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Eastern Pacific Expeditions of the New York Zoological Society. XXXVI. Mollusks from the West Coast of Mexico and Central America. Part V.[1]

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(Plate I).

[This is the thirty-sixth of a series of papers dealing with the collections of the Eastern Pacific Expeditions of the New York Zoological Society made under the direction of William Beebe. The present paper is concerned with specimens taken on the Templeton Crocker Expedition (1936) and the Eastern Pacific *Zaca* Expedition (1937-1938). For data on localities, dates, dredges, etc., refer to *Zoologica*, Vol. XXII, No. 2, pp. 33-46, and Vol. XXIII, No. 14, pp. 287-298.]

CONTENTS.

INTRODUCTION.

This is the fifth of a series of papers dealing with collections of mollusks taken on the Templeton Crocker Expedition (1936) and the Eastern Pacific *Zaca* Expedition (1937-1938). The general plan of presentation followed in the present contribution is that mentioned in Part II of this series of papers[2]. Formal headings and keys are given only for the species collected by the Expeditions of 1936 and 1937-38. Occasionally additional species are included in the keys for convenience but in such cases it is indicated which ones do not occur in the present collections.

Acknowledgment is due Dr. G. D. Hanna, Curator, Department of Paleontology of the California Academy of Sciences, and Mr. A. G. Smith, Berkeley, California, for their assistance and suggestions. Acknowledgment is especially due Dr. A. Myra Keen, Stanford University, California, for assistance in the identification of some of the species of Leptonidae and for suggestions regarding the classification of the Cardiidae. The preparation of the photographs by Mr. Frank L. Rogers is here acknowledged: his work was accomplished during the course of Federal Works Progress Administration Project Number 8569.

[1] Contribution No. 744, Department of Tropical Research, New York Zoological Society.

[2] Hertlein, L. G., and Strong, A. M. Eastern Pacific Expeditions of the New York Zoological Society. XXXII. Mollusks from the West Coast of Mexico and Central America. Part II. *Zoologica*, New York Zool. Soc., Vol. 28, Pt. 3, December 6, 1943, pp. 149-168, pl. 1.

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Superfamily Lucinacea.

FAMILY UNGULINIDAE [=DIPLODONTIDAE].

Genus *Taras* Risso.

Key to the subgenera of *Taras*.

A. Sculpture concentric only
  a. Subglobose, nearly equilateral; white ..... *Taras* s.s.
  aa. Compressed, inequilateral; a dark periostracum usually present ..... *Felaniella*
B. Sculpture concentric, also punctate, pustulate or subreticulate ..... *Phlyctiderma*

Subgenus *Taras* s.s.

Key to the species of *Taras* s.s.

A. Shell globose
  a. Shell thick ..... *orbellus*
  aa. Shell thin ..... *inezensis*
B. Shell subquadrate; thin ..... *subquadratus*

Taras (Taras) inezensis Hertlein & Strong, sp. nov.

Plate I, Figures 1 and 4.

Shell a right valve, inflated, umbos projecting, anterior dorsal margin broadly rounded, posterior dorsal margin sloping obliquely, ventral half of margin suborbicular; hinge with anterior cardinal tooth and a posterior cardinal wide and strongly bifid on end and on top but not completely bifid in center. Length, 18.4 mm.; height, 16.9 mm.; convexity (one valve), 8 mm.

Holotype, right valve from collecting station 146-D-1, Lat. 26° 54′ 20″ N., Long. 111° 48′ 45″ W., Santa Inez Bay, east coast of Lower California, dredged in 35 fathoms (64 meters), Templeton Crocker Expedition, 1936. A small specimen of this species was dredged at Tenacatita Bay, Mexico. by the Templeton Crocker Expedition in 1932.

This new species differs from *Taras orbellus* Gould in the thinner shell, more strongly projecting beaks and umbos, the more steeply sloping dorsal margin, and in the character of the broad posterior cardinal tooth which is very strongly bifid, giving the appearance of two teeth.

The posterior dorsal margin of the shell of *Taras inezensis* is less projecting than that of *T. artemidis* Dall[3] in which it is not only more projecting but subtruncate or very obliquely rounded.

Taras (Taras) orbellus Gould.

Lucina orbella Gould, *Proc. Boston Soc. Nat. Hist.*, Vol. 4, November, 1851, p. 90. "San Diego, Lieut. Green."—Gould. *Boston Journ. Nat. Hist.*, Vol. 6, 1853, p. 395, pl. 15, fig. 3. "From San Diego. Lieut. Green. Santa Barbara. Col. Jewett."

[3] *Diplodonta (Felaniella) artemidis* Dall, *Proc. U. S. Nat. Mus.*, Vol. 37, November 24, 1909, pp. 156, 263, pl. 28, fig. 8. "On the 'inside' or lagoon beach at Capon, in the sand." Peru.

Diplodonta orbella Gould, I. S. Oldroyd, *Stanford Univ. Publ. Univ. Ser. Geol. Sci.*, Vol. 1, 1924, p. 124, pl. 6, figs. 5 and 6. Type Locality cited. Range, Pribiloff Islands, Alaska, to the Gulf of California.

Type Locality: San Diego, California.

Range: Pribiloff Islands, Alaska, to the Gulf of California.

Collecting Stations: Mexico: East of Cedros Island (126-D-10), 60 fathoms, crushed shell and eel grass; Santa Inez Bay, Gulf of California (145-D-1-3), 4-13 fathoms, sand.

Description: The globose shell and the centrally situated inconspicuous beaks are characters which serve to separate *Taras orbellus* from other species of the genus in west American waters This species sometimes forms a nest of sand cemented by mucus so that the shell is wholly concealed.

Distribution: Specimens of *Taras orbellus* in the present collection were dredged at depths of 4-60 fathoms, on a bottom of sand, crushed shell and eel grass. The species ranges from Alaska to the Gulf of California and also has been recorded from Miocene to Recent in western North America.

Taras (Taras) subquadratus Carpenter.

Plate I, Figure 11.

Diplodonta subquadrata Carpenter, *Proc. Zool. Soc. London* for 1855 (issued February 5, 1856), p. 230. "Mazatlan." Recent.—Dall, *Proc. U. S. Nat. Mus.*, Vol 23, 1901, p. 795. Catalina Island, California, south to Panama, in 16 to 36 fathoms.—Soot-Ryen, *Nyt Mag. Naturvid.*, Bd. 70 (Medd. Fra. Zool. Mus. Oslo, No. 27), 1932, p. 319, pl. 1, fig. 2. Floreana (Charles) Island, Galápagos Islands, Recent.

Type Locality: Mazatlan, Mexico.

Range: San Ignacio Lagoon, Lower California, to Gorgona Island, Colombia, and the Galápagos Islands.

Collecting Stations: Mexico: Arena Bank (136-D-30), 35 fathoms, sand, weed; Ceralbo Channel (137-D-3), 46 fathoms, rock; Santa Inez Bay (143-D-1), 29 fathoms, mud, crushed shell, weed, (145-D-1, 3), 4-13 fathoms, sand (146-D-1), 35 fathoms, mud, crushed shell; Gorda Banks (150-D-2, 24), 60-75 fathoms, sand, calcareous algae; Cape San Lucas, Lower California; 3 mi. off Pyramid Rock, Clarion Island (163-D-2), 55 fathoms, rock, coral; El Salvador: La Union, Gulf of Fonseca (199-D-12), 5 fathoms, mud; Nicaragua: Corinto (200-D-1-3, 16), 2-7 fathoms, mangrove leaves; Costa Rica: Port Parker (203-D-1, 3), 12-15 fathoms, sandy mud, crushed shell, shelly mud; Port Culebra (206-D-1, 2, 3), 14 fathoms, sandy mud.

Description: The shell of *Taras subquadratus* is thinner, much more compressed and quadrate in form than that of *T. orbellus*.

The cardinal teeth are less sloping than are those of *T. orbellus*, in which species they are more nearly parallel to the hinge line. The angularity of the outline of the shell of *T. subquadratus* is more pronounced in large shells. The largest specimen in the collection measures: length, 29 mm.; height, 25 mm.; convexity (one valve), 7.6 mm.

Distribution: Specimens of this species were dredged at depths of 2 to 75 fathoms. The greatest number of specimens was dredged off Port Parker, Costa Rica, in 12 fathoms. The species has been recorded from the Pleistocene of San Quintin, Lower California.

Subgenus ***Felaniella*** Dall.

Key to the species of *Felaniella*.

A. Shell large, wide ..... *sericatus*
B. Shell small, narrow ..... *obliquus*

Taras (Felaniella) obliquus Philippi.

Diplodonta obliqua Philippi, *Zeitschr. f. Malakozool.*, Jahrg. 3, February, 1846, p. 20. "Patria: Mazatlan."

Not *Lucina obliqua* Philippi, 1850.

Lucina calculus Reeve, Conch. Icon., Vol. 6, *Lucina*, August, 1850, species 68, pl. 11, fig. 68. "Hab. Gulf of Nicoiya (dredged from among coarse sand at a depth of from ten to thirteen fathoms); Cuming."

Diplodonta (*Felaniella*) *obliqua* Philippi, Dall, *Proc. U. S. Nat. Mus.*, Vol. 23, 1901, p. 796. Cape San Lucas, Lower California, to Guayaquil, Ecuador.

Type Locality: Mazatlan, Mexico.

Range: Cape San Lucas, Lower California, to Guayaquil, Ecuador.

Collecting Station: Nicaragua: Corinto (200-D-10, 11, 16, 19), 4-13 fathoms, mangrove leaves, sand.

Description: Shell small, narrow, oblique, rather compressed, polished, white.

The shell of this species differs from other west American species of the genus in the narrower, oblique form. It differs from *Lucina prolongata* Carpenter, which it somewhat resembles in shape, in possessing a thinner shell, and in lacking the depressed lunule which is present on Carpenter's species.

Taras (*Felaniella*) *minor* Dall from the Bowden Miocene of Jamaica is a somewhat similar species.

Distribution: Specimens of *Taras obliquus* were dredged by the Expedition in 4 to 13 fathoms off Corinto, Nicaragua, on a bottom of sand and mangrove leaves.

Taras (Felaniella) sericatus Reeve.

Plate I, Figure 10.

Lucina sericata Reeve, Conch. Icon., Vol. 6, *Lucina*, June, 1850, species 55, pl. 9, fig. 55. "Hab.—?"—Adams & Reeve, Voy. Samarang, Moll., 1848 (issued 1850), p. 80, pl. 24, fig. 6, [not the locality "Hab. Philippine Archipelago."]

Lucina cornea Reeve, Conch. Icon., Vol. 6, *Lucina*, June, 1850, species 25, pl. 9, fig. 25. "Hab. Gulf of Nicoiya (in coarse sand at a depth of from ten to thirteen fathoms); Cuming."

Lucina nitens Reeve, Conch. Icon., Vol. 6, *Lucina*, June, 1850, species 50, pl. 9, fig. 50. "Hab. Isle of Muerte, Bay of Guayaquil (in sandy mud at a depth of about eleven fathoms); Cuming."

Diplodonta (*Felaniella*) *sericata* Reeve, Dall, *Proc. U. S. Nat. Mus.*, Vol. 23, 1901, p. 796. Lower California to Panama.

Taras parilis (Conrad) variety *sericatus* (Reeve), Grant & Gale, *Mem. San Diego Soc. Nat. Hist.*, Vol. 1, 1931, p. 295, pl. 14, figs. 12a, 12b. Earlier records cited. Pleistocene and Recent.

Type Locality: Gulf of Nicoya, Costa Rica (here designated as type locality). No locality originally cited.

Range: Monterey Bay, California (Burch); San Ignacio Lagoon, Lower California, to Guayaquil, Ecuador. [We have not seen specimens from north of San Ignacio Lagoon, Lower California.]

Collecting Stations: Mexico: Santa Inez Bay, Gulf of California (145-D-1-3), 4-13 fathoms, sand; Chamela Bay; Nicaragua: Corinto (200-D-10, 11, 16, 17, 19, also beach) 4-13 fathoms, mangrove leaves, sand; Costa Rica: Culebra Bay; Golfito, Gulf of Dulce; Panama: Gulf of Chiriqui (221-D-1-5), 35-40 fathoms, sandy mud.

Description: Shell thin, compressed, higher than long, obliquely produced posteriorly; semi-pellucid, white, covered by a pale-olive colored periostracum. A large specimen measures approximately 22 mm. from beak to base.

Large specimens of *Taras sericatus* are thicker and more quadrate in outline than juvenile forms.

The shell of this species is much wider and larger than that of *Taras obliquus*. *Taras candeanus* d'Orbigny, which occurs in the Caribbean region, is a similar species.

The name *Lucina sericata* was originally proposed by Reeve for a specimen the locality of which was unknown. Later Adams & Reeve referred to the species and gave the locality as the Philippine Islands. Hidalgo[4] later cited the species from the Philippine Islands and referred it to the genus *Lucina*. If this generic allocation is correct it would appear that the species referred to by Hidalgo is a different one from that described by Reeve which is a "*Diplodonta*," as pointed out by Lamy. Carpenter, Dall, Lamy and others have considered Reeve's species to be a west American shell. An additional reason for accepting this conclusion is that at least

[4] Hidalgo, J. G., Cat. Mol. Test. Filipinas. *Rev. R. Acad. Cienc.* Madrid, Vol. 3, 1905, p. 11. See also Lamy, E., *Journ. de Conchyl.*, Vol. 65, No. 4, 1921, p. 375.

three other species cited by Adams & Reeve from the East Indian region are now known to occur in tropical west American waters. These include *"Artemis" dunkeri* Philippi, cited from "Eastern Seas," and *Conus borneensis*, cited from Borneo, but which is now thought to be identical with *Conus arcuatus* Sowerby, a west American species.

After a consideration of the facts relating to *Lucina sericata* we have, at least for the present, accepted it as the earliest name for the west American species discussed here. The names *Lucina cornea* Reeve and *Lucina nitens* Reeve were also applied to the same species as *L. sericata* Reeve.

Distribution: Specimens of this species were collected on the beach and dredged at depths of 4-40 fathoms from off western Mexico and Central America. It occurs south to Ecuador. We have not seen specimens from north of San Ignacio Lagoon, Lower California. It is known to occur in the Pleistocene of southern California and Lower California.

Subgenus **Phlyctiderma** Dall.

Taras (Phlyctiderma) semirugosus Dall.

Diplodonta semiaspera, ? Phil., Carpenter, Cat. Mazatlan Shells, November, 1855, p. 102. Mazatlan. Also other localities.

Not *Diplodonta semiaspera* Philippi, 1836.

Diplodonta (*Phlyctiderma*) *semirugosa* Dall, *Jour. Conch.*, Vol. 9, No. 8, October 1, 1899, p. 246. "Range. Gulf of California."—Dall, *Proc. U. S. Nat. Mus.*, Vol. 23, 1901, p. 796. Gulf of California to Panama.

Type Locality: Gulf of California.

Range: Gulf of California to Panama.

Collecting Stations: El Salvador: Meanguera Island, Gulf of Fonseca (199-D-1), 16 fathoms, sand, mud, crushed shell; La Union, Gulf of Fonseca (199-D-12), 5 fathoms, mud; Nicaragua: Corinto (200-D-10, 17), 7-10 fathoms, mangrove leaves, sand; Costa Rica: Port Parker (203-D-1, 3), 12-15 fathoms, sandy mud, crushed shell, shelly mud; Cedro Island, Gulf of Nicoya (213-D-1-10), 4-10 fathoms, mud, sand, crushed shell.

Description: Shell subrounded, moderately inflated, somewhat expanded anteriorly and posteriorly; in some specimens the posterior area is set off by a faint depression; surface ornamented by fine concentric sculpture and the entire surface is finely punctate. One of the largest specimens measures approximately 15 mm. (beak to base).

The smaller size, finer sculpture and more externally placed ligament are characters which serve to separate the shell of this species from that of *Taras caelatus* Reeve[5].

[5] *Lucina caelata* Reeve, Conch. Icon., Vol. 6, *Lucina*, June, 1850, species 27, pl. 6, figs. 27a, 27b. "Hab. Island of Muerte, Bay of Guayaquil (dredged from a depth of about eleven fathoms) ; Cuming."

A specimen of Reeve's species was collected by the senior author at Sihuatanejo Bay, Mexico. *Taras semiasperus* Philippi, a West Indian species, is said to be less globose and to possess somewhat different sculpture than that of *T. semirugosus*.

Carpenter described a shell from Mazatlan under the name of *"Diplodonta ? semiaspera*, var. *discrepans"*[6]. According to Dall (1901), this is an indeterminable form and a pencil sketch of it made by Carpenter somewhat resembles a young *Taras orbellus*.

Distribution: Specimens of *Taras semirugosus* were dredged by the expedition from El Salvador to Costa Rica at depths of 5 to 16 fathoms.

Superfamily Leptonacea.

Family Leptonidae.

Key to the genera of the Leptonidae.

A. Shell punctate; pallial line crenulated
  a. Adductor impressions lying entirely within the pallial line ..... *Solecardia*
  aa. Adductor impressions not lying entirely within the pallial line ..... *Bornia*[7]

B. Shell not punctate
  a. Shell equilateral or nearly so
    b. Inflated; 1 cardinal tooth in right and 2 in left valve ..... *Kellia*
    bb. Compressed; 1 cardinal tooth in each valve ..... *Pseudopythina*
  aa. Shell inequilateral
    c. Right valve with cardinal teeth
      d. Lateral teeth present
        e. 2 anterior laterals in left valve; shell minute; hinge large ..... *Lasaea*
        ee. 1 anterior lateral in left valve ..... *Erycina*
      dd. Lateral teeth lacking *Aligena*
    cc. Right valve without cardinal teeth ..... *Rochefortia*

Genus **Erycina** Lamarck.

Erycina colpoica Dall.

Erycina colpoica Dall, *Proc. U. S. Nat. Mus.*, Vol. 45, No. 2002, June 11, 1913, p. 596. "Beach at the head of the Gulf of California."—Dall, *Proc. U. S. Nat. Mus.*, Vol. 66, Art. 17, 1925, p. 16, pl. 27, fig. 2. "Gulf of California."

Type Locality: Beach at the head of the Gulf of California.

[6] *Diplodonta ? semiaspera*, var. *discrepans* Carpenter, Cat. Mazatlan Shells, November, 1855, p. 103. "Hab.—Mazatlan; 1 sp. in burrow from Chama." See also Dall, W. H., *Proc. U. S. Nat. Mus.*, Vol. 23, 1901, p. 797.

[7] Not represented in the present collection.

Range: Gulf of California to Corinto, Nicaragua.

Collecting Stations: Mexico: Santa Inez Bay, Gulf of California (145-D-1-3), 4-13 fathoms, sand; Port Guatulco (195-D-9), 7 fathoms, gr. sand, crushed shell; Nicaragua: Corinto (200-D-19), 12-13 fathoms, mangrove leaves, also on beach.

Description: Shell small, white, equivalve, very inequilateral, the anterior end much the longer and somewhat expanded, posterior shorter and smaller, both rounded; the dorsal and basal margins slightly arcuate, subparallel; surface sculptured only with concentric incremental lines, covered with a thin, pale yellowish periostracum; beaks low, inconspicuous, valves rather compressed; interior polished, hinge formula $\frac{\text{lo.01.olo}}{\text{ol.10.lol}}$; chondrophore very narrow, oblique, and posteriorly directed. Length of shell, 10; of anterior part, 8.1; height, 6; diameter, 3.5 mm. (Dall).

Most of the specimens in the present collection measure about 6-8 mm. in length. Some show a tinge of salmon-yellow coloration.

Distribution: This species was dredged in Santa Inez Bay in the Gulf of California and was taken quite abundantly at Corinto, Nicaragua, in beach drift and at a depth of 12-13 fathoms. A few specimens, apparently the same species, were taken off Port Guatulco, Mexico, in 7 fathoms. The present record of occurrence at Corinto is an extension south of the known range of the species.

Genus ***Kellia*** Turton.

Kellia suborbicularis Montagu.

Mya suborbicularis Montagu, Test. Brit., Pt. 1, 1803, p. 39. "In hard lime-stone at Plymouth." Also "sometimes dredged up in Salcomb-bay"; Pt. 2, 1803, p. 564; Suppl., 1808, pl. 26, fig. 6.

Kellia suborbicularis Montagu, Forbes & Hanley, Hist. Brit. Moll., Vol. 2, 1849, p. 87, Vol. 1, pl. 0, figs. 4, 4a (animal), pl. 18, figs. 9, 9a, 9b, 1848. Various localities cited in northern Europe and south to the Mediterranean. [For dates of issue of this work see A. Reynell, *Proc. Malacol. Soc.* London, Vol. 13, 1918, pp. 25-26].—H. & A. Adams, Gen. Rec. Moll., Vol. 3, 1858, pl. 114, figs. 8, 8a, 8b, 8c.

Type Locality: Plymouth, England (cited as type locality by I. S. Oldroyd, 1924, and accepted as such by the present authors). Also cited originally from Salcomb Bay, England.

Range: Sitka, Alaska, to Peru. Also Atlantic.

Collecting Station: Mexico: Port Guatulco (195-D-9), 7 fathoms, green sand, crushed shell.

Description: Shell small, thin, suborbicular or roundly subquadrate; ornamented by concentric lines of growth.

There appears to be no method by which the shells in the present collection can be separated with certainty from the European *Kellia suborbicularis* and we have therefore referred them to that species. One specimen is quite round and is similar to the figures of *Kellia biocculta* de Folin[8] but the hinge agrees with *K. suborbicularis* rather than with the species described by de Folin.

Distribution: A few specimens of *Kellia suborbicularis* were dredged by the Expedition at Port Guatulco, Mexico, in 7 fathoms. It has been cited as ranging south to Peru. It also has been recorded as occurring in the Pliocene and Pleistocene of western North America and from Miocene to Recent in Europe. At the present time the species occurs from Alaska to Peru, and in the north and south Atlantic and is said to occur in other regions.

Genus ***Aligena*** Lea.

Burch[9] has discussed and illustrated several west American species of *Aligena*. Orcutt[10] cited "*Aligena cooperi* Dall" from Magdalena Bay, Lower California, but so far as we know this is a *nomen nudum*. *Aligena pisum* Dall[11], was described from the Strait of Magellan in 61 fathoms.

Key[12] to the species of *Aligena*.

A. Shell with a median radial constriction ..... *cokeri*

B. Shell without a median radial constriction

  a. Anterior portion of shell sloping steeply down ..... *cerritensis*[13]

  aa. Anterior portion of shell broadly rounded

    b. Posterior portion of shell rounded, sloping gently down; left valve with a tooth ..... *nucea*

    bb. Posterior portion of shell nearly straight, sloping abruptly down; left valve edentulous ..... *redondoensis*[13]

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[8] *Erycina* (*Kellia*) *biocculta* de Folin, Les Méléagrinicoles, (Havre), 1867, p. 21, pl. 3, figs. 8, 9, 10, 11, 12. Cited on p. 9 as from "environs des Negritos" or "iles aux Perles dans la baie de Panama". —de Folin, Fonds de la Mer, Vol. 1, 1867-1871, p. 8 (as *Erycina biocculta*). "La baie de Panama."

[9] Burch, T. A Survey of the West American Aligenas with a description of a new species. *Nautilus*, Vol. 55, No. 2, October, 1941, pp. 48-51, 1 pl.

[10] Orcutt, C. R., *West American Sci.*, Vol. 21, No. 5 (Whole No. 169), May, 1919, p. 39.

[11] *Aligena pisum* Dall, *Bull. Mus. Comp. Zool.*, Vol. 43, No. 6, October, 1908, p. 413. "U.S.S. 'Albatross', station 2778, Magellan Strait, in 61 fathoms, mud, bottom temperature 48°F. U. S. N. Mus. 110,715."

[12] Adapted from T. Burch.

[13] Not represented in the present collection.

Aligena cokeri Dall.

Aligena cokeri Dall, *Proc. U. S. Nat. Mus.*, Vol. 37, No. 1704, November 24, 1909, p. 155, pl. 28, figs. 5 and 6. "Attached to worm tubes thrown upon the beach of the lagoon at Capon, Peru. The worms live in the beach."—T. Burch, *Nautilus*, Vol. 55, No. 2, October, 1941, p. 49. Original record cited.

Type Locality: Capon, Peru, beach of the lagoon, attached to worm tubes.

Range: Punta Penasco, Gulf of California, to Capon, Peru.

Collecting Stations: Mexico: Santa Inez Bay, Gulf of California (145-D-1-3), 4-13 fathoms, sand; Nicaragua: Corinto (200-D-16, 19), 4-13 fathoms, mangrove leaves, also on beach.

Description: Shell small, white, thin, fragile, roundly quadrate; a wide shallow radial furrow is present on the medial portion of the shell; beaks high, tumid, closely adjacent, slightly anteriorly directed and situated somewhat anteriorly; sculpture of concentric incremental lines and little elevated concentric threads; hinge edentulous, a small callosity present in front of the ligament; pallial line entire. A large specimen measures approximately: length, 9.5 mm.; height, 8 mm.; convexity (one valve), 4 mm.

The shell of this species is similar to that of *Aligena aequata* Conrad from the Miocene of Virginia. The presence of a medial radial furrow on *A. cokeri* easily serves to separate it from other west American species of *Aligena*. The present specimens appear to be identical with the shell from the Pleistocene of Magdalena Bay, Lower California, which was identified as *A. nucea* by E. K. Jordan.

Distribution: Two small valves of this species were dredged in Santa Inez Bay, Gulf of California, and three valves were dredged by the Expedition at Corinto, Nicaragua, in 4 to 13 fathoms. This is an extension north of the known range of the species.

Aligena nucea Dall.

Aligena nucea Dall, *Proc. U. S. Nat. Mus.*, Vol. 45, No. 2002, June 11, 1913, p. 597. "Gulf of California."—Dall, *Proc. U. S. Nat. Mus.*, Vol. 66, Art. 17, 1925, p. 2, pl. 28, fig. 2. "Gulf of California."—T. Burch, *Nautilus*, Vol. 55, No. 2, 1941, p. 49, pl. 4, figs. 3 and 4. Original locality cited.

Type Locality: Gulf of California.

Range: Punta Penasco, Gulf of California, to Corinto, Nicaragua.

Collecting Stations: Mexico: Santa Inez Bay, Gulf of California (145-D-1-3), 4-13 fathoms, sand; Nicaragua: Corinto, beach.

Description: Shell small, white, rather solid, ovate, slightly inequilateral, moderately inflated; surface rather rude, with irregular, rather coarse incremental lines; beaks full, somewhat posterior, the anterior end of the shell shorter; interior porcellanous, the muscular scars unusually large, the pallial line irregular, entire; hinge with a long, strong, narrow chondrophore, a small pustular projection in front of it, as usual in the genus. Length of shell, 4.0; of anterior portion, 1.75; height, 3.0; diameter, 2.2 mm. (Original description).

The gently sloping posterior portion of the shell and the presence of a tooth in the left valve of this species are characters which serve to separate it from *A. redondoensis* T. Burch, dredged off Redondo Beach, California, in which the posterior margin slopes abruptly down and the hinge of the left valve is edentulous.

Distribution: Two single valves of this species were dredged in Santa Inez Bay in the Gulf of California in 4-13 fathoms and one valve was taken on the beach at Corinto, Nicaragua. This is an extension south of the known range of this species.

Genus **_Rochefortia_** Vélain.

Key to the species of *Rochefortia*.

A. Shell oval; diaphanous ..... *chalcedonica*

B. Shell subquadrate; opaque; umbos appressed ..... *subquadrata*

Rochefortia chalcedonica Carpenter.

?Montacuta chalcedonica Carpenter, Cat. Mazatlan Shells, April, 1857, p. 531. "Hab. —Mazatlan; 1 valve off frond of *Murex nigritus;* L'pool Col."

Mysella chalcedonica Carpenter, Dall, *Proc. U. S. Nat. Mus.*, Vol. 21, No. 1177, 1899, p. 881. Mazatlan.

Type Locality: Mazatlan, Mexico, on *Murex nigritus*.

Range: Santa Inez Bay, Gulf of California, to Mazatlan, Mexico.

Collecting Station: Mexico: Santa Inez Bay, Gulf of California (145-D-1-3), 4-13 fathoms, sand.

Description: "?M. t. tenuissimâ, interdum opacâ, interdum diaphanâ, castaneâ; ovali, marginibus regulariter excurvatis, umbone prominente; nitente, sed striulis tenuissimis, et concentricis, et radiantibus; valvâ alterâ dent. card. post. elongato, ant. evanescente, lat. nullis; alterâ. . . . " "Long. .02, lat. .028, alt. .006." (Original description).

The type of this species has never been figured but Carpenter's description fits the present specimens rather well. The thin, chalcedonic shell, as indicated by its specific name, is a characteristic feature of this species.

Distribution: A few single valves, here referred to this species, were dredged by the expedition in Santa Inez Bay in the Gulf of California, in 4-13 fathoms. This is the first record of the occurrence of this species outside of the type locality.

Rochefortia subquadrata Carpenter.

?*Montacuta subquadrata* Carpenter, Cat. Mazatlan Shells, December, 1855, p. 113. "Hab.—Mazatlan; off Chamae, extremely rare; L'pool Col."

?Mysella subquadrata Carpenter, Dall, *Proc. U. S. Nat. Mus.*, Vol. 21, No. 1177, 1899, p. 881. Mazatlan.

Type Locality: Mazatlan, Mexico, off Chamae.

Range: Santa Inez Bay, Gulf of California, to Mazatlan, Mexico.

Collecting Station: Mexico: Santa Inez Bay, Gulf of California (145-D-1-3), 4-13 fathoms, sand.

Description: "M. t. oblongâ, subquadratâ, solidiore, flavescente seu cinereâ; sulcis concentricis, creberrimis, rotundatis; umbonibus appressis, lunulâ excavatâ; valvâ alterâ dent. card. uno, inter fossas duas, dent. lat. longis, prominentibus; valvâ alterâ dent. card. uno, elongato, prope marginem, fossâ unâ, latâ; dent. lat. subobsoletis." "Long. .1, lat. .13, alt. .03." (Original description).

A left valve in the present collection agrees well with Carpenter's description of "?*Montacuta subquadrata*." The subquadrate outline, appressed umbos and excavated lunule mentioned by Carpenter are noticeable on the present specimen. Carpenter mentioned that "Outside it resembles in miniature some of the oval Oolitic Astartidae."

Distribution: One left valve of this species was dredged by the Expedition in Santa Inez Bay, Gulf of California, in 4-13 fathoms. This is the first record of the occurrence of this species outside the type locality.

Genus ***Pseudopythina*** Fischer.

Pseudopythina Fischer in Monterosato, Nom. Gen. e Spec. Medit. (Palermo), 1884, p. 17. Sole species cited, "*P. Mac-Andrewi*, Fischer (*Kellia*)—*Journ. Conchyl.* 1867, p. 194, t. 9, f. 1 (Coste del Portogallo)." Also "*Pythina* sp., M'Andrew—Rep. 1856 (Faro). Gibilterra (Hidalgo)."—Fischer, Man. de Conchyl., 1887, p. 1026. Sole species, "*P. Mac-Andrewi*, Fischer."—Dall, *Trans. Wagner Free Inst. Sci.*, Vol. 3, Pt. 5, December, 1900, p. 1142. Type, *Kellia MacAndrewi* Fischer.

Type (by monotypy): *Pseudopythina macandrewi* Fischer [=*Kellia Mac-Andrewi* Fischer, *Journ. de Conchyl.*, Vol. 15, 1867, p. 194, pl. 9, fig. 1. "Hab. Nord de l'Espagne; bassin d'Arcachon (Gironde)"].

Description: West American shells referred to this genus are elliptical, subquadrangular or trapezoidal in outline, somewhat compressed, often slightly flattened medially, and possess 1 cardinal tooth in each valve. The type species of the genus is said to possess 2 cardinal teeth in each valve.

Pseudopythina chacei Dall.

Erycina chacei Dall, *Proc. U. S. Nat. Mus.*, Vol. 52, No. 2183, December 27, 1916, p. 410. "Station 4343, off the South Coronado Island, in 155 fathoms."

Pseudopythina chacei Dall, Keen in Burch, *Min. Conch. Club South. Calif.*, No. 40, October, 1944, p. 17, figs. pp. 12 and 18. Santa Rosa Island, California, to South Coronado Island, Mexico.

Type Locality: Off South Coronado Island, Mexico, in 155 fathoms.

Range: Santa Rosa Island, California, to Santa Inez Bay, Gulf of California.

Collecting Station: Mexico: Santa Inez Bay, Gulf of California (145-D-1-3), 4-13 fathoms, sand.

Description: Shell small, compressed, rounded-quadrate; nearly equilateral, the anterior end slightly shorter; beaks low, pustular, minute; dorsal margin nearly straight, basal margin gently arcuate; surface finely concentrically striate, whitish under a pale ashy periostracum, both ends nearly evenly rounded, hinge very feeble. Length, 5.3; height, 3.5; diameter, 1.8 mm. (Original description).

Two small left valves in the present collection agree well with Dall's description of "*Erycina*" *chacei*. A comparison of these specimens with a photograph of the type of Dall's species and with a drawing of the hinge in the possession of Dr. A. M. Keen, reveals only slight differences between these and the present shells. We have therefore, at least for the present, referred the specimens to Dall's species.

Judging from the description alone, it is possible that the present specimens may be referable to the species described as *Montacuta elliptica* Carpenter[14] described from Mazatlan, Mexico. The type of that species has never been illustrated and we are uncertain whether or not our specimens could be referred to it.

Distribution: Two single valves of this species were dredged in Santa Inez Bay, Gulf of California, in 4-13 fathoms. This is an extension south of the known range of the species.

Genus ***Lasaea*** Leach in Brown.

A. M. Keen[15] has discussed the genus *Lasaea* and cited the Recent species referable to it.

Key to the species of *Lasaea*.

A. Anterior dorsal margin broadly rounded; umbos very tumid; subquadrate

[14] *Montacuta elliptica* Carpenter, Cat. Mazatlan Shells, December, 1855, p. 113. "Hab.—Mazatlan; off *Chama* and *Spondylus*, extremely rare; L'pool Col." —Dall, *Proc. U. S. Nat. Mus.*, Vol. 21, 1899, p. 881 (as *Mysella elliptica*). Mazatlan.

[15] Keen, A. M. New Pelecypod species of the genera Lasaea and Crassinella. *Proc. Malacol. Soc. London*, Vol. 23, Pt. 1, March 16, 1938, pp. 18-32, 1 pl. See also corrections in Vol. 23, Pt. 4, March 15, 1939, p. 252.

a. Anterior end evenly rounded *cistula*[15a]
aa. Anterior end slightly obliquely rounded ..... *petitiana*
B. Anterior dorsal margin sloping obliquely; umbos less tumid; shell more elongate ..... *subviridis*[15a]

Lasaea petitiana Recluz.

Poronia petitiana Recluz, *Rev. Zool. Soc. Cuvierienne*, Vol. 6, 1843, p. 175. "Hab. Callao de Lima, ou elle ne parait pas rare."

Lasaea petitiana Recluz, Keen, *Proc. Malacol. Soc. London*, Vol. 23, Pt. 1, March 16, 1938, pp. 19, 22. Original record cited.

Type Locality: Callao, Peru.

Range: Atacama, Chile, to the Galápagos Islands.

Collecting Station: Ecuador: Tower Island, Galápagos Islands, shore.

Description: "Testa ovata seu ovato-trigona, convexo-depressa, inaequilatera, anticè producta, albido-rosea, transversim substriata; apicibus parvis, vix antice flexis utroque latere dentibusque roseo-pictis; fovea ligamentali latiuscula; marginibus valvarum acutiusculis." "Long. 2½ mill., larg. 3 mill., conv., 2 mill." (Original description).

The minute, inflated, subquadrate, often reddish-tinted shell of this species is much like that of *Lasaea cistula* Keen[16] described from Halfmoon Bay, California, but the anterior dorsal margin appears to slope a little more obliquely. Compared to *L. subviridis* Dall, the anterior dorsal margin of the present species slopes much less steeply and the umbos are more tumid, as in *L. cistula*. Some of the largest specimens in the present collection are 2.5-2.75 mm. in length.

The exact synonymy and range of this species are uncertain. Dall[17] considered it to be identical with *Kellia miliaris Philippi*[18] which was described from the Strait of Magellan. Haas[19] stated that specimens which he identified as *Lasaea miliaris* Philippi from Peru are hardly separable from *L. cistula* Keen.

Lasaea macrodon Stempell[20] was described from Juan Fernandez Island.

Distribution: Several specimens in the present collection, apparently referable to this species, were collected, probably by William Beebe, on Tower Island, Galapágos Islands, in 1925. Although not a part of the present collections of the Expeditions of the *Zaca*, the species is recorded here for convenience of reference. The exact range of this species is uncertain. Dall recorded it as ranging south to the Strait of Magellan. The present shells appear to belong to the species cited by the present authors under the name of *Lasaea rubra* from the Pleistocene of the Galápagos Islands.

Genus **Solecardia** Conrad.

Solecardia eburnea Conrad.

Solecardia eburnea Conrad, *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 4, 1849, p. 155. Described under the title "Shells are from the coasts of Lower California and Peru."—Conrad, *Jour. Acad. Nat. Sci. Philadelphia*, Ser. 2, Vol. 1, 1850, p. 279, pl. 39, fig. 1. Locality same as in preceding reference.—Dall, *Proc. U. S. Nat. Mus.*, Vol. 21, 1899, pp. 875, 879, 884. "Cape St. Lucas to Panama."

Not *Scintilla eburnea* Mörch, *Journ. de Conchyl.*, Vol. 24, No. 4, 1876, p. 373. "Hab. Saint-Thomas," dredged. Renamed *Solecardia mörchi* Dall, *Proc. U. S. Nat. Mus.*, Vol. 21, June 26, 1899, p. 884.

Scintilla cumingii Deshayes, *Proc. Zool. Soc. London* for 1855 (issued January 5, 1856), p. 173. "Hab. ad littora Panamensia." —Sowerby, Conch. Icon., Vol. 19, *Scintilla*, 1874, species 3, pl. 1, figs. 3a, 3b. Panama.

Type Locality: Lower California.

Range: Punta Penasco, Gulf of California, to Panama.

Collecting Station: Mexico: Santa Inez Bay, Gulf of California (144-D-2), 2½ fathoms, sand, weed, rocks.

Description: Shell ovately oblong, thin, punctate; hinge with 2 diverging teeth and a linear oblique cartilage pit between; pallial line entire. "In this singular bivalve the pallial impression shows no junction with the adductor impressions, but joins the extremities of the cardinal plate. The muscular impressions are as distinct on the exterior as on the interior" (Conrad).

A specimen in the present collection measures: length, 21.2 mm.; height, 14.3 mm.

The large size of the shell, for the family, and the close radial rows of fine pits on the outer surface, are very distinctive features of this species. It is the type of the genus *Solecardia*.

Wood[21] mentioned a similarity between *Kellia ambigua* Nyst from the Crag Pliocene of England and *Solecardia eburnea* Conrad.

Some of the Hawaiian species originally referred to *Solecardia* have been placed in

[15a] Not represented in the present collection.

[16] *Lasaea cistula* Keen, *Proc. Malacol. Soc. London*, Vol. 23, Pt. 1, March 16, 1938, p. 25, pl. 2, figs. 7-9. "Type locality.—Moss Beach, Half Moon Bay, California—Sect. 4, T. 5 S., R. 6 W., Mount Diablo Meridian."

[17] Dall, W. H., *Proc. U. S. Nat. Mus.*, Vol. 37, 1909, p. 264.

[18] *Kellia miliaris* Philippi, *Archiv f. Naturgesch.*, Jahrg. 11, Bd. 1, 1845, p. 51. "Patria Fretum Magellanicum, Eagle Bay, frequens."—Philippi, Reise durch die Wueste Atacama (Eduard Anton: Halle), 1860, p. 175, pl. 7, figs. a [cited as d on pl.], b, c. Indicated as ranging from Cobija to the Strait of Magellan.

[19] Haas, F., *Zool. Ser. Field Mus. Nat. Hist.*, Vol 29, No. 1, 1943, p. 17. With *Mytilus granulatus* from rocks at Chincha Norte Island, Peru.

[20] *Lasaea macrodon* Stempell, *Zool. Jahrb.*, Suppl. Bd. 5. Fauna Chilensis, Bd. 2, December 20, 1899, p. 231, figs. 16, 17. "3 Exemplare aus der Bahia Padres auf Juan Fernandez."

[21] *Kellia ambigua* Nyst, Wood, *Palaeontogr. Soc.*, Vol. 4, Mon. Crag Moll., Pt. 2, No. 1, Bivalves, for 1850 (issued June, 1851), p. 120, Tab. 12, figs. 11a, 11b.

the genus *Nesobornia* Dall, Bartsch & Rehder, 1938, the type of which is *Solecardia ovata* Gould.

Distribution: A single valve of *Solecardia eburnea* was dredged by the Expedition in Santa Inez Bay in the Gulf of California. It has been recorded as ranging south to Panama.

Family Sportellidae.

Key to the genera of the Sportellidae.

A. Left valve with one cardinal tooth ..... *Basterotia*

B. Left valve with two cardinal teeth ..... *Sportella*

Genus ***Basterotia*** Mayer in Hörnes.

Harlea Gray, Synop. Brit. Mus., 1842, p. 78. [No species cited]. See E. A. Smith, *Proc. Zool. Soc. London*, April 1, 1890, p. 303.

Eucharis Recluz, *Journ. de Conchyl.*, Vol. 1, 1850, p. 164. Type, *Corbula quadrata* Hinds.—Fischer, *Journ. de Conchyl.*, Vol. 34, No. 3, 1886, p. 198.

Not *Eucharis* Latreille, 1804.

Basterotia Hörnes, Verhandl. k. k. Zool.-Bot. Gesell. Wien, Bd. 9, 1859, Abh. p. 71. *Basterotia corbuloides* Hörnes cited and illustrated. [*Corbula quadrata* (as illustrated by Reeve, pl. 5, fig. 40) was mentioned as a similar species but it was not definitely referred to the genus *Basterotia*].

Not *Basterotia* Bayle in Jousseaume, *Bull. Soc. Zool. France*, Vol. 9, 1884, p. 95. Gastropoda.

Type (by Monotypy): *Basterotia corbuloides* Hörnes, Verhandl. k. k. Zool.-Bot. Gesell. Wien, Bd. 9, 1859, p. 71, [three figs.]. "Wiener Becken." See also Hörnes, Abhandl. k. k. Geol. Reichsanst., Bd. 4, 1870, p. 40, pl. 3, figs. 11a-g. Various localities cited in Vienna Basin, Austria. Miocene.

The species originally described as *Anisodonta peninsulare* by E. K. Jordan, from the Pleistocene of Magdalena Bay, Lower California, has been found among beach shells along the west coast of the tropical Americas. The species appears to be referable to the genus *Basterotia* Mayer in Hörnes which is known from Miocene to Recent. Species living in the present seas have been described from the south Atlantic, Caribbean, and western Pacific. The west coast of Mexico, Nicaragua, and the Galápagos Islands can now be added to the records of the distribution of the genus.

Lamy[22] has cited the species referred to this genus.

Basterotia peninsularis Jordan.

Anisodonta peninsulare E. K. Jordan, *Contrib. Dept. Geol. Stanford Univ.*, Vol. 1, No. 4, November 13, 1936, p. 147, pl. 18, figs. 11, 12. "Magdalena Bay, Lower California." "Pleistocene."

Type Locality: Magdalena Bay, Lower California. Pleistocene.

Range: Port Guatulco, Mexico, to Corinto, Nicaragua, and the Galápagos Islands.

Collecting Stations: Mexico: Port Guatulco (195-D-9), 7 fathoms, gr. sand, crushed shell; Nicaragua: Corinto, beach drift.

Description: Shell subquadrate, thin; umbos gently rounded, a broadly rounded shoulder on the posterior portion of the shell; anterior end short; a prominent cardinal tooth which is separated from the resilium pit by a distinct notch. Length, 15 mm.; height, 10.6 mm.; convexity of left valve, 4 mm. (Jordan).

A right valve in the present collection measures approximately: length, 13 mm.; height, 8 mm.; convexity (one valve), 3 mm.

Distribution: One fairly large valve of this species was found in the beach drift at Corinto, Nicaragua. Another very small valve also referred to this species was dredged in 7 fathoms at Port Guatulco, Mexico. This is the first record of the occurrence of the species living in west American waters. Heretofore it has been known to occur only in the Pleistocene of Magdalena Bay, Lower California. Specimens apparently referable to this species were collected by Professor Nicholas Reformatsky in the Pleistocene of Albemarle Island, Galápagos group. Dr. A. M. Keen of Stanford University, called our attention to the fact that this species also occurs in the Recent fauna of the Galápagos Islands.

Genus ***Sportella*** Deshayes.

Sportella Deshayes, Descript. Anim. s. Vert. bas. Paris, Vol. 1, 1858, p. 593. Type, *Psammotea dubia* Deshayes.—Dall, *Trans. Wagner Free Inst. Sci.*, Vol. 3, Pt. 5, 1900, p. 1125. Type, *Psammotea dubia* Deshayes. [On p. 1125 as *Psammobia dubia* Deshayes].

Type (by original designation): *Psammotea dubia* Deshayes, Descript. Coq. Fos. env. Paris, Vol. 1, 1824, p. 76, pl. 10, figs. 13, 14. "Localité: Parnes, C. G."

Shell oblong, transverse, smooth, flattened, subequilateral, closed, margins simple and sharp. Hinge narrow bearing two unequal teeth diverging in the left valve, a single simple one in right valve. Muscular impressions large, oval, nearly equal. Pallial impression simple. Ligament external [translation from Deshayes, 1858].

Sportella stearnsii Dall.

Sportella stearnsii Dall, *Proc. U. S. Nat. Mus.*, Vol. 21, No. 1177, June, 1899, p. 885, pl. 87, figs. 9, 12. "Gulf of California, exact locality unknown."

[22] Lamy, E. Note sur le genre Basterotia Mayer, 1859 [Mollusques Lamellibranches]. *Comp. Rend. Congrès des Soc. Savantes*. Paris, 1925, pp. 503-508, 1 fig. in text.

Type Locality: Gulf of California.

Range: Gulf of California to Corinto, Nicaragua, and the Galápagos Islands.

Collecting Stations: Mexico: Santa Inez Bay, Gulf of California (145-D-1-3), 4-13 fathoms, sand; Nicaragua: Corinto (200-D-17), 7-10 fathoms, sand, also in beach drift.

Description: Shell of moderate size for the genus, inequilateral, not very convex, white, with an almost imperceptible yellowish epidermis; anterior dorsal margin nearly straight, the base parallel with it, the ends bluntly rounded; surface nearly smooth, with faint incremental lines and microscopic sagrination; teeth normal, strong, the posterior cardinal prominent, vertical; ligament strong, external, on a nymph; resilium well developed, its area of attachment thickened; posterior adductor scar rounded, unusually large. Lon. 13.5, alt. 10, diam. 5 mm. (Dall).

A right valve from Corinto, Nicaragua, measures approximately: length, 14 mm.; height, 8.8 mm.; convexity (one valve), 3 mm.

Distribution: One valve of this species was dredged in Santa Inez Bay, Gulf of California, three single valves were found in the beach drift and one left valve was dredged in 7-10 fathoms at Corinto, Nicaragua. The occurrence here recorded from Corinto, as well as that from the Galápagos Islands, represents an extension south of the known range of this species.

Superfamily Cardiacea.

Family Cardiidae.

A paper dealing with the nomenclature of the superspecific units of this family has been published by A. M. Keen[23].

Genus **Cardium** Linnaeus.

Key to the subgenera[24] of *Cardium*.

A. Shell decidedly longer than high
  a. Two distinct areas of sculpture; no lateral teeth ..... *Lophocardium*
  aa. Without distinct areas of sculpture; lateral teeth present ..... *Papyridea*

B. Shell decidedly higher than long, or round
  a. Shell nearly smooth ..... *Laevicardium*
  aa. Shell strongly sculptured
    b. Posterior area set off with strong concentric or scaly sculpture
      c. All ribs and interspaces on posterior area crossed by strong concentric laminae *Nemocardium*
      cc. Various ribs on posterior area with strong scales only *Microcardium*
    bb. Posterior area not set off with strong concentric or scaly sculpture
      d. Umbos abruptly angulated posteriorly; posterior margin truncated
        e. Ribs beaded; anterior laterals crowded against cardinals; shell small *Trigoniocardia*
        ee. Ribs with fine concentric imbrications; cardinals symetrically spaced between anterior and posterior laterals ..... *Americardia*
      dd. Umbos rounded or roundly angled posteriorly
        f. Ribs broad, flattish; smooth on top
          g. Very convex; ribs without scales ... *Mexicardia*
          gg. Gently convex; central ribs fringed with scales on anterior and posterior sides; elongate *Acrosterigma*
        ff. Ribs narrow, well elevated; central ribs with scales or nodes on posterior side.
          h. Central ribs with scales on posterior side and arching over top *Trachycardium*
          hh. Central ribs with a serrate ridge or nodes on posterior side only or nodes on both sides
            i. Central ribs with an elevated serrate ridge on posterior side .... *Phlogocardia*
            ii. Central ribs with diagonal nodes on posterior (and on some specimens also, to a lesser degree, on anterior) side *Dallocardia*

Subgenus **Lophocardium** Fischer.

Cardium (Lophocardium) annettae Dall.

Plate I, Figures 3, 8 and 13.

Cardium (*Lophocardium*) *annettae* Dall, *Nautilus*, Vol. 3, No. 2, June, 1889, p. 13. "Dredged in 25 fathoms off the coast of Lower California, near Cerros Island."

Lophocardium annettae Dall, *Proc. U. S. Nat. Mus.*, Vol. 12, 1889 (issued March 7, 1890), p. 264, pl. 10, fig. 4. "Hab.—Coast of Lower California at station 2828 in north

[23] Keen, A. M. Nomenclatural Units of the Pelecypod Family Cardiidae. *Bull. Mus. Roy. Hist. Nat. Belgique*, Tome 13, No. 7, March, 1937, pp. 1-22.

[24] The subgenus *Dinocardium* has been omitted from this key because it is believed that it does not occur in the west American fauna.

latitude 24° 11′ and west longitude 109° 55′ in 10 fathoms; fragments were collected at Stations 2823 and 2826, in 8 to 27 fathoms, shelly bottom, within a few miles of the preceding and also in material dredged near San Clemente Island in 25 fathoms."

Protocardia (Lophocardium) annettae Dall, Dall, *Proc. U. S. Nat. Mus.*, Vol. 23, 1901, p. 392. Gulf of California, 6 to 24 fathoms.

Type Locality: Off the coast of Lower California, near Cedros Island, in 25 fathoms.

Range: San Clemente Island, California, to Port Culebra, Costa Rica.

Collecting Stations: Mexico: East of Cedros Island; Santa Inez Bay, Gulf of California (143-D-2, 4), 25-30 fathoms, mud, crushed shell, sand; Port Guatulco (195-D-21), 18 fathoms, mud; Costa Rica: Port Parker (203-D-1, 2, 3), 12-15 fathoms, sandy mud, crushed shell, shelly sand and mud, algae; Port Culebra (206-D-1, 2, 3), 14 fathoms, sandy mud.

Description: Shell elongated, thin, fragile, gaping posteriorly; color salmon pink to almost white, the color deepest on the posterior area; a raised radial lamina fringed with periostracum separates about five-sixths of the shell from the posterior area; the surface of this anterior area is finely reticulated; flat, little elevated, radial ribs become very weak and can be observed only with magnification on the anterior end, the radial sculpture is crossed by fine raised irregular concentric laminae; the posterior area is ornamented by well developed radials crossed by somewhat irregular laminae which are sparser and higher than the radials and much higher than on the anterior area; two pointed cardinal teeth are present in the right valve and one in the left but lateral teeth are absent; periostracum light brown in color. The largest specimen in the present collection is 46.8 mm. long and 38.7 mm. high.

A study of the series available suggests that there are not two species of this remarkable group of shells in the area, and were it not for Broderip's statement regarding *cumingii* that the lamina separating the posterior part of the shell from the remainder is *Mactra*-like, we would feel that the name *annettae* should be relegated to the synonymy of *Cardium cumingii*[25]. L. C. Smith[26] discussed both species and stated that the lamina on *C. cumingii* is not made of shelly material.

Dall stated that the bounding ridge of the type of *C. annettae* is notched and fringed with periostracum and much less prominent than that of *C. cumingii*. Specimens from as far south as Costa Rica show some variation in the height and character of the lamina and it is not certain that the specific name *annettae* can be retained for a form distinct from *C. cumingii*.

Distribution: Specimens of *Cardium annettae* were dredged at depths of 12 to 30 fathoms from Cedros Island to Costa Rica. It was not found abundantly at any locality and in some localities specimens of this fragile shell were broken into pieces.

Subgenus ***Papyridea*** Swainson.

Cardium (Papyridea) aspersum Sowerby.

Cardium aspersum Sowerby, *Proc. Zool. Soc. London*, September 8, 1833, p. 85. "Hab. ad Sanctam Elenam et ad Montem Christe." "Found in sandy mud at seven fathoms depth."—Sowerby, Conch. Illustr., *Cardium*, Cat., p. 2, 1840?, pl. 48, fig. 15, January, 1834. St. Elena.—Reeve, Conch. Syst., Vol. 1, 1841, p. 99, pl. 75, fig. 15.

Type Locality: Santa Elena, Ecuador (here designated as type locality). Montechristi also cited originally.

Range: Manuela Lagoon, Lower California, and the Gulf of California, to Lobitos, Peru.

Collecting Stations: Mexico: Southeast of Cedros Island (126-D-19), 25 fathoms, rocks, algae; Cape San Lucas; Santa Inez Bay, Gulf of California (141-D-2), 10-15 fathoms, sand, weed; Port Guatulco; Nicaragua: Corinto (200-D-19), mangrove leaves; Panama: Hannibal Banks.

Description: Shell elongately oval, subequilateral, gaping; mottled with reddish-brown and light colored areas; ribs numerous, the anterior ones finer and crenulated, the central ones flattened, the posterior ones coarser and ornamented with short spines; the ends of the ribs form a serrated margin posteriorly.

Cardium aspersum is very similar to the Atlantic species *C. spinosum* Meuschen but the form from the eastern Pacific appears to have flatter ribs and less posterior elongation. The form described by *Verrill* as *Papyridea bullata* var. *californica*[27] has not been illustrated but is probably identical with the species described by Sowerby.

Distribution: *Cardium aspersum* was collected on beaches and dredged at depths of 10 to 25 fathoms from Cedros Island to Panama. It is also known to occur in the Pleistocene of Magdalena Bay, Lower California, of Oaxaca, Mexico, and the Galápagos Islands.

[25] *Cardium cumingii* Broderip, *Proc. Zool. Soc. London*, September 8, 1833, p. 82. "Hab. in Americâ Centrali. (Gulf of Dulce)." "It was obtained from sandy mud, at a depth of twelve fathoms."—Reeve, Conch. Icon., Vol. 2, *Cardium*, 1844, species 59, pl. 12, fig. 59. Original locality cited.

[26] Smith, L. C., *Mus. Comp. Zool., Occ. Papers on Moll.*, No. 4, July 30, 1945, p. 31-32.

[27] *Papyridea bullata* Sw. var. *californica* Verrill, *Amer. Jour. Sci.*, Ser. 2, Vol. 49, March, 1870, p. 225. "La Paz."

Subgenus ***Phlogocardia*** Stewart.

Cardium (Phlogocardia) belcheri Broderip & Sowerby.

Cardium belcheri Broderip & Sowerby, *Zool. Jour.*, Vol. 4, January, 1829, p. 366, pl. 9, fig. 3. "Hab. in Oceano Pacifico." Dredged "to the northward of Isabella Island, at the entrance to the Gulf of California, in 15 fathoms."—Sowerby, Conch. Illustr., *Cardium*, Cat., p. 3, No. 41, 1840?. "Coast of California and Panuma" [Panama].—Reeve, Conch. Icon., Vol. 2, *Cardium*, 1844, species 5, pl. 1, fig. 5. "Hab. California and Panama; Belcher."

Type Locality: North of Isabel Island, Mexico, at the entrance to the Gulf of California, in 15 fathoms.

Range: Cedros Island, Lower California, and the Gulf of California, to Panama.

Collecting Stations: Mexico: East of Cedros Island (126-D-2), 38 fathoms, mud; Arena Bank, Gulf of California (136-D-15), 40 fathoms, mud, crushed shell; Santa Inez Bay (141-D-1-4), 7-20 fathoms, sand, crushed shell, calcareous algae, weed, (142-D-2), 30-35 fathoms, muddy sand, crushed shell, (143-D-1-5), 18-30 fathoms, mud, crushed shell, sand, weed; Costa Rica: 14 miles S.E. of Judas Point (214-D-1-4), 42-61 fathoms, mud, shell, rocks; Panama: Gulf of Chiriqui (221-D-1-5), 35-40 fathoms, sandy mud.

Description: Shell elongately oval from beak to base, inflated; ornamented by about 24 triangular ribs which, on the posterior side, are surmounted by a narrow, serrated ridge. A large specimen measures approximately 53 mm. in altitude.

Cardium stiriatum Brown & Pilsbry from the Miocene of Panama, and *C. stiriatum leonense* Mansfield from the upper Miocene of Florida, are forms similar to *C. belcheri*. Other species of this group occur in the late Tertiary of the Caribbean region.

Distribution: *Cardium belcheri* was dredged at several localities between Cedros Island, Lower California, and Panama, at depths of 7 to 61 fathoms.

Subgenus ***Americardia*** Stewart.

Key to the species of *Americardia*.

A. About 28 fairly broad, flat ribs; interior with brownish-red areas ..... *biangulatum*

B. About 30 narrow ribs; interior white ..... *guanacastense*

Cardium (Americardia) biangulatum Broderip & Sowerby.

Cardium biangulatum Broderip & Sowerby, *Zool. Jour.*, Vol. 4, January, 1829, p. 367. "Hab."—Sowerby, Conch. Illustr., *Cardium*, Cat., p. 7, 1840?, pl. 46, fig. 2, issued between July 19, 1833, and January, 1834. "St. Elena, Mr. Cuming."—Reeve, Conch. Icon., Vol. 2, *Cardium*, 1844, species 29, pl. 6, fig. 29. "Hab. St. Elena and Isle of Plata, West Columbia (found in coral sand at the depth of seventeen fathoms); Cuming."

Type Locality: Santa Elena, Ecuador (here designated as type locality). No locality cited originally but Santa Elena cited with first illustration of the species.

Range: Catalina Island, California, to Guayaquil, Ecuador.

Collecting Stations: Mexico: East of Cedros Island (126-D-2), 38 fathoms, mud; Santa Inez Bay (142-D-1-4), 30-50 fathoms, sand, crushed shell, muddy sand, weed, calcareous algae, (143-D-1), 29 fathoms, mud, crushed shell, weeds, (145-D-1, 3), 4-13 fathoms, sand, also at San Domingo Point and Monument Station; coast of Lower California; Arena Point; Cape San Lucas; Port Angeles; Port Guatulco (195-D-9, 10, also on shore), 4-7 fathoms, gray sand, crushed shell; Santa Cruz Bay; Tangola-Tangola Bay (196-D-6, 7, 14, 15), 5-7 fathoms, sand, crushed shell; Nicaragua: Corinto (200-D-19), 12-13 fathoms, mangrove leaves; Costa Rica: Port Parker (203-D-1, 3, also on shore), 12-15 fathoms, sandy mud, crushed shell, shelly mud; Cedro Island, Gulf of Nicoya (213-D-4-15), 4-40 fathoms, mud, sand, crushed shell; Golfito, Gulf of Dulce.

Description: Shell inflated, umbos abruptly angulated posteriorly, posterior end concavely flexed and truncated; ribs fairly broad, flattened, about 27-28 in number; color of exterior light brown with reddish-brown spots, interior white tinged with reddish-brown areas.

The shell of this species is proportionately broader, the ribs fewer and broader, and the interior is partially colored reddish-brown in comparison to that of *C. guanacastense*, which is white. *Cardium medium* of the Caribbean region is similar in shape but has more numerous and narrower ribs.

Distribution: *Cardium biangulatum* was collected at many localities from Cedros Island, Lower California, to Costa Rica, on beaches and dredged at depths of 4 to 50 fathoms. The largest number of specimens was found at Corinto, Nicaragua. The species is known to occur from Pliocene to Recent in the Gulf of California region and in the Pleistocene of the San Pedro region in southern California.

Cardium (Americardia) guanacastense Hertlein & Strong, sp. nov.

Cardium planicostatum Sowerby, *Proc. Zool. Soc. London*, September 8, 1833, p. 83. "Hab. ad oras Americae Centralis. (Guacomayo)." "Found in fine sand, at a depth of thirteen fathoms." — Sowerby, Conch. Il-

lustr., *Cardium*, Cat., p. 7, 1840?, pl. 50, fig. 25, February, 1834. "Guacomayo. Mr. Cuming."—Reeve, Conch. Icon., Vol. 2, *Cardium*, 1844, species 31, pl. 6, fig. 31. Original locality cited.

Not *Cardium planicostatum* Sedgwick & Murchison, 1829.

Cardium (Fragum) magnificum (Deshayes MS) in Carpenter, Dall, *Proc. U. S. Nat. Mus.*, Vol. 23, 1901, p. 390. Lower California to Paita, Peru, in 10 to 13 fathoms.

Not *Cardium magnificum* Deshayes in Carpenter, Rept. Brit. Assoc. Adv. Sci. for 1856 (issued 1857), p. 187. "Is. Plata, St. Elena," coral sand, in 17 fathoms. Reference to Plate 6, fig. 29 of Reeve [which represents *Cardium biangulatum* Broderip & Sowerby].

Type Locality: Culebra Bay, Costa Rica.

Range: Off San Jose del Cabo, Lower California, to Paita, Peru.

Collecting Station: Costa Rica: Culebra Bay.

Description: Shell somewhat cordate, the beaks somewhat attenuated, rounded anteriorly, truncated posteriorly, umbos angulated posteriorly and sloping abruptly downward, the median portion of the posterior area concave; sculptured with about 30 narrow, flat-topped ribs of which about 20 occur anterior to the posterior umbonal angulation and about 10 posterior to it, ribs and interspaces crossed by fine concentric imbrications; hinge with 2 cardinals, the anterior the larger, and 2 laterals which are double in the left valve; exterior yellowish-white and pinkish and with somewhat irregularly concentric blotches of brown, the interior white. The type measures: height (beak to base), 25 mm.; length, approximately, 22 mm. Another specimen, a right valve, measures: height, 46 mm.: length, 36 mm.

Holotype, left valve, in Calif. Acad. Sci. Paleo. Type Coll., from Culebra Bay, Province of Guanacaste, Costa Rica. A right valve, somewhat worn, also was collected at the type locality.

The shell of this species is in general shape similar to that of *Cardium biangulatum* but it is proportionately higher and narrower, has about 30 radial ribs which are narrower, and the interior is white rather than with reddish-brown areas.

The first citation of *Cardium magnificum* was by Carpenter (1857, p. 187) who stated "*Cardium biangulatum* [= *magnificum*, Desh.]" with a reference to Reeve's plate 6, figure 29, which represents *C. biangulatum*. Carpenter did not make any additional statement regarding *Cardium magnificum* in any subsequent publication. Dall, 1901, stated regarding *C. magnificum* "This is *Cardium planicostatum* Sowerby, 1833, not of Sedgwick and Murchison, 1829." He also stated that Carpenter was mistaken in referring Deshayes' species to *Cardium medium*. Dall apparently referred to Carpenter's statement (1863, p. 364; 1864, p. 552. See *Smithson. Miscell. Coll.*, No. 252, 1872, pp. 38, 201) that a specimen identified by C. B. Adams as *C. planicostatum* Sowerby "may be a worn valve of *Hemicardia biangulata*, but more resembles a ballast specimen of the W. Indian *H. media*."

It seems reasonable to suppose that Deshayes intended to propose the specific name *magnificum* to replace the preoccupied name *planicostatum* of Sowerby. However, according to the rules of nomenclature, the name *Cardium magnificum* must be relegated to the synonymy of *Cardium biangulatum*. Sowerby's combination of names, *Cardium planicostatum*, had been used earlier by Sedgwick & Murchison; therefore a new name is required for *Cardium planicostatum* of Sowerby and the name *Cardium guanacastense* based upon a type from Culebra Bay, Costa Rica, is here proposed.

Cardium arrestum Dall from the Caloosahatchie Pliocene of Florida is a similar species.

Distribution: Two specimens of this species were collected by the Expedition at Culebra Bay, Costa Rica. The northernmost locality represented by specimens in the collection of the California Academy of Sciences is that of shells collected by the Templeton Crocker Expedition in 1932 off Mexico in Lat. 23° 03′ N., Long. 109° 31′ to 109° 36′ W. The species also has been recorded as occurring in the Pliocene of Costa Rica, and in the Pleistocene of Ecuador.

Subgenus ***Nemocardium*** Meek.

Cardium (Nemocardium) centifilosum Carpenter.

Cardium var. *centifilosum* Carpenter, Rept. Brit. Assoc. Adv. Sci. for 1863 (issued August, 1864), p. 611. "Cat. Is., 30-40 fm.," p. 642. Santa Barbara Islands. Reprint in *Smithson. Miscell. Coll.*, No. 252, 1872, pp. 97, 128.

Cardium (Protocardium) centifilosum Carpenter, Packard, *Univ. Calif. Publ. Zool.*, Vol. 14, No. 2, 1918, p. 267, pl. 20, figs. 2a, 2b, 2c, 2d. Dredged in 40 and 46 fathoms on a bottom of fine dark green sand off the Farallon Islands, California.

Type Locality: Catalina Island, California, 30-40 fathoms.

Range: Farallon Islands, California, to Abreojos Point, Lower California.

Collecting Station: Mexico: Cedros Island (126-D-3, 6, 10, 12, 15), 40-60 fathoms, mud, crushed shell, eel grass.

Description: Shell small, roundly trigonal, ornamented by numerous fine radial ribs, the posterior ribs are coarser and are

crossed by raised concentric lamellae. Average specimens in the present collection measure approximately 15 mm. in height.

Cardium centifilosum richardsoni Whiteaves, a northern form of this species, is generally a little larger and more coarsely sculptured.

Distribution: *Cardium centifilosum* was found in five dredge hauls in the channel east of Cedros Island, Lower California, from depths of 40-60 fathoms. The species has also been recorded from the Pliocene and questionably from the Miocene of California.

Subgenus **Microcardium** Thiele.

Cardium (Microcardium) pazianum Dall.

Plate I, Figures 9, 12, 15 and 16.

Protocardia paziana Dall, *Proc. U. S. Nat. Mus.*, Vol. 52, December 27, 1916, p. 412. "Off La Paz, Gulf of California, in 10 fathoms."

Type Locality: Off La Paz, Lower California, in 10 fathoms.

Range: Cedros Island, Lower California, to Santa Inez Bay in the Gulf of California, to Panama.

Collecting Stations: East of Cedros Island (126-D-10), 60 fathoms, crushed shell, eel grass; Arena Bank, Gulf of California (136-D-22, 24, 26, 29, 31), 35-70 fathoms, mud, *Arca* conglomerate, sand, crushed shell, rock, weed, calcareous algae; Santa Inez Bay (141-D-2), 10-15 fathoms, sand, weed, (142-D-2), 30-35 fathoms, mud, sand, crushed shell, (146-D-1), 35 fathoms, mud, crushed shell, (147-D-2), 60 fathoms, mud, crushed shell; Gorda Banks (150-D-8, 9), 40-60 fathoms, muddy sand; Manzanillo, (184-D-2), 30 fathoms, gravelly sand; Costa Rica: Port Parker (203-D-1, 3), 12-15 fathoms, sandy mud, crushed shell, shelly mud; 14 mi. S. E. of Judas Point (214-D-1-4), mud, shell, rocks; Panama: Gulf of Chiriqui (221-D-1-5), 35-40 fathoms, sandy mud.

Description: Shell small, thin, rounded, posteriorly somewhat obliquely produced and subtruncated; the anterior area ornamented by about 40 fine ribs which are finely nodulous where the concentric crosses the radial sculpture; posterior area with about 22 ribs which are minutely scaled, but interspersed in this series there are five or six with comparatively large scales; the color of the shell is yellowish-white, some specimens entirely so, but many are ornamented by vivid red and orange interiorly toward the hinge and occasionally there is exteriorly a narrow concentric band which is tinged with this color. A large specimen measures approximately 15.2 mm. in length and 15 mm. in height.

This species is very close to "*Protocardia*" *panamensis* Dall[28], a Panamanian species, which was described as possessing a shorter shell with about 33 ribs and the interior whitish and polished. No mention was made at the time of description of any orange red color on the shell. From the illustration given by Dall there seems to be little to separate the two species except color. However, the coloration is variable and there is often variability in the proportion of length to height in the shells of *Cardium* and furthermore the presence of *C. pazianum* as far south as Panama leads us to doubt whether *C. pazianum* is really distinct from *P. panamensis*. We have for the present retained the name *pazianum* because of the color, the greater length in proportion to height, and because we have but one somewhat imperfect specimen from Panama for comparison, but even it shows a faint trace of pink above the hinge line. *Cardium* (*Microcardium*) *peramabile* Dall[29], the type of *Microcardium* and its subspecies *tinctum* Dall[30], are similar to the two west American species here mentioned.

Distribution: This species was dredged from east of Cedros Island, Mexico, to the Gulf of Chiriqui, Panama, at depths of 10-70 fathoms.

Subgenus **Mexicardia** Stewart.

Cardium (Mexicardia) procerum Sowerby.

Cardium procerum Sowerby, *Proc. Zool. Soc. London*, September 8, 1833, p. 83. "Hab. in Americâ Centrali. (Real Llejos)." "Found in coarse sand in from four to six fathoms water."—Reeve, Conch. Icon., Vol. 2, *Cardium*, 1844, species 51, pl. 10, fig. 51. Original locality cited.

Cardium laticostatum Sowerby, *Proc. Zool. Soc. London*, September 8, 1833, p. 85. "Hab. in Sinu Xipixapi." "Found in sandy mud at the depth of eleven fathoms."—Sowerby, Conch. Illustr., *Cardium*, Cat., p. 1, 1840?, pl. 51, fig. 30, February, 1834. "Xipixapi, West Colombia. Mr. Cuming."

Cardium panamense Sowerby, *Proc. Zool. Soc. London*, September 8, 1833, p. 85. "Hab. ad Panamam." "Found in sandy mud at a depth of ten fathoms."—Reeve, Conch. Icon., Vol. 2, *Cardium*, 1844, species 56, pl. 11, fig. 56. Original locality cited.

Cardium subelangatum "Reeve," Valenciennes, Zool. Voy. Venus, 1846, Atlas, pl. 17, fig. 2.

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[28] *Protocardia panamensis* Dall, *Bull. Mus. Comp. Zool.*, Vol. 43, No. 6, October, 1908, p. 415, pl. 18, fig. 1. "Gulf of Panama, in 182 fathoms, mud."

[29] *Cardium (Fulvia) peramabilis* Dall, *Bul. Mus. Comp. Zool.*, Vol. 9, No. 2, 1881, p. 132. Various localities cited, Siesbee, 119 fathoms, Barbados, 100 fathoms; off Sombrero, 54-72 fathoms; west of Florida. 50 fathoms, etc.—Dall, *Bul. Mus. Comp. Zool.*, Vol. 12, No. 6, 1886, p. 269, pl. 4, fig. 7.

[30] See *Microcardium tinctum* Dall, McLean, *Mem. Soc. Cubana Hist. Nat.*, Vol. 13, No. 3, 1939, p. 173. pl. 26, figs. 5 and 6. Key West, Florida, and the West Indies, in 7 to 100 fathoms.

Cardium rotundatum Carpenter, Rept. Brit. Assoc. Adv. Sci. for 1856 (issued 1857), pp. 247, 307. Mazatlan, Mexico; Gulf of California.—Carpenter, Cat. Mazatlan Shells, April, 1857, p. 531. "Mazatlan: extremely rare, off Spondylus."

Cardium eudoxia Dall, *Proc. U. S. Nat. Mus.*, Vol. 52, No. 2183, December 27, 1916, p. 412. "Station 3020 Gulf of California, in 7 fathoms."—Keen, *Min. Conch. Club South. Calif.*, No. 41, November, 1944, p. 25. "The holotype, from the Gulf of California, is a young *Trachycardium* (*Mexicardia*) *procerum*."

Cardium parvulum Li, *Bull. Geol. Soc. China*, Vol. 9, No. 3, October, 1930, p. 259, pl. 3, fig. 22. Panama Bay. "Probably Recent."

Type Locality: Real Llejos [near Corinto], Nicaragua, in 4 to 6 fathoms, sand.

Range: Lagoon Head (Lat. 28° 15′ N., Long. 114° 07′ W.), Lower California, to Lobos Islands, Peru.

Collecting Stations: Mexico: Santa Inez Bay, on beach, also at Monument Station; Banderas Bay; Chamela Bay; Tenacatita Bay; Santa Cruz Bay; Guatemala: 7 mi. W. of Champerico (197-D-2), 14 fathoms, mud; Nicaragua: Corinto (200-D-1, 3, 11, 19), 2-13 fathoms, mangrove leaves, also on beach, and at Isla Encantada; San Juan del Sur; Costa Rica: Port Parker; Port Culebra; Cedro Island, Gulf of Nicoya (213-D-1-10), 4-10 fathoms, mud, crushed shell; Golfito, Gulf of Dulce; Panama: Isla Parida; Bahia Honda.

Description: Shell elongately trigonal, somewhat oblique posteriorly, 22 to 25 smooth, flattish-topped, radial ribs, these are not strongly developed on the anterior slope of the shell but the posterior margin is serrated due to the projecting ends of the ribs which interlock with the opposite valve; externally brownish colored with a tendency toward yellowish or whitish colored concentric areas.

In the young stages up to about 35 mm. in length the shell is longer in proportion to the height while in the more adult stages the height is much greater than the length. The ribs are rounded in the younger stages up to 10 or 15 mm. in length but they gradually become broader, subtriangular and flatter and are separated by narrow and fairly deep interspaces. The rather considerable variation in shape during the growth has led to descriptions of this species under several different names, such as *Cardium laticostatum* Sowerby, which name was based on a young rounded stage of *C. procerum*. Large specimens of this species attain a height of more than 80 mm.

Distribution: *Cardium procerum* occurs commonly from the Gulf of California to Peru. It was collected from the Gulf of California to Panama on the beaches and dredged at depths of 2 to 14 fathoms. The largest number of specimens of this species found at any locality was in the beach drift at Corinto, Nicaragua. The species is also known to occur in the Pleistocene of southern California, Lower California, Costa Rica and Panama, and in the Pliocene and Pleistocene of Ecuador.

Subgenus ***Trigoniocardia*** Dall.

Key to the species of *Trigoniocardia*.

A. Shell subtrigonal; about 18 strongly noded ribs ..... *graniferum*

B. Shell subovate; about 21 finely noded ribs ..... *obovale*

Cardium (Trigoniocardia) graniferum
Broderip & Sowerby.

Cardium graniferum Broderip & Sowerby, *Zool. Jour.*, Vol. 4, January, 1829, p. 367. "Hab. ad littora Oceani Pacifici." "Dug from a depth of about 6 inches in the mud of the Estaro de Mazatlan." — Sowerby, Conch. Illustr., *Cardium*, Cat., p. 3, 1840?, pl. 49, fig. 17, January, 1834. "Pacific Ocean. Mr. Cuming."—Reeve, Conch. Icon., Vol. 2, *Cardium*, 1844, species 43, pl. 8, fig. 43. "Hab. Gulf. of Nicoya, Central America; and Xipixapi, West Columbia; Cuming."

Type Locality: Mazatlan, Mexico, in about 6 inches, mud.

Range: Gulf of California, to Zorritos, Peru.

Collecting Stations: Mexico: Santa Inez Bay, Gulf of California (145-D-1, 3), 4-13 fathoms, sand; San Domingo Point; Port Guatulco (195-D-19, 21), 17-18 fathoms, mud, crushed shell; El Salvador: Meanguera Island, Gulf of Fonseca (199-D-1), 16 fathoms, sand, mud, crushed shell; Nicaragua: Corinto (200-D-3, 10, 17, 19), 2-13 fathoms mangrove leaves, sand, also on beach; Costa Rica: Port Parker (203-D-1), 15 fathoms, sandy mud, crushed shell; Cedro Island, Gulf of Nicoya (213-D-1-10), 4-10 fathoms, mud, sand, crushed shell; Golfito Bay, Gulf of Dulce (218); Panama: Bahia Honda (222).

Description: Shell small, subtrigonal, there are about a dozen rather widely spaced, elevated, triangular, finely noded ribs followed by about 6 to 8 finer, closely spaced, noded ribs which occur on the steeply sloping posterior area; the interspaces are marked by deep narrow, transverse grooves. A large specimen measures approximately 15 mm. in altitude. Reeve has mentioned the *Trigonia*-like appearance of this shell.

Cardium haitense Sowerby from the Miocene of the Caribbean region is a similar species.

Distribution: Specimens of *Cardium*

graniferum were collected at various localities from the Gulf of California to Panama on beaches and dredged at depths of 4 to 18 fathoms. The largest number of specimens was found in the beach drift at Corinto, Nicaragua. It is also known to occur in the Pleistocene of Magdalena Bay, Lower California, and Panama and in the Pliocene of Ecuador. A fossil form cited as "*Cardium* (*Fragum*) aff. *graniferum* Broderip"[31] has been recorded from Barbados Island.

Cardium (Trigoniocardia) obovale Sowerby.

Cardium obovale Sowerby, *Proc. Zool. Soc. London,* September 8, 1833, p. 84. "Hab. ad oras Americae Meridionalis. (Xipixapi)." "Found in sandy mud at eleven fathoms depth."—Sowerby, Conch. Illustr., *Cardium,* Cat., p. 7, 1840?, pl. 46, fig. 4, issued between July 19, 1833, and January, 1834. "Xipixapi. Mr. Cuming."—Reeve, Conch. Icon., Vol. 2, *Cardium,* 1845, species 117, pl. 21, fig. 117. Original locality cited.—Hertlein, *Bull. South. Calif. Acad. Sci.,* Vol. 33, Pt. 2, May-August (issued August 31), 1934, p. 62, pl. 21, fig. 14. Maria Magdalena Island, Tres Marias group, Mexico, Pleistocene.

Type Locality: Xipixapi (Jipijapa), Ecuador, in 11 fathoms, sandy mud.

Range: Magdalena Bay, Lower California, and the Gulf of California to Salinas, Ecuador.

Collecting Stations: Mexico: San Lucas Bay (135-D-2), 8-16 fathoms, sand; 17 mi. S. E. of Acapulco (189-D-3), 13 fathoms, mud; Guatemala: 7 mi. W. of Champerico (197-D-1, 2), 14 fathoms, mud; El Salvador: La Libertad (198-D-1, 2), 13-14 fathoms, mud; Nicaragua: Corinto (200-D-10, 11, 16, 19, 20-26), 1.5-13 fathoms, mangrove leaves, sand, also on beach; Panama: Gulf of Chiriqui (221-D-1-5), 35-40 fathoms, sand, mud.

Description: Shell small, subovate, oblique, fairly convex and peaked, ornamented by about 21 finely noded radial ribs, those anteriorly and posteriorly somewhat broadly and asymmetrically triangular, those along the posterior umbonal ridge higher and rounded, those on the posterior area, about 8 in number, flatter, narrower and closer together than those on the anterior area; interspaces transversely grooved. A large specimen in the collection of the California Academy of Sciences from near Isabel Island, west Mexico, measures, approximately, 20.5 mm. in altitude, 14 mm. in length, convexity (one valve) 8 mm.

Cardium ovuloides Reeve[32], described without information as to the locality, appears to be similar to *C. obovale* but was described as possessing sculpture similar to that of *C. graniferum*. *Cardium* (*Trigoniocardia*) *cabopasadum* Pilsbry & Olsson[33] from the Pliocene of Ecuador and *Cardium* (*Trigoniocardia*) *spiekeri* Hanna & Israelsky from the upper Miocene of Ecuador and Pliocene of Peru are other species of the *C. obovale* group.

Distribution: Specimens of *Cardium obovale* were collected from Cape San Lucas Bay, Lower California, to the Gulf of Chiriqui, Panama, on the beach and dredged at depths of 1.5 to 40 fathoms. The largest number found at any one locality was west of Champerico, Guatemala, in 14 fathoms on a muddy bottom. This species is also known to occur in the Pleistocene of the Tres Marias Islands, and in the Pliocene of Panama and Ecuador.

Subgenus **Laevicardium** Swainson.

Key to the species of *Laevicardium*.

A. Shell large, very convex; radially grooved ..... *elatum*

B. Shell small, more compressed, oblique; smooth or with very fine nearly obsolete ribbing

  a. Elongately trigonal; interior spotted, banded or entirely reddish-brown

    b. Interior entirely reddish-brown or with concentric bands *elenense*

    bb. Interior with reddish-brown spots; shell broader ..... *apicinum*

  aa. Elongately oblique; interior white with a yellow patch under the umbos ..... *clarionense*

Cardium (Laevicardium) clarionense Hertlein & Strong, sp. nov.

Plate I, Figures 5, 6, 7 and 14.

Shell very obliquely ovate, rather compressed, pointed at the beaks, very slightly gaping at the sides; smooth over most of the surface but with fine radial sculpture along the basal margin and at the edges of the resting stages, internally with the basal and the lower half of the anterior margin finely serrated; there is also a narrow posterior area defined by a slight angle exteriorly but scarcely visible internally; exterior light yellowish, variously maculated and spotted with brown, internally with a large yellow patch extending from the beaks to the middle of the shell, a broad white band along the margins; lateral teeth strong, cardinal teeth small, two in the left valve, one in the right. The type measures: maximum vertical diameter, 31.4 mm.; max-

[31] *Cardium* (*Fragum*) aff. *graniferum* Broderip, Trechtmann, *Geol. Mag.*, Vol. 70 (Whole No. 823), 1933, p. 35. Fossil at Gun Hill, Barbados.

[32] *Cardium ovuloides* Reeve, Conch. Icon., Vol. 2, *Cardium*, March, 1845, species 126, pl. 22, fig. 126. "Hab.—?"

[33] *Cardium* (*Trigoniocardia*) *cabopasadum* Pilsbry & Olsson, *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 93, September 9, 1941, p. 59, pl. 12, figs. 6, 7. "Jama formation, Puerto Jama." Ecuador, Pliocene.

imum longitudinal diameter, 23.9 mm.; convexity (both valves), 16.5 mm.

Holotype, (California Academy of Sciences Paleo. Type Coll.), from Station 163-D-2, dredged 3 miles off Pyramid Rock, south of Clarion Island, Lat. 18° 19′ N., Long. 114° 45′ W., in 55 fathoms (100 meters), rock and coral bottom. Two complete specimens and three odd valves were dredged at the same locality. Additional specimens were dredged as follows: one valve at Arena Bank (136-D-15), 40 fathoms, mud, crushed shell; one valve at Arena Bank (136-D-28), 85 fathoms, muddy sand; one specimen in Ceralbo Channel (137-D-1), 46 fathoms, rock; one specimen at Santa Inez Bay (143-D-3), 35 fathoms, mud, crushed shell, and two specimens from the same locality but without further information.

Range: Santa Inez Bay, Gulf of California, to Clarion Island, Revillagigedo group.

This species resembles in many ways the young of *Cardium elatum* Sowerby of the same size but is much more oblique and more compressed. It differs from *Cardium elenense* Sowerby in the larger size, more oblique shape and in the coloration, particularly the large internal yellow patch. The largest single specimen of the new species measures: maximum vertical diameter, 41 mm.; maximum longitudinal diameter, 32 mm.

Cardium (Laevicardium) elatum Sowerby.

Cardium elatum Sowerby, *Proc. Zool. Soc. London*, September 8, 1833, p. 84. "Hab. ad Guaymas in Sinu Californiensi." "Found in sandy mud at low water."—Sowerby, Conch. Illustr., *Cardium*, Cat., p. 5, 1840?, pl. 46, fig. 3, issued between July 19, 1833 and January, 1834. "California."—Reeve, Conch. Icon., Vol. 2, *Cardium*, 1844, species 41, pl. 8, fig. 41. "Hab. Bay of California (found on mud-banks at low water)."

Type Locality: Guaymas, Sonora, Mexico, in the Gulf of California, at low water, in sandy mud.

Range: San Pedro, California, to Panama.

Collecting Stations: Mexico: Santa Inez Bay, Monument Station; 1 mile south of San Domingo Point, Concepcion Bay; Banderas Bay.

Description: Shell large, oval, somewhat oblique, very ventricose, yellow, with a thin brownish periostracum; surface ornamented by numerous shallow radiating grooves, but the anterior and posterior margins are smooth; ventral margin serrated and interlocking.

This is the largest Recent species of *Cardium* known. A large specimen from San Diego, California, in the collections of the California Academy of Sciences measures approximately 170 mm. in altitude and Lowe has mentioned a specimen slightly larger (5½ inches long) from the Gulf of California.

Distribution: This species was taken in Santa Inez Bay in the Gulf of California, and at Banderas Bay, Mexico. It has been recorded as occurring south to Panama but we have not seen specimens from south of Tenacatita Bay, west Mexico. It is also known to occur in the Pleistocene of southern California and Lower California and in the archaeologic ruins and middens of southwestern United States.

Cardium (Laevicardium) elenense Sowerby.

Cardium elenense Sowerby, Conch. Illustr., *Cardium*, Cat., p. 6 (*elenensis*), 8 (*elenense*), No. 73, 1840?, pl. 181, fig. 58, issued between June, 1839, and 1841. "St. Elena." [Shaw (*Proc. Malacol. Soc. London*, Vol. 8, 1909, p. 340) cited the date of issue of the Catalogue of *Cardium* in Conch. Illustr., as "*Cardium*. Cat., pp. 1-8, with part 184? 1840?." Tomlin, 1928, cited the Conch. Illustr., as the earliest reference to the present species].—Sowerby, *Proc. Zool. Soc. London* for 1840 (issued May, 1841), p. 109. "Hab. ad Sanctam Elenam. H. Cuming legit." Ref. to Conch. Illustr., fig. 58.—Reeve, Conch. Icon., Vol. 2, *Cardium*, 1845, species 104, pl. 20, fig. 104. "Hab. St. Elena, West Columbia (found in sandy mud at the depth of seven fathoms); Cuming."—E. K. Jordan, *Contrib. Dept. Geol. Stanford Univ.*, Vol. 1, No. 4, 1936, p. 134. Magdalena Bay, Santa Margarita Island and San Ignacio Lagoon, Lower California, Pleistocene. Recent, Gulf of California.

Type Locality: Santa Elena, Ecuador.

Range: Magdalena Bay and the Gulf of California, to Salinas, Ecuador, and the Galápagos Islands.

Collecting Stations: Mexico: Gulf of California; Arena Bank (136-D-6, 30), 35 fathoms, sand, weed; Santa Inez Bay (141-D-2), 10-15 fathoms, sand, weed, (142-D-4), 40-50 fathoms, sand, (143-D-1), 29 fathoms, mud, crushed shell, weed, (144-D-2), 2½ fathoms, sand, weed, rocks, (145-D-1), 13 fathoms, sand, also 1 mile off San Domingo Point, Concepcion Bay; Arena Point Area; San Lucas Bay, off west beach; Cape San Lucas; Port Guatulco (195-D-1, 2, 3, 6, 7, 13, 19), 2.5-17 fathoms, sand, algae, crushed shell, rocks, green mud; Tangola-Tangola Bay (196-D-14), 5 fathoms, crushed shell; Nicaragua: Corinto (200-D-3, 17, 19), 2-13 fathoms, mangrove leaves, sand, also on beach; Costa Rica: Port Parker (203-D-1, 2, 3, 4-15), 1-15 fathoms, sandy mud, crushed shell, shelly mud, algae, gravel, rocks, coral; Cedro Island, Gulf of Nicoya (213-D-1-10), 4-10 fathoms, mud, sand, crushed shell; Golfito, Gulf of Dulce (218-D-8), 6 fathoms,

mangrove leaves, mud, shells; Panama: Bahia Honda (222), 3-11 fathoms, rocks, coral, shells, green mud, leaves.

Description: Shell thin, smooth, oval, gently inflated, externally colored reddish-yellow and brown, with brown or purple dots, interiorly with reddish-brown bands or, in some specimens, almost completely reddish-brown. Weathered specimens usually show the presence of fine radial sculpture. Height about 20 mm.

Cavdium elenense is very similar to the subspecies *C. elenense apicinum* Carpenter but appears to be narrower in form and is exteriorly ornamented by more color of yellow with reddish-brown bands on the beaks and the interior is more completely colored reddish-brown or with concentric bands rather than spotted and blotched as in *C. elenense apicinum*. *Cardium elenense* is similar to the generally more northern *C. substriatum* Conrad, from southern California, but is smaller and is colored reddish-brown exteriorly while Conrad's species never shows more than obscure markings upon a yellowish-gray background.

A number of species of this group occur both Recent and fossil in the Caribbean region.

Distribution: *Cavdium elenense* was collected at many localities from the Gulf of California to Panama, on the beach and at depths of 1 to 50 fathoms. The largest number of specimens, approximately 200, were dredged in Santa Inez Bay in 13 fathoms on a sandy bottom. The species has also been cited as occurring in the Pleistocene of Lower California, the Tres Marias Islands and Panama, and in the Pliocene of Ecuador.

Cardium (Laevicardium) elenense apicinum Carpenter.

Levicardium apicinum Carpenter, *Ann. & Mag. Nat. Hist.*, Ser. 3, Vol. 13, April, 1864, p. 313. Cape St. Lucas, Lower California. Reprint in *Smithson. Miscell. Coll.*, No. 252, 1872, p. 211. See also pp. 23, 104, 261 (as *Liocardium apicinum*).

Cardium (*Liocardium*) *apicinum* Carpenter, Stearns, *Proc. U. S. Nat. Mus.*, Vol. 17, 1894, p. 151. Boca de las Piedras; Mulege Bay; Cape San Lucas; Mazatlan.

Cardium apicinum Carpenter, Strong and Hanna, *Proc. Calif. Acad. Sci.*, Ser. 4, Vol. 19, No. 3, 1930, p. 15. Maria Madre Island, Tres Marias Islands.

Type Locality: Cape San Lucas, Lower California.

Range: Gulf of California to Isla Grande, West Mexico, and probably to Peru.

Collecting Station: Mexico: Arena Bank (136-D-30), 35 fathoms, sand, weed.

Description: The form described as *Cardium apicinum* by Carpenter appears to intergrade with *C. elenense* Sowerby but some of the northern specimens appear to be separable as a subspecies. They are broader with more spotted coloring both exteriorly and interiorly. Specimens of *C. elenense* from Santa Elena, Ecuador, are externally more yellowish in color with reddish-brown concentric bands on the beaks and the interior is almost completely dark reddish-brown or with concentric bands of this color.

Distribution: Specimens of this subspecies were dredged by the Expedition on Arena Bank, in 35 fathoms, on a sand and weed bottom.

Subgenus **Dinocardium** Dall.

Cardium (Dinocardium) robustum Solander.

Cardium magnum Born, *Mus. Caes. Vind.*, 1780, p. 46, pl. 3, fig. 5. "Habitat ad Jamaicam, Linnaeus."—Reeve, Conch. Icon., Vol. 2, *Cardium*, 1844, species 20, pl. 4, fig. 20. "Hab. Gulf of Mexico."

Not *Cardium magnum* Linnaeus, Syst. Nat., ed. 10, 1758, p. 680. "Habitat ad Jamaicam."

Cardium robustum Solander, Cat. Portland Mus., 1786, p. 58, No. 1358, p. 162, No. 3517. "A large and fine *Cardium robustum*, S. from Florida, very scarce—Lister, 328. 165."

Cardium (*Dinocardium*) *robustum* Solander, McLean, *Mem. Soc. Cubana Hist. Nat.*, Vol. 13, No. 3, June, 1939, p. 163, pl. 24, figs. 10-11. Virginia to Belize, British Honduras and in the West Indies south to Jamaica.

Type Locality: Florida.

Range: Virginia to Belize, British Honduras, and in the West Indies south to Jamaica.

Collecting Station: Mexico: Santa Inez Bay, Gulf of California.

Description: One valve of *Cardium robustum* was collected at Santa Inez Bay. This is a Caribbean species and has not been recorded as occurring in the Gulf of California. The specimen was probably brought to the Gulf of California by some adventitious means. It is interesting to note that this species has been reported by Brand[34] as occurring in archaeologic ruins and middens of southwest United States along with other undoubted east American shells. The shape, ribbing and color of the specimen is typical and agrees perfectly with specimens in the collections of the California Academy of Sciences which were collected in Florida by Henry Hemphill.

Distribution: *Cardium robustum* is a Caribbean species and occurs in that region from Virginia to British Honduras and in the West Indies to Jamaica. It has also been

[34] Brand, D. D., Yearbook Assoc. Pac. Coast Geogr., Vol. 4, 1938, p. 5.

reported from upper Miocene to Recent in that region.

Subgenus ***Trachycardium*** Mörch.

Cardium (Trachycardium) consors Sowerby.

Cardium consors Sowerby, *Proc. Zool. Soc. London,* September 8, 1833, p. 85. "Hab. ad Sanctam Elenam et ad Guacamayo." "Collected in sandy mud at from six to eleven fathoms."—Sowerby, Conch. Illustr., *Cardium,* Cat., p. 3, 1840?, pl. 47, fig. 8, issued between July 19, 1833, and January, 1834. Original locality cited.—Reeve, Conch. Icon., Vol. 2, *Cardium,* 1845, species 86, pl. 17, fig. 86. Original locality cited.

Type Locality: Santa Elena, Ecuador, in 6 to 11 fathoms, sandy mud (here designated as type locality). "Guacamayo" also cited originally.

Range: Gulf of California to Guayaquil, Ecuador, and the Galápagos Islands.

Collecting Stations: Mexico: Arena Point (136-D-32), 42 fathoms, sand; Ceralbo Island; Santa Inez Bay, and at Monument Station; Chamela Bay (182-D-1), 8 fathoms, sand, algae; Sihuatanejo Bay; Port Guatulco (195-D-2, 3, 5, 8, 11, 19) 2-17 fathoms, sand, crushed shell, algae, green sand, green mud, also on beach; Tangola-Tangola Bay (196-D-6, 7, 8, 14, 15), 5-9 fathoms, sand, crushed shell; Costa Rica: Port Parker; Golfito; Panama: Bahia Honda.

Description: Shell elongately oval, very convex, thick, somewhat oblique and gaping posteriorly; ornamented by about 30 to 34 strong, elevated, radial ribs which bear strong, close-set squamose imbrications which are compressly flattened on the posterior side, extend over the top, but are absent on the anterior side of the ribs; colored yellowish-white stained with brown especially on the posterior portion, the interior colored reddish-purple with white along the margins. Large shells attain a height of about 75 mm.

A variety of this species said to be more elongated and with the imbrications rather distant from each other was named *laxum* by Dall[35]. *Cardium isocardia* Linnaeus, which occurs in the Caribbean region, is similar to *C. consors,* as is *C. emmonsi* Conrad in the Pliocene of North Carolina.

Distribution: *Cardium consors* was collected at a number of localities from the Gulf of California to Panama on the beach and dredged at depths of 2 to 24 fathoms. It occurs commonly in that region. It is also known to occur in the Pliocene and Pleistocene of the Gulf of California region, and has been cited from the Quaternary of Manta, Ecuador.

[35] Dall, W. H., *Proc. U. S. Nat. Mus.,* Vol. 23, No. 1214, January, 1901, p. 389. Gulf of California.

Subgenus ***Acrosterigma*** Dall.

Cardium (Acrosterigma) pristipleura Dall.

Cardium maculosum Sowerby, *Proc. Zool. Soc. London,* September 8, 1833, p. 85. "Hab. ad Insulas Tres Marias, in Sinu Californiensi." "Found on the sands."

Not *Cardium maculosum* Wood, 1815.

Cardium maculatum Sowerby, Conch. Illustr., *Cardium,* Cat., p. 4, 1840?, pl. 49, fig. 18, January, 1834. "California." New name for *Cardium maculosum* Sowerby, not *C. maculosum* Wood.—Reeve, Conch. Icon., Vol. 2, *Cardium,* 1844, species 58, pl. 11, fig. 58. "Hab. Island of Tres Marias, Gulf of Mexico."

Not *Cardium maculatum* Gmelin, 1792.

Cardium (Trachycardium) pristipleura Dall, *Proc. U. S. Nat. Mus.,* Vol. 23, 1901, p. 389. "Range: Gulf of California (La Paz) and west coast of Middle America." A new name for *Cardium maculosum* Sowerby, 1833, not *C. maculosum* Wood, 1815. *Cardium maculatum* "Reeve" not *C. maculatum* Gmelin.

Cardium (Trachycardium) hornelli Tomlin, *Jour. Conch.,* Vol. 18, No. 7, May, 1928, p. 194. "Gorgona" Island, Colombia, on shore. A new name for *Cardium maculosum* Sowerby, not *C. maculosum* Wood; *C. maculatum* Sowerby, not *C. maculatum* Gmelin.

Type Locality: Tres Marias Islands, west Mexico, on the sands.

Range: Gulf of California to Guayaquil, Ecuador.

Collecting Stations: Mexico: Ceralbo Island, Gulf of California; Port Guatulco (195-D-6, 18), 3-6 fathoms, sand, algae, crushed shell; Tangola-Tangola Bay, on beach; Panama: Bahia Honda; Colombia: Gorgona Island.

Description: Shell elongately obliquely ovate, gently convex; ornamented by 34 to 39 flattened, laterally imbricated ribs; colored exteriorly whitish-yellow and reddish-brown, the interior white. Height about 60-70 mm.

Distribution: Specimens of this species were collected from west Mexico to Colombia, on the beach and dredged at depths of 3-6 fathoms, usually only one or two specimens at a locality.

Subgenus ***Dallocardia*** Stewart.

Cardium (Dallocardia) senticosum Sowerby.

Cardium senticosum Sowerby, *Proc. Zool. Soc. London,* September 8, 1833, p. 84. "Hab. ad Sanctam Elenam, Americae Meridionalis." "Found in sandy mud at from six to twelve fathoms depth."—Sowerby, Conch. Illustr., *Cardium,* Cat., p. 3, 1840?, pl. 47, fig. 10, issued between July 19, 1833, and January, 1834. "St. Elena."

Cardium rastrum Reeve, Conch. Icon., Vol. 2, *Cardium,* 1845, species 82, pl. 16, fig. 82.

"Hab.—?." Referred to *Cardium senticosum* in errata.

Type Locality: Santa Elena, Ecuador, in 6 to 12 fathoms, sandy mud.

Range: West coast of Lower California in about Lat. 24° N., and the Gulf of California, to Paita, Peru.

Collecting Stations: Mexico: Port Guatulco (195-D-7, 14), 4-4.5 fathoms, rocks, coral; Guatemala: 7 mi. W. of Champerico (197-D-1,2), 14 fathoms, mud; El Salvador: La Libertad (198-D-1, 2), 13-14 fathoms, mud; Meanguera Island, Gulf of Fonseca (199-D-1), 16 fathoms sand, mud, crushed shell; Nicaragua: Potosi and Monypenny Point, Gulf of Fonseca (199-D-6), 4 fathoms, mud; Corinto (200-D-10, 11, 19), 7-13 fathoms, sand, mangrove leaves; Costa Rica: Cedro Island, Gulf of Nicoya (213-D-1-10), 4-10 fathoms, mud, sand, crushed shell; Jasper Island; Golfito Bay, Gulf of Dulce; Panama: Gulf of Chiriqui (221-D-1-5), 35-40 fathoms, sandy mud.

Description: Shell rounded, gently convex, ornamented with 36 to 39 ribs which in their earlier stages are subtriangular but later become subrounded; the ribs bear obliquely projecting scale-like imbrications which toward the ventral margin develop into oblique nodes; on the central ribs the nodes are strongly developed on the posterior side, although on some specimens, they are also present, but to a lesser degree, on the anterior side; on the anterior ribs nodes may be present on top or on the anterior side while on the posterior ribs they are strongly developed on the posterior side; exteriorly the color is brownish-white and banded or spotted with reddish-brown or purple, interiorly the portion under the umbones is usually reddish-purple; the remainder, and sometimes all of the shell, is white. The shell attains an altitude of 40 mm. Some specimens from off Guatemala in 14 fathoms on a muddy bottom are thinner and less colored than the other specimens.

Cardium muricatum Linnaeus from the western Atlantic is a similar species. Möricke has considered *Cardium auca* d'Orbigny from the Tertiary of Chile to be a subspecies of *C. senticosum*. We have not seen specimens of the fossil form from Chile.

Distribution: Specimens of *Cardium senticosum* were collected from West Mexico to Panama, on the beach and dredged from depths of 4 to 40 fathoms, mostly on muddy bottoms. The largest number of specimens was taken off Meanguera Island in the Gulf of Fonseca in 16 fathoms. This species is also known to occur in the Pleistocene of Maria Magdalena Island, Tres Marias group, also Panama and Ecuador.

Superfamily Cyrenacea.

Family Corbiculidae.

Genus ***Polymesoda*** Rafinesque.

A monograph of the American Corbiculidae by Prime[36] is very useful as an aid in the identification of the American species of *Polymesoda*.

Key to the species of *Polymesoda*.

A. Posteriorly attenuated and pointed ..... *anomala*

B. Posteriorly subrounded and slightly truncated ..... *recluzii*

Polymesoda anomala Deshayes.

Cyrena anomala Deshayes, *Proc. Zool. Soc. London* for 1854 (issued January 10, 1855), p. 21. "Hab. Bay of Caraccas; Peru." —Deshayes, Cat. Conch. Bivalve Shells Brit. Mus., Pt. 2, 1854, p. 257. "Hab. Sinus Caraccasensis et ad oras Peruvianas. Coll Cuming."—Prime, *Smithson. Miscell. Coll.*, Vol. 7, Article 5, No. 145, 1865, p. 30, fig. 24. "Hab. South America in Peru. (Cabinets of Cuming and Prime.)"—Sowerby, Conch. Icon., Vol. 20, *Cyrena*, 1878, species 109, pl. 19, fig. 109. "Hab. Bay of Caraccas."

Cyrena peruviana Deshayes, Cat. Conch. Bivalve Shells Brit. Mus., Pt. 2, 1854, p. 259. "Hab. Tumbez in littore Peruviano. Coll. Cuming."

Type Locality: Bay of Caraccas, Ecuador (here designated as type locality). Peru also cited originally.

Range: Corinto, Nicaragua, to Tumbez, Peru.

Collecting Stations: Nicaragua: Corinto, Castanones peninsular lagoon, also Isla Encantada; Colombia: Gorgona Island.

Description: Shell subtrigonal, thin, umbos inflated, anterior end rounded, ventral margin evenly rounded, posterior end attenuated and pointed, umbos with a carina posteriorly from which the shell slopes steeply to the margin; periostracum olive green in color and raised in crenulated, concentric lamellae; hinge area narrow; the hinge area, also the interior of the shell under the umbos, is purple, the remainder white.

Distribution: The present record of this species from Corinto, Nicaragua, is an extension north of the known range. It occurs in brackish water.

Polymesoda recluzii Prime.

Cyrena cordiformis Recluz, *Journ. de Conchyl.*, Vol. 4, December, 1853, p. 251, pl. 7, fig. 9. [No locality cited].—Deshayes, Cat. Conch. Bivalve Shells Brit. Mus., Pt. 2,

[36] Prime, T. Monograph of the American Corbiculidae. *Smithson. Miscell. Coll.*, Vol. 7, Article 5, No. 145, December, 1865, pp. I-XI, 1-80, 86 figs. in text.

1854, p. 259. "Hab.—?"—Sowerby, Conch. Icon., Vol. 20, *Cyrena*, 1878, species 27, pl. 8, figs. 27a, 27b. "Payta, Peru."

Not *Cyrena cordiformis* Deshayes, Dict. Class. Hist. Nat., Vermes, 1824, p. 290.

Cyrena recluzii Prime, *Smithson. Miscell. Coll.*, Vol. 7, Article 5, No. 145 (Mon. Amer. Corbiculidae), December, 1865, p. 24, fig. 19. "Hab. Central America. (Cabinet of Cuming.)"

Polymesoda inflata var. *cordiformis* Recluz, von Martens, Biol. Centrali-Americana, (Land and Freshwater Moll.), October, 1900, p. 549. "Hab. ?Central America."

Type Locality: Central America.

Range: Puntarenas, Costa Rica, to Paita, Peru.

Collecting Stations: Costa Rica: Puntarenas; Puntarenas Lagoon; Ballenas Bay, Gulf of Nicoya.

Description: Shell subtrigonal, heart-shaped, inflated, moderately thick; posterior angulation present, a gentle depressed or flattened area posterior to the angulation; exteriorly covered with a dark olive green periostracum raised in irregular concentric lamellae; hinge with three cardinals and two right laterals, interior purple near the posterior margin, also small patches on posterior part of hinge and below beaks, the remainder white tinged with purple bands showing through from the other side.

"Cyrena" maratima C. B. Adams was considered to be identical with *Polymesoda recluzii* by von Martens. He also pointed out that *P. recluzii* differs from *P. panamensis* Prime[37] in that the shell is more angulated posteriorly below the furrow. Both *P. recluzii* (cited as *cordiformis*) and *P. panamensis* were considered by von Martens to be only varieties of *P. inflata* Philippi, a species in which it appears that the shell lacks a distinct posterior furrow. *Polymesoda isocardioides* Deshayes is very similar to *P. recluzii* but according to Prime it possesses a thinner shell, narrower hinge margin and smaller teeth.

Distribution: A few specimens of *Polymesoda recluzii* were collected by the Expedition at Puntarenas and at Ballenas Bay in the Gulf of Nicoya, Costa Rica. It occurs in brackish water and ranges south to Peru.

[37] Not to be confused with *Cyrenoida panamensis* Pilsbry & Zetek, *Nautilus*, Vol. 45, No. 2, October, 1931, p. 69, pl. 3, fig. 4. "Near Panama City."

EXPLANATION OF THE PLATE.

PLATE I.

Fig. 1. *Taras* (*Taras*) *inezensis* Hertlein & Strong, sp. nov. Holotype, right valve, from Station 146-D-1, Santa Inez Bay, east coast of Lower California, Mexico. Lat 26° 54′ 20″ N., Long. 111° 48′ 45″ W., dredged in 35 fathoms (64 meters). Length, 18.4 mm.; height, 16.9 mm. P. 130.

Fig. 2. *Chama sordida* Broderip. Hypotype, lower valve, from Station 136-D-13, Arena Bank, Gulf of California, Lat. 23° 29′ N., Long. 109° 24 ′ W., dredged in 45 fathoms (82 meters). Height, 44 mm. (including *Arca* shell [shown on upper portion of figure] to which the *Chama* is attached).

This species was discussed in *Zoologica*, New York Zool. Soc., Vol. 31(8):109.

Fig. 3. *Cardium* (*Lophocardium*) *annettae* Dall. Hypotype, left valve, from Station 143-D-2, Santa Inez Bay, east coast of Lower California, Lat. 26° 58′ N., Long. 111° 56′ 30″ W., dredged in 30 fathoms (55 meters). Length, 41 mm.; height, 35.5 mm. P. 138.

Fig. 4. *Taras* (*Taras*) *inezensis* Hertlein & Strong, sp. nov. View of the interior of the specimen shown in Figure 1.

Fig. 5. *Cardium* (*Laevicardium*) *clarionense* Hertlein & Strong, sp. nov. Holotype, left valve, from Station 163-D-2, 3 miles off Pyramid Rock, Clarion Island, Lat. 18° 19′ N., Long. 114° 45′ W., dredged in 55 fathoms (100 meters). Length, 23.9 mm.; height, 31.4 mm. View of the interior. P. 144.

Fig. 6. *Cardium* (*Laevicardium*) *clarionense* Hertlein & Strong, sp. nov. Holotype, left valve. View of the exterior of the specimen shown in Figure 5.

Fig. 7. *Cardium* (*Laevicardium*) *clarionense* Hertlein & Strong, sp. nov. Holotype. View of the exterior of the right valve.

Fig. 8. *Cardium* (*Lophocardium*) *annettae* Dall. Hypotype, left valve, from Station 143-D-4, Santa Inez Bay, east coast of Lower California, Lat. 26° 55′ N., Long. 111° 54′ W., dredged in 25 fathoms (46 meters). Length, 26.5 mm.; height, 22.3 mm. View of the exterior. P. 138.

Fig. 9. *Cardium* (*Microcardium*) *pazianum* Dall. Hypotype, right valve, from Station 141-D-2, Santa Inez Bay, east coast of Lower California, Lat. 27° 01′ N., Long. 111° 58′ 30″ W., dredged in 10-15 fathoms (18-27 meters). Length, 15 mm.; height, 14 mm. View of the exterior. P. 142.

Fig. 10. *Taras* (*Felaniella*) *sericatus* Reeve. Hypotype, right valve, from Chamela Bay, Mexico. Length, 22.6 mm.; height, 22 mm. View of the exterior. P. 131.

Fig. 11. *Taras* (*Taras*) *subquadratus* Carpenter. Hypotype, right valve, from Station 163-D-2, 3 miles off Pyramid Rock, Clarion Island, Lat. 18° 19′ N., Long. 114° 45′ W., dredged in 55 fathoms (100 meters). View of the exterior. Length, 29 mm.; height, 25 mm. This is an unusually large specimen of this species. P. 130.

Fig. 12. *Cardium* (*Microcardium*) *pazianum* Dall. Hypotype, left valve of specimen shown in Figure 9.

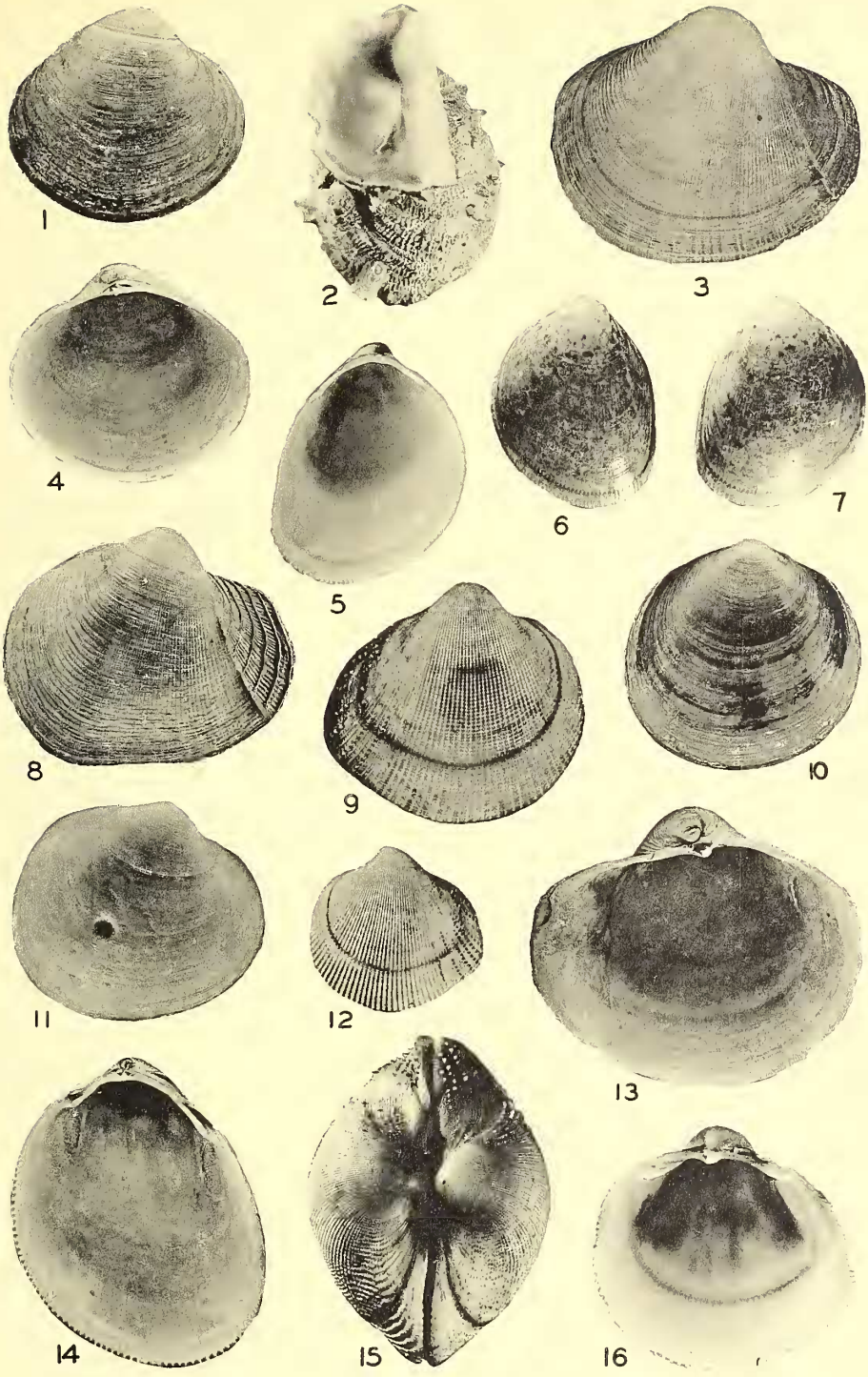
Fig. 13. *Cardium* (*Lophocardium*) *annettae* Dall. View of the interior of the specimen shown in Figure 3.

Fig. 14. *Cardium* (*Laevicardium*) *clarionense* Hertlein & Strong, sp. nov. Paratype, right valve, from Station 143-D-3, Santa Inez Bay, east coast of Lower California, Lat. 26° 57′ N., Long. 111° 56′ W., dredged in 35 fathoms (64 meters). Height, 41 mm. View of the interior. P. 144.

Fig. 15. *Cardium* (*Microcardium*) *pazianum* Dall. Umbonal view of specimens shown in Figures 9 and 12.

Fig. 16. *Cardium* (*Microcardium*) *pazianum* Dall. View of the interior of the specimen shown in Figure 9.

All the specimens illustrated on this plate are in the type collection of the Department of Paleontology of the California Academy of Sciences.



MOLLUSKS FROM THE WEST COAST OF MEXICO AND CENTRAL AMERICA.