

19.

Eastern Pacific Expeditions of the New York Zoological Society. XLII.
Mollusks from the West Coast of Mexico and Central America. Part IX.¹

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(Plates I & II.)

[This is the forty-second 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.	Page
Introduction	217
Superfamily Tellinacea	218
Family Sanguinolaridae	218
Genus <i>Gari</i> Schumacher	218
Subgenus <i>Psammocola</i> Blainville	218
<i>Gari</i> (<i>Psammocola</i>) <i>maxima</i> Deshayes	218
<i>Gari</i> (<i>Psammocola</i>) <i>regularis</i> Carpenter	218
Genus <i>Sanguinolaria</i> Lamarck	219
Subgenus <i>Sanguinolaria</i> s.s.	219
<i>Sanguinolaria</i> (<i>Sanguinolaria</i>) <i>purpurea</i> Deshayes	219
<i>Sanguinolaria</i> (<i>Sanguinolaria</i>) <i>tellinoides</i> A. Adams	219
<i>Sanguinolaria</i> (<i>Sanguinolaria</i>) <i>vespertina</i> Pilsbry & Lowe	220
Subgenus <i>Psammotella</i> Hermannsen	220
<i>Sanguinolaria</i> (<i>Psammotella</i>) <i>bertini</i> Pilsbry & Lowe	220
Genus <i>Heterodonax</i> Mörch	221
<i>Heterodonax</i> <i>bimaculata</i> Linnaeus	221
Genus <i>Tagelus</i> Gray	222
Subgenus <i>Tagelus</i> s.s.	222
<i>Tagelus</i> (<i>Tagelus</i>) <i>affinis</i> C. B. Adams	222
<i>Tagelus</i> (<i>Tagelus</i>) <i>californianus</i> Conrad	222
<i>Tagelus</i> (<i>Tagelus</i>) <i>violascens</i> Carpenter	223
Subgenus <i>Mesopleura</i> Conrad	223
<i>Tagelus</i> (<i>Mesopleura</i>) <i>peruvianus</i> Pilsbry & Olsson	224
<i>Tagelus</i> (<i>Mesopleura</i>) <i>politus</i> Carpenter	224
<i>Tagelus</i> (<i>Mesopleura</i>) <i>subteres</i> Conrad	225
Superfamily Solenacea	225
Family Solenidae	225
Genus <i>Solen</i> Linnaeus	225
<i>Solen</i> <i>crockeri</i> Hertlein & Strong, sp. nov.	225
<i>Solen</i> <i>pazensis</i> Lowe	226
<i>Solen</i> <i>pfeifferi</i> Dunker	226
<i>Solen</i> <i>rosaceus</i> Carpenter	226
Genus <i>Ensis</i> Schumacher	227
<i>Ensis</i> <i>californicus</i> Dall	227
Genus <i>Solecurtus</i> Blainville	227
<i>Solecurtus</i> <i>broggii</i> Pilsbry & Olsson	227
<i>Solecurtus</i> <i>guaymasensis</i> Lowe	228
Superfamily Mactracea	229
Family Mactridae	229
Genus <i>Mactra</i> Linnaeus	229
Subgenus <i>Mactrotoma</i> Dall	229
<i>Mactra</i> (<i>Mactrotoma</i>) <i>nasuta</i> Gould	229
Subgenus <i>Micromactra</i> Dall	231
<i>Mactra</i> (<i>Micromactra</i>) <i>angusta</i> Reeve	231
<i>Mactra</i> (<i>Micromactra</i>) <i>fonsecana</i> Hertlein & Strong, sp. nov.	232
<i>Mactra</i> (<i>Micromactra</i>) <i>vanatae</i> Pilsbry & Lowe	232
Genus <i>Mulinia</i> Gray	233
<i>Mulinia</i> <i>pallida</i> Broderip & Sowerby	233
Genus <i>Mactrella</i> Gray	233
Subgenus <i>Mactrella</i> s.s.	233
<i>Mactrella</i> (<i>Mactrella</i>) <i>clisia</i> Dall	233
<i>Mactrella</i> (<i>Mactrella</i>) <i>exoleta</i> Gray	234
Subgenus <i>Mactrinula</i> Gray	234
<i>Mactrella</i> (<i>Mactrinula</i>) <i>goniocyma</i> Pilsbry & Lowe	234

Subgenus <i>Harvella</i> Gray	235
<i>Mactrella</i> (<i>Harvella</i>) <i>elegans</i> Sowerby	235
Genus <i>Anatina</i> Schumacher	235
Subgenus <i>Raëta</i> Gray	235
<i>Anatina</i> (<i>Raëta</i>) <i>undulata</i> Gould	235
Superfamily Myacea	236
Family Aloididae	236
Genus <i>Aloidis</i> Megerle von Mühlfeld	236
Subgenus <i>Aloidis</i> s.s.	237
<i>Aloidis</i> (<i>Aloidis</i>) <i>speciosa</i> Reeve	237
Subgenus <i>Caryocorbula</i> Gardner	237
<i>Aloidis</i> (<i>Caryocorbula</i>) <i>bicarinata</i> Sowerby	238
<i>Aloidis</i> (<i>Caryocorbula</i>) <i>biradiata</i> Sowerby	238
<i>Aloidis</i> (<i>Caryocorbula</i>) <i>luteola</i> Carpenter	239
<i>Aloidis</i> (<i>Caryocorbula</i>) <i>marmorata</i> Hinds	239
<i>Aloidis</i> (<i>Caryocorbula</i>) <i>nasuta</i> Sowerby	240
<i>Aloidis</i> (<i>Caryocorbula</i>) <i>nuciformis</i> Sowerby	241
<i>Aloidis</i> (<i>Caryocorbula</i>) <i>ovulata</i> Sowerby	241
<i>Aloidis</i> (<i>Caryocorbula</i>) <i>porcella</i> Dall	242
<i>Aloidis</i> (<i>Caryocorbula</i>) <i>ventricosa</i> Adams & Reeve	242
Subgenus <i>Tenuicorbula</i> Olsson	243
<i>Aloidis</i> (<i>Tenuicorbula</i>) <i>fragilis</i> Hinds	243
Family Hiatellidae	244
Genus <i>Hiatella</i> Daudin	244
<i>Hiatella</i> <i>arctica</i> Linnaeus	244
Family Gastrochaenidae	245
Genus <i>Rocellaria</i> Blainville	246
<i>Rocellaria</i> <i>ovata</i> Sowerby	246
Superfamily Adesmacea	247
Family Pholadidae	248
Genus <i>Barnea</i> Leach	248
<i>Barnea</i> <i>pacifica</i> Stearns	248
Genus <i>Jouannetia</i> des Moulins	248
Subgenus <i>Triumphalia</i> Sowerby	248
<i>Jouannetia</i> (<i>Triumphalia</i>) <i>pectinata</i> Conrad	248
Genus <i>Parapholas</i> Conrad	249
<i>Parapholas</i> <i>calva</i> Gray in Sowerby	249
Genus <i>Martesia</i> Leach	249
<i>Martesia</i> <i>curta</i> Sowerby	249
<i>Martesia</i> <i>intercalata</i> Carpenter	250

INTRODUCTION.

This is the ninth 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 is, in general, 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 1937-1938. 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. The present paper completes the work dealing with the Pelecypoda.

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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. See especially pp. 149-150.

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SUPERFAMILY TELLINACEA.

FAMILY SANGUINOLARIIDAE.

Key to the genera of the Sanguinolariidae.

A. Shell with posterior gape or chink

a. Length about four times the height
Tagelus

aa. Length about twice the height

b. Pallial sinus wider anterior to the posterior adductor impression; shell elliptical; periostracum sometimes (subgen. *Nuttalia*) shiny
Sanguinolaria

bb. Pallial sinus not wider (or only slightly so) anterior to the posterior adductor impression; shell subrectangular; periostracum dull
Gari

B. Shell without posterior gape or chink

Heterodonax

Genus *Gari* Schumacher.

Key to the subgenera of *Gari*.

A. Shell somewhat pointed posteriorly; compressed; only slightly gaping..... *Gari s.s.*³

B. Shell bluntly rounded posteriorly; decidedly gaping *Psammocola*

Subgenus *Psammocola* Blainville.

Key to the species of *Psammocola*.

A. Posterior area ornamented with fine radial grooves; shell elongate..... *regularis*

B. Posterior area ornamented with lines of growth only

a. Shell subquadrate; posterior end truncately rounded; purplish *lata*³

aa. Shell rectangular; posterior end obliquely truncately rounded; yellowish-white with brownish-pink or purplish rays *maxima*

Gari (Psammocola) maxima Deshayes.

Psammobia maxima Deshayes, *Proc. Zool. Soc. London* for 1854, p. 317 (issued May 8, 1855). "Hab. — ? Coll. Cuming." — Reeve, *Conch. Icon.*, Vol. 10, *Psammobia*, 1857, species 4, pl. 1, fig. 4. "Hab. Panama."

Type Locality: Panama. [Cited as locality for the species by Reeve and designated as type locality by the present authors]. No locality originally cited.

Range: Georges Island, Gulf of California, to Gorgona Island, Colombia.

Collecting Station: Colombia: Gorgona Island.

Description: Shell ovately rectangular, inequilateral, somewhat compressed, rounded anteriorly, somewhat steeply, obliquely, roundly truncated and gaping posteriorly; ornamented with rude concentric growth striae and ridges; yellowish-white and rayed

with brownish-pink or purple; pallial sinus extending nearly to or slightly beyond a line vertical with the beaks, rounded anteriorly and for about one-half its length confluent with the pallial line.

The single specimen in the present collection measures approximately: length, 54 mm.; height, 33 mm.; convexity (both valves together), 16 mm.; pallial sinus extends anteriorly 32 mm. from the posterior end of the shell.

Gari lata Deshayes⁴ described from Central America and Santa Elena, Ecuador, is less elongate and more quadrate in outline and the posterior end is less obliquely truncated.

Distribution: Only one specimen of this species was taken by the expedition at Gorgona Island, Colombia. This record furnishes a slight extension south of the known range of the species.

Gari (Psammocola) regularis Carpenter.

Plate II, Fig. 10.

Psammobia (?*Amphichaena*) *regularis* Carpenter, *Ann. & Mag. Nat. Hist.*, Ser. 3, Vol. 13, April, 1864, p. 312. From "Cape St. Lucas." Reprint in *Smithson. Miscell. Coll.*, No. 252, 1872, p. 210.

Psammobia regularis Carpenter, I. S. Oldroyd, *Stanford Univ. Publ. Univ. Ser. Geol. Sci.*, Vol. 1, 1924, p. 184. San Diego, California, to Cape San Lucas, Lower California.

Type Locality: Cape San Lucas, Lower California, Mexico.

Range: Catalina Island, California, to the Gulf of California and south to Port Guatulco, Mexico.

Collecting Stations: Mexico: Gorda Banks (150-D-6), 60 fathoms, muddy sand, rocks; Point Arena; Port Guatulco (195-D-9), 7 fathoms, gr. sand, crushed shell.

Description: Shell elongate, nearly equilateral, anterior end rounded, posterior end roundly truncated, posterior dorsal area depressed and ornamented with fine, radial, incised lines; exteriorly and interiorly mottled with white and purple, the exterior covered with a golden brown periostracum; hinge of right valve with a strong cardinal, the left with a cardinal and a thin posterior lamella; pallial sinus blunt or bluntly rounded at anterior end and extending to or slightly beyond a line vertical with the beaks, and for about half its length confluent with the pallial line.

A specimen from Ceralbo Island, Gulf of California, in the collections of the California Academy of Sciences, measures: length, 46.8 mm.; height, 25 mm.; convexity (both valves together), 15 mm.; pallial sinus extends anteriorly 25 mm. from the posterior margin of the shell.

The shell of this species is very much more elongate than that of *Gari maxima* Deshayes

⁴ *Psammobia lata* Deshayes, *Proc. Zool. Soc. London* for 1854, p. 318 (issued May 8, 1855). "Hab. Central America; Sancta Elena. Coll. Cuming." — Reeve, *Conch. Icon.*, Vol. 10, *Psammobia*, June, 1857, species 7, pl. 1, fig. 7. "Hab. St. Elena, West Columbia; Cuming."

³ Not represented in the present collection.

and the posterior area is ornamented with fine incised lines rather than smooth.

Distribution: This species has been recorded previously from southern California to the Gulf of California. The present record from Port Guatulco, Mexico, furnishes an extension south of the known range of this species.

Genus *Sanguinolaria* Lamarck.

Key to the subgenera of *Sanguinolaria*.

- A. Pallial sinus entirely confluent below with pallial line *Sanguinolaria* s.s.
- B. Pallial sinus confluent below for about $\frac{1}{2}$ its length with pallial line *Psammotella*

Subgenus *Sanguinolaria* s.s.

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

- A. Shell colored entirely red or pink
 - a. Shell very thin; about 35 mm. in length *purpurea*
 - aa. Shell thick; large, about 50-75 mm. in length *tellinoides*
- B. Shell pink on umbonal area, white or buff below *vespertina*

Sanguinolaria (*Sanguinolaria*) *purpurea* Deshayes.

Plate II, Figs. 5 & 8.

Sanguinolaria purpurea Deshayes, *Proc. Zool. Soc. London* for 1854, p. 346 (issued May 16, 1855). "Hab.—? Coll. Cuming."—Reeve, *Conch. Icon.*, Vol. 10, *Sanguinolaria*, 1857, species 5, pl. 1, fig. 5. Hab.—?—Carpenter, *Cat. Mazatlan Shells*, August, 1855, p. 31, Mazatlan, Mexico.

Type Locality: No locality cited originally. Mazatlan, Mexico (here designated as type locality).

Range: San Lucas Bay, Lower California, to Mazatlan, Mexico.

Collecting Station: Mexico: San Lucas Bay, Lower California (135-D-25), 7 fathoms, sand.

Description: S. testa ovato-transversa, tenui, fragili, pellucida, convexiuscula, inaequilaterali, omnino intus extusque purpureo-sanguinea, transversim obsolete et irregulariter striata; latere antico brevior, lato, semielliptico, superne inferneque convexiusculo; latere postico attenuato, superne recto, declivi, obtuso, hiante; cardine in unaquaque valva inaequaliter bidentato; sinu pallii triangulari, superne angulato, antice oblique truncato, impressionem muscularem posticam versus longe strangulato. (Original description).

Shell ovately transverse, thin, fragile, transparent, flatly convex, inequilateral, transversely closely striated, interior deep shining blood-purple, anterior side rounded, posterior regularly attenuately rounded. (Reeve).

The specimen of this species in the present collection measures approximately: length, 34 mm.; height, 21 mm.; convexity (both valves together), 9 mm.; pallial sinus extends

anteriorly 26.5 mm. from the posterior margin of the shell.

The pallial sinus in the present specimen is confluent below with the pallial line. This feature does not agree with Reeve's illustration where the pallial sinus is free from the pallial line. We are uncertain as to whether or not this feature as shown in Reeve's figure can be regarded as characteristic of this species because in similar species the sinus is usually entirely or at least partly confluent with the pallial line.

Carpenter's remarks (1855) on *Sanguinolaria purpurea* agree well with our specimen but it is also true that later⁵ he referred that record to *S. miniata* Gould, a species now believed to be identical with *S. tellinoides* A. Adams.

The present specimen differs from *S. tellinoides* in that it is thinner, more oval in outline, less pointed posteriorly, the pallial sinus is somewhat more abruptly truncated anteriorly and the color is more of a deep "blood-purple" as mentioned by Deshayes and Reeve. The thinner shell, the color which covers the entire shell and the less expanded anterior dorsal margin are characters which serve to separate this species from *S. vespertina* Pilsbry & Lowe.

Distribution: A single specimen of this species was dredged by the expedition in San Lucas Bay in 7 fathoms. At the present time this rare species is known to occur only in the southern portion of the Gulf of California region, at Mazatlan and San Lucas Bay.

Sanguinolaria (*Sanguinolaria*) *tellinoides* A. Adams.

Sanguinolaria tellinoides A. Adams, *Proc. Zool. Soc. London* for 1849, p. 170, pl. 6, fig. 6, (issued January to June, 1850). "Hab. in Sinu Californiae."—Reeve, *Conch. Icon.*, Vol. 10, *Sanguinolaria*, 1857, species 3, pl. 1, fig. 3. "Hab. Gulf of California."

Tellina miniata Gould, *Proc. Boston Soc. Nat. Hist.*, Vol. 4, November, 1851, p. 90. "Inhabits San Juan." [Lower California].—Gould, *Boston Jour. Nat. Hist.*, Vol. 6, October, 1853, p. 397, pl. 16, fig. 1. "Inhabits San Juan."

Type Locality: Gulf of California.

Range: Gulf of California to Gorgona Island, Colombia.

Collecting Stations: Nicaragua: Potosi and Monypenny Point, Gulf of Fonseca, beach; Costa Rica: Gulf of Dulce, beach; Colombia: Gorgona Island, beach.

Description: Shell elongately oval, inequilateral, anterior side the shorter, broader and rounded; posterior side somewhat feebly flexuously impressed from the umbos, attenuated and roundly pointed at the end; fresh specimens are minutely decussately striated; color deep rose, sometimes purplish-red around the beak and umbonal area; pallial sinus fairly high and angulated in the middle, confluent with the pallial line below.

⁵ Carpenter, P. P., *Proc. Zool. Soc. London* for 1856, p. 199 (issued January 7, 1857).

The largest specimen in the present collection, slightly worn, measures approximately: length, 75 mm.; height, 44 mm.; convexity (one valve), 10.5 mm.; pallial sinus extends anteriorly 61 mm. from the posterior margin of the shell.

An elongate variety of *S. tellinoides* was named *elongata* by Mörch.⁶

Compared to *Sanguinolaria bertini* Pilsbry & Lowe, the shell of *S. tellinoides* is higher in proportion to the length, much wider posteriorly, and the pallial sinus is high and angulated rather than rounded.

Sanguinolaria sanguinolenta Gmelin is a somewhat similar species in east American waters.

Distribution: The present record of the occurrence of *Sanguinolaria tellinoides* at Gorgona Island, Colombia, is a slight extension southward of the known range of the species.

***Sanguinolaria (Sanguinolaria) vespertina*
Pilsbry & Lowe.**

Sanguinolaria vespertina Pilsbry & Lowe, *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 84, May 21, 1932, p. 90, pl. 12, figs. 3 and 4 (as *Semele vespertina* on expl. to pl.). Type from "San Juan del Sur, Nicaragua (Lowe)." Also, Corinto, Nicaragua.

Type Locality: San Juan del Sur, Nicaragua.

Range: Tangola-Tangola Bay, Oaxaca, Mexico, to Uvita Bay, Costa Rica.

Collecting Stations: Mexico: Tangola-Tangola Bay, beach; Costa Rica: Uvita Bay, beach.

Description: Shell with the general characters of *Sanguinolaria tellinoides* but smaller, more ovate, more inflated, the anterior dorsal area more expanded, the posterior end wider; ornamented with concentric lines of growth and some very weak radiating striae; colored deep pink on the beaks and umbonal region but whitish or buff on the lower half. Generally 25 to 30 mm. in length.

The shell of this species is similar to that of the east American *Sanguinolaria sanguinolenta* Gmelin but is thinner, the hinge plate is narrower and the teeth are smaller.

Sanguinolaria ovalis Reeve⁷ was described from Central America. According to the description it is thin-shelled, especially convex in the umbonal region and whitish tinged with pink. The illustration indicates that the anterior dorsal margin is somewhat expanded similar to that of *S. vespertina*. Mörch⁸ considered *S. ovalis* to be a valid species but Dall⁹ considered it to be a young form of *S. tellinoides*. From the illustration it is difficult to determine with certainty whether or not it might be identical with *S. vespertina* and accordingly we have re-

tained the name proposed by Pilsbry & Lowe which undoubtedly applies to the present specimens.

Distribution: Two small specimens referred to *Sanguinolaria vespertina* in the present collection furnish an extension both to the north and to the south of the known range of this species.

Subgenus *Psammotella* Herrmannsen.

Psammotelle Blainville, *Dict. Sci. Nat.*, Vol. 52, 1826, p. 541. [Vernacular].

Psammotella Herrmannsen, *Indic. Gen. Malacol.*, Suppl., December, 1852, p. 114. Sole species: "*T. rufescens* Chemn." — Dall, *Trans. Wagner Free Inst. Sci.*, Vol. 3, Pt. 5, 1900, p. 978. Type: *P. operculata* Gmelin (= *Tellina rufescens* Chemnitz).

Type (by monotypy): *Tellina rufescens* Chemnitz, *Neues Syst. Conchyl.-Cab.*, Bd. 6, 1782, p. 105, Taf. 11, fig. 97 [which = *Tellina operculata* Gmelin, *Syst. Nat.*, ed. 13, Tom. 1, Pars 6, 1790, p. 3235. "Habitat in India? rarior." Reference to Chemnitz, Bd. 6, pl. 11, fig. 97, and Knorr, *Vergn.*, Vol. 6, pl. 12, fig. 1?]. [West Indies].

Shell elongate, rostrate, inequivalve, the left valve flattened; pallial sinus discrepant in the two valves, narrower in front, partly confluent with the pallial line, otherwise like *Sanguinolaria*. (Dall).

***Sanguinolaria (Psammotella) bertini*
Pilsbry & Lowe.**

Tellina rufescens Chemnitz, Hanley, *Thes. Conch.*, Vol. 1, 1846, p. 307 pl. 63, fig. 213. "Tumbez, Peru; soft sandy mud, five fathoms (Cuming)."

Not *Tellina rufescens* Chemnitz, *Neues Syst. Conchyl.-Cab.*, Bd. 6, 1782, p. 105, Taf. 11, fig. 97.

Not *Tellina rufescens* Gmelin, *Syst. Nat.*, ed. 13, Tom. 1, Pars 6, 1790, p. 3238. "Habitat—." Ref. to Gualtieri, *Test.*, Tab. 85, fig. C.

Not *Tellina rufescens* Dillwyn, *Descript. Cat. Rec. Shells*, Vol. 1, 1817, p. 85. "Inhabits the coast of Brazil. Humphreys."

Tellina hanleyi Bertin, *Nouv. Arch. Mus. Hist. Nat.* (Paris), Ser. 2, Vol. 1, 1878, p. 268. "Habite les côtes du Pérou et celles de l'Amérique centrale." New name for *Tellina rufescens* Chemnitz cited by Hanley, 1846. Not *T. rufescens* Chemnitz, 1782. Brazil.

Not *Tellina hanleyi* Dunker, 1853.

Sanguinolaria bertini Pilsbry & Lowe, *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 84, May 21, 1932, p. 91, pl. 10, figs. 7, 8. Type from Acapulco, Mexico. Also collected at "Panamá (McNeil); Champerico, Guatemala (J. L. Bailey); Montijo Bay, San Juan del Sur, Corinto and Acapulco (Lowe)." A new name for *Tellina rufescens* of Hanley, 1846, not *T. rufescens* Gmelin, 1790, nor Dillwyn, 1817. *Tellina hanleyi* Bertin, 1878, not *T. hanleyi* Dunker, 1853.

Type Locality: Acapulco, Mexico.

Range: San Ignacio Lagoon, Lower California, to the Gulf of California and south to Lobitos, Peru.

⁶ [*Sanguinolaria tellinoides*] var. *elongata* Mörch, *Malakozool. Blätter*, Bd. 7, December, 1860, p. 185.

⁷ *Sanguinolaria ovalis* Reeve, *Conch. Icon.*, Vol. 10, *Sanguinolaria*, March, 1857, species 2, pl. 1, fig. 2. "Hab. Central America."

⁸ Mörch, O. A. L., *Malakozool. Blätter*, Bd. 7, December, 1860, p. 185. Sonsonate, El Salvador.

⁹ Dall, W. H., *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 50, 1898, p. 61.

Collecting Station: Costa Rica: Gulf of Dulce.

Description: Shell rather narrowly elongate, gaping, left valve flattened, anterior end elliptically rounded, the posterior end rostrate and bluntly pointed; posterior dorsal margin depressed, and a depressed radial area occurs anterior to the rounded umbonal ridge; often with sub-obsolete radial striae; color dark rose in zones and darker toward the beaks; pallial sinus rounded, extending about two-thirds the length of the shell and for about two-thirds its length confluent with the pallial line.

A specimen collected in the Gulf of Dulce, Costa Rica, measures: length, 57 mm.; height, 28.6 mm.; convexity (both valves together), 12.5 mm.; pallial sinus extends anteriorly 38.8 mm. from the posterior margin of the shell. A large right valve collected on the coast below San Ignacio Lagoon, Lower California, in the Henry Hemphill collection of the California Academy of Sciences, measures: length, 91.8 mm.; height, 47 mm.; convexity (one valve), 14 mm.; pallial sinus extends anteriorly 65 mm. from the posterior margin of the shell.

There is an element of doubt regarding the correct name of this species. Hanley (1846) cited *Tellina rufescens* Chemnitz from Peru but the true *T. rufescens* Chemnitz is from Brazil as indicated by Dillwyn. Bertin in 1878 named the west American form *Tellina hanleyi*. Pilsbry & Lowe pointed out that there is a prior usage of that combination of names, that of *Tellina hanleyi* Dunker, 1853, from Loanda, West Africa. They therefore renamed the west American species *Sanguinolaria bertini*, based on a type specimen from Acapulco, Mexico.

Salisbury¹⁰ in 1934 stated that the west American species named *Tellina hanleyi* by Bertin and later renamed by Pilsbry & Lowe can take the name of *Tellina cruentae* Solander.¹¹ The name *Tellina cruentae* was used by Solander in the Catalogue of the Portland Museum on page 10 and as *Tellina cruenta* on page 58 where a reference was given citing "Knorr. VI. 12.1." Gmelin cited this figure of Knorr as representing his *Tellina operculata*. Dillwyn, who had access to the Banks Collection and Solander's manuscript of the Portland Catalogue, likewise cited Knorr's reference under the east American "*Tellina*" *operculata* Gmelin. Pilsbry,¹² in discussing the conclusion of Salisbury, stated that it seems unlikely that Knorr would have had the west American shell but he also admitted that "While it seems rather unlikely that this west American shell was possessed by Knorr prior to 1771, it is possible, and his figure is certainly very good for it." He recommended the spelling *cruenta*, used by Solander on page 58, if the name is to be adopted.

We have not seen Knorr's figure but in view of the foregoing opinions expressed by various authors we are inclined to use the specific name *bertini* until it is more definitely proved that Solander's name *cruenta* can be applied to it.

The shell of *Sanguinolaria bertini* is very similar to the east American *S. operculata* Gmelin but in general it is narrower posteriorly and the pallial sinus is usually a little more arched posteriorly and confluent with the pallial line for a greater distance than that of the east American species.

Distribution: This species was taken only in the Gulf of Dulce but it occurs from Lower California to Peru.

Genus *Heterodonax* Mörch.

Heterodonax bimaculata Linnaeus.

Tellina bimaculata Linnaeus, Syst. Nat., ed. 10, 1758, p. 677. "Habitat in O. Europaeo." — Chemnitz, Neues Syst. Conchyl.-Cab., Bd. 6, 1782, p. 132, pl. 13, fig. 127, fig. 132 lit. a, b. "Sie wohnt an den westindischen Ufern, und an einigen Stranden der europäischen Meere." — Sowerby, Conch. Icon., Vol. 17, *Tellina*, 1866, species 94, pl. 18, figs. 94a, 94b, 94c. West Indies.

Psammobia pacifica Conrad, Jour. Acad. Nat. Sci. Philadelphia, Vol. 7, 1837, p. 241, pl. 18, fig. 13. "Inhabits in deepish water on a sandy bottom, near Sta. Diego." California.

Tellina vicina C. B. Adams, Ann. Lyceum Nat. Hist. New York, Vol. 5, July, 1852, pp. 509, 546 (separate pp. 285, 322). "Panama."

Donax ovalina Deshayes, Proc. Zool. Soc. London for 1854, p. 352 (issued May 16, 1855). "Hab. Central America. Coll. Cumming." — Sowerby, Thes. Conch., Vol. 3, 1866, p. 312, pl. 283 (*Donax*, pl. 4), fig. 104 (as *Donax ovalinus*).

Type Locality: Europe originally cited. West Indies cited as type locality by I. S. Oldroyd, 1924.

Range: Monterey, California, to Panama. Also Florida to Brazil.

Collecting Stations: Mexico: Cape San Lucas, beach; Port Guatulco, beach; Nicaragua: Potosi and Monypenny Point, beach; Costa Rica: Port Parker, beach; Port Culebra and Culebra Bay, beach; Golfo, beach.

Description: Shell triangularly rounded, inequilateral, the anterior side the longer, the posterior end rounded or roundly truncated, smooth, variously colored, white with two oblong crimson spots on the inside, or violet with oblong radial reddish streaks, or pink, orange, or some combination of the foregoing; two cardinals and two laterals in each valve, the laterals often not well defined; pallial sinus extends about three-fifths the length of the shell, slightly ascending, the end blunt, obliquely rounded below, confluent below with the pallial line for only a short distance or sometimes for a third its length.

A large specimen collected at San Diego, California, by Henry Hemphill measures: length, 27.3 mm.; height, 22.5 mm.; convexity (both valves together), 11 mm.; pallial

¹⁰ Salisbury, A. E., Proc. Malacol. Soc. London, Vol. 21, Pt. 2, 1934, p. 88.

¹¹ *Tellina cruentae* Solander, Cat. Portland Mus., 1786, p. 10, "*cruenta*" on p. 58. See also Dall, W. H., Nautilus, Vol. 34, No. 3, 1921, p. 99.

¹² Pilsbry, H. A., Nautilus, Vol. 49, No. 4, 1936, p. 140.

sinus extends anteriorly 15.6 mm. from the posterior margin of the shell.

This species has received a number of different names due probably to the variation in form and color as well as the wide distribution. Specimens from both the Atlantic and Pacific coasts are referable to the species described by Linnaeus as *Tellina bimaculata*.

Heterodonax alexandra Dall,¹³ described from the Pliocene of Louisiana, was compared to *H. bimaculata*.

Distribution: Specimens of *Heterodonax bimaculata* were taken by the expedition along the beach from Mexico to Costa Rica. It is often found near the high tide line on sandy shores of bays in southern California. This is one of the species common to the Atlantic and Pacific coasts of America. Forbes and Hanley¹⁴ pointed out that early records of *H. bimaculata* (as *Tellina bimaculata*) from the coasts of Great Britain were probably based on specimens spuriously introduced there. It has also been reported as occurring in the Pleistocene of southern California and at Magdalena Bay, Lower California, as well as in the Caribbean region.

Genus *Tagelus* Gray.

Key to the subgenera of *Tagelus*.

- A. Shell with internal radial rib (sometimes faint or lacking in adult).....*Mesopleura*
- B. Shell without internal rib.....*Tagelus* s.s.

Subgenus *Tagelus* s.s.

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

- A. Pallial sinus not extending past a line vertical with the beaks.....*californianus*
- B. Pallial sinus extending past a line vertical with the beaks
 - a. Shell large (length often exceeding 60 mm.), thick; violet coloration externally on umbonal areas.....*violascens*
 - aa. Shell smaller (length usually less than 60 mm.), thin; white or brownish
 - b. Shell rather short; pallial sinus extends anteriorly about 53% the length of the shell.....*affinis*
 - bb. Shell more elongate; pallial sinus extends anteriorly about 60% the length of the shell.....*longisinuatus*¹⁵

Tagelus (Tagelus) affinis C. B. Adams.

Plate I, Figs. 9 & 11.

Solecurtus affinis C. B. Adams, *Ann. Lyceum Nat. Hist. New York*, Vol. 5, July, 1852, pp. 524, 548 (separate pp. 300, 324). "Panama."

Silicaria affinis C. B. Adams, Mörch, *Malakozool. Blätter*, Bd. 7, December, 1860, p. 184. Realejo, Nicaragua.

¹³ *Heterodonax alexandra* Dall, *Proc. U. S. Nat. Mus.*, Vol. 46, December 6, 1913, p. 228, pl. 20, fig. 8. From "near Alexandria, Louisiana." Pliocene.

¹⁴ Forbes, E., and Hanley, S., *Hist. Brit. Moll.*, Vol. 1, 1853 (issued 1848), pp. 310-311. For dates of issue of this work see Tomlin, J. R. le B., and Fisher, N., *Jour. Conch.*, Vol. 20, No. 5, August 22, 1935, pp. 150-151.

¹⁵ Not represented in the present collection.

Type Locality: Panama.

Range: Gulf of California to Panama.

Collecting Stations: Mexico: Chamela Bay, beach; El Salvador: Meanguera Island, Gulf of Fonseca (199-D-1), 16 fathoms, sand, mud, crushed shell; La Union, Gulf of Fonseca (199-D-8, 13-16, 22-25), 3-6 fathoms, mud, mangrove leaves; Costa Rica: Port Parker, beach; Port Culebra, beach; Culebra Bay, beach; Panama: Gulf of Chiriqui (221-D-1-5), 35-40 fathoms, sandy mud.

Description: Shell much elongated, compressed, cylindric, well rounded at both extremities; ventral edge straight or slightly arcuated: white beneath a deep yellowish brown epidermis: with unequal striae of growth: beaks not prominent, a little behind the middle of the shell: umbones compressed along the middle: ligament broad, with stout nymphaeal callosities: teeth small, one in the left, and two in the right valve. This is the analogue of *S. cariboeus*. Length, 2.25 inches; height, .8 inch; breadth, .55 inch. (Original description).

A specimen in the collections of the California Academy of Sciences collected in Panama Bay by F. M. Anderson measures: length, 56.4 mm.; height, 20.8 mm.; convexity (both valves together), 14 mm.; pallial sinus extends anteriorly 30.4 mm. from the posterior end of the shell.

The pallial sinus in typical *Tagelus affinis* extends to a line slightly beyond the beaks, that is, about 53 per cent. of the length of the shell. The anterior end of the sinus is broadly rounded and joins the pallial line with only a slight bend posteriorly. The length of the shell and of the pallial sinus varies somewhat. The shells in the northern part of the range are often narrower and more elongate with a narrower and more acutely rounded pallial sinus which extends about 60 per cent. of the length of the shell, that is, well past a line vertical with the beaks. This form is known as *Tagelus affinis longisinuatus* Pilsbry & Lowe.¹⁶

Tagelus peruanus Dunker,¹⁷ described from Peru, is very similar to *T. affinis*. According to Sowerby's illustration the shell is a little higher in proportion to the length as compared to Adams' species.

Distribution: This species was taken from Chamela Bay, Mexico, to the Gulf of Chiriqui, Panama, on beaches and dredged at depths of 3-40 fathoms.

Tagelus (Tagelus) californianus Conrad.

Plate I, Fig. 1.

S[olecurtus]. californianus Conrad, *Jour. Acad. Nat. Sci. Philadelphia*, Vol. 7, 1837, p. 233, pl. 18, fig. 3. "Inhabits muddy salt marshes, in the neighborhood of Sta. Bar-

¹⁶ *Tagelus affinis longisinuatus* Pilsbry & Lowe, *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 84, May 21, 1932, p. 91, pl. 11, figs. 4 and 5. "Mazatlan."

¹⁷ *Silicaria peruana* Dunker, *Proc. Zool. Soc. London*, December 10, 1861, p. 426. "Hab. in littore Peruano (H. Cuming)."

Solecurtus peruanus Dunker, Sowerby, *Conch. Icon.*, Vol. 19, *Solecurtus*, November, 1874, species 38, pl. 8, fig. 38. "Hab. Tumbes, Peru."

bara; Common." — Sowerby, Conch. Icon., Vol. 19, *Solecurtus*, 1874, species 36, pl. 8, fig. 36. "Hab. California."

Tagelus californianus Conrad, Grant & Gale, *Mem. San Diego Soc. Nat. Hist.*, Vol. 1, 1931, p. 384, pl. 21, figs. 2a, 2b, 3. Earlier records cited, Pliocene to Recent.

Type Locality: Neighborhood of Santa Barbara, California, muddy salt marshes.

Range: Monterey, California, to the Gulf of California and south to Panama.

Collecting Stations: Mexico: Cape San Lucas, Lower California, beach; Costa Rica: Port Culebra, beach.

Description: Shell elongated, compressed, beaks nearly central, dorsal and ventral margins nearly parallel, anterior end broadly rounded, posteriorly with a rounded umbonal ridge and with the posterior area somewhat flattened and in young forms the periostracum on this portion is often radially striated, the end truncated; color exteriorly yellowish-white under a dark brown periostracum, interior white; the pallial sinus varies somewhat but usually does not extend to a line vertical with the beaks, it is rather acutely rounded anteriorly and at the junction with the pallial line forms an acute angle.

A large specimen collected at San Diego, California, by Henry Hemphill, measures approximately: length, 112 mm.; height, 31.5 mm.; convexity (both valves together), 20 mm.; pallial sinus extends anteriorly 50 mm. from the posterior end of the shell. Orcutt mentioned specimens from Santo Domingo, Lower California, which measured 120 mm. in length.

Compared to *Tagelus affinis* the shell of *Tagelus californianus* is much longer in proportion to the height, thicker, the flattened posterior area is more pronounced and, in young forms, the periostracum is radially striated, the pallial sinus is usually shorter, more acutely rounded, and at the junction with the pallial line, which takes place proportionately farther anteriorly, it forms an acute angle. Compared to *T. violascens*, the anterior dorsal margin of *T. californianus* is usually somewhat straighter, the pallial sinus is shorter and the shell is yellowish-white exteriorly rather than violet on the umbonal region.

Distribution: One valve of this species was taken on the beach at Cape San Lucas, Lower California, and one single valve was taken on the beach at Port Culebra, Costa Rica. It is also known to occur from Pliocene to Recent in western North America.

***Tagelus (Tagelus) violascens* Carpenter.**

Plate I, Figs. 4 & 6.

Solecurtus violascens Carpenter, Cat. Mazatlan Shells, August, 1855, p. 27 (footnote). "Hab. S. W. Mexico." — Sowerby, Conch. Icon., Vol. 19, *Solecurtus*, 1874, species 24, pl. 58, fig. 24. "Hab. S. W. Mexico."

Type Locality: Southwest Mexico.

Range: Gulf of California to Port Culebra, Costa Rica.

Collecting Station: Costa Rica: Port Culebra.

Description: "S. t. 'S. affine' simili, sed majore, solida, violascente, rugis epidermidis tenuioribus; nymphis elongatis, sinu pallii versus umbones minus arcuato. Long. .95, lat. 3.33, alt. .56." (Original description).

Carpenter compared this species with *Tagelus politus* and *T. affinis* and stated that with regard to color it is intermediate between these two. He also mentioned that the anterior adductor impression of *T. violascens* tapers off irregularly, uniting with the two small impressions which occur between the umbo and the anterior impression.

One right valve in the collection from Port Culebra, Costa Rica, measures: length, 83 mm.; height, 26 mm.; convexity (one valve), 8 mm.; the pallial sinus extends anteriorly 39 mm. from the posterior end (incomplete) of the shell. It is somewhat worn and shows only traces of the violet coloration on the umbonal region. A specimen in the collection of Stanford University, which was collected by H. N. Lowe at Salina Cruz, Oaxaca, Mexico, measures: length, 85 mm.; height, 30 mm.; convexity (both valves together), 21.8 mm.; pallial sinus extends anteriorly 47 mm. from the posterior end of the shell.

As mentioned by Carpenter the shell of this species is larger, more elongate and thicker than that of *Tagelus affinis*. It bears considerable similarity to *T. californianus* but differs from that species in the violet coloration, greater height in proportion to the length, usually more arcuate anterior dorsal margin and in that the pallial sinus is longer and extends past a line vertical with the beaks.

Distribution: The present record of *Tagelus violascens* from Port Culebra, Costa Rica, is an extension south of the known occurrence of this species. Some of the records in the literature referring to this species are referable to *Tagelus politus*. Olsson has reported *T. violascens* as occurring in the Pleistocene of Panama.

Subgenus *Mesopleura* Conrad.

Key to the species of *Mesopleura*.

- A. Posterior dorsal margin with a flange-like expansion *peruvianus*
- B. Posterior dorsal margin without a flange-like expansion
 - a. Shell thin and narrow
 - b. Dorsal margins slope very gently from the beaks; dark violet coloration *politus*
 - bb. Dorsal margins slope more steeply from the beaks; light violet coloration *subteres*
 - aa. Shell thick and comparatively higher and larger *dombeii*¹⁸

¹⁸ Not represented in the present collection.

Tagelus (Mesopleura) peruvianus

Pilsbry & Olsson.

Tagelus (Mesopleura) peruvianus Pilsbry & Olsson, *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 93, September 9, 1941, p. 70, pl. 18, fig. 5. "Punta Blanca beds." Ecuador, Pliocene. Also Recent, coast of northwest Peru and Ecuador.

Type Locality: Punta Blanca beds of Ecuador, Pliocene.

Range: Port Culebra, Costa Rica, to Negritos, Peru.

Collecting Station: Costa Rica: Port Culebra, beach.

Description: The shell is broad, elongate, its height about a third of its length, parallel sided, and of moderate convexity; the small beak is located not quite centrally, the posterior end being the longer; ventral margin straight, the dorsal a little arched on the anterior side, winged on the posterior; ends rounded, the posterior obliquely so; surface marked by growth-lines which are strongest on the anterior and posterior ends; the shells are usually a little warped in the middle, producing a small gap at each end; when young the interior shows the well-marked thickened ray of *Mesopleura*, but in the adult this rib may disappear entirely or persists only in a slight thickening of this part of the shell; pallial sinus ample, rounded, higher within the shell than at its opening, reaching not quite to the middle of the length. When young the shell is quite thin, translucent, tinged with lilac, the rays brownish; epidermis dark olive-black usually absent from the umbones, which are light-colored and rayed. Length, 85 mm.; height, 28.5 mm.; semidiameter, 8 mm. (Original description).

The type of this species is a fossil but the last sentence in the description was based on Recent shells.

The shell of this species differs from *Tagelus (Mesopleura) dombeii* Lamarck,¹⁹ which also was described from South America, in that the shell is proportionately higher and is characterized by a flange or wing-like extension of the posterior dorsal margin.

One right valve of this species is represented in the present collection from Port Culebra, Costa Rica. It measures 66.5 mm. in length and 24 mm. in altitude; convexity (one valve), 6.5 mm.; pallial sinus extends anteriorly 29 mm. from the posterior end of the shell. A faint trace of a median rib is present on the interior of the shell. Exteriorly there are two grooves running pos-

teriorly from the beak to the posterior margin, one reaches the margin just below the middle of the posterior end and the other halfway between this and the dorsal margin. It is tinged with purple and brown rays.

Distribution: The present record of this species from Port Culebra, Costa Rica, is an extension north of the known range. A left valve of this species 39.5 mm. in length, in the collection of the California Academy of Sciences, was collected by Woodbridge Williams in Santa Elena Bay, Ecuador. This species also is known to occur in the Pliocene of Ecuador and in the Pleistocene of Panama.

***Tagelus (Mesopleura) politus* Carpenter.**

Plate I, Figs. 8 & 10.

Solecurtus politus Carpenter, Cat. Mazatlan Shells, August, 1855, p. 27. "Hab.—Mazatlan: 4 specimens found with *affinis*; L'pool Col."

Type Locality: Mazatlan, Mexico.

Range: Gulf of California to Panama.

Collecting Stations: Mexico: Santa Inez Bay, Gulf of California (145-D-1, 3), 4-13 fathoms, sand, also on shore; Port Guatulco (195-D-19, 20, 21), 17-23 fathoms, gr. mud, crushed shell, mud; Tangola-Tangola Bay (196-D-13, 14, 18), 5-30 fathoms, gr. sand, crushed shell, mud; Guatemala: 7 miles west of Champerico (197-D-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: Corinto, beach; Costa Rica: Port Parker (203-D-1-3), 12-15 fathoms, sandy mud, crushed shell, shelly sand, algae, shelly mud; Cedro Island (213-D-1-10), 4-10 fathoms, mud, sand, crushed shell; 1 mile south of Golfito Bay, shore.

Description: Shell thin, subtranslucent, rayed with violet. Carpenter mentioned that it may be "Known at once by the brownish violet colour, glossy epidermis, and dark ray corresponding with a slightly prominent ridge within . . . In the pallial sinus, *S. affinis* is intermediate between *politus* and *violascens*."

The pallial sinus is rounded anteriorly and extends to the internal median ray.

A valve from Tangola-Tangola Bay, Mexico, measures: length, 35 mm.; height, 12.8 mm.; convexity (one valve), 3.7 mm.; pallial sinus extends anteriorly 16 mm. from the posterior end of the shell. Large specimens attain a length of about 40 mm. or slightly more.

Compared to *Tagelus subteres* Conrad which occurs from Santa Barbara, California, to Cape San Lucas, Lower California, the shell of *T. politus* is usually smaller and thinner, much more darkly colored with violet both exteriorly and interiorly and the dorsal margins slope more gently from the beaks.

Distribution: This species was taken at a number of localities from Santa Inez Bay in the Gulf of California to Golfito Bay, Costa Rica, on the beach and also dredged at depths

¹⁹ *Solen dombeii* Lamarck, *Anim. s. Vert.*, Vol. 5, July, 1818, p. 454. "Habite les mers de l'Amérique méridionale, les cotes du Pérou." Reference to *Encycl. Meth.*, pl. 224, figs. 1a, 1b, 1c.—Chenu, *Illustr. Conchyl.*, *Solen*, 1843, pl. 5, figs. 1, 1a, 2, 2a, 2b, 3, 3a, 4, 4a, 5.

Solecurtus dombei Lamarck, Sowerby, *Conch. Icon.*, Vol. 19, *Solecurtus*, August, 1874, species 30, pl. 7, figs. 30a, 30b. "Hab. S. America."

Solecurtus rufa "Bosch.", Sowerby, *Conch. Icon.*, Vol. 19, *Solecurtus*, August 1874, species 30, pl. 6, fig. 27. "Hab. —?" Not *Glycimeris rufa* Bose, *Hist. Nat. Coq.*, Vol. 3, AN X [1801], p. 6, pl. 17, fig. 3. "Se trouve dans les grands fleuves, et lacs de l'Amérique méridionale."

Solecurtus coquimbensis Sowerby, *Conch. Icon.*, Vol. 19, *Solecurtus*, August, 1874, species 22, pl. 5, figs. 22a, 22b. "Hab. Coquimbo."

of 4-30 fathoms, usually on a muddy or sandy, shelly bottom. It is a common species along the west Mexican coast and is also known to occur in the Pleistocene of Magdalena Bay, Lower California.

***Tagelus (Mesopleura) subteres* Conrad.**

Plate I, Figs. 12 & 13.

S[olecurtus]. subteres Conrad, *Jour. Acad. Nat. Sci. Philadelphia*, Vol. 7, 1837, p. 233, pl. 17, fig. 10. "Inhabits in the vicinity of Sta. Barbara." [California].

Tagelus subteres Conrad, Johnson & Snook, *Seashore Anim. Pac. Coast* (Macmillan Co., New York), 1927 (also ed. 1935), p. 457, fig. 459.

Type Locality: Vicinity of Santa Barbara, California.

Range: Santa Barbara, California, to Cape San Lucas, Lower California.

Collecting Station: Mexico: Cape San Lucas, Lower California, on beach.

Description: Shell linear-oval, inflated or subcylindrical, slightly arcuate; beaks central, very obtuse, extremities equally rounded; colour pale purple, obscurely rayed; epidermis yellowish brown, finely wrinkled; teeth two in each valve; posterior tooth of the right valve dilated. Length, two and a quarter inches. (Original description).

A left valve from Cape San Lucas, Lower California, measures: length, 46.8 mm.; height, 15.5 mm.; convexity (one valve), 5 mm. A specimen from San Diego, California, in the Henry Hemphill Collection in the California Academy of Sciences, measures: length, 45.6 mm.; height, 14.5 mm.; convexity (both valves together), 9 mm.

A left valve of a *Tagelus* from Cape San Lucas, Lower California, in the present collection appears to be referable to *Tagelus subteres* Conrad. The size of this specimen (46.8 mm. in length) and the comparatively thick shell as well as the slope of the dorsal margins agree well with Conrad's species.

Compared to *Tagelus politus* Carpenter, the shell of *T. subteres* is usually larger, thicker, the dorsal margins slope more strongly from the beaks and the violet coloration is much paler both exteriorly and interiorly.

Distribution: A single left valve of this species was collected by the expedition on the beach at Cape San Lucas, Lower California. It also has been recorded as occurring in the Pleistocene at San Quintin Bay, Lower California.

SUPERFAMILY SOLENACEA.

FAMILY SOLENIDAE.

Key to the genera and subgenera of the Solenidae.

- A. Shell with oblique clapboard sculpture exteriorly *Solecurtus*
- B. Shell smooth
 - a. Beaks terminal
 - b. One cardinal tooth in left valve *Solen*

bb. Two cardinal teeth in left valve *Ensis*

aa. Beaks not terminal
(subgenus) *Solena*²⁰

Genus *Solen* Linnaeus.

Key to the species of *Solen*.

- A. Shell colored with purple or rose
 - a. Shell very elongate; pale rose color on umbos *rosaceus*
 - aa. Shell higher in proportion to the length; purple banded
 - b. Periostracum with triangle of darker color on each valve *pazensis*
 - bb. Periostracum with even brown color over entire valves *pfeifferi*
- B. Shell white
 - a. Elongate; length (type), 60 mm., height, 8.5 mm. *mexicanus*²¹
 - aa. Higher in proportion to the length; length (type), 38.8 mm., height, 10.5 mm. *crockeri*

***Solen crockeri* Hertlein & Strong, sp. nov.**

Plate I, Figs. 3, 5 & 7.

Shell small, short, thin, white, nearly straight, parallel-sided, convex, beaks at anterior end; anterior end steeply obliquely truncated; posterior end nearly squarely truncated but sloping slightly anteriorly; hinge and ligament normal; shell covered with a thin, light olive translucent periostracum. Length, 38.8 mm.; length of ligament, 6 mm.; height, 10.5 mm.; convexity (both valves together), 6.8 mm.

Holotype, (Calif. Acad. Sci. Paleo. Type Coll.), from Station 199-D-3, Lat. 13° 03' N., Long. 87° 30' W., Monypenny Point, Nicaragua, in the Gulf of Fonseca, dredged in 6 fathoms (11 meters), mud. Paratypes and additional specimens in the immediate vicinity (Sta. 199-D-1, 5, 8, 14, 16), 5-16 fathoms, sand, mud, crushed shell, mangrove leaves.

This new species appears to be similar to *Solen mexicanus* Dall but is very much higher in proportion to the length. *Solen mexicanus* Dall,²² a white shell with an unusually long ligament, was described from the Gulf of Tehuantepec, Mexico, and was compared to *Solen linearis* Chemnitz. The type has not been illustrated but the measurements given were: "Length of shell, 60 mm.; of ligament, 11 mm.; width of valves, 8.5 mm.; diameter, 5.5 mm."

The white shell and greater height in proportion to the length are features which serve to separate *Solen crockeri* from *Solen pfeifferi* Dunker and *S. pazensis* Lowe.

This species is named for Mr. Templeton Crocker, enthusiastic collector, whose yacht

²⁰ Not represented in the present collection. *Solen rudis* C. B. Adams, described from Panama, is referable to this subgenus.

²¹ Not represented in the present collection.

²² *Solen mexicanus* Dall, *Proc. U. S. Nat. Mus.*, Vol. 22, No. 1185, October 9, 1899, p. 110. "Specimen from the Gulf of Tehuantepec." Also recorded as occurring at Digg's Point, Gulf of California (see Eyerdam, *Min. Conch. Club South. Calif.*, No. 47, April, 1945, p. 28).

Zaca was used on the expedition during which the type specimens were collected.

***Solen pazensis* Lowe.**

Solen pazensis Lowe, *Trans. San Diego Soc. Nat. Hist.*, Vol. 8, No. 6, March 21, 1935, p. 17, pl. 1, fig. 6. "La Paz, Lower California, tidal zone."

Type Locality: La Paz, Lower California, Mexico, in the tidal zone.

Range: La Paz to Tangola-Tangola Bay, Mexico.

Collecting Station: Mexico: Tangola-Tangola Bay (196-D-6, 7), 6-7 fathoms, sand, crushed shell.

Description: The specimen which we have referred to *Solen pazensis* is oblong with anteriorly terminal beaks, the anterior extremity is rather steeply truncated and the posterior end is rather squarely truncated but rounded at the dorsal and ventral margins. The periostracum is of a shiny horn color. There are darker blotches on the anterior ends and a darker triangle is bounded by a line which runs from the anterior dorsal to the posterior ventral margin. This triangle is not so pronounced on the present specimen as that shown on the figure given by Lowe. Dark purplish bands of color occur parallel to the lines of growth and the interior of the shell is purplish. The specimen measures approximately: length, 31 mm.; height, 7.6 mm.; convexity (both valves together), 4 mm.

This species is very similar to *Solen pfeifferi* Dunker which was described from Ecuador. The measurements of the present specimen indicate a greater height in proportion to the length in comparison to specimens of *S. pfeifferi* in the present collection. However, the measurements given for the type specimens of the two species differ but little. The main difference mentioned in the original description of *S. pazensis* is in the color but on the present specimen this does not differ much from that of *S. pfeifferi*. It is possible that *S. pazensis* is only a northern form or subspecies of *S. pfeifferi* but from the specimens available at the present time we are not able definitely to determine the relationship of the two.

Distribution: A single specimen referred to this species was dredged by the expedition in Tangola-Tangola Bay, Mexico, in 6-7 fathoms. This is an extension south of the known range of this species.

***Solen pfeifferi* Dunker.**

Plate I, Fig. 2.

Solen pfeifferi Dunker, *Proc. Zool. Soc. London*, December 10, 1861, p. 420. "Hab. Caraccas, West Columbia (H. Cuming)." — Sowerby, *Conch. Icon.*, Vol. 19, *Solen*, June, 1874, species 26, pl. 6, fig. 26. "Hab. Bay of Caraccas." — Clessin, *Conchyl.-Cab. von Martini-Chemnitz*, Bd. 11, Abt. 3, *Solenacea*, 1888, p. 29, Taf. 12, fig. 6. Original locality cited.

Type Locality: Caraccas, Ecuador.

Range: Tangola-Tangola Bay, Oaxaca, Mexico, to the Bay of Caraccas, Ecuador.

Collecting Stations: Mexico: Tangola-Tangola Bay (196-D-13), 10 fathoms, gr. sand, crushed shell; Nicaragua: Corinto (200-D-10, 11, 16, 19), 4-13 fathoms, mangrove leaves, sand, also on beach.

Description: "Testa linearis, brevis, paullo curvata, solidula, convexa, alba, area zonis fulvis picta; margines dorsi et basis exacte paralleli, aliquantulum curvati, extremitas antica oblique truncata, sulcata, supra et infra obtusa; extremitas postica rotundato-truncata, margini antico subparallela; epidermis olivacea." "Species parva, callosa, 52 mm. longa, 10 alta, 7 lata." (Original description).

Specimens in the present collection agree with Sowerby's illustration of *Solen pfeifferi*. They are straight, banded with purple, the anterior end is obliquely truncated and the posterior end is rather abruptly truncated. The largest specimen, a right valve, measures: length, 35 mm.; height, 7.2 mm.; convexity (one valve), 2.2 mm. A smaller specimen measures 25.4 mm. in length and 5.6 mm. in height.

The type specimen of *Solen pazensis* Lowe measured: length, 57.5 mm.; height, 11.5 mm. Other than differences in color there seems to be but little to aid in separating that species from *S. pfeifferi*.

Compared to *Solen rosaceus* the shell of *Solen pfeifferi* is higher in proportion to the length, the posterior end is less rounded and it is colored by purple bands rather than light rose.

Solen oerstedii Mörch²³ was described from Puntarenas, Costa Rica. It has not been illustrated but according to the description the umbonal area is colored red and the dimensions given were, length 69 mm. and height 11 mm. The species was said to be analogous to *Solen tehuelchus* d'Orbigny of Patagonia.

Distribution: Specimens of this species, nearly all single valves, were taken, but not abundantly, at Tangola-Tangola Bay, Mexico, and at Corinto, Nicaragua. This is an extension north of the known range of this species. Dautzenberg²⁴ recorded some poorly preserved specimens, questionably referable to this species, from two localities in Venezuela. We are uncertain what species is represented by those records.

***Solen rosaceus* Carpenter.**

Solen ?sicarius, var. *rosaceus* Carpenter, *Rept. Brit. Assoc. Adv. Sci.* for 1863 (issued August, 1864), pp. 536, 638. Cited from the vicinity of Santa Barbara and the region between San Pedro and San Diego, California. Reprint in *Smithson. Miscell. Coll.*, No. 252, 1872, pp. 22, 124. — Carpenter, *Ann. & Mag. Nat. Hist.*, Ser. 3, Vol. 15, March,

²³ *Solen oerstedii* Mörch, *Malakozool. Blätter*, Bd. 7, December, 1860, p. 183. "Puntarenas." Costa Rica.

²⁴ ?*Solen pfeifferi* Dunker, Dautzenberg, *Mem. Zool. Soc. France*, Vol. 13, 1900, p. 252.

1865, p. 177. "Hab. Sta. Barbara (Jewett); S. Pedro (Cooper)." Reprint in *Smithson. Miscell. Coll.*, No. 252, 1872, p. 279.

Solen rosaceus Carpenter, Weymouth, *Calif. Fish & Game Comm., Fish Bull.*, No. 4, 1920, p. 50, pl. 15, fig. 3. San Diego, California.—Johnson & Snook, *Seashore Anim. Pac. Coast* (Macmillan Co., New York), 1927 (also ed. 1935), p. 458, figs. 456 and 457. It burrows in the mud of bay shores from Santa Barbara, California, to the Gulf of California.

Type Locality: Santa Barbara, California (cited as type locality by I. S. Oldroyd in 1924 and accepted as such by the present authors). Also cited originally as occurring in the region between San Pedro and San Diego, California.

Range: Santa Barbara, California, to Punta Penasco, Sonora, in the Gulf of California, and south to Mazatlan, Sinaloa, Mexico.

Collecting Stations: Mexico: Cape San Lucas, Lower California; San Lucas Bay (135-D-25), 7 fathoms, sand; [?] Santa Inez Bay (145-D-1, 3), 4-13 fathoms, sand.

Description: The original description, a comparison with *Solen sicarius* Gould, follows: "Straight, narrower, longer, smaller; glossy, rosy." The shell of *Solen rosaceus* is more cylindrical, the anterior extremity is more rounded, and it is longer and narrower than that of *S. sicarius*.

A specimen from Cape San Lucas measures: length, 47.5 mm.; height, 9 mm.; convexity (both valves together), 6 mm. Large specimens of this species attain a length of about 75 mm. according to Johnson & Snook.

According to Weymouth "It is interesting as being capable of a kind of 'swimming' though habitually found in burrows."

Solen tanozawaensis Nomura,²⁵ described from the lower Miocene of Japan, is less arcuate dorsally than *S. rosaceus* to which species it was compared.

Distribution: Only a few specimens, one or two at a locality, were collected in the Cape San Lucas region and one doubtfully identified as this species in Santa Inez Bay. It burrows in the mud of bay shores and on sand flats from Santa Barbara, California, to Punto Penasco, Sonora, Mexico, in the Gulf of California, and south to Mazatlan, where it was collected by the senior author. It has been recorded from Miocene to Recent in California and in the Pleistocene in Lower California.

Genus *Ensis* Schumacher.

Ensis californicus Dall.

Ensis californicus Dall, *Proc. U. S. Nat. Mus.*, Vol. 22, No. 1185, October 9, 1899, p. 110. "Specimen from 14 fathoms, sand, off the island of San Pedro Martir, Gulf of California." — I. S. Oldroyd, *Stanford Univ.*

²⁵ *Solen tanozawaensis* Nomura, *Saito Ho-On Kai Mus. Res. Bull.*, No. 6, September, 1935, p. 64, pl. 7 (6), fig. 3. "Tanozawa (near railroad station) Odo-mura." Nisi-Togaru district, Aomori-ken, northeast Honshu, Japan. Lower Miocene.

Publ. Univ. Ser. Geol. Sci., Vol. 1, 1924, p. 189, pl. 49, fig. 6. Type locality cited. Range, Monterey Bay, California, to the Gulf of California.

Type Locality: Off the island of San Pedro Martir, Gulf of California, in 14 fathoms, sand.

Range: Monterey, California, to the Gulf of California and south to Manzanillo, Mexico.

Collecting Station: Mexico: Manzanillo (184-D-2), 30 fathoms, gravelly sand.

Description: Shell small, slender, arcuate, the sides nearly parallel, the valves being slightly attenuated toward the ends, beaks anterior, the anterior truncation bluntly rounded, the posterior similar; color white with livid pink streaks concentrically disposed; epidermis olivaceous brilliantly polished; hinge with small and very delicate cardinals (usually broken off), one in the right and two in the left valve, the dorsal ridge comparatively strong and elevated, shorter than the ligament. Length of shell, 60 mm.; of dorsal tooth or ridge, 5.2 mm.; of ligament, 9 mm.; width of shell, 7 mm.; perpendicular to the chord of the arc formed by the dorsal margin of the valves, 2 mm. (Dall).

The present specimen, a left valve, measures approximately: length, 60.5 mm.; height, 7.3 mm.; convexity (one valve), 2 mm.

Compared to the east American *Ensis minor* Dall,²⁶ the west coast shell is smaller when adult, wider in front than posteriorly, and the valves are less arcuate and proportionately narrower.

Distribution: A single left valve of *Ensis californicus* was dredged by the expedition at Manzanillo, Mexico, in 30 fathoms on a sandy bottom. This is an extension south of the known range of the species.

Genus *Solecuretus* Blainville.

Key to the species of *Solecuretus*.

- A. Obliquely sculptured posteriorly only; periostracum black *broggii*
- B. Obliquely sculptured both posteriorly and and in greater part anteriorly; periostracum yellowish-brown *guaymasensis*

Solecuretus broggii Pilsbry & Olsson.

Solecuretus broggii Pilsbry & Olsson, *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 93, September 9, 1941, p. 71, pl. 18, fig. 4. "Jama formation, Puerto Jama. Also recent, the Type, A.N.S.P. 175547, from Callo, Port of Jipijapa, Ecuador."

Type Locality: Callo, port of Jipijapa, Ecuador.

Range: Gulf of Chiriqui, Panama, to Ecuador and northern Peru.

Collecting Station: Panama: Gulf of Chiriqui (221-D-1, 5), 35-40 fathoms, sandy mud.

²⁶ See *Ensis minor* Dall, Perry, *Bull. Amer. Paleo.*, Vol. 26, No. 95, August 12, 1940, p. 81, pl. 17, fig. 112. Southwest Florida. In sandy bottoms—on sand bars in shallow water and at moderate depths.

Description: Shell rather large, broadly soleniform, moderately convex, with a wide, open, posterior gap; dorsal and ventral margins parallel, nearly straight, the anterior end rounded, the posterior flatly rounded to subtruncate; umbones not prominent, with the small beak a short distance behind the front third of the length. Surface marked with lines of growth except on the posterior area where, in addition, there is a series of spaced, irregular lines which cross the shell vertically and bend obliquely forward near their lower ends. There are also faint, wide, depressed rays radiating from the umbones to the ventral margin, from the vertical of the beaks backward. Interior of right valve with a deep, wide, pallial sinus reaching to a point forward of the line of the beaks; anterior adductor scar fairly distinct, situated well into the interior of the valve in its dorsal portion. Hinge with a large, erect, hook-shaped cardinal tooth, preceding a small, oblique pit of the resilium and a large, thick, erect plate for the attachment of the ligament. (In life the shell is covered with a black epidermis). Length, 84 mm.; height, 33 mm.; semidiameter 10.3 mm. Type. (Original description).

A right valve in the present collection dredged in the Gulf of Chiriqui, Panama, measures: length, 35.5 mm.; height, 15 mm.; convexity (one valve), 4.8 mm.

This specimen is thicker, longer in proportion to the length, and the oblique sculpture is more distantly spaced and more nearly vertically inclined in comparison to that of specimens of *Solecortus guaymasensis* of the same size. Oblique sculpture on the present specimen is present a little farther anteriorly than that shown on the illustration of the type specimen of *Solecortus broggii* but the general features of our shell suggest its identity with that species.

Solecortus gatumensis Toula,²⁷ described from the Gatun Miocene of Panama, is a very similar species. It also is said to lack oblique sculpture on the anterior half of the shell.

Distribution: A single valve of this species was dredged in the Gulf of Chiriqui, Panama, in 35-40 fathoms. This is an extension north of the known range of the species. It also has been recorded as occurring in the Pliocene of Ecuador and in the Pleistocene of Panama.

Solecortus guaymasensis Lowe.

Psammosolen guaymasensis Lowe, *Trans. San Diego Soc. Nat. Hist.*, Vol. 8, No. 6, March 21, 1935, p. 18, pl. 1, fig. 7. "Guaymas, 20 fathoms." Type. Also from . . . "off Angel de la Guardia Island, Gulf of California."

Type Locality: Guaymas, Sonora, Mexico, in 20 fathoms.

Range: Cedros Island, Lower California, to Angel de la Guardia Island, Gulf of California, and south to the Gulf of Chiriqui, Panama.

Collecting Stations: Mexico: East of Cedros Island (126-D-2, 8-11, 17), 38-60 fathoms, mud, crushed shell, eel grass; Cape San Lucas, Lower California; Panama: Gulf of Chiriqui (221-D-1, 5), 35-40 fathoms, sand, mud.

Description: Shell subcylindric, broadly soleniform, gaping at both ends, beaks not prominent, situated at about one-third the length of the shell from the anterior end; white under a thin, yellowish-brown periostracum, usually absent near the beaks but closely adherent toward the edges; anterior end evenly rounded, the posterior end somewhat obliquely rounded, basal margin straight, posterior dorsal margin straight, anterior dorsal margin gently sloping especially on young shells but on some specimens, especially on large shells, it is nearly straight; exterior surface sculptured with rather indistinct lines of growth and fine, raised lines resembling overlapping clapboard structure which cross the shell, posteriorly approaching a vertical but quite oblique toward the anterior end; on the anterior and posterior ends the adult shell is ornamented with faint radiating striae; ligament external, strong, attached to a projecting nymph; hinge of right valve with a sharp, curved, projecting tooth directly under the beak, posterior to which there is a flattened, erect process against which there is fitted a broad, hooked tooth in the left valve; pallial sinus fairly wide extending slightly past a line vertical with the beaks, descending a little toward the end which is elliptically rounded, for about half its length below, it is confluent with the pallial line.

A large specimen dredged east of Cedros Island measures: length, 55.6 mm.; height, 23 mm.; convexity (both valves together), 17 mm.; pallial sinus extends forward 38 mm. from the posterior end of the shell.

The anterior dorsal margin of young specimens slopes decidedly from the beak but this appears to be a variable character. Large specimens in the collection of the California Academy of Sciences which were collected by Woodbridge Williams at Arena Point, Lower California, have the anterior dorsal margin nearly straight. Miss Viola Bristol of the San Diego Society of Natural History kindly compared some of our specimens with the type and paratype of "*Psammosolen*" *guaymasensis* Lowe. She stated that the type specimen is an old, thickened shell on which the anterior dorsal margin is approximately straight. Furthermore the oblique sculpture consists of more numerous lines than the original illustration shows and that these are not incised lines but rather offset or clapboard ornamentation. Young specimens in the present collection were said to be identical with Lowe's paratype. For these reasons we have identified our specimens with *Solecortus guaymasensis* rather than considering them to be referable to *S. broggii*.

Solecortus broggii Pilsbry & Lowe, described from Ecuador, is ornamented, mostly

²⁷ *Solecortus gatumensis* Toula, *Jahrb. K. K. Geol. Reichsanst.*, Bd. 58, Heft 4, 1908 (1909), p. 732 (60), pl. 28 (4), fig. 12. "von Gatun am Panama-Kanal." Miocene.

on the posterior part of the shell, by more widely spaced and more vertically inclined sculpture.

The present species apparently bears only a general similarity to such species as *Solecortus vicksburgensis* Aldrich²⁸ from the Vicksburg Oligocene of Mississippi, and "*Psamosolen*" *aldrichi* Gardner²⁹ from the Miocene of Florida. *Solecortus cumingianus* Dunker is another species which occurs in the Pliocene of Florida. *Solecortus sanctaemarthae* which occurs in Caribbean waters is much higher in proportion to the length in comparison to *S. guaymasensis*.

Distribution: Specimens of this species were dredged by the expedition east of Cedros Island, Lower California, to the Gulf of Chiriqui, Panama, in 35-60 fathoms. The present records of occurrence extend the known range of the species both to the north and to the south.

SUPERFAMILY MACTRACEA.

FAMILY MACTRIDAE.

A number of generic, subgeneric and specific names have been applied to the Macridae by various workers. These distinctions are based for the most part on the hinge characters. Unless shells are in perfect condition some of the small laminae in the hinge are difficult to observe or may be missing entirely. Discussions of the hinge characters of this family by Dall³⁰ as well as the discussion and excellent drawings of hinges by Lamy³¹ are of great assistance in a study of the Macridae.

Key to the genera and subgenera of the Macridae.

- A. Shell partly or entirely concentrically undulated or wave-plaited
 - a. Wave-plaited on beaks only (or partly so, occasionally lacking) *Micromactra*
 - aa. Entire shell concentrically undulated
 - b. Posterior end very elongate *Raëta*
 - bb. Posterior end short
 - c. Posterior angulation with a lamina or keel
 - d. Anterior laterals well developed *Mactrinula*

²⁸ *Solecortus vicksburgensis* Aldrich, *Cincinnati Jour. Nat. Hist.*, Vol. 8, July, 1885, p. 145, pl. 2, fig. 1. Vicksburg, Mississippi. Oligocene.

Psamosolen vicksburgensis Aldrich, Gardner, *U. S. Geol. Surv., Prof. Paper* 142-E, 1928, p. 216, pl. 33, fig. 1.

²⁹ *Psamosolen aldrichi* Gardner, *U. S. Geol. Surv., Prof. Paper* 142-E, 1928, p. 216, pl. 33, figs. 2 and 3. "1 mile below Baileys Ferry, Chipola River, Calhoun County, Fla." "Chipola formation." Lower Miocene.

³⁰ Dall, W. H. Synopsis of a Review of the Genera of Recent and Tertiary Macridae and Mesodesmatidae. *Proc. Malacol. Soc. London*, Vol. 1, No. 5, March, 1895, pp. 203-213.—Dall, W. H., *Trans. Wagner Free Inst. Sci.*, Vol. 3, Pt. 4, April, 1898, pp. 862-891. See also Dall, W. H. Synopsis of the Macridae of Northwest America, South to Panama. *Nautilus*, Vol. 8, No. 4, August, 1894, pp. 39-43.

³¹ Lamy, E. Révision des Macridae vivants du Muséum d'Histoire Naturelle de Paris. *Journ. de Conchyl.*, Vol. 63, No. 3, November 30, 1917, pp. 173-275, pl. 6, 8 figs. in text; No. 4, February 28, 1918, pp. 291-411, pl. 7, 22 figs. in text. See also Tomlin, J. R. leB., *Jour. Conch.*, Vol. 17, No. 5, July, 1924, pp. 134-136.

dd. Anterior laterals very short
Harvella

cc. Posterior angulation without a lamina or keel

*Tumbeziconcha*³²

B. Shell smooth or concentrically threaded, not undulated

a. Ligament partly external

b. Chondrophore set off from ligament by a shelly lamina

c. Posteriorly rostrate

Anatina s.s.³²

cc. Ovately trigonal or elongate

d. Shell ovately elongated; impressed fasciole on posterior dorsal area with darker periostracum *Mactrotoma*

dd. Shell ovately trigonal

e. Thin; posterior lateral teeth short *Mactrella*

ee. Thick; posterior lateral teeth long. *Mactra* s.s.³²

bb. Chondrophore not set off from ligament by a shelly lamina. *Spisula*³²

aa. Ligament entirely internal *Mulinia*

Genus *Mactra* Linnaeus.

Subgenus *Mactrotoma* Dall.

Mactra (Mactrotoma) nasuta Gould.

Plate II, Fig. 12.

Mactra nasuta Gould, *Proc. Boston Soc. Nat. Hist.*, Vol. 4, November, 1851, p. 88. "Mazatlan, Lieut. Green; San Pedro, Maj. Rich."—Packard, *Univ. Calif. Publ. Bull. Dept. Geol.*, Vol. 9, No. 15, May 1, 1916, p. 278, pl. 12, figs. 2a, 2b, 2c. San Pedro, California. Range, San Pedro, California, to west Colombia (Dall).

Mactra (Spisula) fragilis Chemnitz, Carpenter, Cat. Mazatlan Shells, September, 1855, p. 51. [Record from Mazatlan, only].

Not *Mactra fragilis* Chemnitz = *Mactra brasiliiana* Lamarck. Caribbean region.

Type Locality: Mazatlan, Mexico.

Range: San Pedro, California, to west Colombia.

Collecting Stations: Mexico: Arena Bank (136-D-16, 30), 30-45 fathoms, muddy sand, sand, weed; Colombia: Gorgona Island, shore.

Description: Shell solid, transverse, ovately cuneate, white, periostracum straw-colored, posteriorly thickened and darkened; beaks nearly median, acute; anterior side narrow, compressed, gently sloping; posterior side wider, truncated, gaping; posterior dorsal area lanceolate, excavated; interior polished, white; ligamental pit very oblique; tooth V-shaped, thin, elongated; lateral teeth thickened. Long. $3\frac{1}{4}$; lat. 1; alt. $2\frac{1}{4}$ poll. (Free translation of Gould's original description).

The analogue of *M. brasiliiana*, distinguished by the posterior position of the beaks and the more attenuated form of the

³² Not represented in the present collection.

anterior half caused by the concave outline of the dorsal margin. The parts composing the hinge are more oblique (Gould).

Specimens in the present collection agree so perfectly with Gould's original description of *Macra nasuta* that we have referred them to that species. The submedian position of the beaks, the tapering and roundly pointed anterior end, the truncated posterior end and the lanceolate posterior area bounded by two ridges between which the periostracum becomes thickened and darker are characteristic features of this species. The pallial sinus is rounded at the end and projects forward about two-fifths the length of the shell and is free from the pallial line below. On some specimens, especially large ones, a faint median angulation occurs from the umbos to the ventral margin. The largest specimen in the present collection, a right valve from Gorgona Island, Colombia, measures approximately: length, 118.5 mm.; height, 82 mm.; convexity (one valve), 20.5 mm.; pallial sinus extends anteriorly 47 mm. from the posterior margin of the shell.

Gould³³ in 1853 stated regarding *Macra nasuta*: "This species, described in Proceedings Bost. Soc. Nat. Hist., Nov., 1851, IV, 88, agrees so nearly with *M. falcata*, also described by me, (op. cit. III. 216,) that I hesitate to reproduce it as new without a direct comparison of the two shells, which I have it not now in my power to make. They will for the present, therefore, be regarded as synonymous. *M. falcata*, however, was found at Puget's Sound, while *M. nasuta* was found by Maj. Rich at San Pedro, and by Lieut. Green, (with a doubt,) at Mazatlan."

These later remarks of Gould do not appear to be in conformity with those given at the time of the original description where it was stated that *Macra nasuta* is the analogue of *Macra brasiliensis* Lamarck,³⁴ a statement which is true of the present specimens here referred to *M. nasuta*. Gould's remarks in 1853 seem applicable to *Macra planulata* Conrad³⁵ or to *Macra dolabriformis* Conrad,³⁶ or the generally more northern *M. falcata* Gould.³⁷ However, it is true that

³³ Gould, A., *Boston Jour. Nat. Hist.*, Vol. 6, October, 1853, p. 393.

³⁴ See *Macra fragilis* Chemnitz, Reeve, *Conch. Icon.*, Vol. 8, *Macra*, 1854, species 47, pl. 11, fig. 47. Honduras. Also *Macra (Mactrotoma) fragilis* Chemnitz, Lamy, *Journ. de Conchyl.*, Vol. 63, No. 3, 1917, p. 246, pl. 6, figs. 5 and 7. [With synonymy].

³⁵ *Macra planulata* Conrad, *Jour. Acad. Nat. Sci. Philadelphia*, Vol. 7, 1837, p. 240. "Inhabits with the former" [that is *M. californica* which "Inhabits muddy marshes, bare at low water, near Sta. Barbara; rare."]

Spisula falcata Gould, Packard, *Univ. Calif. Publ. Bull. Dept. Geol.*, Vol. 9, No. 15, May 1, 1916, pl. 26, figs. 1a, 1b, 1c. Not *Macra falcata* Gould.

³⁶ *Spisula dolabriformis* Conrad, *Amer. Jour. Conch.*, Vol. 3, Pt. 2, September 5, 1867, p. 193. "Inhabits Panama." [Described as "*Spissula*" *dolabriformis* but corrected to *Spisula dolabriformis* in Ap. p. 44].—Conrad, *Amer. Jour. Conch.*, Vol. 5, Pt. 2, 1869, p. 108, pl. 12, fig. 1. [Smaller figure only. The larger figure showing the hinge appears to represent *M. hemphilli* Dall or a similar form].

³⁷ *Macra falcata* Gould, *Proc. Boston Soc. Nat. Hist.*, Vol. 3, May, 1850, p. 216. "Hab. Puget Sound, Oregon."—Gould, U. S. Explor. Exped., *Atlas, Moll.*, 1856, pl. 34, figs. 506, 506a, 506b.—I. S. Oldroyd, *Stanford Univ. Publ. Univ. Ser. Geol. Sci.*, Vol. 1, 1924, p. 195, pl. 20, figs. 1, 2, 3. [Copies of Gould's figures 506 and 506b.].

at the time of the original description of *Macra falcata* Gould, from Puget Sound, he compared it to *M. brasiliensis* and *M. ovalis*.

Macra dolabriformis Conrad (the smaller of Conrad's figures, 1869), described from Panama, bears a resemblance to *M. planulata* but is quite distinct. It can be separated from *M. planulata* by the more attenuated form anteriorly, the anterior dorsal margin beneath the beaks is more projecting and in adult shells there is a narrow radial depression anterior to the posterior angulation. Interiorly the pallial sinus is much wider, slightly longer, and joins the posterior adductor impression considerably above the base while in *M. planulata* it joins the adductor impression at or near the base and extends forward in nearly a straight line. The ventral margin of the hinge plate in *M. dolabriformis* forms nearly a straight line while in *M. planulata* it is decidedly curved around the chondrophore. The interior of *M. dolabriformis* is smooth while that of adult specimens of *M. planulata* is marked by irregularities radiating from under the umbos.

The general shape of *Macra falcata* is similar to that of *M. dolabriformis* but it is more elongate in proportion to the height. The dorsal area both anteriorly and posteriorly is narrower and not upturned at the edges as it is in *M. dolabriformis*. Furthermore the lunule-like area on *M. dolabriformis* is long, lanceolate and delimited by a subangulation. On *M. falcata* this area is somewhat depressed but not sharply delimited except just below the beaks. The pallial sinus of *M. falcata* is similar to that of *M. planulata* in that it extends forward from near the base of the anterior adductor impression but it is slightly wider and longer than in Conrad's species.

This group of closely related species has been discussed by Burch³⁸ and others. Burch placed *Macra dolabriformis*, *M. falcata*, *M. hemphilli* and *M. planulata* under the genus *Spisula*.

Dall³⁹ was of the opinion that the species described as *Macra californica* by Reeve⁴⁰ and Deshayes and later named *Macra deshayesi* by Conrad could be referred to *Macra nasuta*. The figure given by Reeve is not at all typical of *M. nasuta*. Grant & Gale mentioned that in some cases specimens of young *Schizothaerus nuttallii* Conrad have been mistakenly referred to *M. nasuta*. It seems quite possible that this may be true in the case of the species described by Reeve as *M. californica*. *Macra hiantina* Deshayes,⁴¹ an unfigured species described from

³⁸ See *Min. Conch. Club. South. Calif.*, No. 44, February, 1945, pp. 17-18.

³⁹ Dall, W. H., *Nautilus*, Vol. 8, No. 4, August, 1894, p. 39.

⁴⁰ *Macra californica* Reeve, *Conch. Icon.*, Vol. 8, *Macra*, May, 1854, species 114, pl. 20, fig. 114. "Hab. California."—Deshayes, *Proc. Zool. Soc. London* for 1854 (issued February 10, 1855), p. 68. "Hab. Gulf of California. Coll. Cum." Not *Macra californica* Conrad.

⁴¹ *Macra hiantina* Deshayes, *Proc. Zool. Soc. London* for 1854 (issued February 10, 1855), p. 68. "Hab. Puna, Guayaquil."

Ecuador, was placed in the synonymy of *M. nasuta* by Dall. He also referred "*M. ovalina* Auct. not Lam." (see Reeve's pl. 14, fig. 66 "Hab. West Columbia; Cuming.") to *M. nasuta*. Lamy⁴² considered Lamarck's species illustrated by Reeve to be referable to *Macra depressa* Spengler which occurs in the western Pacific.

Distribution: Two valves of *Macra nasuta* were dredged by the expedition in 30-45 fathoms on Arena Bank in the Gulf of California and one valve was collected on the beach at Gorgona Island, Colombia. We have seen a specimen from Newport Beach, California, but the species apparently occurs but rarely as far north as southern California. It also has been cited as occurring in the upper Pleistocene of the San Pedro region by De Long.⁴³

Subgenus *Micromacra* Dall.

Key to the species of *Micromacra*.

- A. Pallial sinus extending to or past a line vertical with the beaks
 - a. Shell high, height 68 to 70 per cent. of the length *isthmica*⁴⁴
 - aa. Shell elongate, height 63-65 per cent. of the length *fonsecana*
- B. Pallial sinus not extending to a line vertical with the beaks
 - a. Anterior dorsal margin concave; thin *angusta*
 - aa. Anterior dorsal margin nearly straight
 - b. Beaks entirely or partly wave-plaited
 - c. Wave-plaited over entire beaks *californica*⁴⁴
 - cc. Wave-plaited only on posterior curve of beaks *vanatta*
 - bb. Beaks not wave-plaited *acymata*⁴⁴

Macra (Micromacra) angusta Reeve.

Plate II, Figs. 14 & 18.

Macra angusta Reeve, Conch. Icon., Vol. 8, *Macra*, May, 1854, species 93, pl. 18, fig. 93. "Hab. Panama. Cuming."—Deshayes, *Proc. Zool. Soc. London* for 1854, p. 67 (issued February 10, 1855. "Hab. Panama. Coll. Cuming."—Weinkauff, *Conchyl.-Cab. von Martini-Chemnitz*, Bd. 11, Abt. 2, *Macracea*, 1884, p. 70, Taf. 25, figs. 2, 2a. Panama.

Type Locality: Panama.

Range: Champerico, Guatemala, to Zorritos, Peru.

Collecting Stations: Guatemala: 7 miles west of Champerico (197-D-1, 2), 14 fathoms, mud; El Salvador: La Libertad (198-D-1, 2), 13-14 fathoms, mud.

Description: Shell ovately transverse, nar-

row, rather triangular, nearly equilateral, compressed, white, thin, fragile, transversely regularly striated, anterior side a little the shorter, obtuse, rather concave at the upper part, posterior side slanting at the upper part, attenuated; area narrow, elongated, flat, with a ridge on each side; umbos very small, a little oblique, regularly wave-plaited; lunule very small, lanceolate. (Original description).

The pallial sinus is broadly rounded at the end and extends to about three-sevenths the length of the shell, usually only the posterior portion confluent with the pallial line below or sometimes almost wholly free.

The largest specimen in the present collection, a right valve from off Guatemala, measures: length, 42 mm.; height, 26.6 mm.; convexity (one valve), 6.5 mm.; pallial sinus extends anteriorly 20.3 mm. from the posterior margin of the shell.

Specimens in the present collection agree exactly with Reeve's original figure and description of *Macra angusta*. These are characterized by the thin, white, fragile shell, concentrically wave-plaited on the umbos, and with a decided concavity in the anterior dorsal margin below the beaks.

The shell illustrated under the name of *Macra angusta* by Pilsbry & Lowe represents a different shell which lacks the concavity in front of the beaks, and has the anterior end less broadly rounded, the posterior end broader and the pallial sinus longer. It is described in the present paper under the name of *Macra (Micromacra) fonsecana*.

The more elongate outline and the concave margin in front of the beaks are features which serve as an aid in separating *Macra angusta* from *Macra californica* Conrad, a more northern species.

Some of the other described forms of the *Macra angusta* group belonging to *Micromacra* are the following: *Macra macescens* Guppy, 1866, from the Miocene of Trinidad; *M. macescens haasi* Hertlein & Strong [= *M. macescens elongata* Haas⁴⁵], Miocene of Costa Rica; *M. iridia* Olsson, 1932, Miocene of Peru; *M. atacama* Pilsbry & Olsson, 1941, Pliocene of Ecuador. Forms similar to *M. californica* are: *M. californica maracaibensis* H. & K. Hodson, 1931, Miocene of Venezuela; *M. californica onnechiura* Otuka, 1937, mid-Tertiary of Japan; *Macra janeiroensis* E. A. Smith, 1915, off Rio de Janeiro, Brazil; and perhaps *M. tholoensis* Ladd, 1934, Neogene of Fiji.

Distribution: Specimens of *Macra angusta* were dredged by the expedition off Guatemala and El Salvador at depths of 13-14 fathoms on a mud bottom. This is an extension north of the known range of the species. Species of this group occurred on both sides of Central America during the Miocene.

⁴² Lamy, E., *Journ. de Conchyl.*, Vol. 63, No. 3, 1917, p. 255.

Nomura (Sci. Repts. Tohoku Imper. Univ., Sendai, Japan, Ser. 2, (Geol.), Vol. 15, No. 2, 1932, p. 91 (27), cited *M. ovalina* as occurring both fossil and Recent in Japan.

⁴³ De Long, Jr., J. H., *Trans. San Diego Soc. Nat. Hist.*, Vol. 9, No. 25 1941, opp. p. 244.

⁴⁴ Not represented in the present collection.

⁴⁵ *Macra (Micromacra) macescens* Guppy var. *elongata* Haas, *Jour. Paleo.*, Vol. 16, No. 3, May, 1942, p. 313, text fig. 1. (p. 314). "Probably Carballo, Costa Rica, middle Miocene." Not *Macra elongata* Quoy & Gaimard, 1835.

The new subspecific name *haasi* is here proposed for the form described by Haas.

Mactra (Micromactra) fonsecana

Hertlein & Strong, sp. nov.

Plate II, Figs. 16, 19 & 20.

Mactra (Micromactra) angusta Deshayes, Pilsbry & Lowe, *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 84, May 21, 1932, p. 89, pl. 15, figs. 3, 4; pl. 16, fig. 3. "Panama" and "Montijo Bay."

Not *Mactra angusta* Reeve, 1854.

Shell elongate, white covered by a brownish-gray periostracum, moderately compressed, gaping widely behind and slightly so in front, lunular region and escutcheon flattened; anterior dorsal margin nearly straight from beaks to the broadly rounded anterior end which merges into the very broadly rounded ventral margin, posterior end obliquely subtruncated; umbos concentrically wave-plaited in front and behind but only faintly so in the middle; the remainder of the shell is ornamented with concentric threads and the posterior area is set off by two or three irregular radial threads; hinge typical for the subgenus; interior smooth, white; pallial sinus long, rounded at the end, projecting for about two-thirds the length of the shell and for most of its length confluent with the pallial line. Length, 53.2 mm.; height, 34.5 mm.; convexity (both valves together), 17.5 mm.; pallial sinus extends anteriorly 32 mm. from the posterior margin of the shell.

Holotype in California Academy of Sciences Paleontology Type Collection, from Potosi and Monypenny Point, Nicaragua, Gulf of Fonseca. Paratypes from the same locality. A paratype from Panama Bay was collected by F. M. Anderson.

Additional specimens were taken by the expedition at the following stations: 7 miles west of Champerico, Guatemala (197-D-2), 14 fathoms, mud; Meanguera Island, Gulf of Fonseca, El Salvador (199-D-1), 16 fathoms, mud; Corinto, Nicaragua, beach.

The shell of this species differs from that of *Mactra angusta* in the nearly straight anterior dorsal margin, rather than excavated in the lunular area, in the broader subtruncated posterior end and in the much longer pallial sinus.

Specimens in the collection which agree exactly with Reeve's original figure and description of *M. angusta* are quite distinct from the shell illustrated under that name by Pilsbry & Lowe.

Mactra (Micromactra) vanattae

Pilsbry & Lowe.

Mactra (Micromactra) vanattae Pilsbry & Lowe, *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 84, May 21, 1932, p. 90, pl. 16, figs. 4, 4a, 4b. "Beach at eastern end of Panama City (Pinchot Exped., 1929). Type 155921 ANSP. La Union, Gulf of Fonseca (Lowe, 1931)."

Type Locality: Beach at eastern end of Panama City, Panama.

Range: Champerico, Guatemala, to Panama Bay.

Collecting Stations: Guatemala: 7 miles west of Champerico (197-D-2), 14 fathoms, mud; Nicaragua: Corinto, beach.

Description: Shell with outline similar to that of *Mactra californica*, fairly thick, compressed, gaping posteriorly, white under a thin grayish-drab periostracum; umbos delicately concentrically wave-plaited in front of the posterior angulation but lacking on the anterior convexity; pallial sinus elliptically rounded at the end and extending about 45 percent the length of the shell and for most of its length confluent with the pallial line.

The largest specimen in the present collection, a left valve from off Guatemala, measures: length, 32 mm.; height, 21.8 mm.; convexity (one valve), 5.5 mm.; pallial sinus extends anteriorly 14.5 mm. from the posterior margin of the shell.

The shell of this species differs from that of *Mactra californica* in that the concentric wave-plaited sculpture is present only on the posterior portion of the umbos in front of the posterior angulation, it is thicker, the hinge plate is heavier and the posterior end is a little more truncated. The shell of this species is thicker, more elongate and lacks the concavity in the lunular area which is so pronounced on shells of *M. angusta*. The shell of *M. vanattae* is less elongate, thicker, and the pallial sinus is shorter than that of *Mactra fonsecana*.

A subspecies, *Mactra vanattae acymata* Pilsbry & Lowe⁴⁶ was described from Panama. The umbos of this subspecies are said to lack completely any concentric undulations. As pointed out by Pilsbry & Lowe it would thus technically not belong to the subgenus *Micromactra*.

Mactra (Micromactra) isthmica Pilsbry & Lowe⁴⁷ is somewhat similar to *M. vanattae*, but differs in that the pallial sinus extends past the middle of the shell and the height of the shell is greater in proportion to the length.

Mactra (Mactroderma) velata Philippi⁴⁸, which also occurs at Panama, possesses a large, thick shell on which the posterior end is evenly, rather acutely rounded rather than truncated and the posterior dorsal margin slopes more abruptly than that of *M. vanattae acymata*.

Distribution: Only a couple of left valves of *Mactra vanattae* were taken by the expedition off Champerico, Guatemala, and at Corinto, Nicaragua. The present record of the species from off Guatemala is an extension north of the known range of the species.

⁴⁶*Mactra (Micromactra) vanattae* var. *acymata* Pilsbry & Lowe, *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 84, May 21, 1932, p. 90, pl. 16, figs. 1, 1a. "From Panama."

⁴⁷*Mactra (Micromactra) isthmica* Pilsbry & Lowe, *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 84, May 21, 1932, p. 89, pl. 15, figs. 1, 2; pl. 16, fig. 5. "Near Panama City (J. Zetek)." Also from La Union, El Salvador, in the Gulf of Fonseca.

⁴⁸*Mactra velata* Philippi, *Zeitschr. f. Malakozool.*, Jahrg. 5, No. 10, 1848, p. 153. "Patria: Panama."—Philippi, *Abbild. u. Beschreib. Conchyl.*, Bd. 3, Heft 8, November, 1850, p. 137 (11), pl. 3, fig. 5. Panama.—Reeve, *Conch. Icon.*, Vol. 8, *Mactra*, 1854, species 20, pl. 5, fig. 20. "Hab. Panama (on the reef); C. B. Adams."

Genus *Mulinia* Gray.*Mulinia pallida* Broderip & Sowerby.

Macra pallida Broderip & Sowerby, *Zool. Jour.*, Vol. 4, No. 15, January, 1829, p. 360. "Hab. ad littora Oceani Pacifici." "From St. Blas."

Mulinia donaciformis Gray, *Mag. Nat. Hist.*, New Ser., Vol. 1, July, 1837, p. 376. "Inhabits South Sea—Capt. Beechey's Expedition."—Sowerby, *Zool. Beechey's Voy.*, Moll., 1839, p. 154, pl. 44, fig. 13. [Not the record "from Nevis"]. Also illustrated by Reeve, *Conch. Icon.*, Vol. 8, *Macra*, 1854, pl. 13, fig. 60.

Macra angulata Reeve, *Conch. Icon.*, Vol. 8, *Macra*, April, 1854, species 34, pl. 9, fig. 34. "Hab. Gulf of California."

Macra carinulata Reeve, *Conch. Icon.*, Vol. 8, *Macra*, April, 1854, species 38, pl. 10, fig. 38. "Hab. Gulf of California."

Macra goniata Deshayes, *Proc. Zool. Soc. London* for 1854, p. 70 (issued February 10, 1855). "Hab. California."

Macra (Mulinia) bistrigata Mörch, *Mala-kozool. Blätter*, Bd. 7, December, 1860, p. 182. "Realejo." Nicaragua.

Macra bistrigata Mörch, Weinkauff, *Conchyl.-Cab. von Martini-Chemnitz*, Bd. 11, Abt. 2, *Macracea*, 1884, p. 102, Taf. 34, figs. 5-7. "Vaterland: Busen von Panama (Oersted)."

Mulinia pallida Broderip & Sowerby, *Lamy, Journ. de Conchyl.*, Vol. 63, No. 4, 1918, p. 335. Mazatlan; Guatemala; Panama; Callao; Guayacan.

Macra (Mulinia) pallida Broderip & Sowerby, Grant & Gale, *Mem. San Diego Soc. Nat. Hist.*, Vol. 1, 1931, p. 400, pl. 22, figs. 7a, 7b, 7c. Earlier records cited.

Type Locality: San Blas, Tepic, Mexico.

Range: Gulf of California to Paita, Peru.

Collecting Stations: Mexico: 17 miles SE. × E. of Acapulco (189-D-3), 13 fathoms, mud; Nicaragua: Corinto (200-D-19), 12-13 fathoms, mangrove leaves.

Description: Shell roundly trigonal, ventricose, white covered by a yellowish-olive periostracum; anterior end rounded, ventral margin broadly rounded, posterior margin sloping, nearly straight and where it joins the ventral margin acutely rounded or angulated; an angulation is present from the beak to the posterior ventral end of each valve; pallial sinus short, narrow and extending about two-fifths the length of the shell and free from the pallial line.

The specimens of this species in the present collection are small, not over 32 mm. in length. A right valve collected by the senior author at Panama Vieja (Old Panama) measures; length, 56 mm.; height, 44.5 mm.; convexity (one valve), 17 mm.; pallial sinus projects anteriorly 27.5 mm. from the posterior margin of the shell.

The shell of this species is very variable. This has caused it to receive many different specific names which are now relegated to synonymy. According to Pilsbry⁴⁹ the speci-

mens from Panama illustrated by Li⁵⁰ under the names of "*Corbula altirostris*" and "*Corbula cf. swiftiana* Adams," can be referred to *Mulinia pallida*.

A very similar but somewhat more elongate form from Guaymas, Mexico, was described by Dall under the name of *Mulinia modesta*⁵¹. It appears to be of not more than subspecific value and may not be sufficiently distinct to merit a special name. This form occurs from Magdalena Bay to the Gulf of California. A large specimen in the collections of the California Academy of Sciences which was collected by Henry Hemphill at Magdalena Bay, Lower California, measures: length, 74.5 mm.; height, 61 mm.; convexity (both valves together), 44.5 mm.; pallial sinus projects anteriorly 33 mm. from the posterior margin of the shell.

Distribution: A few specimens of *Mulinia pallida* were taken by the expedition at two localities off Mexico and Nicaragua, in 12-13 fathoms. It occurs commonly from the Gulf of California to Peru. It also has been recorded as occurring in the Pleistocene of Magdalena Bay, Lower California, and in the Pliocene and Quaternary of Ecuador. According to Grant & Gale, the records of the occurrence of "*Macra exoleta*" in the Pleistocene of southern California can be referred to *M. pallida modesta*.

Genus *Mactrella* Gray.Subgenus *Mactrella s.s.*

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

- A. Shell with a strong high keel posteriorly
 - a. Shell with a posterior gape.....*clisia*
 - aa. Shell without a posterior gape
.....*subalata*⁵²
- B. Shell with a sharp angulation or low ridge posteriorly*exoleta*

Mactrella (Mactrella) clisia Dall.

Mactrella clisia Dall, *Nautilus*, Vol. 29, No. 6, October, 1915, p. 62. "West coast of Mexico." Also cited as occurring from Manzanillo, west Mexico, to Santa Elena, Ecuador.—Dall, *Proc. U. S. Nat. Mus.*, Vol. 52, December 27, 1916, p. 415. "Type from Manzanillo, Mexico. Range thence to Santa Elena, Ecuador."

Type Locality: Manzanillo, Mexico.

Range: Gulf of California to Salinas, Ecuador.

Collecting Stations: Mexico: 17 miles SE. × E. of Acapulco (189-D-2), 20 fathoms, sandy mud, algae; Nicaragua: Corinto (200-D-19), 12-13 fathoms, mangrove leaves;

⁴⁹ Pilsbry, H. A., *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 83, 1931, p. 431.

⁵⁰ Li, C. C., *Bull. Geol. Soc. China*, Vol. 9, No. 3, October, 1930, p. 263, pl. 5, fig. 37 (*Corbula altirostris*); p. 264, pl. 5, fig. 39 (*Corbula cf. swiftiana*). Dredged in Panama Bay in 10-40 feet in mud at the mouth of the Rio Grande near La Boca about one mile from the mainland. "Horizon: Gatun formation." [Recent].

⁵¹ *Mulinia modesta* Dall, *Nautilus*, Vol. 8, No. 1, May, 1894, p. 5, pl. 1 [lower figure]. "Habitat, Guaymas."

⁵² Not represented in the present collection.

Costa Rica: Piedra Blanca, shore; Gulf of Dulce, beach; Golfito, beach.

Description: Shell thin, white, arcuate, attenuated and compressed anteriorly, with no circumscribed lunule, and with a small gape posteriorly; posterior slope flattened and externally bordered by a sharp angle surmounted by a thin elevated keel; pallial sinus short, sloping to a blunt rounded point which extends to about three-eighths the length of the shell and free from the pallial line.

A specimen from the Gulf of California in the collections of the California Academy of Sciences measures approximately: length, 77 mm.; height, 60.5 mm.; convexity (both valves together), 32 mm.; pallial sinus projects anteriorly 28 mm. from the posterior margin of the shell.

The shell of this species is easily separable from that of *Mactrella exoleta* by the presence of a strong elevated posterior keel.

Mactrella alata subalata Mörch⁵³ has been reported as occurring from Corinto, Nicaragua, to Santa Elena, Ecuador. According to Olsson it is a rare shell sometimes found with *M. clisia* but "it is always distinct, recognized by its longer shell and absence of the small posterior gap so characteristic of *clisia*."

Distribution: A few specimens, usually a single valve at a locality, were collected by the expedition at a few stations between southwest Mexico and Costa Rica.

Mactrella (Mactrella) exoleta Gray.

Mactra exoleta Gray, *Mag. Nat. Hist.*, New Ser. Vol. 1, 1837, p. 372. "Inhabits—" —Hanley, *Cat. Rec. Bivalve Shells*, p. 33, 1843, p. 340, 1856, pl. 11, fig. 51, 1843. "Cape Horn." —Reeve, *Conch. Icon.*, Vol. 8, *Mactra*, 1854, species 16, pl. 4, fig. 16. "Hab. Cape Horn and West Columbia." —Carpenter, *Cat. Mazatlan Shells*, September, 1855, p. 50. Mazatlan, Mexico. Also earlier records cited. —Weinkauff, *Conchyl.-Cab. von Martini-Chemnitz*, Bd. 11, Abt. 2, *Mastracea*, 1884, p. 24, Taf. 8, figs. 1 and 2. —Grant & Gale, *Mem. San Diego Soc. Nat. Hist.*, Vol. 1, 1931, p. 402 (in text), pl. 22, figs. 10a, 10b. Coast of Guerrero, Mexico.

Lutraria ventricosa Gould, *Proc. Boston Soc. Nat. Hist.*, Vol. 4, November, 1851, p. 89. "Inhabits Mazatlan."

Type Locality: No locality originally cited. Corinto, Nicaragua (here designated as type locality).

Range: Gulf of California to Punta Picos, Peru.

Collecting Stations: Mexico: 17 miles SE. × E. of Acapulco (189-D-3), mud; Nicaragua: Corinto (200-D-19), 12-13 fathoms, mangrove leaves.

⁵³ *Mactra (Mactrella) subalata* Mörch, *Malakozool. Blätter*, Bd. 7, December, 1860, p. 180. "Realejo." [Near Corinto, Nicaragua]. Illustrated as *Mactra alata* Spengler, Reeve, *Conch. Icon.*, Vol. 8, *Mactra*, 1854, species 29, pl. 8, fig. 29. "West Columbia; Cuming." Not *Mactra alata* Spengler, 1802. A Caribbean species.

Mactra alata Spengler var. *subalata* Mörch, Olsson, *Nautilus*, Vol. 48, No. 3, 1935, p. 105. Costa Rica to Santa Elena, Ecuador,

Description: Shell trigonal, white, thin, pellucid, slightly concentrically striated; covered with a thin pale periostraca; the anterior slope compressed, produced; the hinder slope ventricose, flattened, edged, with a slightly raised keel. (Original description).

The shell of this species is transversely obliquely cordate, thin, ventricose, smooth or finely concentrically striated. The anterior side is somewhat attenuated, the posterior obliquely truncated and bearing a low ridge at the angle. The pallial sinus is rather short, tapering to a bluntly rounded end which extends to about two-fifths the length of the shell and is free from the pallial line.

A large specimen from the Gulf of California in the collections of the California Academy of Sciences measures approximately: length, 121.5 mm.; height, 90.5 mm.; convexity (both valves in place), 56 mm.; pallial sinus extends anteriorly 55 mm. from the posterior end of the shell.

Distribution: Three small specimens of this species were dredged by the expedition southeast of Acapulco, Mexico, and off Corinto, Nicaragua, in 12-13 fathoms. It also has been reported by Olsson as occurring in the Miocene of Peru⁵⁴ and Costa Rica⁵⁵.

Subgenus *Mactrinula* Gray.

Mactrella (Mactrinula) goniocyma Pilsbry & Lowe.

Mactra (Mactrinula) goniocyma Pilsbry & Lowe, *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 84, May 21, 1932, p. 90, pl. 15, figs. 5 and 6. "Nicaragua: San Juan del Sur." —Strong, Hanna & Hertlein, *Proc. Calif. Acad. Sci.*, Ser. 4, Vol. 21, No. 10, 1933, p. 118. Acapulco, Mexico.

Type Locality: San Juan del Sur, Nicaragua.

Range: Acapulco Bay, Mexico, to La Libertad, El Salvador.

Collecting Stations: El Salvador: La Libertad (198-D-1, 2), 13-14 fathoms, mud.

Description: Shell very thin, fragile, rather compressed, ovately triangular in shape, color whitish; sculptured with oblique concentric corrugations which are angulated along a vertical from the beaks in the form of broad Vs and crossed obliquely by very fine sharp, concentric striae; a lamina occurs radiating to the posterior-basal angle and a low unornamented convexity occurs between the lamina and the posterior dorsal angle; lunular area smooth, lanceolate.

A left valve in the present collection measures approximately: length, 22 mm.; height (incomplete), 15.5 mm.; convexity (one valve), 4.5 mm.

The presence of a posterior lamina or keel serves to separate shells of the present species from those of *Mactrella (Tumbezicon-*

⁵⁴ *Mactra (Mactrella) exoleta* Gray, Olsson, *Bull. Amer. Paleol.*, Vol. 19, Bull. No. 68, 1932, p. 129. Upper Zorritos of Punta Picos, Peru. Miocene.

⁵⁵ *Mactra exoleta* Gray, Olsson, *Bull. Amer. Paleol.*, Vol. 9, Bull. No. 39, 1922, p. 434 (262), pl. 31 (28), fig. 2. "Gatun Stage: Boucary Creek." Costa Rica. Miocene.

cha) *thracioides* Adams & Reeve⁵⁶ reported from La Union, El Salvador, to Tumbes, Peru, which is ornamented only with concentric sculpture.

Distribution: Three left valves of *Mactra* (*Mactrinula*) *goniocyma*, somewhat imperfectly preserved, were dredged by the expedition at La Libertad, El Salvador, in 13-14 fathoms on a muddy bottom.

Subgenus *Harvella* Gray.

Mactrella (*Harvella*) *elegans* Sowerby.

Mactra elegans Sowerby, Cat. Shells Tankerville, Ap. 1825, p. II, pl. 1, fig. 3. [No locality cited].—Reeve, Conch. Icon., Vol. 8, *Mactra*, 1854, species 89, pl. 17, fig. 89. [Not the record "Hab. Florida"].—Weinkauff, Conchyl.-Cab. von Martini-Chemnitz, Bd. 11, Abt. 2, Mactracea, 1884, p. 87, Taf. 30, figs. 3, 3a.

Harvella elegans Sowerby, H. & A. Adams, Gen. Rec. Shells, Vol. 2, 1856, p. 378, pl. 99, figs. 4, 4a.—Chenu, Man. de Conchyl., Vol. 2, 1862, p. 56, figs. 229, 230.

Harvella pacifica Conrad, Amer. Jour. Conch., Vol. 3, Pt. 2, September 5, 1867, p. 192. "Inhabits Panama."—Conrad, Amer. Jour. Conch., Vol. 5, Pt. 2, October 7, 1869, p. 108, pl. 12, fig. 2.

Raeta maxima Li, Bull. Geol. Soc. China, Vol. 9, No. 3, October, 1930, p. 263, pl. 5, fig. 35. Dredged in "from 10 ft. to 40 ft. in the mud at the mouth of the Rio Grande near La Boca about one mile from the mainland in Panama Bay".

Type Locality: No locality cited originally. Panama Bay (here designated as type locality).

Range: Gulf of California to Zorritos, Peru.

Collecting Stations: Mexico: Banderas Bay, beach; El Salvador: La Union (198-D-2), 14 fathoms, mud; Costa Rica: Gulf of Dulce, beach; Panama: Gulf of Chiriqui (221-1-5), 35-40 fathoms, sandy mud.

Description: M. testâ rotundato-trigonâ, tumidâ, tenui, anticè acutè carinatâ, superficîe elegantèr concentricè sulcatâ; sulcis rotundatis. "A much rounder and more tumid shell than *Mactra plicataria*." (Original description).

The shell of *Mactrella* (*Harvella*) *elegans* is roundly trigonal, thin, white (sometimes stained brown around the margin), quite convex, concentrically undulated and ornamented with fine concentric striae as well as fine, somewhat irregular, but mostly radial wrinkles. A lamellated keel occurs along the posterior dorsal angulation. Between the keel and the steeply sloping posterior dorsal area the shell is ornamented only with concentric lines of growth, the dorsal area is somewhat concave behind the umbos. The lunular area

is elongately cordate and smooth. The pallial sinus is rather narrow, rounded at the end and extends about two-thirds the length of the shell and is free from the pallial line.

A right valve of this species collected by the senior author along the beach at Panama Vieja (Old Panama), where it occurred abundantly, measures approximately: length, 61 mm.; height, 52 mm.; convexity (one valve), 20 mm.; pallial sinus projects anteriorly 39 mm. from the posterior margin of the shell. A left valve measures 64 mm. in length.

A subspecies *Mactrella elegans tucilla* Olsson⁵⁷ has been described from the Miocene of Peru. Other similar species are *Mactrella estrellana* Olsson, from the Miocene of Peru, and *M. sancti-blasii* Maury, 1925, from the Miocene of Trinidad, both of which were compared to *Mactrella* (*Harvella*) *elegans*.

Distribution: A few specimens of this species were collected by the expedition in the region between Banderas Bay, Mexico, and the Gulf of Chiriqui, Panama, on the beach and dredged in 14-40 fathoms, on a muddy bottom. Some of the early authors who studied this species recorded it from Florida but now it is definitely known to occur only in tropical west American waters. It has also been recorded occurring in the Miocene of Colombia⁵⁸ and De Long⁵⁹ cited it as occurring in the Palos Verdes Sands, upper Pleistocene, Signal Hill, Long Beach, California.

Genus *Anatina* Schumacher.

Subgenus *Raëta* Gray.

Anatina (*Raëta*) *undulata* Gould.

Lutraria undulata Gould, Proc. Boston Soc. Nat. Hist., Vol. 4, November, 1851, p. 89. "Inhabits La Paz, Lower California."—Gould, Boston Jour. Nat. Hist., Vol. 6, 1853, p. 391, pl. 15, fig. 7. La Paz, Lower California.

Labiosa undulata Gould, I. S. Oldroyd, Stanford Univ. Publ. Univ. Ser. Geol. Sci., Vol. 1, 1924, p. 191, pl. 21, fig. 11. (Copy of Gould's figure). Type locality cited. Range, San Pedro, California, to Panama. Also Pleistocene of San Pedro and San Diego, California.

Anatina (*Raëta*) *undulata* Gould, Grant & Gale, Mem. San Diego Soc. Nat. Hist., Vol. 1, 1931, p. 407, pl. 23, figs. 5a, 5b, 5c. Earlier records cited. Pleistocene and Recent.

Type Locality: La Paz, Lower California.

Range: San Pedro, California (Dall); Ensenada, Lower California (Burch). Scammon Lagoon, Lower California, to Kino Bay in the Gulf of California and south to Piedra Redonda, Peru.

⁵⁷ *Harvella elegans tucilla* Olsson, Bull. Amer. Paleo., Vol. 19, Bull. 68, June 30, 1932, p. 129, pl. 14, fig. 1. "Tumbes formation, Que. Tucilla at Zorritos." Peru. Miocene.

⁵⁸ *Mactrella* (*Harvella*) *elegans* Sowerby, Anderson, Proc. Calif. Acad. Sci., Ser. 4, Vol. 18, No. 4, March 29, 1929, p. 176, pl. 21, figs. 5 and 6. Horizon M-N, of the Tuberá group, at the west foot of Tuberá Mountain, Colombia. Miocene.

⁵⁹ De Long, Jr., J. H., Trans. San Diego Soc. Nat. Hist., Vol. 9, No. 25, April 30, 1941, p. 242. Also in table opposite p. 244 (as *Mactra* "*elegens*" Sowerby).

⁵⁶ *Mactra thracioides* Adams & Reeve, Zool. Voy. Samarang, 1848, p. 81, pl. 23, fig. 8. "Hab. Eastern Seas."—Reeve, Conch. Icon., Vol. 8, *Mactra*, May, 1854, species 116, pl. 20, fig. 116. Eastern Seas.—Pilsbry & Olsson, Nautilus, Vol. 48, No. 4, 1935, pp. 120-121, pl. 6, fig. 9. Port Pizarro and the mouth of the Tumbes River, Peru. Records also cited from La Union, El Salvador, and Ecuador. *Tumbezi-concha* proposed (p. 119) with the type *Mactra thracioides* Adams & Reeve.

Collecting Stations: El Salvador: Meanguera Island, Gulf of Fonseca (199-D-1), 16 fathoms, sand, mud, crushed shell; Nicaragua: Monypenny Point, Gulf of Fonseca (199-D-5), 7 fathoms, mud.

Description: Shell elongately ovate, ventricose, thin, fragile, concentrically undulated; anterior end broadly rounded; posterior end very elongate, compressed, acutely rounded, gaping; beaks nearly medially or a little anteriorly situated; a narrow posterior dorsal area is bounded by a ridge at which the concentric undulations end abruptly; a depressed area in front of the beaks is not undulated; the undulations of the shell are ornamented with minute radial wrinkles. Large specimens almost entirely lack concentric undulations in the later stages of growth. The pallial sinus, tapering and sloping above, bluntly rounded at the end, extends about three-fifths the length of the shell and is free from the pallial line.

One of the larger specimens in the present collection measures approximately 45 mm. in length but it is not perfectly preserved. A large left valve in the collections of the California Academy of Sciences collected by Henry Hemphill at Scammon Lagoon, Lower California, measures: length, 119 mm.; height, 95 mm.; convexity (one valve), 36 mm.; pallial sinus projects anteriorly 89 mm. from the posterior margin of the shell.

Compared to the east American *Anatina* (*Raëta*) *canaliculata* Say, the west American shell is more elongate and tapering posteriorly and the beaks are more anteriorly situated.

The subspecies described as *Labiosa* (*Raëta*) *undulata gardnerae* Spieker, 1922, from the Miocene of Peru, and *Labiosa undulata mirandana* H. & K. Hodson, 1931, from the Miocene of Venezuela, are similar forms.

Distribution: A few valves of this fragile shell were dredged by the expedition in 7-16 fathoms in the Gulf of Fonseca. It is known to occur from Scammon Lagoon, Lower California, to northern Peru. It also has been recorded from the Miocene of Peru by Olsson⁶⁰ who placed in the synonymy of this species, *Raëta gibbosa* Gabb, described as a fossil from Peru, *Labiosa* (*Raëta*) *ventricosa* Spieker described from the Miocene of Peru, and *Labiosa* (*Raëta*) *hasletti* Anderson which was described from the Miocene of Colombia. *Anatina* (*Raëta*) *undulata* also has been recorded as occurring in the Miocene of Venezuela by H. & K. Hodson⁶¹. It also has been recorded as occurring in the Pliocene of Ecuador and Costa Rica and in the Pleistocene of Ecuador, Panama, Lower California and southern California.

⁶⁰ *Labiosa* (*Raëta*) *undulata undulata* Gould, Olsson, *Bull. Amer. Paleo.*, Vol. 19, Bull. No. 68, June 30, 1932, p. 131, pl. 14, fig. 11. "Tumbez formation, Que. Tucillal at Zorritos." Peru. Miocene.

⁶¹ *Labiosa* (*Raëta*) *undulata* Gould, H. & K. Hodson, *Bull. Amer. Paleo.*, Vol. 16, No. 59, October 1, 1931, p. 21, pl. 7, fig. 6. Urumaco, District of Democracia, Falcón, Venezuela. Upper middle Miocene.

SUPERFAMILY MYACEA.

FAMILY ALOIDIDAE.

Lamy⁶² has recently published a revision of the Aloididae in the Museum of Natural History in Paris.

Genus *Aloidis* Megerle von Mühlfeld.

Corbula Bruguière, *Encycl. Méthod.*, 1797, pl. 230. [Species figured but not named].—Lamarck, *Syst. Anim. s. Vert.*, 1801, p. 137. Species originally cited: *Corbula sulcata*, *C. laevigata*, *C. margaritacea*, *C. gallica*, *C. striata*.—Schmidt, *Versuch. Conchyl. Samml.*, 1818, pp. 77, 177. "Typ. *Corbula sulcata*. *Encyclop. Tab.* 230. Fig. 1. a.b.c."

Not *Corbula* Bolten, *Mus. Bolt.*, 1798, p. 184.—Winckworth, *Proc. Malacol. Soc. London*, Vol. 19, Pt. 1, March, 1930, p. 15. "I therefore designate *Corbula anomala*, Bolten, based on Chemnitz, 6, figs. 79, 80, as type of *Corbula*, which thus becomes an absolute synonym of *Asaphis*, Modeer, 1793."

Aloidis Megerle von Mühlfeld, *Ges. Naturf. Freunde zu Berlin*, Vol. 5, 1811, p. 67. Species cited: *Aloidis guineensis*. Ref. to "Linn. *Syst. Nat.* pag. 3287" and "Chemn. *Conch.* 10. t. 172. f. 1670. 1671."—Winckworth, *Proc. Malacol. Soc. London*, Vol. 19, Pt. 1, March, 1930, p. 15.

Type (by monotypy): *Aloidis guineensis* Megerle von Mühlfeld, based on Chemnitz, *Neues Syst. Conchyl.-Cab.*, Bd. 10, 1788, pl. 172, figs. 1670 and 1671. "von der Guineischen Küste." (p.358). [= *Corbula sulcata* Lamarck. Illustrated by Vokes, *Bull. Amer. Mus. Nat. Hist.*, Vol. 86, Art. 1, 1945, pl. 1, figs. 1-5. Senegal. Recent].

The name *Aloidis* Megerle von Mühlfeld, 1811, replaces *Corbula* Bruguière, 1797, which was cited without named species. It also replaces *Corbula* of Lamarck, 1801, due to an earlier *Corbula* of Bolten, 1798, which has as type *Corbula anomala* Bolten. *Corbula* Bolten thus becomes a synonym of *Asaphis* Modeer. *Aloidis guineensis* Megerle von Mühlfeld, the type of *Aloidis*, is identical with *Corbula sulcata* Lamarck which is the type of *Corbula* Lamarck. *Aloidis* therefore exactly replaces *Corbula* as generally used in the literature. Vokes⁶³ has recently discussed this genus and considered *Corbula* Lamarck to be a valid name for it.

Species of *Aloidis* occur in many parts of the world in marine and brackish waters. They prefer the warmer waters and are said to occur especially abundantly in the China Sea.

About 18 species from west American waters have been described under the genus "*Corbula*".

⁶² Lamy, E. Révision des Corbulidae vivants du Muséum National d'Histoire Naturelle de Paris. *Journ. de Conchyl.*, Vol. 84, No. 1, July 31, 1941, pp. 5-33, 6 figs. in text; Vol. 84, No. 2, November 15, 1941, pp. 121-144; Vol. 84, No. 3, December 2, 1941, pp. 211-254.

⁶³ Vokes, H. E. Supraspecific Groups of the Pelecypod Family Corbulidae. *Bull. Amer. Mus. Nat. Hist.*, Vol. 86, Art. 1, October 10, 1945, pp. 7-10.

Key to the species of *Aloidis*.

A. Shell elongate, with a prominent, narrow rostrum

a. Shell with a sharp, elevated carina posteriorly *tenuis*⁶⁴

aa. Shell without an elevated carina posteriorly

b. With radial striae; white

c. Shell thick; fine striae on umbos *nasuta*

cc. Shell thin; fine reticulate sculpture over entire shell *fragilis*

bb. Without radial striae; umbos and inner margins pink *ovulata*

B. Shell trigonal or subquadrate

a. Right valve much the larger; rayed with red *speciosa*

aa. Nearly equivalve, right valve slightly the larger

b. Posterior end obliquely truncated

c. Valves flattened; sculpture fine

d. Length exceeding 10 mm.; umbos purplish with two white radiating rays

..... *biradiata*

dd. Length usually not exceeding 10 mm.; white, yellow, bluish-gray, occasionally faintly biradiate *luteola*

cc. Valves ventricose

e. Shell with red spot under beaks; often mottled *marmorata*

ee. Shell entirely white

f. Posterior dorsal area with radial rows of pustules *porcella*

ff. Posterior dorsal area without radial sculpture *ventricosa*

bb. Posterior end abruptly truncated

g. Shell subglobose, nut-like form

..... *nuciformis*

gg. Shell subquadrate; posteriorly bicarinate

..... *bicarinata*

Subgenus *Aloidis* s.s.

Aloidis (Aloidis) speciosa Reeve.

Corbula radiata Sowerby, *Proc. Zool. Soc. London*, May 17, 1833, p. 36, "Hab. ad Acapulcam." "A single specimen was picked up on the sands."

Not *Corbula radiata* Brocchi, 1814. Fossil in Italy.

Corbula speciosa Reeve, *Conch. Icon.*, Vol. 2, *Corbula*, August, 1843, species 6, pl. 1, fig. 6. "Hab. Gulf of Nicoya (dredged in seven fathoms' water)."—Hinds, *Proc. Zool. Soc. London*, November, 1843, p. 57. "Hab. Panama; from six fathoms, mud. Gulf of Nicoya, Central America."—Hinds, *Zool. Voy. Sul-*

phur, *Moll.*, Pt. 3, 1844 [January, 1845, on cover of Pt. 3], p. 68, pl. 20, figs. 7, 8. Original locality cited.

Type Locality: Gulf of Nicoya, Central America, in 7 fathoms.

Range: Santa Inez Bay, Gulf of California, to Panama Bay.

Collecting Stations: Mexico: Santa Inez Bay, Gulf of California (142-D-2), 30-35 fathoms, muddy sand, crushed shell; 13 miles west of Mazatlan (155-D-1), 56 fathoms, mud; 3 miles off Pyramid Rock, Clarion Island (163-D-2), 55 fathoms, rock, coral; Nicaragua: Corinto (200-D-19), 12-13 fathoms, mangrove leaves; Costa Rica: 14 miles S. × E. of Judas Point (214-D-1-4), 42-61 fathoms, mud, rocks.

Description: Shell trigonally ovate, very inequivalve, high, thick, rounded anteriorly, posteriorly somewhat rostrate, truncated at the end, the posterior area set off by a strong angulation; escutcheon and lunular areas present; right valve the larger, with deeply grooved concentric rugose sculpture; the left valve finely, somewhat obliquely, concentrically grooved; umbonal area of each valve with radial striae on perfect specimens; both valves whitish rayed with bright red or occasionally mostly red.

A specimen dredged off Clarion Island, measures: length, 19.2 mm.; height, 15.4 mm.; convexity (both valves together), 12.5 mm.

The shells of fully grown individuals of *Aloidis speciosa* are ornamented with deep red colored rays which are unusually bright and well defined for a member of this genus. A considerable number of smaller shells having the same shape as young stages of the full grown colored forms have been referred to *A. speciosa* but they do not possess a trace of the vivid coloration. These are subrectangular, only moderately inequivalve with a sharp posterior umbonal angulation, slightly depressed medially, and perfect specimens are ornamented by fairly widely spaced concentric ribbing which together with the interspaces is crossed by fine radial striae. Such young specimens might easily be mistaken for some other species.

Aloidis dietziana C. B. Adams⁶⁵ is a similar species occurring in the Caribbean region.

Distribution: *Aloidis speciosa* was dredged by the expedition at a few localities from the Gulf of California to Costa Rica, in 30-61 fathoms. It is recorded here for the first time from Clarion Island and from the Gulf of California although it was known to occur at the Tres Marias Islands and south to Panama.

Subgenus *Caryocorbula* Gardner.

Caryocorbula Gardner, *Nautilus*, Vol. 40, No. 2, October, 1926, p. 46. "Type.—*Corbula alabamiensis* Isaac Lea. Claiborne Eocene of

⁶⁵ *Corbula dietziana* C. B. Adams, *Contrib. to Conch.*, No. 12, October, 1852, p. 235. "Habitat.—Kingston harbor (Jamaica), along the 'Palisades,' southeast from the city."—Dall, *Bull. Mus. Comp. Zool.*, Vol. 12, No. 6, September, 1886, p. 314, pl. 1, figs. 5, 5a, 5b. "Identified and figured from the types."

⁶⁴ Not represented in the present collection.

the East Coast and Gulf from South Carolina to the Rio Grande."—Gardner, *U. S. Geol. Surv., Prof. Paper* 142-E, 1928, p. 230. "Type: *Corbula alabamiensis* Isaac Lea."

Type (by original designation): *Corbula alabamiensis* Lea [*Contrib. Geol.*, December, 1833, p. 45, pl. 1, fig. 12. Tertiary of Claiborne, Alabama].

Shell small or of moderate dimensions; acutely keeled posteriorly; slightly inequivalvate; the right valve a little larger and a little higher relatively than the left; both valves concentrically rugose, the sculpture upon the right valve in some species stronger and more regular than upon the left; a microscopically fine radial lineation developed in some of the later species, particularly upon the posterior keel; ligament, dental muscle and sinal characters similar to those of *Corbula s.s.* (Gardner).

***Aloidis (Caryocorbula) bicarinata* Sowerby.**

Corbula bicarinata Sowerby, *Proc. Zool. Soc. London*, May 17, 1833, p. 35. "Hab. ad littora Columbiae Occidentalis." "Found in sandy mud at from seven to seventeen fathoms at Panama, Real Llejos, Caraccas and St. Elena."—Hanley, *Cat. Rec. Bivalve Shells*, 1843, p. 46, suppl. pl. 12, fig. 31. "W. Columbia."—Reeve, *Conch. Icon.*, Vol. 2, *Corbula*, January, 1844, species 23, pl. 3, fig. 23. Original localities cited.

Type Locality: Panama, in 17 fathoms (here designated as type locality). Real Llejos, Caraccas and Santa Elena also cited originally.

Range: Gulf of California to Guayaquil, Ecuador (Dall).

Collecting Stations: Guatemala: 7 miles west of Champerico (197-D-2), 14 fathoms, mud; El Salvador: La Union, Gulf of Fonseca (199-D-22), 3 fathoms, mud, mangrove leaves; Nicaragua: Corinto (200-D-19), 12-13 fathoms, mangrove leaves, also on beach.

Description: Shell squarely ovate, nearly equilateral and equivalve, moderately thick, whitish, anteriorly rounded, posteriorly abruptly truncated; a sharp umbonal angulation runs from the beaks to the posterior ventral margin and another angulation occurs between this and the dorsal margin; a depressed area occurs below the beaks and a rather smooth, depressed, elongately ovate escutcheon occurs back of the beaks; both valves are sculptured with fine, nearly evenly spaced, concentric threads.

The specimens in the present collection are somewhat worn. A well preserved specimen from Guaymas Bay, Mexico, in the collections of the California Academy of Sciences, measures: length, 11.8 mm.; height, 8.5 mm.; convexity (both valves together), 7.2 mm.

Corbula alba Philippi⁶⁶ was described from Mazatlan, Mexico. It was said to resemble "*Corbula*" *bicarinata* and Carpenter⁶⁷ suggested that it might be referable to the species described by Sowerby.

⁶⁶ *Corbula alba* Philippi, *Zeit. f. Malakozool.*, Jahrg. 3, January, 1846, p. 19. "Patria: Mazatlan."

⁶⁷ Carpenter, P. P., *Rept. Brit. Assoc. Adv. Sci.* for 1856 (issued 1857), p. 224.

Distribution: This species was dredged by the expedition from Guatemala to Nicaragua in 12-14 fathoms and was taken in the beach drift at Corinto, Nicaragua.

***Aloidis (Caryocorbula) biradiata* Sowerby.**

Corbula biradiata Sowerby, *Proc. Zool. Soc. London*, May 17, 1833, p. 35. "Hab. ad Chiriqui et ad sinum caraccensem." "Found in mud and sand in from three to six fathoms at Chiriqui, and in seven fathoms in the Bay of Caraccas."—Reeve, *Conch. Icon.*, Vol. 2, *Corbula*, August, 1843, species 3, pl. 1, fig. 3. Original localities cited.—Hanley, *Cat. Rec. Bivalve Shells*, 1843, p. 47, suppl. pl. 10, fig. 51. Caraccas, Ecuador.

Corbula rubra C. B. Adams, *Ann. Lyceum Nat. Hist. New York*, Vol. 5, July, 1852, pp. 523, 548 (separate pp. 299, 324). "Habitat.—Panama."—Carpenter, *Proc. Zool. Soc. London*, 1863, p. 368. Reprint in *Smithson. Miscell. Coll.*, No. 252, 1872, p. 204. "A young orange-tinted specimen of *C. biradiata*, No. 503. The broad 'flexure' is an accidental growth, not shown in the lines of growth of an earlier stage."

Corbula polychroma Carpenter, *Proc. Zool. Soc. London* for 1856, p. 198 (issued January 7, 1857). "Hab. In Sinu Californiensi (Lieut. Shipley in Mus. Cuming.)." [Not the record "Sta. Barbara (Col. Jewett in Mus. Gould)." = *C. luteola* Carpenter].

Type Locality: Chiriqui, Panama, in 3-6 fathoms mud and sand (here designated as type locality). Bay of Caraccas, Ecuador, also cited originally.

Range: Guaymas, Mexico, to Guayaquil, Ecuador.

Collecting Stations: El Salvador: La Union (199-D-22), 3 fathoms, mud, mangrove leaves; Nicaragua: Corinto (200-D-4-7, 17, 19), ½-13 fathoms, mangrove leaves, sand, also in beach drift; Costa Rica: Port Parker, on beach.

Description: Shell ovately oblong, somewhat compressed, nearly equivalve, the right valve slightly the larger; anterior end rounded; posterior end somewhat projecting, the end obliquely truncated, a sharp umbonal angulation is present; an area in front of the beaks is depressed, likewise an elongately ovate sloping area back of the beaks; valves sculptured with fine, fairly close concentric striae; color light purple with two white radiating rays, one along each umbonal ridge, the interior often blood red.

A well preserved specimen in the collections of the California Academy of Sciences which was collected by the senior author on the beach at Panama City, measures: length, 13.5 mm.; height, 9 mm.; convexity (both valves together), 6.2 mm.

Perfect specimens of this species may be recognized by the two radiating white rays and often by the blood red color of the interior.

Distribution: Specimens of this species were taken by the expedition from the Gulf of Fonseca to Port Parker, Costa Rica, at

depths of $\frac{1}{2}$ to 13 fathoms, as well as on the beach. It has been cited by Pilsbry & Olsson as occurring in the Pliocene of Ecuador and in the Pleistocene of Panama by Olsson. Rutten⁶⁸ cited "*Corbula* cf. *biradiata*" from the Quaternary of Surinam in the Dutch West Indies but probably that record can be referred to a Caribbean species.

***Aloidis (Caryocorbula) luteola* Carpenter.**

Corbula luteola Carpenter, *Rept. Brit. Assoc. Adv. Sci.* for 1863 (issued August, 1864), pp. 611, 637. From the region between San Diego and San Pedro, California. Reprint in *Smithson. Miscell. Coll.*, No. 252, 1872, pp. 97, 123—Carpenter, *Proc. Calif. Acad. Nat. Sci.*, Vol. 3, February, 1865, p. 207. "Hab. San Diego, San Pedro, 50, alive, at low water."—Arnold, *Mem. Calif. Acad. Sci.*, Vol. 3, 1903, p. 181, pl. 17, fig. 11. Pliocene of San Pedro, Pleistocene of San Pedro, Los Cerritos and San Diego, California, and Recent in the same region.

Corbula (Lentidium) luteola Carpenter, Grant & Gale, *Mem. San Diego Soc. Nat. Hist.*, Vol. 1, 1931, p. 421, pl. 19, figs. 2 and 7. Upper Miocene of California and Pleistocene of California and Lower California. Recent from Monterey, California, to Acapulco, Mexico (Jordan).

Type Locality: Between San Diego and San Pedro, California.

Range: Monterey, California, to Cape San Lucas, Lower California.

Collecting Station: Mexico: Cape San Lucas, Lower California, on beach.

Description: Shell similar to *C. biradiata*, but much smaller; not obese, transverse, rosy-yellow, toward the dorsal area sometimes obscurely biradiate; angle much less carinate, posteriorly defined; anterior rounded, expanded; concentrically closely but obtusely lirate; umbos obtuse; interior with small teeth; pallial line angulate, not sinuated; adductor scars thick; margin in adult shell overlapping posteriorly. Length, 0.42; height, 0.28; diameter, 0.16. (Free translation of Carpenter's description, 1865).

A specimen of this species in the collections of the California Academy of Sciences collected at San Diego, California, by O. N. Sanford, measures: length, 10 mm.; height, 6.8 mm.; convexity (both valves together), 4.6 mm.

Some of the characteristic features of this little nearly equivalve shell are the rather compressed form, subcentral beaks which are only slightly anteriorly situated and the fine, close, concentric sculpture.

Aloidis luteola rosea Williamson, 1905, is a rose colored form of this species.

Aloidis luteola is very similar to *Aloidis biradiata* as mentioned by Carpenter but it is smaller and usually less colored on the umbonal region.

Verco called attention to the compressed

form of *Corbula compressa*,⁶⁹ an Australian species, and its similarity to *Aloidis luteola* in this feature. They are of course quite distinct species. The species described by Verco was later renamed *Corbula verconis* by Finlay.

Distribution: A few somewhat worn valves referable to this species were taken by the expedition on the beach at Cape San Lucas, Lower California. E. K. Jordan cited the species as ranging south to Acapulco, Mexico, but we have not seen specimens from south of Cape San Lucas. According to Burch this species is often found on a bottom of rocky rubble. It also has been reported as occurring from upper Miocene to Recent in California and in the Pleistocene of Lower California.

***Aloidis (Caryocorbula) marmorata* Hinds.**

Plate II, Fig. 17.

Corbula marmorata Hinds, *Proc. Zool. Soc. London*, November, 1843, p. 58. "Hab. West coast of Veragua; from twenty-six fathoms, mud." "Cab. Belcher."—Hinds *Zool. Voy. Sulphur*, Moll., Pt. 3, January, 1845 (on cover), p. 69, pl. 20, fig. 13. Original locality cited.—Reeve, *Conch. Icon.*, Vol. 2, *Corbula*, May, 1844, species 39, pl. 5, fig. 39. Original locality cited.

Type Locality: West coast of Veragua, Panama, in 26 fathoms, mud.

Range: Punta Penasco, Sonora, Mexico, to Panama.

Collecting Stations: Mexico: Port Guatulco (195-D-9), 7 fathoms, gr. sand, crushed shell; Nicaragua: Corinto, beach; Costa Rica: Port Parker (203-D-1, 3), 12-15 fathoms, sandy mud, shelly mud, crushed shell.

Description: Shell small, ovately trigonal, nearly equivalve, whitish, mottled, a purplish-red spot present under the beaks; rounded in front, slightly projecting posteriorly and obliquely truncated at the end, often with a short lamellated projection; a strong posterior umbonal angulation marks off a flattish sloping posterior area; an excavated area is present beneath the beaks but only a minute sloping escutcheon is present back of the beaks; sculpture consists of strong, often somewhat angular or carinate concentric ribs which continue with equal strength over the posterior area but become finer toward the posterior and anterior dorsal margins; the interspaces and especially the posterior dorsal area is ornamented with fine radial striae; interior often pinkish with well defined whitish adductor impressions.

One of the largest specimens in the present collection measures: length, 7 mm.; height, 4.8 mm.; convexity (both valves together), 3.4 mm.

The shell of this species is characterized by the presence of a purplish-red spot under

⁶⁹ *Corbula compressa* Verco, *Trans. Roy. Soc. South Australia*, Vol. 20, Pt. 2, December, 1896, p. 230, pl. 8, figs. 2, 2a, 2b. "Habitat.—Yankalilla Bay, in sludge, at 20 fathoms, many alive; Backstairs Passage, Port Lincoln, Eastern Cove, Kangaroo Island, at varying depths, several (Verco)."

Corbula verconis Finlay, *Trans. New Zealand Inst.*, Vol. 57, 1927, p. 531. New name for *Corbula compressa* Verco, 1896, not *C. compressa* Lea, 1833.

⁶⁸ Rutten, L. M. R., *Leidische Geol. Mededeel.*, Deel 5, 1931, p. 661.

the beaks and by the strong concentric and fine radial sculpture.

Corbula venusta Angas,⁷⁰ an Australian species, ornamented with a short carnelian-red ray at the anterior side of the umbos, was compared by its author to *Aloidis marmorata*.

Distribution: This species was taken by the expedition from Port Guatulco, Mexico, to Costa Rica, on the beach and at depths of 7-15 fathoms.

***Aloidis (Caryocorbula) nasuta* Sowerby.**

Plate II, Fig. 9.

Corbula nasuta Sowerby, *Proc. Zool. Soc. London*, May 17, 1833, p. 35. "Hab. ad Xipixapi." "Found in sandy mud at a depth of ten fathoms. Some small specimens which I suppose to be the young of this species were found in the gulf of Nicoiyo."—Reeve, *Conch. Icon.*, Vol. 2, *Corbula*, August, 1843, species 1, pl. 1, fig. 1. Original locality records cited.

Corbula pustulosa Carpenter, *Cat. Mazatlan Shells*, August, 1855, p. 22. "Panama and St. Blas, 33 fm. R. B. Hinds, Mus. Cuming.—Mazatlan: one small pair nestling in *Spondylus*, and 1 valve in *Chamae*, L'pool Col."

Type Locality: Xipixapi [Jipijapa], Ecuador, in 10 fathoms, sandy mud. (Of *Corbula pustulosa* Carpenter, Panama, in 33 fathoms, here selected as type locality).

Range: Magdalena Bay, Lower California, to Punta Penasco, Sonora, Mexico, in the Gulf of California, and south to Zorritos, Peru.

Collecting Stations: Mexico: Santa Inez Bay, Gulf of California (145-D-1-3), 4-13 fathoms, sand; Cape San Lucas; 4 miles SSW. of Maldonado Point (192-D-3), 38 fathoms, mud; Port Guatulco (195-D-20), 23 fathoms, mud; Tangola-Tangola Bay (196-D-14, 15, 19, 20), 5-50 fathoms, crushed shell, mud; Guatemala: 7 miles west 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; La Union, Gulf of Fonseca (199-D-12, 13), 5-6 fathoms, mud; Nicaragua: Corinto (200-D-16, 19), 4-13 fathoms, mangrove leaves, also on beach; Costa Rica: Port Parker (203-D-1, 3), 12-15 fathoms, shelly sand, crushed shell, shelly mud; Cedro Island, Gulf of Nicoya (213-D-1-10), 4-10 fathoms, mud, sand, crushed shell; Golfito (218), 16 fathoms, sand, mud, crushed shell.

Description: Shell elongately oval, inflated, inequivalve, the right valve the larger, thick, white, rostrate posteriorly; posterior umbonal angulation present, the posterior dorsal area is somewhat excavated; a depressed elongate escutcheon is set off by an angulation; sculpture consists of moderately fine but somewhat irregular concentric threads sometimes coarser toward the ventral margin, and on the early part of the shell fine radial striae composed of very fine pustules.

A large but somewhat worn right valve from Corinto, Nicaragua, in the present collection measures: length, 14 mm.; height, 9 mm.; convexity (one valve), 4.4 mm. The posterior attenuation at the end of the valve is, as often happens, worn off. A smaller perfect specimen in the collection of the California Academy of Sciences, dredged off Mexico, measures: length, 13 mm.; height, 7 mm.; convexity (both valves together), 6.5 mm.

As mentioned long ago by Mörch and more recently by Olsson, the umbonal area of this species is ornamented with fine radial striae. These striae are composed of very fine pustules. Hundreds of small shells in the present collection with this type of radial sculpture agree exactly with Carpenter's description of *Corbula pustulosa*. These appear to be identical with the young stages of *Aloidis nasuta*. We have therefore placed Carpenter's species in the synonymy of *Aloidis nasuta*.

Reeve's figure⁷¹ of "*Corbula*" *obesa* Hinds is of a small, elongate shell somewhat similar to that of young *Aloidis nasuta*. Hind's original illustration of "*Corbula*" *obesa* indicates a higher, more globose shell similar to that of *A. porcella* Dall. In view of the fact that no radial striae were mentioned by Reeve we have hesitated to refer his illustration of "*Corbula*" *obesa* to *A. nasuta* but it seems quite possible that it may be referable to Sowerby's species.

Aloidis nasuta has been recorded in the literature as occurring in distant localities, but so far as known it occurs only in west American waters. Hedley⁷² mentioned that it was erroneously recorded from Sydney, Australia. Von Ihering⁷³ cited it from Brazil. The species described by Conrad⁷⁴ as *Corbula nasuta* from the Eocene of Alabama, was later referred by Dall to "*Corbula*" *alabamensis* Lea. The species cited as *Corbula nasuta* by Conrad,⁷⁵ from the Tertiary of Texas was later considered to be a distinct species and was named *Corbula conradi* by Dall.⁷⁶ That species, at the present time, is known to occur in the Caribbean region from Cape Hatteras to Cartagena Bay, Colombia, in 4 to 63 fathoms.

"*Corbula*" *nelsoni* Olsson, 1932, described

⁷¹ *Corbula obesa* Hinds, Reeve, *Conch. Icon.*, Vol. 2, *Corbula*, May, 1844, species 38, pl. 5, fig. 38. Cited from Veragua, Panama, and San Blas, Mexico, in 20-32 fathoms.

⁷² Hedley, C., *Jour. Roy. Soc. New South Wales*, Vol. 51, Suppl., 1918, p. M31.

The species referred to *Corbula nasuta* in Australia is probably *C. coxi* Pilsbry, *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 49, 1897, p. 363, pl. 9, figs. 1, 2, 3. "Sydney Head (John Brazier), and Eden, Twofold Bay, New South Wales (Dr. J. C. Cox)."

⁷³ Von Ihering, H., *Rev. Mus. Paulista*, Vol. 2, 1897, p. 169.

⁷⁴ *Corbula nasuta* Conrad, *Foss. Shells Tert. Form.*, Vol. 1, No. 3, August, 1833, p. 60 (38), pl. 19, fig. 4. "Locality, Claiborne, Alab."

⁷⁵ *Corbula nasuta* Conrad, Conrad, *Rept. Mexican Boundary Survey*, Vol. 1, Pt. 2, 1857, p. 161, pl. 19, fig. 4. "Locality.—Western Texas." Tertiary.

⁷⁶ Dall, W. H., *Trans. Wagner Free Inst. Sci.*, Vol. 3, Pt. 4, April, 1898, p. 842. Illustrated by Dall, *U. S. Nat. Mus.*, Bull. 37, 1889, pl. 2, figs. 6a, 6b, 6c, 6d. See Maury, *Bull. Amer. Paleo.*, Vol. 8, Bull. No. 34, 1920, p. 140 (108).

⁷⁰ *Corbula venusta* Angas, *Proc. Zool. Soc. London*, January 3, 1871, p. 20, pl. 1, fig. 29. "Hab. Dredged on the 'Sow and Pigs' bank, Port Jackson." Australia.

from the Miocene of Peru, is similar to *Aloidis nasuta*.

Distribution: Specimens of *Aloidis nasuta* were taken by the expedition from Santa Inez Bay in the Gulf of California to the Gulf of Dulce in Costa Rica, on the beach and dredged at depths of 4 to 50 fathoms. It occurs in this region more commonly than any other species of *Aloidis* and ranges south to Zorritos, Peru. It also has been recorded as occurring in the Pliocene of Ecuador.

***Aloidis (Caryocorbula) nuciformis* Sowerby.**

Plate II, Fig. 1.

Corbula nuciformis Sowerby, *Proc. Zool. Soc. London*, May 17, 1833, p. 35. "Hab. in Americâ Centrali." "Found at a depth of six fathoms in sandy mud at Real Llejós." Also found as a fossil near Guayaquil, Ecuador.—Reeve, *Conch. Icon.*, Vol. 2, *Corbula*, September, 1843, species 9, pl. 2, fig. 9. Original locality cited.

Type Locality: Real Llejós [near Corinto], Nicaragua, in 6 fathoms, sandy mud.

Range: Concepcion Bay, Gulf of California, to Guayaquil, Ecuador.

Collecting Stations: Mexico: Tangola-Tangola Bay (196-D-20), 50 fathoms, mud; Costa Rica: off Ballena Bay, Gulf of Nicoya (213-D-11-17), 35-40 fathoms, mud.

Description: Shell trigonally ovate, very inflated, nearly equivalve, right valve a little the larger, beaks nearly central, white covered by a brownish periostracum, anteriorly rounded, posteriorly shortly rostrate and truncated at the end; a depressed radial area present anterior to the posterior umbonal angulation; along the posterior dorsal margin a depressed area is set off by an angulation; exteriorly the valves are concentrically grooved which results in fine, rounded, somewhat irregular concentric riblets.

One of the largest specimens in the present collection measures: length, 11.5 mm.; height, 9.8 mm.; convexity (both valves together), 8 mm. Another specimen measures: length, 10.4 mm.; height, 9.8 mm.; convexity (both valves together), 8.2 mm.

As suggested by its specific name, the shell of this species is characterized by the subglobose, rounded, nut-like form. The posterior rostration is very short and abruptly truncated in comparison to *A. nasuta*.

Distribution: This species was dredged by the expedition at two localities, off Tangola-Tangola Bay, Mexico, and off Ballena Bay, Costa Rica, in 35-50 fathoms, on a mud bottom. At the time of the original description of this species Sowerby mentioned that it also occurs as a fossil near Guayaquil, Ecuador.

***Aloidis (Caryocorbula) ovulata* Sowerby.**

Plate II, Fig. 11.

Corbula ovulata Sowerby, *Proc. Zool. Soc. London*, May 17, 1833, p. 35. "Hab. ad littora Americae Meridionalis." "Found in sandy mud at various depths, from seven to seventeen fathoms, at Xipixapi, and in the Bays

of Montijo and Caraccas. Detached valves of a beautiful pink colour were picked up on the sands at Real Llejós and Mazatlan."—Reeve, *Conch. Icon.*, Vol. 2, *Corbula*, August, 1843, species 7, pl. 1, fig. 7. Original locality records cited.—Hanley, *Cat. Rec. Bivalve Shells*, 1843, p. 47, suppl. pl. 10, fig. 52. South America.

Corbula cf. collazica Maury, Li, *Bull. Geol. Soc. China*, Vol. 9, No. 3, October, 1930, p. 263, pl. 5, figs. 36, 36a (on expl. to plate as *C. collazia*). Dredged in Panama Bay, in 10-40 feet. "Horizon: Gatun formation."—Pilsbry, *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 83, 1931, p. 431. "*=Corbula ovulata* Sowb." Recent.

Type Locality: Xipixapi [Jipijapa], Ecuador (here designated as type locality). Bay of Caraccas, Ecuador, and Montijo Bay, Panama, also cited originally.

Range: Ballandra Bay in the Gulf of California to Punta Picos, Peru.

Collecting Stations: Mexico: Banderas Bay, beach; Chamela Bay, beach; Tenacatita Bay, beach; Manzanillo (184-D-2), 30 fathoms, gravelly sand; Guatemala: 7 miles west of Champerico (197-D-2), 14 fathoms, mud; El Salvador: La Libertad (198-D-2), 14 fathoms, mud; Nicaragua: Corinto (200-D-20-26), 1.5-6.5 fathoms, mangrove leaves, also on beach; Isla Cardon; Costa Rica: Culebra Bay, beach.

Description: Shell elongately ovate, nearly equivalve, thick, rounded anteriorly, rostrate posteriorly, posterior umbonal ridge present; posterior dorsal area sloping, flattened or slightly excavated; along the dorsal margin a long sloping area is marked off by a carination; valves finely concentrically grooved; color purplish or pink on umbonal area and beaks, distal areas white; interior white, tinged with pink around the margins.

A specimen in the collections of the California Academy of Sciences dredged near Acapulco, Mexico, by the Templeton Crocker Expedition, 1932, measures: length, 24 mm.; height, 14 mm.; Convexity (both valves together), 11.5 mm.

The large size, elongately ovate shape, and purplish-pink color of the umbonal areas and inner margins are characteristic features of this species.

The inner surface of the posterior end of some specimens shows two depressions corresponding to siphonal tubes such as mentioned by Vokes⁷⁷ in some Cretaceous and Eocene species of Aloididae.

Distribution: This species was taken by the expedition at a number of localities from Banderas Bay, Mexico, to Culebra Bay, Costa Rica, on beaches and at depths of 1.5 to 30 fathoms. It also has been recorded as occurring in the Miocene of Peru by Olsson⁷⁸, the Pliocene of Panama and Costa Rica, and in the Pliocene of Ecuador by Pilsbry & Olsson.

⁷⁷ Vokes, H. E., *Amer. Jour. Sci.*, Vol. 242, No. 11, November 1, 1944, p. 619.

⁷⁸ *Corbula (Caryocorbula) ovulata* Sowerby, Olsson, *Bull. Amer. Paleol.*, Vol. 19, Bull. 68, June 30, 1932, p. 140. "Tumbez formation, Que. Tucillal at Zorritos."

***Aloidis (Caryocorbula) porcella* Dall.**

Plate II, Figs. 13 & 15.

Corbula porcella Dall, *Proc. U. S. Nat. Mus.*, Vol. 52, No. 2183, December 27, 1916, p. 415. "Station 2838, off Lower California, in 44 fathoms, mud. The species extends northward to the Santa Barbara Islands, California." [Station 2838=Lat. 28° 12' 00" N., Long. 115° 19' 00" W., in 44 fathoms, green mud].—Dall, *U. S. Nat. Mus., Bull.* 112, 1921, p. 54. Santa Rosa Island, California, to Panama.—I. S. Oldroyd, *Stanford Univ. Publ. Univ. Ser. Geol. Sci.*, Vol. 1, 1924, p. 204. Same records as cited by Dall.

Type Locality: East of Cedros Island, Lat. 28° 12' 00" N., Long. 115° 09' 00" W., off Lower California, in 44 fathoms, green mud.

Range: Santa Rosa Island, California, to Panama (Dall).

Collecting Stations: Mexico: East of Cedros Island (126-D-9, 12, 15), 42-56 fathoms, crushed shell, mud; Costa Rica: off Ballena Bay, Gulf of Nicoya (213-D-11-17), 35-40 fathoms, mud.

Description: Shell small, ashy white, inequivalve, the left valve smaller; inequilateral, the posterior end larger; rounded in front, pointed behind; a prominent angle separates the posterior dorsal area from the rest of the disk; surface concentrically evenly threaded, the threads a little more pronounced on the dorsal area; an obscure almost microscopic radial striation is sometimes apparent; the siphons protrude beyond the rostrum with a dense covering of wrinkled periostracum; interior white, hinge normal, the basal margin of the right valve partly overlapping that of the left valve; pallial sinus obsolete. Length, 8.5; height, 4; diameter, 4.5 mm.; but the shell is often larger. (Original description).

Specimens in the present collection from near the type locality of *Aloidis porcella* agree with Dall's description of that species. There is variation in size; a large specimen measures: length, 7.8 mm.; height, 5.1 mm.; convexity (both valves together), 4.4 mm.

This species is characterized by the rather high, trigonal, convex valves on which the beaks are anteriorly situated, and by the radial striae composed of rows of pustules on the posterior dorsal area as well as, sometimes, on the umbonal area. The pustules, when present on the umbonal area are well developed and rather widely spaced. These features as well as the coarser concentric sculpture easily separate the species from *Aloidis luteola*. The more highly trigonal shell, the shorter posterior end and wider posterior dorsal area are features which serve to separate *A. porcella* from the young of *A. nasuta*. The radial sculpture of *A. porcella* is composed of coarser and more widely spaced pustules than that of the young of *A. nasuta*.

The original illustration of "*Corbula*"

obesa Hinds⁷⁹ represents a small shell similar to the ones here referred to *Aloidis porcella*. No mention was made of radial sculpture in Hind's original description. This character on *A. porcella* is sometimes only faintly developed. Dall, 1921, cited both *A. porcella* and *A. obesa* as ranging from southern California to Panama. It seems possible that the two may be identical or that the species described by Dall may be only a subspecies of *A. obesa*. However, until it is known whether or not radial sculpture is present on Hind's type of *A. obesa* we have considered it advisable to recognize Dall's species as valid. It has already been mentioned under the discussion of *Aloidis nasuta* Sowerby that the shell illustrated by Reeve under the name "*Corbula*" *obesa* is elongate in outline and bears a resemblance to Sowerby's species, *A. nasuta*, rather than to *A. obesa*.

Distribution: This species was dredged by the expedition at three localities near the type locality, east of Cedros Island, off Lower California, in 42-56 fathoms, on a bottom of crushed shell and mud, also in Ballena Bay, Costa Rica, in 35-40 fathoms. It also has been recorded as occurring in the Pleistocene of Magdalena Bay, Lower California. The species cited under the name of "*Corbula fragilis*" from the Pleistocene of Tomales Bay, California, appears to be referable to *Aloidis porcella* or a similar species.

Aloidis (Caryocorbula) ventricosa

Adams & Reeve

Plate II, Figs. 3 & 4.

Corbula ventricosa A. Adams & Reeve, *Zool. Voy. Samarang, Moll.*, August, 1850, p. 83, pl. 23, fig. 12. "Hab. China Sea."—Carpenter, *Rept. Brit. Assoc. Adv. Sci.* for 1856 (issued 1857), pp. 284, 300. Bay of Panama; Gulf of California.

Type Locality: "China Sea" originally cited but this is now believed to be erroneous. Typical specimens have been collected near Acapulco, Mexico.

Range: Gulf of California to Panama.

Collecting Station: Mexico: Tangola-Tangola Bay (196-D-20), 50 fathoms, mud.

Description: Shell subtrigonally-ovate, ventricose, anteriorly rounded, posterior a little the longer, angulated, subtruncated, dirty white, partly covered with a dusky periostracum. (Free translation of original description). "A very dull simple species, peculiar in form." (Adams & Reeve).

In addition to the foregoing description it can be remarked that the shell is somewhat variable. The right valve is a little the larger; a strong posterior umbonal angulation and sometimes anterior to this a low radial depression is present; toward the dorsal margin another but weaker angulation is pres-

⁷⁹ *Corbula obesa* Hinds, *Proc. Zool. Soc. London*, November, 1843, p. 57. "Hab. The west coast of America, between 8° 57' and 21° 32' north latitude, in from twenty-two to thirty-three fathoms, mud; namely, Panama, coast of Veragua, and San Blas."—Hinds, *Zool. Voy. Sulphur, Moll.*, Pt. 3, 1844 [January, 1845 on cover], p. 68, pl. 29, fig. 12. Original locality cited.

ent and between this and the first angulation and also between it and the dorsal margin the shell is sometimes slightly excavated; lunular region excavated but not circumscribed; sculptured with strong somewhat irregular, concentric grooves; exteriorly dirty white partly covered by a dull olive periostracum, the interior white.

The largest specimen in the present collection measures: length, 13.6 mm.; height, 9.8 mm.; convexity (both valves together), 8.2 mm.

A few specimens dredged by the expedition off Tangola-Tangola Bay, west Mexico, are identical with shells in the collections of the California Academy of Sciences which were dredged off west Mexico by the Templeton Crocker expedition in 1932. Carpenter in 1857 cited "*Corbula*" *ventricosa* Adams & Reeve from Panama and the Gulf of California. The original locality for that species given by Adams & Reeve was "China Sea." We have not noticed any citation of that species in recent lists of mollusks found in that general region. It has already been pointed out in the discussion of *Taras sericata* Reeve that several species collected by Belcher and described by Adams & Reeve which were said to come from Oriental waters are now known to occur only in west American waters where Belcher collected during a former expedition. These include the species cited by Adams & Reeve as *Lucina sericata*, *Artemis dunkeri*, *Cytherea virginea* and *Macra thracioides*. These occurrences serve to strengthen the reliability of Carpenter's record of "*Corbula*" *ventricosa* from west American waters, especially when it is realized that Carpenter had access to the types in the British Museum for comparative purposes. These facts together with the fact that our specimens agree well with the original description and illustration of "*Corbula*" *ventricosa* have led us, at least for the present, to identify our shells with the species described by Adams & Reeve.

The species described as *Corbula* (*Cuneocorbula*) *ira* by Dall⁸⁰, from the Gulf of Panama in 182 fathoms, appears to be a similar species. The type was not illustrated. Dall compared his species to "*Corbula*" *knoxiana* Adams⁸¹ from Jamaica which species, he stated, was more elongated and has three instead of two ridges on the dorsal area. The right valve of Dall's species was said to be the smaller while in the present shell the right valve is a little the larger and overlaps the left. The concentric sculpture on Dall's species appears to be more regular and a little more widely spaced. These differences appear to separate the present specimens from Dall's species but the lack of illustration of Dall's type precludes any further opinion as to the relationship of the two.

⁸⁰ *Corbula* (*Cuneocorbula*) *ira* Dall, *Bull. Mus. Comp. Zool.*, Vol. 43, No. 6, October, 1908, p. 423. "U.S.S. 'Albatross,' station 3355, Gulf of Panama, in 182 fathoms, mud, bottom temperature 54.1° F. U.S.N.M. 122,944."

⁸¹ See Dall, W. H., *Bull. Mus. Comp. Zool.*, Vol. 12, No. 6, September, 1886, p. 313, pl. 1, figs. 3, 3a, 3b, 3c. Figures of Adams' type.

Distribution: This species was dredged by the expedition at Tangola-Tangola Bay, Mexico, in 50 fathoms on a muddy bottom. It also was dredged near Acapulco, Mexico, by the Templeton Crocker Expedition in 1932.

Subgenus *Tenuicorbula* Olsson.

Tenuicorbula Olsson, *Bull. Amer. Paleol.*, Vol. 19, Bull. No. 68, June 30, 1932, pp. 3, 136, 141. "Type.—*Corbula tenuis* Sowerby."

Type (by original designation): *Corbula tenuis* Sowerby [*Proc. Zool. Soc. London*, May 17, 1833, p. 36. "Hab. in Americâ Centrali." "One specimen was dredged among sandy mud at a depth of twelve fathoms in the Bay of Montijo."—Reeve, *Conch. Icon.*, Vol. 2, *Corbula*, September, 1843, species 13, pl. 2, fig. 13. Original locality cited. Also described as *Corbula glypta* Li, *Bull. Geol. Soc. China*, Vol. 9, No. 3, October, 1930, p. 264, pl. 5 figs. 38, 38a. Dredged in 10-40 feet in mud at the mouth of the Rio Grande near La Boca about one mile from the mainland in Panama Bay].

Shell usually thin, inequilateral, subequivalve; posterior side contracted, with a strong, cord-like posterior keel, defining the posterior area which is more coarsely sculptured than the rest of the valve surface; a smaller secondary keel in the middle, defines an escutcheon-like area; no lunule; posterior side obliquely truncate and bicarinate at the end; hinge normal with a strong cardinal tooth in right valve, the ligament pit notch-like, small and seemingly passing internally beneath the beaks; in the left valve, a grooved posterior cardinal; external sculpture of fine, concentric threads coarser on the posterior area. (Original description).

Aloidis (*Tenuicorbula*) *fragilis* Hinds.

Corbula fragilis Hinds, *Proc. Zool. Soc. London*, November, 1843, p. 56. "Hab. West coast of Veragua; from eighteen fathoms, mud." "Cab. Belcher."—Reeve, *Conch. Icon.*, Vol. 2, *Corbula*, January, 1844, species 19, pl. 3, fig. 19. Type locality cited.—Hinds, *Zool. Voy. Sulphur*, Moll., Pt. 3, 1844 [January, 1845, on cover of Pt. 3], p. 68, pl. 20, fig. 11. Original locality cited.

Type Locality: West coast of Veragua, Panama, in 18 fathoms, mud.

Range: Gulf of California, to Panama.

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

Description: Shell ovate, thin, white, striated, transverse striae very finely reticulated, anteriorly subproduced, rounded, posteriorly elongated, subrotund at umbos; ventral margin of right valve acute, produced; umbos straight, smooth, equal. Long. 7; lat. 3; alt. 4 lin. (Free translation of original description).

The thin, delicate, subequivalve, ovately diamond-shaped shell and the sculpture consisting of fine reticulate striae are characteristic features of this species.

Distribution: A couple of somewhat worn

specimens dredged by the expedition in Santa Inez Bay in the Gulf of California have been referred questionably to *Aloidis fragilis*. Dall, 1921, reported the species as ranging from Monterey Bay, California, to Panama, but we have not seen specimens from other than tropical or subtropical west American waters. It has been recorded as occurring in the Pleistocene of Magdalena Bay, Lower California, and near Tomales Bay, California, but specimens assigned to this species from those localities in the collections studied by us appear to be referable to *Aloidis porcella* Dall or related species.

FAMILY HIATELLIDAE.

Revisions or lists of the species of the family Hiatellidae [Saxicavidae] have been published by Tryon⁸² and by Lamy.⁸³

Genus *Hiatella* Daudin.

Hiatella Daudin in Bosc, Hist. Nat. des Coquilles, Vol. 3, AN X [1801], p. 120. Species cited: *Hiatella biaperta*, p. 120, pl. 21, fig. 2. "Se trouve sur la côte de Tranquebar" and *Hiatella monoperta*, p. 121, pl. 21, fig. 1. "Se trouve sur les côtes de Tranquebar."—Iredale, Rec. Australian Mus., Vol. 17, No. 9, June 27, 1930, p. 406.—Powell, Shellfish of New Zealand, 1937, p. 61. Type, *Mya arctica* Linnaeus.—Cotton & Godfrey, Handbook of Flora and Fauna of South Australia issued by South Australian branch of Brit. Sci. Guild (Adelaide), 1938, p. 284. "Genotype—*H. arctica* Linné".

Saxicava Fleuriau-Bellevue, Journ. de Physique de Chimie, d'Hist. Nat. et des Arts, Tome 54 (AN X), May, 1802, p. 354. "La saxicave striée, *saxicava striata*". On p. 349, "Quatrième Genre." "Saxicave" and "*Saxicave striée*." "Perce les rochers des côtes de la Rochelle."—Fleurieu-Bellevue, Bull. des Sci. par la Soc. Philomathique (Paris), Tome 3, No. 62, 1802, p. 107. "IV^e. Genre. Saxicave, Saxicava." "Espèce. Saxicave striée."—Children, Quart. Jour. Sci. Lit. and Arts, Vol. 14, 1823, p. 302. Reprint by Kennard, Salisbury & Woodward, Smithsonian. Miscell. Coll., Vol. 82, No. 17 (Publ. 3112), 1931, p. 7. Type indicated as "*S. rugosa* (*Mytilus rugosus* Linn.)."—Dall, Trans. Wagner Free Inst. Sci., Vol. 3, Pt. 4, April, 1898, p. 833. Type, *Mya arctica* Linnaeus.—Lamy, Journ. de Conchyl., Vol. 68, No. 3, 1924, p. 218. Type: *Saxicava striata* Fl.=*Mya arctica* Linnaeus.—Grant & Gale, Mem. San Diego Soc. Nat. Hist., Vol. 1, 1931, p. 427. Type (as designated by Children): *Mytilus rugosus* Linnaeus, 1867.

Didonta Schumacher, Essai Nouv. Syst. Test., 1817, pp. 42, 125, pl. 6, fig. 2 (a, b). Species cited: *Didonta bicarinata* Schumacher, Reference to *Solen minutus* Lin-

naeus, Chemnitz, Neues Syst. Conchyl.-Cab., Bd. 6, 1782, p. 67, Tab. 6, figs. 51, 52. [= *Mya arctica* Linnaeus].

Type (here designated): *Hiatella biaperta* Bosc. [Hist. Nat. des Coq., Vol. 3, AN X [1801], p. 120, pl. 21, fig. 2. "Se trouve sur la côte de Tranquebar." [= *Mya arctica* Linnaeus.].

Shell small, irregular, very inequilateral, the young with a cardinal tooth like *Panomya*, the adult with the teeth obsolete; pallial line discontinuous, siphons naked, slightly separated at the tips and in normal specimens completely retractile, shell burrowing, or nestling in gravel or broken shell, or perforating rocks, corallines, or dead shells like pholads. (Description of *Saxicava* by Dall).

We have used the name *Hiatella* Daudin instead of *Saxicava* Fleuriau de Bellevue because the date of publication of *Hiatella* given by Sherborn and by Iredale indicates that it is the earlier name. Unless a ruling in favor of suspension of the rules of nomenclature is obtained in the present case there appears to be no grounds for rejecting the name *Hiatella*. We have selected *Hiatella biaperta* Bosc, one of the two original species, as the type. Gray, 1847, selected *Solen minutus* as the type but that species was not included in the two species originally cited under *Hiatella*. Lamy and others have placed *Hiatella biaperta* in the synonymy of *H. arctica*. *Saxicava* thus becomes a virtual synonym of *Hiatella*.*

Unless well preserved, the species of *Hiatella* are sometimes difficult to separate due to the shapes assumed by these burrowing or nestling forms.

Hiatella arctica Linnaeus.

Mya arctica Linnaeus, Syst. Nat., ed. 12, 1767, p. 1113. "Habitat in Oceano Norvegico."—Hanley, Ipsa Linn. Conch., 1855, p. 28. Also p. 461.

Solen minutus Linnaeus, Syst. Nat., ed. 12, 1767, p. 1115. "Habitat in O. Norvegico. Martin."—Chemnitz, Neues Syst. Conchyl.-Cab., Bd. 6, 1782, p. 67, pl. 6, figs. 51, 52. Iceland; Greenland; Norway. Shallow and deep water.—Hanley, Ipsa Linn. Conch., 1855, p. 32. Also p. 462.

Hiatella biaperta Bosc, Hist. Nat. Coq., Vol. 3, AN X [1801], p. 120, pl. 21, fig. 2. "Se trouve sur la côte de Tranquebar."

Hiatella monoptera Bosc, Hist. Nat. Coq., Vol. 3, AN X [1801], p. 120, pl. 21, fig. 1. "Se trouve sur les côtes de Tranquebar."

Didonta bicarinata Schumacher, Essai Nouv. Syst. Test., 1817, p. 125, pl. 6, figs. 2a, 2b.

Hiatella arctica Linnaeus, Lamarck, Anim. s. Vert., Vol. 6, 1819, p. 30. "Habite les mers du Nord, dans le sable, et se rencontre parmi les fucus."

Saxicava arctica Linnaeus, Philippi,

⁸² Tryon, Jr., G. W. Catalogue of the Families Saxicavidae, Myidae and Corbulidae. Amer. Jour. Conch., Vol. 4, Pt. 5, ap., May 6, 1869, pp. 59-68. Saxicavidae, pp. 59-60.

⁸³ Lamy, E. Révision des Saxicavidae vivants du Muséum national d'Histoire Naturelle de Paris. Journ. de Conchyl., Vol. 68, No. 3, October, 1924, pp. 218-248; Vol. 68, No. 4, March, 1925, pp. 261-283.

* A paper by Henry Dodge entitled "Hiatella Daudin Versus Saxicava Bellevue" (Nautilus, Vol. 64, No. 1, July, 1950, pp. 29-33), appeared after the present paper was submitted for publication.

Enum. Moll. Sicil., Vol. 1, 1836, p. 20, pl. 3, figs. 3, 3a-d. Sicily. Recent and fossil.—Forbes & Hanley, Hist. Brit. Moll., Vol. 1, 1853 (issued April 1, 1848), p. 141, pl. 6, figs. 4-6. Great Britain. Boreal and Arctic regions of the north Atlantic. Rarely in Mediterranean.—Sowerby, Conch. Icon., Vol. 20, *Saxicava*, 1875, species 1, pl. 1, figs. 1a, 1b, 1c, 1d. Arctic regions, British and North American coasts.—Sars, Bid Kunds. Norges Arkt. Fauna. I. Moll. Reg. Arct. Norvegiae, 1878, p. 95, pl. 20, figs. 8a, 8b, 8c. Norway and Arctic regions.—Clessin, Conchyl.-Cab. Martini-Chemnitz, Bd. 11, Abt. 4a, *Saxicavidae*, 1895, p. 37, pl. 7, figs. 1-3.—Bucquoy, Dautzenberg & Dollfus, Moll. Mar. Roussillon, Vol. 2, Fasc. 11, 1896, p. 589, pl. 86, figs. 1-4; 5-11 (var.). Mediterranean; Atlantic from Norway to the Cape of Good Hope and St. Helena. Japan, Western America, Australia, New Zealand (Smith) [with synonymy].—I. S. Oldroyd, *Stanford Univ. Publ. Univ. Ser. Geol. Sci.*, Vol. 1, 1924, p. 208, pl. 9, fig. 6; pl. 51, fig. 4. Arctic Ocean to Panama. Also Atlantic—Lamy, *Journ. de Conchyl.*, Vol. 68, No. 3, 1924, p. 222. Numerous localities cited.—Grant & Gale, *Mem. San Diego Soc. Nat. Hist.*, Vol. 1, 1931, p. 427. Earlier records cited. Miocene to Recent.

Type Locality: Norwegian seas.

Range: Arctic Ocean to Panama. Also Mediterranean; Atlantic from Norway to the Cape of Good Hope; western Atlantic from the Arctic to the West Indies.

Collecting Stations: Mexico: Port Guatulco (195-D-9), 7 fathoms, gr. sand, crushed shell; Nicaragua: Corinto (200-D-19), 12-13 fathoms, mangrove leaves; Costa Rica: Piedra Blanca Bay (208-D-1, 10), 2-6 fathoms, rocks, sand, algae.

Description: "M. testa striata: valvulis carinis duabus spinulosus; cardine edentulo. Habitat in Oceano Norvegico. *F. Zoega*. Testa magnitudine *Fabae*, rudis, facie *Arcae* noae, pallida. Antice retuso-planiuscula, parte anteriore obtusissima, posteriore brevior, acutiuscula; pars interior a natibus excurrit angulis duobus remotis antrorsum subaculeatis. Cavitas interna lactea est. Cardo vix ullus." (Linnaeus. Original description).

A left valve in the present collection from Costa Rica measures approximately 20 mm. in length and 10 mm. in height.

The shell of *Hiatella arctica* differs from that of *H. pholadiformis* Linnaeus in the more compressed, squarely rectangular shape with the posterior end as wide as the anterior, in the presence of one or two radiating ridges ornamented with scaly spines, in that the beaks are nearer the anterior end, and in the presence of a tooth in the left valve. The posterior end of *H. pholadis* is usually tapering and the hinge is usually without teeth. Sars has given good illustrations showing the hinges of these two species. The foregoing criteria may not always serve to separate the two species but with

shells not extremely irregular and especially on those showing the young stages of growth some of the features mentioned usually serve to separate the two forms.

Hiatella arctica is very similar to *H. rugosa* Linnaeus, a species occurring in the North Atlantic and Mediterranean. According to Bucquoy, Dautzenberg & Dollfus *H. rugosa* lives in shallower water and has no byssus. Other features said to be characteristic of *Hiatella rugosa* are lack of radiating carinations except on the summits of the umbos and the absence of hinge teeth.

Hiatella antarctica Philippi⁸⁴, regarded by some authors as a subspecies of *H. arctica*, is a similar form occurring in the Magellanic and Antarctic regions.

Hiatella hawaiiensis Dall, Bartsch & Rehder⁸⁵, recently described from Hawaii, is said to differ from *H. arctica* in possessing a more rugose shell in which the teeth are virtually lacking.

In addition to *Hiatella arctica*, at least six other species of "*Saxicava*" have been cited as occurring in tropical west American waters. These are *Saxicava pholadis* Linnaeus, *S. purpurascens* Sowerby, *S. solida* Sowerby, *S. tenuis* Sowerby, *S. acuta* De Folin and *S. initialis* De Folin.

Distribution: A few specimens apparently referable to *Hiatella arctica* were collected by the expedition off Mexico, Nicaragua and Costa Rica. It has been recorded from many localities in the Pacific from the Arctic Ocean to Panama and from Miocene to Recent. It also has a wide distribution in the Arctic and Atlantic Ocean.

FAMILY GASTROCHAENIDAE.

A synopsis of the Recent species of this family has been published by Tryon⁸⁶ and a revision of a number of the living species has been published by Lamy⁸⁷. Philippi⁸⁸ and Kühnelt⁸⁹ have made special studies of the anatomy and biology of some of the species in this family.

Dall, 1898, stated that "*Gastrochaena*" extends well into the Mesozoic. The genus has been cited from the upper Cretaceous of

⁸⁴ *Saxicava antarctica* Philippi, *Archiv f. Naturgesch.*, Jahrg. 11, Bd. 1, 1845, p. 51. "Patria: Insulae Chonos infra Chiloe."—Hedley, Australasian Antart. Exped. 1911-1914. *Sci. Repts. Ser. C*, Vol. 4, Pt. 1, November 6, 1916, p. 33, pl. 4, figs. 51, 52, 53. Macquarie Island in the Antarctic.

⁸⁵ *Saxicava hawaiiensis* Dall, Bartsch & Rehder, *Bernice P. Bishop Mus.*, Bull. 153, July 25, 1938, p. 200, pl. 50, figs. 13 and 14. Dredged "on a coral reef, at Fort Armstrong, Oahu, 8-15 feet."

⁸⁶ Tryon, Jr., G. W. Synopsis of the Recent Species of Gastrochaenidae, a Family of Acephalous Mollusca. *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 13, March 31, 1862, pp. 465-494.

⁸⁷ Lamy, E. Révision des Gastrochaenidae vivants du Muséum National d'Histoire Naturelle de Paris. *Journ. de Conchyl.*, Vol. 68, No. 4, March 20, 1925, pp. 284-319. —Notes sur les espèces Lamarckiennes appartenant à la famille des Gastrochaenidae. *Bull. Mus. Nat. d'Hist. Nat. (Paris)*, Vol. 28, 1922, pp. 307-311.

⁸⁸ Philippi, R. A., *Archiv f. Naturgesch.*, Jahrg. 11, Bd. 1, 1845, pp. 185-188, pl. 7, figs. 1-10.

⁸⁹ Kühnelt, W., *Palaeobiol.*, Bd. 5, Lief. 3, 1933, pp. 386-395.

Libya by Quaas⁹⁰ and from California by Packard⁹¹.

Kummelia Stephenson⁹², with the type *Gastrochaena americana* Gabb, has been described from the Rancocas group, Eocene of New Jersey.

Genus *Rocellaria* Blainville.

Rocellaria Blainville, Dict. Sci. Nat. (Levrault), Vol. 57, 1828 (issued January 10, 1829), p. 244. Sole species: *G. modiolina* Lamarck.—Tryon, *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 13, March 31, 1862, p. 477.—Iredale, *Proc. Malacol. Soc. London*, Vol. 11, Pt. 5, 1915, p. 297. "Type (by monotypy): *G. modiolina*, Lamk.=*Mya dubia*, Pennant."—Prashad, Siboga Exped., Monogr. 53c, 1932, Lamell., p. 315. Type, *Rocellaria dubia* Pennant.—Dall, Bartsch & Rehder, *Bernice P. Bishop Mus., Bull.* 153, July 25, 1938, p. 201. "Type: *Gastrochaena modiolina* Lamarck=*Mya dubia* Pennant (by monotypy)."

Type (by monotypy): *Gastrochaena modiolina* Lamarck [Hist. Nat. Anim. s. vert., Vol. 5, July, 1818, p. 447. "Habite près de la Rochelle et sur les côtes d'Angleterre." Reference to *Mya dubia* Pennant, Zool. Brit., Vol. 4, pl. 44, fig. 19, and Encycl. Meth., pl. 219, figs. 3 and 4 "Non bene."—Forbes & Hanley, Hist. Brit. Moll., Vol. 1, 1853 (issued April 1, 1848), p. 132, pl. 2, figs. 5, 6, 7, 8; and (animal) pl. F, fig. 5. Great Britain. (= *Mya dubia* Pennant, Brit. Zool., Vol. 4, 1777, p. 82, pl. 44, fig. 19. Also illustrated by Sowerby, Conch. Icon., Vol. 20, *Gastrochaena*, 1878, pl. 1, figs. 1a-c, and by Sowerby, Thes. Conch., Vol. 5, 1884, p. 127, pl. 470, fig. 2. British and Mediterranean coasts)].

Shell of small to medium size, ovate with the anterior end pointed and with the ventral margin below the point strongly gaping; the shell is moderately thin, inflated and white in color, with the umbones near the anterior end. The surface is covered with strong concentric incremental lines or wrinkles, which are often lamellar. Ligament external, posterior, moderately long. Hinge line rather straight, somewhat thickened, toothless. The interior is white, with a large ovate posterior and a small, ovate anterior muscle scar; the pallial sinus is moderately deep and rather sharply angular. (Dall, Bartsch & Rehder).

Dall, 1898, pointed out that species of this genus form "flask-shaped excavations (chiefly in shells and corals) which are lined with calcareous matter, or when not protected by a burrow, forming a partial or complete shelly tube to which extraneous matter is attached."

The west American shells here included under the genus *Rocellaria* Blainville were by

⁹⁰ *Gastrochaena* sp., Quaas, *Palaeontogr.*, Bd. 30, Th. 2, Lief. 4, November, 1902, p. 232, Tab. 25, figs. 16a, b, 17a, b. Lower Danian (overwegischichten) in Libyschen Wüste.

⁹¹ *Gastrochaena* sp., Packard, *Univ. Calif. Publ. Bull. Dept. Geol. Sci.*, Vol. 13, No. 10, June 30, 1922, p. 428, pl. 31, fig. 1.

⁹² *Kummelia* Stephenson, *Jour. Washington Acad. Sci.*, Vol. 27, No. 2, February 15, 1937, p. 60. See also Stephenson's remarks on *Gastrochaena* and related genera (*Univ. Texas Publ.* No. 4101, October, 1941, pp. 242-244).

earlier authors referred to *Gastrochaena* Spengler. Iredale (1915) has given reasons for accepting *Rocellaria* with the type *Gastrochaena modiolina* Lamarck (= *Mya dubia* Pennant) for shells of this group. The genus *Gastrochaena* Spengler⁹³ with the type *Gastrochaena mumia* Spengler includes shells whose characters differ somewhat from those of *Rocellaria*. This usage of *Gastrochaena* includes *Fistulana* of recent authors.

In western North America "*Gastrochaena*" *dubitata* M. A. Hanna, 1927, has been described from the Eocene and species referable to *Rocellaria* have been recorded in the Pleistocene and Recent.

In eastern North America *Rocellaria* occurs at least as early as the Miocene and perhaps in the Eocene.

Dall, Bartsch & Rehder, 1938, have recently described three new species of this genus from the Hawaiian Islands, *R. hawaiiensis*, *R. kanaka* and *R. oahuana*.

Rocellaria ovata Sowerby.

Plate II, Fig. 2.

Gastrochaena ovata Sowerby, *Proc. Zool. Soc. London*, June 17, 1834, p. 21. "Hab. in Sinu Panamensi (Isle of Perico,) et ad Insulam Platae." "Found in *Spondyli* at the Isle of Perico, and in coral rocks, at a depth of seventeen fathoms, at the island of Plata."—Tryon, *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 13, March 31, 1862, p. 481.—Sowerby, Conch. Icon., Vol. 20, 1878, *Gastrochaena*, species 16, pl. 3, figs. 16a, 16b. "Hab. Panama."—Sowerby, Thes. Conch., Vol. 5, 1884, *Gastrochaena*, p. 128, pl. 470, fig. 9. Panama.—Lamy, *Journ. de Conchyl.*, Vol. 68, No. 4, 1925, p. 304. The Carolinas to the West Indies on the Atlantic coast, and from the Gulf of California to Ecuador on the Pacific coast.

Type Locality: Island of Perico, Bay of Panama, in *Spondyli* (here designated as type locality). Also cited originally from the Island of La Plata, Ecuador, in 17 fathoms, in coral rock.

Range: Scammon Lagoon, Lower California, to the Gulf of California and south to the Island of La Plata, Ecuador. Also in the Atlantic from South Carolina to the West Indies.

Collecting Stations: Mexico: Arena Point, Lower California; Port Guatulco (195-D-15), 1.5 fathoms, coral; Costa Rica: Uvita Bay, in coral heads.

Description: Gast. testâ ovatâ, albicante, longitudinaliter striatâ, striis exilibus, lamellosis, formam marginis semper sequentibus; longitudine lateris antici quintam

⁹³ *Gastrochaena* Spengler, *Nye Saml. K. Danske Vidensk.-Selsk. Skrifter* (Kjøben.), Vol. 2, 1783, p. 179. Species cited include *Gastrochaena mumia*, *G. cuneiformis*, and *G. cymbium*. Iredale, 1915, considered H. & A. Adams (Gen. Rec. Moll., Vol. 2, June, 1856, p. 335) as fixing the type of *Gastrochaena* when they cited *G. mumia* Spengler as an example and stated "The curious shell on which Spengler founded this genus is generally known under the name of *Fistulana clava*, Lamarck; it is also the type of the *Chaena* of Retzius." Stoliczka (*Mem. Geol. Surv. India. Palaeont. Indica*, (Ser. 6, Vol. 3). Cret. Fauna South. India, Vol. 3, 1870, p. XV), definitely designated *Gastrochaena mumia* Spengler as type.

partem testae aequante: long. 1.2, lat. 0.7, alt. 0.7 poll. (Original description).

Ovate, whitish, with concentric striae, which are slender, lamellar, and following the shape of the margin: anterior side quadruple the length of the posterior, and rounded at the extremity: gape very large. 7/10 . . . 1½ [inches]. (Hanley, Cat. Rec. Biv. Shells, 1843, pp. 10-11).

Tryon summarized the criteria useful in separating *Rocellaria ovata* from other similar forms as follows: "The great difference in the relative length of the anterior and posterior sides will readily distinguish this species from *R. brevis*. *R. dubia* has a slight truncation of the posterior margin of the valves, while this species is always rounded posteriorly. The absence of the laminar hinge-plate and the length of the hiatus also separate this shell from both *R. dubia* and *R. hians*."

Rocellaria rotunda Dall⁹⁴ was originally described as a variety of *R. ovata* from the Bowden formation, Jamaica, Miocene. It has also been recorded as occurring in the Miocene of Florida and Costa Rica. Compared to the Recent species *R. ovata*, the fossil form is said to be smaller, thinner, with a more elongate form and a more distinct myophore.

Distribution: A few specimens of this species were taken by the expedition in the Gulf of California, at Port Guatulco, Mexico, and at Uvita Bay, Costa Rica. This is one of the species which occurs both in Pacific and Atlantic waters. Tryon stated, "I have made a very close comparison between specimens from Panama and those from the West Indies and Charleston, without detecting the slightest difference between them."

SUPERFAMILY ADESMACEA.

Key to the genera and subgenera of the Adesmacea.

- A. Anterior margin incised to form approximately a right angle
 - a. Pallets present at siphonal end
 - b. Pallets simple, fork-shaped, or paddle-shaped *Teredo*⁹⁵
 - bb. Pallets compound, feather-like in appearance *Bankia*⁹⁵
 - aa. Pallets absent *Xylophaga*⁹⁵
- B. Anterior margin not forming a definite angle
 - a. With a furrow dividing the shell into roughened anterior and smooth posterior areas
 - b. Anterior gape in adult shell closed by a callum
 - c. Dorsal margin doubled or reflected both anterior and posterior to beaks *Parapholas*
 - cc. Dorsal margin doubled or reflected only anterior to beaks or not at all

- d. With elongate median ventral accessory plate
 - e. Very short, subglobose; inequivalve, callum of left valve overlapping that of right *Jouannetia*
 - f. Two impressed radiating grooves
 - (subgenus)
 - Jouannetia s.s.*⁹⁵
 - ff. One impressed radiating groove
 - (subgenus)
 - Triumphalia*
- ee. Elongate, equivalve
 - Martesia*

- dd. Without ventral accessory plate
 - g. Accessory plate above umbos present . . . (subgenus) *Penitella*⁹⁵
 - gg. Accessory plate above umbos lacking . . . *Pholadidea*⁹⁵

- bb. Anterior gape in adult shell not closed by a callum
 - h. Accessory plates rudimentary or lacking
 - i. Shell large, coarse
 - Zirfaea*⁹⁵
 - ii. Shell small; subglobose; posterior end very short; anterior margin thickened and dentate
 - Navea*⁹⁵
 - hh. Accessory plates well developed
 - j. 2 small accessory plates in front of beaks only; shell very thin; posterior end much produced
 - (subgenus)
 - Nettastomella*⁹⁵
 - jj. 1 large acces-

⁹⁴ For references to this species see Gardner, J., U. S. Geol. Surv., Prof. Paper 142-E, 1928, p. 238.

⁹⁵ Not represented in the present collection.

s o r y
plate in
front of
beaks
and 1
narrow
plate
back of
beaks

*Hiata*⁹⁵

aa. Without a furrow; callum lacking

k. Reflected margin of shell divided into two layers which are separated by about 12 vertical partitions *Pholas*⁹⁵

kk. Reflected margin of shell undivided *Barnea*

FAMILY PHOLADIDAE.

Important papers dealing with this family have been published by Tryon⁹⁶ and Lamy.⁹⁷

Genus *Barnea* Leach.

Barnea pacifica Stearns.

Pholas pacifica Stearns, Conch. Memoranda, No. 7, August 28, 1871, p. 1. Republished in *Proc. Calif. Acad. Sci.*, Vol. 5, May, 1873, p. 81, pl. 1, figs. 6, 6a, 6b, 6c. "Habitat.—Alameda, San Francisco Bay, California, where in some places it is common in sandy mud between tide marks."

Barnea pacifica Stearns, I. S. Oldroyd, *Stanford Univ. Publ. Univ. Ser. Geol. Sci.*, Vol. 1, 1924, p. 209, pl. 21, figs. 2, 3, 4. (Copy of Stearns' illustrations). San Francisco Bay to Lower California.

Type Locality: Alameda, San Francisco Bay, California, in sandy mud between tide marks.

Range: San Francisco Bay, California, to Peru.

Collecting Station: Nicaragua: Corinto (200-D-19), 12-13 fathoms, mangrove leaves.

Description: A small right valve 19.5 mm. in length appears referable to this species. The dorsal and ventral margins are subparallel. It is ornamented with fine radial and concentric sculpture which, where the two cross, form fine scaly projections on the anterior ventral area. The anterior end is subangulate, the anterior ventral margin obliquely truncated; the posterior end is truncated, slightly rounded above, broadly so below.

The anterior end of the present specimen is less pointed than that of young specimens of *Barnea pacifica* in the Henry Hemphill collection in the California Academy of Sciences. This feature, perhaps, may vary in a series of specimens.

⁹⁵ Not represented in the present collection.

⁹⁶ Tryon, Jr., G. W. On the Classification and Synonymy of the Recent species of Pholadidae. *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 14, 1862, pp. 191-221. See also Dall, W. H., *Trans. Wagner Free Inst. Sci.*, Vol. 3, Pt. 4, April, 1898, pp. 814-823.

⁹⁷ Lamy, E. Révision des Pholadidae vivants du Muséum National d'Histoire Naturelle de Paris. *Journ. de Conchyl.*, Vol. 69, No. 1, July 5, 1925, pp. 19-51; Vol. 69, No. 2, October 10, 1925, pp. 79-103; Vol. 69, No. 3, January 31, 1926, pp. 136-168, 3 figs. in text; Vol. 69, No. 4, May 15, 1926, pp. 193-222.

Lamy placed *Barnea pacifica* in the synonymy of *B. spathulata* Deshayes,⁹⁸ a species originally described from Chile. We have not seen specimens from Chile but judging from the illustration, it appears that the posterior end of *B. spathulata* is a little more rounded than that of *B. pacifica*. We are uncertain whether or not Stearns' species, described from San Francisco Bay, California, is identical with *B. spathulata* and we have therefore referred the present specimens to *B. pacifica*. Olsson⁹⁹ cited *B. pacifica* from Peru and Gigoux¹⁰⁰ cited it from Chile.

According to the original description of *Barnea subtruncata* Sowerby,¹⁰¹ that species is very close to *S. parva* Pennant, a north European species. The anterior end of *B. parva* is much more attenuated and the posterior end is more tapering and rounded than that of the present specimen. The type of *B. subtruncata* has not been illustrated but the illustration of *B. lamellosa* d'Orbigny,¹⁰² a form placed by Dall¹⁰³ in the synonymy of *B. subtruncata* and considered by Lamy to be a subspecies of *B. subtruncata*, does bear a strong resemblance to *B. parva*.

Distribution: A single small valve of this species was dredged by the expedition at Corinto, Nicaragua, in 12-13 fathoms.

Genus *Jouannetia* des Moulins.

A systematic review of a number of species of the genus *Jouannetia*, especially fossil forms, has been published by Sieverts.¹⁰⁴

Subgenus *Triumphalia* Sowerby.

Jouannetia (Triumphalia) pectinata Conrad.

Plate II, Fig. 6.

Pholadopsis pectinata Conrad, *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 4, 1849, p. 156. [No locality cited but the shells described were "from the coasts of Lower California and Peru."].—Conrad, *Jour. Acad. Nat. Sci. Philadelphia*, Ser. 2, Vol. 1, January, 1850, p. 279, pl. 39, fig. 3. Original localities cited.

⁹⁸ *Pholas spathulata* Deshayes, *Mag. de Zool.*, Guérin-Menev., Vol. 5, Moll., 1843, pl. 79, p. 1 [two figs.]. "Habite les mers du Chili."

Not *Pholas spathulata* Sowerby, *Proc. Zool. Soc. London* for 1849, p. 162 (issued between January and June, 1850). "From New Zealand." Renamed *Pholadidea suteri* by Lamy, 1925.

Barnea (Cyrtopleura) spathulata Deshayes, Lamy, *Journ. de Conchyl.*, Vol. 69, No. 2, 1925, p. 89. Payta, Peru; Chile.

⁹⁹ Olsson, A. A., *Nautilus*, Vol. 37, No. 4, 1924, p. 130. Paíta and Lobitos, Peru.

¹⁰⁰ Gigoux, E. E., *Rev. Chilensis Hist. Nat.*, Vol. 38, 1934, p. 285. Atacama, Chile.

¹⁰¹ *Pholas subtruncata* Sowerby, *Proc. Zool. Soc. London*, November 25, 1834, p. 69. "Hab. ad Insulam Platae, Columbiæ Occidentalis." "Found in soft stone at a depth of seventeen fathoms. Very like our British *Pholas parva*." See also *Barnea (Anchomas) subtruncata* Sowerby, Lamy, *Journ. de Conchyl.*, Vol. 69, No. 2, 1925, p. 82.

¹⁰² *Pholas lamellosa* d'Orbigny, *Voy. Amér. Mérid.*, Vol. 5, Moll., 1846, p. 498, pl. 77, figs. 20, 21 . . . "sur toute la côte de Patagonie, au sud du Rio Negro, au niveau des marées ordinaires de vives eaux. Elle se creuse un trou dans les couches de grès friable et de calcaires."

¹⁰³ Dall, W. H., *Proc. U. S. Nat. Mus.*, Vol. 37, 1909, p. 276.

¹⁰⁴ Sieverts, H. Beiträge zur Paläontologie des Ostindischen Archipels. IX. *Jouannetia cumingi* (Sowerby) aus dem Pliocän von Timor. Nebst Bemerkungen über andere Arten dieser Gattung. *Neues Jahrb. f. Min. Geol. und Paläo.*, Beil. Bd. 71, Abt. B, Heft 2, 1933, pp. 267-302, 2 text-figs.

Triumphalia pulcherrima Sowerby, *Proc. Zool. Soc. London* for 1849, p. 161, pl. 5, figs. 2, 2a, b, c, d, (issued between January and June, 1850). "Found in soft stone at low water at West Colombia; Cuming."—Sowerby, *Thes. Conch.*, Vol. 2, 1849, p. 501, pl. 106, figs. 58, 59. Original locality cited.

Jouannetia pulcherrima Sowerby, Chenu, *Man. de Conchyl.*, Vol. 2, 1862, p. 8, fig. 37.

Pholas pulcherrima Sowerby, Sowerby, *Conch. Icon.*, Vol. 18, *Pholas*, August, 1872, species 44, pl. 11, fig. 44. Original locality cited.

Jouannetia (Triumphalia) pectinata Conrad, Lamy, *Journ. de Conchyl.*, Vol. 69, No. 4, 1926, p. 219. Acapulco, Mexico.

Type Locality: East coast of Lower California (here designated as type locality). Exact locality not cited originally but the shells described were "from the coasts of Lower California and Peru." Of *Triumphalia pulcherrima*, West Colombia.

Range: Acapulco, Mexico, to Peru.

Collecting Station: Costa Rica: Port Parker.

Description: Ovate, very thin and fragile, profoundly gaping posteriorly; profoundly ventricose anteriorly; valves with elevated waved laminae terminating near a profound sinus, which extends from beak to base; right valve undulated near the posterior end, reflected, margin pectinated; both valves have concentric lines. (Original description).

A right valve in the present collection measures approximately: length, 29 mm.; height (incomplete), 21 mm.; convexity (one valve, incomplete), 10 mm.

The concentric sculpture on the posterior portion of a left valve in the present collection is crossed by faint radiating lines. Radial sculpture is not present on the corresponding area of the right valve. However, the present specimens are not perfectly preserved. The posterior margins of the valves show traces of the pectinated sculpture mentioned by Conrad as present on the shell of this species.

Distribution: Two single valves of this species were collected by the expedition at Port Parker, Costa Rica.

Genus *Parapholas* Conrad.

Parapholas calva Gray in Sowerby.

Pholas calva Gray MS., Sowerby, *Proc. Zool. Soc. London*, November 25, 1834, p. 69. "Hab. ad Sinum Panamæ." "Found in *Spondyli*, at a depth of twelve fathoms, at the Isle of Perico in the Bay of Panama: the young shells have also been taken out of hard stones at low water in the same place."—Sowerby, *Thes. Conch.*, Vol. 2, 1849, p. 493, pl. 105, figs. 51-53. "Collected by Mr. Cuming in very hard stone at low water, in Panamá Bay."—Sowerby, *Conch. Icon.*, Vol. 18, *Pholas*, March, 1872, species 20, pl. 5, fig. 20. [Same locality record as in preceding reference].

Parapholas bisulcata Conrad, *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 4, 1849, p. 156. [No exact locality cited but shells were de-

scribed "from the coasts of Lower California and Peru"].—Conrad, *Jour. Acad. Nat. Sci. Philadelphia*, Ser. 2, Vol. 1, 1850, p. 279, pl. 39, fig. 5. [Not fig. 4]. Original localities cited.

Martesia calva Sowerby, Chenu, *Man. de Conchyl.*, Vol. 2, 1862, p. 9, figs. 45, 46, 47.

Parapholas calva Sowerby, Lamy, *Compt. Rend. Congress Soc. Savantes*, Paris, 1924, p. 248. Panama.—Lamy, *Journ. de Conchyl.*, Vol. 69, No. 3, 1926, p. 165.

Type Locality: Island of Perico in the Bay of Panama, in 12 fathoms, in *Spondylus*.

Range: Corinto, Nicaragua, to Panama. Probably to Peru.

Collecting Station: Nicaragua: Corinto (200-D-19), 12-13 fathoms, mangrove leaves.

Description: A right valve in the present collection, approximately 25 mm. long, appears to be referable to *Parapholas calva*. The imperfect preservation and lack of dorsal plates leaves positive identification of the specimen open to doubt but the shape and ornamentation agree more nearly with this than with any other species. The narrow tapering posterior end is rounded and not sharply acuminate like that of *P. acuminata* Sowerby.¹⁰⁵ A variety, *Parapholas calva* var. *nana*¹⁰⁶ Sowerby, also was described from Panama.

Distribution: A single small and somewhat worn valve here referred to *Parapholas calva* was dredged by the expedition at Corinto, Nicaragua, in 12-13 fathoms.

Genus *Martesia* Leach.

Key to the species of *Martesia*.

A. Sculpture on anterior area fine; dorsal plate projects deeply between valves

intercalata

B. Sculpture on anterior area moderately coarse; dorsal plate not projecting deeply between valves *curta*

Martesia curta Sowerby.

Pholas curta Sowerby, *Proc. Zool. Soc. London*, November 25, 1834, p. 71. "Hab. ad littora Columbiae Occidentalis." "From the Isle of Lions, Province of Veragua, in soft stone at low water."—Sowerby, *Thes. Conch.*, Vol. 2, 1849, p. 494, pl. 104, figs. 33, 34; pl. 108, fig. 105. Fig. 105 from a specimen in the British Museum. The others from "... in soft stone at low water on the coast of West Colombia, by Mr. Cuming."—Sowerby, *Conch. Icon.*, Vol. 18, *Pholas*, March, 1872, species 16, pl. 5, figs. 16a, 16b. [Same locality as in preceding reference].

Martesia curta Sowerby, Dall, *Proc. U. S.*

¹⁰⁵ *Pholas acuminata* Sowerby, *Proc. Zool. Soc. London*, November 25, 1834, p. 70. "Hab. ad Panamam." "Found in limestone at low water."—Sowerby, *Thes. Conch.*, Vol. 2, 1849, p. 492, pl. 105, figs. 48, 49, 50. Original locality cited. —Sowerby, *Conch. Icon.*, Vol. 18, *Pholas*, March, 1872, species 19, pl. 5, fig. 19. Original locality cited.

Parapholas acuminata Sowerby, Lamy, *Journ. de Conchyl.*, Vol. 69, No. 3, 1926, p. 163. Paita, Peru. [Not the records from California].

¹⁰⁶ *Pholas calva* var. *nana* Sowerby, *Proc. Zool. Soc. London*, November 25, 1834, p. 70. "Hab. ad Panamam." "Found in hard stones at low water." See also Lamy, *Journ. de Conchyl.*, Vol. 69, No. 3, 1926, p. 166. Panama,

Nat. Mus., Vol. 37, 1909, pp. 161, 277. Gulf of Panama, to Tumbes, Peru. Also Atlantic and Antilles.—Lamy, *Journ. de Conchyl.*, Vol. 69, No. 4, 1926, p. 208. United States.

Type Locality: Island of Lions, Veragua, Panama, at low water, in soft stone.

Range: Magdalena Bay, Lower California, to Tumbes, Peru. Also Atlantic and Antilles (Dall).

Collecting Station: Nicaragua: Corinto (200-D-19), 12-13 fathoms, mangrove leaves.

Description: Shell elongately ovate, with a callum, rounded and ventricose anteriorly, tapering posteriorly and rounded at the end; valves divided into two areas of sculpture by a grooved band, anterior portion sculptured with concentric ridges crossed by radiating striae, posterior area with well developed concentric sculpture which becomes obsolete posteriorly; an accessory plate present anterior to the beaks; periostracum thin, light olive green.

A very small right valve about 6 mm. in length agrees well in shape and sculpture with adult specimens of *Martesia curta*. A specimen of this species in the collections of the California Academy of Sciences, collected by Mr. W. D. Clark at Tabor Island, Chame Bay, Panama, measures: length, 31 mm.; height, 15.5 mm.; convexity (both valves together), 14.5 mm.

Distribution: Only a single small valve, here assigned to this species, was dredged by the expedition in 12-13 fathoms off Corinto, Nicaragua.

***Martesia intercalata* Carpenter.**

Martesia intercalata Carpenter, Cat. Mazatlan Shells, August, 1855, p. 13. "Hab.—Mazatlan; in *Spondylus Lamarckii* [= *S. calcifer*, see p. 547], extremely rare; Havre Col."—Lamy, *Journ. de Conchyl.*, Vol. 69, No. 4, 1926, p. 209. Original record cited.—

Schenck, *Jour. Paleo.*, Vol. 18, No. 5, 1945, p. 519, pl. 66, figs. 17, 18. Magdalena Bay, Lower California, Mexico.

Type Locality: Mazatlan, Mexico, in *Spondylus calcifer*.

Range: Mazatlan, Mexico, to Panama.

Collecting Station: Nicaragua: Corinto (200-D-19), 12-13 fathoms, mangrove leaves.

Description: A left valve 14.5 mm. in length in the present collection is assigned to *Martesia intercalata*. The sculpture on the anterior portion of the valve is very fine and the concentric sculpture on the posterior portion is weak. A small portion of what appears to have been the umbonal shield is attached to the umbo. Carpenter stated: "The species is named from the remarkable way in which the umbonal shield pushes itself in anteriorly between the projecting portions of the closed valves; and in which the cup, which pouts out from the otherwise rounded extremity, pushes itself in between the anterior and posterior plates, cleaving them and thrusting them back".

The sculpture on the anterior end of the present specimen is finer than that on *Martesia curta* Sowerby. This sculpture is similar to that shown in the illustration of *Hiata infelix* McLean & Zetek¹⁰⁷ but that shell is said to completely lack a callum. M. Smith¹⁰⁸, 1944, placed *H. infelix* in the family Terebidae.

Distribution: A single left valve here assigned to *Martesia intercalata* was dredged in 12-13 fathoms at Corinto, Nicaragua. Similar specimens in the Henry Hemphill Collection in the California Academy of Sciences were secured at Panama by Newcomb.

¹⁰⁷ *Hiata infelix* McLean & Zetek, *Nautilus*, Vol. 49, No. 4, April, 1936, p. 111, pl. 8, figs. 1-4. "Balboa, Canal Zone."

¹⁰⁸ Smith, M., Panamic Mar. Shells (Trop. Photogr. Lab., Winter Park, Florida), 1944, p. 69, fig. 885.

EXPLANATION OF THE PLATES.

PLATE I.

- Fig. 1. *Tagelus (Tagelus) californianus* Conrad. Hypotype, left valve from Loc. 4506 (C.A.S. H. Hemphill Coll.), San Diego, California. Length, 111.6 mm.; height, 30 mm. P. 222.
- Fig. 2. *Solen pfeifferi* Dunker. Hypotype, left valve, from Station 200-D-10, Corinto, Nicaragua, Lat. 12° 27' 46" N., Long. 87° 11' 32" W., dredged in 7 fathoms (12.8 meters). Length, 34.1 mm.; height, 7.1 mm. P. 226.
- Fig. 3. *Solen crockeri* Hertlein & Strong, sp. nov. Holotype, left valve, from Station 199-D-3, Monypenny Point, Nicaragua, in the Gulf of Fonseca, Lat. 13° 03' N., Long. 87° 30' W., dredged in 6 fathoms (11 meters). Length, 38.8 mm.; height, 10.5 mm. P. 225.
- Fig. 4. *Tagelus (Tagelus) violascens* Carpenter. Hypotype (Stanford Univ. Coll.), left valve, from Salina Cruz, Oaxaca, Mexico; H. N. Lowe Coll. Length, 85 mm.; height, 30 mm. P. 223.
- Fig. 5. *Solen crockeri* Hertlein & Strong, sp. nov. Holotype, right valve of the specimen shown in Fig. 3.
- Fig. 6. *Tagelus (Tagelus) violascens* Carpenter. Hypotype, left valve. View of the exterior of the specimen shown in Fig. 4.
- Fig. 7. *Solen crockeri* Hertlein & Strong, sp. nov. Holotype, right valve. View of the interior of the specimen shown in Fig. 5.
- Fig. 8. *Tagelus (Mesopleura) politus* Carpenter. Hypotype, left valve, from Loc. 28186 (C.A.S.), Kino Bay, Sonora, Mexico, in the Gulf of California; H. N. Lowe Coll. Length 33.8 mm.; height, 10.8 mm. P. 224.
- Fig. 9. *Tagelus (Tagelus) affinis* C. B. Adams. Hypotype, left valve, from Loc. 24061 (C.A.S.), Bay of Panama; F. M. Anderson Coll. Length, 58 mm.; height, 20.6 mm. P. 222.
- Fig. 10. *Tagelus (Mesopleura) politus* Carpenter. Hypotype, left valve, from the same locality as the specimen shown in Fig. 8. Length, 35.1 mm.; height, 12.4 mm.
- Fig. 11. *Tagelus (Tagelus) affinis* C. B. Adams. Hypotype, left valve. View of the exterior of the specimen shown in Fig. 9.
- Fig. 12. *Tagelus (Mesopleura) subteres* Conrad. Hypotype, left valve, from Loc. 4509 (C.A.S. H. Hemphill Coll.), San Diego, California. Length, 39.8 mm.; height, 13.4 mm. P. 225.

Fig. 13. *Tagelus (Mesopleura) subteres* Conrad. Hypotype, left valve, from the same locality as the specimen shown in Fig. 12. Length, 45.6 mm.; height, 14.2 mm. P. 225.

Fig. 14. *Tellina (Scrobiculina) viridotincta* Carpenter. Hypotype, right valve, from Loc. 23811 (C.A.S.), Gulf of California. Length, 59.6 mm.; height, 43.3 mm.

This species was discussed in *Zoologica*, New York Zool. Soc., Vol. 34, No. 9, p. 66.

Fig. 15. *Tellina (Phyllodella) insculpta* Hanley. Hypotype, right valve, from Station 197-D-2, 7 miles west of Champerico, Guatemala, Lat. 14° 13' N., Long. 92° 02' W., dredged in 14 fathoms (25 meters). Length, 34.6 mm.; height, 18.7 mm.

This species was discussed in *Zoologica*, New York Zool. Soc., Vol. 34, No. 9, p. 87.

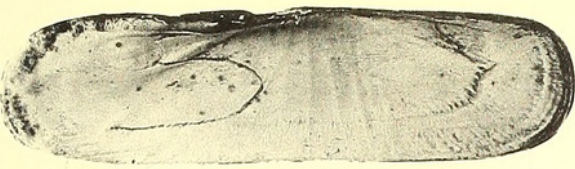
All the specimens illustrated on this plate except that shown in Figures 4 and 6 are in the type collection of the Department of Paleontology of the California Academy of Sciences.

PLATE II.

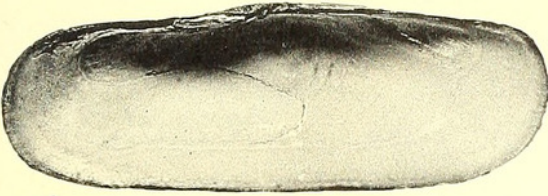
- Fig. 1. *Aloidis (Caryocorbula) nuciformis* Sowerby. Hypotype, left valve, from Loc. 27570 (C.A.S.), dredged between the Gulf of Tehuantepec and Acapulco, Mexico; Templeton Crocker Exped., 1932. Length, 9.9 mm.; height, 8 mm. P. 241.
- Fig. 2. *Rocellaria ovata* Sowerby. Hypotype, right valve, from Uvita Bay, Costa Rica. Length, 10 mm.; height, 4.8 mm. P. 246.
- Fig. 3. *Aloidis (Caryocorbula) ventricosa* Adams & Reeve. Hypotype, right valve, from the same locality as the specimen shown in Fig. 1. Length, 12.2 mm.; height, 9.2 mm. P. 242.
- Fig. 4. *Aloidis (Caryocorbula) ventricosa* Adams & Reeve. Hypotype, left valve, from the same locality as the specimen shown in Fig. 1. Length, 13.5 mm.; height, 9.4 mm. P. 242.
- Fig. 5. *Sanguinolaria purpurea* Deshayes. Hypotype, left valve, from Station 135-D-25, San Lucas Bay, Lower California, Mexico, Lat. 22° 53' N., Long. 109° 54' W., dredged in 7 fathoms (13 meters). Length, 34 mm.; height, 20.9 mm. P. 219.

- Fig. 6. *Jouannetia (Triumphalia) pectinata* Conrad. Hypotype, right valve, from Port Parker, Costa Rica. Length, 29 mm.; height, 21 mm. P. 248.
- Fig. 7. *Tellina (Eurytellina) eburnea* Hanley. Hypotype, right valve, from Station 197-D-2, 7 miles west of Champerico, Guatemala, Lat. 14° 13' N., Long. 92° 02' W., dredged in 14 fathoms (25 meters). Length, 26.5 mm.; height, 17.5 mm.
This species was discussed in *Zoologica*, New York Zool. Soc., Vol. 34, No. 9, p. 73.
- Fig. 8. *Sanguinolaria purpurea* Deshayes. Hypotype left valve. View of the interior of the specimen shown in Fig. 5.
- Fig. 9. *Aloidis (Caryocorbula) nasuta* Sowerby. Hypotype, from Loc. 27584 (C.A.S.), about 10 miles due east of San Jose del Cabo, Lower California, Mexico, Lat. 23° 03' to 23° 06' N., Long. 109° 31' to 109° 36' W., dredged in 20-220 fathoms; Templeton Crocker Exped., 1932. Length, 12.1 mm.; height, 7 mm. View showing left valve and a portion of the right valve. P. 240.
- Fig. 10. *Gari regularis* Carpenter. Hypotype, right valve, from Loc. 24074 (C.A.S.), off Cerralbo Island, Gulf of California (between Cerralbo Island and Arena Point, Lower California); F. Baker Coll. Length, 46.3 mm.; height, 25.0 mm. P. 218.
- Fig. 11. *Aloidis (Caryocorbula) ovulata* Sowerby. Hypotype, left valve, from Loc. 27572 (C.A.S.), a few miles south of Acapulco, Mexico, dredged in 15-20 fathoms; Templeton Crocker Exped., 1932. Length, 23.6 mm.; height, 13 mm. P. 241.
- Fig. 12. *Mactra (Mactrotoma) nasuta* Gould. Hypotype, left valve, from Loc. 24062 (C.A.S.), San Lucas Bay, Lower California, Mexico. Length, 66.5 mm.; height, 48.6 mm. P. 229.
- Fig. 13. *Aloidis (Caryocorbula) porcella* Dall. Hypotype, right valve, from Station 126-D-12, east of Cedros Island, off the west coast of Lower California, Mexico, Lat. 28° 20' N., Long. 115° 10' 30" W., dredged in 45 fathoms (82 meters). Length, 6.1 mm.; height, 4.3 mm. P. 242.
- Fig. 14. *Mactra (Micromactra) angusta* Reeve. Hypotype, right valve, from Station 198-D-1, La Libertad, El Salvador, Lat. 13° 27' 20" N., Long. 89° 19' 20" W., dredged in 13 fathoms (24 meters). Length, 33.8 mm.; height, 21.6 mm. View of the interior.
- Fig. 15. *Aloidis (Caryocorbula) porcella* Dall. Hypotype, right valve, from the same locality as the specimen shown in Fig. 13. Length, 7 mm.; height, 4.9 mm. View showing radial rows of pustules on posterior area. P. 242.
- Fig. 16. *Mactra (Micromactra) fonsecana* Hertlein & Strong, sp. nov. Holotype, left valve, from Potosi and Monypenny Point, Nicaragua, in the Gulf of Fonseca. Length, 53.2 mm.; height, 34.5 mm. View of the interior. P. 232.
- Fig. 17. *Aloidis (Caryocorbula) marmorata* Hinds. Hypotype, left valve, from Station 195-D-9, Port Guatulco, Mexico, Lat. 15° 44' 28" N., Long. 96° 07' 51" W., dredged in 7 fathoms (12.6 meters). Length, 7.0 mm.; height, 4.7 mm.
- Fig. 18. *Mactra (Micromactra) angusta* Reeve. Hypotype, right valve. View of the exterior of the specimen shown in Fig. 14.
- Fig. 19. *Mactra (Micromactra) fonsecana* Hertlein & Strong, sp. nov. Holotype. View of the interior of the right valve of the specimen shown in Fig. 16.
- Fig. 20. *Mactra (Micromactra) fonsecana* Hertlein & Strong, sp. nov. Holotype. View of the exterior of the specimen shown in Fig. 19.

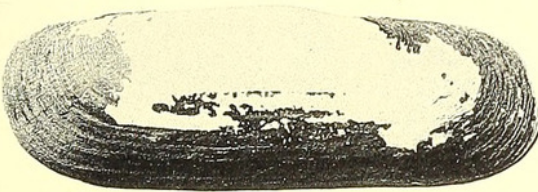
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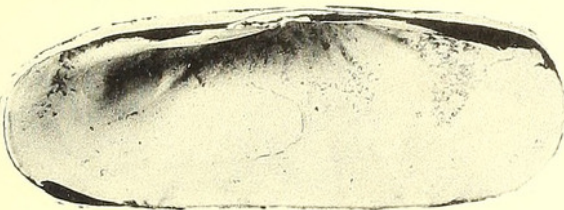
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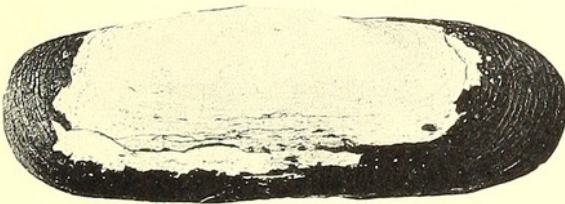
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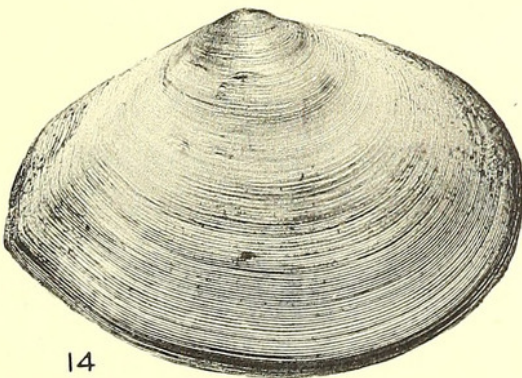
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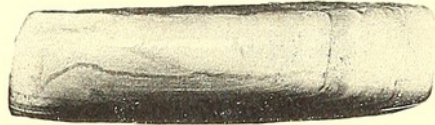
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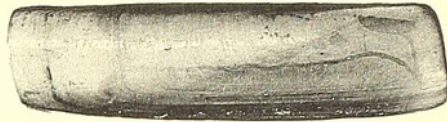
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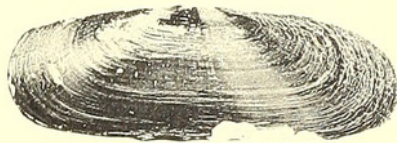
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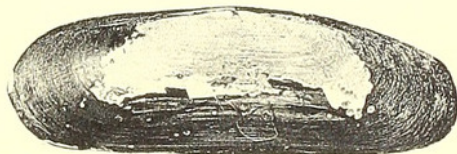
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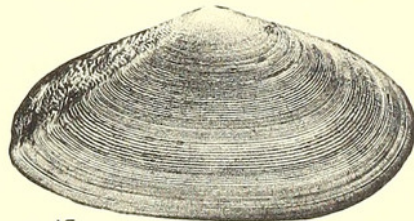
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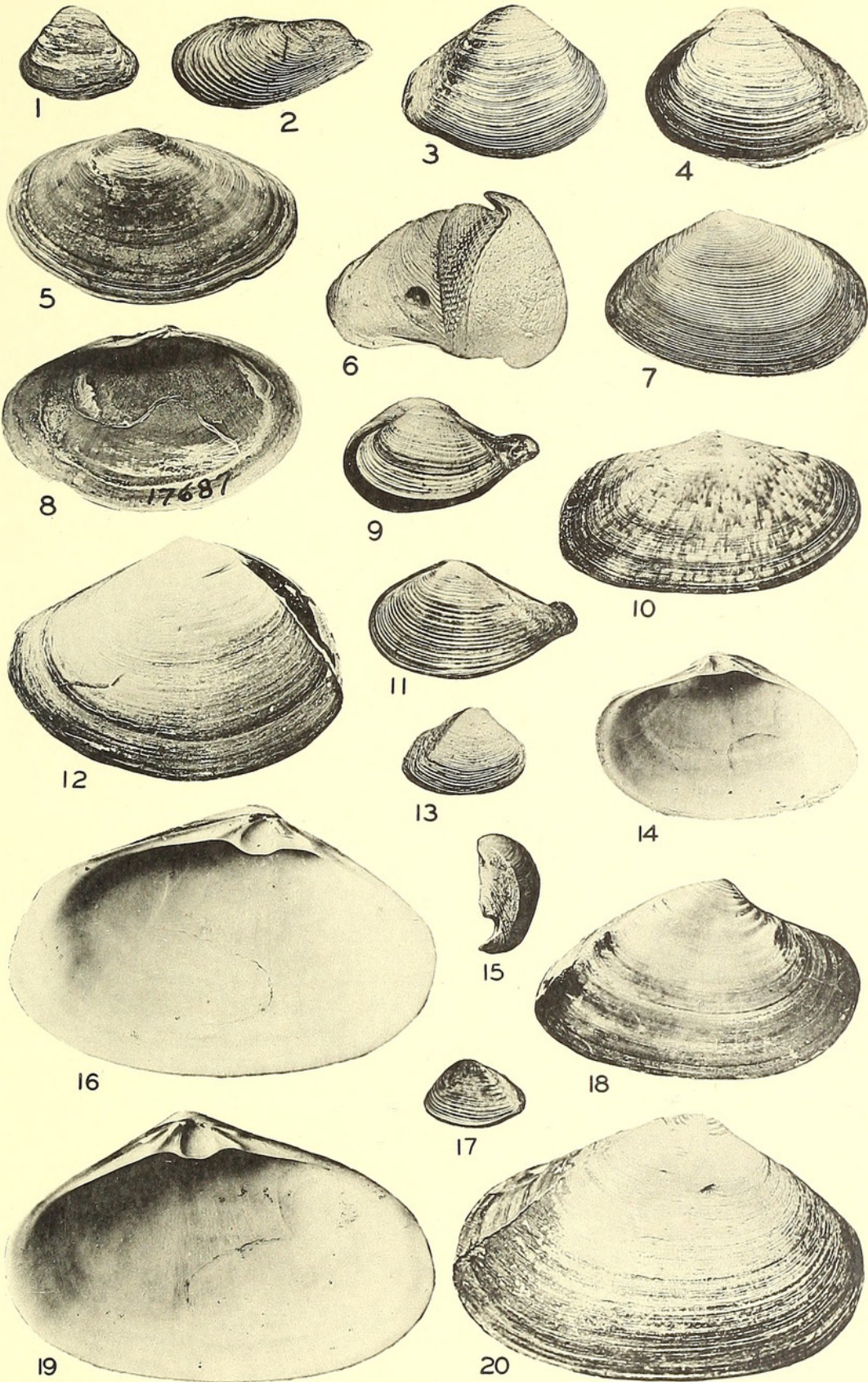
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