The West American Marginellidae

BY

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(Plates 48 to 51; 5 Text figures)

INTRODUCTION

THE GENERIC NAMES of the Marginellidae were recently outlined by COAN (1965) in preparation for the treatment of the family in the *Treatise on Invertebrate Paleontology*. At the time of that study, we began a survey of the West American Pleistocene and Recent species. COAN (*l. c.*) included a brief, preliminary account of our thoughts on the classification of these forms, with the opinion that our final analysis would probably differ significantly. This has proved to be the case.

Generic and suprageneric allocations for the West Coast species discussed in this report are based on the above-mentioned review. In that paper, the genus *Kogomea* HABE, 1951, was used for certain of our species for the first time; we continue that usage and introduce to West American literature the generic name *Volvarinella* HABE, 1951. References to the original descriptions of genera may be found in COAN (1965), while references to most of their type species may be located through the reviews of TOMLIN (1917 and 1919). References to all other species discussed in this report are included in the literature cited.

Because most of the previously published records of the marginellids on this coast are unreliable – owing to many misinterpretations of the species – we have based our range reports almost entirely on material we have actually examined. We have inspected over 950 lots of marginellids, including all in the following collections:

Stanford University, Paleontology Division
California Academy of Sciences, Department of Geology
United States National Museum, Division of Mollusks
Santa Barbara Museum of Natural History
San Diego Natural History Museum
Los Angeles County Museum, Departments of Invertebrate Paleontology and Invertebrate Zoology
The Allan Hancock Foundation, University of Southern California
and the private collections of Dr. S. Stillman Berry, Mr. and Mrs. Crawford N. Cate, Eugene Coan, Mr. George P. Kanakoff, Mr. James H. McLean, Barry Roth, Dr. Donald R. Shasky, and Mr. Allyn G. Smith.

Various other persons loaned us individual lots from their collections. Dr. Myra Keen examined, on our behalf, the material in the Mollusca Section of the British Museum (Natural History) and that in the Academy of Natural Sciences of Philadelphia. Dr. Ruth Turner examined some lots in the Museum of Comparative Zoology, Harvard University.

In the course of this research, we discovered a new species of *Persicula* in material at the California Academy of Sciences and at the Los Angeles County Museum. Because the commentary we wished to make about it was too long to fit into the present format, we published its description in an earlier article (COAN & ROTH, 1965). The other undescribed forms which came to light during our study were available in such small numbers that they are not formally named, but are mentioned (and two are illustrated) in order to alert collectors and workers. They should not be named until adequate material is available.

We now recognize about 22 species of Marginellidae in the Eastern Pacific, but this number will probably increase to as many as 25 when the Panamic and Peruvian faunal provinces are better known. Table 1 lists the genera and summarizes the information presently available about them.

We compare many of the West American forms to Caribbean species, as most of the West Coast Marginel-

lidae seem to have arrived through the once-submerged Central American area from their probable point of origin in the Eocene Tethys Sea of Eurasia. Many Caribbean forms are closely related to West American species; in a few cases, the same species has been reported on both sides of Central America. The Pacific Ocean islands have few marginellids, and seem not to have contributed to the West American fauna. There is, however, the possibility of migrants from Japan and China around the North Pacific, especially with regard to members of the genera of the Cystiscinae.

We have included brief synonymies, listing original descriptions, first illustrations, and other papers that have contributed new information to our knowledge of the species in question. Measurements of type material are given, first in millimeters, then in the units originally utilized.

We have omitted mention of several species reported from the Eastern Pacific in error and of two species described without locality data which Tomlin (1917) incorrectly synonymizes with West American forms.

Reviewing the West American Marginellidae has been far more difficult than we anticipated when we began. Virtually every species has posed one or more problems, some of which we could solve by studying the type specimens. (Illustrations of two of Mörch's types have been provided through the courtesy of the Zoological Museum of the University of Copenhagen. Illustrations of most of Mörch's West American types, including these two, will be published by Dr. Myra Keen of Stanford University.) Many forms are rare, however, and pose questions that must remain open until more material becomes available. By illustrating type specimens, many for the first time, we believe we have provided a good foundation for further work on this family.

KEY TO THE WEST AMERICAN MARGINELLIDAE

This key is intended for use in identifying mature, relatively unworn specimens. A mature specimen is recognizable by its thickened outer lip. A magnifying glass or a binocular dissecting microscope is necessary to identify the small members of the subfamily Cystiscinae. The key is only partly dichotomous and consists of a part leading to the genera followed by separate keys to identify the species of the genera.

Table 1

Quaternary Species of West American Marginellidae, Data summarized by Genera

name	number of species	geographic range	geologic range	bathymetric range meters
Marginellinae				
Marginella (Prunum)	5	Guatemala to Chile	Plio. to Recent	Intertidal to 60
Persicula	5 (6?)	So. Baja Calif. to Ecuador; Galapagos Islands	Plio. to Recent	Intertidal to 80
Volvarina (Volvarina)	2	So. Calif. to Costa Rica; Galapagos Islands	Low. Pleist. to Recent	Intertidal to 40
Volvarinella	1	Galapagos Islands	Recent only	80 to 1300
Cystiscinae				
Cystiscus	4	Central Calif. to So. Baja California	Low. Pleist. to Recent	Intertidal to 60
Kogomea (Kogomea)	3	Central Calif. to Ecuador; Galapagos Islands	Low. Pleist. to Recent	Intertidal to 120
Cypraeolina	1	Alaska to Panama	Low. Pleist. to Recent	Intertidal to 110 (? to 1700)
Total:	21 (22?)			

Abbreviations:
Calif. = California
Low. = Lower
Pleist. = Pleistocene
Plio. = Pliocene
So. = Southern

1. Spire high, a little less than half of total length .... *Volvarinella eremus*
- Spire low to absent 2
2. Aperture with a distinct anterior notch, visible from dorsal (back) view 3
- Anterior end of aperture rounded 4
3. Shell medium-sized, over 6 mm long, colored ..... *Persicula*
- Shell small to minute, less than 6 mm long, white .... *Kogomea*
4. Shell small to medium-sized but over 6 mm long, usually colored 5
- Shell minute to small, less than 6 mm long, white 6
5. Shell more than 10 mm long, globose to ovate-elongate .... *Marginella (Prunum)*
- Shell less than 10 mm long, cylindrical .... *Volvarina taeniolata*
6. Outer lip denticulate within, posterior end of outer lip covering spire ..... *Cypraeolina margaritula*
- Outer lip smooth within, spire low, but not covered by outer lip ..... *Cystiscus*

Persicula

1. Shell unicolored (may have faint darker banding anteriorly) ..... *Persicula hilli*
- Shell with a distinct pattern 2
2. Pattern of evenly-spaced, spiral color lines ... *Persicula bandera*
- Pattern of rows of rectangular spots ..... *Persicula porcellana*
- Pattern of horseshoe-shaped markings ..... *Persicula phrygia*
- Pattern of wavy axial lines ..... *Persicula "frumentum"*
- Pattern of spiral rows of short dashes ..... *Persicula imbricata*

Kogomea

1. Spire rounded, outer lip sometimes with obscure denticles; Costa Rica to Ecuador ..... *Kogomea minor*
- Spire slightly elevated 2
2. Outer lip smooth within; San Pedro to Costa Rica .... *Kogomea polita*
- Outer lip with denticles; Monterey to Cabo San Lucas .. .. *Kogomea subtrigona*

Marginella (Prunum)

1. Shell pure white, globose ... *Marginella (Prunum) albuminosa*
- Shell colored, ovate to ovate-elongate 2
2. Shell with brown spiral banding .. *Marginella (P.) woodbridgei*
- Shell without distinct banding 3
3. Shell elongate-ovate (length usually more than 1.8 times width), outer lip smooth .....*Marginella (P.) sapotilla*
- Shell ovate, length usually less than 1.8 times width 4
4. Outer lip with teeth ..... *Marginella (P.)* sp.
- Outer lip smooth ..... *Marginella (P.) curta*

Volvarina taeniolata

1. Shell tinged pink; Galapagos Islands .. *Volvarina taeniolata rosa*
- Shell not pink; California to Costa Rica .... *Volvarina taeniolata taeniolata*

Cystiscus

1. Shell ovate, length no more than 1.7 times width, spire low .. 2

Explanation of Plate 48

Figure 1. *Marginella (Prunum) sapotilla* HINDS. Lectotype, British Museum (Natural History). Panama. x 1.3 (ventral view) [MK]

Figures 2, 3. *Marginella (Prunum) sapotilla.* Hypotype, SUPTC 9839, Balboa Yacht Club, sandbar, Balboa, Canal Zone, Panama, coll. by Mr. Beil, Feb. 1954, x 2.0 (ventral and dorsal views) [JM]

Figure 4. *Marginella (Prunum) curta* SOWERBY, Hypotype, BM (NH), Paita, Peru, d'Orbigny collection, x 1 (?) (ventral view) [MK]

Figures 5, 6. *Marginella (Prunum) curta,* Hypotype, CASGTC 12748, CAS Loc. 36671, Paita, Peru, coll. by Don L. Frizzell, 1937-1938, x 2.1 (ventral and dorsal views) [MK]

Figures 7, 8. *Marginella (Prunum)* sp. Hypotype, CASGTC 12749, CAS Loc. 27557, off Puntarenas, Costa Rica, x 2.1 (ventral and dorsal views) [MK]

Figures 9, 10. *Marginella (Prunum) woodbridgei* HERTLEIN & STRONG, Holotype, CASGTC 7253, CAS Loc. 29042, San José, Guatemala, x 1.8 (ventral and dorsal views) [LGH]

Figure 11. *Marginella (Prunum) albuminosa* DALL. Holotype. USNM 101068, "West Mexico," x 1.1 (ventral view) [USNM]

Figures 12, 13. *Persicula porcellana* (GMELIN), CHEMNITZ (1788), figures 1419 and 1420, Spengler collection, x 1 (?) (ventral and dorsal views) [COPIES]

Figures 14, 15. *Persicula porcellana,* Neotype of *Voluta porcellana* GMELIN and Lectotype of *Marginella tessellata* LAMARCK, Mus. Hist. Nat. Geneva. Lamarckian collection, no locality given in original, x 2.4 (ventral and dorsal views) [EB-PM]

Figures 16, 17. *Persicula porcellana.* Hypotype, SUPTC 9840, Isla Coiba, Panama, coll. by James Zetek, x 2.8 (ventral and dorsal views) [JM]

Figure 18. *Persicula imbricata* (HINDS). Lectotype (in center) and 2 paralectotypes, BM (NH), Acapulco, Guerrero, Mexico. x 1.3 [MK]

Figures 19, 20. *Persicula imbricata.* Holotype (?) of *Marginella vautieri* BERNARDI. Loc. unknown, BERNARDI (1853: figs. 13, 14). x 2 (ventral and dorsal views) [COPIES]

Abbreviations in Plate Explanations

ANSP – Academy of Natural Sciences, Philadelphia, lot no.
BM (NH) – British Museum (Natural History)
CAS Loc. – California Academy of Sciences Locality no.
CASGTC – California Academy of Sciences Geology Type Collection no.
[COPIES] – original illustrations reproduced by photocopy machine
[EB-PM] – photographs courtesy of Dr. Eugene Binder, processed by Mr. Perfecto Mary
[JM] – photograph(s) by Mr. James H. McLean
[KVWP] – photograph(s) courtesy of Dr. Katherine Van Winkle Palmer
LACM – Los Angeles County Museum, type lot no.
[LGH] – photographs courtesy of Dr. Leo G. Hertlein

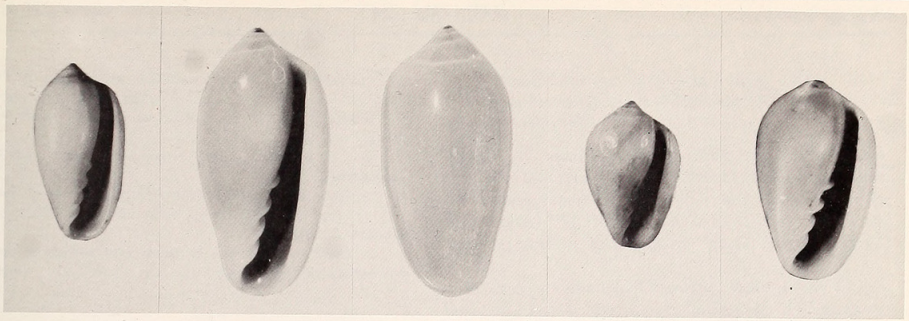

Figure 1 Figure 2 Figure 3 Figure 4 Figure 5

Figure 6 Figure 7 Figure 8 Figure 9 Figure 10

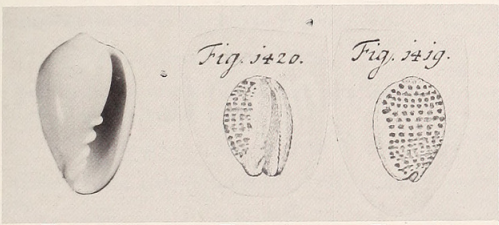

Figure 11 Figure 12 Figure 13

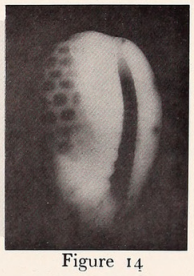

Figure 14

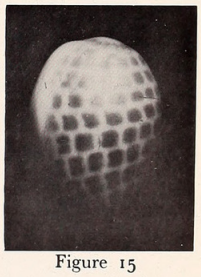

Figure 15

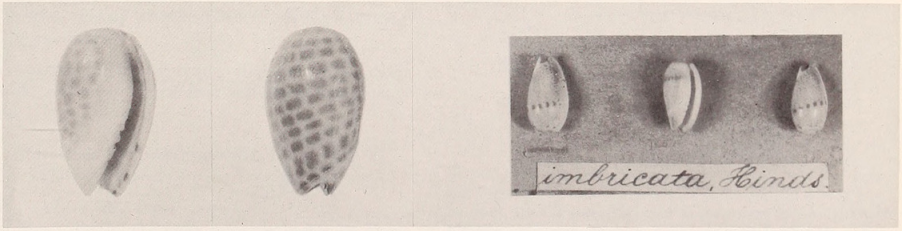

Figure 16 Figure 17 Figure 18

- Shell elongate, almost cylindrical, length twice width or more, spire slightly elevated 3
2. Shell thick; Monterey to Pacific coast of Baja California ..... *Cystiscus jewettii*
- Shell thin, translucent; southern Gulf of California .... *Cystiscus sp.*
3. Outer lip most thickened posterior to center of aperture; Santa Barbara to Cabo San Lucas (common) .... *Cystiscus politulus*
- Outer lip thickest near center of aperture; San Diego .. (rare) ..... *Cystiscus myrmecoon*

Volutacea

Marginellidae Fleming, 1828

Shells medium-sized to minute; spire absent to variable in height; surface smooth, highly polished in most; white or brightly colored; sculpture wanting or limited to axial plications on shoulder; aperture normally narrow, but sometimes flaring; outer lip thickened in most, smooth, dentate, or even serrate; anterior canal variable in depth; columella with about four folds, mainly on anterior half, but often grading into denticles posteriorly. Operculum wanting. Foot of animal large; siphon long, without modifications; tentacles variable in length; eyes on bases of tentacles; extended mantle covering most of shell; proboscis extensible. Radula reduced to a single rachidian plate, either flat or arched, with few to many cusps; cusps somewhat variable in size; Eocene to Recent.

Marginellinae Fleming, 1828

Shells medium-sized to small; radular tooth with fewer than 50 cusps; usually brightly colored.

Marginella Lamarck, 1799

Type species: *Voluta glabella* Linnaeus, 1758; monotypy.

Spire medium to low, outer lip smooth or denticulate.

(Prunum) Herrmannsen, 1852

Type species: *Voluta prunum* Gmelin, 1791; monotypy and tautonymy.

Spire present but low; aperture relatively narrow; outer lip thick, smooth or denticulate within; anterior notch shallow.

Marginella (Prunum) sapotilla Hinds, 1844
(Plate 48; Figures 1 to 3; Text figure 1)

Marginella sapotilla Hinds, 1844a: 74
—, Hinds, 1844b: 45 (species 185); plt. 13, figs. 10, 11
—, Dall, 1909: 211
—, Keen, 1958: 434; fig. 671 (after Hinds, 1844b)
Marginella evax Li, 1930: 270-271; plt. 7, fig. 58
—, Pilsbry, 1931: 433

Types: *M. sapotilla* – British Museum (Natural History). The lectotype we have selected is illustrated here. This leaves 2 paralectotypes on either side of it on the card labeled "M. C., Panama, 5-13 f. sandy mud" and three on another card labeled "M. C. Panama, H. C.; *M.* n. sp."

M. evax – Columbia University, Paleontology Collection, no. 22118. We hereby designate the specimen illustrated by Li (1930) as lectotype. This leaves 40 paralectotypes, not 5 as implied by Pilsbry (1931). One of these specimens is a mature adult of only 16.5 mm in length.

Type localities: *M. sapotilla* – Panama, 5 to 13 fms., on sandy mud.

M. evax – Panama Bay, about one mile off mouth of Panama Canal, on mud, 10 to 40 feet; collected by Donald F. MacDonald in 1907.

Sizes: *M. sapotilla* – 23.3 mm [11 lines] long (given by Hinds, 1844a). Our lectotype is 25 mm long (measured by Dr. Keen).

M. evax – 27 mm long and 13 mm wide (given by Li). We measured it as 28.2 mm long and 13.8 mm wide.

Diagnosis: Shell medium-sized, elongate-ovate; ashy-yellow, sometimes with very faint spiral banding; tinged with dull orange on outside of outer lip and along anterior margin; spire moderately elevated; aperture narrow, brown within; outer lip moderately thickened by white callus, smooth within; translucent to white callus restricted to a small patch on inner lip a little posterior from center; columella with four oblique, nearly-parallel folds.

Range and Ecology: Bahía Honda to Bella Vista, Panama, probably as far south as Ecuador, but Dall's (1909) record from Peru is probably of the next species. It is found intertidally to 60 meters on mud bottoms. Olsson

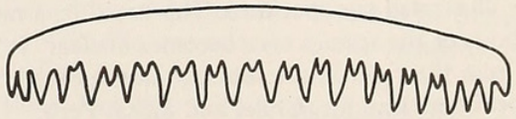

Figure 1
Rachidian radular plate of *Marginella (Prunum) sapotilla* Hinds. Hypotype, Calif. Acad. Sci. Invert. Zool. no. 233 (Type Slide Series no. 301), Isla Otoque, Bahía de Panama, 10 m, coll. by James H. McLean and Eugene Bergeron, June 1965, x 60 (each plate is about 0.8 mm across)

(1942) has reported this form from the Pliocene and Pleistocene of Panama. We have examined 23 lots.

Discussion: *Marginella sapotilla* has a very close Caribbean analogue, *M. prunum* (GMELIN, 1791), type of the subgenus *Prunum*. It differs from this species in being more solid and cylindrical and in having a narrower aperture. In addition, the outer lip of the Caribbean form is more produced posteriorly. There have been reports of *M. sapotilla* from the West Coast as *M. prunum* and as *M. caerulescens* LAMARCK, 1822, a synonym of the latter.

Marginella (P.) godini OLSSON, 1964 (p. 133, plt. 23, figs. 10, 10a), described from the Esmeraldas Formation (probably Pliocene) at Quebrada Camarones, Ecuador, is very similar to *M. sapotilla* but was described as having a more elevated spire and a body whorl more contracted at its base. These characteristics, however, appear in some live-collected specimens.

Illustrations: Lectotype of *M. sapotilla* – Plate 48, Figure 1.

Hypotype, Stanford Univ., SUPTC no. 9839 – Plate 48, Figures 2-3 (from Stanford general collection, lot no. 47804).

Rachidian radular plate, Calif. Acad. Sci. Dept. Invert. Zool., hypotype no. 233 (Type Slide Series no. 301) – Text figure 1.

Marginella (Prunum) curta SOWERBY, 1832

(Plate 48; Figures 4 to 6)

Marginella curta SOWERBY, 1832: 105
—, KIENER, 1834: 12-13 (species 15); plt. 7, fig. 30
—, DALL, 1909: 211
—, OLSSON, 1924: 123
—, KEEN, 1958: 434; fig. 670 (from Berry coll., taken at Paita, Peru; not from Stanford coll. as stated on p. 552)

Types: On two recent trips to the British Museum (Natural History), Dr. Myra Keen was unable to locate specimens from either type locality. The types are apparently lost. There are, however, 7 specimens on one card in the British Museum from d'Orbigny material from which we have illustrated one specimen. This could be a neotype if the status of the species ever becomes unclear. It is the second from the right in the top row on the card.

Type localities: Iquique, Chile, and Paita, Peru.

Size: 20.3 mm [.8 poll.] long and 11.4 mm [.45 poll.] wide (given by SOWERBY).

Diagnosis: Shell medium-sized, ovate, narrower anteriorly; ashy yellow, with faint spiral banding; tinged with dull orange on outside of outer lip and along anterior margin; spire low; aperture fairly narrow, wider anteriorly, brown within; outer lip thickened by a white callus. especially near middle of aperture, smooth within; translucent to white callus on inner lip, sometimes forming a pad near the shoulder of the whorl; columella with four diverging folds, the most posterior nearly perpendicular to aperture; base of columella flattened.

Range and Ecology: Manta, Ecuador, to Iquique, Chile, but possibly as far north as southern Panama. DALL (1909) reported this species from the Gulf of California, probably in error; there are no specimens in the National Museum collection from farther north than Peru. Found from 2 to 20 meters, on sand. We have examined 27 lots.

Discussion: *Marginella curta* is shorter than *M. sapotilla*, the callousing around the aperture is heavier, and the columellar folds splay out to a greater degree on the body whorl. The base of the columella is slightly flattened, while it is not in *M. sapotilla*.

Marginella cincta KIENER, 1834 (p. 21; plt. 8, fig. 32) appears to be a Caribbean analogue, although it was described from an unknown location. We have seen specimens attributable to this species from the east coast of Mexico and OLSSON & MCGINTY (1958) have reported it from the east coast of Panama. *Marginella curta* differs from *M. cincta* in having a wider aperture anteriorly and in not having the outer lip produced to as great a degree posteriorly.

Marginella curta is also similar to *M. incrassata* NELSON, 1870, reported and figured from the Miocene of northern Peru (OLSSON, 1932) and reported from the Pliocene of western Ecuador (PILSBRY & OLSSON, 1941).

Illustrations: Hypotype, British Museum (Natural History) – Plate 48, Figure 4.

Hypotype, Calif. Acad. Sci., CASGTC no. 12748 – Plate 48, Figures 5-6.

Marginella (Prunum) sp.

(Plate 48; Figures 7 to 8)

Among our notes on *Marginella (Prunum) curta* in the collections we examined was mention of one lot in the California Academy of Sciences from Costa Rica. Seeking to verify this apparent range extension, we borrowed the two specimens comprising the lot. Upon reexamination, these proved to be something very different. We have illustrated the more complete of the two specimens.

Locality: CAS loc. 27557, dredged "just off" Puntarenas, Costa Rica, "hauls 1R and 3R," 1 July 1932, Templeton-Crocker Expedition of the California Academy of Sciences. The data for the dredge hauls made during this day of the expedition are incomplete as to exact latitude and longitude. These specimens probably came from only

one of the two mentioned hauls, but we cannot be sure which one. Dr. Leo G. Hertlein was able to find out that the last of three dredge hauls was made by 11:30 a. m. and that the expedition was at 10° 03′ N latitude by 12:00 noon. This means that these specimens are from somewhere along the route of the expedition on the morning of 1 July, between Puntarenas in the Golfo de Nicoya, around the Peninsula de Nicoya, and north to the latitude mentioned on the outer coast of the peninsula.

Size: The figured specimen is 18.2 mm long and 12.1 mm wide. The unfigured specimen is 18.7 mm long, but is too broken for us to measure its width.

Diagnosis: Shell medium-sized, broadly ovate, narrower anteriorly; pale brownish-orange, with white callus; spire slightly elevated; aperture narrow, even, white within, with a deep posterior canal; outer lip greatly thickened with callus, which also extends up alongside spire; inner margin of outer lip finely denticulate along its entire length, most evident anteriorly; inner lip with a thick, lumpy callus which extends well onto body whorl; columella with four folds of equal size, diverging as they pass onto body whorl.

Discussion: The chief differences of this species from *Marginella (Prunum) curta* are as follows:

Table 2

	M. (P.) curta	*M. (P.)* sp.
Aperture:	wide, widest at base	narrow, even
Outer lip:	moderately thickened, smooth	very thick, finely toothed
Outline:	shoulder posterior of center, length (our hypotype) 1.6 x width	shoulder near center, length 1.5 x width
Callus on inner lip:	smooth, thin (except posterior pad)	lumpy, thick

The specimens are dead and badly worn, and, although they were dredged, it is possible that they are fossils. For this reason, we hesitate to give the form a name, as there are similar species reported from the Miocene and Pliocene of the Caribbean area. These are discussed by Woodring (1928: 238-239). For instance, such a form is illustrated as "*Marginella coniformis* Sowerby, 1850," from the Gatun Formation on the Isthmus of Panama by Brown & Pilsbry (1911); the anterior end of the outer lip of the present specimens seems to be more sinuate than that in the shell illustrated by these authors.

Future collecting in the area will probably show whether these specimens represent a living species or are from an off-shore Miocene or Pliocene outcrop.

Our placement of this species in the subgenus *Prunum* is provisional only. Because of its denticulate outer lip it approaches *Euryentome* Cossman, 1899, but the type species of that subgenus has a deep anterior canal. The presence or absence of denticulation on the outer lip does not seem to be of great taxonomic significance in this family, so we feel its allocation to *Prunum* is probably best. There are members of the latter subgenus in the Caribbean which resemble the present species in the narrowness of the aperture.

Illustrations: Hypotype, Calif. Acad. Sci., CASGTC no. 12749 – Plate 48, Figures 7-8 (Unfigured specimen: CASGTC no. 12750).

Marginella (Prunum) woodbridgei
Hertlein & Strong, 1951

(Plate 48; Figures 9 to 10)

Marginella woodbridgei Hertlein & Strong, 1951: 80; plt. 26, figs. 3, 4
—, Keen, 1958: 434; fig. 672 (specimen from Berry coll.)

Types: Holotype, Calif. Acad. Sci., CASGTC no. 7253; paratype, CASGTC no. 7254.

Type Locality: CAS loc. no. 29042, San José, Guatemala; collected by Woodbridge Williams in April, 1937.

Size: 12.5 mm long and 7.2 mm wide (holotype, as given by Hertlein & Strong).

Diagnosis: Shell small, ovate; slate colored, with two poorly-defined narrow darker bands; apex orange with traces of same color on outside of outer lip, along sutures, and between the white columellar folds; spire low, sutures edged with white; aperture narrow, brown within; outer lip thickened with white callus, smooth within; columella with four parallel, sharply-descending folds.

Range: This species has been collected only at San José, Guatemala at a depth of 23 m. We have seen 8 lots.

Discussion: Hertlein & Strong suggest that *M. storeria* Couthouy, 1837, may be a Caribbean analogue. Another related form from the same area seems to be *M. apicina* Menke, 1828. We are unsure of the relation between these two East Coast species.

Illustrations: Holotype – Plate 48, Figures 9-10.

Marginella (Prunum) albuminosa Dall, 1919

(Plate 48; Figure 11)

Marginella albuminosa Dall, 1919: 306-307
—, Keen, 1958: 433; fig. 668 (holotype)

Type: USNM no. 101068 (unique holotype).
Type Locality: "West Mexico, received from Prof. Alfred Dugès."
Size: 27 mm long and 14 mm wide (holotype, as given by DALL).
Diagnosis: Shell medium-sized, broadly ovate, thin for its size; creamy white; slightly yellow on spire, on base of columella, and outside of outer lip; spire low; aperture wide, white within; outer lip with a narrow thickening, smooth within; columella with four oblique, widely-spaced folds.
Discussion: The outer lip is thinner and the aperture wider than in either *M. sapotilla* or *M. curta*.

The species has not been reported since its description and may belong in some other geographic province.
Illustration: Holotype – Plate 48, Figure 11.

Persicula SCHUMACHER, 1817

Type species: *Persicula variabilis* SCHUMACHER, 1817 (= *Voluta persicula* LINNAEUS, 1758); monotypy.

Shell medium-sized to small; spire low, usually concealed; outer lip usually denticulate; aperture narrow, curved, with a notch at its anterior end.

No West Coast forms closely resemble *Persicula persicula* (LINNAEUS, 1758), the West African type species of the genus. Because of the gradation among the members of this genus from forms resembling *P. persicula* to forms resembling *P. interruptolineata* (MEGERLE, 1816), type (by monotypy) of *Rabicea* GRAY, 1857, COAN (1965) considered the latter genus to be synonymous with *Persicula*. We have followed that synonymy, but consider our species to be closer to the *Rabicea* end of the spectrum.

Persicula porcellana (GMELIN, 1791)

(Plate 48; Figures 12 to 17)

Voluta porcellana GMELIN, 1791: 3449 (species 139)
Marginella porcellana (GMELIN), REEVE, 1864: plt. 13, figs. 53 a, 53 b
Persicula porcellana (GMELIN), KEEN, 1958: 436; fig. 680 (after KIENER, 1834)
Marginella tessellata LAMARCK, 1822: 361-362 (species 24)
—, KIENER, 1834: 24 (species 33); plt. 5, fig. 20

Types: *Persicula porcellana* – GMELIN (1791) cites CHEMNITZ (1788, vol. 10; plt. 150, figs. 1419 and 1420). We reproduce both of these figures here. When Dr. Myra Keen was at the University of Copenhagen in 1965, she made an attempt to find the specimen from the Spengler collection upon which was based the Chemnitz illustrations. A label was present, but persistent searching failed to produce the specimen which originally went with the label. Thus, the specimen seems to be lost.

When we studied the Chemnitz figures, we considered the possibility that the specimen might have been a

Explanation of Plate 49

Figures 21, 22. *Persicula imbricata*. Holotype of *P. dubiosa* DALL, USNM 56775, Acapulco, Guerrero, Mexico, x 4.1 (ventral and dorsal views) [ventral - JM; dorsal - MK]

Figures 23, 24. *Persicula imbricata*. Holotype of *P. adamsiana* PILSBRY & LOWE, ANSP 155338, Bahía Montijo, Panama, x 3.6 (ventral and dorsal views) [RR]

Figures 25a-c. *Persicula imbricata*. 3 Hypotypes, SUPTC 9842, Puerto Guatulco, Oaxaca, Mexico, x 2.6 (ventral view) [MK]

Figures 26, 27. *Persicula imbricata*. Hypotype. SUPTC 9843, Acapulco, Guerrero, Mexico, coll. by Ralph Arnold, x 3.1 (ventral and dorsal views) [JM]

Figures 28, 29. *Persicula imbricata*. Hypotype. CASGTC 12751, CAS Loc. 27202, Acapulco, Guerrero, Mexico, beaches and shallow dredgings, coll. by Leo G. Hertlein, 1931, x 7.1 (ventral and dorsal views) [MK]

Figures 30, 31. *Persicula imbricata*. Hypotype, CASGTC 12752, CAS Loc. 27217, Tenacatita, Jalisco, Mexico, beach on the north side of bay, coll. by Leo G. Hertlein, 10-11 December 1931, x 3, (ventral and dorsal views) [MK]

Figures 32, 33. *Persicula imbricata*. Hypotype. CASGTC 12753, CAS Loc. 29042, San José, Guatemala, 20-30m, coll. by Woodbridge Williams, April 1937, x 3 (ventral and dorsal views) [MK]

Figures 34, 35. *Persicula interruptolineata* (MEGERLE, 1816). MEGERLE's original figures, x 3.4 (ventral and dorsal views) [COPIES]

Figures 36, 37. *Persicula interruptolineata*. Hypotype. SUPTC 9841, Bahía Santa Marta, Colombia, Caribbean coast, coll. by C. E. Baker, x 3.3 (ventral and dorsal views) [JM]

[MK] – photograph(s) by Dr. A. Myra Keen
[NMW] – photographs courtesy of National Museum of Wales
[PM] – photograph(s) by Mr. Perfecto Mary
[RR] – photographs by Dr. Robert Robertson
[RT] – photograph courtesy of Dr. Ruth D. Turner
SUPTC – Stanford University Paleontology Type Collection
USNM – United States National Museum, Division of Mollusks, collection
[USNM] – photogaph courtesy of USNM, Division of Mollusks
[ZMUC] – photograph courtesy of Zoological Museum, University of Copenhagen

- Shell elongate, almost cylindrical, length twice width or more, spire slightly elevated 3
2. Shell thick; Monterey to Pacific coast of Baja California ..... *Cystiscus jewettii*
- Shell thin, translucent; southern Gulf of California .... *Cystiscus sp.*
3. Outer lip most thickened posterior to center of aperture; Santa Barbara to Cabo San Lucas (common) .... *Cystiscus politulus*
- Outer lip thickest near center of aperture; San Diego .. (rare) ..... *Cystiscus myrmecoon*

Volutacea

Marginellidae Fleming, 1828

Shells medium-sized to minute; spire absent to variable in height; surface smooth, highly polished in most; white or brightly colored; sculpture wanting or limited to axial plications on shoulder; aperture normally narrow, but sometimes flaring; outer lip thickened in most, smooth, dentate, or even serrate; anterior canal variable in depth; columella with about four folds, mainly on anterior half, but often grading into denticles posteriorly. Operculum wanting. Foot of animal large; siphon long, without modifications; tentacles variable in length; eyes on bases of tentacles; extended mantle covering most of shell; proboscis extensible. Radula reduced to a single rachidian plate, either flat or arched, with few to many cusps; cusps somewhat variable in size; Eocene to Recent.

Marginellinae Fleming, 1828

Shells medium-sized to small; radular tooth with fewer than 50 cusps; usually brightly colored.

Marginella Lamarck, 1799

Type species: *Voluta glabella* Linnaeus, 1758; monotypy.

Spire medium to low, outer lip smooth or denticulate.

(Prunum) Herrmannsen, 1852

Type species: *Voluta prunum* Gmelin, 1791; monotypy and tautonymy.

Spire present but low; aperture relatively narrow; outer lip thick, smooth or denticulate within; anterior notch shallow.

Marginella (Prunum) sapotilla Hinds, 1844
(Plate 48; Figures 1 to 3; Text figure 1)

Marginella sapotilla Hinds, 1844a: 74
—, Hinds, 1844b: 45 (species 185); plt. 13, figs. 10, 11
—, Dall, 1909: 211
—, Keen, 1958: 434; fig. 671 (after Hinds, 1844b)
Marginella evax Li, 1930: 270-271; plt. 7, fig. 58
—, Pilsbry, 1931: 433

Types: *M. sapotilla* – British Museum (Natural History). The lectotype we have selected is illustrated here. This leaves 2 paralectotypes on either side of it on the card labeled "M. C., Panama, 5-13 f. sandy mud" and three on another card labeled "M. C. Panama, H. C.; *M.* n. sp."

M. evax – Columbia University, Paleontology Collection, no. 22118. We hereby designate the specimen illustrated by Li (1930) as lectotype. This leaves 40 paralectotypes, not 5 as implied by Pilsbry (1931). One of these specimens is a mature adult of only 16.5 mm in length.

Type localities: *M. sapotilla* – Panama, 5 to 13 fms., on sandy mud.

M. evax – Panama Bay, about one mile off mouth of Panama Canal, on mud, 10 to 40 feet; collected by Donald F. MacDonald in 1907.

Sizes: *M. sapotilla* – 23.3 mm [11 lines] long (given by Hinds, 1844a). Our lectotype is 25 mm long (measured by Dr. Keen).

M. evax – 27 mm long and 13 mm wide (given by Li). We measured it as 28.2 mm long and 13.8 mm wide.

Diagnosis: Shell medium-sized, elongate-ovate; ashy-yellow, sometimes with very faint spiral banding; tinged with dull orange on outside of outer lip and along anterior margin; spire moderately elevated; aperture narrow, brown within; outer lip moderately thickened by white callus, smooth within; translucent to white callus restricted to a small patch on inner lip a little posterior from center; columella with four oblique, nearly-parallel folds.

Range and Ecology: Bahía Honda to Bella Vista, Panama, probably as far south as Ecuador, but Dall's (1909) record from Peru is probably of the next species. It is found intertidally to 60 meters on mud bottoms. Olsson

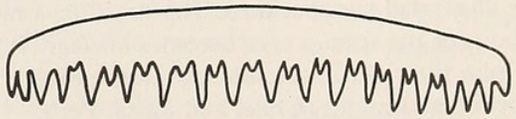

Figure 1
Rachidian radular plate of *Marginella (Prunum) sapotilla* Hinds. Hypotype, Calif. Acad. Sci. Invert. Zool. no. 233 (Type Slide Series no. 301), Isla Otoque, Bahía de Panama, 10 m, coll. by James H. McLean and Eugene Bergeron, June 1965, x 60 (each plate is about 0.8 mm across)

(1942) has reported this form from the Pliocene and Pleistocene of Panama. We have examined 23 lots.

Discussion: *Marginella sapotilla* has a very close Caribbean analogue, *M. prunum* (GMELIN, 1791), type of the subgenus *Prunum*. It differs from this species in being more solid and cylindrical and in having a narrower aperture. In addition, the outer lip of the Caribbean form is more produced posteriorly. There have been reports of *M. sapotilla* from the West Coast as *M. prunum* and as *M. caerulescens* LAMARCK, 1822, a synonym of the latter.

Marginella (P.) godini OLSSON, 1964 (p. 133, plt. 23, figs. 10, 10a), described from the Esmeraldas Formation (probably Pliocene) at Quebrada Camarones, Ecuador, is very similar to *M. sapotilla* but was described as having a more elevated spire and a body whorl more contracted at its base. These characteristics, however, appear in some live-collected specimens.

Illustrations: Lectotype of *M. sapotilla* – Plate 48, Figure 1.

Hypotype, Stanford Univ., SUPTC no. 9839 – Plate 48, Figures 2-3 (from Stanford general collection, lot no. 47804).

Rachidian radular plate, Calif. Acad. Sci. Dept. Invert. Zool., hypotype no. 233 (Type Slide Series no. 301) – Text figure 1.

Marginella (Prunum) curta SOWERBY, 1832

(Plate 48; Figures 4 to 6)

Marginella curta SOWERBY, 1832: 105
—, KIENER, 1834: 12-13 (species 15); plt. 7, fig. 30
—, DALL, 1909: 211
—, OLSSON, 1924: 123
—, KEEN, 1958: 434; fig. 670 (from Berry coll., taken at Paita, Peru; not from Stanford coll. as stated on p. 552)

Types: On two recent trips to the British Museum (Natural History), Dr. Myra Keen was unable to locate specimens from either type locality. The types are apparently lost. There are, however, 7 specimens on one card in the British Museum from d'Orbigny material from which we have illustrated one specimen. This could be a neotype if the status of the species ever becomes unclear. It is the second from the right in the top row on the card.

Type localities: Iquique, Chile, and Paita, Peru.

Size: 20.3 mm [.8 poll.] long and 11.4 mm [.45 poll.] wide (given by SOWERBY).

Diagnosis: Shell medium-sized, ovate, narrower anteriorly; ashy yellow, with faint spiral banding; tinged with dull orange on outside of outer lip and along anterior margin; spire low; aperture fairly narrow, wider anteriorly, brown within; outer lip thickened by a white callus. especially near middle of aperture, smooth within; translucent to white callus on inner lip, sometimes forming a pad near the shoulder of the whorl; columella with four diverging folds, the most posterior nearly perpendicular to aperture; base of columella flattened.

Range and Ecology: Manta, Ecuador, to Iquique, Chile, but possibly as far north as southern Panama. DALL (1909) reported this species from the Gulf of California, probably in error; there are no specimens in the National Museum collection from farther north than Peru. Found from 2 to 20 meters, on sand. We have examined 27 lots.

Discussion: *Marginella curta* is shorter than *M. sapotilla*, the callousing around the aperture is heavier, and the columellar folds splay out to a greater degree on the body whorl. The base of the columella is slightly flattened, while it is not in *M. sapotilla*.

Marginella cincta KIENER, 1834 (p. 21; plt. 8, fig. 32) appears to be a Caribbean analogue, although it was described from an unknown location. We have seen specimens attributable to this species from the east coast of Mexico and OLSSON & MCGINTY (1958) have reported it from the east coast of Panama. *Marginella curta* differs from *M. cincta* in having a wider aperture anteriorly and in not having the outer lip produced to as great a degree posteriorly.

Marginella curta is also similar to *M. incrassata* NELSON, 1870, reported and figured from the Miocene of northern Peru (OLSSON, 1932) and reported from the Pliocene of western Ecuador (PILSBRY & OLSSON, 1941).

Illustrations: Hypotype, British Museum (Natural History) – Plate 48, Figure 4.

Hypotype, Calif. Acad. Sci., CASGTC no. 12748 – Plate 48, Figures 5-6.

Marginella (Prunum) sp.

(Plate 48; Figures 7 to 8)

Among our notes on *Marginella (Prunum) curta* in the collections we examined was mention of one lot in the California Academy of Sciences from Costa Rica. Seeking to verify this apparent range extension, we borrowed the two specimens comprising the lot. Upon reexamination, these proved to be something very different. We have illustrated the more complete of the two specimens.

Locality: CAS loc. 27557, dredged "just off" Puntarenas, Costa Rica, "hauls 1R and 3R," 1 July 1932, Templeton-Crocker Expedition of the California Academy of Sciences. The data for the dredge hauls made during this day of the expedition are incomplete as to exact latitude and longitude. These specimens probably came from only

one of the two mentioned hauls, but we cannot be sure which one. Dr. Leo G. Hertlein was able to find out that the last of three dredge hauls was made by 11:30 a. m. and that the expedition was at 10° 03′ N latitude by 12:00 noon. This means that these specimens are from somewhere along the route of the expedition on the morning of 1 July, between Puntarenas in the Golfo de Nicoya, around the Peninsula de Nicoya, and north to the latitude mentioned on the outer coast of the peninsula.

Size: The figured specimen is 18.2 mm long and 12.1 mm wide. The unfigured specimen is 18.7 mm long, but is too broken for us to measure its width.

Diagnosis: Shell medium-sized, broadly ovate, narrower anteriorly; pale brownish-orange, with white callus; spire slightly elevated; aperture narrow, even, white within, with a deep posterior canal; outer lip greatly thickened with callus, which also extends up alongside spire; inner margin of outer lip finely denticulate along its entire length, most evident anteriorly; inner lip with a thick, lumpy callus which extends well onto body whorl; columella with four folds of equal size, diverging as they pass onto body whorl.

Discussion: The chief differences of this species from *Marginella (Prunum) curta* are as follows:

Table 2

	M. (P.) curta	*M. (P.)* sp.
Aperture:	wide, widest at base	narrow, even
Outer lip:	moderately thickened, smooth	very thick, finely toothed
Outline:	shoulder posterior of center, length (our hypotype) 1.6 x width	shoulder near center, length 1.5 x width
Callus on inner lip:	smooth, thin (except posterior pad)	lumpy, thick

The specimens are dead and badly worn, and, although they were dredged, it is possible that they are fossils. For this reason, we hesitate to give the form a name, as there are similar species reported from the Miocene and Pliocene of the Caribbean area. These are discussed by Woodring (1928: 238-239). For instance, such a form is illustrated as "*Marginella coniformis* Sowerby, 1850," from the Gatun Formation on the Isthmus of Panama by Brown & Pilsbry (1911); the anterior end of the outer lip of the present specimens seems to be more sinuate than that in the shell illustrated by these authors.

Future collecting in the area will probably show whether these specimens represent a living species or are from an off-shore Miocene or Pliocene outcrop.

Our placement of this species in the subgenus *Prunum* is provisional only. Because of its denticulate outer lip it approaches *Euryentome* Cossman, 1899, but the type species of that subgenus has a deep anterior canal. The presence or absence of denticulation on the outer lip does not seem to be of great taxonomic significance in this family, so we feel its allocation to *Prunum* is probably best. There are members of the latter subgenus in the Caribbean which resemble the present species in the narrowness of the aperture.

Illustrations: Hypotype, Calif. Acad. Sci., CASGTC no. 12749 – Plate 48, Figures 7-8 (Unfigured specimen: CASGTC no. 12750).

Marginella (Prunum) woodbridgei
Hertlein & Strong, 1951

(Plate 48; Figures 9 to 10)

Marginella woodbridgei Hertlein & Strong, 1951: 80; plt. 26, figs. 3, 4
—, Keen, 1958: 434; fig. 672 (specimen from Berry coll.)

Types: Holotype, Calif. Acad. Sci., CASGTC no. 7253; paratype, CASGTC no. 7254.

Type Locality: CAS loc. no. 29042, San José, Guatemala; collected by Woodbridge Williams in April, 1937.

Size: 12.5 mm long and 7.2 mm wide (holotype, as given by Hertlein & Strong).

Diagnosis: Shell small, ovate; slate colored, with two poorly-defined narrow darker bands; apex orange with traces of same color on outside of outer lip, along sutures, and between the white columellar folds; spire low, sutures edged with white; aperture narrow, brown within; outer lip thickened with white callus, smooth within; columella with four parallel, sharply-descending folds.

Range: This species has been collected only at San José, Guatemala at a depth of 23 m. We have seen 8 lots.

Discussion: Hertlein & Strong suggest that *M. storeria* Couthouy, 1837, may be a Caribbean analogue. Another related form from the same area seems to be *M. apicina* Menke, 1828. We are unsure of the relation between these two East Coast species.

Illustrations: Holotype – Plate 48, Figures 9-10.

Marginella (Prunum) albuminosa Dall, 1919

(Plate 48; Figure 11)

Marginella albuminosa Dall, 1919: 306-307
—, Keen, 1958: 433; fig. 668 (holotype)

Type: USNM no. 101068 (unique holotype).
Type Locality: "West Mexico, received from Prof. Alfred Dugès."
Size: 27 mm long and 14 mm wide (holotype, as given by DALL).
Diagnosis: Shell medium-sized, broadly ovate, thin for its size; creamy white; slightly yellow on spire, on base of columella, and outside of outer lip; spire low; aperture wide, white within; outer lip with a narrow thickening, smooth within; columella with four oblique, widely-spaced folds.
Discussion: The outer lip is thinner and the aperture wider than in either *M. sapotilla* or *M. curta*.

The species has not been reported since its description and may belong in some other geographic province.
Illustration: Holotype – Plate 48, Figure 11.

Persicula SCHUMACHER, 1817

Type species: *Persicula variabilis* SCHUMACHER, 1817 (= *Voluta persicula* LINNAEUS, 1758); monotypy.

Shell medium-sized to small; spire low, usually concealed; outer lip usually denticulate; aperture narrow, curved, with a notch at its anterior end.

No West Coast forms closely resemble *Persicula persicula* (LINNAEUS, 1758), the West African type species of the genus. Because of the gradation among the members of this genus from forms resembling *P. persicula* to forms resembling *P. interruptolineata* (MEGERLE, 1816), type (by monotypy) of *Rabicea* GRAY, 1857, COAN (1965) considered the latter genus to be synonymous with *Persicula*. We have followed that synonymy, but consider our species to be closer to the *Rabicea* end of the spectrum.

Persicula porcellana (GMELIN, 1791)

(Plate 48; Figures 12 to 17)

Voluta porcellana GMELIN, 1791: 3449 (species 139)
Marginella porcellana (GMELIN), REEVE, 1864: plt. 13, figs. 53 a, 53 b
Persicula porcellana (GMELIN), KEEN, 1958: 436; fig. 680 (after KIENER, 1834)
Marginella tessellata LAMARCK, 1822: 361-362 (species 24)
—, KIENER, 1834: 24 (species 33); plt. 5, fig. 20

Types: *Persicula porcellana* – GMELIN (1791) cites CHEMNITZ (1788, vol. 10; plt. 150, figs. 1419 and 1420). We reproduce both of these figures here. When Dr. Myra Keen was at the University of Copenhagen in 1965, she made an attempt to find the specimen from the Spengler collection upon which was based the Chemnitz illustrations. A label was present, but persistent searching failed to produce the specimen which originally went with the label. Thus, the specimen seems to be lost.

When we studied the Chemnitz figures, we considered the possibility that the specimen might have been a

Explanation of Plate 49

Figures 21, 22. *Persicula imbricata*. Holotype of *P. dubiosa* DALL, USNM 56775, Acapulco, Guerrero, Mexico, x 4.1 (ventral and dorsal views) [ventral - JM; dorsal - MK]

Figures 23, 24. *Persicula imbricata*. Holotype of *P. adamsiana* PILSBRY & LOWE, ANSP 155338, Bahía Montijo, Panama, x 3.6 (ventral and dorsal views) [RR]

Figures 25a-c. *Persicula imbricata*. 3 Hypotypes, SUPTC 9842, Puerto Guatulco, Oaxaca, Mexico, x 2.6 (ventral view) [MK]

Figures 26, 27. *Persicula imbricata*. Hypotype. SUPTC 9843, Acapulco, Guerrero, Mexico, coll. by Ralph Arnold, x 3.1 (ventral and dorsal views) [JM]

Figures 28, 29. *Persicula imbricata*. Hypotype. CASGTC 12751, CAS Loc. 27202, Acapulco, Guerrero, Mexico, beaches and shallow dredgings, coll. by Leo G. Hertlein, 1931, x 7.1 (ventral and dorsal views) [MK]

Figures 30, 31. *Persicula imbricata*. Hypotype, CASGTC 12752, CAS Loc. 27217, Tenacatita, Jalisco, Mexico, beach on the north side of bay, coll. by Leo G. Hertlein, 10-11 December 1931, x 3, (ventral and dorsal views) [MK]

Figures 32, 33. *Persicula imbricata*. Hypotype. CASGTC 12753, CAS Loc. 29042, San José, Guatemala, 20-30m, coll. by Woodbridge Williams, April 1937, x 3 (ventral and dorsal views) [MK]

Figures 34, 35. *Persicula interruptolineata* (MEGERLE, 1816). MEGERLE's original figures, x 3.4 (ventral and dorsal views) [COPIES]

Figures 36, 37. *Persicula interruptolineata*. Hypotype. SUPTC 9841, Bahía Santa Marta, Colombia, Caribbean coast, coll. by C. E. Baker, x 3.3 (ventral and dorsal views) [JM]

[MK] – photograph(s) by Dr. A. Myra Keen
[NMW] – photographs courtesy of National Museum of Wales
[PM] – photograph(s) by Mr. Perfecto Mary
[RR] – photographs by Dr. Robert Robertson
[RT] – photograph courtesy of Dr. Ruth D. Turner
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[USNM] – photogaph courtesy of USNM, Division of Mollusks
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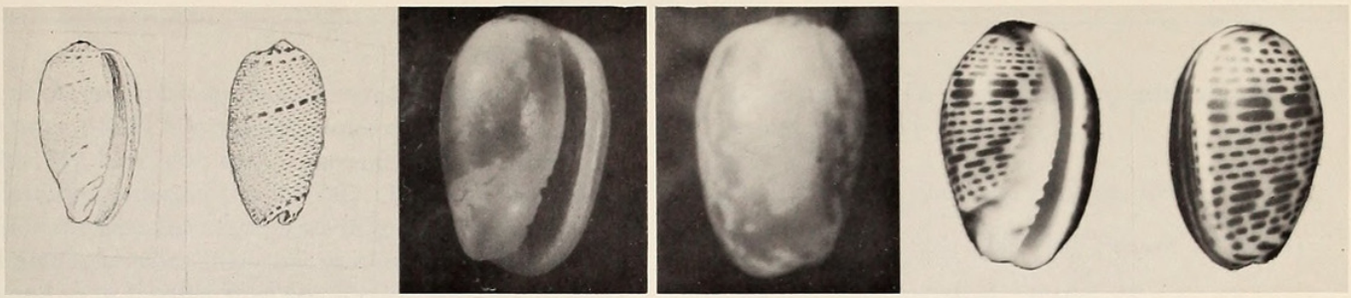

Figure 19 Figure 20 Figure 21 Figure 22 Figure 23 Figure 24

Figure 25 a Figure 25 b Figure 25 c Figure 26 Figure 27

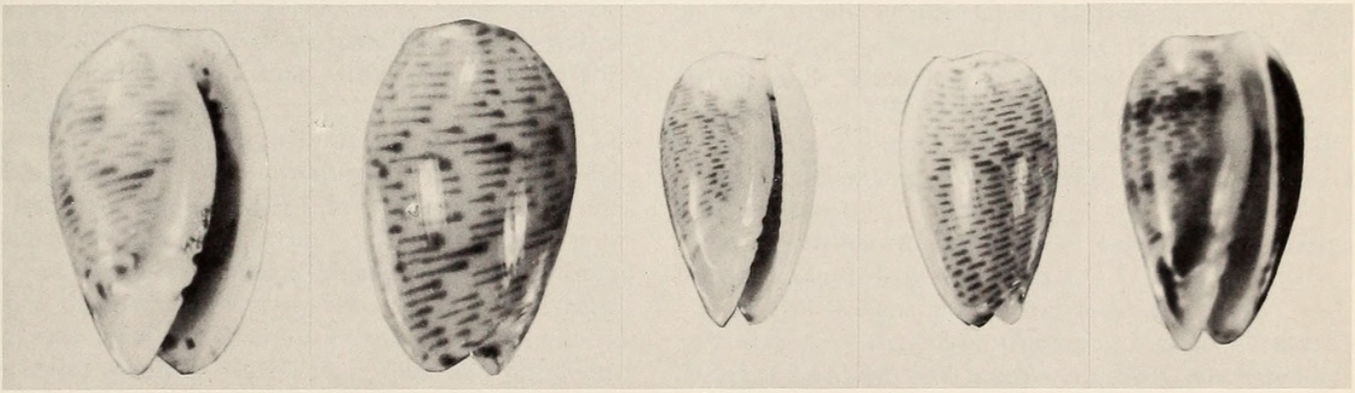

Figure 28 Figure 29 Figure 30 Figure 31 Figure 32

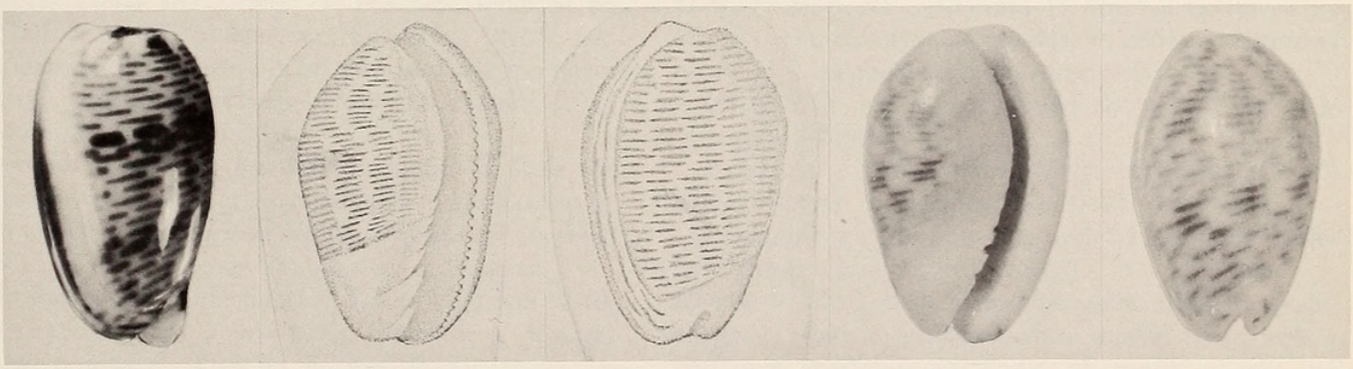

Figure 33 Figure 34 Figure 35 Figure 36 Figure 37

form of the variable Caribbean *Persicula interrupolineata* (MEGERLE, 1816) in which the bands were broken up into patches. We have seen such a specimen of this species in the Stanford collection(no. 37656). The specimen illustrated in the Chemnitz figures seems to have more rows of spots and is broader than any specimens of *P. porcella-* spots and to be broader than any specimens of *P. porcellana* we have examined. Gmelin's description does not add any important information. In the interest of the stability of both West American and Caribbean nomenclature, we hereby designate a neotype for Gmelin's species, this being the same specimen we have illustrated and designated as a lectotype of Lamarck's *Marginella tessellata.*

M. tessellata – Muséum d'Histoire Naturelle, Geneva. There is one specimen in the lot. We are hereby designating this specimen as a lectotype of Lamarck's species and as the neotype of *Persicula porcellana,* for the reasons presented above.

Type Localities: *P. porcellana* – Indian Ocean, evidently in error.

M. tessellata – None given in original description.

Sizes: *P. porcellana* – None given in original description.

M. tessellata – 16.9 mm [7.5 lignes] long (given by LAMARCK). The lectotype we have illustrated measures 16.5 mm long and 10 mm wide (calculated by Dr. Binder).

Diagnosis: Shell medium-sized, ovate; tan, with 10 to 13 regular spiral rows of brownish-red, rectangular spots; spire low, covered with enamel; heavy tan callus on inner lip, thinner on outer lip; aperture even, notched at its posterior end, with a deep, oblique canal at anterior end from which a ridge extends spirally around the base of body whorl; inner margin of outer lip of mature specimens finely denticulate; columella with 5 main folds and finer ones posteriorly, the second most anterior fold widest and bifid.

Range: To our knowledge, this species has been taken only in Panama, in the area between Golfo de Montijo and and Islas Coiba and Jicarón. It has been reported on the Caribbean side of Panama (SOWERBY, 1846 b, and REDFIELD, 1870 b), but we have not found any specimens from this area in the collections we have examined. We have seen 10 lots.

Discussion: If material positively known to be from the Caribbean comes to light, an examination will have to be made to determine whether analogous forms are involved or the same species occurs on both sides of Panama.

Illustrations: Chemnitz's figures – Plate 48, Figures 12-13.

Neotype of *Persicula porcellana,* Lectotype of *Marginella tessellata* – Plate 48, Figures 14-15.

Hypotype, Stanford Univ., SUPTC no. 9840 – Plate 48, Figures 16-17 (from Stanford general collection lot no. 46552).

Persicula imbricata (HINDS, 1844)

(Plate 48; Figure 18; Plate 49; Figures 19 to 33)

Marginella imbricata HINDS, 1844 a: 76
—, SOWERBY, 1846 a: 396 (species 86); plt. 78, figs. 211, 212
Persicula imbricata (HINDS), KEEN, 1958: 435; fig. 677 (line drawing, SUPTC no. 9850, from Stanford general coll. lot no. 33299 from Oaxaca, Mexico)
Marginella vautieri BERNARDI, 1853: 68; plt. 2, figs. 13, 14
Persicula dubiosa DALL, 1871: 103-104; plt. 15, fig. 17
—, KEEN, 1958: 435; fig. 674 (line drawing after DALL, 1871)
Persicula (Rabicea) adamsiana PILSBRY & LOWE, 1932: 62; plt. 4, fig. 9
—, KEEN, 1958: 434; fig. 673 (line drawing after PILSBRY & LOWE, 1932)

Types: *P. imbricata* – British Museum (Natural History). We hereby designate the specimen we have illustrated as lectotype, leaving two specimens on either side of the lectotype on the same card as paralectotypes. The card is labeled "M. C., Acapulco, Col. Moffat" on the back and "Maracaibo" (in error) on the front.

M. vautieri – Type probably lost (letter of 3 Sept. 1964 from Dr. Edouard Fischer-Piette).

P. dubiosa – USNM no. 56775 (holotype).

P. adamsiana – Acad. Nat. Sci. Philadelphia, no. 155338 (holotype); San Diego Soc. Nat. Hist. type collection, no. 773 (paratype).

Type Localities: *P. imbricata* – Acapulco, Guerrero, Mexico; collected by Col. Moffat.

P. vautieri – None given in original description.

P. dubiosa – Acapulco, Guerrero, Mexico, "from a bushel of fragments and beach-worn shells, purchased by me . . . , in October, 1868."

P. adamsiana – Bahía Montijo, Republic of Panama; collected by H. N. Lowe.

Sizes: *P. imbricata* – 10.6 mm [5 lines] long (given by HINDS). Our lectotype is very close to this size (measured by aid of ruler photographed with types).

M. vautieri – 11 mm long and about 4.75 mm wide (given by BERNARDI).

P. dubiosa – 7.6 mm [.3 in.] long and 5.1 mm [.2 in.] wide (holotype, as given by DALL).

P. adamsiana – 8.4 mm long and 5.3 mm wide (holotype, as given by PILSBRY & LOWE).

Diagnosis: Shell small to medium-sized, ovate to ovate-elongate; white to yellowish-white ground color, with a pattern of reddish-brown dashes of varying lengths and widths, arranged in spiral bands, and, to a lesser degree,

in axial columns; most often with two bands of heavier dashes placed so as to divide the shell into thirds; base of columella tinged with brown; spire naked to covered with a callus pad, raised in occasional specimens, circled by a ring of brown markings; outer lip heavily calloused, white, often streaked with light to dark brown outside, finely denticulate within; inner lip with a white callus, thicker anteriorly; aperture even and narrow, with a deep, oblique anterior notch; columella with four main folds, often with additional ones posteriorly, the second most anterior broad and bifid.

Range: Cabo San Lucas, Baja California, and Tenacatita, Jalisco, Mexico, to La Libertad, Ecuador, and the Galapagos Islands; 14 to 60 meters; Pleistocene of Ecuador (HOFFSTETTER, 1952). We have examined 40 lots.

Discussion: This complex of names has been our most difficult problem. We hope we have solved it correctly, but material is sufficiently rare in collections that we may not yet have the complete story. Our conclusion is that there is one species on this coast which has a wide degree of variation among populations, but that none of the populations is isolated enough to be regarded as a subspecies. In this way, the form is similar to its Caribbean analogue, *Persicula interruptolineata,* which also has been excessively named, as we will show.

We have seen specimens close to the lectotype of *Persicula imbricata* from the Acapulco area. For this reason, we are fairly sure that HINDS' cited locality is correct and that we are recognizing, in the area of the type locality, what HINDS intended, but we also have, from offshore, many small but mature specimens of a form that, except for its smaller size and slightly different patterning, is not separable from HINDS' specimens. This smaller form is very close to the type of *P. adamsiana,* described from Panama. As further evidence of the intergradation from elongate specimens to smaller, more ovate specimens, we have illustrated three specimens of different lengths from a lot from Bahía Guatulco, Oaxaca, Mexico. We have also illustrated both an elongate and a short form from the Acapulco area, and an elongate specimen from Bahía Tenacatita, Jalisco, Mexico, north of Acapulco.

DALL's species, *Persicula dubiosa,* was based on a badly-worn specimen from Acapulco. The fact that it came from Acapulco at once makes us question its distinctness. Photographs of the type confirmed our suspicions, but we also borrowed the specimen because the pictures failed to bring out certain critical features. It is, in most respects, similar to the small specimens from the Acapulco area, the only major difference being the color patterning. *Persicula imbricata* may occasionally be dark colored; to illustrate this point, we have chosen a specimen from San José, Guatemala. In the Stanford University collection (no. 50248) there is a specimen of *P. interruptolineata* from the Caribbean coast of Venezuela. On it, the "short brown dashes" have fused together until one could best describe the shell as being brown, with white bars and streaks – approximately the words with which DALL described his *P. dubiosa.* The reader will note, in our illustrations of the holotype, a trace of the small brown spots encircling the spire and on the base of the columella. These are also to be found on specimens of more typical *P. imbricata.*

Marginella vautieri was described without a locality, but the figures indicate that it is probably a synonym of *Persicula imbricata,* this first recognized by REDFIELD (1870). The spire in BERNARDI's specimen is unusually high and the patterning is not typical. Since the type is evidently no longer available, this synonymy cannot be further verified.

A few words should be said with regard to the Caribbean form. LAMARCK (1822) redescribed it as *Marginella interrupta.* It was apparently many years before workers rediscovered and began using MEGERLE's name. We have copied herein MEGERLE's original figures, as they are not readily available. The Caribbean form differs from *Persicula imbricata* in being more ovate and thickened. The color patterning varies to an even greater extent than the West American form. OLSSON & MCGINTY (1958) have described a subspecies, *P. adamsiana weberi,* from the eastern coast of Panama, but they did not compare it with *P. interruptolineata.* Their form appears to be a juvenile specimen of the latter. WEISBORD (1962) has apparently provided two other names for the Caribbean form, *Persicula (Rabicea) interrupta mareana* and *P. (R.) hodsoni,* both from the Lower Mare Formation [Late Pliocene or early Pleistocene] of Venezuela. We include an illustration of the Caribbean form for comparison. There are several other names referable to this species.

Illustrations: Lectotype and paralectotypes of *P. imbricata* – Plate 48, Figure 18.

Original illustrations of *M. vautieri* – Plate 49, Figures 19-20.

Holotype of *P. dubiosa* – Plate 49, Figures 21-22.

Holotype of *P. adamsiana* – Plate 49, Figures 23-24.

Hypotypes (3) from Bahía Guatulco, Stanford Univ. SUPTC no. 9842 – Plate 49, Figures 25 (a-c) (from Stanford general collection lot no. 50264).

Hypotype from Acapulco, Stanford Univ., SUPTC no. 9843 – Plate 49, Figures 26-27 (from Stanford general collection lot no. 26509).

Hypotype from Acapulco, Calif. Acad. Sci., CASGTC no. 12751 – Plate 49, Figures 28-29.
Hypotype from Tenacatita, Calif. Acad. Sci., CASGTC no. 12752 – Plate 49, Figures 30-31.
Hypotype from San José, Guatemala, Calif. Acad. Sci., CASGTC no. 12753 – Plate 49, Figures 32-33.
Original illustrations of *P. interruptolineata* – Plate 49, Figures 34-35.
Hypotype of *P. interruptolineata*, Stanford Univ., SUPTC no. 9841 – Plate 49, Figures 36-37.

Persicula bandera Coan & Roth, 1965

(Plate 50; Figures 38 to 39)

Persicula bandera Coan & Roth, 1965: 67-69; plt. 12, figs. 1-5 (holotype)

Types: Holotype, Los Angeles County Museum, no. 1141; paratypes widely distributed.
Type Locality: Bahía de las Banderas, Nayarit-Jalisco border, Mexico, 3 meters, on mud; collected by Mr. and Mrs. Cornelius Willis.
Size: 12.5 mm long and 8.4 mm wide (holotype).
Diagnosis: Shell medium-sized, ovate, narrower anteriorly; yellowish-tan, with 15 to 17 brown spiral color lines spaced at regular intervals; entirely covered by a glaze of translucent grey enamel; outer lip calloused, white, tinged on the outside with brown; inner lip covered by white callus; spire low, covered by enamel, circled by a ring of merging brown blotches; aperture narrow, even, with a notch at the posterior end and a deep, oblique anterior canal; aperture white within; fine denticulations on inside margin of outer lip; columella with four folds, the second most anterior widest and bifid.
Range: This species has been taken only in Bahía de las Banderas, although shells pierced for stringing as beads have been found among Indian remains at Casas Grandes, Chihuahua, Mexico. We have seen 4 lots.
Illustrations: Holotype – Plate 50, Figures 38-39.

Persicula hilli (Smith, 1950)

(Plate 50; Figures 40 to 41)

Marginella hilli Smith, 1950: 61; plt. 4, fig. 6
Persicula hilli (Smith), Keen, 1958: 435; fig. 676 (specimen in Berry coll.)

Type: According to Dr. Joshua L. Baily, Jr., Smith's type material is in the University of Alabama. We have thus far received no reply from that institution to our letters of inquiry.
Type Locality: Bahía Chamela, Jalisco, Mexico.
Size: 15 mm long and 10 mm wide (holotype, as given by Smith).
Diagnosis: Shell medium-sized, ovate, narrower anteriorly; grey, with indistinct darker grey spiral banding, especially anteriorly; body whorl crossed by distinct growth lines; outer lip thickened, white, tinged on outside with yellow-brown; spire slightly elevated, but covered with enamel, circled by a chocolate-brown band; aperture narrow, slightly wider anteriorly, notched at the posterior end, with a deep, oblique anterior canal; outer lip finely denticulate; inner lip with a white callus; columella with five distinct folds, the second most anterior widest and bifid.
Range: Collected only at the type locality, from 30 to 80 meters. We have seen 3 lots.
Discussion: We know of no Caribbean analogue. It is interesting to note that both this species and *Persicula bandera* have been found only in single bays on the Mexican coast, while *P. imbricata* is widely distributed and very variable.
Illustrations: Hypotype, Calif. Acad. Sci., CASGTC no. 12754 – Plate 50, Figures 40-41.

Persicula phrygia (Sowerby, 1846)

(Plate 50; Figures 42 to 44)

Marginella phrygia Sowerby, 1846b : 394 (species 79) ; plt. 78, figs. 218, 219
—, Reeve, 1865: plt. 15, fig. 67
Persicula phrygia (Sowerby), Keen, 1958: 435; fig.. 679 (composite line drawing, Stanford general coll. lot no. 33307, from Oaxaca, Mexico)

Types: Holotype, British Museum (Natural History), no. 80.9.18.6, mounted on a card labeled "California" with three other specimens, possibly paratypes. The holotype is marked with an "x" and is the second from right.
Type Locality: None given in original description. Reeve (1865) first attributes this form to the West Coast.
Size: 6.5 mm long and 4.2 mm wide (based on ruler photographed with type specimens).
Diagnosis: Shell small, ovate, slightly narrower anteriorly; white or pale straw-colored, with reddish-brown markings in the shape of horseshoes, opening to the right, arranged in rows both spirally and axially; markings on the periphery and just above anterior canal usually largest and darkest; no callus over spire; inner lip with a weakly-developed white callus; aperture narrow, a little wider anteriorly; anterior end with an oblique notch; outer lip finely denticulate; columella with four main folds and finer ones posteriorly, second most anterior the strongest.
Range: Bahía Magdalena and La Paz, Baja California,

and Las Tres Marías, Nayarit, Mexico, to Panama, probably to Ecuador, and on several of the Galapagos Islands; (?) Pliocene of the Galapagos Islands (CAS 27249 and 27250); Pleistocene of Las Tres Marías (HERTLEIN, 1934). Intertidal to 20 meters. We have seen 39 lots.

Discussion: There seem to be three related Caribbean forms, but there is taxonomic confusion surrounding them. These are *Persicula maculosa* (KIENER, 1834), discussed below, *Marginella sagittata* HINDS, 1844a, and *Persicula swainsoniana* (PETIT, 1851) [*nom. nov. pro Marginella guttata* SWAINSON, 1830, not *M. guttata* LINK, 1807, nor *M. guttata* (DILLWYN, 1817)]. REDFIELD (1870a), followed by TOMLIN (1917), suggested that *P. swainsoniana* is a synonym of *P. phrygia,* and REDFIELD (*l. c.*) proposed *Marginella calculus* for the Caribbean species. SWAINSON's figure, however, shows that his species is closer to the Caribbean form, as its spire is covered by callus, and its spots are too elongate and do not form two darker bands dividing the body whorl into thirds. We suspect that *M. swainsoniana* is an earlier name for REDFIELD's species, but a neotype may have to be designated for SWAINSON's species to stabilize the nomenclature.

Illustrations: Holotype and possible paratypes – Plate 50, Figure 42.

Hypotype, Stanford Univ., SUPTC no. 9844 – Plate 50, Figures 43-44 (from Stanford general collection lot no. 50335).

Persicula frumentum (SOWERBY, 1832)

(Plate 50; Figures 45 to 47)

Marginella frumentum SOWERBY, 1832: 57
—, SOWERBY, 1846b: 393 (species 75); plt. 78, figs. 221, 222
—, TOMLIN, 1917: 267
Persicula frumentum (SOWERBY), KEEN, 1958: 435; fig. 675 (line drawing of specimen figured herein)

Types: TOMLIN (1917) indicates that there are two lots in the British Museum (Natural History), one containing two specimens and one containing three, both labeled "West Indies." He suggests that the lot with three specimens is probably the type lot. We have illustrated the center specimen glued on this card. This is a potential lectotype, but we have decided not to make a selection at this time. The only other lot that Dr. Keen could find in the British Museum is one of a single specimen, and probably TOMLIN was in error about a lot of two specimens. This lot (no. 74.12.11.88) is from the collection of Mrs. Lombe Taylor; and a note on the back of the card indicates that this specimen was figured by REEVE (1865; pl. 15, fig.71).

Type Locality: The location SOWERBY (1832) gives for his original specimens is "St. Elena and Salango [Ecuador], but SOWERBY (1846b) and TOMLIN (1917) suggest that they probably came from the Caribbean. The specific name has been applied to shells from that area.

Explanation of Plate 50

Figures 38, 39. *Persicula bandera* COAN & ROTH. Holotype, LACM 1141, Bahía de las Banderas, Nayarit, Mexico, x 2.6 (ventral and dorsal views) [PM]

Figures 40, 41. *Persicula hilli* (SMITH), Hypotype. CASGTC 12754, CAS Loc. 33029, Bahía Chamela, Jalisco, Mexico, 30-80m, x 2.5 (ventral and dorsal views) [JM]

Figure 42. *Persicula phrygia* (SOWERBY). Holotype (second from right, marked with "x") and 3 possible paratypes, BM (NH) 80.9.18.6, no locality given in original. x 2.1 [MK]

Figures 43, 44. *Persicula phrygia.* Hypotype. SUPTC 9844. Sappho Cove, Chatham Island, Galápagos Islands, coll. by W. H. Ochsner. x 4.1 (ventral and dorsal views) [JM]

Figure 45. *Persicula frumentum* (SOWERBY) [?]. Hypotype. BM (NH). Caribbean (?). x 2.0 (ventral view) [MK]

Figures 46, 47. *Persicula* cf. *P. frumentum.* Hypotype. SUPTC 9845. La Paz, Baja California, Mexico. Stanford Univ. Exped., x 4.1 (ventral and dorsal views) [JM]

Figure 48. *Volvarina taeniolata* MÖRCH. Lectotype. Zool. Mus., Univ. of Copenhagen. Islas Los Bocorones, Costa Rica. x 9.8 (ventral view) [ZMUC]

Figures 49, 50. *Volvarina taeniolata.* Holotype of *Marginella californica* TOMLIN. National Museum of Wales. California. x 4.1 (ventral and dorsal views) [NMW]

Figure 51. *Volvarina taeniolata.* Holotype of *Marginella californica* "var." *parallela* DALL, USNM 217843. Bahía Magdalena, Baja California, Mexico. x 6.5 (ventral view) [MK]

Figures 52, 53. *Volvarina taeniolata.* Hypotype. CASGTC 12755, CAS Loc. 23779 D, María Madre, Las Tres Marías, Nayarit, Mexico, 10-20m, along east shore of island, x 4.0 (ventral and dorsal views) [JM]

Figures 54, 55. *Volvarina taeniolata.* Hypotype, SUPTC 9846, 10 mi. north of Isla Espíritu Santo, Baja California, Mexico, 6om, coll. by Damon L. Burford, 1955, x 4.0 (ventral and dorsal views) [JM]

Figures 56, 57. *Volvarina taeniolata rosa* (SCHWENGEL), Holotype. ANSP 170298. Wreck Bay, Chatham Island, Galápagos Islands. x 4.6 (ventral and dorsal views) [RR]

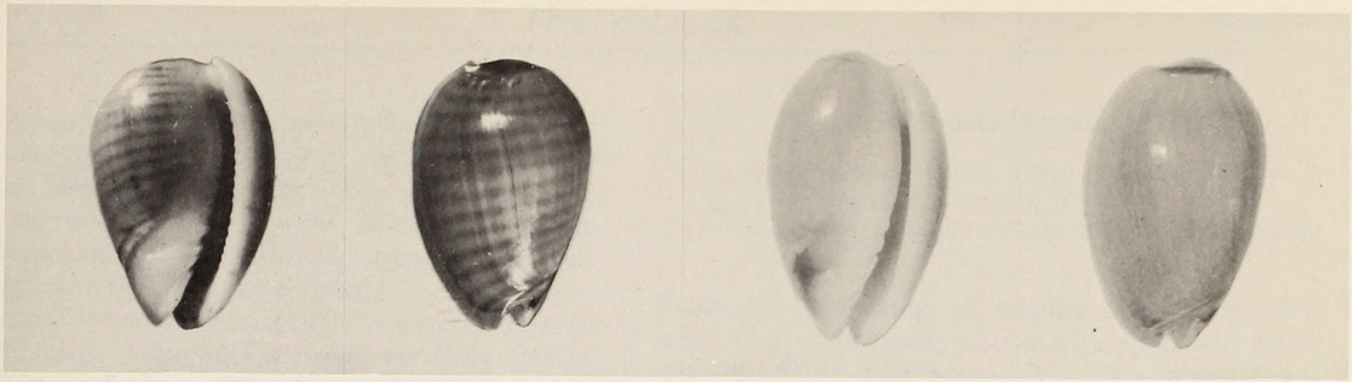

Figure 38 Figure 39 Figure 40 Figure 41

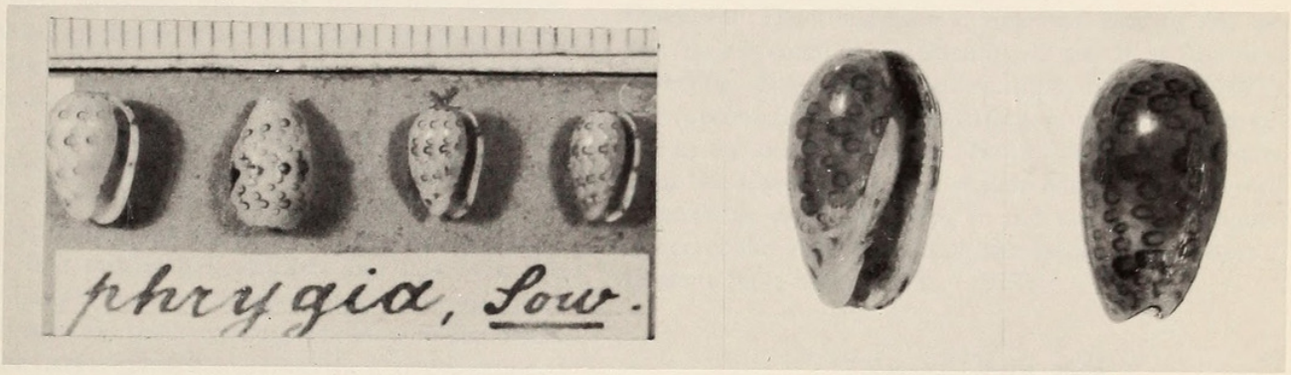

Figure 42 Figure 43 Figure 44

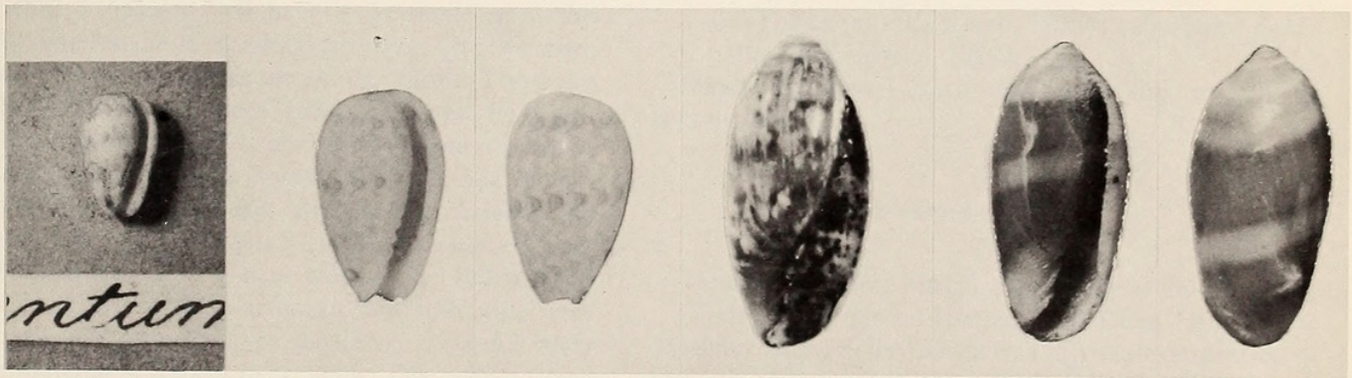

Figure 45 Figure 46 Figure 47 Figure 48 Figure 49 Figure 50

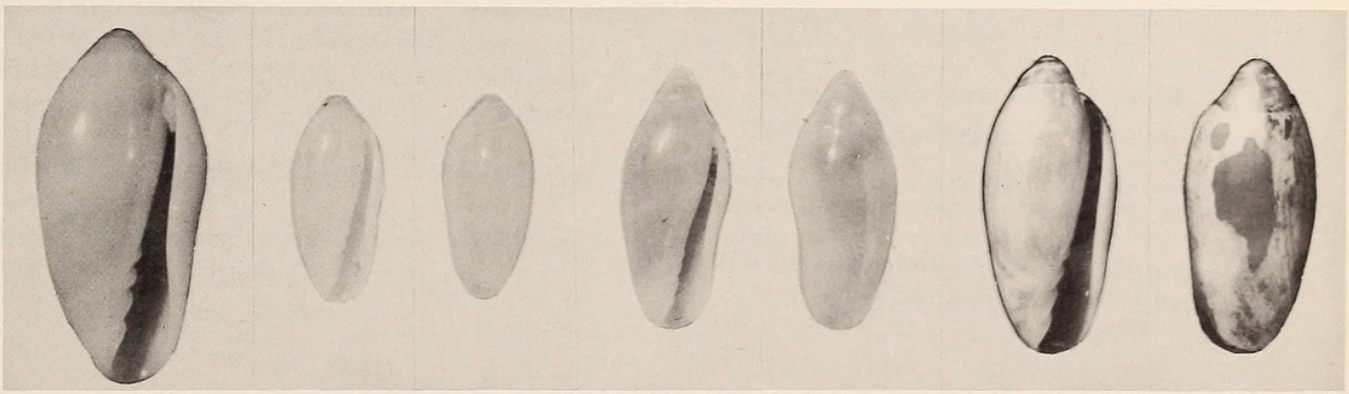

Figure 51 Figure 52 Figure 53 Figure 54 Figure 55 Figure 56 Figure 57

Size: 7.6 mm long and 5.1 mm wide (given by SOWERBY).
Diagnosis: A potential lectotype in the British Museum (Natural History) may be described thus: Shell small, ovate, narrower anteriorly; white, with reddish-brown axial serpentine markings, shaded darker on their left sides; aperture slightly wider anteriorly.
Range and Discussion: DALL (1871) reported this species from "Panama, Cape St. Lucas and the Galapagos Islands," using the name "*P. catenata* Phil." (apparently an error for *Voluta catenata* MONTAGU, 1803). Later, DALL (1909) extended the range to include Ecuador. There are no specimens from West Coast localities in the U. S. National Museum collection. In fact, we have been able to locate only one specimen from the West Coast – a shell in the Stanford University collection labeled "La Paz, Gulf of California: Stanford Expedition." In spite of intensive collecting in this area in recent years, no additional specimens have been found. There is always the possibility that mixing has occurred and that even this specimen has an incorrect locality. In any case, we have illustrated it to aid other workers. It differs in the placement of the darker spiral bands from the above-mentioned British Museum material.

If additional specimens are collected from the West Coast, then a decision will have to be made as to the correct name for the West American form. The literature contains three other names for similar forms. These are *Marginella pulchella* KIENER, 1834 (p. 27; plt. 9; fig. 40 [not 41, as stated on p. 27]), described without a locality; *Marginella fluctuata* C. B. ADAMS, 1850 (p. 56-57), described from Jamaica; and *Marginella chrysomelina* REDFIELD, 1848 (p. 492; plt. 22, fig. 2), described from the "West Indies (?)." These may all be referable to species occurring in the Caribbean, but since two were described with uncertain type localities, a careful study of type material will have to be made. One solution may be to designate as neotype of *P. frumentum* a specimen known to come from one of the Ecuadorian type localities, when and if such a shell becomes available, thereby fixing *frumentum* as a West American name, and disregarding the questionable lots in the British Museum. Until then, we choose to regard the entire problem as a Caribbean one!
Illustrations: British Museum hypotype – Plate 50, Figure 45.
Hypotype (cf. *frumentum*), Stanford Univ., SUPTC no. 9845 – Plate 50, Figures 46-47.

Persicula maculosa (KIENER, 1834)

Marginella maculosa KIENER, 1834: 26 (species 36); plt. 9, fig. 39 (not fig. 40 as stated on p. 26)
Persicula maculosa (KIENER), KEEN, 1958: 435; fig. 678 (copy of original figure)

Diagnosis: (Translation of original description) Shell small, oval, diaphanous, covered with white and tawny spots, the larger and darker spots forming two bands around the shell; spire umbilicate; lip smooth; with eight folds on the columella, the lower ones more visible.
Discussion: Described from an unknown locality, this species has not come to our attention in any West American collection. Subsequent authors, such as DALL (1885), have recorded it from the Caribbean, and there are two lots in the British Museum (Natural History) collection from the Caribbean which match KIENER's figure well. It probably does not belong to our fauna. The original source of the error, allocating the species to "Californ.," seems to have been PAETEL (1873).

Volvarina HINDS, 1844

Type species: *Marginella nitida* HINDS, 1844 a (= *Voluta mitrella* RISSO, 1826); subsequent designation of REDFIELD, 1870 b.

Small, elongate; low-spired; outer lip smooth or slightly dentate.

(Volvarina, s. s.)

Tapering at base; aperture relatively wide.

COAN (1965) placed the two West Coast forms in the subgenus *Haloginella* LASERON, 1957. An examination of material of *Volvarina (V.) mitrella* (RISSO, 1826), and of *V. (H.) mustellina* (ANGAS, 1871), the type species of *Haloginella*, now requires us to place our species in *Volvarina* in the strict sense.

Volvarina taeniolata MÖRCH, 1860

(Plate 50; Figures 48 to 55; Text figure 2)

Volvarina taeniolata MÖRCH, 1860: 86 (species 109)
Marginella taeniolata (MÖRCH), KEEN, 1958: 433 (mentioned only)
"*Marginella varia* SOWERBY," *auctt.*, not of SOWERBY, 1846 a
—, ARNOLD, 1903: 222 (species 203); plt. 4, fig. 9

Marginella californica TOMLIN, 1916: 138
Marginella (Hyalina) californica TOMLIN, DALL, 1921: 85
Hyalina (Hyalina) californica (TOMLIN), GRANT & GALE, 1931: 630
Hyalina californica (TOMLIN), BURCH, 1945: 25
Marginella californica TOMLIN, KEEN, 1958: 433; fig. 669 (after ARNOLD, 1903)
Marginella californica "var." *parallela* DALL, 1918: 6

Types: *V. taeniolata* – Zoological Museum, University of Copenhagen. We designate the specimen we have illustrated as lectotype, leaving three paralectotypes.

M. californica – National Museum of Wales (holotype).

M. c. parallela – USNM no. 217843 (holotype).

Type Localities: *V. taeniolata* – Islas Los Bocorones, Costa Rica, at 30 fms. ("org.").

M. californica – California.

M. c. parallela – Bahía Magdalena, Baja California; collected by Charles R. Orcutt.

Size: *V. taeniolata* – 4 mm long and 2 mm wide (given by MÖRCH).

M. californica – 9 mm long and 4.5 mm wide (holotype, as given by TOMLIN).

M. c. parallela – 6.7 mm long and 3 mm wide ("average" *fide* DALL)

Diagnosis: Shell small, cylindrical; white or yellowish, with three more or less evident brown bands, the most posterior just below suture; when distinct, the bands are edged with lines of darker reddish-brown; anterior third of columella white; spire low to somewhat elevated; outer lip narrowly thickened, straight or slightly sinuate medially; columella with four, nearly-parallel folds.

Range: South side of Point Conception, California, through southern California, including the offshore islands, through the Gulf of California, to Costa Rica, probably to Panama. Specimens from south of Guaymas, Sonora, Mexico, are rare in collections. Dr. Donald R. Shasky of Redlands, California, has a series taken at Salina Cruz, Oaxaca, Mexico, in 1963, and, except for the type lot of *Volvarina taeniolata,* these are the most southern specimens we have noted. It also occurs in the Lower and Upper Pleistocene of California, and the Pleistocene of Baja California and Las Tres Marías (HERTLEIN, 1934). We have examined about 220 lots.

Ecology: Intertidally to 40 meters, always among rocks. Eugene Coan observed several specimens at Bahía San Luis Gonzaga, Baja California (Gulf of California), on the evening of 21 March 1965, crawling single-file across an intertidal rock.

Discussion: *Volvarina taeniolata* was described from Costa Rica, based on immature specimens and was not subsequently recognized because it was never illustrated. California specimens, which early authors had identified as *Marginella varia* SOWERBY, 1846a, were renamed *M. californica* by TOMLIN (1916), who showed that SOWERBY's species was based on two Caribbean forms, both distinct from the West Coast species.

Should further examination ever prove specimens from the northern part of the range consistently distinct from southern ones, TOMLIN's name will be available.

As can be seen from our illustrations, this is a highly variable species. The brown banding may be entirely absent, as in some specimens from the southern part of the Gulf of California. Two such specimens are illustrated here, a pale specimen from Isla Espíritu Santo showing the height the spire may attain and extreme sinuosity of the outer lip, and a specimen from Las Tres Marías, Nayarit, Mexico, which is completely white, cylindrical, and gently tapering.

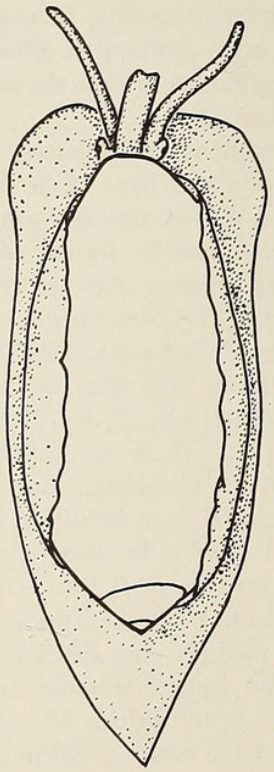

Figure 2
Volvarina taeniolata MÖRCH, a living specimen, Bahía San Luis Gonzaga, Baja California, intertidal, 21 March 1965. x 5

There are two Caribbean analogues. One is the common *Volvarina avena* (KIENER, 1834, *ex* VALENCIENNES MS), which differs in being larger and usually more elon-

gate, in having the brown bands differently positioned, and in having a higher spire. The other is *V. albolineata* D'ORBIGNY, 1842, which differs in being smaller, having different band positioning, and in having a whiter ground color between the bands.

The Animal: Living specimens were observed at Bahía San Luis Gonzaga, Baja California. The mantle is tan, with a darker border and dark spots. The siphon is brown. The tentacles are long and colorless, and the eyes are located on swellings at their bases. The side of the foot is colorless, with light and dark opaque spots. One of these specimens is illustrated in Text figure 2.

Illustrations: Lectotype of *Volvarina taeniolata* – Plate 50, Figure 48.

Holotype of *Marginella californica* – Plate 50, Figures 49-50.

Holotype of *M. c. parallela* – Plate 50, Figure 51.

Hypotype, Calif. Acad. Sci., CASGTC no. 12755 – Plate 50, Figures 52-53.

Hypotype, Stanford Univ., SUPTC no. 9846 – Plate 50, Figures 54-55 (from Stanford general collection lot no. 45952).

A living specimen – Text figure 2.

Volvarina taeniolata rosa (SCHWENGEL, 1938)

(Plate 50; Figures 56 to 57; Plate 51; Figures 58 to 59)

Marginella rosa SCHWENGEL, 1938: 3; fig. 1
—, KEEN, 1958: 433 (mentioned only)

Type: Acad. Nat. Sci. Philadelphia, no. 170298 (holotype).

Type Locality: Wreck Bay, Chatham Island, Galapagos Islands; George Vanderbilt South Pacific Expedition, 1937; collected by Ronald W. Smith.

Size: 8.1 mm long and 3.6 mm wide (holotype, as given by SCHWENGEL).

Diagnosis: This subspecies differs from the typical in being bright pink in color, with the spiral banding only faintly developed. It tapers at the base more smoothly than specimens from California.

Range: Reported only from the Galapagos Islands, where it occurs intertidally to several meters' depth on nearly all islands in the group. We have examined 9 lots.

Discussion: Young specimens of this subspecies closely resemble *Volvarina t. taeniolata* in having more distinct brown bands, the pink coloring becoming apparent in mature specimens. The pink pigment also seems to be fugitive, bleaching out of beach specimens while the brown banding remains.

There are one or more analogous forms in the Caribbean, which, like *Volvarina taeniolata rosa* have been considered subspecies of other, non-pink forms. One of these is *V. avena beyerleana* (BERNARDI, 1853b).

Illustrations: Holotype – Plate 50, Figures 56-57.

Hypotype, Stanford Univ., SUPTC no. 9849 – Plate 51, Figures 58-59 (from Stanford general collection lot no. 50196).

Volvarinella HABE, 1951.

Type species: *Volvarinella makiyamai* HABE, 1951; original designation.

Small, relatively high-spired; outer lip smooth within or weakly dentate, especially posteriorly; usually with brown banding.

The generic name *Eburnospira* OLSSON & HARBISON, 1953, was omitted by COAN (1965). The type of this genus, which seems to be a junior synonym of *Volvarinella*, is *Marginella eburneola* CONRAD, 1834.

Volvarinella eremus (DALL, 1919)

(Plate 51; Figures 60 to 63)

Marginella eremus DALL, 1919: 307
Marginella anticlea DALL, 1919: 307 - 308

Types: *V. eremus* – USNM no. 207622 (holotype).

M. anticlea – USNM no. 194986 (lectotype, designated and figured herein). This leaves 15 specimens as paralectotypes (no. 667027).

Type Localities: *V. eremus* – U. S. Fish Commission Station no. 2808, in 634 fathoms, on sand, near the Galapagos Islands.

M. anticlea – U. S. Fish Commission Station no. 2813, in 40 fathoms, on coral sand, among the Galapagos Islands.

Sizes: *V. eremus* – 5 mm long and 2.4 mm wide (holotype, as given by DALL).

M. anticlea – 3.5 mm long and 1.6 mm wide (given by DALL).

Diagnosis: Shell small, spindle-shaped; white, circled by two narrow brown bands which divide body whorl into thirds; spire with a large, blunt nucleus; sutures obscured by a thin coat of enamel; aperture even, with a small posterior notch; outer lip slightly thickened, with obscure denticulation and, in adult specimens, a single large denticle near its posterior end; columella with four, nearly-equal folds.

Range: In and near the Galapagos Islands, in depths between 80 and 1300 meters. We have noted 3 lots.

Discussion: An examination of photographs of type material of DALL's two species has led us to combine both under the first-occurring name. In addition, the unique

Coan, Eugene V. and Roth, Barry. 1966. "The west American Marginellidae." *The veliger* 8, 276–299.

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