

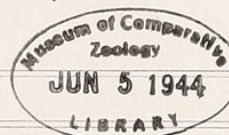
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CARDIIDAE



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THE FAMILY CARDIIDAE IN THE WESTERN ATLANTIC¹

BY

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The family Cardiidae is an exceedingly important one in the class Pelecypoda. These are the true cockle shells or heart clams. The family possesses many species and is world-wide in distribution, though the numbers are much reduced south of the tropics. The most ornate and highly colored species are limited mainly to the tropical and temperate zones. There is a wide range in size within this family, from the very small deep sea species to those whose capaciousness is equalled or exceeded only by the tridacnids, certain Chinese *Anadonta* and a few species of *Panope*.

Cerastoderma edule Linné is an important item of food in the British Isles and Western Europe. Lister mentioned that in his time cockles were eaten raw as well as cooked. Jeffreys in 1863 pointed out that in England "cockle-gathering is a useful, though humble branch of national industry." Elsewhere, *Cardium* species are not reported as so used,



Plate 1, *Trachycardium muricatum* Linné
Tice Island, Caxambas, Florida (about 3×)

¹ Included genera are *Cerastoderma*, *Clinocardium*, *Dinocardium*, *Laevicardium*, *Microcardium*, *Papyridea*, *Serripes*, *Trachycardium* and *Trigoniocardia*.

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but this may be due to the fact that they are not generally numerous enough to be developed commercially.

Some species are inter-tidal, though most exist below low-water line to 100 fathoms. Certain species are found beyond this depth though few are known to exist in profound depths. They live generally in sand or sandy mud, at or just below the surface. According to Step (1927, p. 142) *C. edule* Linné has been known to climb up submerged posts, spinning a byssus to aid in the ascent. On Sanibel Island, *D. robustum vanhyningi* is often seen pushing its way out of the sand and forcing itself a few feet along the sand bars by means of its strong muscular foot.

Most of the material studied in this number occurs north of South America, but it is probable that the species reported from Trinidad extend south along the coast of Brasil.

In the Western Atlantic there are twenty-one named forms, not a large number, though fairly proportionate on the basis of species in most families that are world-wide in distribution. These are grouped into nine genera and three subgenera.

This report is based in part upon the studies of R. A. McLean,¹ former student of the senior author and now Assistant Curator of Mollusks in the Academy of Natural Sciences, Philadelphia. His references given for all species have greatly facilitated our work on this number.

For many years practically all members of the family Cardiidae were referred to a single genus, *Cardium*. During the past 15 years much critical work has been done on this family, several new generic names instituted and many lesser categories raised to full generic rank.

We have followed the studies of Ralph B. Stewart² and A. Myra Keen³ who have worked out the genera very meticulously.

The genus *Cardium* in the restricted sense does not occur in the Western Atlantic. Children, in 1823, designated the type of the genus to be *Cardium costatum* Linné, which is a large, thin and highly costate species, quite different from most other members of the family. It occurs on the West African coast.

Genus *Trachycardium* Mörch

Trachycardium Mörch 1853, Catalogus Conchyliorum, Comes de Yoldi, 2, p. 34.

Genotype, *Cardium isocardia* Linné (by subsequent designation, von Martens 1870).

Shell strongly ribbed and generally with numerous arched, recurved or denticulated scales on the ribs. The posterior slope has these scales much accentuated and may be the only area on the shell surface where scales occur. Shells in this genus are generally higher than long.

There are four species of *Trachycardium* in the Western Atlantic.

¹ McLean, R. A. 1939, Mem. Soc. Cubana Hist. Nat. 13, pp. 157-173, pl. 23-26.

² Stewart, R. B. 1930, Gabb's California Cretaceous and Tertiary Type Lamellibranchs, Special Publ. no. 3, Acad. Nat. Sci. Philadelphia, pp. 252-280.

³ Keen, A. M. 1937, Nomenclatural Units of the Pelecypod Family Cardiidae, Bull. du Musée Royal d'Histoire Nat. de Belgique, 13, no. 7, pp. 1-22.

Key to the species of the genus *Trachycardium*

- | | |
|--|--------------------|
| 1. Shell with strong imbricated scales on the ribs | 2 |
| Shell nearly smooth or with denticulated scales on the ribs | 3 |
| 2. Ribs 31-37. Scales extending across each rib | <i>isocardia</i> |
| Ribs 27-31. Scales covering about half of each rib | <i>egmontianum</i> |
| 3. Disc of shell with the ribs smooth. Denticulated scales on the last few ribs of posterior slope | <i>magnum</i> |
| Disc of shell with the ribs generally denticulated. Ribs on remainder of shell strongly denticulated | <i>muricatum</i> |

***Trachycardium isocardia* Linné, Plate 2**

Cardium isocardia Linné 1758, Syst. Nat., ed. 10, p. 679 (locality unknown); McLean 1939, Mem. Soc. Cubana Hist. Nat. **13**, p. 159.

Cardium eburniferum Guppy 1875, Ann. Mag. Nat. Hist. (4) **15**, p. 51, pl. 7, fig. 3 (South coast of Trinidad).

Description. Shell varying from 50 to 75 mm. in height, inflated, subelongated, rather heavy and strongly ribbed. External color creamy, generally with reddish brown irregular patches. Interior color consists of a wide band of salmon, shading to purple, which extends from the umbo to the ventral margin of the shell, leaving both the anterior and posterior sides whitish. The inner margin is yellowish. Umbones prominent, subcentral. Ligament strong and prominent. Lunule small and relatively inconspicuous. Escutcheon not defined. Sculpture consists of 31 to 37 radiating ribs which possess numerous arcuate imbricated scales, completely crossing each rib. These scales are much more strongly developed on the posterior slope of both valves. The margin of the shell is strongly serrated. Periostracum a dull straw color, rather inconspicuous.

	length	height	width	
(large)	60	75	60 mm.	Monte Cristi, Hispaniola
(average)	51	63	50	Tobago, Lesser Antilles

Types. We select Linné's reference to Franz M. Regenfuss 1758 (Auserlesne Schnecken, Muscheln und andre Schaalthiere, p. 37, pl. 5, fig. 56) to be the type figure. Regenfuss gave the Danish West Indies (Virgin Islands) as the type locality. We restrict the type locality to St. Thomas in this island group.

Common name. Prickly cardium.

Remarks. See *T. egmontianum*.

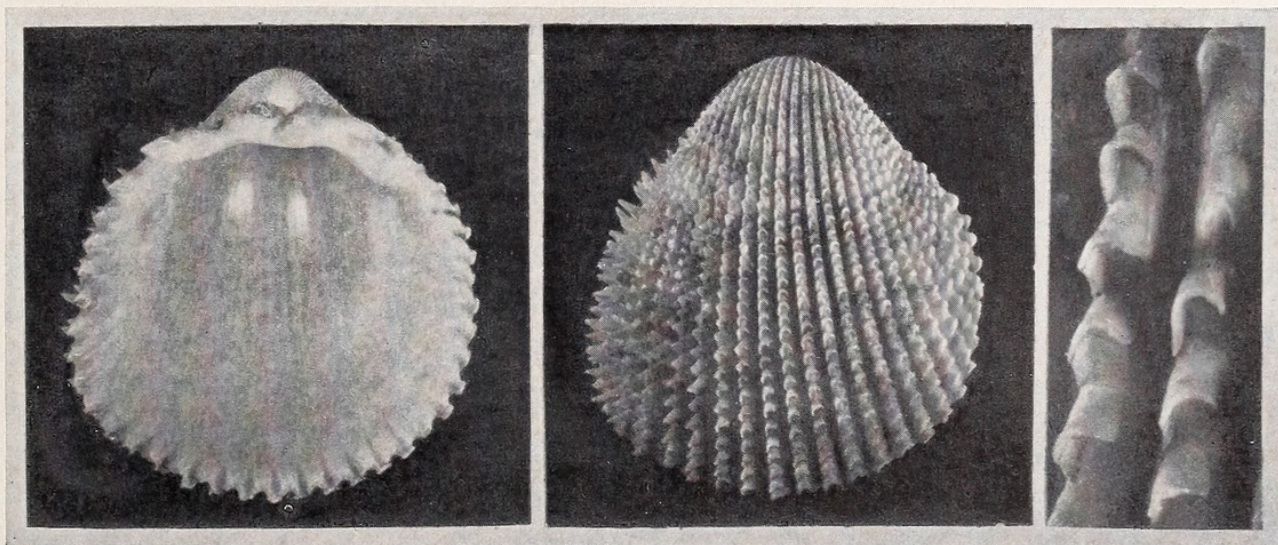


Plate 2. *Trachycardium isocardia* Linné
Tobago Island, Lesser Antilles (natural size); sculpture (6×)

Range. Hispaniola, Jamaica, Puerto Rico, the Virgin Islands and south to the northern coast of South America. It probably extends north along the Central American coast, at least as far as southern Mexico.

Records. HISPANIOLA: Monte Cristi; Santa Bárbara de Samaná (both MCZ). JAMAICA: (MCZ). PUERTO RICO: Mayagüez (MCZ); Humacao (Univ. of Michigan). VIRGIN ISLANDS: Guana Id., Tortola; Caneel Bay, St. John (both M. Dewey); St. Croix (H.A. Beatty); St. Thomas (MCZ). LESSER ANTILLES: Nevis; Fontenary Beach and Grand Anse, Grenada (all H. G. Kugler); Tobago (MCZ); Chaguaramas, Trinidad (H. G. Kugler). MEXICO: Veracruz (M. E. Bourgeois).

Trachycardium egmontianum Shuttleworth, Plate 3

Cardium egmontianum Shuttleworth 1856, Jour. de Conch. **5**, p. 172 (Egmont Key, Tampa Bay, Florida).

Cardium floridanum Heilprin 1887, Trans. Wagner Free Inst. Sci. Philadelphia, **1**, p. 92, pl. 11, figs. 25-25a (Pliocene; Caloosahatchie formation, Florida).

Cardium isocardia Linné, Dall 1901 (in part) Bull. United States Fish Commission 1900 [1901] **1**, p. 488.

Cardium isocardia egmontianum Shuttleworth, McLean 1939, Mem. Soc. Cubana Hist. Nat., **13**, p. 160.

Description. Shell varying from 40 to 60 mm. in height, inflated, subelongated, rather heavy and strongly ribbed. External color white to tawny or gray with most specimens showing patches of color which may be yellow, brown or occasionally purple. Interior generally suffused with shades of salmon and purple extending to the ventral margin. Anterior area whitish, posterior margin fringed with yellow. Umbones prominent and subcentral. Ligament strong. Lunule small and relatively inconspicuous. Escutcheon not defined. Sculpture consists of 27 to 31 radiating ribs which possess numerous arcuate imbricated scales, which are more fully developed on the posterior side of each rib and on the posterior slope of each valve. Margin strongly serrated. Periostracum grayish to straw colored and rather inconspicuous.

	length	height	width	
(large)	48	59	45 mm.	Lake Worth, Florida
(average)	39	47	35	Egmont Key, Florida

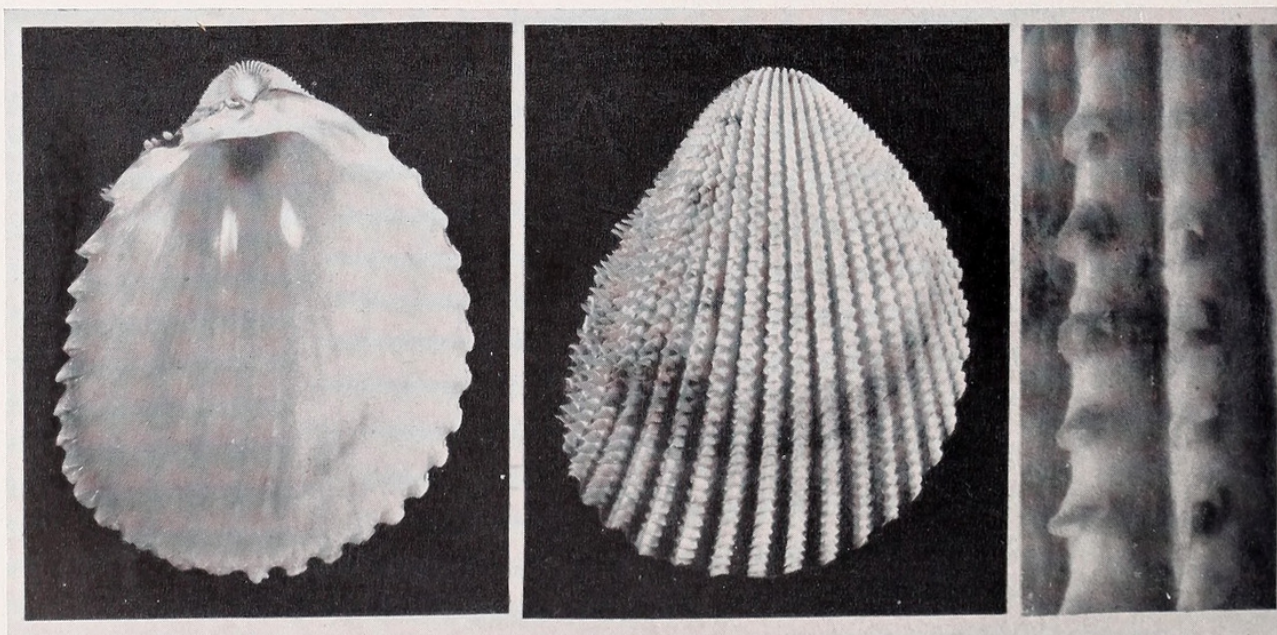


Plate 3. *Trachycardium egmontianum* Shuttleworth
Indian River, St. Lucie Inlet, Florida (natural size); sculpture (6×)

Types. According to Sherborn, the Shuttleworth collection is still in Berne, Switzerland. The type locality is Egmont Key which is at the mouth of Tampa Bay, Florida. The original specimens were collected by Rugel.

Common name. Prickly cardium.

Remarks. In our opinion, *T. egmontianum* is a distinct species. It is, of course, closely related to *T. isocardia*. The differences, though slight, are remarkably constant and, so far as we have been able to detect, there are no intergrades. Our material indicates no overlap of ranges. *T. egmontianum* differs from *T. isocardia* by the following characteristics: *T. isocardia* possesses larger imbricated scales which render its appearance much more spinose. These scales on *T. isocardia* extend completely across the rib while the scales produced on *T. egmontianum* cover little more than half the rib. *T. egmontianum* has 27 to 31 ribs, while *T. isocardia* has 31 to 37 ribs. In *T. egmontianum*, the interior coloration is more diffused and extends to the posterior margin, leaving only the anterior side white. On the other hand, the interior coloration of *T. isocardia* is produced in a broad band from the umbones to the central margins, leaving both anterior and posterior sides whitish. This is not to be confused with the yellowish coloration on the posterior margin which both species possess. Generally, *T. isocardia* reaches a larger size. Albino specimens of *T. egmontianum* have been reported from Florida and we have specimens from Cayo Francés, Caibarién, Cuba.

Range. North Carolina south to Florida, the Bahamas and Cuba.

Records. NORTH CAROLINA: Beaufort Bay (MCZ). FLORIDA: Canaveral; Cocoa Beach; North Inlet, Lake Worth; Biscayne Bay; Dry Tortugas; Pavilion Key; Cape Romano; Naples; Sanibel Id.; Sarasota; Egmont Key, Tampa; Clearwater; Cedar Keys (all MCZ). BAHAMAS: North Bimini Id.; Hatched Bay and Governors Harbour, Eleuthera; Orange Creek, Cat Id.; Simms, Long Id. (all MCZ); Stocking Id., Great Exuma (W. Gunther); Nassau Harbor, New Providence (A. H. Patterson). CUBA: Cayo Francés, Caibarién (P. J. Bermúdez); mouth of Río Arimao, Cienfuegos (MCZ).

Subgenus *Acrosterigma* Dall

Acrosterigma Dall 1900, Trans. Wagner Free Inst. Sci. Philadelphia, **3**, pt. 5, p. 1073.

Subgenotype, *Cardium dalli* Heilprin (by original designation).

Shell similar in outline to *Trachycardium* s. s. but having the scale ornamentation of the disc reduced to vestiges along the sides of the ridges. The hinge plate and position of the teeth are about the same in both groups.

Trachycardium (*Acrosterigma*) *magnum* Linné, Plate 4, figs. 1-2

Cardium magnum Linné 1758, Syst. Nat. ed. 10, p. 680 (Jamaica); *ibid.* 1767, ed. 12, **1**, part 3, p. 1123; Gmelin 1790, Syst. Nat. ed. 13, p. 3250; W. Wood 1815, General Conchology, London, p. 221, pl. 53, fig. 3.

Cardium leucostomum Born 1780, Testacea Musei Caesarei Vindobonensis, p. 46, pl. 3, fig. 6 (Jamaica). (Refers to Lister, pl. 331, fig. 168).

Cardium marmoreum Lamarck 1819, Animaux sans Vertèbres **6**, p. 9 (Jamaica). (Refers to Lister, pl. 331, fig. 168).

Cardium elongatum Sowerby 1831, Genera of Recent and Fossil Shells, *Cardium*, fig. 1; *non Cardium elongatum* Bruguière 1789.

Cardium subelongatum Sowerby 1840, Proc. Zool. Soc. London, **8**, p. 108 (St. Thomas [Virgin Islands]).

Description. Shell ranging from 55 to 90 mm. in height, moderately inflated, elongate, rather heavy and strongly ribbed. External color a light cream with a series of warm reddish brown, irregular patches. Generally, there is a suffusion of reddish color over the posterior slope. Interior china white with a blush of orange buff color extending from the umbonal area to about the mid-region. As a rule, the posterior margin is a pale yellowish color, merging into a pale purple at the extreme edge. Umbones moderately prominent, subcentral. Ligament strong and prominent. Lunule small and relatively inconspicuous. Escutcheon not defined. Sculpture consisting of 32 to 35 radiating ribs. There are small denticulated scales on the ribs of the posterior region only. Ribs in the mid-area are quite smooth on the surface, but in the channels between, their sides are finely ribbed. On the anterior slope, the ribs show a superimposed rippling of overlapping folds to make the appearance of fine pleating. Margin serrated. Periostracum brownish, conspicuous on the posterior slope.

	length	height	width	
(large)	67	87	46 mm.	Little San Salvador Island, Bahamas
(average)	50	65	39	St. Johns, Virgin Islands

Types. We select Gmelin's reference in the thirteenth edition of *Systema Naturae* (Lister 1685, *Hist. Syn. Meth. Conchyliorum*, pl. 331, fig. 168) to be the type figure of this species. Linné in the original description cited no references and had apparently based his description on a specimen. His locality of Jamaica, however, leaves little question as to what the species could be, as there are only two other species in this genus large enough to fall into this category and these were both described by Linné, namely *T. isocardia* and *T. muricatum*.

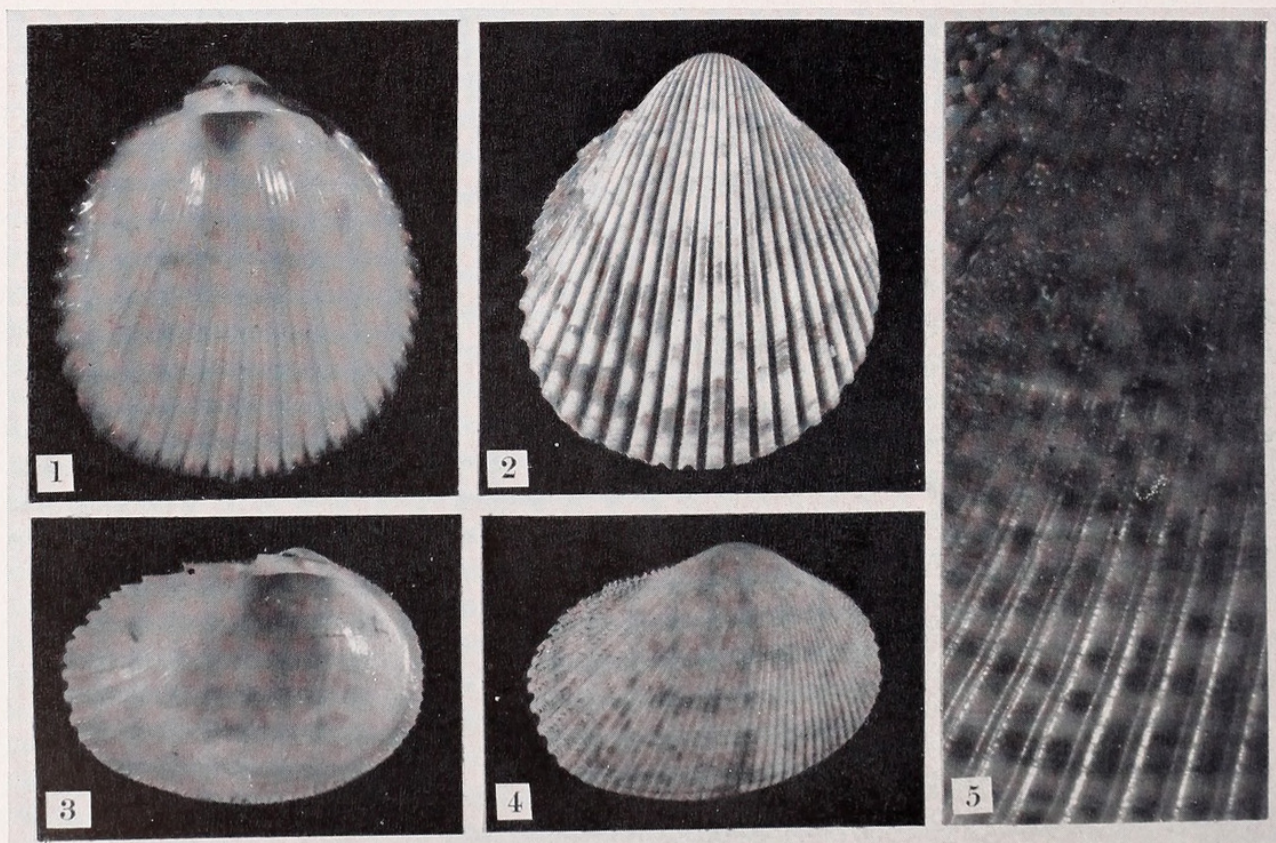


Plate 4. Fig. 1-2, *Trachycardium magnum* Linné, Barbados (natural size). Fig. 3-4, *Papyridea hiatus* Meuschen, St. Thomas, Virgin Islands (natural size). Fig. 5, *P. hiatus* Meuschen, Lake Worth, Florida (6×)

Remarks. In our opinion, there is no question but that this is Linné's species. The differences cited by Bruguière, Wood, and others appear to be quite trivial and in many cases, their opinions were based on figures published as wood cuts which seldom, if ever, were executed with exactness.

Bruguière's *T. elongatum* was probably based on an East Indian specimen. *T. magnum* and *T. elongatum* are exceedingly close, the differences being very slight indeed. However, it seems best to keep them separate until more material is available for serious comparative study. Bruguière pointed out that *T. elongatum* possesses 39 to 40 ribs, while *T. magnum* generally has 32 to 35. However, we possess specimens of *T. magnum* showing a variation in the number of ribs, one specimen having 40 ribs, two specimens with 38 while all others have less than 36 ribs. We believe that this variation in the number of ribs has been responsible for most of the confusion which has existed.

Mr. A. H. Patterson, who has collected *T. magnum* in the Bahamas, reports that the foot of this species is phosphorescent. The discovery was made during a black-out which occurred while he was cleaning the shell.

See *Remarks* under *T. muricatum*.

Range. South Florida, Bahamas, south through the West Indies to Brasil.

Records. FLORIDA: Garden Key, Dry Tortugas (T. Van Hyning). BAHAMAS: Eight Mile Rock, Grand Bahama Id.; Strangers Cay, Little Abaco Id.; Cat Cay, Bimini Ids.; Dick's Point, New Providence; Governors Harbour, Eleuthera; Arthurstown, Cat Id.; Simms, Long Id.; Little San Salvador; Matthewtown, Gt. Inagua (all MCZ); Nassau Harbor (A. H. Patterson). HISPANIOLA: Puerto Sosúa (MCZ). JAMAICA (MCZ). PUERTO RICO: Humacao (Univ. of Mich.). VIRGIN ISLANDS: The Baths, Virgin Gorda; Marina Cay, Tortola (both M. Dewey); St. John; St. Thomas (both MCZ). LESSER ANTILLES: Barbados; Trinidad (both MCZ). BRASIL: Off Bahía (S. Lat. $11^{\circ}45'$; W. Long. $37^{\circ}27'$) Hassler, station 15, in 200 fathoms (MCZ).

Subgenus **Dallocardia** Stewart

Dallocardia Stewart 1930, Spec. Publ. no. 3, Acad. Nat. Sci. Philadelphia, p. 264.

Subgenotype, *Cardium quadragenarium* Conrad (original designation).

Species of this subgenus are quite close in their relationship to *Trachycardium* s.s. They differ, however, in possessing a hinge plate which is narrower and lighter in structure. The cardinal teeth are slightly posterior. *T. muricatum* is considered a *Dallocardia* since its ornamentation and outline are so similar to those of the subgenotype *T. quadragenarium* Conrad, of the West Coast.

Trachycardium (Dallocardia) muricatum Linné, Plates 1 and 5

Cardium muricatum Linné 1758, Syst. Nat., ed. 10, p. 680 (Gulf of Campeche [Mexico]); *non Cardium muricatum* Linné 1758, Syst. Nat. ed. 10, p. 679.

Cardium campechiense Röding 1798, Museum Boltenianum, p. 191, no. 407 (locality not given) refers to Chemnitz 1782, Conchylien-Cabinet (1) 6, p. 186, pl. 17, fig. 178 (West Indies).

Cardium gossei Deshayes 1854, Proc. Zool. Soc. London, p. 330 (West Indies).

Description. Shell ranging from 40 to 65 mm. in height, inflated, subcircular to subquadrate in outline, moderately heavy and strongly ribbed. External color a light cream with irregular patches of brownish red. Occasional specimens, however, are diffused with

shades of yellow and orange. Interior white, sometimes yellow-tinted. Florida specimens show a wash of yellow over most of the interior. Under the umbones there is a yellowish patch, bordered on either side by streaks of wine-red. This is a characteristic feature and is rarely absent. Occasionally, however, this patch becomes an area of solid color superimposed on the yellow. Umbones prominent, subcentral. Ligament strong and prominent. Lunule small and relatively inconspicuous. Escutcheon not defined. Sculpture consists of 30 to 40 radiating ribs which possess small denticulated scales. These scales are more numerous on the anterior and posterior slopes and are frequently absent on the mid-area of the disc. These denticulated scales vary in their position on the ribs, those of the anterior slope being developed on the anterior side of the rib, while the other ribs show development of the scales pointing posteriorly. The line of demarkation is somewhere between the 11th and 14th ribs on the anterior slope, usually marked by 1 to 3 ribs which bear a double row of scales. Beyond this area, the single rows of scales are on the posterior side of the rib. Margins strongly serrated. Periostracum brownish and fairly conspicuous, particularly near the margins.

	length	height	width	
(large)	60	63	41 mm.	Gulf of San José, Argentina
(average)	39	42	28	Naples, Florida

Types. Linné's description was probably based upon a specimen, as he gives no references. Because of this, we here select Chemnitz, Conchylien-Cabinet (1), 6, pl. 17, fig. 178 to be the type figure. We here limit the type locality to Veracruz, in the Gulf of Campeche, Mexico.

Remarks. This species is most readily differentiated from *T. magnum*, which is nearest in relationship, by having the denticulated scales more or less well distributed over the entire shell. In *T. magnum*, the scales are limited to the posterior slope. Furthermore, *T. magnum* is far more elongated.

Range. North Carolina south to Argentina, including the West Indies and the Gulf of Mexico.

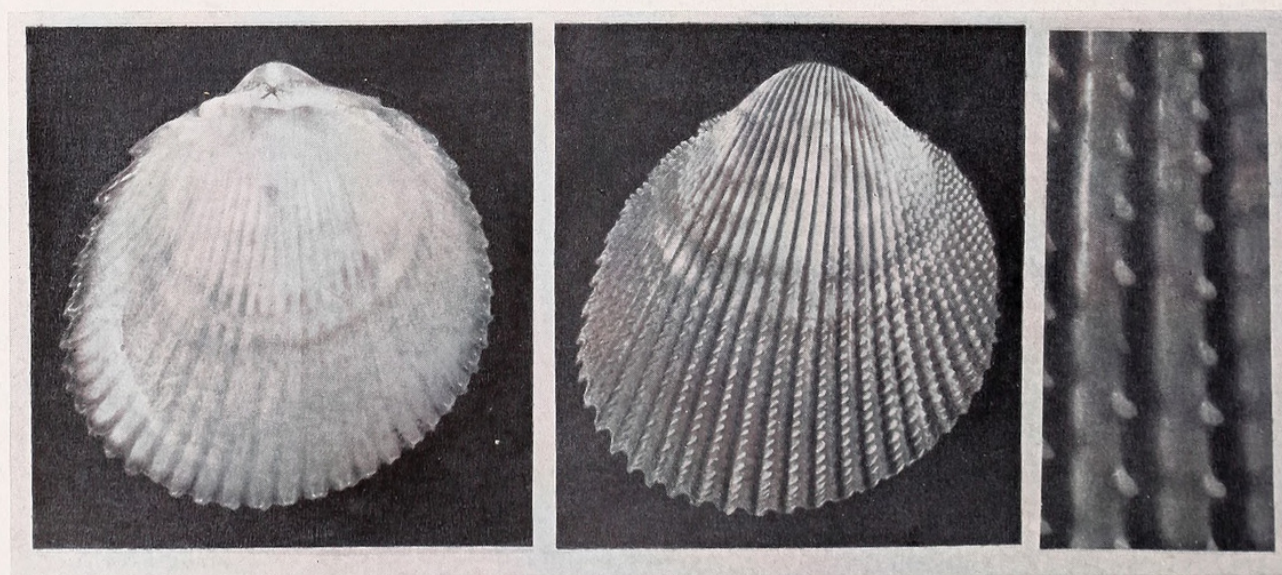


Plate 5. *Trachycardium muricatum* Linné
Jamaica (natural size); sculpture (6×)

Records. NORTH CAROLINA: Beaufort Bay (MCZ). SOUTH CAROLINA: Myrtle Beach; Charleston (both MCZ). FLORIDA: Canaveral; North Inlet, Lake Worth; Biscayne Bay; Sugar Loaf Key; Sombrero Key; Key West; Cape Sable (all MCZ); Tice Id., Caxambas (M. Bills); Sanibel Id.; Sarasota; Pass-a-Grille (all MCZ). TEXAS: Port Aransas; Matagorda Bay (both MCZ). BAHAMAS: West End, Grand Bahama Id.; Cave Cay, Little Abaco Id.; Whale Cay Channel, Great Abaco Id.; South Bimini Id.; Mangrove Cay, Andros Id.; Dick's Point, New Providence; Simms, Long Id. (all MCZ). CUBA: Habana; Nuevitas; Caibarién; La Milpa, Cienfuegos Bay; Fish Point, Guantánamo Bay (all MCZ). HISPANIOLA: Monte Cristi; Santa Bárbara de Samaná (both MCZ). JAMAICA: Port Antonio; Portland Bight (both MCZ). PUERTO RICO: Mayagüez; Guanica; Ponce (all MCZ); Río Herrera, near Loiza Vieja (R. Kenk); Humacao (Univ. of Mich.). VIRGIN ISLANDS: Bogart's Bay, Tortola; Caneel Bay, St. John (both M. Dewey); St. Thomas (MCZ). LESSER ANTILLES: Guadeloupe; Le Marin, Martinique; Pigeon Point, Tobago (all MCZ); Fontenay Beach, Grenada; Saline Bay and Mayaro Bay, Trinidad (all H. G. Kugler). MEXICO: Alvarado, Veracruz (M. E. Bourgeois). BRITISH GUIANA: 4 miles east of Georgetown (MCZ). BRASIL: Penha, Ilha de Itaparica, Estado da Bahia; Praia da Boa Viragem, Nictheroy, Estado do Rio de Janeiro; Praia de Mucuripe, Fortaleza, Estado de Ceará; Praia Comprida, Victoria, Estado de Espirito Santo; Praia de Imbituba, Estado de Santa Catarina (all P. de Oliveira). ARGENTINA: Gulfo San José (A. Carcelles); off Belem Head, Gulfo de San Matías in 25 fathoms (*Hassler* Voyage, MCZ).

Genus *Dinocardium* Dall

Dinocardium Dall 1900, Trans. Wagner Free Inst. Sci. Philadelphia **3**, pt. 5, p. 1074.

Genotype, *Cardium magnum* Born (= *Cardium robustum* Solander) (by original designation).

Shell large with more or less coloration. Its sculpture is without spines or elevated scales. Anterior ribs have slightly raised arcuate imbrications. Posterior ribs are depressed and smooth.

There is only the type species and its subspecies in the Western Atlantic.

Dinocardium robustum Solander, Plate 6

Cardium magnum Born 1780, Testacea Musei Caesarei Vindobonensis, p. 46, pl. 3, fig. 5; *non Cardium magnum* Linné 1758, Syst. Nat. ed. 10, p. 680.

Cardium robustum Solander 1786, Portland Catalogue, p. 58 (Florida).

Cardium ventricosum Bruguière 1789, Encyclopédie Méthodique **1**, p. 228 (Campeachy [Mexico]).

Cardium maculatum Gmelin 1790, [in] Linné, Syst. Nat. ed. 13, p. 3225.

Cardium carolinensis Conrad 1863, Proc. Acad. Nat. Sci. Philadelphia for 1862 [1863], p. 576 (Florida). [Based on fig. 1, pl. 19, p. 63, *Cardium magnum* Born, Toumey and Holmes 1857, Pleiocene Fossils of South Carolina, Charleston, S.C.]

Description. Shell varying from 75 to 106 mm. (3 to 4 inches) in height, inflated, subquadrate, moderately heavy and strongly ribbed. External color straw, with only occasional specimens showing color patches which are mostly confined to the upper portion of the disc. The posterior slope is mainly mahogany red, shading toward purple near the margin of the shell. Interior color rose, shading to a brownish rose on the posterior and basal margins; anterior margin white. Umbones high and full. Ligament large. Lunule and escutcheon poorly defined. Sculpture consisting of 32 to 36 broadly-rounded radiat-

ing ribs. The first eight ribs of the posterior slope are flattened, roughened only by many fine growth lines. The whole posterior area has an appearance of comparative smoothness.

	length	height	width	
(large)	106	104	75 mm.	Beaufort Bay, North Carolina
(large)	99	94	72	Corpus Christi, Texas
(average)	86	85	63	Off North Carolina, N. Lat. $35^{\circ}50'$; W. Long. $75^{\circ}26'$ (in 10 fathoms)

Types. The type figure is that of Born (1780 Testacea Musei Caesarei Vindobonensis p. 46, pl. 3, fig. 5). Born's reference to Jamaica was in error, since he undoubtedly thought he was dealing with *T. magnum* Linné as to name and locality. Solander gave Florida as the type locality of *D. robustum*. However, he referred to the figure in Lister, pl. 328, fig. 165, which was recorded from Campeche, Mexico. This latter locality can be accepted as the type locality of *D. robustum*, which is the typical subquadrate form pictured by Lister.

Remarks. See under *D. robustum vanhyningi*.

Range. Along the Atlantic coast, from Cape May, New Jersey, (Dall 1900, p. 386) south to Central Florida and in the Gulf of Mexico from North Florida west and south to British Honduras in Central America.

Records. VIRGINIA: ten miles south of Virginia Beach (MCZ). NORTH CAROLINA: N. Lat. $35^{\circ}50'$; W. Long. $75^{\circ}26'$ (in 10 fathoms); Beaufort Bay (both MCZ); Ocracoke Island (Charleston Museum). SOUTH CAROLINA: Myrtle Beach (MCZ); Sullivan's Id.; Isle of Palms; Folly Island; Edisto Island and Capers Island (all Charleston Museum), Charleston (MCZ). GEORGIA: Brunswick Beach, St. Simon's Id.; Sea Island, Glynn Co. (both MCZ). FLORIDA: Seabreeze; Amelia Id.; Coronado; Cocoa Beach; Canaveral (all MCZ). LOUISIANA: Grand Isle and Shell Isle (both M. L. Hayes). TEXAS: Corpus Christi; Port Aransas (both MCZ). MEXICO: Alvarado, Veracruz (M. E. Bourgeois).

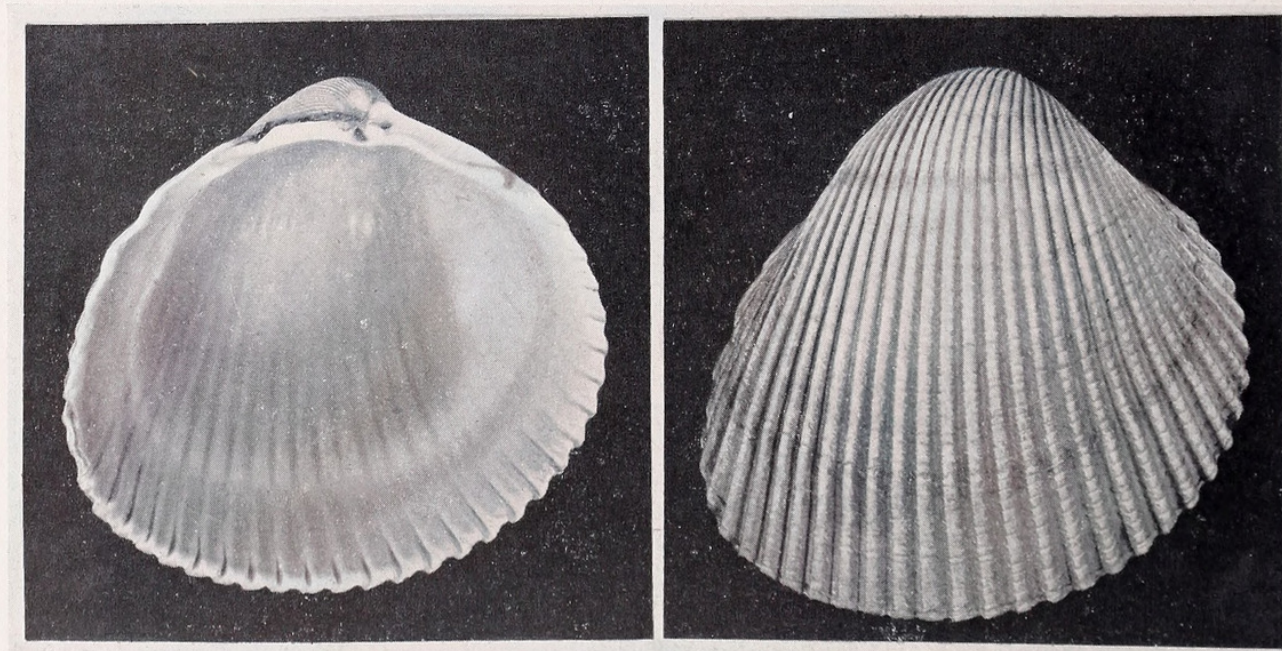


Plate 6, *Dinocardium robustum* Solander
Off North Carolina in 10 fathoms (reduced from $3\frac{1}{4}$ inches)

Dinocardium robustum vanhyningi, new subspecies, Plate 7

Cardium ventricosum Lamarck 1819, (in part) Anim. s. Vert. **6**, p. 10; Ency. Méth. **2**, pl. 299, fig. 1; *non* *C. ventricosum* Bruguière 1789.

Cardium magnum 'Born' Reeve 1844, Conch. Icon. **2**, **Cardium**, pl. 4, fig. 20; *non* *C. magnum* Linné.

Description. Shell varying from 80 to 120 mm. ($3\frac{1}{2}$ to 5 inches) in height, inflated, lengthened obliquely, moderately heavy and strongly ribbed. External color straw, marked with irregular bands of blotches which are mahogany red, shading to purplish brown. These blotches are distinct and are generally on the ribs. The posterior slope is mainly mahogany red, shading toward purple near the margin of the shell. Interior color a rose brown, distributed rather generally, except along the anterior margin which is white. Umbones high and full. Ligament large. Lunule and escutcheon poorly defined. Sculpture consisting of 32 to 36 ribs, broadly rounded and radiating from the umbones. The posterior slope descends sharply. The first eight ribs of the posterior slope are flattened and roughened only by many fine growth lines giving the whole posterior area an appearance of comparative smoothness.

	length	height	width	
(large)	93	117	80 mm.	Sanibel Island, Florida
(average)	82	110	70	Pavilion Key, Florida

Types. Holotype, Museum of Comparative Zoölogy no. 151146, Sanibel Island, Florida. Additional paratypes from Sanibel Island.

Remarks. The subspecies *vanhyningi* is exceedingly close to the typical form. The differential characteristics, however, appear to be constant, and these, coupled with the difference in ranges, make it necessary to separate the two forms.

D. robustum vanhyningi is a common cockle on the west coast of Florida, between Cape Sable and the Tampa Bay area. This subspecies differs from *D. robustum* in being more obliquely elongated, which gives it a decidedly triangular appearance and produces a much



Plate 7. *Dinocardium robustum vanhyningi* Clench and Smith
Sanibel Island, Florida (reduced from $3\frac{1}{2}$ inches)

steeper angle at the margin of the posterior slope. The average size of *D. r. vanhyningi* is considerably greater than that of *D. robustum*. In addition it has much more color.

It is possible that these two forms may intergrade where their ranges meet or overlap along the northwest Florida coast, but as yet we have no proof that this is the case. Our present material shows definitely a geographical segregation of this new subspecies.

Named for Mr. T. Van Hyning, Director of the Florida State Museum, Gainesville, Florida.

Range. Cape Sable region north to Clearwater, Florida.

Records. FLORIDA: Clearwater; Port Tampa; Egmont Key; Mullet Key, Tampa Bay; Casey Key Beach; 2 mi. N.W. of Nokomis, Manatee Co.; Pass-a-Grille; Long Key, Sarasota; Lemon Bay; Boca Grande; Sanibel Island; Marco Island; Naples; Pavilion Key (all MCZ).

Genus *Cerastoderma* Poli

Cerastoderma Poli 1795, *Testacea Utriusque Siciliae* 2, pp. 252, 258.

Genotype, *Cardium edule* Linné (by subsequent designation, von Martens 1870).

Shell unicolored, white, gray or dull cream, and possessing a coarse periostracum. The shell is round or oval, ribbed radially and not gaping. Ligament short and straight.

The two species that occur in the Western Atlantic are found north of the Carolinas and usually in deep water.

Key to the species of the genus *Cerastoderma*

Ribs flattened, sculpture weak, often obsolete on the disc	<i>pinnulatum</i>
Ribs arcuate, sculpture strong over entire surface of shell	<i>elegantulum</i>

Cerastoderma pinnulatum Conrad, Plate 8, figs. 1-7

Cardium pinnulatum Conrad 1831, *Jour. Acad. Nat. Sci. Philadelphia*, 6, pt. 2, p. 260, pl. 11, fig. 8 (Massachusetts).

Description. Shell small, varying from 6 to 14 mm. in height, inflated, subovate, thin and strongly ribbed. External color cream. Interior glossy white. Rarely, a specimen shows a suffusion of orange brown color, more pronounced toward the posterior. Umbones subcentral and low. Ligament inconspicuous but strong. Lunule and escutcheon poorly defined. The sculpture consists of 22 to 28 radiating ribs which are flattened and gently rounded. These ribs possess thin, slightly arched scales, except on the posterior slope where these scales are denticulated. The scales are often obsolete on the disc. Margin strongly serrated. Periostracum dull cream color and rather inconspicuous.

	length	height	width	
(large)	13.1	12.5	8.2 mm.	Cultivator Shoals, Georges Bank, off Massachusetts in 65 fathoms
(average)	9	8.8	5.3	Off Duxbury, Massachusetts in 18 fathoms

Types. Academy of Natural Sciences, Philadelphia, no. 63763. (Conrad's original number was 1087.) The type locality of Massachusetts is here restricted to Woods Hole, Mass.

Remarks. This species is found mainly below low-water line and is far more abundant north of Cape Cod than it is south of this point. Mr. James Miller reports that on the banks off Nova Scotia it is the most abundant mollusk dredged.

C. pinnulatum is readily distinguished from young specimens of *C. ciliatum* by possessing small and separated scales on the ribs. The rib scales on *C. elegantulum* are arched and overlapping. It is to be noted, however, that the rib scales on *C. pinnulatum* are frequently worn or broken away, but they usually leave behind scars where they were attached.

Range. Labrador to North Carolina (McLean 1939, p. 163).

Records. LABRADOR: Nain in 7 fathoms; Gready Harbor in 12 fathoms. NOVA SCOTIA: Le Have Bank in 45 fathoms; off Mosher River; Cape Sable in 40 fathoms; about 43 miles west by south from Cape Sable in 110 fathoms. NEW BRUNSWICK: Bradelles Bank in 66 fathoms; Grand Manan in 15 fathoms. MAINE: Perry in 10 fathoms; Eastport; Copscook Bay; Frenchmans Bay; Duck Island, Mt. Desert; Isle au Haut; Rockland in 45 fathoms; Wiscasset; Casco Bay. NEW HAMPSHIRE: Off New Hampshire (N. Lat.

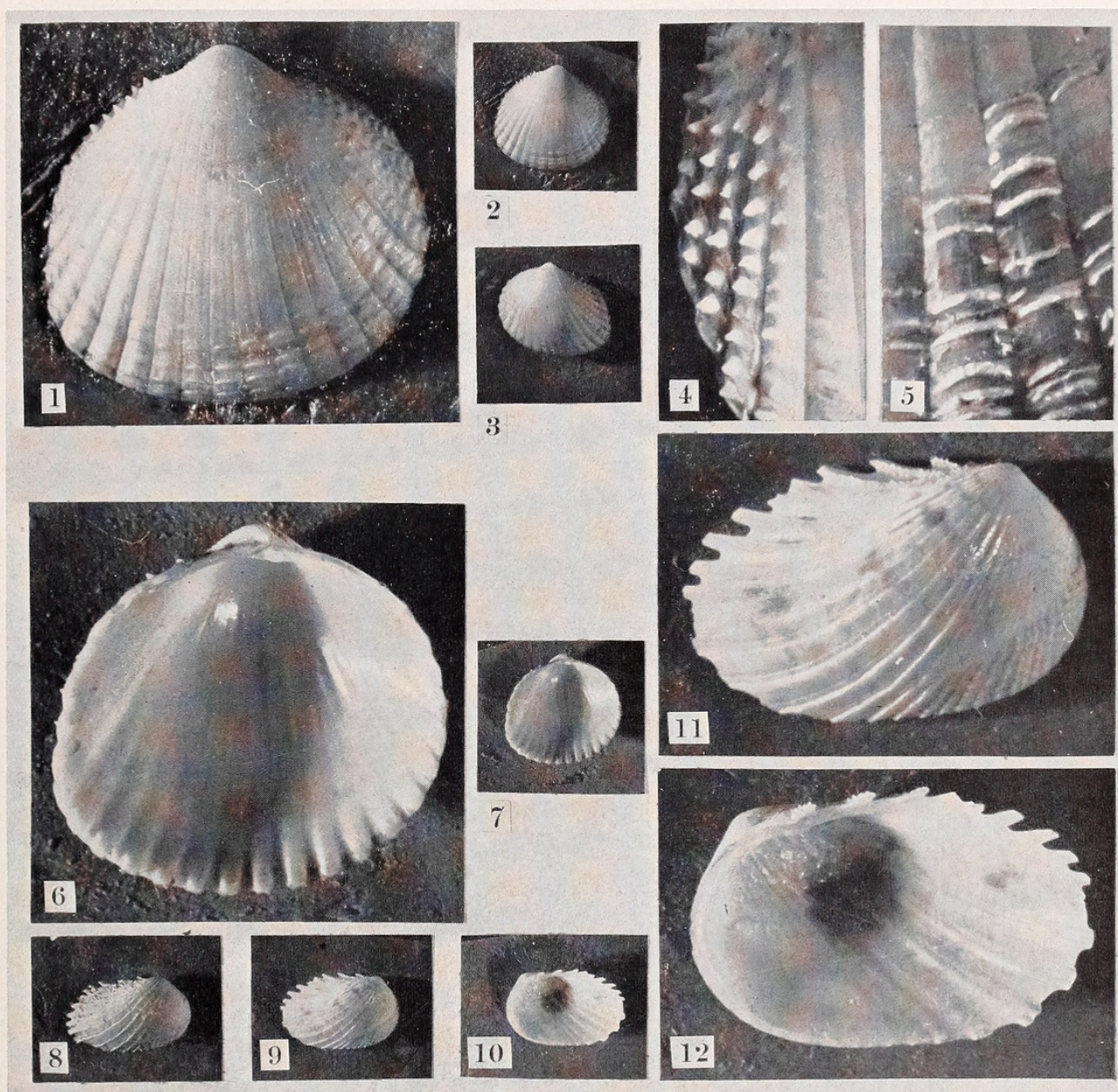


Plate 8. Fig. 1-7, *Cerastoderma pinnulatum* Conrad, Georges Bank, off Massachusetts (fig. 1 and 6, $3\times$; fig. 2, 3 and 7, natural size; fig. 4, $7\times$; fig. 5, $10\times$). Fig. 8-12, *Papyridea semisulcatum* Gray, Puerto Sosúa, Hispaniola (fig. 8-10, natural size; fig. 11-12, about $3\times$)

42°00'; W. Long. 69°50') in 105 fathoms. MASSACHUSETTS: Kettle Island, Magnolia; Salem; off Duxbury in 18 fathoms; Plymouth; Woods Hole; Cultivator Shoal, Georges Bank in 65 fathoms; Buzzards Bay; Martha's Vineyard. RHODE ISLAND: 4 miles south of Block Island in 21 fathoms; 34 miles south of Block Island in 35 fathoms; 57 miles south of Block Island in 50 fathoms (all MCZ). NEW YORK: Orient, Long Island (R. Latham). NEW JERSEY: Off New Jersey (N. Lat. 40°12'; W. Long. 72°26') in 33 fathoms (MCZ).

Cerastoderma elegantulum Beck, Plate 9

Cardium elegantulum Beck 1842, [in] Möller Naturhist. Tidsskrift (1), 4, p. 93 (Greenland); G. O. Sars 1878, Mollusca Regionis Arcticae Norvegiae, p. 47, pl. 5, fig. 5a-b; non *Cardium elegantulum* Römer 1849; non *Cardium elegantulum* d'Orbigny 1850.

Description. Shell small, reaching about 14 mm. in length, inflated, subovate, moderately heavy and strongly ribbed. External color yellowish white. Interior glossy white. Umbones subcentral and low. Ligament strong. Lunule and escutcheon poorly defined. The sculpture consists of 22 to 28 radiating, ornate ribs which possess compact, arched, overlapping scales. Margin strongly serrated. Periostracum inconspicuous.

	length	height	width	
(large)	11.5	10	7 mm.	Hammerfest, Norway
(average)	9.5	8.1	5.8	Greenland

Types. The location of Beck's types is unknown to us. The type locality is Greenland. A specific place should be named as the type locality when more material is at hand for study.

Remarks. We can add little here. This species is either very rare or exists only in

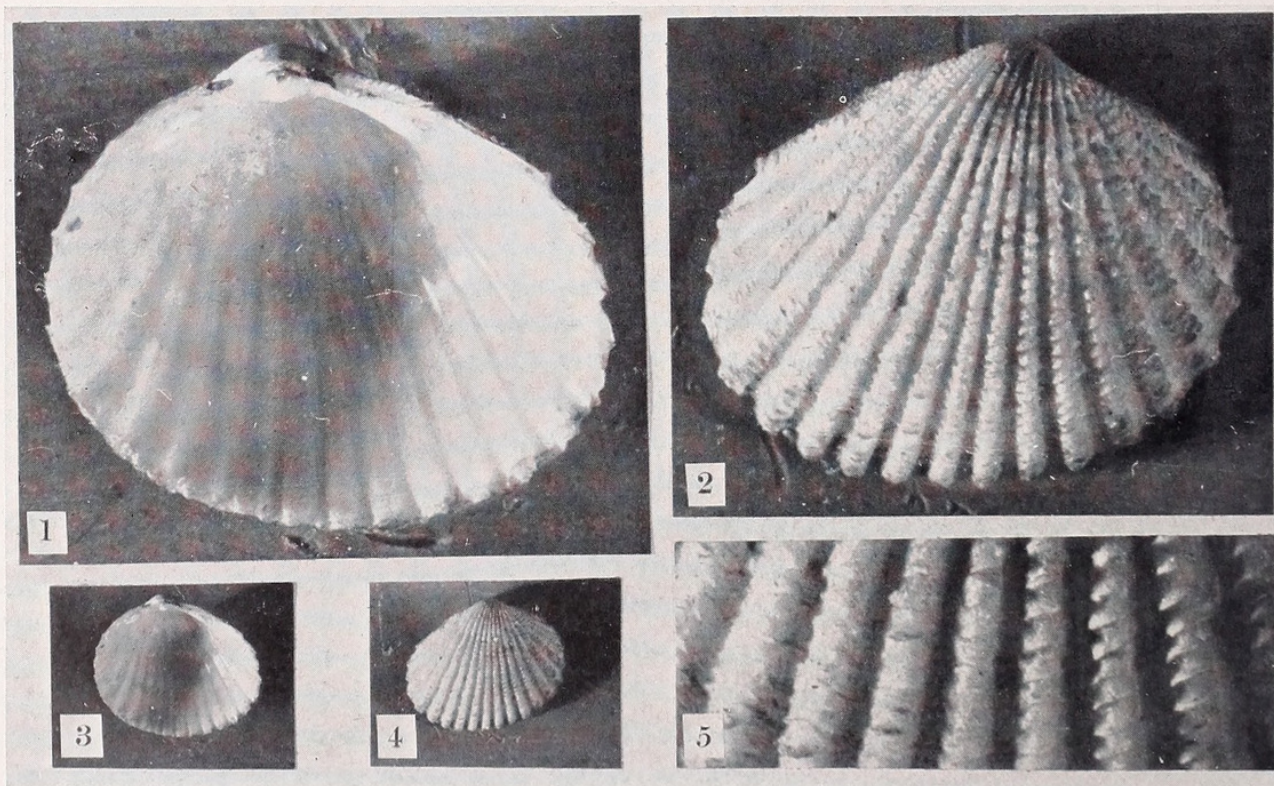


Plate 9. *Cerastoderma elegantulum* Beck

Fig. 1-5, Hammerfest, Norway (fig. 1-2, 6×; fig. 3-4, 2×; fig. 5, 12×)

the extreme northern latitudes as Owen Bryant failed to locate any specimens during his extensive dredgings off the coast of Labrador. The compact arched and overlapping scales on the ribs readily differentiate this form from *C. pinnulatum*.

Range. Greenland and Northern Europe. Probably circumpolar.

Records. GREENLAND. NORWAY: Hammerfest (both MCZ).

Genus *Clinocardium* Keen

Clinocardium Keen 1936, Trans. San Diego Soc. Nat. Hist. **8**, p. 119.

Genotype, *Cardium nuttallii* Conrad 1837 (original designation).

Shell medium to large, trigonal, oblique, usually ventricose. Umbones recurved, position of the umbones usually about two-thirds the distance between the posterior and the anterior ends of the shell. Sculpture of from 28 to 55 rounded radial ribs and concentric growth lines which may cross the ribs as conspicuous loops but never as spines. Ligament long, narrow and oval. Interior porcellaneous. Margins serrated. Hinge arched, cardinals in each valve slightly nearer the anterior than the posterior laterals. Muscle scars large, pallial line simple.

Clinocardium ciliatum O. Fabricius, Plate 10

Cardium ciliatum O. Fabricius 1780, Fauna Groenlandica, p. 410 (Greenland); G. O. Sars 1878, Mollusca Regionis Arcticae Norvegiae, p. 46, pl. 5, fig. 4a-b.

Cardium islandicum Bruguière 1789, Ency. Méth. **1**, p. 222 (Iceland). [Refers to Chemnitz, Conchylien-Cabinet (1), **6**, p. 200, pl. 19, fig. 195-6]; Gmelin 1790, [in] Linné, Syst. Nat. ed. 13, p. 3252.

Cardium edule N. Mohr 1786, Ilsandsk Naturhistorie, p. 128 (Iceland); *non Cardium edule* Linné 1758.

Cardium boreale Broderip and Sowerby 1829, Zool. Jour. **4**, p. 368 (Arctic Ocean); *non C. boreale* Reeve.

Cardium pubescens Couthouy 1838, Boston Jour. Nat. Hist. **2**, p. 61, pl. 3, fig. 6 (Massachusetts Bay).

Cardium arcticum Sowerby 1840, Proc. Zool. Soc. London **8**, p. 106, (Arctic Sea); Sowerby 1841, Conchological Illust., fig. 26.

Cardium dawsoni Stimpson 1862, Proc. Acad. Nat. Sci. Philadelphia, p. 58, text figure. (Pleistocene: Hudson Bay).

Cardium hayesi Stimpson 1868, Proc. Acad. Nat. Sci. Philadelphia, p. 142 (Disco Island, [Greenland]).

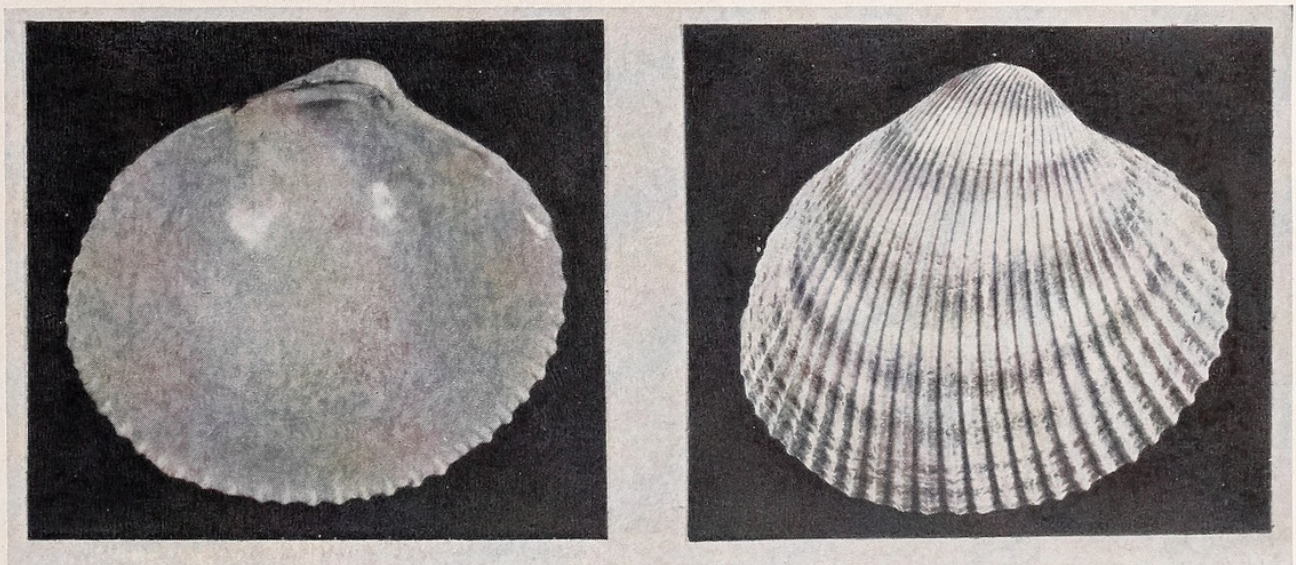


Plate 10. *Clinocardium ciliatum* Fabricius
Banquereau Bank, off Nova Scotia in 80 fathoms (natural size)

Description. Shell varying from 45 to 70 mm. in height, inflated, subovate, moderately thin and strongly ribbed. External color drab with most specimens showing concentric bands of darker coloration. Young specimens pale cream. Interior coloration ivory, with occasional specimens showing horizontally arranged patches of a darker color. Umbones subcentral, prominent but fairly low. Ligament strong. Lunule and escutcheon faintly outlined. Sculpture consisting of 32 to 38 radiating ribs. The ribs are ridged, crossed by growth lines, which appear to be quite rough under a 10x lens. Margin strongly serrated. Periostracum conspicuous, grayish in color.

	length	height	width	
(large)	70	65	43 mm.	Penobscot Bay, Maine
(average)	57	51	35	Banquereau Bank, off Nova Scotia, in 80 fathoms

Types. Fabricius' types are in the Copenhagen Museum (I. S. Oldroyd, 1924, p. 142). The type locality is Greenland.

Remarks. *C. ciliatum* is the only representative of the genus *Clinocardium* in the Western Atlantic. This species, among our northern forms, differs strikingly from both *Cerasoderma pinnulatum* and *C. elegantulum* by lacking scales on the ribs. In cross-section, the ribs of *C. ciliatum* are V-shaped. See remarks under *C. pinnulatum* for differentiating young specimens of these two species.

C. ciliatum is not an abundant species at the southern limit of its range, but to judge by the numerous lots obtained by Owen Bryant off Labrador, it is fairly abundant in that region.

Range. Circumpolar; in the Western Atlantic from Greenland south to Massachusetts.

Records. GREENLAND. LABRADOR: off Hebron, in 100 fathoms; off Beachy Id. in 80 fathoms; Port Manvers in 30 fathoms; Nain; Shoal Tickle, 20 miles southeast of Nain; Gready Harbor; off Egg Harbor in 20 fathoms; Battle Harbor in 50 fathoms. NEWFOUNDLAND: St. Pierre Bank. NOVA SCOTIA: Banquereau Bank in 80 fathoms; Middle Bank in 35 fathoms; 15 miles east of Sable Id. in 55 fathoms. NEW BRUNSWICK: Bradelles Bank in 35 fathoms; Grand Manan. QUEBEC: Mingan Id. off Saguenay. ONTARIO: Moose River, St. James Bay. MAINE: Eastport; Frenchmans Bay; Trenton Point; Penobscot Bay in 45 fathoms; Portland. MASSACHUSETTS: Ipswich Bay in 13 fathoms; Brewer Ledge, Provincetown; Duxbury in 18 fathoms; off Manomet in 12 fathoms; Georges Bank (N. Lat. 42°04'; W. Long. 66°00') in 55 fathoms (all MCZ).

Genus *Papyridea* Swainson

Papyridea Swainson 1840, Treatise on Malacology, p. 374.

Genotype, *Cardium soleniforme* Bruguière 1789 (= *C. hiatus* Meuschen 1787) (by subsequent designation Gray 1847).

Shell transversely oval, inequilateral, the anterior and posterior sides almost always gaping. Radially and obliquely ribbed, the ribs often more or less spiny. Posterior portion of shell longer than anterior, with the ribs of the posterior slope extending beyond the margins of the valves, so that the ribs of the opposing valves form a series of interlocking teeth.

Key to the species of the genus *Papyridea*

Shell more than 20 mm. in length	<i>hiatus</i>
Shell less than 20 mm. in length	<i>semisulcatum</i>

Papyridea hiatus Meuschen, Plate 4, figs. 3-5

Cardium hiatus Meuschen 1787, Museum Geversianum p. 442 (locality not given). [Refers to Gualtierius 1742, Index Test. Conchy. pl. 85, fig. H].

Cardium spinosum Meuschen 1787, Museum Geversianum p. 442 (locality not given); *non C. spinosum* Solander 1786, Cat. Portland Museum p. 105. [Meuschen refers to Lister 1685, Syn. Meth. Conchy. pl. 342, fig. 179 (Jamaica)].

Solen bullatum of authors, not of Linné 1758.

Cardium soleniforme Bruguière 1789, Ency. Méth. Vers 1, pt. 1, p. 235 (Santo Domingo and Martinique).

Cardium hiuleum Reeve 1845, Conch. Icon. 2, **Cardium**, no. 123 (locality unknown). [Dall (1900, p. 387) considers this species of Reeve's a monstrosity].

Description. Shell varying from 30 to 40 mm. in length, thin, longer than high, gaping at both ends and having its radial ribs slanted obliquely. External color white, with a finely blotched pattern of color markings which are usually pinkish purple but may show shades of yellow and chestnut. The interior coloration is much the same as the exterior, with the color blotches showing through. There is usually a pattern of color immediately under the umbones, consisting of two streaks of wine-red bordering a portion of cream color. The ventral margin is often marked with fine spots of a warm rose brown color. Umbones fairly prominent and located nearer the anterior end. Ligament relatively strong and conspicuous. Lunule and escutcheon not defined. The sculpture consists of 40-55 fine, obliquely radiating ribs which are minutely spinose, giving a file-like texture to the shell. On the posterior slope, the spines are more fully developed, are denticulate and are located on the posterior side of each rib. The scales on the anterior half of the shell are fine, close-set, sharply arched imbrications which cover the narrow ribs. The margins of the shell are serrated, the deepest serrations being on the posterior margins. Periostracum grayish and quite conspicuous on the anterior and posterior slopes and along the margin of the shell.

	length	height	width	
(large)	41	31	19 mm.	St. Thomas, Virgin Islands
(average)	32	21	15	Lake Worth, Florida

Types. We here select Lister 1685 (Syn. Meth. Conchy. pl. 342, fig. 179) to be the type figure which was given by Meuschen as his only reference for *C. spinosum*. Jamaica is the type locality.

Common name. Spiny Paper Cockle.

Remarks. Unfortunately, the well-known name, *Papyridea spinosum*, must be changed to *P. hiatus* as the above synonymy indicates.

This species, though widely distributed, does not appear to be very abundant. Our field experience shows that it exists a little below the low-water line. Fresh specimens are remarkably spinose but readily lose the minute spines on the disc by being beach rolled.

Range. North Carolina to Brasil (McLean 1939, p. 165).

Records. NORTH CAROLINA: Shackleford Bank, Beaufort (U. of Mich.). SOUTH CAROLINA: Pawley's Island (Charleston Museum). FLORIDA: Lake Worth; Pompano; Sombrero Key; Sugar Loaf Key; Key West; Sanibel Island; Pass-a-Grille (all MCZ); Sunrise Beach, St. Petersburg (Charleston Museum). BAHAMAS: Eight Mile Rock, Grand Bahama Island; North Bimini Island; Governors Harbour, Eleuthera; Simms, Long Island (all MCZ). CUBA: Cabañas (C. G. Aguayo); Cayo Caimán, Caibarién (P. J. Bermúdez); Guantánamo Bay (MCZ). HISPANIOLA: Cabo Macorís (MCZ). Jamaica

(MCZ). VIRGIN ISLANDS: St. Thomas (MCZ); Guana Island, Tortola (M. Dewey). LESSER ANTILLES: Fontenary Beach, Grenada (H. G. Kugler). CARIBBEAN ISLANDS: Aruba (Charleston Museum).

Papyridea semisulcatum Gray, Plate 8, figs. 8-12

Cardium semisulcatum Gray 1825, Ann. of Phil. **25**, (n.s.) p. 138 (locality not given).

Cardium ringiculum Sowerby 1834, Conch. Illus. pl. 48, fig. 11 (St. Vincents); Sowerby 1841, Proc. Zool. Soc. London **8**, p. 106 (Ceylon).

Cardium petitianum d'Orbigny 1846, [in] Ramon de la Sagra, Hist. L'Isle de Cuba, Mollusques, **2**, p. 309, pl. 27, fig. 50-52 (Guadeloupe [Lesser Antilles]).

Description. Shell small, thin and delicate, varying from 8 to 15 mm. in length. There is a slight gap at the anterior end but none at the posterior end where the serrations are so greatly developed that they cause an interlocking of the valves. The radial ribs are slanted obliquely. External color is generally white, though a few specimens show pink tinges of color and a few are orange-yellow. The interior color is the same as the exterior. Umbones prominent and located nearer to the anterior end. Ligament relatively strong and conspicuous. Lunule and escutcheon not defined. The sculpture consists of about 30 ribs. On the anterior slope, the first six or eight ribs are very narrow and show a very fine bead-like crenulation. Toward the middle of the shell the ribs become wider, flatter and much smoother, showing only wavy lines in place of the imbrications. Toward the posterior slope, the ribs become raised and narrower, but retain the wavy sculpture of the disc. On the last few ribs of the posterior slope there are a few denticulate scales. Only the posterior half of the shell shows serrated margins and these are markedly developed. Periostracum grayish and quite conspicuous on the posterior and anterior slopes.

	length	height	width	
(large)	13	9	6.2 mm.	Guana Island, Tortola, Virgin Islands
(average)	9	6	4.8	Arthurstown, Cat Island, Bahamas

Types. Gray's types are in the British Museum. As Gray did not give a type locality we select St. Vincent, Lesser Antilles, as cited by Sowerby for *C. ringiculum*. McLean (1900, p. 165) was in error in citing Cuba as a locality on the authority of d'Orbigny. The latter gave only Guadeloupe Island in his description of *C. petitianum*.

Remarks. We can add little to what is known about this species. From our material, we judge that it is a comparatively rare species. We have few dredged specimens, but according to Dall (1889, p. 54) this species (as *C. petitianum* d'Orb.) has been dredged in depths of 300 fathoms.

Range. Southern Florida, Bermuda (Verrill and Bush 1900, p. 519) and south through the West Indies to Trinidad (McLean 1939, p. 165).

Records. FLORIDA: Off Key West; Pelican Shoals. BAHAMAS: Nassau, New Providence; Arthurstown, Cat Island; Matthewtown, Gt. Inagua (all MCZ). CUBA: Pueblo Nuevo, Matanzas Bay (P. J. Bermúdez). HISPANIOLA: Cabo Macorís; Puerto Sosúa (both MCZ). VIRGIN ISLANDS: Guana Island, Tortola; Devils Bay, Virgin Gorda (both M. Dewey); St. Thomas (MCZ).

Genus **Trigoniocardia** Dall

Trigoniocardia Dall 1900, Trans. Wagner Free Inst. Sci. **3**, pt. 5, p. 1075.

Genotype, *Cardium graniferum* Broderip and Sowerby (by original designation).

Shell with the posterior slope sharply to moderately descending. Strongly ribbed, the ribs generally being somewhat smaller on the posterior slope. Channels between the ribs concentrically sculptured with fine thread-like ridges. The anterior lateral teeth are crowded against the cardinals.

Key to the subgenera of *Trigoniocardia*

1. Hinge having the anterior laterals relatively close to the cardinals and the posterior laterals more remote *Trigoniocardia* s.s.
2. Hinge having the anterior laterals almost as far removed from the cardinals as the posterior laterals *Americardia*

Subgenus *Trigoniocardia* Dall

Shell with the posterior slope moderately descending, strongly ribbed and possessing concentric sculpture between the ribs; generally white or grayish on the outside, white or slightly colored with streaks or a blotch of reddish brown on the inside. Hinge having the anterior lateral teeth close to the cardinal teeth, the posterior laterals more distant.

Key to the species of the subgenus *Trigoniocardia*

1. Shell with about 16 ribs, three or four of which are much larger than the others *ceramidum*
2. Shell with about 26 ribs, all of which are about the same size *antillarum*

Trigoniocardia antillarum d'Orbigny, Plate 11, figs. 3-4

Cardium antillarum d'Orbigny 1846, [in] Ramon de la Sagra, Hist. L'Isle de Cuba, Mollusques, **2**, p. 309, pl. 27, fig. 53-55. (Cuba; Jamaica; Martinique and Guadeloupe.)

Cardium guppyi Thiele 1910, Zool. Jahrbuch., Suppl. 11, pp. 129-130, pl. 9, fig. 25-26 (Barbados).

Description. Shell small, moderately heavy, varying from 10 to 15 mm. in length, inflated, subquadrate and strongly ribbed. External color white with occasional specimens showing small patches of chestnut color and some showing a pinkish tinge. Interior white. A good many specimens show a pattern of chestnut color under the umbones, in

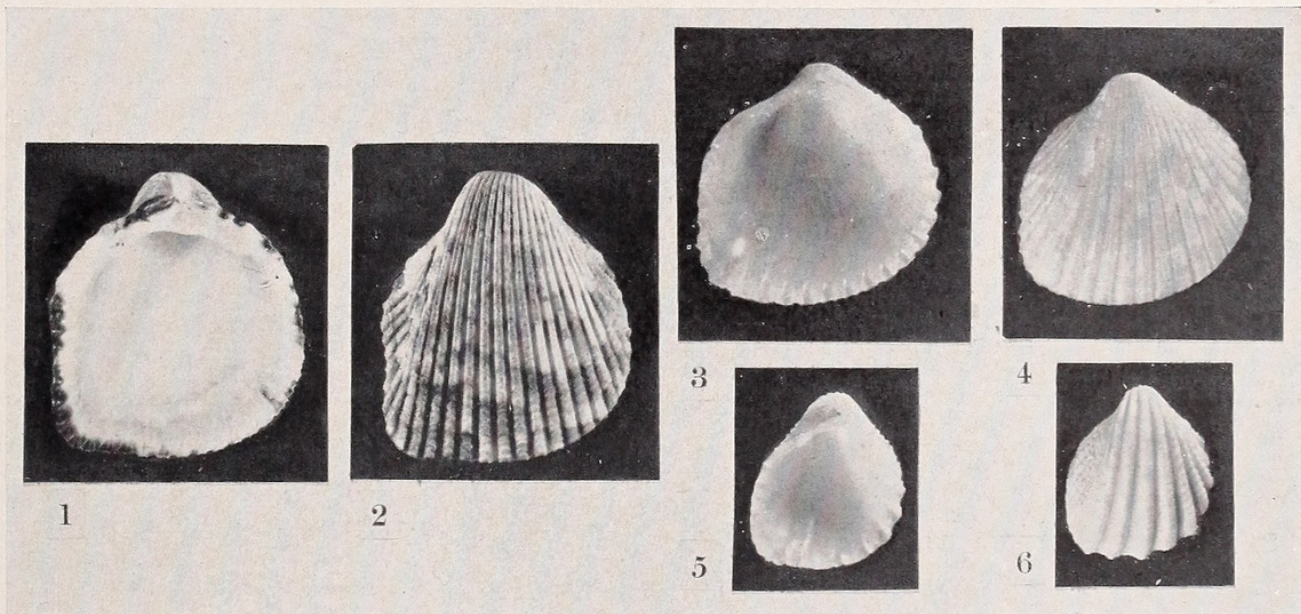


Plate 11. Fig. 1-2, *Trigoniocardia medium* Linné, Guadeloupe, Lesser Antilles (natural size). Fig. 3-4, *T. antillarum* d'Orbigny, Pueblo Nuevo, Matanzas Bay, Cuba (3×). Fig. 5-6, *T. ceramidum* Dall, St. Thomas, Virgin Islands (2×)

the form of two streaks, the longer streak following the posterior slope, some specimens having a solid patch of chestnut color. Umbones prominent, subcentral. Ligament small. Lunule and escutcheon not seen. The sculpture consists of 26–29 radial ribs which are about the same width over the entire shell. About 9 of the ribs are on the moderately sharply descending posterior slope. Some shells show low imbrications on all ribs. Some have imbrications only on the anterior slope. A good many have comparatively smooth ribs. The channels between the ribs have a very fine concentric sculpture which can be seen with a powerful lens. Margins strongly serrated. Periostracum inconspicuous.

	length	height	width	
(large)	14.5	14.5	11.5 mm.	Orange Creek, Cat Island, Bahamas
(average)	9.2	9.5	7	Fox Hill Beach, New Providence, Bahamas

Types. The types are probably in the British Museum (Sherborn 1940, p. 103). The type locality is Habana, Cuba, selected by McLean (1939, p. 166) from among the several localities given by d'Orbigny.

Remarks. *T. antillarum* is very similar to *T. ceramidum* in size, shape and general coloration. *T. antillarum* runs slightly larger and often shows some color blotches which *T. ceramidum* does not possess. The sculpture is the best differentiating character, since *T. ceramidum* has three or four very prominent ribs on the disc of the shell.

Range. Straits of Florida, Bahamas and south through the Lesser Antilles (Dall 1889, p. 52).

Records. BAHAMAS: Whale Cay Channel, Gt. Abaco Island; Cat Cay, Bimini Islands; Adelaide, New Providence; Orange Creek, Cat Island; Little San Salvador, 18 miles west of Cat Island; Mangrove Cay, Andros Island; Cape St. Maria, Long Island; Matthewtown, Gt. Inagua (all MCZ). CUBA: Pueblo Nuevo, Matanzas Bay; Caibarién; Cayo Megano Grande, Camagüey (all P. J. Bermúdez); La Chorrera (C. G. Aguayo). JAMAICA: (Charleston Museum). VIRGIN ISLANDS: Bogart's Bay, Tortola; Devil's Bay, Virgin Gorda; Caneel Bay, St. John (all M. Dewey).

Trigoniocardia ceramidum Dall, Plate 11, figs. 5–6

Cardium sp. indet. Dall 1881, Bull. Mus. Comp. Zoöl., **9**, p. 132 (off Havana in 182 fathoms).

Cardium ceramidum Dall 1886, Bull. Mus. Comp. Zoöl., **12**, p. 269, pl. 4, fig. 6, (off Havana; Samaná Bay [Hispaniola]; St. Thomas).

Description. Shell small but heavy, varying from 6–10 mm. in length, inflated, subquadrate and strongly ribbed. External color creamy white. Interior greyish white. Umbones prominent and subcentral. Ligament small. Lunule and escutcheon not seen. The sculpture consists of 16–18 ribs, three or four of which are very heavy and wide on the disc. They become very fine on the sharply descending slope and gradually finer on the anterior side. There are minute denticulated scales placed on the ridge of the rib, nearly always seen on the slopes but very often obsolete on the ribs of the disc. The channels between the ribs have very fine concentric sculpture. Margins strongly serrated. Periostracum grayish and inconspicuous.

	length	height	width	
(large)	10.5	9.6	8 mm.	Monte Cristi, Hispaniola
(average)	9.5	9.6	7	Mayagüez, Puerto Rico

Types. Co-types, Museum of Comparative Zoölogy, no. 8005, from off Habana, Cuba, in 182 fathoms.

Remarks. The shape of this species is quite variable, particularly in the ratio of height to length. In addition, it varies greatly in the degree of spinosity. See remarks under *T. antillarum*.

Range. Greater Antilles.

Records. CUBA: off Habana in 182 fathoms. HISPANIOLA: Monte Cristi; Puerto Plata. JAMAICA. PUERTO RICO: Mayagüez. VIRGIN ISLANDS: St. Thomas (all MCZ).

Subgenus *Americardia* Stewart

Americardia Stewart 1930, Special Publication no. 3, Acad. Nat. Sci. Philadelphia, p. 267.

Subgenotype, *Cardium medium* Linné (by original designation).

Shell fairly heavy and generally blotched with brown or brownish red. Hinge having the anterior lateral and posterior lateral teeth about the same distance from the cardinal teeth.

Trigoniocardia (Americardia) medium Linné, Plate 11, figs. 1-2

Cardium medium Linné 1758, Systema Naturae ed. 10, p. 678 (Indian Ocean); Gmelin 1790, Syst. Nat. ed. 13, p. 3246 (American Ocean).

Cardium venustum Dunker 1861, Malacozool. Blätter 8, p. 37 (Antillean Seas).

Hemicardium columba Heilprin 1887, Trans. Wagner Free Inst. Sci. Philadelphia, 1, p. 93, pl. 11, fig. 26-26a (Pliocene; Caloosahatchie formation, Florida).

Description. Shell varying from 25 to 55 mm. in height, inflated, inequilateral, heavy and strongly ribbed. External color white, mottled with shades of reddish brown, color deepest on the posterior slope. The interior is usually white but may show shades of orange, rose-brown or purple which is more pronounced on the inside of the posterior slope. Umbones prominent and subcentral. Ligament strong. Lunule and escutcheon not defined. The sculpture consists of from 33 to 36 radiating ribs, about twelve of which are on the sharply descending posterior slope. These ribs are covered with close-set, chevron-shaped plates. On old specimens, particularly those which have been exposed to wave action, these plates or scales have disappeared, leaving hardly any indication of their insertion points. There is a very inconspicuous concentric sculpture between the ribs. Margin strongly serrated. Periostracum grayish, inconspicuous.

	length	height	width	
(large)	38	45	37 mm.	Orange Creek, Cat Island, Bahamas
(average)	30	34	28	Guadeloupe, Lesser Antilles

Types. We here select Lister 1685 (Syn. Meth. Conchy. pl. 316, fig. 153) to be the type. The type locality, according to Linné in 1758 and 1767, was the Indian Ocean. Gmelin, in 1790, changed it to the American Ocean. Habana, Cuba is the type locality selected by McLean (1939, p. 167).

Range. Bermuda, North Carolina and south through the West Indies to Brasil (Dall 1889, p. 52).

Records. BERMUDA: South of Castle Rock in 80-100 fathoms (MCZ). FLORIDA: Lake Worth; Biscayne Bay in 4 fathoms; Key Largo; Knight's Key; Bonefish Key;

Sugar Loaf Key; Key West (all MCZ). BAHAMAS: Strangers Cay, Little Abaco Id.; West End, Grand Bahama; North Bimini Id.; Dick's Point, New Providence; Savannah Sound, Eleuthera; Orange Creek, Cat Island; Stocking Island, Great Exuma; Simms, Long Island; Samaná Cay, Crooked Island Group; Matthewtown, Gt. Inagua (all MCZ). CUBA: Matanzas Bay; Cienfuegos (both MCZ); Cayo Francés, Caibarién; La Chorrera (both P.J. Bermudéz). HISPANIOLA: Monte Cristi; Porto Sosúa; Santa Bárbara de Samaná; Cabo Macorís (all MCZ). PUERTO RICO: Ponce; Mayagüez (both MCZ). VIRGIN ISLANDS: Guana Island, Tortola; Caneel Bay, St. Johns; The Baths, Virgin Gorda Island (all M. Dewey); St. Croix; St. Thomas (both MCZ). LESSER ANTILLES: Antigua (Charleston Museum); Guadeloupe; off Barbados in 100 fathoms (both MCZ); Grand Anse, Grenada; Carenage, N.W. Trinidad (both H.G. Kugler). COLOMBIA: Cartagena (MCZ).

Genus *Laevicardium* Swainson

Laevicardium Swainson 1840, Treatise on Malacology, p. 373.

Liocardium Agassiz 1846, Nomenclatoris Zoologici Index Universalis, p. 212.

Genotype, *Cardium oblongum* Gmelin (by subsequent designation, Stoliczka 1871).

Shell generally inflated, moderately thin, smooth to very finely ribbed, not gaping. Lateral teeth prominent and large, the anterior laterals being nearer to the cardinals. Cardinal teeth small but well developed.

Key to the species of the genus *Laevicardium*

- | | |
|--|--------------------|
| 1. Shell minutely papillose on slopes and border | <i>mortoni</i> |
| Shell not papillose | 2 |
| 2. Shell smooth and polished, moderately large, more than 22 mm. in height | <i>laevigatum</i> |
| Shell smooth and polished, small, less than 22 mm. in height | 3 |
| 3. Shell subquadrate, with pink umbones | <i>sybariticum</i> |
| Shell very oblique, color in an allover pattern | <i>pictum</i> |

Laevicardium laevigatum Linné, Plate 12, figs. 1-5

Cardium laevigatum Linné 1758, Systema Naturae, ed. 10, p. 680 (locality unknown); Linné 1767, Syst. Nat. ed. 12, p. 1123; Gmelin 1790, Syst. Nat. ed. 13, p. 3251 (Atlantic Ocean and Indian Ocean); Born 1780, Musei Caesarei Vindobonensis, p. 47; Lamarck 1819, Anim. s. Vert. 6, p. 11.

Cardium citrinum Wood 1815, General Conchology, p. 223, pl. 54, fig. 3 (Mediterranean; Indian Ocean; South America and West Indies).

Cardium brasilianum Lamarck 1819, Anim. s. Vert., 6, p. 5 (Rio de Janeiro, Brasil).

Cardium oviputamen Reeve 1844, Conch. Icon. 2, **Cardium**, pl. 7, fig. 36 (locality unknown).

Cardium vetellinum Reeve 1844, Conch. Icon. 2, **Cardium**, pl. 7, fig. 37 (locality unknown).

Cardium lamarchii d'Orbigny 1846, Voyage dans L'Amerique Merionale 5, p. 591 (Coast of Brasil) *non Cardium lamarchii* Reeve 1845.

Cardium lineatum 'Gmelin' Krebs 1864, the West Indian Marine Shells, p. 115 (West Indies); *non C. lineatum* Gmelin 1790 [in] Linné's Syst. Nat. ed. 13, p. 3246.

Cardium glabratum Römer 1869, [in] Martini und Chemnitz Conchylien-Cabinet (2), 10, pt. 2, p. 91-92, pl. 13, figs. 8-9 (Island of Margarita, Antillean Seas).

Cardium serratum multilineatum Dall and Simpson 1901, Bull. United States Fish Commission for 1900, 20, (1), p. 489 (Mayagüez Harbor, Porto Rico).

* * * *

Note. *Laevicardium serratum* Linné is the name frequently used for this species, but in error. Linné in 1758 and 1767 gave no references and no locality for his *Cardium ser-*

ratum. Gmelin, however, in the 13th edition (1790) gave a single reference, that of Chemnitz 1782, *Conchylien-Cabinet* (1), 6, pl. 18, figs. 185–186. These must, therefore, stand as the type figures of *L. serratum*, which is in our collection from several localities in the Indo-Pacific. The name *L. serratum* must replace that of *L. biradiatum* Bruguière 1789. Bruguière refers to the same figures in Chemnitz mentioned above as his only reference.

Gmelin, in the 13th edition of Linné's *Systema Naturae*, apparently in error, transposed the non-binomial names of Chemnitz (*Cardium citrinum* and *Cardium laevigatum*). Since the non-binomial names in the first eleven volumes of the twelve-volume set of Chemnitz that comprises the first series of the *Conchylien-Cabinet* have been ruled out, the names as used by Gmelin must stand.

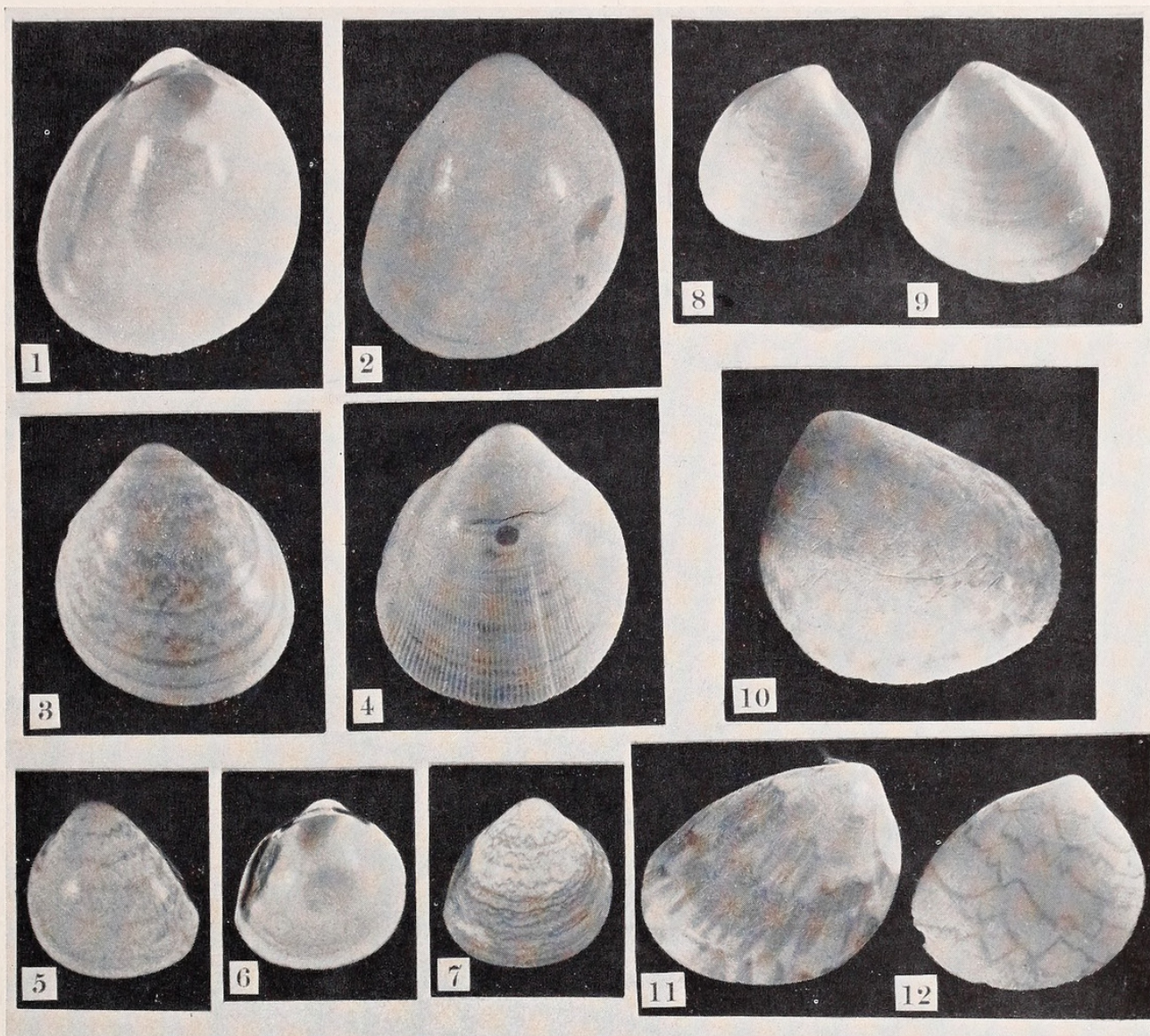


Plate 12. Fig. 1–2, *Laevicardium laevigatum* Linné, Lake Worth, Florida (natural size). Fig. 3, *L. laevigatum* Linné, Monte Cristi, Hispaniola (natural size). Fig. 4, *L. laevigatum* Linné, Puerto Plata, Hispaniola (natural size). Fig. 5, *L. laevigatum* Linné, Salinas, Estado da Bahia, Brasil (natural size). Fig. 6–7, *L. mortoni* Conrad, Orient, Long Island, New York (natural size). Fig. 8–9, *L. sybariticum* Dall, off Castle Rock, Bermuda (2×). Fig. 10, *L. pictum* Ravenel, Lectotype, off Charleston, South Carolina (2×). Fig. 11, *L. pictum* Ravenel, off Fort Walton, Florida (2×). Fig. 12, *L. pictum* Ravenel, off Charleston, South Carolina (2×).

Description. Shell varying from 30–70 mm. in height, smooth, shining and polished, inflated, subelongate to subquadrate, thin to moderately heavy and obscurely ribbed. This is a very variable shell in color, shape and sculpture. The external color may be a pure white, white with rose borders or white with mottlings of brown; or it may be yellow, ranging through shades of canary yellow to burnt orange. The interior coloration is also very variable but is usually harmonious with the exterior. Generally, the color is strongest on the posterior slope but it may be diffused over the interior. The color ranges from the faintest blush to intense shades of yellow-orange and pinkish purple. White shells usually have shades of pink or purple on the inside. Shells which are yellow on the outside usually have a diffused interior coloration, with shades of yellow sometimes streaked with purple. Umbones are subcentral and vary in height proportionately to the size and age of the shell. The ligament is long and strong. There is a well defined, smooth area on both the anterior and posterior slopes, the posterior extending to the ventral margin, the anterior comprising about one-third of the anterior slope. The posterior side of the shell is nearly straight, the anterior rounded. There are about 60 very fine, radiating ribs which may often be seen but rarely felt on the body of the shell. The margin of the shell is serrated from the border of the smooth posterior area to the area of smoothness on the anterior slope. Serrations on some shells are much coarser than on others. Periostracum thin and somewhat deciduous.

	length	height	width	
(large)	50	61	41 mm.	Gulf of Paria, Trinidad, Lesser Antilles
(average)	32	40	22.5	Sugar Loaf Key, Florida, in 2 fathoms

Types. The type is that of Chemnitz, Conchylien-Cabinet (1) 6, pl. 18, f. 189, as given by Gmelin in Linne's Syst. Nat. ed. 13, p. 3251. The type locality is Matanzas Bay, Cuba, designated by McLean (1939, p. 169).

Common name. Egg-shell heart clam.

Remarks. We recommend the grouping of the two subspecies *L. multilineatum* Dall and Simpson and *L. brasilianum* Lamarck with the typical species *L. laevigatum* Linné since it seems impossible to separate them. There is such a range of color, size, shape and lineation that we cannot find consistent characteristics which justify keeping them apart. Dall states, "There are intermediate specimens which can be assigned to one form about as well as the other" (1901, p. 489).

The West Indian form named *Cardium serratum multilineatum* Dall and Simpson was probably described from a series of shells that had more pronounced lineation than the average but nearly all of the shells in this group have obscure vestiges of ribs, more or less developed. However, if this particular form is to retain a separate name, it must be *L. glabratum* Römer, which name has 32 years priority.

In Brasil, at the southern end of the range, specimens appear to be smaller than the typical and possess a more or less consistent color pattern of zigzag lines on the disc and broken bars of reddish brown color on the posterior slope. This latter color is repeated in pattern on the interior. However, parallelism in color, shape and size appear in sporadic individuals throughout the entire range. The southern form was named *Cardium brasilianum* by Lamarck in 1819.

We have one very large single valve from Ponce, Puerto Rico, which measures 82

mm. in height. It may be fossil. It was obtained on the spoil dump near the harbor entrance and may have come from several feet down in the harbor mud.

Range. Cape Hatteras to Brasil.

Records. NORTH CAROLINA: Off Cape Hatteras (N. Lat. $35^{\circ}52'$; W. Long. $75^{\circ}09'$) (MCZ); Ocracoke Island (Charleston Museum). SOUTH CAROLINA: Sullivan's Island (Charleston Museum). FLORIDA: St. Lucie Inlet (M. Cannon); Cape Canaveral; Beacon Hill; Cocoa Beach; Lake Worth; Biscayne Bay; Madera Bay; Key West; Tortugas; Pavilion Key; Sanibel Island; Pass-a-Grille; Anna Maria Key; Gulfport; Cedar Keys; (all MCZ). BERMUDA: Shelly Bay; Hungry Bay (both MCZ). BAHAMAS: Angel Fish Point, Little Abaco Island; Holmes Cay, Grand Bahama Island; North Bimini Island; Nassau, New Providence; Tarpum Bay, Eleuthera; Arthurstown, Cat Island; Watlings Island; Little San Salvador; Stocking Island, Gt. Exuma; Simms, Long Island; Samana Cay, Crooked Island Group; Matthewtown, Gt. Inagua (all MCZ). CUBA: La Chorrera, Habana (C. G. Aguayo); Caibarién (P. J. Bermúdez). HISPANIOLA: Monte Cristi; Puerto Plata (both MCZ). JAMAICA: Portland Bight (MCZ). PUERTO RICO: Ponce; Mayagüez (both MCZ). VIRGIN ISLANDS: St. Thomas; St. John (both MCZ); Guana Island, Tortola; Devil's Bay, Virgin Gorda (both M. Dewey); St. Croix (H. A. Beatty). LESSER ANTILLES: St. Christopher; St. Lucia in 10 fathoms; Barbados (all MCZ); Bugo Reef, Tobago Island; Couva Bank, Gulf of Paria, Trinidad (both H. G. Kugler). CARIBBEAN ISLANDS: Aruba (MCZ). MEXICO: Veracruz (MCZ). PANAMA: Colón (MCZ). COLOMBIA: Cartagena (MCZ). VENEZUELA: Cumana (MCZ). BRASIL: Rio de Janeiro (MCZ); Ilha de Itaparica, Estado da Bahia; Pedra Furado, Estado da Bahia; São João da Barra, Estado do Rio de Janeiro; Ilha de São Sebastião, Estado de São Paulo (all Paulo de Oliveira); Pernambuco (MCZ).

***Laevicardium pictum* Ravenel, Plate 12, figs. 10-12**

Liocardium pictum Ravenel (March) 1861, Proc. Acad. Nat. Sci. Philadelphia, p. 44 (off Charleston Bar, South Carolina); *non Cardium pictum* Dunker (April) 1861, Malak. Blätter 8, p. 37.

Description. Shell small, varying from 11 to 25 mm. in height, moderately thin, polished, only moderately inflated and triangular in shape. The external color is white or cream with delicate shading and patterning of rose or brown. The shell shows some iridescence. Some specimens show brown zig-zag lines which cross the disc. The interior may be white or it may have shades of rose, yellow, or purple, alone or in combination. The umbones are very low and far toward the anterior side. The ligament is small. Lunule and escutcheon are not defined; however, there are areas of comparative smoothness on the posterior and anterior slopes which surround the escutcheon and lunule areas. The sculpture consists of sub-obsolete radial and concentric ribs and still finer growth lines which can be seen under a lens. The margins are very finely serrated on about half of the shell. The periostracum is very inconspicuous.

	length	height	width	
(large)	16	20.2	12 mm.	Dewees Island, South Carolina
(average)	12	14	6.7	Off Fort Walton, Florida

Types. Lectotype here chosen, Charleston Museum no. R 3200 (Ravenel collection) from stomachs of fish off Charleston Bar, Charleston, South Carolina. Paratypes from the same locality in the Charleston Museum.

Remarks. For many years *L. pictum* has been considered a synonym of *L. laevigatum*. It was originally described from specimens found in the stomachs of fish taken in 45 fathoms of water, near Charleston, South Carolina. (See Plate 12, fig. 10). We have seen Ravenel's types, as well as other specimens taken near Charleston. *L. pictum* differs from *L. laevigatum* by being smaller, less inflated and having the very low umbones at the extreme anterior portion of the shell, giving it a very oblique shape. The color pattern is quite different. Through the kindness of L. A. Burry we have seen a fine series of specimens of *L. pictum* collected off Fort Walton, Florida, in 13–19 fathoms. They are identical in shape, color pattern and size with specimens from Charleston and prove very conclusively that *L. pictum* is entirely separate from both *L. laevigatum* and *L. sybariticum*. See remarks under *L. sybariticum*.

Range. Bermuda, South Carolina, Florida and Gulf of Mexico.

Records. BERMUDA: in 7 fathoms (MCZ). SOUTH CAROLINA: off Charleston, stomachs of fish; Folly Beach; Pawley's Island; Dewees Island (all Charleston Museum). FLORIDA: dredged, Lake Worth, Boynton Inlet; off Palm Beach in 85 fathoms (both T. Bayer); off Dania in 17 fathoms (MCZ); off Fort Walton in 13–19 fathoms (L. A. Burry).

Laevicardium sybariticum Dall, Plate 12, figs. 8–9

Laevicardium serratum sybariticum Dall 1886, Bull. Mus. Comp. Zoöl., 12, no. 6, p. 270 (off Barbados, Lesser Antilles).

Description. Shell thin, polished, small, varying from 9 to 17 mm. in height, inflated and subquadrate. External color creamy white with delicate shadings of pink. The umbones are a deep pink. The interior is white and usually shows delicate pink shades. The umbones are conspicuously colored, subcentral and moderately high. Ligament small. Lunule and escutcheon not defined but their areas are smooth. The sculpture consists of minutely fine growth lines and minutely fine radial ribs. Periostracum thin, deciduous and rather smooth.

	length	height	width	
(large)	14.5	17	10 mm.	South of Castle Rock, Bermuda
(average)	8.5	9	5	Flanagan Passage, St. John, Virgin Islands

Types. Lectotype, Museum of Comparative Zoölogy, no. 74296, taken by the *Blake* in 100 fathoms, off Barbados, Lesser Antilles.

Remarks. This is a deep water species and is not a common shell. It may be distinguished from the young of *L. laevigatum* by the characteristically colored umbones. It is more inflated than *L. pictum*, is more delicate and is quite square in shape, while *L. pictum* is flat, scarcely inflated at all and is quite triangular in shape.

Range. Bermuda south through the West Indies in 17 to 190 fathoms.

Records. BERMUDA: $\frac{3}{4}$ mi. south of Castle Rock in 80–100 fathoms. FLORIDA: off Dania in 17 fathoms. BAHAMAS: Whale Cay Channel, Great Abaco. CUBA: Bahía de Cochinos in 180–190 fathoms. VIRGIN ISLANDS: Flanagan Passage, St. John in 27 fathoms. LESSER ANTILLES: off Barbados in 100 fathoms. CARIBBEAN ISLANDS: off Swan Island in 60 fathoms (all MCZ).

Laevicardium mortoni Conrad, Plate 12, figs. 6-7

Cardium mortoni Conrad 1830, Journ. Acad. Nat. Sci., Philadelphia, **6**, pp. 259-260, pl. 11, figs. 5-7. (Rhode Island and Long Island Sound); Dall 1889, Bull. United States National Mus. no. 37, p. 54, pl. 58, fig. 8 (showing soft parts).

Description. Shell varying from 15 to 25 mm. in height, inflated, moderately thin, not gaping. External color a dirty white with or without patterns of brown zigzag markings. Interior smooth and shining, generally tinged with yellow and having a deep purple patch on the posterior side. The interior coloration is very variable. It may be pale with only a few flecks of brownish purple or it may be diffused with shades of purplish brown arranged in concentric patterns, the color most intense in the umbonal cavity. The margins are usually white. Umbones are high and often purplish in color. The ligament is long and quite strong. The lunule and escutcheon are not defined; however there is an area of comparative smoothness on both slopes, the posterior slope descending rather sharply. The anterior lateral teeth are very prominent. The sculpture consists of fine concentric ridges which are minutely papillose on most specimens. The papillose sculpture is invested in, or intensified by the periostracum which becomes quite heavy on the posterior and anterior slopes and a little less heavy along the lower margin. The interior of the shell displays minutely fine, smooth radiating ribs. The margins show very fine serrations.

	length	height	width	
(large)	23	24	19.5 mm.	Westerly, Rhode Island
(average)	17.5	18	12.8	Gulfport, Florida

Types. Academy of Natural Sciences, Philadelphia, no. 54147, from Long Island, New York. (Conrad's original number was 1064).

Common name. "Duck clam." Mr. Roy Latham of Orient, Long Island, reports, "The black duck, scaup, golden-eye, and some other ducks commonly feed upon this cockle."

Remarks. This shell is easily distinguished from *L. laevigatum* by having the minutely papillose exterior, lacking in *L. laevigatum* which is smooth, shiny and polished. *L. mortoni* exists alive at low water mark and in very moderate depths up to one or two fathoms.

It is difficult to understand its occurrence at Caibarién, Cuba. The specimens were taken alive by Dr. Bermúdez and there is no question of the identification. This is the only authentic record we have seen for the West Indies.

Range. Massachusetts to Guatemala.

Records. MASSACHUSETTS: Provincetown; Yarmouth; Dennisport; Hyannisport; Cotuit Highlands; Woods Hole; Marion; New Bedford; Katama Bay, Martha's Vineyard; Wawinet, Nantucket (all MCZ). RHODE ISLAND: East Greenwich; Buttonwoods; Watch Hill; Westerly (all MCZ). NEW YORK: Orient; Mattituck, Long Island (Roy Latham) Greenport; Northport Harbor, Long Island (MCZ). NORTH CAROLINA: Beaufort (MCZ). FLORIDA: Lake Worth; Coconut Grove; Madera Bay; Lignumvitae Key; Sombrero Key; Cape Sable; Sanibel Island (all MCZ); Boca Grande (H. Dodge); Sarasota; Gulfport; Clearwater; Cedar Keys (all MCZ). CUBA: La Sortija, Caibarién (P.J. Bermúdez). TEXAS: Indianola; Port Aransas; Olivia (all MCZ). GUATEMALA: Puerto Barrios (Univ. of Mich.).

Serripes Gould

Aphrodite Lea 1834, Trans. American Phil. Soc. (n.s.) **5**, p. 111; *non Aphrodite* Link 1807; *non Aphrodite* Hübner 1820; *non Aphrodite* Leske 1775; *non Aphrodite* Lendenfeld 1886.

Aphrodite Leach 1839 (pro *Aphrodite* Lea) [in] Sowerby, Conch. Man. p. 70; *non Aphrodite* Linné 1758.

Serripes 'Beck' Gould 1841, Invertebrata of Massachusetts, Cambridge, p. 93.

Genotype, *Cardium groenlandicum* Bruguière 1789 (by monotypy).

Description. Valves generally smooth over the disc but with broad flattened sub-obsolete ribs over the slopes. Hinge plate very narrow; cardinal teeth nearly wanting. Muscular and pallial complex well impressed. Shell moderately gaping.

Serripes groenlandicus Bruguière, Plate 13, figs. 5-7

Venus islandica 'Linné' Fabricius 1780, Fauna Groenlandica, p. 411 (Ipikfaunak, Greenland); *non Venus islandica* Linné 1767.

Cardium groenlandicum Bruguière 1789, Ency. Méth., **1**, p. 222 (Greenland); Gmelin 1790 [in] Linné Syst. Nat., ed. 13, p. 3252 (Greenland and Iceland). [Both authors refer to Chemnitz, Conchylien-Cabinet **6**, pl. 19, fig. 198.]

Maetra radiata Donovan 1799, British Shells **5**, p. 161 (Portsmouth, England).

Cardium edentula Montagu 1808, Test. Brit. Suppl., p. 29 (Portsmouth [England]).

Cardium radiatum 'Donovan' Gray 1824, Append. Parry's Voy. 1819-20, p. 244; *non Dryadin* 1837; *non* Reeve 1845.

Aphrodite columba Lea 1834, Trans. American Phil. Soc. (n.s.) **5**, p. 111, pl. 18, fig. 54 (locality unknown).

Cardium boreale Reeve 1844, Conch. Icon. **2**, **Cardium**, pl. 22, fig. 131 (Greenland); *non Cardium boreale* Broderip and Sowerby 1829.

Cardium fabricii Deshayes 1854, Proc. Zool. Soc. London, p. 333 (Greenland).

Serripes groenlandicus protractus Dall 1900, Trans. Wagner Free Inst. Sci. Philadelphia **3**, pt. 5, p. 112 (Greenland).

Description. Shell large, varying from 50 to 90 mm. in height, thin to moderately heavy, inflated, subquadrate, longer than high and gaping slightly at the posterior. The exterior color is cinereous, with some specimens showing concentric bars of dark brown which border growth stages. Interior color is flat to grayish white. Anterior margin rounded, the posterior side somewhat elongated. Umbones high, inflated and subcentral. Lunule and escutcheon not defined. Ligament large and very strong. The sculpture consists of many broad flattened sub-obsolete ribs which appear accentuated on the posterior and anterior slopes. They may be obsolete or only faintly indicated on the disc. There are concentric ridges which are somewhat irregular but prominent, indicating periods of growth. Muscle scars and pallial line deeply impressed. Pallial line truncated posteriorly. Margins of shell faintly serrated.

	length	height	width	
(large)	99	84	59 mm.	Penobscot Bay, Maine
(average)	72	60	38	Egg Harbor, Labrador

Range. Circumpolar; in North America extending south as far as Cape Cod, Massachusetts and Puget Sound, Washington.

Records. GREENLAND: Dove Bay, Danmark Haven; Egedesminde. LABRADOR: Kamaktavik Bay; Egg Harbor in 7 fathoms; between Cape Mugford and Hebron in 60 fathoms; Nain in 7 fathoms; Shoal Tickle. NEWFOUNDLAND: Grand Banks (Gould's specimen). NEW BRUNSWICK: Grand Manan Bank. NOVA SCOTIA: East of Sable Island in 55 fathoms. MAINE: Eastport in 60 fathoms; Mt. Desert in 5 fathoms; off Owl's

Head, Penobscot Bay in 40 fathoms. MASSACHUSETTS: Cultivator Shoal, Georges Bank in 65 fathoms; Middle Bank in 35 fathoms (all MCZ).

Microcardium Thiele

Microcardium Thiele 1934, Handbuch der Systematischen Wiechtierkunde pt. 3, p. 878.

Genotype, *Cardium (Fulvia) peramabile* Dall 1881 (by subsequent designation, Keen 1937).

Shell delicate, much inflated, with many radial ribs crossed by concentric sculpture. Hinge plate narrow, posterior laterals more distant from the cardinals than are the anterior laterals. Cardinals enlarged, laterals reduced. A very deep pit between the two cardinal teeth in the left valve. Cardinals of right valve proportionately very high.

Key to the species of the genus *Microcardium*

Shell generally white and with about 90 minute ribs	<i>peramabile</i>
Shell with color and with more than 150 minute ribs	<i>tinctum</i>

Microcardium peramabile Dall, Plate 13, figs. 1-2

Cardium (Fulvia) peramabilis Dall 1881, Bull. Mus. Comp. Zoöl. **9**, p. 132 (type locality not indicated).

Cardium peramabile Dall, Keen 1937, Bull. Mus. Royal Hist. Nat. Belgique **13**, no. 7, p. 14.

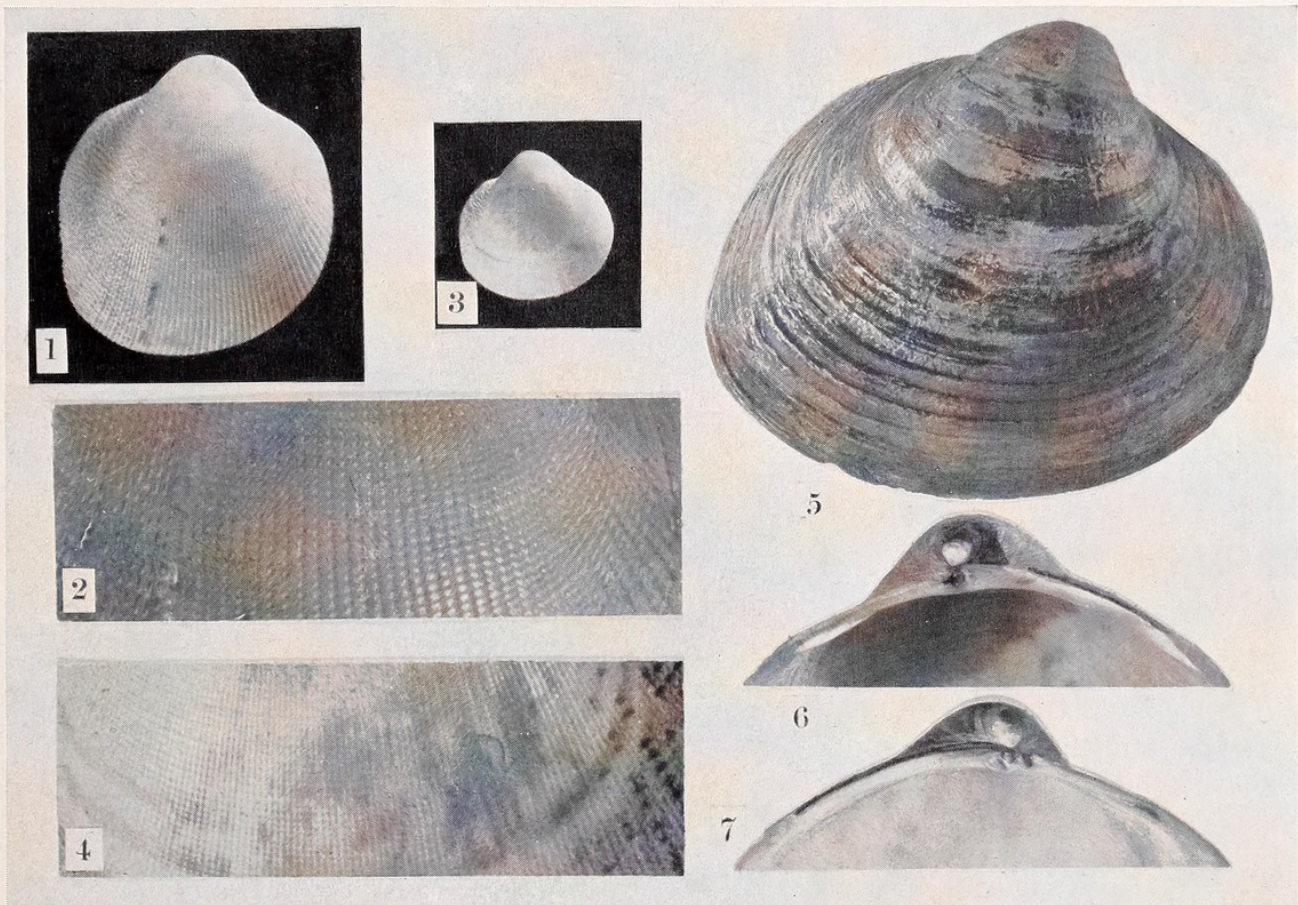


Plate 13. Fig. 1-2, *Microcardium peramabile* Dall, Bahía de Cochinos, Santa Clara, Cuba (fig. 1, 2×; fig. 2, right valve (6×)). Fig. 3-4, *M. tinctum* Dall, off Barbados, Lesser Antilles (fig. 3, 2×; fig. 4, left valve 6×). Fig. 5, *Serripes groenlandicus* Bruguière, off Owl's Head, Penobscot Bay, Maine (slightly reduced). Fig. 6-7, hinge plate of *S. groenlandicus* Bruguière, off Owl's Head, Penobscot Bay, Maine (slightly reduced)

Description. Shell small, varying from 11 to 20 mm. in height, thin, much inflated, subquadrate and not gaping. The color is white, sometimes mottled with delicate shades of brown on the anterior slope. The color of the interior is similar to that of the exterior. Umbones are subcentral, high and prominent. Ligament small. Lunule small but well defined. The escutcheon is not defined. The sculpture is of two types, the more accentuated being on the posterior portion which covers a little more than one-third of the shell. A single prominent rib, larger than any other on the shell, marks the division line between the two areas of sculpture. The anterior sculpture consists of about 45 minute but distinct radiating ribs a little wider than their interspaces and beautifully reticulated by concentric ridges. In the region immediately in front of the umbones, the radiating riblets fail, or become obsolete, and the concentric ones become crowded, wrinkled and irregular. The rib which separates the two types of sculpture is often crested. Beyond this rib, the posterior part of the shell bears about 45 radiating ribs which are more slender than the ribs of the anterior area and have proportionately wider interspaces. The concentric ridges here are merely thin lamellae. There are minute denticulated scales on the posterior slope which have their origin in the interspaces. The ribs are extended beyond the margins, giving a very fine, accentuated serration. Periostracum cream colored and fairly conspicuous on the border and slopes.

	length	height	width	
(large)	16	18	15 mm.	Bahía de Cochinos, Santa Clara, Cuba
(average)	13.5	14.5	12	Bahía de Cochinos, Santa Clara, Cuba

Types. Lectotype, Museum of Comparative Zoölogy no. 8010, off Yucatan (N. Lat. 23°13'; W. Long. 89°16') *Blake*, station 36 in 84 fathoms.

Remarks. This rather remarkable deep sea form has very unusual sculpture for a species of this family in that the reticulated surface shows a strongly developed concentric sculpture. On the upper portion of the disc the sculpture is most uniform and fine and looks almost as if it had been machine-cut.

Though its range is rather extensive, it appears to be common only in the deep water off Cuba.

Range. Rhode Island south through the Lesser Antilles in 18–350 fathoms.

Records. RHODE ISLAND: South of Block Island in 80 fathoms. FLORIDA: off Sand Key, *Blake*, station 9 in 111 fathoms; off Sombrero Key, *Bache*, in 72 fathoms. CUBA: off Habana, *Blake*, station 50, in 119 fathoms; Bahía de Cochinos, *Atlantis*, station 3332, in 175–225 fathoms; Bahía de Corrientes, Pinar del Rio, *Atlantis*, station 3315, in 350 fathoms; off Cayo Coco, Camagüey, *Atlantis*, station 3393 in 220 fathoms; off Punta Alagre, *Atlantis*, station 3419, in 180 fathoms. VIRGIN ISLANDS: off St. Croix, *Blake*, station 132 in 115 fathoms. MEXICO: off Yucatan, *Blake*, station 36, in 84 fathoms; Yucatan Channel, *Bache*, in 100 fathoms. LESSER ANTILLES: off Grenada, *Blake*, station 254 in 164 fathoms; off Dominica, *Blake*, station 177, in 18 fathoms; off Barbados, *Blake*, station 273, in 103 fathoms (all MCZ).

Microcardium tinctum *Dall*, Plate 13, figs. 3–4

Cardium peramabilis tinctum Dall 1881, Bull. Mus. Comp. Zoöl. 9, p. 133; *ibid.* 12, p. 270 (type locality not indicated).

Description. Shell small, varying from 7 to 12 mm., thin, inflated, subquadrate and not gaping. The color is white with faint diffusion of delicate shadings of pink, some shells showing small patches of color near the margins. The interior is white with delicate shades of pink along the posterior slope. The umbones are pink, subcentral, high and prominent. Ligament small. Lunule small but well defined. Escutcheon not outlined. The sculpture consists of more than 150 minute but distinct radiating ribs crossed by finer, almost indistinct concentric lines. The interspaces are very fine. The posterior slope possesses minute denticulated scales protruding from about every fourth interspace. These scales are generally white but an occasional specimen shows scales of a delicate coral shade. The serrations are extremely fine but very distinct.

	length	height	width	
(large)	13	12	9 mm.	off Barbados
(average)	9	8	7	off Barbados

Types. Lectotype, Museum of Comparative Zoölogy, no. 8022, off Fredrikstadt, St. Croix, Virgin Islands, *Blake*, station 127, in 38 fathoms.

Remarks. This species is very similar to *M. peramabile* but it can be easily differentiated. It does not have the sharp line of demarkation between the sculptures of the posterior and anterior slopes. It also has many more ribs and much more color.

Range. Southern Florida south through the Lesser Antilles in 7–225 fathoms.

Records. CUBA: Bahía de Cochinos, *Atlantis*, station 3332, in 175–225 fathoms. VIRGIN ISLANDS: off St. Croix, *Blake*, station 127 in 38 fathoms. LESSER ANTILLES: off Barbados, *Blake*, in 100 fathoms; off Barbados, *Blake*, station 287, in 7–50 fathoms (all MCZ).

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Notes

C. apertum Bruguière 1789, Ency. Méth. Vers 1, pt. 1, p. 226 is based upon the figure of Martini 1782, Conchylien-Cabinet, (1) 6, pl. 18, fig. 181–183.

This species is said to have come from Jamaica. It is unknown in the Western Atlantic.

C. pictum Dunker 1861, Malak. Blätter, 8, p. 37 (West Indies); *non C. pictum* Ravenel.

According to Dall (1900, p. 388) this is probably a European species. Dunker, himself, compared it with *C. papillosum* Poli which occurs in the Mediterranean.

C. regulare Bruguière 1789, Ency. Méth. Vers 1, pt. 1, p. 227 (Santo Domingo).

This species occurs in the Mediterranean Sea.

C. rugatum Dillwyn 1817, Desc. Cat. Recent Shells, p. 125 (Jamaica and the East Indies).

This species is an absolute synonym of *C. apertum* Bruguière as it is based upon the same figures quoted for this latter species.

C. squamosum Gmelin 1790 in Linné's Systema Naturae, ed. 13, p. 3256 (no locality).

This name is based upon the figure of Gualtieri 1742, Index Testarum Conchyliorum, pl. 71, fig. N. This illustration may be that of *T. isocardia* Linné, of the Western Atlantic, or it may be that of *T. consors* Sowerby, of the Eastern Pacific. If this species is eventually considered the same as *T. isocardia* it will become a synonym. If it should be decided that the figure is that of *T. consors*, the name would take priority and would replace this latter name.



Clench, William James and Smith, L. C. 1944. "The family Cardiidae in the Western Atlantic." *Johnsonia* 1(13), 1–32.

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