

SYNOPSIS OF THE FAMILY CARDIIDÆ AND OF THE NORTH AMERICAN SPECIES.

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In pursuance of the plan already carried out for the Mastracea, Diplodontidæ, Leptonacea, Psammobiidæ, Solenidæ, and Tellinidæ, I have prepared the following synopsis of the *Cardiidæ*, to include the species found on both coasts of North America, as well as the subdivisions of the family considered as a whole. I should perhaps explain, for the benefit of students who have not followed recent systematic changes, that this family is here regarded as not including the curious brackish-water forms associated with *Adacna* in the waters of the Caspian and the Tertiary horizons of southeastern Europe. These forms were separated as a distinct family, *Limnocardiidæ*, by Stoliczka in 1870.

The forms included in the present paper have the hinge teeth arched (Cyclodont), springing from below the hinge margin, with the hinge plate obscure or undeveloped, and in many cases the two cardinal teeth in one of the valves rotated so that one stands above the other, while in the opposite valve one precedes the other horizontally, so that the axes of the two pairs when the shell is closed cross each other nearly at right angles. There is a small and a large cardinal in each valve; when the shell is closed the two small cardinals are external to the large ones. The laterals are present in all except *Lophocardium*. The sculpture of the shell is chiefly radial, the lobes of the mantle free below the siphons, the foot geniculate, elongated, and rounded, except in *Serripes*, which has it compressed and serrate below. The gills have a very simple type of reticulation, strongly plicate; the anal chamber in some cases is separated from the pedal by a siphonal septum. The ligament and resilium are parivincular, external and posterior. The valves have serrate margins and frequently gape behind.

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SYNOPSIS OF THE FAMILY CARDIIDÆ.

Genus *CARDIUM* (Linnæus) Lamarck.

(Syn. *Cardium* Linnaeus, 1758, part; + *Cerastes* and *Cerastoderma* Poli, 1795; + *Acanthocardia* Gray, 1851; + *Acanthocardium* Roemer, 1869; + *Eucardium* Fischer, 1887; + *Criocardium* Conrad, 1870; + *Cardia* [Conrad, MS.] Whitfield, 1885; + *Plagiocardium* Cossmann, 1887; + *Papillicardium*, Sacco, 1899.)

Subgenus *Cardium* s. s. Type *Cardium aculeatum* Linnaeus.

Subgenus *Trachycardium* Mörch. (Syn. *Trochycardium* Mörch, 1853; + *Granocardium* Gabb, 1868.) Type, *Cardium isocardia* Linnaeus.

Section *Aerosterigma* Dall, 1900. Shell with an elevated mesial rib internally, radiating from the umbonal cavity. Type, *Cardium dalli* Heilprin; Pliocene of Florida.

Subgenus **Ringicardium** Fischer. (Syn. *Ringicardium* Fischer, 1887; + *Bucardium* Gray, 1853, *ex parte*, not of Megerle, 1811; *Pectunculus* (Adanson) Mörch, 1853; not of Lamarck, 1799.) Type, *Cardium ringens* Gmelin.

Subgenus **Cerastoderma** Mörch. (Syn. *Cerastoderma* Mörch, 1853; + *Cardium* s. s. Gray, 1851, not of Lamarck, 1799; + *Parvicardium* Monterosato, 1884.) Type, *Cardium edule* Linnæus.

Section *Dinocardium* Dall, 1900. Type, *Cardium magnum* Born.

Subgenus **Ethmocardium** White, 1880. Type, *Cardium whitei* Dall, = *Cardium speciosum* Meek and Hayden, 1857, not *Cardium speciosum* Adams and Reeve, 1850; Cretaceous.

Subgenus **Tropidocardium** Roemer. (Syn. *Tropidocardium* Roemer, 1868; + *Cardium* s. s. of many authors, not of Lamarck, 1799.) Type, *Cardium costatum* Linnæus.

Subgenus **Fragum** Bolten. (Syn. *Fragum* Bolten, 1798; + *Isocardia* Oken, 1815, not of Lamarck, 1799; + *Hemicardium* Swainson, 1840; + *Bucardium* Gray, 1853; + *Lozocardium* Cossmann, 1887.)

Section *Fragum* s. s. Type, *Cardium unedo* Linnæus.

Section *Hemicardium* (Cuvier) Dall, 1900. Type, *Cardium hemicardium* Linnæus.

Section *Trigoniocardia* Dall, 1900. Type, *Cardium graniferum* Sowerby.

Section *Ctenocardia* H. and A. Adams, 1857. Type, *Cardium hystriæ* Reeve.

Subgenus **Papyridea** Swainson (Syn. *Papyridea* Swainson, 1840.) Type, *Cardium spinosum* Meuschen.

Section *Fulvia* Gray. (Syn. *Fulvia* Gray, 1853, not *Fulvia* H. and A. Adams, 1858; Fischer, 1887, etc.) Type, *Cardium apertum* Bruguière.

Subgenus **Lævicardium** Swainson. (Syn. *Lævicardium* Swainson, 1840; + *Liocardium* Mörch, 1853.) Type, *Cardium norvegicum* Spengler.

Section *Pachycardium* Conrad, 1870. Type, *Cardium spillmani* Conrad; Cretaceous.

Subgenus **Discors** Deshayes. (Syn. *Discors* Deshayes, 1858; + *Lyrocardium* Meek, 1876; + *Amphicardium* von Martens, 1880; + *Dicardium* Dollfus and Dautzenberg, 1886.) Type, *Cardium subdiscors* d'Orbigny.

Genus SERRIPES Beck.

(Syn. *Serripes* (Beck) Gould, 1841; + *Aphrodite* Lea, 1834, not Hübner, 1816; + *Acardo* Swainson, 1840, not of Lamarck, 1799.) Type, *Cardium grønlandicum* Gmelin.

Genus CORCULUM Bolten.

(Syn. *Corculum* Bolten, 1798; + *Cardissa* Megerle, 1811; + *Isocardia* Oken, 1815, not of Lamarck, 1799; + *Les Hemicardes* Cuvier, 1817, *ex parte*; + *Hemicardium* Ferussac, 1822; + *Hemicardium* Mörch, 1853.) Type, *Cardium cardissa* Linnaeus.

Genus LUNULICARDIA Gray.

(Syn. *Lunulicardia* Gray, 1853; + *Opisocardium* Bayle, 1879.) Type, *Cardium retusum* Linnaeus.

Genus AVICULARIUM Gray.

(Syn. *Avicularium* Gray, 1853; + *Lithocardium* Woodward, 1854.)

Section *Avicularium* s. s. Type, *Cardium aviculare* Lamarck.

Section *Byssocardium* Munier Chalmas, 1882. Type, *Cardium emarginatum* Deshayes.

(*Pterocardia* Bayan, 1874, and *Goniocardium* Vasseur, 1880, are suspiciously close to *Avicularium*.)

Genus PROTOCARDIA Beyrich.

(Syn. *Protocardia* Beyrich, 1845; + *Protocardium* Meek and Hayden, 1860; + *Nemocardium* Meek, 1876.)

Section *Protocardia* s. s. Type, *Cardium hillanum* Sowerby.

Section *Nemocardium* Meek. Type, *Cardium semispermum* Deshayes.

Section *Leptocardia* Meek, 1876. Type, *Cardium subquadratum*.

Evans and Shumard; Cretaceous.

Subgenus **Lophocardium** Fischer, 1887. Type, *Cardium cumingi* Broderip.

? Genus HEMIDONAX Mörch.

(Syn. *Hemidonax* Mörch, 1870; + *Donacocardium* Vest, 1876; + *Donacocardium* von Martens, 1876.) Type, *Cardium donaciforme* Schroeter.

This group probably belongs with the Donacidae.

EAST AMERICAN SPECIES.

Cardium (Trachycardium) isocardia Linnaeus, 1758.

Range: Cape Hatteras, North Carolina, to Trinidad Island, West Indies. Pliocene to Recent.

This includes *Cardium equontianum* Shuttleworth, 1856, and *Cardium churruiferum* Guppy, 1875.

Cardium (Trachycardium) muricatum Linnaeus, 1758.

Range: North Carolina to Santa Caterina, Brazil. Pleistocene.

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This is *Cardium muricatum* Linnaeus, No. 69, not No. 62, 1758; + *Cardium campechiense* Bolten, 1798; + *Cardium gossei* Deshayes, 1854.

Cardium (Trachycardium) leucostoma Born, 1780.

Range: West Indies.

This includes *Cardium marmoratum* Lamarck, 1819; + *Cardium elongatum* Wood, 1815, and Sowerby, 1831, not Bruguière, 1789; + *Cardium magnum* Wood, 1825. I am inclined to think this shell may be the original *Cardium magnum* Linnaeus.

Cardium (Trachycardium) subelongatum Sowerby, 1840.

Range: Southern West Indies.

This is not the *Cardium angulatum* Lamarck as assumed by some authors.

Cardium (Cerastoderma) ciliatum O. Fabricius, 1780.

Range: Arctic and boreal seas south to Cape Cod on the Atlantic and to Puget Sound on the Pacific side.

This is *Cardium islandicum* Chemnitz, 1782; + *Cardium edule* Mohr, 1786, not of Linnaeus; + *Cardium pubescens* Couthouy, 1838; + *Cardium arcticum* Sowerby, 1840; + *Cardium dawsoni* Stimpson, 1862; + *Cardium hayesi* Stimpson, 1863; + *Cardium boreale* Broderip and Sowerby, 1829, not of Reeve, 1844. The small compact specimens which have lost their pubescence form Stimpson's *Cardium hayesi*.

Cardium (Cerastoderma) elegantulum Beck, 1842.

Range: Greenland, 90 fathoms.

This is described from Beck's manuscript in Möller's Index Moll. Grönl., 1842.

Cardium (Cerastoderma) pinnulatum Conrad, 1831.

Range: Labrador to Cape Lookout, North Carolina, in 1 to 266 fathoms. Also Pleistocene of New Brunswick.

Cardium (Dinocardium) robustum Solander, 1786.

Range: Cape May, New Jersey, south to Belize and Jamaica, West Indies. Upper Miocene to Recent.

This is best known under the name of *Cardium magnum* Born, 1780, but it is not the *Cardium magnum* of Linnaeus, 1758; it is *Cardium ventricosum* Bruguière, 1789; *Cardium maculatum* Gmelin, 1792; + *Cardium carolinense* Conrad, 1862, not of Conrad, 1875.

Cardium (Fragum) medium Linnaeus, 1758.

Range: Cape Lookout, North Carolina, south to Santa Marta, Brazil. Upper Miocene to Recent.

This includes *Cardium venustum* Dunker, 1861, and *Cardium columba* Heilprin, 1886; but not *Cardium magnificentum* Deshayes, as stated by Carpenter.

Cardium (Trigoniocardia) antillarum Orbigny, 1845.

Range: Straits of Florida to Guadeloupe Island, West Indies, in 2 to 182 fathoms.

This includes *Cardium ceramidum* Dall, 1886.

Cardium (Papyridea) spinosum Meuschen, 1787.

Range: Cape Hatteras, North Carolina, south to Santa Marta, Brazil. Pleistocene.

This includes *Cardium hiatus* Meuschen, 1787; + *Cardium bullatum* Chemnitz (Solen), 1782, not of Linnaeus, 1758; + *Cardium bullatum* of many authors but not of Linnaeus; + *Cardium soleniforme* Bruguière, 1789; ? + *Cardium latum* Born, 1780, not *Cardium latum* "Born" Reeve, 1844; + *Cardium hiuleum* Reeve (monstr.), 1844.

Curiously the Pliocene form of Florida is identical, not with the existing type of the Antilles, but with that of the southeast Atlantic, St. Helena, and the Cape Verde Islands, a variety with the angle of the ribs minutely crenulate, which I have named *Cardium spinosum* var. *turtoni*. The Pacific species is hardly more than varietally different from the West Indian form, and will retain Sowerby's name of *aspersum* in a varietal sense.

Cardium (Papyridea) semisulcatum Gray, 1825.

Range: Southern Florida, south through the West Indies to Trinidad and the Cape of Good Hope, in 3 to 300 fathoms. Pliocene to Recent.

This is *Cardium ringiculum* Sowerby, 1840; + *Cardium petitianum* Orbigny, 1845.

Cardium (Lævicardium) serratum Linnaeus, 1758.

Range: Cape Hatteras, North Carolina, south to Guadeloupe, West Indies, in 1 to 75 fathoms. Oligocene to Recent.

This is not *Cardium serratum* Pennant, 1778; but is the *Cardium lævigatum* of Born, 1780; and of Lamarck, 1819; the *Cardium citrinum* of Wood, 1815; the *Cardium pictum* Ravenel, 1861 (*testa juv.*), but not of Dunker, 1861; the *Cardium lineatum* of Krebs, 1864, but not of Gmelin, 1792; the *Cardium pristis* Valenciennes, 1846; probably the *Cardium oriputamen* Reeve, 1844; the *Cardium venustum* of Gabb, 1873, but not of Dunker, 1861; the *Cardium lævigatum* Reeve, 1844, but not of Linnaeus, 1758; and the *Cardium glabratum* of Roemer, 1869.

Cardium serratum var. **brasilianum** Lamarck, 1819.

Range: Southern West Indies south along the coast of Brazil.

This is the *Cardium lamarckii* Orbigny, 1847, but not the *Cardium brasiliense* of Gmelin, 1792, which was founded on the figure of an *Arca*.

Cardium serratum var. **sybariticum** Dall, 1886.

Range: West Indies (Barbados, etc.), in 100 fathoms or more. Oligocene to Recent.

This is a deep-water dwarf form of *serratum*. It may include *Cardium pictum* Ravenel, but certainty can not be attained on account of the loss of Ravenel's types.

Cardium (Lævicardium) mortoni Conrad, 1830.

Range: Nova Scotia to Santa Marta, Brazil, in 1 to 5 fathoms. Miocene to Recent.

Serripes gronlandicus Gmelin, 1792.

Range: Arctic and boreal seas, south to Cape Cod on the Atlantic and Puget Sound on the Pacific side, in 2 to 60 fathoms. Pleistocene.

This is the *Mactra radiata* of Donovan, 1799; the *Cardium edentulum* of Montagu, 1808; *Aphrodite columba* Lea, 1834; *Cardium boreale* Reeve, 1844, not of Broderip and Sowerby, 1829; and *Cardium fabricii* Deshayes, 1854.

Protocardia peramabilis Dall, 1886.

Range: Rhode Island southward in deep water to Grenada, West Indies, 18 to 164 fathoms.

Protocardia tineta Dall, 1886.

Range: Key West, Barbados, Santa Cruz, and Porto Rico, in 7 to 100 fathoms.

This was described as a variety of the preceding, which is a white or yellowish shell, but the receipt of more specimens shows them to be quite distinct.

NOTES.

Cardium haitense Guppy, as of Sowerby, 1877, said to be dredged alive in the Gulf of Paria, is probably *Cardium antillarum* Orbigny or a related species.

Cardium pictum Dunker, 1861 (April, not *Cardium pictum* Ravenel, February, 1861), is probably a variety of *Cardium papillosum* Poli, from south Europe, with a wrong locality label. It was a dealer's shell.

Cardium pectinatum (Linnaeus) Menke, cited from St. Vincent, is from the island of that name in the Cape Verde group, not the Antillean St. Vincent.

Cardium cygnorum Deshayes, cited by J. Matthew Jones from Bermuda, is probably a misidentification, as Deshayes's species came from Swan River, Australia, and if found on Bermuda must have been adventitious.

Cardium echinatum O. Fabricius, 1780, from Greenland was doubtless derived from European ballast.

Cardium fasciatum Montagu, of Wheatley, 1842, from South Carolina, and De Kay, 1843, has not been authenticated as occurring on the American coast, though it occurs in Iceland.

WEST AMERICAN SPECIES.

Cardium (Trachycardium) quadragenarium Conrad, 1837.

Range: Santa Barbara, California, to Todos Santos Bay, Lower California, in 24 to 60 fathoms.

This is *Cardium luteolabrum* Gould, 1851; + *Cardium xanthochelium* (Gould MS.) Carpenter, 1856; + *Cardium arenatum* Carpenter (*testa juv.*), 1857; + *Cardium setosum* Tryon, 1872, not Redfield, 1846.

Shells from deep water are remarkably fine and among the largest of the genus. The number of ribs ranges from 42 to 44 and in a remarkable oval variety, much more oblique than the typical form, to 46. It may be noted that nearly all *Cardia* have an oval and a more rotund variety, possibly to be correlated with sex.

Cardium (Trachycardium) consors Sowerby, 1833.

Range: Gulf of California south to the Galapagos Islands.

A fine and well-known shell. A variety *larum* Dall has the imbrications twice as distant as usual and more elongated. The specimens seen were from the Gulf of California and were all of a color decidedly lighter than the type. The ribs vary from 31 to 34.

Cardium (Trachycardium) maculosum Wood, 1815.

Range: Panamic region; St. Elena, Colombia.

This is *Cardium multistriatum* Sowerby, 1833, and perhaps also *Cardium arenicolum* Reeve, 1845.

Cardium (Trachycardium) pristipleura Dall, 1900.

Range: Gulf of California (La Paz) and west coast of Middle America.

This is *Cardium maculosum* Sowerby, 1833, not Wood, 1815; + *Cardium maculatum* Reeve, 1844, not Gmelin, 1792. The shell has 34 to 39 ribs, laterally imbricate. *Cardium lacunosum* Reeve, 1845, should be compared with it.

Cardium (Trachycardium) senticosum Sowerby, 1833.

Range: Gulf of California to Payta, Peru.

This is *Cardium muricatum* Menke, not Linnaeus; + *Cardium rastrosum* Reeve, 1844; + (?) *Cardium lima* Reeve, 1845; + *Cardium lucinoides* Carpenter (*testa juv.*), 1857. It is the Pacific coast analogue of *Cardium muricatum* Linnaeus.

Cardium (Trachycardium) belcheri Sowerby, 1829.

Range: Gulf of California, in 6 to 24 fathoms.

Cardium (Ringicardium) procerum Sowerby, 1833.

Range: Lower California, from the vicinity of Cerros Island south to Ecuador, and Payta, Peru. Pleistocene of upper California.

This is *Cardium laticostatum* Sowerby, 1833, and *Cardium panamense* Sowerby, 1833; + *Cardium subelongatum* Valenciennes, 1846, not of Sowerby, 1840; + *Cardium rotundatum* Carpenter (*testa juv.*), 1857.

There are 7 ribs on the posterior area while the rest of the shell has from 13 to 18.

Cardium (Cerastoderma) corbis Martyn, 1784.

Range: Pribilof Islands, Bering Sea, and the Aleutian chain, and southward to San Diego, California, and Hakodadi, Japan.

This is *Cardium nuttallii* Conrad, 1838; + *Cardium californianum* Conrad (*testa jur.*), 1838; + *Cardium nuttallianum* Carpenter, 1864.

This fine shell normally has thickened loops thrown upward over the backs of the ribs as its proper sculpture, but in some young shells the height of the loops becomes obsolete, giving an ornament nearly of the type of some species of *Trachycardium*.

Cardium (Cerastoderma) californiense Deshayes, 1839.

Range: Bering Strait southward to Oregon, and Monterey, California, and to Hakodadi, Japan.

This is *Cardium pseudofossile* Reeve, 1844, and *Cardium blandum* Gould (*testa jur.*), 1850.

A variety *comorensis* Dall occurs in the bowlder clay of Vancouver Island with the ribs depressed and flattened to such an extent as to be defined only by the interstitial lines.

Cardium (Cerastoderma) ciliatum O. Fabricius, 1780.

Range: Arctic and boreal seas, southward to Puget Sound and Japan.

For synonymy see under the head of this species in the East American list. The same varieties occur on both coasts.

Cardium (Cerastoderma) decoratum Grewingk, 1850.

Range: Bowlder clays of Alaska and British Columbia.

This species may very likely be found alive hereafter.

Cardium (Fragum) magnificum (Deshayes MS.) in Carpenter, 1857.

Range: Lower California south to Payta, Peru, in 10 to 13 fathoms.

This is *Cardium planicostatum* Sowerby, 1833, not of Sedgwick and Murchison, 1829. Carpenter wrongly refers Deshayes's name to *Cardium medium* as a synonym, but the species is amply distinct from *Cardium medium* and represents it on the Pacific coast.

Cardium (Fragum) biangulatum Sowerby, 1829.

Range: Catalina Island, California, south to Panama.

Cardium (Trigoniocardia) graniferum Broderip and Sowerby, 1829.

Range: Gulf of California to Panama.

Cardium (Trigoniocardia) alabastrum Carpenter, 1857.

Range: Gulf of California, 8 to 24 fathoms; Mazatlan.

Cardium (Trigoniocardia) ovuloide Reeve, 1845.

Range: West coast of middle America?

Cardium (Trigoniocardia) obovale Sowerby, 1833.

Range: Margarita Bay, Lower California, to Ecuador.

Cardium (Papyridea) spinosum Meuschen, 1787, variety **asperum** Sowerby, 1833.

Range: Margarita Bay, Lower California, and the Gulf of California, south to Panama.

This is cited as *Cardium "asperum"* Sowerby by Roemer, 1869. For the synonymy of the species see the East American list.

Cardium (Lævicardium) elatum Sowerby, 1833.

Range: San Pedro, California, and south to Panama. Pleistocene of California.

This is the largest species of the genus. One valve in the United States National Museum measures 170 mm. in height and 143 mm. in length.

Cardium (Lævicardium) substriatum Conrad, 1838.

Range: From Catalina Island and San Pedro, California, south to San Ignacio lagoon, Lower California. Pleistocene of California.

This is *Cardium eruentatum* Gould, 1856.

Cardium (Lævicardium) elenense Sowerby, 1840.

Range: Gulf of California, south to Panama: Clarion Island.

This is *Cardium apicinum* Carpenter, 1864, as Carpenter himself suspected.

Serripes grönlandicus Gmelin, 1792.

Range: Arctic seas, south to Puget Sound and Hakodadi. Pleistocene.

The synonymy is cited in the East American list.

Serripes laperousei Deshayes, 1839.

Range: Bering Strait, at Plover Bay, south to Avatcha Bay, Kamchatka, and Sitka, Alaska.

This is a well-defined species and the specific characters can be recognized in shells less than an inch long.

Protocardia centiflosa Carpenter, 1864.

Range: Queen Charlotte Islands, British Columbia, south to San Diego, California.

Protocardia centiflosa var. **richardsonii**, Whiteaves, 1878.

Range: Queen Charlotte Islands, British Columbia, south to the coast of Oregon.

This is *Fulvia modesta* Adams and Reeve, var. *centiflosa* Carpenter. The *Protocardia modesta* appears to me distinct from the American shell and is a native of Japan. The northern specimens forming the variety are a little stronger and coarser than those from California, with which they seem to be united by intermediate gradations, though the extremes have apparently good distinctions.

Protocardia (Lophocardium) cumingii Sowerby, 1833.

Range: Gulf of Dulce, Central America, 12 fathoms.

Protocardia (Lophocardium) annettæ Dall, 1889.

Range: Gulf of California, 6 to 24 fathoms.

This is distinguished from the preceding species by its greater altitude and lower radial keel.

NOTES.

Cardium aculeatum Linnaeus was found, a single worn valve, by Dr. John S. Newberry at Acapulco. It was doubtless a ballast specimen.

Cardium triangulatum "Sowerby" Carpenter, 1857. I have not been able to discover in the literature. It is perhaps a manuscript name taken from a museum tablet.

Cardium gemmatum Gould, in Carpenter, Rep. British Association, 1857, p. 229, appears to be merely a "list name" and does not appear in Gould's works.

Cardium orbita Sowerby, 1833, appears to be an Indo-Pacific and not an American species.