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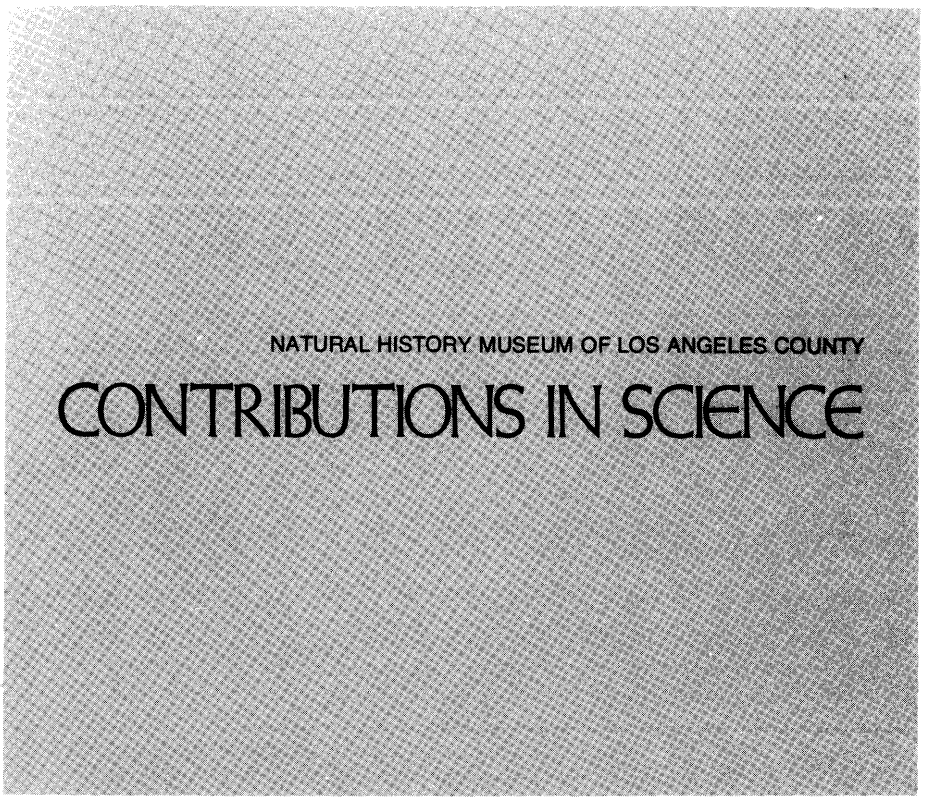
NUMBER 292
MARCH 25, 1978

NEW SPECIES AND RECORDS OF TROPICAL WEST AMERICAN MARGINELLIDAE (MOLLUSCA: NEOGASTROPODA)

By BARRY ROTH



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NEW SPECIES AND RECORDS OF TROPICAL WEST AMERICAN MARGINELLIDAE (MOLLUSCA: NEOGASTROPODA)[1]

By BARRY ROTH[2]

ABSTRACT: Six new species of Marginellidae are described: *Prunum* (*Prunum*) *gorgonense* from off Gorgona Island, Colombia; *Prunum* (*Prunum*) *macleani* from Ecuador; *Prunum* (*Microspira*) *aletes* and *Dentimargo zetetes* from localities on the Pacific coast of Costa Rica; *Dentimargo epacrodonta* from the Republic of Panama; and *Volvarina innexa* from the Galapagos Islands. *Prunum* (*Microspira*) *aletes* is similar to several Caribbean species and Neogene species from Florida. *Prunum* (*Prunum*) *curtum* (Sowerby) ranges into temperate waters south of the Panamic province; records from the Gulf of Panamà need confirmation. The radula of *Prunum* (*Prunum*) *woodbridgei* (Hertlein and Strong) is illustrated and compared to that of *Prunum storerium* (Couthouy). *Dentimargo anticlea* (Dall) is tentatively recognized from several Galapagan localities.

INTRODUCTION

Recent accounts of the members of the Marginellidae known from the Panamic faunal province of tropical western America (Coan and Roth *in* Keen 1971; Roth and Coan 1971) cite 20 named species and subspecies. The extensive molluscan collections of the Section of Malacology of the Natural History Museum of Los Angeles County (LACM), and the gastropod collections of the Allan Hancock Foundation, currently on loan to that section, have furnished material for the description of the following new species and additional information concerning species previously described.

I acknowledge the courtesy of James H. McLean, Curator of Invertebrate Zoology, LACM, in making these collections available for study and aiding in the preparation of this paper. For assistance of various kinds during this investigation I am indebted to Emily H. Vokes, Eugene V. Coan, Antonio J. Ferreira, and Patrick LaFollette. An earlier draft of part of the manuscript was read critically by J. Wyatt Durham. Joseph Rosewater, Thomas R. Waller, and Frederick J. Collier lent comparative material from the National Museum of Natural History. Phillip W. Clover supplied information on type material studied by him in European museums.

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FAMILY MARGINELLIDAE FLEMING

GENUS *PRUNUM* HERRMANNSEN 1852

Type species, by monotypy and tautonymy, *Voluta prunum* Gmelin 1791; Recent, Caribbean region.

As stated by Woodring (1970), *Prunum* is the proper generic allocation for a large number of fossil and Recent species. *Prunum* in the broad sense includes ovate to elongate shells with medium to low spire, aperture narrow or wide but not flaring anteriorly, outer lip more or less thickened and smooth or denticulate, and some development of callus around the aperture.

SUBGENUS *PRUNUM* SENSU STRICTO

Outer lip not greatly thickened, smooth within; anterior canal shallow; callousing around aperture generally limited to small patch on parietal wall; color pattern, when present, generally of indistinct banding.

Prunum (Prunum) gorgonense NEW SPECIES

Figure 1

Diagnosis: A small, elongate *Prunum* differing from other west American species in the relatively high spire, narrow body whorl, and short aperture, colored pale pinkish tan with interior of aperture yellow.

Description of holotype: Shell rather small for the genus, elongate-ovate, narrower anteriorly, highly polished, solid. Color pale pinkish tan with two very faint, narrow, darker spiral bands dividing the body whorl into thirds, and a narrow zone of apricot-orange immediately below the suture. Apex translucent, apricot-orange; outer lip white; interior of aperture golden yellow. Spire elevated, apical angle about 60°, covered by a transparent glaze, which leaves sutures visible but impalpable. Outer lip with simple convex curvature, sharply varicose externally, not denticulate. Aperture narrow, wider anteriorly, with a short posterior notch; anterior margin evenly rounded, without indentation. Parietal wall moderately convex, not calloused. Columella very slightly concave, with four oblique folds including fold at base of columella, the two most anterior folds close together and fusing distally into a low, white fasciole that proceeds around anterior end of shell to merge with outer lip callus. Length 16.2 mm, width 8.0 mm.

Type locality: AFH 221-34, off Gorgona Island, Colombia (3° 01′ 25″ N, 78° 10′ W), in 37 m on rock and shell bottom. Collected by Allan Hancock Pacific Expedition of 1934, 12 February 1934. One specimen.

Type material: Holotype, LACM-AHF 1777.

Referred material: One immature specimen, AHF 228-34, between Gorgona and Gorgonilla Islands, Colombia (2° 56′ 20″ N, 78° 14′ W), mud and sand bottom. Collected by Allan Hancock Pacific Expedition of 1934, 12 February 1934.

Discussion: Prunum (Prunum) gorgonense is smaller and much paler than *Prunum (Prunum) sapotilla* (Hinds 1844), which is grayish brown with a deep brown aperture, tinged with dull orange outside the outer lip. The new species has a proportionally higher spire, shorter aperture, and less inflated body whorl than *P. sapotilla*. The latter species appears to be confined to the region of the Gulf of Panama.

In shape *P. gorgonense* is closer to *Prunum (Prunum) godini* Olsson 1964, from the Esmeraldas Formation, Neogene of Ecuador, and may be a descendant of that species (Figs. 2, 3). *Prunum godini* is larger (holotype 21.8 mm long), broader at the shoulder, and has the columella markedly excavated anteriorly so that the two most anterior folds diverge, rather than converge as in *P. gorgonense*. The fossil species also has a raised vertical callus rim anteriorly, visible in left side view (Fig. 3), which is absent in *P. gorgonense*.

The columellar folds of *P. gorgonense* like those of other species of the subgenus are concave in profile, with the hollow surface directed posteriorly.

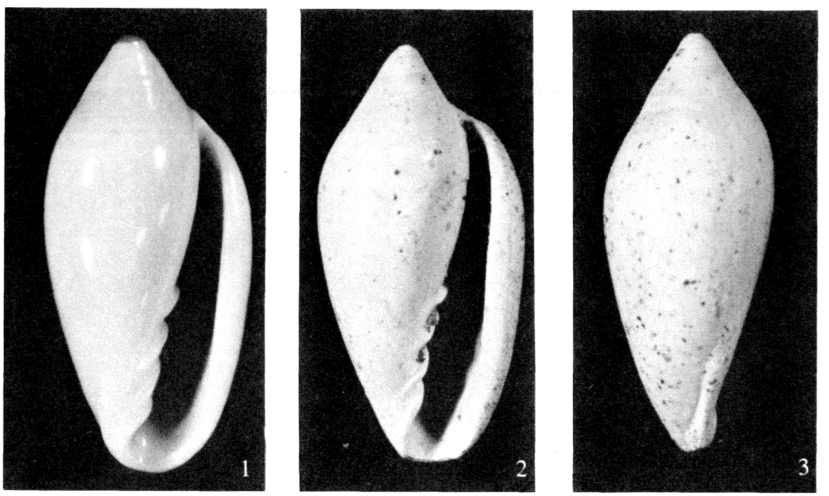
Etymology: gorgonense—from Gorgona Island, the type locality.

Prunum (Prunum) curtum (Sowerby 1832)

Figure 4

Marginella curta Sowerby 1832:105; Reeve 1864: pl. 6, figs. 23a, 23b.
Marginella (Prunum) curta Sowerby, Coan and Roth 1966:280, pl. 48, figs. 4-6.
Prunum (Prunum) curtum (Sowerby), Coan and Roth *in* Keen 1971:633, fig. 1398.

Although it was described from Iquique, Chile, and Paita, Peru, few collections



FIGURES 1-3. 1. *Prunum (Prunum) gorgonense* new species, holotype, LACM-AHF 1777, length 16.2 mm. 2-3. *Prunum (Prunum) godini* Olsson, holotype, USNM 643945, length 21.8 mm.

of this species have been made south of the Panamic province. Fresh beach shells were found in some numbers on an intertidal sandbar at Laguna Grande, Ica Province, Peru (14° 08′ S, 76° 15′ W) by J. H. McLean and Victor Alamo, 31 March 1972. One specimen from that locality (LACM 72-77) is illustrated. An analogous situation in the Atlantic Ocean is the presence of *Prunum* species in temperate waters of Argentina (Carcelles 1944).

No verified type material of this species is known to exist (Coan and Roth 1966). The specimens from Laguna Grande agree with the original diagnosis and with Reeve's (1864) figure of a specimen from the Cuming collection. For purposes of comparison with *Prunum (Prunum) macleani,* I have considered the Laguna Grande material to represent typical *P. curtum*.

Coan and Roth *in* Keen (1971) cite this species as ranging north to Manta, Ecuador. Lots at LACM from the Gulf of Panama differ in several details from South American specimens and may represent other, unrecognized, species.

Prunum (Prunum) macleani NEW SPECIES

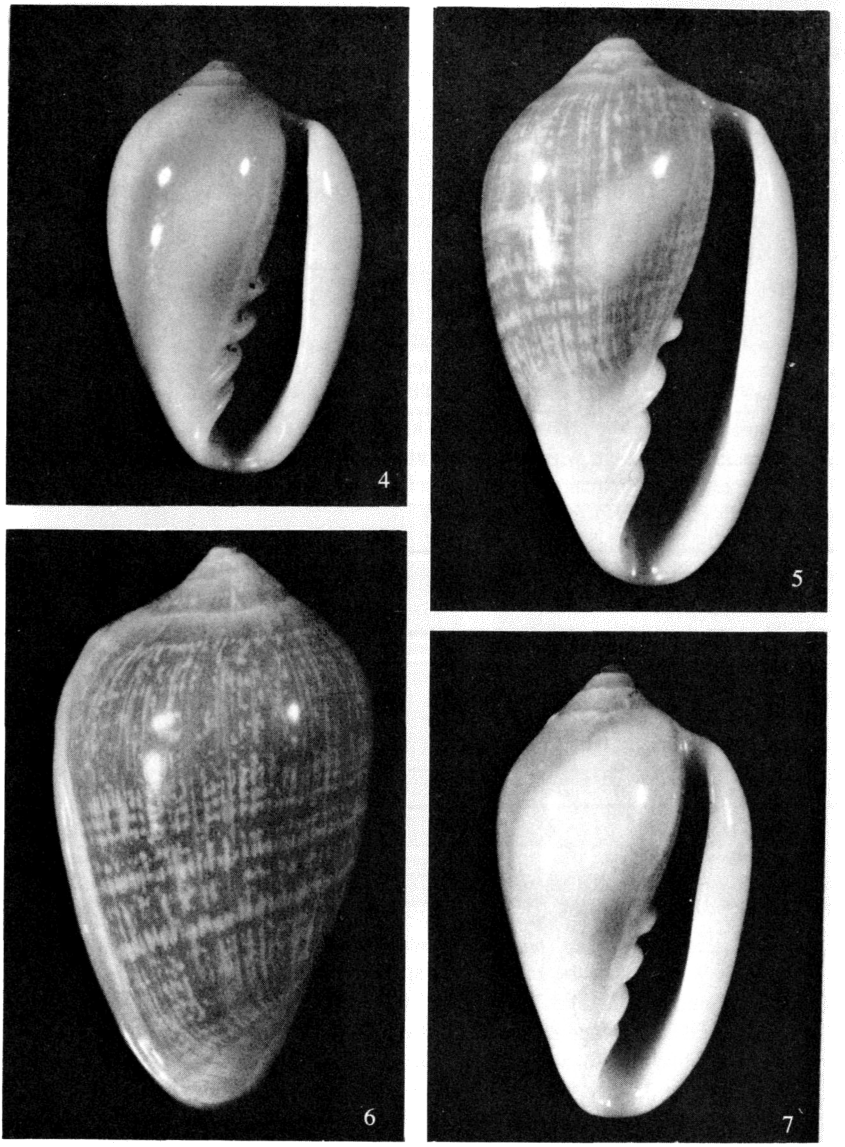
Figures 5-8

Diagnosis: A large *Prunum* with relatively low spire, differing from other west American species in the elongate-conic body whorl, wide aperture, and coloration: muted rose with white flecking in spiral bands, apertural callus edged with bright orange.

Description of holotype: Shell large for the genus, inflated, ovate-conic, narrower anteriorly, highly polished, solid. Color muted rose to rosy tan with a lighter, poorly defined, flesh color subsutural band and fine white flecking tending toward arrangement in spiral bands, most evident around middle of body whorl and near anterior end. Apex translucent, rosy brown; spire low, apical angle about 80°, light flesh color, covered by a transparent glaze which renders suture indistinct. Aperture moderately wide, wider anteriorly, rose color within, anterior margin somewhat effuse. Outer lip varicose, white on ventral surface, margined with brilliant orange externally, not denticulate. Parietal wall moderately convex with a patch of translucent, whitish callus. Columella concave, with four oblique, moderately diverging folds, including fold at base of columella; the two most anterior folds most oblique, nearly parallel, and closer together than posterior two folds, merging distally into a low, white fasciole with a bright orange external margin that proceeds around anterior end of shell to merge with outer lip callus. Length 36.6 mm, width 21.2 mm.

Type locality: Station 778, *Anton Bruun* Cruise 18B (LACM 66-198), west of Cabo Pasado, Ecuador (0° 21′ S, 80° 41′ W), in 19 m, collected 12 September 1966. Twelve specimens.

Type material: Holotype, USNM 749065. One paratype, USNM 749066. Nine paratypes (shells) and one paratype radula slide, LACM 1778. One paratype, California Academy of Sciences, Geology Type Collection 55607. The paratypes differ slightly from the holotype in height of spire, posterior extent of outer lip, degree of development of parietal callus, and depth of ground color. In the lowest-spired ex-



FIGURES 4-7. 4. *Prunum* (*Prunum*) *curtum* (Sowerby), hypotype, CASG 54324, Laguna Grande, Ica Province, Peru, length 17.8 mm. 5-6. *Prunum* (*Prunum*) *macleani* new species, holotype, USNM 749065, length 36.6 mm. 7. *Prunum* (*Prunum*) *macleani* new species, hypotype, AHF 213-34, off La Plata Island. Ecuador. length 22.7 mm.

ample, the apical angle is about 130° and the outer lip extends nearly as far backward as the tip of the spire.

Referred material: Thirteen specimens, AHF 213-34, off La Plata Island, Ecuador (1° 15′ 25″ S, 81° 05′ 15″ W), 13-18 m on rock bottom. Collected by Allan Hancock Pacific Expedition of 1934, 10 February 1934. Three specimens, AHF 212-34, off La Plata Island, Ecuador (1° 15′ S, 81° 04′ 15″ W), 82-100 m on rock and mud. Collected by Allan Hancock Pacific Expedition of 1934, 10 February 1934. These specimens range from 15.4 to 23 mm in length and are more strongly calloused on the face of the body whorl (Fig. 7).

Discussion: This handsome species is the largest marginellid known from the eastern Pacific region and, in the form represented by the type lot, could not be confused with any other species. The referred material from off La Plata Island, however, is much smaller and superficially resembles *Prunum (Prunum) curtum*. These specimens are distinguished from *P. curtum* by their roseate color, more elongate-conic body whorl, and effuse anterior end of the aperture. *Prunum curtum* is usually grayish yellow or grayish brown with a variable amount of lighter flecking. Its body whorl is shorter and broader than that of *P. macleani,* with a characteristic gibbous angulation of the upper part. Its anterior end appears truncated in ventral view. The exterior of its outer lip callus is brownish orange, and this same color appears, often quite extensively, around the edge of the parietal callus (Fig. 4). The interior of the aperture is commonly brown.

The radula of *Prunum (Prunum) macleani* (Fig. 8) consists of broad, nearly straight, comblike rachidian teeth on which large and small cusps alternate. Each tooth of the figured specimen bears 29 cusps.

Etymology: The species is named for Dr. James H. McLean.

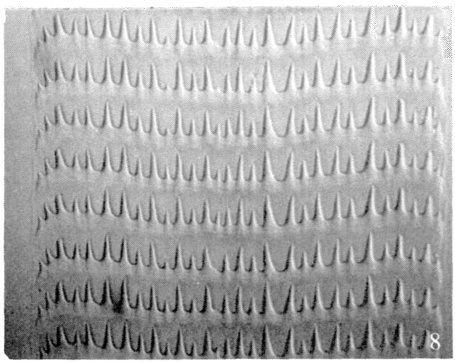
Prunum (Prunum) woodbridgei (Hertlein and Strong 1951)

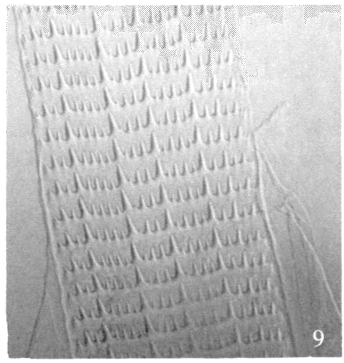
Figure 9

Marginella woodbridgei Hertlein and Strong 1951:80, pl. 26, figs. 3, 4.
Prunum (Prunum) woodbridgei (Hertlein and Strong), Coan and Roth *in* Keen 1971:633, fig. 1400.

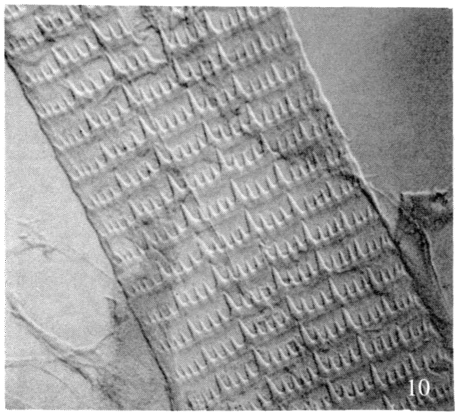
Figure 9 illustrates the radula of a specimen from AHF 930-39, off San Jose Light, Guatemala (13° 52′ 35″ N, 91° 01′ 02″ W), 22-24 m on fine black sand, collected 23 March 1939. The radula consists of a single row of approximately 35 broad, straight, comblike rachidian teeth on which large cusps alternate with from 1-4 smaller cusps. A total of 24 cusps are present on each tooth of the figured specimen.

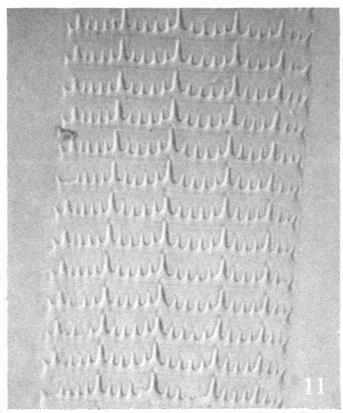
The radula is closely similar to that of *Prunum storerium* (Couthouy 1837) (Figs. 10, 11), a Caribbean species. The shell characters noted by Hertlein and Strong (1951) also suggest close relationship between the two species. The radula of *Prunum apicinum* (Menke 1828), suggested by Coan and Roth (1966) as another allied species, is less similar. *Prunum storerium* frequently is placed in the subgenus *Microspira* Conrad 1868, based on the extensive callousing around the aperture and on the face of the body whorl (*cf.* Woodring 1970:331-332); but this character evidently cuts





FIGURES 8-9. 8. *Prunum* (*Prunum*) *macleani* new species, radula of paratype, LACM 1778. 9. *Prunum* (*Prunum*) *woodbridgei* (Hertlein and Strong), radula, AHF 930-39, off San Jose Light, Guatemala.





FIGURES 10-11. Radulae of *Prunum storerium* (Couthouy), Margarita Island, Venezuela.

across phyletic lines based upon radular features, which are assumed to be more conservative.

SUBGENUS *MICROSPIRA* CONRAD 1868

Type species, by monotypy, *Volutella* (*Microspira*) *oviformis* Conrad 1868; Miocene, Virginia.

Outer lip thick, smooth to finely denticulate within; anterior canal shallow; spire low, sometimes depressed but not fully involuted, covered with a wash of callus; callousing generally extensive around aperture and on face of body whorl; color pattern, when present, of banding and/or irregular spotting.

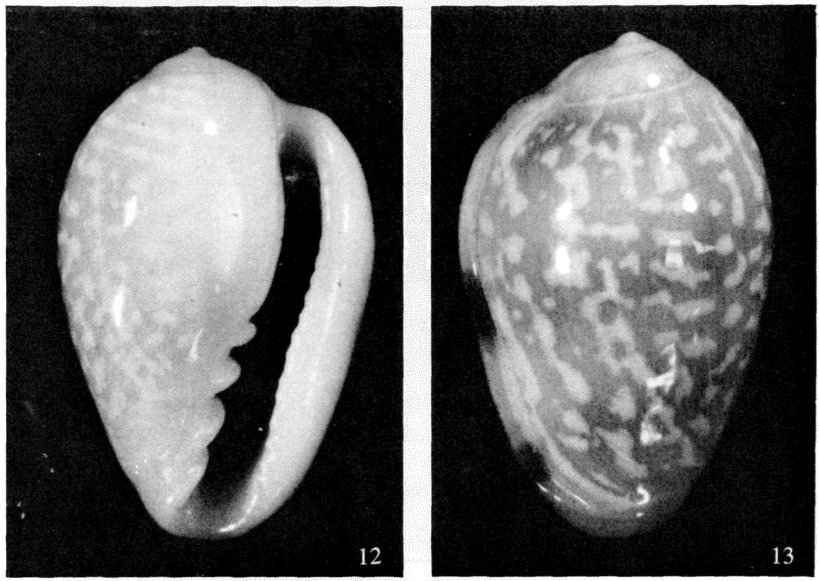
Pending further studies, *Egouena* Jousseaume 1875 (type species, *Egouena egouen* Jousseaume = *Marginella amygdala* Kiener; Recent, west Africa), and *Leptegouana* Woodring 1929 (type species, *Voluta guttata* Dillwyn; Recent, West Indies), are here tentatively considered synonyms of *Microspira,* an interpretation suggested by Woodring (1970). The chief characters on which supraspecific taxa in the *Prunum* group are traditionally recognized pertain to development of callus on body whorl and spire and the degree of thickening of the outer lip—characters having limited phyletic significance, as discussed above under *Prunum (Prunum) woodbridgei*. With the exclusion of the generally less calloused species of *Prunum*, (SENSU STRICTO), *Microspira,* as broadly construed, contains the majority of recent and fossil species of the genus.

Prunum (Microspira) aletes NEW SPECIES

Figures 12-13

Marginella (Prunum) species, Coan and Roth 1966:280, pl. 48, figs. 7, 8.
Prunum (Microspira) species Coan and Roth, Woodring 1970:332.

Diagnosis: A pyriform marginellid distinguished from other west American species of *Prunum* by its ground color of orange-brown with indistinct darker brown



FIGURES 12-13. *Prunum (Microspira) aletes* new species, holotype, LACM 1779, length 15.2 mm.

spiral bands and an overall pattern of irregular white flecks, narrow, sinuous aperture, denticulate outer lip, and calloused parietal wall.

Description of holotype: Shell of medium size for the subgenus, solid, pyriform, inflated at shoulder, narrower anteriorly, with a shallow constriction across body whorl slightly anterior to middle. Entire shell somewhat dorsoventrally flattened. Surface highly polished, unsculptured. Color pale orange-brown with three darker, rather indistinct, purplish brown spiral bands, the first immediately below the suture, the second at the middle of the body whorl, and the third at the anterior one-fourth of body whorl. Shell completely overlain by a layer of clear enamel, rendering suture indistinct and, on the body whorl, bearing numerous white flecks of irregular shape, which tend to fall into ranks parallel to outer lip and into series oblique to axis of shell. Spire low, light apricot-orange; extreme apex white. Outer lip white, sharply varicose externally and bearing two brown spots aligned with the two lower color bands on body whorl; slightly constricted medially; finely denticulate along most of its length. Aperture narrow, even, shallowly S-curved, banded brown and apricot-orange inside; terminating posteriorly in a deep, straight sulcus. Parietal wall concave anteriorly, convex posteriorly, covered with translucent white callus that thickens to rim the posterior sulcus and continues up apertural side of spire nearly to apex. Center of parietal callus thickened into an acute, axially elongate node. Columella with four nearly equal, diverging folds, including one at base of columella, the two lowest folds terminating anteriorly in a weakly developed, white fasciole that is continuous with the varicose outer lip around anterior end of shell. Length 15.2 mm, width 10.0 mm.

Type locality: LACM locality 72-21, 3-11 m in cove between Isla San Jose and Isla Cocinero, Islas Murcielagos, Guanacaste Province, Costa Rica (10° 51′ 50″ N, 86° 55′ 30″ W), collected by P. LaFollette, D. Cadien, A. J. Ferreira, 17 February 1972 (R/V *Searcher* station 404-405). Four specimens.

Type material: Holotype, LACM 1779. Two paratypes, LACM 1780. One paratype, California Academy of Sciences, Geology Type Collection, 55608. The paratypes differ very slightly from the holotype in development of the white spotting on the body whorl and in extent of the parietal callus. Two are of paler ground color than the holotype, with light orange, rather than brown, transverse bands. The paratypes range from 13.7 to 16 mm in length.

Referred material: The species was taken by the R/V *Searcher* at eight other stations off Costa Rica: **392,** LACM 72-12, 1.6 km offshore between Bahia Elena and Juanillo Bay, Guanacaste Province (10° 57′ 20″ N, 85° 46′ 08″ W), in 53.0-26 m, 14 February 1972, 1 immature specimen; **403**, LACM 72-20, cove on west side of Isla Cocinero, Islas Murcielagos, Guanacaste Province (10° 51′ 27″ N, 86° 55′ 15″ W), in 12-18 m, 16 February 1972, one specimen; **409**, LACM 72-24, anchorage in cove, northeast side of Isla San Pedrita, Islas Murcielagos, Guanacaste Province (10° 51′ 40″ N, 86° 57′ 54″ W), in 18-24 m, 17 February 1972, two specimens; **415**, LACM 72-30, south tip of Punta Santa Elena, Guanacaste Province (10° 53′ 35″ N, 85° 57′ 52″ W), in 12-15 m, 18 February 1972, four specimens; **423**, LACM 72-37, between the two Vivadores Norte Islands, near Bahia Culebra, Guanacaste Province (10° 36′ 42″ N, 85° 43′ 00″ W), in 18-21 m, 19 February 1972, two specimens; **428**,

LACM 72-40, 1.6 km off beach, Bahia Brasilito, Guanacaste Province (10° 25′ 57″ N, 85° 49′ 18″ W), in 18 m, 20 February 1972, three specimens; **431-432**, LACM 72-42, 2.4 km east of Punta Ballena, Bahia Ballena, Puntarenas (9° 44′ 15″ N, 84° 33′ 45″ W), in 3-15 m, 21 and 22 February 1972, one specimen; **480-481**, LACM 72-67, off Isla del Caño, NW side, Puntarenas Province (8° 45′ N, 84° 00′ W), in 73-82 m, 16 March 1972, one specimen.

One specimen, AHF 245-34, off Pacora Island, off Bahia Honda, Panama (7° 44′ 19″ N, 81° 35′ 23″ W), 27-46 m on rock and shell bottom, collected 21 February 1934.

Two specimens, California Academy of Sciences, Geology Type Collection 12749, 12750, from CAS locality 27557, dredged off Puntarenas, Costa Rica, by the Templeton Crocker Expedition, 1 July 1932. These two worn specimens are the ones described by Coan and Roth (1966:280, pl. 48, figs. 7, 8) as "*Marginella* (*Prunum*) sp."

Discussion: Placement of this species in the subgenus *Microspira* was first suggested by Woodring (1970), citing the Coan and Roth (1966) illustrations. This is the first verified record of the subgenus in west American waters. (*Marginella albuminosa* Dall 1919, probably a *Microspira,* is now thought to have been reported from west Mexico in error; *cf.* Keen 1971:907.)

The color pattern of *Prunum* (*Microspira*) *aletes* distinguishes it from all other known eastern Pacific Marginellidae. Its pyriform shape, narrow, S-curved aperture, and dorsoventral flattening of the shall are other diagnostic characters. *Prunum sapotilla* (Hinds), which may be sympatric with *P. aletes* in the region of Bahia Honda, Panama, sometimes has faint spiral bands, but it is much more elongate and lacks any trace of white spotting. Coan and Roth (1966: table 2) contrasted the new species to *Prunum curtum* (Sowerby) on several features, including the narrow aperture, the thick, finely toothed outer lip, and the outline of the shell. *Prunum woodbridgei* (Hertlein and Strong) is brownish gray, not spotted, and has an open, simply curved aperture.

The dark spiral bands of *P. aletes* are at least partially antecedent to the clear enamel with white spots that lies over them. An immature specimen (LACM 72-12) is plainly banded and has much sparser spotting than any of the adult specimens. Young specimens of the Caribbean *Prunum storerium* (Couthouy) are conspicuously banded with purple on a straw-colored ground, this pattern later being obscured by the predominantly gray enamel of mature shells.

Like many other tropical west American marginellids, *Prunum* (*Microspira*) *aletes* is most similar to species now living in the Caribbean region. The actual number of western Atlantic species remains to be determined. Probably closest to *P. aletes* is the species from Grand Cayman Island, British West Indies, figured by Abbott (1958:84, pl. 2, figs. j, k) as "*Prunum pruniosum* Hinds" (error for *Marginella pruinosa* Hinds 1844) with *Marginella nivea* C. B. Adams 1850, placed in synonymy. Abbott (1958:84) described the species thus: "Shell 8 to 12 mm. in length, resembling *guttatum,* but with its white spots half as small; with numerous, weak, uneven, denticulations on the inner [outer?] lip; with 3 weak, diffused spiral bands of yellowish brown (or absent); without color spots on the outer lip, and with a slightly raised spire

which is never covered by the labral callus." Some color variation among Grand Cayman populations was also specified. The narrow aperture is doubly curved, as in *P. aletes*.

Tryon (1882) united *Marginella pruinosa* and *Marginella nivosa* Hinds 1844, under the latter name; this synonymy was disputed by Abbott (1958). *Marginella nivea* C. B. Adams 1850, described from Jamaica, is also similar. The lectotype, figured by Clench and Turner (1950), is a worn, whitish shell 9 mm long, of the same general shape as Abbott's Grand Cayman species, with columellar folds more nearly parallel. Tryon (1882) cited *M. nivea* as another synonym of *M. nivosa*. Examination of large suites of Caribbean material may be necessary to settle the question of synonymy. Some workers consider the presence or absence of dark spots on the outer lip to be taxonomically significant.

Prunum (*Microspira*) *guttatum* (Dillwyn 1817) from Florida, the West Indies, and Panama, is another white-flecked species. It is larger than *P. aletes,* frequently reaching 20 mm or more in length, and more regularly ovate than the Pacific species. Its apertural callus may extend as far as, or even posterior to, the tip of its low spire. The outer lip is slightly constricted medially and bears a variable number of orange-brown blotches. The labral denticulation is very weak in all specimens examined. In form and color, *P. guttatum* is quite variable; notes on one variation were given by Bayer (1943).

The somewhat similar *Prunum* (*Microspira*) *roscidum* (Redfield 1860), living from New Jersey to eastern Florida, was contrasted to *P. guttatum* by Abbott (1957). In the synonymy of *P. roscidum,* Abbott included *Marginella eulima* Dall 1892, late Neogene of Shell Creek and Caloosahatchie beds, Florida, which was described as having opaque white flakes on translucent enamel and was itself a renaming of spotted specimens previously (Dall 1890) referred to *Marginella limatula* Conrad 1834. Dall (1892) suggested that *M. eulima* might be ancestral to *M. nivosa*. Spotted patterns, sometimes detectable under ultraviolet light, characterize a number of other small to medium-sized species from the Neogene of Florida.

Prunum (*Microspira*) *donovani* (Olsson 1967) of the Pinecrest beds, middle Pliocene of southern Florida (Akers 1974), more than twice the size of *P. aletes* and having five instead of four columellar folds, appears to be another relative. Under ultraviolet light it shows a pattern of spots in the superficial enamel and, beneath, transverse banding (Olsson 1967: pl. 8, figs. 9a-9c).

Throughout the later Tertiary, *Microspira* constitutes a prolific group in the American tropics. Discrimination of probable lineages is difficult. It seems certain, however, that several stocks of white-spotted species existed in the area prior to the closing of the Central American isthmus. On the west, one such stock has survived to the present day, represented by *P. aletes*.

Etymology: aletes—Gr., a wanderer.

GENUS *DENTIMARGO* COSSMANN 1899

Type species, by original designation, *Marginella dentifera* Lamarck 1803; Eocene, western Europe.

Small to minute, biconic, high-spired; anterior notch absent; outer lip smooth or denticulate within, commonly with a large posterior denticle.

Eburnospira Olsson & Harbison 1953 (type species, *Marginella eburneola* Conrad), *Longinella* Laseron 1957, *non* Gros and Lestage 1927 (type species, *Marginella maugeana* Hedley), and *Volvarinella* Habe 1951 (type species, *V. makiyamai* Habe), are regarded as synonyms of *Dentimargo*.

Dentimargo anticlea (Dall 1919)

Marginella anticlea Dall 1919:307. Coan and Roth 1966:289, pl. 51, fig. 61 (in synonymy of *Volvarinella eremus* [Dall]).

Coan and Roth (1966) synonymized this species with *Marginella eremus* Dall 1919, considering the type lot of *M. anticlea* to represent immature specimens of *M. eremus*. The lectotype of *anticlea* is smaller, less sharply biconic, and lacks the prominent labral denticle of *M. eremus*. Its nucleus is moderately large and blunt, and projects little from the succeeding whorls. The LACM-AHF collections contain material from the Galapagos Islands, from depths of approximately 80 to 110 meters, which seems at least tentatively referable to *Dentimargo anticlea*. Since these specimens show evidence of maturity—e.g., slight thickening and inturning of the outer lip and development of a low posterior denticle a short distance inside the aperture —at lengths of 2.7 to 3.5 mm, they call into question the premise that Dall's two nominal taxa represent growth stages of the same species.

These specimens share with the lectotype of *M. anticlea* a low, blunt nuclear shorl, a columella excavated so that the most posterior fold projects farthest into the aperture, and an acute posterior angle of the aperture.

Referred material: Two specimens, bottom sample AHF 406, Hancock Bank, northeast of Charles Island, Galapagos Islands, Ecuador (01° 03′ 30″ S, 90° 17′ 30″ W), 110 m. Collected by Allan Hancock Pacific Expedition of 1933, 5 February 1933. Five specimens, bottom sample AHF 415, north of Indefatigable Island, Galapagos Islands (0° 27′ S, 90° 22′ W), 100 m. Collected by Allan Hancock Pacific Expedition of 1933, 17 February 1933. One immature specimen, bottom sample AHF 411, north of Duncan Island, Galapagos Islands (approx. 0° 35′ S, 90° 40′ W), 82 m. Collected by Allan Hancock Pacific Expedition of 1933, 15 February 1933. Seven specimens (four juvenile), bottom sample AHF 417, north of Indefatigable Island, Galapagos Islands (0° 27′ S, 90° 22′ W), 100 m. Collected by Allan Hancock Pacific Expedition of 1933, 17 February 1933.

A lot of three specimens, bottom sample AHF 400, Gardner Bay, Hood Island, Galapagos Islands (approx. 01° 22′ S, 89° 39′ W), 31 m, collected by Allan Hancock Pacific Expedition of 1933, 25 January 1933, is distinctive in having a medium-sized, moderately elevated nucleus, higher and more conic spire, aperture 58% of total length of shell (compared to an average of 66% for specimens from bottom sample AHF 415), and slightly more shouldered body whorl, resulting in a more obtuse posterior angle of aperture. The largest specimen is 3.7 mm long. One additional, worn individual from bottom sample AHF 407, Albemarle Point, Albemarle Island, Galapagos

Islands (approx. 0° 12′ N, 91° 21′ W), 91 m, collected by Allan Hancock Pacific Expedition of 1933, 10 February 1933, is intermediate in spire height and projection of the nucleus. I believe the Hood Island specimens to be extreme members in a varying series of shallow water populations of *Dentimargo anticlea*.

Coan and Roth (1966: pl. 51, figs. 62, 63) illustrated as a hypotype of "*Volvarinella*" *eremus* (Dall) a high-spired shell with orange-brown bands around the body whorl; the same figure was reprinted by Keen (1971: fig. 1401). The figured specimen, from the Stanford University collection (SUPTC 9847), was labeled Albemarle Island, Galapagos Islands. It is extremely similar to specimens of *Dentimargo aureocincta* (Stearns 1873) from Cedar Key, Florida (Locality 852, California Academy of Sciences Department of Geology), particularly in size, disposition of the color bands, prominence of columellar folds, and arrangement of teeth along the convex and thickened outer lip. They also share a marked diagonal truncation of the outer lip anteriorly. Unless further collecting in the Galapagos turns up material to confirm the record, it appears probable that the Stanford specimen is a misallocated Atlantic shell. The only *Dentimargo* species in tropical west America definitely known to have brown banding is *D. zetetes*, described below.

Dentimargo zetetes NEW SPECIES

FIGURE 14

Diagnosis: A small, gracefully fusiform *Dentimargo* with whorls of spire only slightly convex, sutures scarcely impressed; distinguished from other west American species by the presence of orange-brown spiral banding which is composite in size and strength of the bands.

Description of holotype: Shell rather small for the genus, gracefully fusiform, somewhat inflated anteriorly. Surface highly polished, unsculptured. Translucent white, with four narrow, sharply defined, orange brown spiral bands on body whorl, the first band paler than the rest, just anterior to suture, the remaining three dividing the body whorl approximately into fourths; regions between second and third, and third and fourth bands lightly colored orange-brown, with faint indications of secondary banding; with a poorly defined orange-brown zone extending from anterior end of shell to just anterior of last narrow band. Nucleus small, rounded, moderately projecting. Spire high, of three whorls, flat-sided; suture indistinct, scarcely impressed; two posterior color bands showing on whorls of spire. Outer lip thick, convex, white with color bands continuing to its edge, with moderately broad, sloping shoulder behind aperture; interior with one major denticle posteriorly and three smaller, low, obscure denticles medially. Aperture moderately wide, whitish inside with color bands showing through, anterior margin slightly produced, posterior angle obtuse, posterior notch distinct. Parietal wall faintly convex, uncalloused. Columella shallowly concave, with four diverging, nearly equidistant folds including fold at base of columella; posterior three folds subequal in size, basal one smaller. Length 4.1 mm, width 2.0 mm, length of aperture 2.2 mm.

Type locality: LACM locality 72-7, 1-11 m, Punta Isla to 500 m south of point,

Bahia Elena, Guanacaste Province, Costa Rica (10° 56′ 00″ N, 85° 48′ 55″ W), collected by P. LaFollette & D. Cadien, 13 February, 1972 (R/V *Searcher* station 382-383). Two specimens.

Type material: Holotype, LACM 1781. Paratype, LACM 1782.

Referred material: Two specimens, AHF 472-35, Port Parker, Costa Rica (10° 57′ 50″ N, 85° 48′ 45″ W), 55 m on shell bottom. Collected by Allan Hancock Pacific Expedition of 1935, 9 February 1935. One specimen, AHF 470-35, Port Parker, Costa Rica (10° 57′ 35″ N, 85° 49′ W), 9 m on sand and mud bottom. Collected by Allan Hancock Pacific Expedition of 1935, 9 February 1935. One specimen, bottom sample AHF 316, Gulfo Elena (Port Parker), Costa Rica (approx. 10° 55′ N, 85° 49′ W), 26 m. Collected by Allan Hancock Pacific Expedition of 1935, 8 February 1935. One specimen, LACM 70-65, Playas del Coco, Costa Rica (10° 33′ N, 85° 43′ W), intertidal. Collected by T. M. Spight, February-March 1970. Two specimens, LACM 72-30, south tip of Punta Santa Elena, Guanacaste Province, Costa Rica (10° 53′ 35″ N, 85° 57′ 52″ W), in 12-15 m, collected by P. LaFollette and D. Cadien, 18 February 1972 (R/V *Searcher* sta. 415). Ninety-five specimens, LACM 72-12, 1.6 km offshore between Bahia Elena and Juanillo Bay, Guanacaste Province, Costa Rica (10° 57′ 20″ N, 85° 46′ 08″ W), in 53-26 m, collected by P. LaFollette and D. Cadien, 14 February 1972 (R/V *Searcher* sta. 392).

Discussion: The paratype is banded similarly to the holotype, and the large lot from LACM locality 72-12 shows minor variations of the same pattern. The banding on a specimen from AHF 472-35 differs in having (starting below the suture) a very faint narrow band, followed by a distinct narrow band on the posterior third of the whorl, a broad band near the middle of the aperture, another narrow band, and a brown zone at the anterior end of the shell. Other specimens show banding faintly but are too worn to permit a detailed description of the pattern. The complex nature of the banding, in both size and strength, nevertheless appears to be a diagnostic character and helps to distinguish *D. zetetes* from the Caribbean *Dentimargo aureocincta* (Stearns 1873), which also differs in having a shorter aperture and denticles borne on the edge of the outer lip rather than a short distance inside the aperture.

Dentimargo zetetes appears to be the only eastern Pacific species with a color pattern, as mentioned above under *D. anticlea*. The latter species has, in most instances, a larger, flatter nucleus and more convex whorls of the spire. *Dentimargo erema* (Dall 1919) is unbanded, has denticles on the edge of the outer lip, and a larger, bulbous nucleus. *Dentimargo epacrodonta* is unbanded, and has a narrower aperture, narrower shoulder on body whorl, and well developed teeth inside the aperture.

Etymology: zetetes—Gr., a searcher.

Dentimargo epacrodonta NEW SPECIES

FIGURE 15

Diagnosis: A small, ivory-white *Dentimargo* distinguished from other west American species by its narrowly shouldered and anteriorly constricted body whorl and the presence of several subequal denticles a short distance inside aperture.

Description of holotype: Shell rather small for the genus, narrowly biconic, produced anteriorly. Surface highly polished, unsculptured. Translucent ivory-white. Body whorl constricted by a broad, shallow sulcus about one-third of the distance from anterior end. Nucleus small, hemispherical, moderately projecting. Spire high, of three convex whorls; suture appressed but distinct; "false suture" (internal trace of each whorl's junction with previous whorl) visible. Outer lip sharp at edge but thickened a short distance back, with narrow, steeply sloping shoulder behind aperture; straight along its medial portion; with seven distinct denticles a short distance inside aperture, of which the most posterior and the fourth are largest, the second and third from posterior are small and sharp, and the three most anterior are low and progressively less distinct. Aperture moderately narrow, produced anteriorly and somewhat effuse toward anterior end of outer lip; posterior angle acute; posterior notch indistinct (on paratype; holotype broken here). Parietal wall excavated, not calloused. Columella markedly concave, with four folds including fold at base of columella; posterior two folds subparallel, anterior two very oblique. Length 3.7 mm, width 1.7 mm, length of aperture 2.0 mm.

Type locality: Bottom sample AHF 308, off Bahia Honda, Republic of Panama (7° 44′ N, 81° 35′ W), 55-64 m. Collected by Allan Hancock Pacific Expedition of 1934, 21 February 1934. Three specimens.

Type material: Holotype, LACM-AHF 1783. Two paratypes, LACM-AHF 1784.

Referred material: One specimen, bottom sample AHF 312, Secas Islands, Republic of Panama (approx. 7° 57′ N, 82° 02′ W), 26 m. Collected by Allan Hancock Pacific Expedition of 1935, 4 February 1935. Three specimens, bottom sample AHF 307, off Secas Islands (approx. 7° 50′ N, 82° 00′ W), 73-146 meters. Collected by Allan Hancock Pacific Expedition of 1934, 22 February 1934.

Discussion: The ivory color, absence of banding, and narrower shoulder distinguish *D. epacrodonta* from *D. zetetes*, which in addition lacks the anterior constriction of the body whorl. No other west American species seems to have the array of apertural denticles shown by *D. epacrodonta*, but identification should not hinge on these characters since, as demonstrated in one paratype, the denticles may be incompletely developed. The dentition of *D. anticlea* (Dall), as far as seen, is dominated by a single strong posterior tooth. The nucleus of *D. anticlea* is proportionally larger and less projecting.

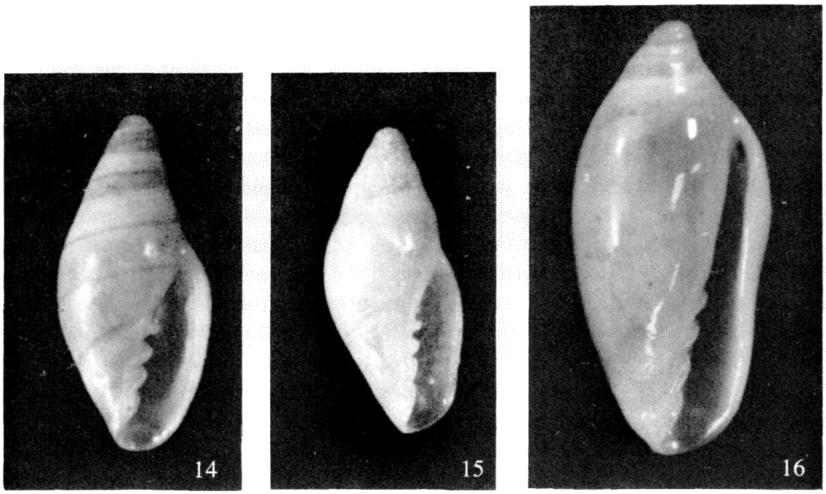
Etymology: Gr., *epakros*, pointed at the end + *odontos*, tooth; a noun.

GENUS *VOLVARINA* HINDS 1844

Type species, by subsequent designation, Redfield 1870, *Marginella nitida* Hinds 1844 (=*Voluta mitrella* Risso 1826); Recent, Mediterranean.

Small, cylindrical to conic; anterior notch absent; outer lip smooth or weakly denticulate within; spire low to moderately elevated.

The status of *Hyalina* Schumacher 1817 (type species, *H. pellucida* Schumacher; Recent, locality unknown), used by some workers for this group of species, is unresolved. Dodge (1955) identified *H. pellucida* with *Voluta pallida* Linnaeus 1767, and considered the latter a recognizable Caribbean species. Woodring (1970) regarded



FIGURES 14-16. 14. *Dentimargo zetetes* new species, holotype, LACM 1781, length 4.1 mm. 15. *Dentimargo epacrodonta* new species, holotype, LACM 1783, length 3.7 mm. 16. *Volvarina innexa* new species, holotype, LACM-AHF 1785, length 5.3 mm.

H. pellucida as unrecognizable and the genus as a *nomen dubium*. No type specimen of *H. pellucida* is extant (J. Knudsen, personal communication); designation of a neotype in conjunction with a revisionary study would resolve the question.[3]

Volvarina innexa NEW SPECIES

FIGURE 16

Diagnosis: A small *Volvarina* with relatively high spire, conic outline, and large nucleus, differing from other west American species by being white with two translucent spiral bands and having a narrow yellow band near the anterior end.

Description of holotype: Shell small for genus, elongate-conic, narrower anteriorly. Surface highly polished, unsculptured. Translucent white with two spiral zones of greater translucency, the first extending from shoulder of body whorl to just below suture, the second at middle of body whorl. Outer lip and extreme anterior end opaque white. Nucleus large; spire elevated, nearly transparent, with "false suture" (internal trace of each whorl's junction with previous whorl) visible; whorls of spire convex. Outer lip varicose externally, thickest posterior to middle, slightly constricted medially, not denticulate. Aperture narrow, evenly widening to anterior end; anterior mar-

[3]Coan and Roth (1976, Jour. Moll. Stud. 42:217–222) recently discussed this problem and designated a neotype.

gin evenly rounded, without indentation; posterior notch shallow. Parietal wall moderately convex, uncalloused. Columella very slightly concave, with four equidistant, nearly parallel folds including fold at base of columella, the folds terminating distally in a weakly defined white fasciole with a pale yellow spiral band along its posterior margin. Length 5.3 mm, width 2.2 mm.

Type locality: Station AHF 177-34, Sullivan Bay, James Island, Galapagos Islands, Ecuador (0° 16′ 30″ S, 90° 35′ 15″ W), 9-37 m on bottom of rock with sand patches. Collected by Allan Hancock Pacific Expedition of 1934, 23 January 1934. One specimen.

Type material: Holotype, LACM-AHF 1785.

Discussion: The high spire, prominent nucleus, and conic outline of *Volvarina innexa* distinguish it from other west American species of the genus, as does its singular color pattern. *Volvarina nyssa* Roth and Coan 1971, from Pinta and Genovesa Islands, Galapagos Islands, has a much lower spire and bright orange-brown bands on the body whorl. *Volvarina taeniolata rosa* (Schwengel 1938) is larger, more ovate in outline, and bright pink in color; some specimens show brown banding like that of the nominate subspecies, which ranges from southern California to Central America. Some specimens from the Gulf of California, like those referred to *Volvarina taeniolata* by Coan and Roth (1966: pl. 50, figs. 54, 55), resemble *V. innexa* in their pale coloration and high spire. They do not however have the large nucleus of the new species. The columellar folds of *V. innexa* seem to be proportionally the largest of any west American *Volvarina* examined. I interpret *V. innexa* as an eastern Pacific representative of the group of high-spired Caribbean Marginellidae which includes *Volvarina veliei* (Pilsbry 1896) and *V. avenacea* (Deshayes 1844).

Etymology: innexa—L., joined.

RESUMEN

Se describen seis nuevas especies de Marginellidae: *Prunum* (*Prunum*) *gorgonense* de la Isla Gorgona, Colombia; *Prunum* (*Prunum*) *macleani* de la República del Ecuador; *Prunum* (*Microspira*) *aletes* y *Dentimargo zetetes* de la costa Pacífica de Costa Rica; *Dentimargo epacrodonta* de la República de Panamá; y *Volvarina innexa* de las Islas Galápagos. *Prunum* (*Microspira*) *aletes* se parece a algunas especies Caribes y a especies Neogenos de Flórida. *Prunum* (*Prunum*) *curtum* (Sowerby) se extiende hasta aguas templados al sur de la provincia Panámica; su presencia en el Golfo de Panamá requiere confirmación. La radula de *Prunum* (*Prunum*) *woodbridgei* (Hertlein y Strong) se ilustra; concuerda bien con la radula de *Prunum storerium* (Couthouy). *Dentimargo anticlea* (Dall)—identificación tentativa—se encuentra en varias localidades en las Islas Galápagos.

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Accepted for publication October 27, 1976.