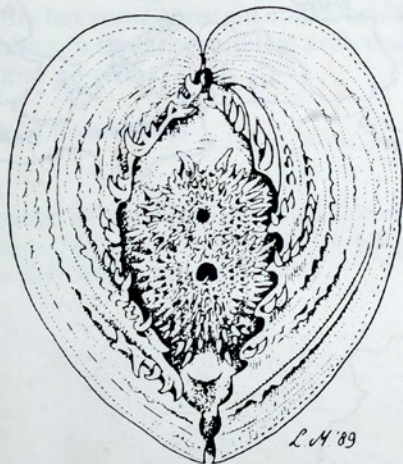
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**INVENTARISATION OF THE RECENT  
EUROPEAN AND WEST AFRICAN  
CARDIIDAE  
(Mollusca, Bivalvia)**



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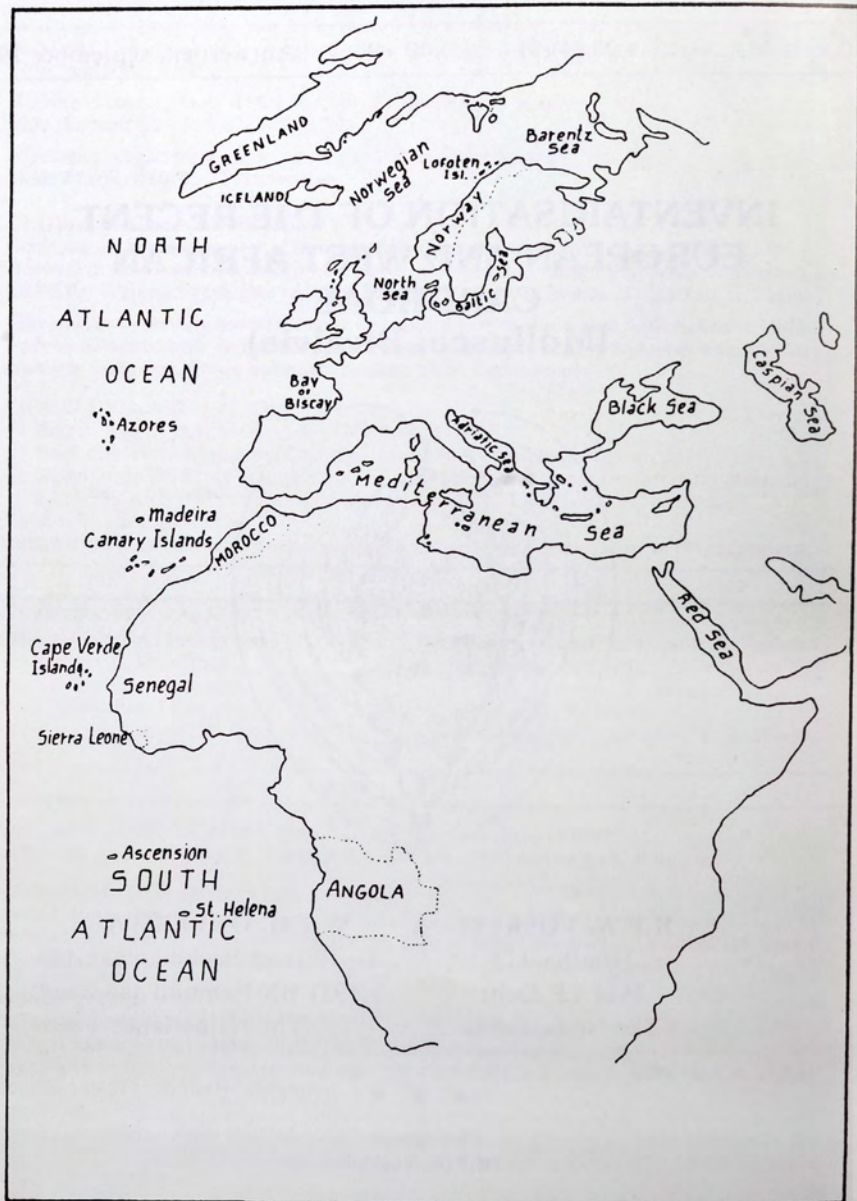


figure 1

On frontcover:  
 Living *Cardium indicum* Lamarck, 1819.

## INTRODUCTION

Our purpose is to give in this paper a summary of the recent species of Cardiidæ in the Eastern Atlantic Ocean. A total of 30 species is recognized and comment is given on several species which were previously assigned to this area by other authors.

The geographical area covered in this paper is as indicated in the map (figure 1).

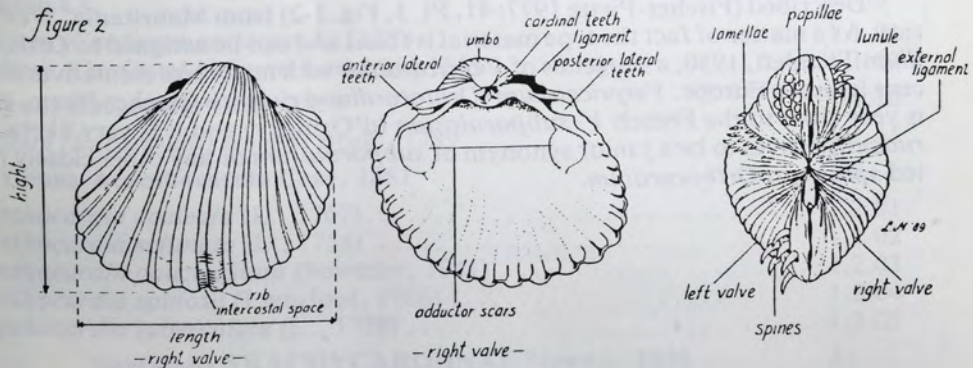
Cardiidæ of the European coasts and Western Africa are very well represented in collections but very little collecting has been done along the Northern African and Western Mediterranean coasts. For this reason we do not give distribution maps of each valid species but indicate their distribution range in the text.

### What is a Cardium?

It is very difficult to define a group of polymorph species such as the Cardiidæ. However this family has some constant characters which clearly separate Cardiidæ from other families in the geographical area under discussion:

- Entire pallial line and no pallial sinus
- External ligament
- Two cardinal teeth in both valves
- Radial sculpture
- Prominent umbos.

Species in Cardiidæ range in size from very small to very large and can be found in very different habitats. Most species covered in this paper can be found intertidally or can be obtained from fishermen.



**Which species are included?**

Included are all species which have been proved to live in the Eastern Atlantic. All species covered here can be found with reliable data in several collections.

**Which species are not included?**

Not included are species originally described from Eastern Atlantic waters, but in fact originate from other parts of the world; or species which are known from small samples or specimens with doubtful data.

Some species from the above mentioned group need some explanation:

***Laevicardium (Trachycardium) couvrili* Fischer-Piette, 1977**

Fischer-Piette (1977: 57, Pl. 5, Fig. 2) described this species from off Gabon, in 20 meters. Only the holotype is known. We believe this to be an Indo-Pacific *Trachycardium*, which opinion was confirmed by Mr. R. von Cosel (Pers. Comm.). In fact it is very close to the *Trachycardium impolitum* (Sowerby, 1841) from the Western Pacific.

***Laevicardium soyeri* Fischer-Piette, 1977**

The type material of this species, described by Fischer-Piette (1977: 19-20, Pl. 1, fig. 4-7), consists of a holotype and three paratypes. The holotype is presumed to be found on Corsica as the original label indicates. The three paratypes are without provenance. Subsequently we found two specimens of this remarkable species in the collection RMNH which originate from New Caledonia. As we consider it very doubtful that such a remarkable and rare species, we have only seen these 6 specimens, truly originates from the Mediterranean, we consider this an Indo-Pacific species. It is not difficult to imagine how specimens from New Caledonia, which was a French colony, could be mixed up with Mediterranean shells.

***Laevicardium (Vepricardium) rudentis* Fischer-Piette, 1977**

Described (Fischer-Piette 1977: 41, Pl. 3, Fig. 1-2) from Mauritania, West Africa. As a matter of fact the type material is fossil and can be assigned to *Orthocardium* Tremlett, 1950, a subgenus of *Vepricardium* with many representatives in Eocene layers in Europe. *Vepricardium (Orthocardium) rudentis* (Fischer-Piette, 1977) is very close to the French *V. subporulosum* (d'Orbigny) and it is very likely that *rudentis* proves to be a junior synonym of *subporulosum* or any other closely related species in *Orthocardium*.

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## ABBREVIATIONS

D	=	Coll. J. Drijver-Bennekom, The Netherlands
KBIN	=	Coll. Koninlijk Belgisch Instituut voor Natuurwetenschappen - Brussels, Belgium
MNHN	=	Coll. Museum National d'Histoire Naturelle - Paris - French
RNH	=	Coll. Rijksmuseum van Natuurlijke Historie - Leiden - The Netherlands
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## SYSTEMATIC INDEX

CLASS BIVALVIA LINNÉ, 1758  
FAMILY CARDIIDAE LAMARCK, 1809

Subfamily CARDIINAE Lamark, 1809	1
Genus <i>Cardium</i> Linné, 1758	1.1
<i>Cardium</i> s.s.	1.1.0
<i>Cardium (Cardium) costatum</i> L., 1758	1.1.01
<i>Cardium (Cardium) indicum</i> Lamarck, 1819	1.1.02
Subgenus <i>Bucardium</i> Gray, 1853	1.1.10
<i>Cardium (Bucardium) ringens</i> Brug., 1789	1.1.11
Genus <i>Acanthocardia</i> Gray, 1851	1.2
<i>Acanthocardia aculeata</i> (L., 1767)	1.2.01
<i>Acanthocardia echinata</i> (L., 1758)	1.2.02
<i>Acanthocardia paucicostata</i> (Sowerby, 1841)	1.2.03
<i>Acanthocardia spinosa</i> (Lightfoot, 1786)	1.2.04
<i>Acanthocardia tuberculata</i> (L., 1758)	1.2.05
Subfamily TRACHYCARDIINAE Stewart, 1930	2
Genus <i>Papyridea</i> Swainson, 1840	2.1
<i>Papyridea Soleniformis</i> (Brugière, 1789)	2.1.01

<b>Subfamily FRAGINAE Stewart, 1930</b>	3
<b>Genus Ctenocardia H. &amp; A. Adams, 1857</b>	3.1
( <i>Ctenocardia speciosa</i> (Adams & Reeve, 1850) .....	3.1.01
<b>Subfamily PROTOCARDIINAE Keen, 1951</b>	4
<b>Genus Lyrocardium Meek, 1876</b>	4.1
( <i>Lyrocardium aeolicum</i> (Born, 1780) .....	4.1.01
<b>Subfamily CERASTODERMATIINAE Nordsieck, 1969</b>	5
<b>Genus Cerastoderma Poli, 1795</b>	5.1
( <i>Cerastoderma edule</i> (L., 1758) .....	5.1.01
( <i>Cerastoderma glaucum</i> (Bruguère, 1789) .....	5.1.02
<b>Genus Cerastobyssum Petersen &amp; Russell, 1973</b>	5.2
( <i>Cerastobyssum hauniense</i> (Petersen & Russell, 1971) .....	5.2.01
<b>Genus Goethemia Lambiotte, 1979</b>	5.3
( <i>Coethemia elegantulum</i> (Beck in Möller, 1842) .....	5.3.01
<b>Genus Parvicardium Monterosato, 1884</b>	5.4
<b>Subgenus Parvicardium s.s.</b>	5.4.0
<i>P. (Parvicardium) exiguum</i> (Gmelin, 1791) .....	5.4.01
<i>P. (Parvicardium) minimum</i> (Philippi, 1836) .....	5.4.02
<i>P. (Parvicardium) pinnulatum</i> (Conrad, 1831) .....	5.4.03
<i>P. (Parvicardium) scabrum</i> (Philippi, 1844) .....	5.4.04
<i>P. (Parvicardium) scriptum</i> (B.D.D., 1892) .....	5.4.05
<i>P. (Parvicardium) siculum</i> (Sowerby, 1841) .....	5.4.06
<i>P. (Parvicardium) vroomi</i> A. M. & G., 1984 .....	5.4.07
<b>Subgenus Papillicardium Sacco, 1899</b>	5.4.10
<i>P. (Papillicardium) papillosum</i> (Poli, 1795) .....	5.4.11
<b>Subfamily LAEVICARDIINAE Keen, 1951</b>	6
<b>Genus Laevicardium Swainson, 1840</b>	6.1
( <i>Laevicardium oblongum</i> (Gmelin, 1791) .....	6.1.01
( <i>Laevicardium crassum</i> (Gmelin, 1791) .....	6.1.02
<b>Genus Fulvia Gray, 1853</b>	6.2
( <i>Fulvia caparti</i> (Nicklès, 1955) .....	6.2.01
( <i>Fulvia serrulata</i> (Deshayes, 1855) .....	6.2.02
( <i>Fulvia papyracea</i> (Bruguère, 1789) .....	6.2.03
<b>Subfamily CLINOCARDIINAE Kafanov, 1975</b>	7
<b>Genus Ciliatocardium Kafanov, 1974</b>	7.1
( <i>Ciliatocardium ciliatum</i> (Fabricius, 1780) .....	7.1.01
<b>Genus Serripes Gould, 1841</b>	7.2
( <i>Serripes groenlandicus</i> (Bruguère, 1789) .....	7.2.01



## SYSTEMATIC PART

Genus *Cardium* Linné, 1758

1.1.

Type-species: *Cardium costatum* L., 1758

Shell relatively thin. More or less gaping posteriorly.

Ribs strongly triangular. Median ribs of the typespecies hollow.

Left valve: two large cardinal teeth which are connected at their bases; one anterior lateral tooth, high and wedge-shaped, with a deep groove above; two posterior lateral teeth, ventral one wedge-shaped, dorsal one small and placed almost on the dorsal margin, divided by a deep groove.

Right valve: two cardinal teeth, high and erect, with a deep pit above; two anterior lateral teeth, ventral one high and lamellous, dorsal one lower and somewhat oblique; two posterior lateral teeth, ventral one high and lamellous, dorsal one placed almost on dorsal margin and very small, divided by a long slit.

Only three living species known.

1.1 Genus *Cardium* Linné, 1758***Cardium (Cardium) costatum* L., 1758**

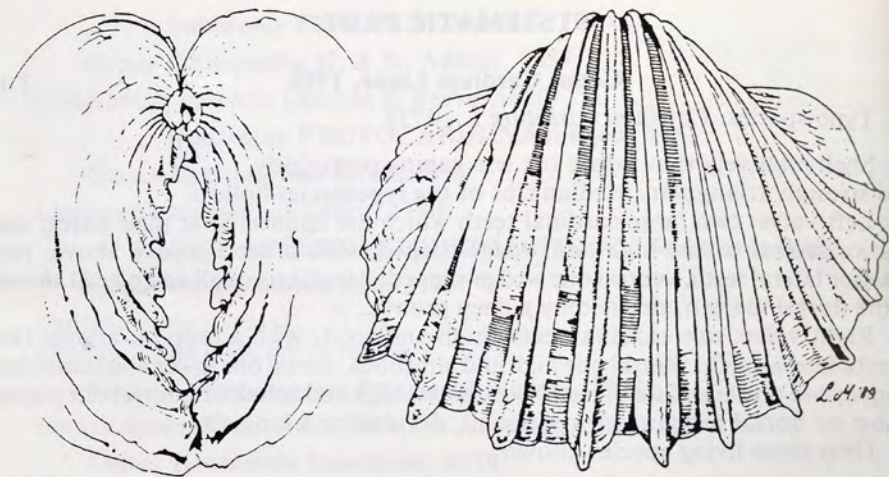
1.1.01

*Cardium costatum* Linné, 1758: 678, No. 58

Description: Shell large and relatively thin. Gaping posteriorly. Broad, flat ribs. The anterior three quarters of the shell contains ribs with hollow, elevated ridges while the posterior quarter of the shell has some lower, triangular ribs. A small area near the anterior-dorsal margin is almost completely smooth. Altogether this species has 16 to 18 clearly visible ribs. Colour dirty white with brown intercostal spaces on the posterior half of the shell. Large specimens reach about 10 cm. in length.

Distribution: Western Africa from Cape Verde Islands to Angola. Living in 10 m. to considerable depth.

Remarks: This is a remarkable species which can not be confused with any other living species. The hollow ribs easily separate *C. costatum* from *C. hians*.



1.1.01 *Cardium costatum* L., 1758

**Cardium (Cardium) indicum** Lamarck, 1819

1.1.02

1814 - *Cardium hians* Brocchi: 508, Nr. 12, Pl. 13, Fig. 6, (Non Spengler, 1799)

1819 - *Cardium indicum* Lamarck: species 2

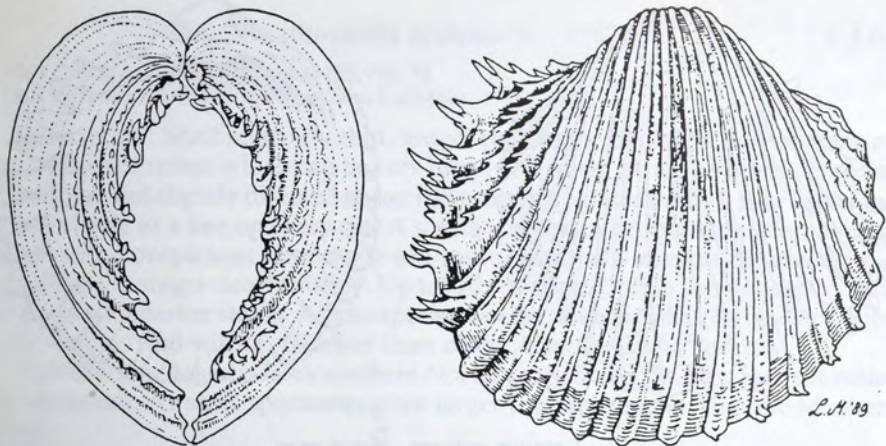
1866 - *Cardium darwini* Mayer: 69-71

1969 - *Ringicardium ringens* Brug., 1798' Nordsieck (Non Brugière, 1789)

**Description:** Shell large, up to 10 cm. long. Strongly gaping posteriorly. 19 to 23 pronounced triangular ribs. Anterior ribs less well developed and ornamented with long spines which are directed posteriorly. Hinge strong with high, erected teeth. Cardinal teeth are a little more rotated than the cardinal teeth of *C. costatum*. Colour dirty white, posterior quarter of shell purple. Most specimens have irregular rusty brown spots over the entire shell.

**Distribution:** Western Africa from Sierra Leone to Angola and the extreme southwestern part of the Mediterranean to Algeria. Lives from 40 to about 80 meters, always deeper than *C. costatum*.

**Remarks:** For many years the name *Cardium hians* was used for this species. *Cardium hians*, however, is preoccupied by *Cardium hians* Spengler, 1799. The next valid name for this species is *Cardium indicum* Lamarck, 1819.



1.1.02 *Cardium indicum* Lamarck, 1819

**Subgenus Bucardium Gray, 1853**

1.1.10

Type-species: *Cardium ringens* Bruguière, 1789

Shells smaller than nominal subgenus. Relatively heavier and more solid. Ribs almost smooth. Posterior ribs strongly digitate, almost no posterior gape.

One recent species.

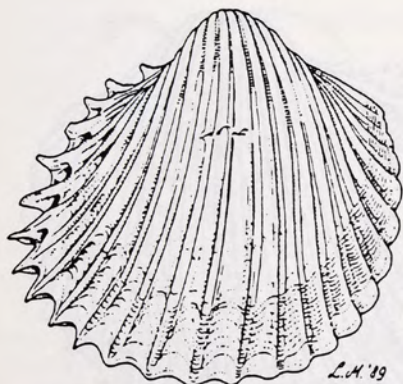
***Cardium* (*Bucardium*) *ringens* Bruguière, 1789**

1.1.11

Description: Shell relatively small and rounded, solid. 26 to 28 smooth, flattened ribs. Posterior 8 to 10 ribs form large projecting points which almost interlock. Intercostal spaces between these ribs carry low concentric ridges. Colour dirty white to yellow. Posterior quarter and lunula pink or magenta. Internal shell white with a pinkish hue near the posterior margin. Margin serrated, ribs hardly visible from within. Reaches about 5 cm.

Distribution: Western Africa from Senegal to Angola. 15 to about 100 m. deep.

Remarks: Easy to identify. Can only be confused with species from the Indo-Pacific genus *Vepricardium* which is a very close relative of *Cardium* and *Acanthocardia*.



1.1.11 *Cardium ringens* Brug. 1789

### Genus *Acanthocardia* Gray, 1845

1.2

Type-species: *Acanthocardia aculeata* (Linné, 1767)

Shells relatively large, thin but solid. Pronounced ribs with spines or papillae. Hinge almost identical with that of *Cardium*. The minor differences are:

Left valve: cardinal teeth equal and connected at their bases; ventral/posterior lateral tooth obscure; slit above the anterior lateral tooth less deep.

Right valve: anterior cardinal a little smaller than the posterior; dorsal/posterior lateral tooth absent.

Five recent species which are all covered here. *Sphaerocardium* Coen, 1933 and *Rudicardium* Coen, 1914 are junior synonyms of *Acanthocardia*.



1.2 Genus *Acanthocardia* Gray, 1851

**Acanthocardia aculeata** (L., 1767)

1.2.01

1767 *Cardium aculeatum* Linné: 1122, No. 781804 *Cardium spinosum* Sowerby (Non Lightfoot, 1786)

Description: Shell relatively thin, longer than high. 20 to 22 ribs with rows of sharp, flattened spines which can be very long posteriorly. Anterior spines broader and stubbier and slightly directed posteriorly. Spines connected by a very low ridge which is visible as a line on every rib. A similar ridge can be found on *A. echinata*. Surface with conspicuous concentric sculpture, most obvious on the intercostal spaces. Growth stages clearly visible. Up to 10 cm. long. Colour tan or deep brown, sometimes with darker stains. Albino specimens occur. Internal shell dirty white. Ribs clearly visible from within. Glossier than other *Acanthocardia* species.

Distribution: Atlantic from southern Norway to Morocco and through the entire Mediterranean. Atlantic specimens grow larger than specimens from the Mediterranean.

Remarks: Confusion with other species is almost impossible. Juvenile specimens can also be identified easily by their relatively high gloss and long spines.

1.2.01 *Acanthocardia aculeata* (L., 1767)**Acanthocardia echinata** (L., 1758)

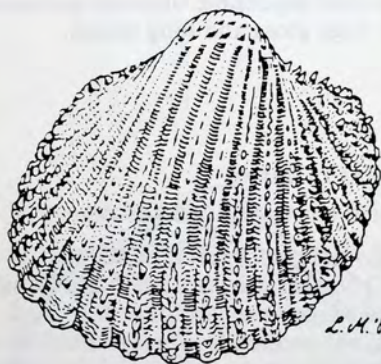
1.2.02

1758 - *Cardium echinatum* Linné: 679, No. 631791 - *Cardium mucronatum* Poli: 252 & 2581826 - *Cardium deshayesi* Payraudeau: 56, Pl. 1, Fig. 33-351834 - *Cardium crassispinosum* Sowerby: Fig. 281891 - *Cardium duregnei* "de Boury MSS" Monterosato: 21892 - *Cardium bullatum* Locard: 303 (Non Linné, 1758)

Description: Solid and heavy, about as long as high, 18 to 22 ribs with a row of coniform or lamelliform spines which are connected at their base by a low ridge. This ridge is visible as a line on every rib. Conspicuous but irregular concentric sculpture, growth stages clearly visible. Colour dirty white to tan. Often with prominent dark brown periostracum. Internal shell white, ribs clearly visible from within. Can reach 7 cm.

Distribution: Atlantic from Iceland and northern Norway to Morocco and through the entire Mediterranean. Subtidal to considerable depths.

Remarks: This species seems to be intermediate between *A. aculeata* and *A. tuberculata*. Specimens from the English and French Channel-coasts can hardly be separated from *A. tuberculata*. Specimens from the Mediterranean have been called *Cardium duregnei*, *C. mucronatum* and *C. deshayesi* but we can see no reason to separate them. On several Mediterranean localities specimens of different forms can be found as well as intermediates between them.



1.2.02 *Acanthocardia echinata* (L., 1758)

### ***Acanthocardia paucicostata* (Sowerby, 1841)**

1.2.03

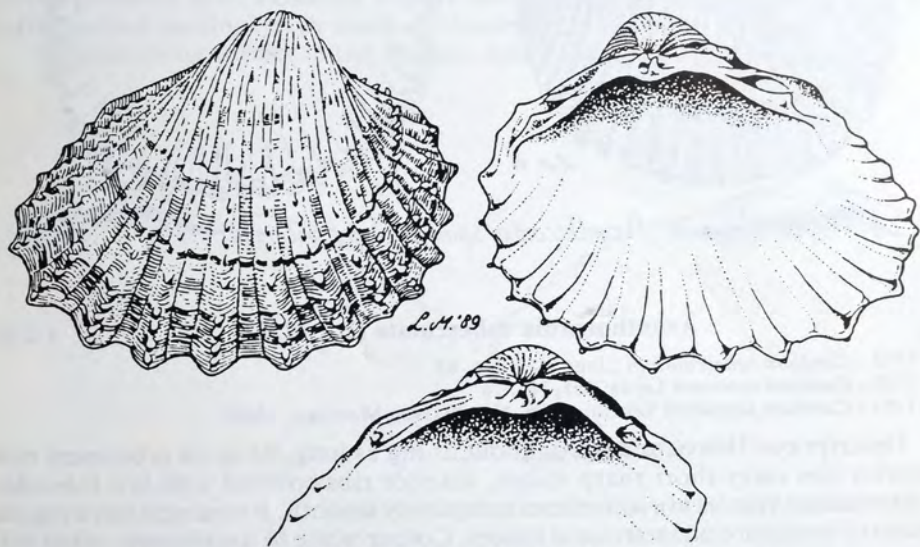
1758 - *Cardium ciliare* Linné: 679, No. 64 (Pro Parte)

1841 - *Cardium paucicostatum* Sowerby: 106

Description: Shell thin and relatively fragile, longer than high. 16 to 18 triangular ribs with low papillae or short spines. Concentric sculpture prominent, especially on the wide intercostal spaces. Colour dirty white to tan, sometimes whiter with darker concentric rays. Ribs clearly visible from within. Seldom longer than 5 cm., most specimens much smaller.

Distribution: Southern England and southern Brittany (France) to the Canary Islands and the Mediterranean. Subtidal to considerable depth.

Remarks: Adult specimens are easy to identify. Juveniles however are sometimes very hard to separate from juveniles of *A. echinata*.



1.2.03 *Acanthocardia paucicostata* (Sowerby, 1841)

### ***Acanthocardia spinosa* (Lightfoot, 1786)**

1.2.04

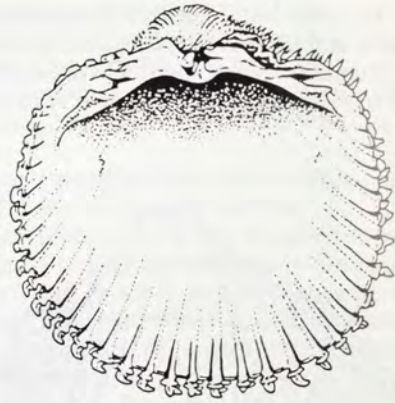
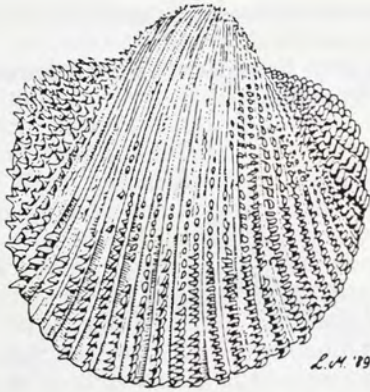
1786 - *Cardium spinosum* Lightfoot in Solander: 105

1819 - *Cardium erinaceum* Lamarck: species 15

Description: Shell solid and heavy, adults higher than long. 33 to 37 prominent, quadrate ribs. Posteriorly these ribs are covered with banded, relatively long and heavy spines. More anteriorly these spines get shorter and stubbier and are converted into a kind of wraths on the 8 to 12 most anterior ribs. Spines not connected by a low ridge as in *A. aculeata* and *A. echinata*. Concentric sculpture clearly visible on intercostal spaces. Shell lightly glossy. Colour brown sometimes with lighter concentric bands. Albinos not uncommon. Large specimens reach 9 cm.

Distribution: This is a Mediterranean species. Can also be found on the Portuguese Algarve coasts.

Remarks: Its high ribcount easily separated this species from the other *Acanthocardia* species. Perfect specimens are real collector items and belong to the most beautiful Cardiidae species known.



1.2.04 *Acanthocardia spinosa* (Lightfoot, 1786)

***Acanthocardia tuberculata* (L., 1758)**

1.2.05

1758 - *Cardium tuberculatum* Linné: 679, No. 65

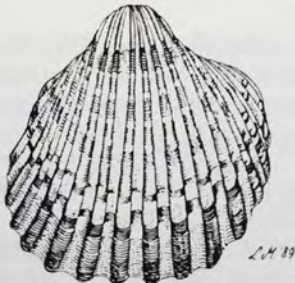
1758 - *Cardium rusticum* Linné: 681, No. 78

1791 - *Cardium fasciatum* Gmelin: 3256, No. 49 (Non Montagu, 1808)

Description: Heavy and solid, about as high as long. 21 to 24 prominent ribs. Posterior ribs carry short sharp spines, anterior ribs covered with low tubercles. Mediterranean species are sometimes completely smooth. Prominent but irregular concentric sculpture on intercostal spaces. Colour white to dark brown, often with lighter concentric bands. Albinos not uncommon. Internal shell dirty white. Margin serrated. Ribs not visible from within. Length to about 7 cm.

Distribution: From southern England and Brittany (France) to the Canary Islands and the Mediterranean. Subtidal to about 100 m.

Remarks: Specimens from Southern England and Western France can be difficult to separate from *A. echinata*. *A. echinata* however has a low ridge on every rib which is absent on *A. tuberculata*.



1.2.05 *Acanthocardia tuberculata* (L., 1758)



## Subfamily TRACHYCARDIINAE Stewart, 1930

2

Genus *Papyridea* Swainson, 1840

2.1.

Type-species: *Papyridea soleniformis* (Bruguière, 1789)

Shell broadly subelliptical, gaping at both ends. Posterior portion of shell longer than anterior. Numerous flattened or triangular ribs which are larger and coarser on the posterior side. Posterior margin serrated. On large cardinal tooth in each valve, second cardinal teeth small or obsolete. Lateral teeth strong.

Several living species in the Atlantic and Eastern Pacific Oceans.

2.1 Genus *Papyridea* Swainson, 1840***Papyridea soleniformis* (Bruguière, 1789)**

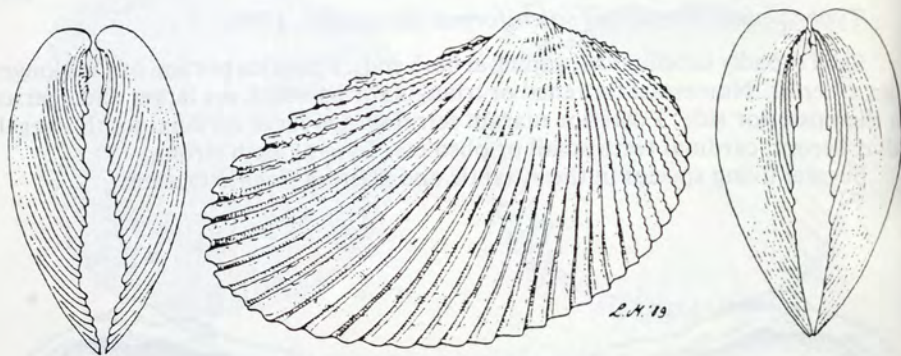
2.1.01

1787 - *Cardium hiatus* Meuschen: 442 (Rejected Work, I.C.Z.N.)1787 - *Cardium spinosum* Meuschen: 442 (Rejected Work, I.C.Z.N.) (Non *spinosum* Lightfoot, 1786)1789 - *Cardium soleniforme* Bruguière: 235

Description: Shell thin and fragile, strongly inaequilateral. Gaping strongly at both ends. 40 to 55 oblique ribs with minute low lamellae that create a file-like structure. Posteriorly the spines are much more developed than anteriorly. Colour white with many minute yellow or purple blotches. Interior colour white with the coloured blotches showing through. Large specimens can reach a length of 45 mm.

Distribution: From North Carolina to Brazil in the Western Atlantic. We have seen specimens from Cape Verde Islands and Angola.

Remarks: This is one of the many Caribbean species which has been found to live also in West-African waters. As there is no other species like this one in West-African waters, identification is very simple.



2.1.01 *Papyridea soleniformis* (Brug. 1789)

**Subfamily FRAGINAE Stewart, 1930**

3

**Genus *Ctenocardia* H. & A. Adams, 1857**

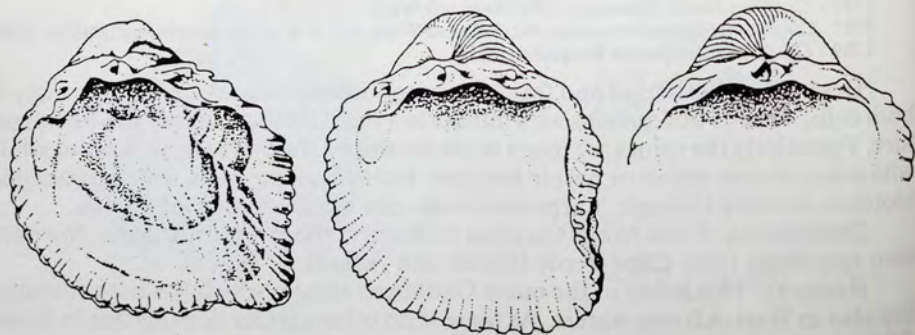
3.1.

Type-species: *Ctenocardia symbolicum* (Iredale, 1929)

Shell quadrate and inflated. Posterior margin straight or curved. Umbonal keel prominent, demarcating a slightly concave posterior area. Left cardinal unequal, widely separated. Single left anterior and left posterior lateral teeth. Two right anterior and two right posterior lateral teeth.

Presence of two posterior lateral teeth in the right valve clearly separate *Ctenocardia* from any other genus in Cardiidae. *Americardia* Stewart, 1930 is a junior synonym.

About ten species in the Atlantic, Pacific and Indian Ocean.



3.1 Genus *Ctenocardia* H & A. Adams, 1857



*C. media* (L., 1758)



3.1.01 *Ctenocardia speciosa* (Adams & Reeve, 1850)

***Ctenocardia speciosa* (Adams & Reeve, 1850)**

3.1.01

1850 - *Cardium speciosum* Adams & Reeve: 77, Pl. 22, Fig. 9.

**Description:** Shell heavy and solid. Higher than long. About 32 ribs with low, transverse lamellae from the anterior margin to the umbonal keel. Posterior slope almost smooth. Anterior margin rounded. Posterior margin strongly curved. Shell having a very oblique outline. Umbos very high and prominent. Umbonal keel strongly defined. Hinge typical for genus. Colour dirty white small brown spots, more dense near the umbones. Up to about 3 cm. high.

**Distribution:** St. Helena Island, Central Atlantic. It is said to be an intertidal species.

**Remarks:** We cover this species in this paper because St. Helena is neglected in papers on the Cardiidae of the Western Atlantic Ocean. *C. speciosa* is very close to the Caribbean *C. media* (L., 1758). It could eventually be a subspecies of *C. media*. We have seen few specimens of this remarkable species which is always separable from *C. media* by having fewer ribs, a more oblique outline and lighter colour. Rosewater (1975: 33) lists *C. media* from Ascension Island. It is not clear if this is *C. speciosa*, *C. media* or maybe an Intermediate of the two. If intermediates between the two species can be found on Ascension Island it would be an argument for considering *speciosa* a subspecies.

**Subfamily PROTOCARDIINAE Keen, 1951**

4

**Genus *Lyrocardium* Meek, 1876**

4.1

Type-species: *Lyrocardium lyratum* (Sowerby, 1841)

Shell rounded, no umbonal keel. External sculpture very distinct. Radial ribs present on posterior part of shell. Anterior part with obsolete radial ribs but with very prominent oblique ridges. Shell smooth, type-species with a very prominent purple periostracum. Ventral margin serrate, serrations tightly interlocking.

**Right valve:** Two cardinal teeth, connected at their bases, erect, ventral cardinal higher; two anterior lateral teeth, ventral one strong, dorsal one very small, separated by a deep slit; one posterior lateral tooth.

Left valve: Two cardinals, unequal, anterior one high, posterior one small, separated by a deep pit; one anterior lateral tooth, high and triangular; one very small posterior lateral tooth.

**Lyrocardium aeolicum** (Born, 1780)

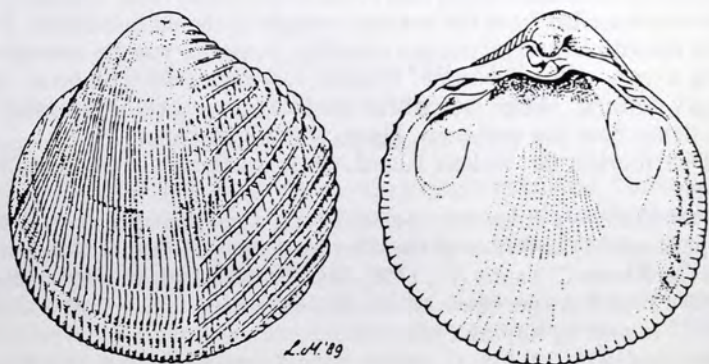
4.1.01

1780 - *Cardium aeolicum* Born: 48

Description: Shell rounded and solid. Many low radial ribs visible, except on extreme posterior part of shell, which is completely smooth. Very prominent ridges on anterior part which are also clearly visible because of their darker colour. Lunule well defined and erect. Colour dirty yellow with large blotches and streaks of brown to purple giving the shell an orange appearance. Margin serrated and interlocking. Hinge typical for genus. Up to 5 cm.

Distribution: Canary Islands. Western Africa from Cape Verde Islands to Angola. From 20 m. and deeper.

Remarks: This has been called *Cardium pectinatum* L., 1758 by many authors. In our opinion this must be considered a Nomen Dubium. *Cardium aeolicum* Born, 1778 is a Nomen Nudum.



4.1.01 *Lyrocardium aeolicum* (Born, 1780)

**Subfamily CERASTODERMATIINAE** Nordsieck, 1969

5

Genus *Cerastoderma* Poli, 1795

5.1

Type-species: *Cerastoderma edule* (L., 1758)

Shells with prominent ribs with low transverse rugae.

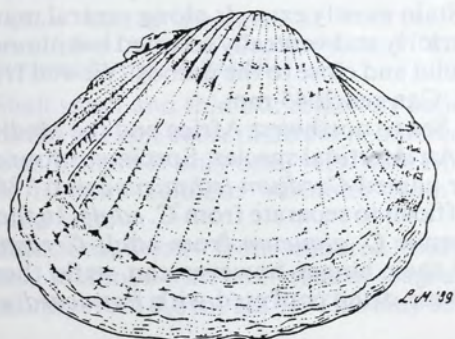
Left valve: two cardinal teeth, connected dorsally; one anterior lateral tooth, fairly high and wedge-shaped; one posterior lateral tooth.

Right valve: two cardinal teeth, anterior one small, posterior one large and erect; two anterior lateral teeth with a deep slit between them; two posterior lateral teeth, ventral one large and wedge-shaped, dorsal one much smaller.

Two living species.

5.1 Genus *Cerastoderma* Poli, 1795

5.1.01

5.1.01 (*Cerastoderma edule* (L., 1758))***Cerastoderma edule* (L., 1758)**

5.1.01

1758 - *Cardium edule* Linné: 681, No. 77

**Description:** Shell solid, adults longer than high. Sometimes almost circular. Juveniles are always rounded and circular. Shape and structure of shell vary extremely in relationship to their natural habitat. 22 to 29 prominent but flat ribs, covered with low, transverse rugae. Growth stages prominent. Narrow intercostal spaces almost smooth. Colour dirty white to tan. Internal shell white with a brown stain around the posterior muscle scar and the posterior margin. Sometimes very slightly gaping posteriorly. Margin serrated. Ribs clearly visible from within but incised only near the margin. Ligament prominent and long, clearly visible when viewed from the shells side. Large specimens reach 6 cm.

**Distribution:** Western Barentsz Sea to Senegal and the extreme western part of the Mediterranean. This is an intertidal species. Replaced in the Mediterranean by *Cerastoderma glaucum*.

**Remarks:** There is much confusion about the Atlantic *Cerastoderma* species. In fact it is very easy. *Cerastoderma edule* is an inhabitant of intertidal areas with a constant supply of fresh water. *Cerastoderma glaucum* lives in shallow lagunes without tidal influences and with higher water-temperature. Juvenile specimens can be difficult to identify.

**Cerastoderma glaucum** (Bruguière, 1789)

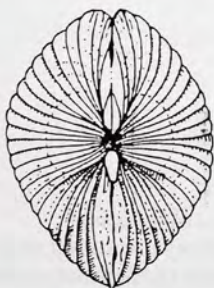
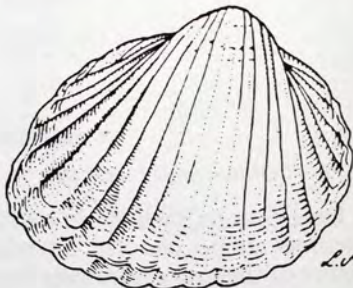
5.1.02

1789 - *Cardium glaucum* Bruguière: 221, No. 141845 - *Cardium lamarckii* Reeve: Pl. 18, No. 93 (Non Orbigny in De La Sagra, 1846, non Coen, 1915)1869 - *Cardium isthmicus* Issel: 74-761985 - *Cerastoderma nunninkae* Lucas

Description: Shell thin but quite solid. Adults extremely inaequilateral and longer than high. 22 to 28 ribs. Intercostal spaces a little wider than in *C. edule*. Ribs low, particularly on posterior slope. Ribs with very low but clearly palpable rugae which can be so wide that they touch on the intercostal spaces. Growth stages prominent. Colour dirty white to greenish, always darker posteriorly. Colour around growth stages darker so that they look even more prominent. Inside white with a dark stain around the posterior muscle scar and the posterior margin, almost always larger than in *C. edule*. Stain mostly extends along ventral margin. Slightly gaping posteriorly. Margin anteriorly and ventrally serrated but almost straight posteriorly. Ligament short and solid and close to the umbos. Viewed from the sides the ligament is almost invisible. Can reach 45 mm.

Distribution: Baltic Sea to northwest Africa and the Mediterranean, including Black and Caspian Sea. An intertidal species. Specimens found in the Gulf of Suez (northern Red Sea) were named *Cardium isthmicus* Issel, 1869.

Remarks: Can be difficult to separate from *C. edule*. In the Baltic Sea problems can arise separating juvenile *C. glaucum* from adult *Cerastobysus hauniense*. Careful examination of their hinges however can settle these problems. In the Mediterranean juveniles are often confused with *Parvicardium scriptum*. (1892).

*edule**glaucum*

L.M. 89

5.1.02 (*Cerastoderma glaucum* (Brug. 1789))**ALISTAIR MONCUR***Worldwide Specimen Shells & Native Crafts*

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**Genus *Cerastobysum* Petersen & Russell, 1973**

5.2

Type-species: *Cerastobysum hauniense* (Petersen & Russell, 1971).

Shell small and rounded, almost smooth. Only one right anterior lateral tooth instead of two in *Parvicardium*. Only one right posterior lateral tooth instead of two in *Cerastoderma*.

*Balticardium* Lambiotte, 1979 is a junior synonym.

One living species.

***Cerastobysum hauniense* (Petersen & Russell, 1971)**

5.2.01

1958 - *Cardium exiguum* "Gmelin" Petersen: 1-31

1962 - *Parvicardium exiguum* "Gmelin" Ziegelmeier: 16, Pl. 8, Fig. 1

1971 - *Cardium hauniense* Petersen & Russell: 11

Description: Shell small and thin but relatively solid, longer than high. 23 to 27 almost smooth ribs. In some cases there are no intercostal spaces between some ribs so that it looks as if there is only one, very wide rib. Growth stages obvious. Never longer than 10 mm.. Colour variable; from white to almost black. Periostracum thin and yellow.

Distribution: Baltic Sea. Known from scattered locations in southeast Denmark and northern Poland. It climbs with its byssus in seagrass. From 0,5 to 37 meters deep in water with salinity from 0,6 to 1,2 ‰. This may be considered a real brackish water species.

Remarks: After being called *Parvicardium exiguum* by several authors for many years, it was described as new in 1971. It can be very difficult to separate this species from juvenile *Cerastoderma glaucum*, with which it lives at least partly sympatric.



5.2.01 *Cerastobysum hauniense* (Pet. & Russ., 1971)

**Genus *Goethemia* Lambiotte, 1979**

5.3.

Type-species: *Goethemia elegantulum* (Beck in Möller, 1842).

Shell small. Strong ribs with prominent sculpture.

Left valve: two small cardinal teeth; one anterior lateral tooth; one posterior lateral tooth, the remains of a second rudimentary posterior lateral tooth still faintly visible.

Right valve: two very small cardinal teeth; two anterior lateral teeth; one posterior lateral tooth.

Only one recent species.

***Goethemia elegantulum* (Beck in Möller, 1842)**

5.3.01

1842 - *Cardium elegantulum* Beck in Möller: 93

1969 - *Vepricardium elegantulum* "Beck" Nordsieck: 103, Pl. 15, Fig. 57.00

Description: Shell small but solid. Larger than high. 22 to 28 strong ribs covered with compact oblique riblets.

Colour dirty white, Internal shell glossy white. Ribs clearly visible from within. Periostracum thin and hardly visible. Never longer than 14 mm.

Distribution: Northern and western Norway, Lofotes, Greenland and northeast North America. Sars (1878: 47) indicates as depths 30 to 50 feet while Nordsieck indicates 25 tot 470 meters.

Remarks: This is a poorly known and relatively rare species. It is not a species in *Vepricardium* as indicated by Nordsieck.





**Genus *Parvicardium* Monterosato, 1884**

5.4

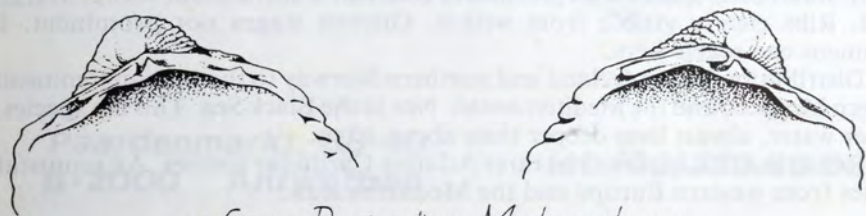
Type-species: *Parvicardium siculum* (Sowerby, 1841)

Shell small to very small. Umbonal keel mostly present. Ribs with prominent sculpture.

Left valve: two cardinal teeth of equal height, separated by a triangular pit; one anterior lateral tooth, low and long, one posterior lateral tooth, almost on dorsal margin and stubby.

Right valve: two cardinal teeth, posterior much larger than anterior; two anterior lateral teeth, ventral one large and wedge-shaped, dorsal one small and almost on dorsal margin; one posterior lateral tooth, low and elongated.

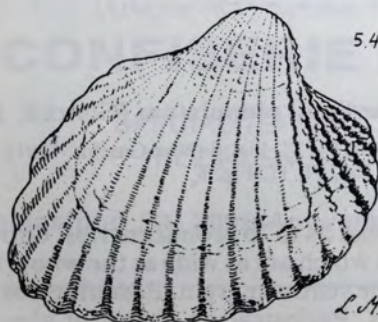
Many species in the Atlantic Ocean and the western Indian Ocean.

5.4 *Genus Parvicardium Monterosato, 1884****Parvicardium (Parvicardium) exiguum* (Gmelin, 1791)**

5.4.01

1791 - *Cardium exiguum* Gmelin: 3255, No. 371799 - *Cardium pygmaeum* Donovan: 32, Fig. 31892 - *Cardium exiguum* var. *hirta* Bucquoy, Dautzenberg & Dollfus: 282, Pl. 45, Fig. 78

Description: Shell small and very solid. 20 to 22 prominent ribs, carrying papillae posteriorly. Ribs often with narrow, regularly ordered incisions at their sides. These are on the ribs and not on the intercostal spaces which are very narrow. On large, adult, specimens all sculpture might be worn off. Shell with prominent umbonal keel, especially in adults. Colour milky white to dirty tan. Periostracum thin and brown. Internal shell white or light green, sometimes with some small brown spots. Ribs not visible from within. This species can attain 20 mm. of length.

5.4.01 *Parvicardium exiguum* (Gmelin, 1791)

L.H. '89

Distribution: From Norway to Gibraltar. It is uncertain if *P. exiguum* exists in the Mediterranean. All specimens we have seen up to now proved to be *P. siculum* or *P. scriptum*. Lives from low water mark to 50 m deep.

Remarks: Not difficult to identify but be very careful with specimens from the Mediterranean.

**Parvicardium (Parvicardium) minimum** (Philippi, 1836) 5.4.02

1836 - *Cardium minimum* Philippi: 51

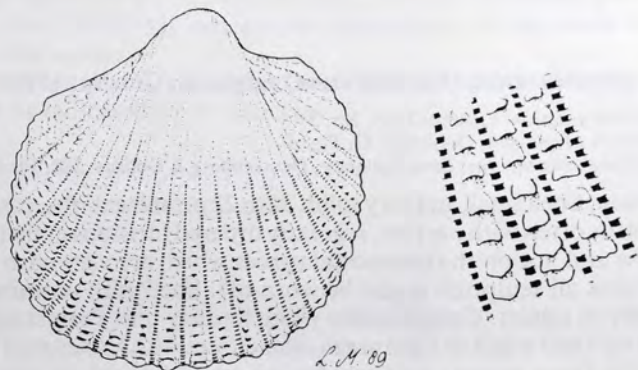
1846 - *Cardium suecicum* "Reeve" Loven: 190

1879 - *Cardium perrieri* Dautzenberg & Fischer: 211, Pl. 6, Fig. 17

Description: Shell thin and fragile. Rounded and bulbous. 28 to 32 prominent ribs which carry a single or rarely a double row of sharp lamellae. The shell looks rough. Intercostal spaces with prominent concentric slit. Colour white. Margin serrated. Ribs clearly visible from within. Growth stages not prominent. Large specimens can reach 1 cm.

Distribution: From Iceland and northern Norway to the Iberian Peninsula and western Morocco and the Mediterranean. Not in the Black Sea. This is a species from deeper water, alwast lives deeper than about 10 m.

Remarks: This is one of the rarer Atlantic Cardiidae species. An unmistakable species from western Europe and the Mediterranean.



5.4.02 *Parvicardium minimum* (Philippi, 1836)

**Parvicardium (Parvicardium) pinnulatum** (Conrad, 1831) 5.4.03

1803 - *Cardium fasciatum* Montagu: 30, Pl. 27, Fig. 6 (Non Gmelin, 1791)

1831 - *Cardium pinnulatum* Conrad: 260, Pl. 11, Fig. 8

1841 - *Cardium ovale* Sowerby: 2

Description: Shell small and solid. 24 to 26 prominent ribs. Growth stages clearly visible. Anterior ribs with lamellae which are as wide as the whole ribs. Median ribs with the same sculpture only near the ventral margin. Posterior ribs with small spines which are less wide than these ribs. Periostracum absent or almost absent. Inter-

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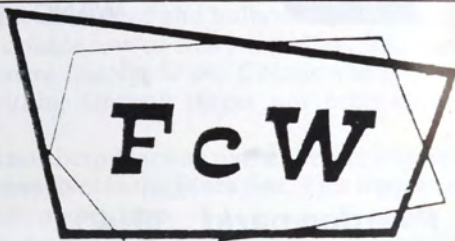
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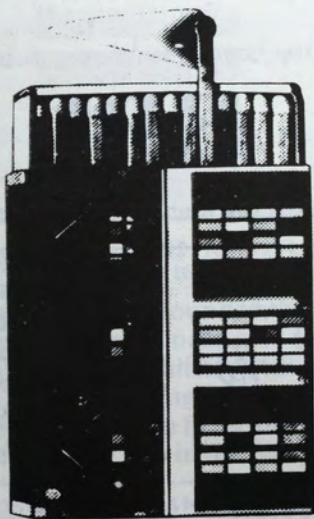


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costal spaces smooth. Ribs clearly visible from within. Colour dirty white to light brown with irregular dark spots. Internal shell white or creamy-orange. Seldom exceeds 10 mm.

Distribution: From Iceland and Moermansk to southern Norway and northern Scotland. From Labrador to North Carolina in the Western Atlantic (Fide Clench & Smith, 1944: 13)

Remarks: We doubt if the distribution of *P. ovale* extends further south in the Eastern Atlantic. All specimens from more southern localities we have seen proved to be other *Parvicardium* species. Considering its northern range it is very difficult to misidentify this species. Problems could eventually arise in localities where *P. ovale* and *P. scabrum* live sympatric.



5.4.03 *Parvicardium pinnulatum* (Conrad, 1831)

**Parvicardium (Parvicardium) scabrum** (Philippi, 1844) 5.4.04

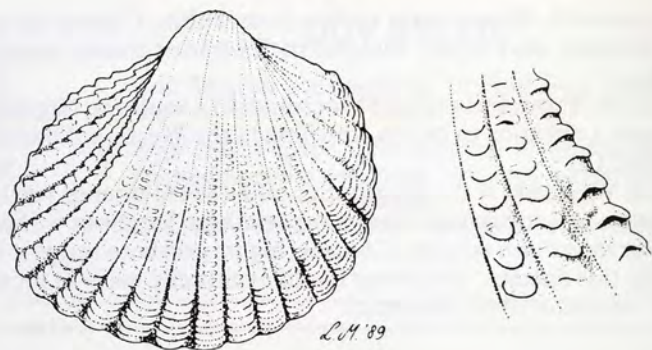
1822 - *Cardium nodosum* "Montagu" Turton, 1822: 186, Pl. 13, Fig. 8 (Non Montagu, 1803)

1844 - *Cardium scabrum* Philippi: 38, Pl. 14, Fig. 16

Description: Shell small but solid. Less rounded than *P. pinnulatum*. 24 to 28 ribs covered with cusp like spines. Fresh specimens with a brown thin periostracum. Colour dirty white to pinkish. Internal shell white or with some small coloured spots. Ribs not visible from within. Can reach a length of 18 mm.

Distribution: From Norway to the Iberian Peninsula, Morocco, Canary Islands and Madeira. Rarely in the Mediterranean, not in the Black Sea. From 9 to 740 meters (Fide Nordsieck, 1969).

Remarks: Ziegelmeier (1962: Plate 7, Fig. 5 & Plate 8, Fig. 2) illustrated *P. pinnulatum* and *P. scabrum*. These photographs clearly show the differences between these two species. A species in Veneridae, *Timoclea ovata* (Pennant, 1777) is commonly confused with *P. scabrum*. *Timoclea ovata* however has a completely different hinge and a pallial sinus.



5.4.04 *Parvicardium scabrum* (Philippi, 1844)

***Parvicardium (Parvicardium) scriptum* (B.D.D., 1892)**

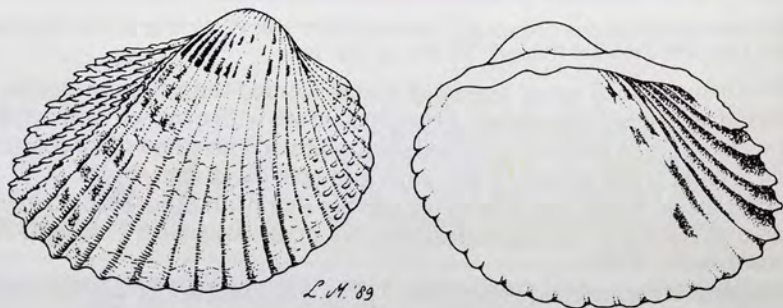
5.4.05

1892 - *Cardium exiguum* var. *scripta* Bucquoy, Dautzenberg & Dollfus: 283, Pl. 45, Fig. 13-18

Description: Shell small and solid with 25 to 28 ribs. Intercostal spaces with prominent transverse incisions. Anterior ribs with small papillae, posterior ribs with roof-like lamellae. A very slight umbonal keel. Colour dirty white, posterior part of shell much darker, from bluish grey to brown, red and almost black. Internal colours same as external colours. Ribs clearly visible from within. This is a small species, never attaining a greater length than about 12 mm.

Distribution: Mediterranean, Portuguese Algarve and the Canary Islands. In shallow water on and under stones.

Remarks: A poorly known species. In fact this is the most common Mediterranean *Parvicardium* species. Hinge and intercostal sculpture clearly separated this species from juvenile *Cerastoderma edule*. Mr. G. Mulder reported this species from northeast Spain in 1.5 m. spun with a byssus under stones.



5.4.05 *Parvicardium scriptum* (B.D.D., 1892)



**Parvicardium (Parvicardium) siculum** (Sowerby, 1841) 5.4.06

1844 - *Cardium parvum* "Mawe" Philippi: 39, Pl. 14, Fig. 17 (Non Da Costa, 1778, Non Mawe, 1823, Non Sowerby, 1841)

1845 - *Cardium stellatum* Reeve: Pl. 20, No. 109

1892 - *Cardium exiguum* var. *commutata* Bucquoy, Dautzenberg & Dollfus: 282-283, Pl. 45, Fig. 9-12

1978 - *Parvicardium exiguum* "Gmelin" Angelo & Gargiullo: 191.

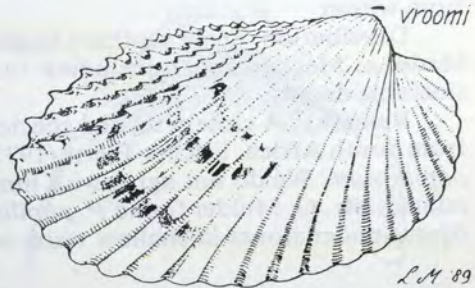
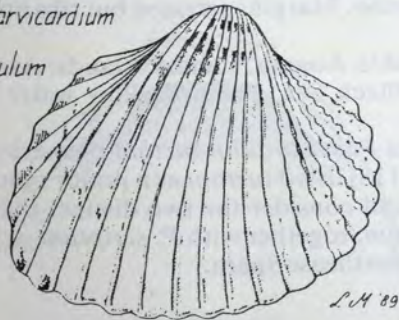
Description: Shell small and relatively thin. 20 to 24 ribs., Intercostal spaces smooth. Anterior 4 to 6 ribs carry irregular stubby spines with a broad base. Ligament short and sunken. Margin from strongly serrated posteriorly to almost smooth anteriorly. Umbonal keel present but not sharply defined as in *P. exiguum*. Ribs clearly visible from within. Shell looks thin and almost transparent. Colour highly variable: from dirty white with greenish spots almost black. Red specimens occur. Periostracum thin but present. Internal colour identic to external colour. Posterior slope usually with darker colour than rest of the shell. Length to about 20 mm.

Distribution: Mediterranean and probably the Black Sea. This species lives in shallow bays and lagunes. Very common in the étangs in southern France. Not known from any Atlantic locality.

Remarks: Often named *Cardium subangulatum* Scacchi, which is a Nomen Nudum. This species is always considered as a form of *Parvicardium exiguum*. It is so distinct from *P. exiguum* so we have no doubt that it is a valid species.

5406 *Parvicardium*

*siculum*



*vroomi*

**Parvicardium (Parvicardium) vroomi** A.M.G., 1984 5.4.07

1855 - *Cardium transversale* Deshayes: 333 (non Römer, 1849)

1984 - *Parvicardium vroomi* Aartsen, Menkhorst & Gittenberger: 67-68, No. 394

Description: Shell small and fragile. Oblong and flat. Length 1.5 times height. 23 to 25 prominent ribs, covered posteriorly with sharp, long spines. Ribs clearly visible from within. Intercostal spaces with many concentric grooves. Not longer than about 6 mm. Colour variable, from almost white to dark brown, but never with one solid colour, always with spots or stains.

Distribution: Western Mediterranean, Canary Islands and Azores. This is a species from deeper water but it is quite common in shellgrit in the Bay of Algeiras, southern Spain.

Remarks: Known as *Parvicardium transversale* or even *Papyridea transversale* (Nordsieck, 1969) Its hinge clearly identifies this species as a *Parvicardium* Can be confused with *P. scriptum*. According to Aartsen et al (1984: 67) the hinge of *vroomi* looks more curved than that of *P. scriptum*.

**Subgenus Papillicardium Sacco, 1899**

5.4.10

Type-species: *Parvicardium papillosum* (Poli, 1795)

Small and more rounded than *Parvicardium s.s.* Hinge identical. Ribs covered with raindrop-like papillae. Intercostal spaces with prominent concentric slits. Few recent species in the Eastern Atlantic and western Indian Oceans.

**Parvicardium (Papillicardium) papillosum** (Poli, 1795)

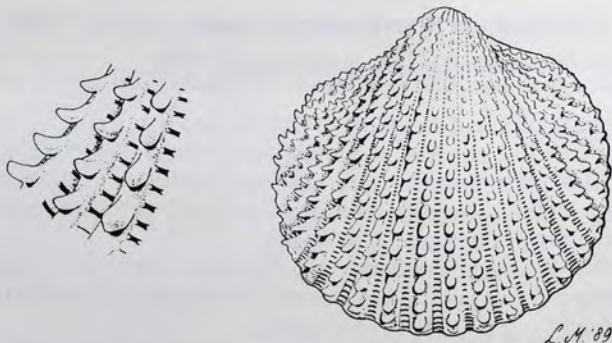
5.4.11

1795 - *Cardium papillosum* Poli: Plate 16, fig. 2-41804 - *Cardium planatum* Renier: 6, No. 731814 - *Cardium punctatum* Brocchi: 666, Pl. 16, Fig. 111826 - *Cardium polii* Payraudeau: 571977 - *Corculum auri* Fischer-Piette: 126-127, Fig. 10

Description: Shell small but very solid. 24 tot 27 prominent ribs, covered with drop-like papillae. These papillae get more pointy near the anterior and posterior extremes of the shell. Intercostal spaces with clearly visible concentric slitches. Growth stages hardly visible. Rarely larger than about 15 mm. Colour dirty white or yellowish, sometimes red. Internal shell smooth and white, sometimes with some red or purple stains, especially near the umbo. Margins serrated but ribs not visible from within.

Distribution: From southern England to Angola, Canary Islands, Azores and Madeira. Mediterranean including the Black Sea. From shallow water to considerable depths.

Remarks: A closely related species is *Parvicardium turtoni* (Sowerby, 1894) from South Africa. Fischer-Piette (1977: 118) listed *turtoni* as a junior synonym of *papillosum*. We do not agree with him and consider the two distinct but closely related. Mr. G. Mulder found *P. papillosum*, together with *P. scriptum*, spun with byssus under stones in shallow water in northeast Spain.

5.4.11 *Papillicardium papillosum* (Poli, 1795)

## Subfamily LAEVICARDIINAE Keen, 1951

6

Genus *Laevicardium* Swainson, 1840

6.1.

Type-species: *Laevicardium oblongum* (Gmelin, 1791)

Shell relatively large, higher than long. Strongly egg-shaped to rounded triangular. More or less prominent ribs on the central part of the shell, posterior and anterior parts almost smooth.

Right valve: two cardinal teeth, ventral one large and erect, dorsal one smaller and almost on dorsal margin, with a deep pit anteriorly, almost near the dorsal margin; one posterior lateral tooth, large and wedge-shaped with a deep groove above; two anterior lateral teeth, ventral one large and lamellous, dorsal one small and almost on dorsal margin, separated by a deep slit.

Left valve: two cardinal teeth, anterior one large and high, posterior one small and wedge-shaped, separated by a deep pit; one posterior lateral tooth, not very large and almost on dorsal margin, sometimes ventrally impressed; one large anterior lateral tooth, wedge-shaped with a long groove above.

Many species worldwide. The largest Cardiidae species is a *Laevicardium*: *L. elatum* (Sowerby, 1833) which can get 17 cm. high and lives in the Panamic fauna-province.



6.1 Genus *Laevicardium* Swainson, 1840

***Laevicardium oblongum* (Gmelin, 1791)**

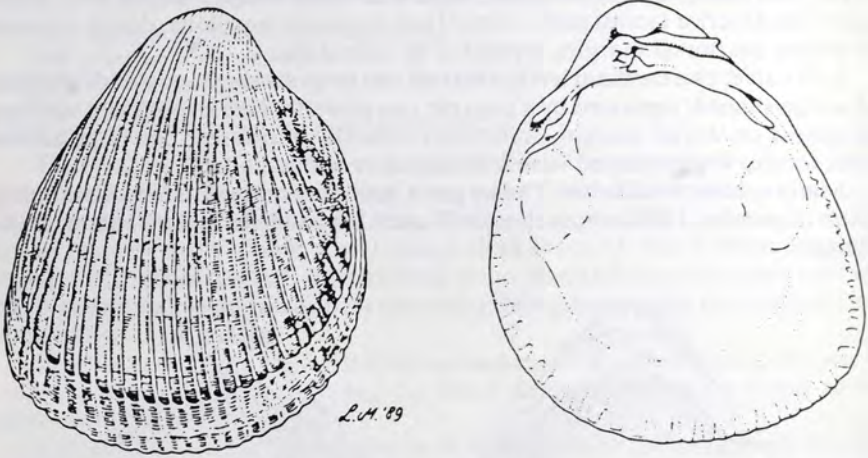
6.1.01

1791 - *Cardium oblongum* Gmelin: 3254, No. 341819 - *Cardium sulcatum* Lamarck: *Cardium* species 24

Description: Shell heavy and solid, higher than long. Oviform and rounded. 25 to 29 ribs on the central part of the shell. Posterior part almost smooth. Growth stages prominent. Large specimens can attain 8 cm. of height. External colour dirty white with a dark red-brown periostracum which is much more prominent than in *L. crassum*. Internal shell white and smooth.

Distribution: Mediterranean, Canary Islands and western Morocco. From 4 to 200 meters.

Remarks: Juveniles can be very close to juvenile *L. crassum*. Specimens from the Portuguese Algarve-coast and southeast Spain can cause many problems. It is not impossible that *L. oblongum* and *L. crassum* interbreed in these areas which would be an argument for considering them subspecies of one valid species; *Laevicardium oblongum oblongum* (Gmelin, 1791) and *L. oblongum crassum* (Gmelin, 1791). More research has to be done however before this can be settled.



6101 *Laevicardium oblongum* (Gmelin, 1791)

***Laevicardium crassum* (Gmelin, 1791)**

6.1.02

1799 - *Cardium norvegicum* "Schröter" Spengler: 42

1889 - *Cardium norvegicum* var. *mediterranea* Bucquoy, Dautzenberg & Dollfus: 302, Pl. 48, Fig. 7-9.

1889 - *Cardium norvegicum* var. *ponderosa* Bucquoy, Dautzenberg & Dollfus: 302, Pl. 48, Fig. 4

Description: Shell solid, mostly triangular, about 40 to 50 very faint ribs which are less well developed on the anterior and posterior parts of the shell. Growth stages clearly visible. Up to 8 cm high. Colour dirty white, light tan or yellow. Juveniles sometimes with a pattern of darker stains. Periostracum thin but strong and olive-green to brown. Internal shell smooth and white, sometimes with some pinkish shades.

Distribution: Lofotes to the Cape Verde Islands and the Mediterranean. From 7 meters to considerable depths.

Remarks: Some authors consider the mediterranean form distinct from the atlantic form. We have seen many samples from mediterranean localities which contained specimens from both forms as well as intermediates so we can not share this opinion.



L.H. 19

6.1.01 *Laevicardium crassum* (Gmelin, 1791)*oblongum***Genus *Fulvia* Gray, 1853**

6.2.

Type-species: *Fulvia aperta* (Bruguière, 1789)

Shell thin to moderately thick, rounded, sometimes gaping posteriorly. Entirely smooth or with a sculpture of low radial cords.

Left valve: cardinal teeth unequal, anterior one strong and conical, posterior one very weak; anterior lateral tooth high and long with a deep slit above; posterior lateral tooth low and almost on dorsal margin.

Right valve: Cardinal equal, connected at their bases, posterior one located at ventral edge of hinge, anterior cardinal conical and on lunular thickening; single posterior large and triangular, separated from dorsal margin by a deep cleft; two anterior lateral teeth, ventral one large and triangular, dorsal one merely a thin ridge near the dorsal margin.

Several species in Indian and Pacific Oceans. Two West-African species referred to *Fulvia* for the first time.

6.2 Genus *Fulvia* Gray, 1853

**Fulvia caparti** (Nicklès, 1955)

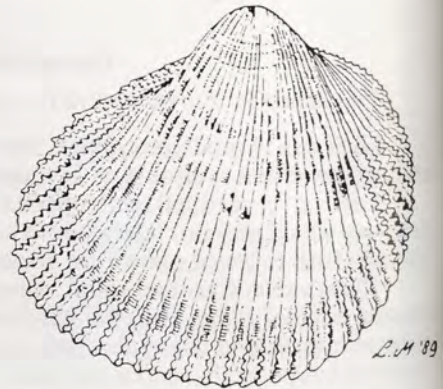
6.2.01

1955 - *Cardium caparti* Nicklès: 173-174, Fig. 27

Description: Shell relatively thin but solid, a little longer than high. About 49 ribs covered with thin, low spines which are most prominent posteriorly and anteriorly. On the posterior slope the form continuous palisades. Margin strongly serrated, ribs not clearly visible from within. Hinge plate of right valve very high and elevated giving the extreme posterior-dorsal margin of the shell an irregular appearance. Colour from white with rusty brown stains to tan. Internal colour white. To about 5 cm height.

Distribution: Western Africa from Senegal to Angola. Always in deeper water from about 50 m. to considerable depths.

Remarks: Although this species and *F. serrulata* both have typical *Fulvia*-hinges and shapes, they also have a very conspicuous rib sculpture which is absent in the Indo-Pacific *Fulvia* species. This might be a valid reason for subgeneric distinction.

6.2.01 *Fulvia caparti* (Nicklès, 1955)6.2.02 *Fulvia serrulata* (Dehayes, 1855)**Fulvia serrulata** (Dehayes, 1855)

6.2.02

1855 - *Cardium serrulatum* Dehayes: 3301885 - *Cardium kobelti* Maltzan: 29-30

Description: Shell relatively small but solid. Rounded, except the posterior margin which is quite sharply angled. 48 tot 55 low ribs, covered with many minute spines. Colour white with many small purple or brown blotches. Umbos often brightly coloured. Internal colour white with a purple zone around the umbos. Ribs not well visible from within. Large specimens can reach a length of 35 mm.

Distribution: Western Africa from Senegal to Angola, from 15 to about 100 meters.

Remarks: Better known as *Cardium kobelti*. Fisher-Piette (1977: Pl. 4, fig. 2) figures the possible holotype of *Cardium serrulatum*.

**Fulvia papyracea** (Bruguère, 1789)

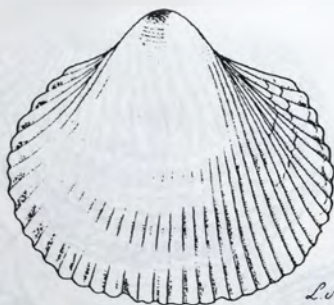
6.2.03

1789 - *Cardium papyraceum* Bruguère: 231

Description: Shell with many faint radial ribs, almost smooth. From longer than high to almost circular. Umbos prominent, shell inaequilateral. Periostracum obsolete or absent. Shell glossy white often with many inconspicuous brown or purple spots. Internal colour white with purple stains. Mediterranean specimens not longer than about 4 cm.

Distribution: Indo-Pacific. Presumably immigrated into the Mediterranean from the Red Sea. Reported from the Mediterranean for the first time in 1974. Subsequently found in Israel and Turkey. See Lindner (1988: 35-37).

Remarks: Systematics and taxonomy of the Indo-Pacific *Fulvia* species is very problematical. Only few species are well defined, others are extremely variable and hard to identify. *Fulvia papyracea* is a very variable species and it is difficult to say if it is the correct name for the specimens under discussion. Recently many specimens of a large *Fulvia* species were reported from Tunisia which probably belong to *F. papyracea*.

6.2.03 *Fulvia papyracea* (Brug., 1789)**Subfamily CLINOCARDIINAE Kafanov, 1975**

7

**Genus Ciliatocardium Kafanov, 1975**

7.1.

Type-species: *Ciliatocardium ciliatum* (Fabricius, 1780)

Shell solid and heavy. Ribs covered with transverse growth striae.

Right valve: two cardinal teeth, ventral one large, dorsal one much smaller, connected at their base; two anterior lateral teeth, ventral one large and a little oblique, dorsal one very small and almost on dorsal margin; one posterior lateral tooth, long and lamellous.

Left valve: two cardinal teeth, anterior one high and erect, posterior one smaller and a little lamellous, connected at their bases; one anterior lateral tooth, impressed ventrally; two posterior lateral teeth, both low and with a shallow slit between.

Few recent species.

**Ciliatocardium ciliatum** (Fabricius, 1780)

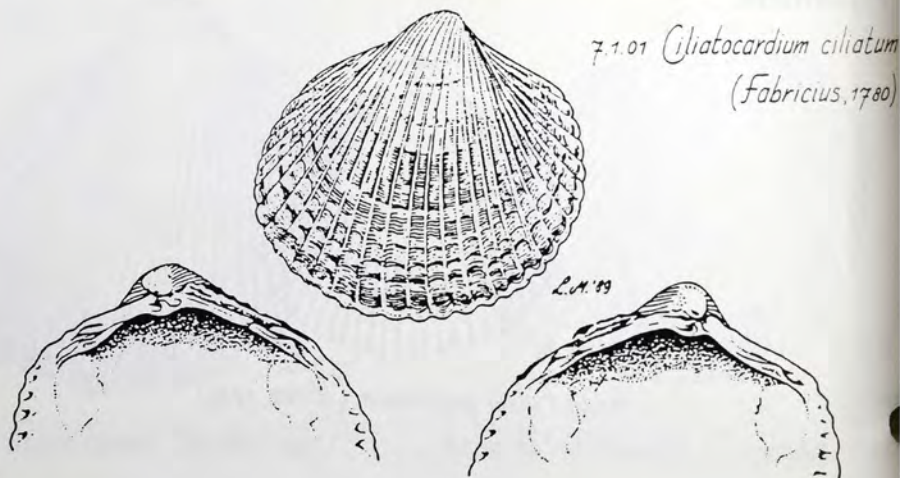
7.1.01

1780 - *Cardium ciliatum* Fabricius: 4101789 - *Cardium islandicum* Bruguière: 222 (non Fabricius, 1780)1829 - *Cardium boreale* Broderip & Sowerby: 368 (non Reeve, 1845)1841 - *Cardium arcticum* Sowerby: 106

Description: Shell solid and heavy, 32 to 38 heavy ribs, crossed by many concentric growth striae which give the ribs a rough appearance. Growth striae also visible in intercostal spaces. Large specimens attain 75 mm. of length. Colour dirty tangley sometimes with faint concentric bands. Periostracum hairy and prominent. Internal colour dirty white, sometimes with darker spots. Margin hardly crenulated ribs hardly visible from within.

Distribution: All arctic seas of Europe, Asia and North America. Northern Norway and Iceland in the Eastern Atlantic. From 10 to 150 meters.

Remarks: Hard to obtain but not rare. Juveniles can be difficult to separate from *Parvicardium ovale* or smaller *Cerastoderma edule* specimens.

**Genus Serripes** Gould, 1841

7.2

Type-species: *Serripes groenlandicus* (Bruguière, 1789)

Shell almost smooth, resembling *Macra* species. Very low ribs which can be almost invisible but always more pronounced posteriorly.

Right valve: two very small cardinal teeth separated by a pit; two anterior lateral teeth, ventral one long and low, dorsal one very small; one posterior lateral tooth, long and lamellous.

Left valve: two very small cardinal teeth; one long anterior lateral tooth separated from dorsal margin by a long, shallow groove; one posterior lateral tooth, long and low.

Two recent species. The genus *Yagudinella* Kafanov, 1975, with one recent species in the Northwestern Pacific, is very closely related.



**Serripes groenlandicus** (Bruguère, 1789)

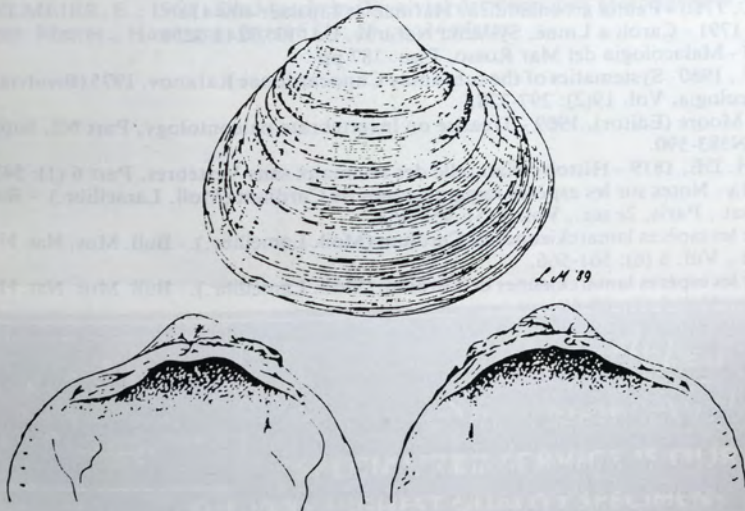
7.2.01

1780 - *Venus islandica* Fabricius: 411 (non Linné, 1758)1789 - *Cardium groenlandicum* Bruguière: 2221800 - *Mactra radiata* Donovan: 1611808 - *Cardium edentulum* Montagu: 29 (Non Deshayes, 1838)1845 - *Cardium boreale* Reeve: Pl. 22, No. 131 (Non Broderip & Sowerby, 1829)1855 - *Cardium fabricii*. Deshayes: 333

Description: Shell relatively thin, specimens in collections often have cracks because of dehydration. Longer than high, often slightly gaping posteriorly. Radial sculpture mostly poorly developed. Completely smooth specimens are often confused with *Mactra* species. Prominent growth stages, especially anteriorly and posteriorly. Strongly developed ligament. Internal colour dirty white, external colour mostly uniformly brown. Juveniles often with coloured spots and bands. Margin slightly serrated. Muscle scars and pallial line deeply impressed and conspicuous. Up to 7 cm. long.

Distribution: All Arctic seas of Europe (Iceland and northern Norway), Asia and North America. From 2 tot 125 m. deep.

Remarks: Hinge and absence of pallial sinus clearly separated this species from all Mactridae.

7.2.01 *Serripes groenlandicus* (Brug. 1789)

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## TABLE OF TAXA

<i>Acanthocardia</i> Gray, 1845	1.2.
<i>aculeata</i> L., 1767	1.2.01
<i>aeolicum</i> Born, 1780	4.1.01
<i>arcticum</i> Sowerby, 1841 = <i>ciliatum</i> Fabricius, 1780	7.1.01
<i>auri</i> Fischer-Piette, 1977 = <i>papillosum</i> Poli, 1795	5.4.11
<i>Balticardium</i> Lambiotte, 1979 = <i>Cerastobysum</i> Pet. & Russ., 1973	5.2
<i>boreale</i> Brod. & Sow., 1829 = <i>ciliatum</i> Fabricius, 1780	7.1.01
<i>boreale</i> Reeve, 1846 = <i>groenlandicus</i> Bruguière, 1789	7.2.01
<i>Bucardium</i> Gray, 1853	1.1.10
<i>bullatum</i> Locard, 1892 = <i>echinata</i> L., 1758	1.2.02
<i>caparti</i> Nicklès, 1955	6.2.01
Cardiinae Lamarck, 1809	1
<i>Cardium</i> Linné, 1758	1.1.0
<i>Cerastobysum</i> Petersen & Russell, 1973	5.2
<i>Cerastoderma</i> Poli, 1795	5.1
Cerastodermatiinae Nordsieck, 1969	5
<i>ciliare</i> L., 1758 = <i>paucicostata</i> Sowerby, 1841	1.2.03
<i>Ciliatocardium</i> Kafanov, 1974	7.1
<i>ciliatum</i> Fabricius, 1780	7.1.01
Clinocardiinae Kafanov, 1975	7
<i>commutata</i> B.D.D., 1892 = <i>siculum</i> Sowerby, 1841	5.4.06
<i>costatum</i> L., 1758	1.1.01
<i>crassispinosum</i> Sowerby, 1834 = <i>echinata</i> L., 1758	1.2.02
<i>crassum</i> Gmelin, 1791	6.1.02
<i>Ctenocardia</i> H. & A. Adams, 1930	3.1
<i>darwinii</i> Mayer, 1866 = <i>indicum</i> Lamarck, 1819	1.1.02
<i>deshayesi</i> Payraudeau, 1826 = <i>echinata</i> L., 1758	1.2.02
<i>duregnei</i> Monterosato, 1891 = <i>echinata</i> L., 1758	1.2.02
<i>echinata</i> L., 1758	1.2.02
<i>edentulum</i> Montagu, 1808 = <i>groenlandicus</i> Bruguière, 1789	7.2.01
<i>edule</i> L., 1758	5.1.01
<i>elegantulum</i> Beck in Möller, 1842	5.3.01
<i>erineum</i> Lamarck, 1819 = <i>spinosa</i> Lightfoot, 1786	1.2.04
<i>exiguum</i> D'Angelo & Gargiullo, 1978 = <i>siculum</i> Sowerby, 1841	5.4.06
<i>exiguum</i> Gmelin, 1791	5.4.01
<i>exiguum</i> 'Gmelin' Petersen, 1958 = <i>hauniense</i> P. & R., 1971	5.2.01
<i>exiguum</i> 'Gmelin' Ziegelmeier, 1962 = <i>hauniense</i> P. & R., 1971	5.2.01
<i>fabricii</i> Deshayes, 1855 - <i>groenlandicus</i> Bruguière, 1789	7.2.01
<i>fasciatum</i> Gmelin, 1791 = <i>tuberculata</i> L., 1758	1.2.05
<i>fasciatum</i> Montagu, 1803 = <i>pinnulatum</i> Conrad, 1831	5.4.03
Fraginae Stewart, 1930	3
<i>Fulvia</i> Gray, 1853	6.2.
<i>glaucum</i> Bruguière, 1789	5.1.02
<i>Goethemia</i> Lambiotte, 1979	5.3.
<i>groenlandicus</i> Bruguière, 1789	7.2.01
<i>hauniense</i> Petersen & Russell, 1971	5.2.01
<i>hians</i> Borcchi, 1814 = <i>indicum</i> Lamarck, 1819	1.1.02
<i>hiatus</i> Meuschen, 1787 = <i>soleniformus</i> Bruguière, 1789	2.1.01
<i>hirta</i> B.D.D., 1892 = <i>exiguum</i> Gmelin, 1791	5.4.01
<i>indicum</i> Lamarck, 1819	1.1.02
<i>islandicum</i> Bruguière, 1789 = <i>ciliatum</i> Fabricius, 1780	7.1.01
<i>islandicum</i> Fabricius, 1780 = <i>groenlandicus</i> Brug., 1789	7.2.01

<i>isthmicus</i> Issel, 1869 = <i>glaucum</i> Bruguière, 1789	5.1.02
<i>kobelti</i> Von Maltzan, 1885 = <i>serrulatum</i> Deshayes, 1855	6.2.02
Laevicardiinae Keen, 1951	6
<i>Laevicardium</i> Swainson, 1840	6.1
<i>lamarckii</i> Reeve, 1845 = <i>glaucum</i> Bruguière, 1789	5.1.02
<i>Lyrocardium</i> Meek, 1876	4.1
<i>mediterranea</i> B.D.D., 1889 = <i>crassum</i> Gmelin, 1791	6.1.02
<i>minimum</i> Philippi, 1836	5.4.02
<i>mucronatum</i> Poli, 1791 = <i>echinata</i> L., 1758	1.2.02
<i>nodosum</i> 'Montagu' Turton, 1822 = <i>scabrum</i> Philippi, 1844	5.4.04
<i>norvegicum</i> 'Schröter' Spengler, 1799 = <i>crassum</i> Gmelin, 1791	6.1.02
<i>nunninkae</i> Lucas, 1985 = <i>glaucum</i> Bruguière, 1789	5.1.02
<i>oblongum</i> Gmelin, 1791	6.1.01
<i>ovale</i> Sowerby, 1840 = <i>pinnulatum</i> Conrad, 1831	5.4.03
<i>Papillicardium</i> Sacco, 1899	5.4.10
<i>papillosum</i> Poli, 1795	5.4.11
<i>papyracea</i> Bruguière, 1789	6.2.03
<i>Papyridea</i> Swainson, 1840	2.1
<i>Parvicardium</i> Monterosato, 1884	5.4.
<i>parvum</i> 'Mawe' Philippi, 1844 = <i>siculum</i> Sowerby, 1841	5.4.06
<i>paucicostata</i> Sowerby, 1841	1.2.03
<i>perrieri</i> Dautzenberg & Fischer, 1879 = <i>minimum</i> Philippi, 1836	5.4.02
<i>pinnulatum</i> Conrad, 1831	5.4.03
<i>planatum</i> Renier, 1804 = <i>papillosum</i> Poli, 1795	5.4.11
<i>polii</i> Payraudea, 1826 = <i>papillosum</i> Poli, 1795	5.4.11
<i>ponderosa</i> B.D.D., 1889 = <i>crassum</i> Gmelin, 1791	6.1.02
Protocardiinae Keen, 1951	4
<i>punctatum</i> Brocchi, 1814 = <i>papillosum</i> Poli, 1795	5.4.11
<i>pygmaeum</i> Donovan, 1799 = <i>exiguum</i> Gmelin, 1791	5.4.01
<i>radiata</i> Donovan, 1799 = <i>groenlandicus</i> Bruguière, 1789	7.2.01
<i>ringens</i> Bruguière, 1789	1.1.11
<i>ringens</i> 'Bruguière' Nordsieck, 1969 = <i>indicum</i> Lamarck, 1819	1.1.02
<i>Rudicardium</i> Coen, 1914 = <i>Acanthocardia</i> Gray, 1845	1.2
<i>rusticum</i> L., 1767 = <i>tuberculata</i> L., 1758	1.2.05
<i>scabrum</i> Philippi, 1844	5.4.04
<i>scriptum</i> Bucquoy, Dautzenberg & Dollfus, 1892	5.4.05
<i>Serripes</i> Gould, 1841	7.2
<i>serrulata</i> Deshayes, 1855	6.2.02
<i>siculum</i> Sowerby, 1841	5.4.06
<i>soleniformis</i> Bruguière, 1789	2.1.01
<i>speciosa</i> Adams & Reeve, 1850	3.1.01
<i>Sphaerocardium</i> Coen, 1933 = <i>Acanthocardia</i> Gray, 1845	1.2
<i>spinosa</i> Lightfoot in Solander, 1786	1.2.04
<i>spinosum</i> Meuschen, 1787 = <i>soleniformis</i> Bruguière, 1789	2.1.01
<i>spinosum</i> Sowerby, 1804 = <i>aculeata</i> L., 1767	1.2.01
<i>stellatum</i> Reeve, 1845 = <i>siculum</i> Sowerby, 1841	5.4.06
<i>suecicum</i> Lovén, 1846 = <i>minimum</i> Philippi, 1836	5.4.02
<i>sulcatum</i> Lamarck, 1819 = <i>oblongum</i> Gmelin, 1791	6.1.01
Trachycardiinae Stewart, 1930	2
<i>transversale</i> Deshayes, 1855 = <i>vroomi</i> A.M.G., 1984	5.4.07
<i>tuberculata</i> L., 1758	1.2.05
<i>vroomi</i> Aartsen, Menkhorst & Gittenberger, 1984	5.4.07

## PLATE 1

1. *Cardium (C.) costatum* L., 1758  
Senegal, off N'Gor, 1987. Coll. RV
2. *Cardium (C.) indicum* Lamarck, 1819  
Senegal, off N'Goree Bay. Coll. WO
3. *Cardium (Bucardium) ringens* Bruguière, 1789  
Senegal, off N'Gor. Coll. RV

## PLATE 2

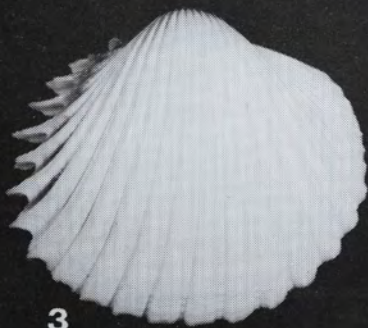
1. *Acanthocardia aculeata* (L., 1767)  
Spain, Dep. Malaga, Estepona. From local fisherman. Coll. RV
2. *Acanthocardia paucicostata* (Sowerby, 18417)  
Spain, Dep. Cadiz, Bay of Cadiz, Valdelagrana. Leg. H.J. & J. Hoenselaar, April 1986. Coll. RV
3. *Acanthocardia tuberculata* (L., 1758)  
Spain, Dep. Tarragona, Ebro-delta, "Pau" S. and E. of delta, about 20 km off San Carlos de la Rapita. On Sand. Leg. G. Gulden / K. Hoogerwerf, April 9, 1980. Coll. RV
4. *Acanthocardia echinata* (L., 1758)  
SYNTYPE of *Cardium deshayes* Payraudeau, 1826 Corsica, Ajaccio. Coll. MNHN.
5. *Acanthocardia spinosa* (Lightfoot, 1786)  
Spain, Dep. Malaga, Estepona. From local fisherman. Coll. RV

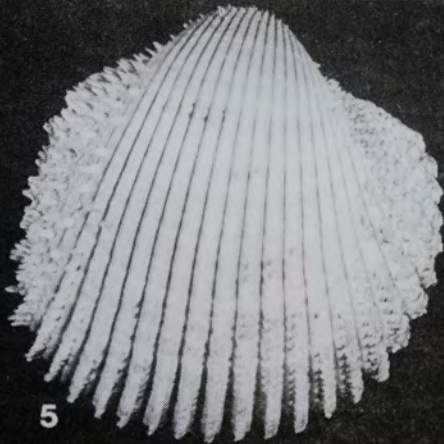
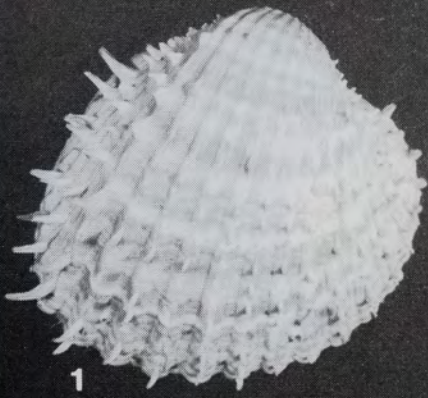
## PLATE 3

1. *Papyridea soleniformis* (Bruguière, 1789)  
Cape Verde Islands, S. Vicente & I. de Sal. Coll. MNHN.
2. *Lyrocardium aeolicum* (Born, 1780)  
Guinea, Conakry. Collected by fisherman, 1985. Coll. WO
3. *Ctenocardia speciosa* (Adams & Reeve, 1850)  
St. Helena, Central Atlantic. Coll. KBIN, Dautzenberg collection.

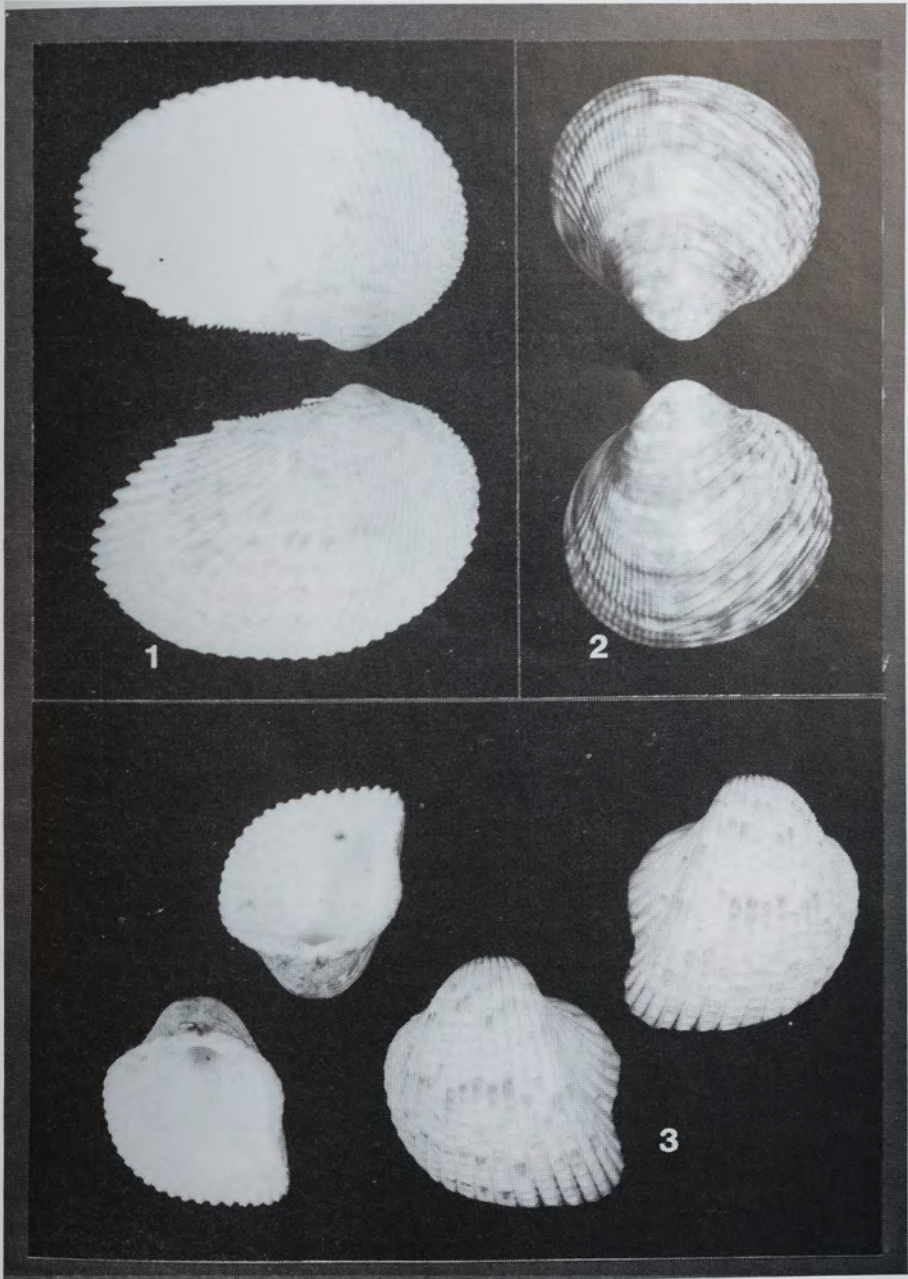
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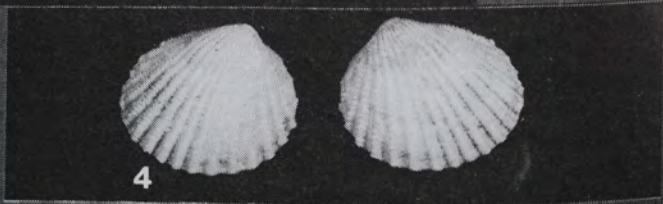
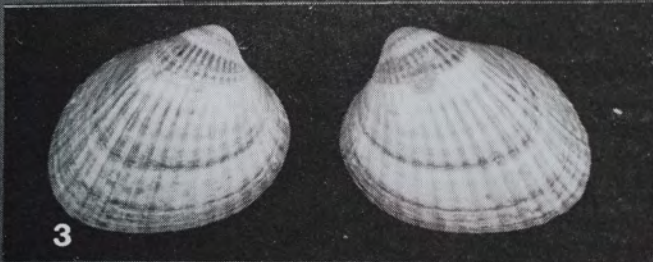
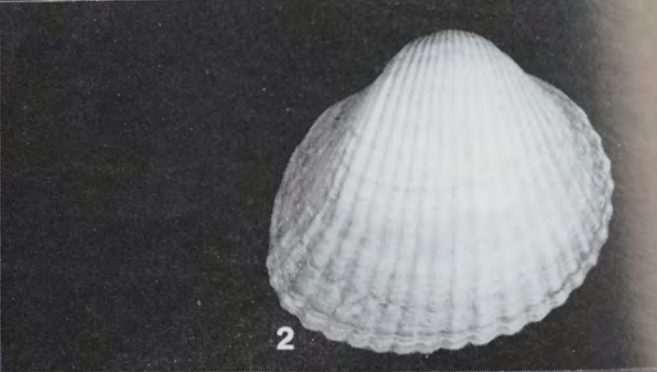
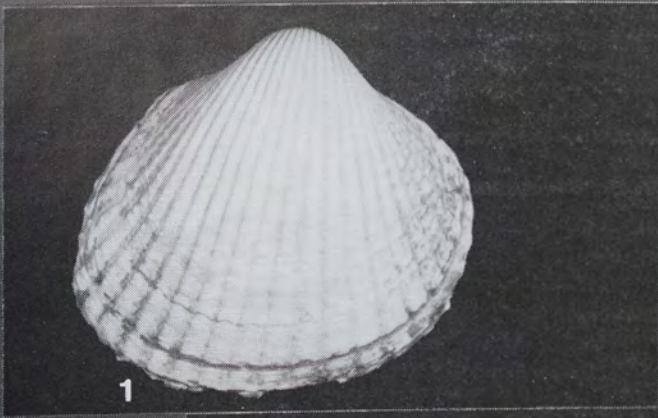
1. *Cerastoderma edule* (L., 1758)  
France, Dep. Côtes-du-Nord, St. Jacut de la Mer. Washed ashore at low tide, June 16, 1986  
Coll. RV
2. *Cerastoderma glaucum* (Bruguière, 1789)  
France, Dep. Bouches-du-Rhône, S.E. Camargue, near Salin de Giraud, S.W. Etang de Grande Palun. In very shallow, warm water, July 21, 1988. Coll. RV
3. *Cerastobysum hauniense* (Petersen & Russell, 1971)  
Denmark, Storstrøm, Sjaellaand, Dybsø Fjord, S. of Naestveld. Leg. G. Høpner Petersen, October 5, 1977. Coll. RNH
4. *Goethemia elegantulum* (Beck in Möller, 1842)  
Finmarken. Coll. J. Mulder. Coll. RNH











## PLATE 5

1. *Parvicardium (P.) exiguum* (Gmelin, 1791)  
France, Dep. Gironde, Arcachon. June 1973. Coll. RNH
2. *Parvicardium (P.) minimum* (Philippi, 1836)  
Norway, near Trondheims Fjord, Stjørnfjord, N. of Flessa lighthouse, 200 m. deep, trawl.  
August 29, 1961. Coll. RNH.
3. *Parvicardium (P.) pinnulatum* (Conrad, 1831)  
Norway, Hjelte Fjord, near the Mefjordboen, 60°36'N - 4°55'E, depth 30-50 m., sand, grab  
and triangular dredge. September 4, 1981. Coll. RNH
4. *Parvicardium (P.) scabrum* (Philippi, 1844)  
France, Dep. Finistère, Brest. 1957. Ex. coll. C.A. v.d. Peijl. Coll. RNH
5. *Parvicardium (P.) scriptum* (B.D.D., 1892)  
Cyprus Island, Limassol. Leg. H. Strack, April 15, 1983. Coll. RV
6. *Parvicardium (P.) siculum* (Sowerby, 1841)  
France, Dep. Hérault, Bassin de Thau, between Agde and Sète, Mèze. In fishers garbage near  
a small harbour, July 25, 1988. Coll. RV

## PLATE 6

1. *Parvicardium (P.) vroomi* Van Aartsen. Menkorst & Gittenberger, 1984  
Spain, Dep. Cadiz, Bay of Algeciras, Getares. Leg. H.J. & J. Hoenselaar. Coll. Wo
2. *Parvicardium (Papillicardium) papillosum* (Poli, 1795)  
Italy, Dep. Liguria, Laigueglia. By skindiving, 3-12 m. deep. Leg. D. Karels, 1973. Coll. RV
3. *Laevicardium oblongum* (Gmelin, 1791)  
Italy, Dep. Liguria, E. of Genua, Santa Margherita Ligure. 50 m deep. Coll. RV
4. *Laevicardium crassum* (Gmelin, 1791)  
France, Dep. Finistère, Keremma. July 1973. Coll. RV

## PLATE 7

1. *Fulvia serrulata* (Deshayes, 1855)  
Senegal, Cap de Naze. Coll. WO
2. *Fulvia caparti* (Nicklès, 1955) PARATYPE  
Atlantide Expedition, Station 49, 7°29'N - 13°38'W., 74-79 m. deep. Coll. Mus. Nat. Hist.  
Copenhagen
3. *Fulvia papyracea* (Bruguère, 1789)  
Tunisia, Gulf of Bou Grara, Djorf, S.E. of ferry-pier. On sandy beach, Leg. K.P. Hooger-  
werf, March 28, 1989. Coll. RV
4. *Ciliatocardium ciliatum* (Fabricius, 1780)  
Iceland, Gufunes. 3 m deep, October 1978. Coll. RV
5. *Serripes groenlandicus* (Bruguère, 1789)  
Iceland, Gufunes. Aliive in sand near tideline, June 1974. Coll. RV

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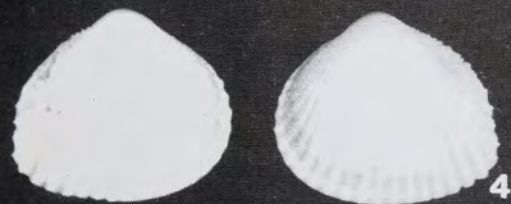
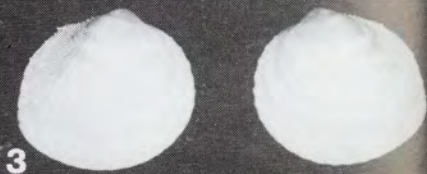
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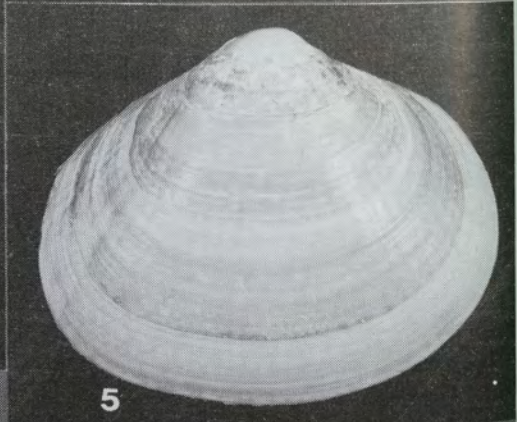
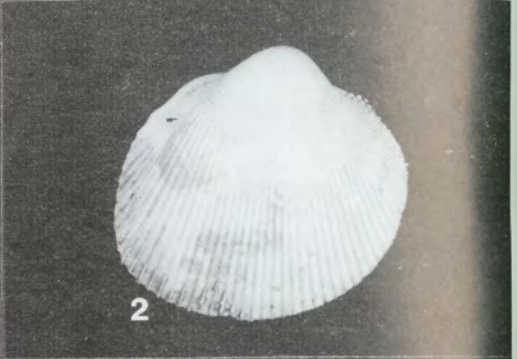
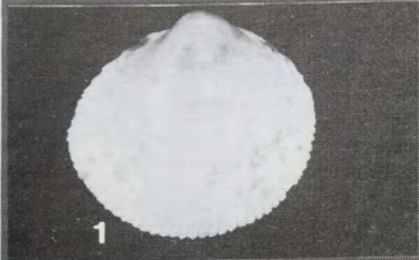
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3



4



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