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MARGINELLIDAE (MOLLUSCA:
NEOGASTROPODA) FROM THE GALÁPAGOS
ISLANDS AND COCOS ISLAND

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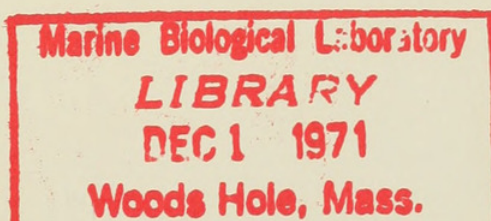
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Eighteen species of the gastropod family Marginellidae have been reported from the eastern Pacific area (Coan and Roth, 1966; Roth and Coan, 1968). The present paper describes four more, recognized in the course of a biogeographic study of the family; three of these receive names. Marginellid records for the Galápagos Islands (Hertlein and Strong, 1939, 1955) and Cocos Island, Costa Rica (Hertlein, 1963), are in part revised.

For generous aid in locating and lending specimens, the authors are indebted to personnel of the Division of Mollusks, United States National Museum, and the Department of Malacology, Academy of Natural Sciences, Philadelphia. Dr. Leo G. Hertlein and Mr. Allyn G. Smith of the California Academy of Sciences contributed valuable opinions and advice. The shell illustrations were prepared by Miss Linette Sabre, Department of Herpetology, California Academy of Sciences.

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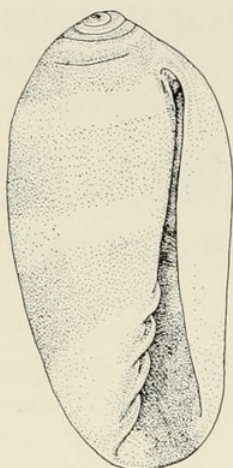


FIGURE 1. *Volvarina nyssa* Roth and Coan, new species. Holotype no. 13713, California Academy of Sciences, Department of Geology, Type Collection. Isla Pinta, Galápagos Islands. Length 5.7 mm.

DESCRIPTIONS OF SPECIES

Volvarina nyssa Roth and Coan, new species.

(Figures 1, 2.)

DESCRIPTION OF HOLOTYPE. Shell small, ovate-cylindrical, narrower anteriorly; highly polished, translucent white; body whorl with three spiral orange-brown bands, the first just anterior to suture, the second on broadest portion of body whorl, the third occupying posterior half of anterior third of shell (as seen in apertural view); spire low, rounded-conical, with portion of posterior color band visible, covered by a transparent glaze which leaves sutures visible but impalpable; outer lip shallowly sinuous medially, white, thickened along its outer margin; aperture with indistinct posterior notch, narrow, widening anteriorly, color bands showing within; anterior margin evenly rounded, without indentation; columella slightly convex, with four equally spaced, sharp, oblique folds on anterior portion, most anterior fold at base of columella. Length 5.7 mm., width 3.0 mm.

TYPE LOCALITY. Southwest side of Isla Pinta (Abingdon), Galápagos Islands, Ecuador ($0^{\circ} 31' N$; $90^{\circ} 46' W$), intertidal area, collected by David Q. Cavagnaro, 25 May 1964.

TYPE MATERIAL. Holotype no. 13713, California Academy of Sciences, Department of Geology, Type Collection. Four paratypes, in alcohol, no. 451, and one paratype, a radula slide, no. 452, California Academy of Sciences, Department of Invertebrate Zoology, Type Collection. One paratype, United States National Museum, Division of Mollusks. One paratype, Academy of Natural Sciences of Philadelphia, Department of Malacology. All paratypes are from the same locality as the holotype.

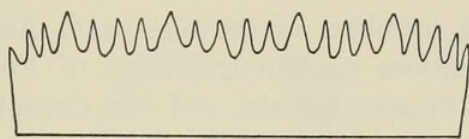


FIGURE 2. *Volvarina nyssa* Roth and Coan, new species, rachidian radular plate. Paratype no. 452, California Academy of Sciences, Department of Invertebrate Zoology, Type Collection. Isla Pinta, Galápagos Islands. Longest dimension 42 μ .

REFERRED MATERIAL. One specimen, California Academy of Sciences locality no. 38871, Darwin Bay, Isla Genovesa (Tower), Galápagos Islands ($0^{\circ} 19' N$; $89^{\circ} 58' W$), in tide pools, collected by Allyn G. Smith, 30 January 1964.

DISCUSSION. In outline, intense coloring, and small size, *Volvarina nyssa* resembles *Volvarina albolineata* (d'Orbigny, 1842) of the Caribbean fauna. The central brown band of the latter species is narrower than that of *V. nyssa* (cf. Warmke and Abbott, 1961, plate 23, figure i). Tryon (1882) reported "*Marginella*" *albolineata* as occurring both in the West Indies and in Lower California, but Tomlin (1916) correctly rejected the eastern Pacific record. All specimens we have seen from both coasts of Baja California belong to the species *Volvarina taeniolata* Moerch, 1860.

Volvarina nyssa is readily distinguished from the pink *Volvarina taeniolata rosa* (Schwengel, 1938), the other Galápagos species of the genus, on the basis of color. Erosion and sunbleaching of dead specimens may reduce the normal pink color of the latter, revealing brown banding which is not, however, as clear and uniform in density as that of *V. nyssa*. The specimens on which Hertlein and Strong (1955) based their Galápagos record of "*Marginella (Hyalina) californica* Tomlin" [= *Volvarina taeniolata taeniolata*] all appear referable to *V. taeniolata rosa*.

Specimens of *Volvarina taeniolata taeniolata* from southern California, which may have color bands disposed as in *V. nyssa*, are larger as adults (length 7.5 to 9 mm.), more inflated and less cylindrical, and have a ground color of pale straw—seldom the clear white of *V. nyssa*. Color bands of the California shells are frequently edged with darker brown, as in the form named *Marginella californica* var. *parallela* Dall, 1918. This seems to be without taxonomic significance.

Banded species of *Volvarina* occur in the western Pacific, in both temperate and tropical waters, but none appears similar enough to *V. nyssa* to require special comparison.

The radula of this new species consists of straight comblike rachidian plates, on which large cusps alternate with groups of three and four smaller cusps (fig. 2). A total of 21 cusps are present on the figured specimen, taken from a shell about 5.5 mm. in length.

Present collecting records of *Volvarina nyssa* are restricted to Isla Pinta and

Isla Genovesa, outlying members of the Galápagos Archipelago north of the equator. Museum collections contain specimens of *Volvarina taeniolata rosa* from Islas Santa Cruz, Pinzón, Rábida, and San Cristóbal, and the portion of Isla Isabela south of the equator. Abbott (1966, figure 2) has plotted the annual surface temperature regimes for the Galápagos area; temperatures north of the equator average higher than those south, particularly during the months June to December. If the apparent geographic separation of *V. nyssa* and *V. taeniolata rosa* is not merely the result of insufficient collecting, temperature may be a cause.

The name "*nyssa*" is a Greek noun meaning a goal, or starting post.

Granula achenea Roth and Coan, new species.

(Figure 3.)

Marginella minor C. B. Adams, BARTSCH and REHDER, Smithsonian. Miscell. Coll., vol. 98, no. 10 (Pub. 3535), p. 18, 1939. Cocos Island, Costa Rica. HERTLEIN, Proc. Calif. Acad. Sci., ser. 4, vol. 32, no. 8, p. 240, 1963. Cocos Island.

Not *Marginella minor* C. B. ADAMS, Catalogue of shells collected at Panama, p. 264, 1852. Panama City, Panama.

DESCRIPTION OF HOLOTYPE. Shell minute, ovate, broader posteriorly; almost transparent, highly polished, colorless but with bluish-white glaze; spire low, convexly conical, unsculptured; outer lip nearly straight, on last whorl advancing high on spire, thickened by callus evenly along its outer edge, with a few faint denticles internally; suture appressed, indistinct, rendered irregular by narrow, closely spaced, longitudinal, raised ridges which extend somewhat protractively across body whorl, becoming fainter and disappearing just behind anterior margin of shell; "false suture" (internal trace of body whorl's junction with previous whorl) visible under enamel of body whorl, just anterior to actual suture; aperture with posterior notch, narrow, widening slightly anteriorly; parietal wall evenly convex, with slight, transparent callousing posteriorly; columella with five evenly spaced folds (including the one at base of columella), and one very faint smaller fold posterior to them; folds thick, nearly square in outline; sharply defined opaque siphonal fasciole present on body whorl adjacent to columellar folds, sculptured with minute papillae; anterior margin of shell indented into small siphonal notch. Length 2.6 mm., width 1.6 mm.

TYPE LOCALITY. Chatham Bay, northeast side of Isla del Coco (Cocos Island), Costa Rica (5° 35' N, 87° 02' W), in 80 feet (24.5 meters), collected by Waldo L. Schmitt, 24 April 1941. The bottom of Chatham Bay is said to consist of coral and sand. The shells in the type lot were dead when collected.

TYPE MATERIAL. Holotype no. 568110, United States National Museum, Division of Mollusks. Thirty-six paratypes, no. 681406, United States National Museum, Division of Mollusks. Paratypes also have been distributed to the California Academy of Sciences; Museum of Comparative Zoology, Harvard University; Los Angeles County Museum of Natural History; Academy of Natural

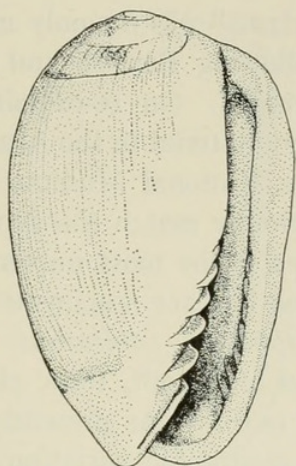


FIGURE 3. *Granula achenea* Roth and Coan, new species. Holotype no. 568110, United States National Museum, Division of Mollusks. Chatham Bay, Isla del Coco. Length 2.6 mm.

Sciences, Philadelphia; Geology Department, Stanford University; and the American Museum of Natural History. The paratypes differ from the holotype mainly in development of callus around the aperture. Younger specimens show less callousing along the edge of the outer lip and on the parietal wall; their columellar folds are sharp instead of thick and somewhat squared as in the holotype, and they do not have denticles inside the outer lip.

REFERRED MATERIAL. One specimen, United States National Museum, no. 427596, Chatham Bay, Cocos Island, collected during Presidential Cruise, 1938, from bottom sample. Twenty-seven specimens, Academy of Natural Sciences of Philadelphia, no. 155005, Chatham Bay, Cocos Island, collected by H. A. Pilsbry, 1929; these show some variation in height of spire.

DISCUSSION. As indicated by McLean (1969), the genus *Granula* Jousseaume, 1875, is a prior synonym of *Kogomea* Habe, 1951, the name which was applied to this group by Coan and Roth (1966). From all other eastern Pacific species of *Granula*, this species is immediately recognizable by the strong and numerous longitudinal ridges which corrugate its surface. The occasional thickening of one or more growth lines has been observed as a variation in some individuals of other species, but not the regular development of a plicate surface over almost the entire shell.

Surface ornamentation of any kind is rare among members of the subfamily Cystiscinae, being otherwise confined to a few species of the recent genera *Pugnus* and *Marginellopsis* and the Miocene genus *Topaginella*, none of which is known from the eastern Pacific region.

In outline *Granula achenea* is not as conspicuously conical as *Granula minor* (C. B. Adams, 1852); its spire is more inflated than that of *Granula polita* (Carpenter, 1857).

"*Marginella minor* C. B. Adams" was the only marginellid listed by Hertlein (1963) from Cocos Island, following Bartsch and Rehder (1939); Coan and Roth (1966) repeated this record. On re-examining Bartsch and Rehder's specimen and other Cocos Island material in the Academy of Natural Sciences of Philadelphia and United States National Museum collections, we were unable to find any specimens which closely match the typical form of *Granula minor* from Panama. *Granula achenea* is the most numerous Cocos Island species in the collections. With it in some lots are specimens of a species of *Granula* resembling the lectotype of *Gibberula coniformis* Moersch, 1860 [= *Granula polita*], from Costa Rica (Coan and Roth, 1966, plate 51, fig. 75), but with a lower spire and differences in outline. As presently construed, *Granula polita* is a species with considerable geographic variation; further study may permit the discrimination of localized subspecies, or even more extensive reclassification.

The name proposed is a noun formed from the botanical term, achene, a dry seed, derived from the Greek *achanes*, not gaping.

***Granula insularum* Roth and Coan, new species.**

(Figure 4.)

Marginella (Cystiscus) minor C. B. Adams, HERTLEIN and STRONG, Essays in Nat. Sci. in Honor of Capt. Allan Hancock, p. 127, 1955 (in part).

Marginella (Cystiscus) polita Carpenter, HERTLEIN and STRONG, Essays in Nat. Sci. in Honor of Capt. Allan Hancock, p. 128, 1955 (in part).

Marginella (Cystiscus) regularis Carpenter, HERTLEIN and STRONG, Essays in Nat. Sci. in Honor of Capt. Allan Hancock, p. 128, 1955 (in whole or part).

DESCRIPTION OF HOLOTYPE. Shell minute, elongate-ovate, broader posteriorly; translucent, white, polished, without sculpture; spire very low, evenly dome-shaped; outer lip nearly straight, on last whorl extending high on body whorl, smooth within, thickened by callus along its outer edge, most strongly thickened on posterior portion; suture very fine and faint; "false suture" (internal trace of body whorl's junction with previous whorl) visible through body whorl anterior to suture; aperture with oblique, curved posterior notch; posterior third of aperture moderately narrow, anterior portion wider; parietal wall gently and evenly convex, irregularly calloused on posterior half; columella with five folds (including the one at base of columella), anterior two subequal and strong, most posterior one very faint; minute granulation visible on parietal area adjacent to columellar folds; anterior margin of shell indented into a broad, somewhat oblique, siphonal notch. Length 2.5 mm., width 1.5 mm.

TYPE LOCALITY. California Academy of Sciences locality no. 27221, Caleta Black (Black Bight), about one mile west of Tagus Cove at south end of Banks Bay, Isla Isabela (Albemarle), Galápagos Islands (0° 15' S, 91° 23' W), on black sand beach, collected by Leo G. Hertlein, 5 January 1932. The shells in the type lot were dead when collected.

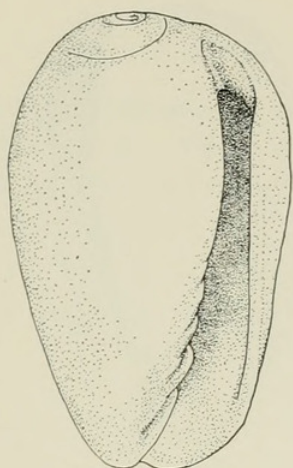


FIGURE 4. *Granula insularum* Roth and Coan, new species. Holotype no. 13715, California Academy of Sciences, Department of Geology, Type Collection. Caleta Black, Isla Isabela, Galápagos Islands. Length 2.5 mm.

TYPE MATERIAL. Holotype no. 13715, California Academy of Sciences, Department of Geology, Type Collection. Five paratypes, nos. 13716–13720, California Academy of Sciences, Department of Geology, Type Collection. Paratypes also have been distributed to the Museum of Comparative Zoology, Harvard University; United States National Museum; American Museum of Natural History; Academy of Natural Sciences, Philadelphia; Geology Department, Stanford University; San Diego Natural History Museum; and the Los Angeles County Museum of Natural History. All paratypes are from the same locality as the holotype. The length/width ratio is inconstant in this species, and some paratypes are shorter, in proportion to greatest diameter, than the holotype.

REFERRED MATERIAL. Galápagos Islands: Fifteen specimens, California Academy of Sciences locality no. 27232, Conway Bay, Isla Santa Cruz (Indefatigable); four specimens, California Academy of Sciences locality no. 38910, beach at west end of south channel of Isla Santa Cruz, collected by V. A. Zullo, 14 February 1964; about thirty specimens, California Academy of Sciences locality no. 27249, yellow beds in cliffs on west side of Isla Baltra (South Seymour), collected by Leo G. Hertlein, 16–18 January 1932, late Pliocene. Four specimens, Academy of Natural Sciences, Philadelphia, no. 154787, Seymour Bay, Isla Santa Cruz; about seventy specimens, Academy of Natural Sciences, Philadelphia, nos. 153220, 153222, and 170349, Wreck Bay, Isla San Cristóbal (Chatham).

DISCUSSION. The very low spire and elongate outline of *Granula insularum* are sufficient to distinguish it from other eastern Pacific species of the genus. *Granula minor* (C. B. Adams), which may be low-spired, is smaller (length 2.3 mm.) and much more conical. *Granula polita* (Carpenter, 1857), while elongate in some populations, especially in the southwestern portion of the Gulf

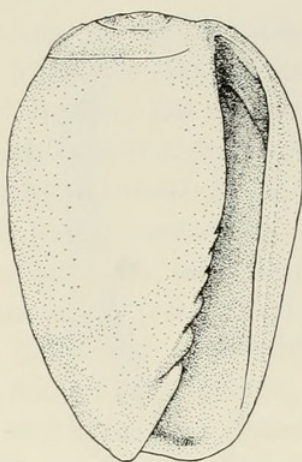


FIGURE 5. *Persicula* (?) species. Hypotype no. 13721, California Academy of Sciences, Department of Geology, Type Collection. Caleta Black, Isla Isabela, Galápagos Islands. Length 3.5 mm.

of California, has not been seen with the very low, dome-shaped spire of *G. insularum*. The outer lip of *G. polita* is also characteristically more sinuous medially, and often faintly denticulate within. Members of the genus *Cystiscus*, which may resemble the new species in general outline, do not have the anterior margin indented into a siphonal notch.

Granula insularum (including the type lot) constitutes part of the Galápagos records by Hertlein and Strong (1955) of "*Marginella* (*Cystiscus*) *minor*," "*M. (C.) polita*," and "*M. (C.) regularis*," and is the most numerous marginellid species present in that material. Specimens tentatively referable to *Granula minor* and *Granula polita* are also present. Their relationship to typical mainland specimens of those species is still under study. As shown by Coan and Roth (1966), *Marginella regularis* Carpenter, 1864, is a synonym of *Granula subtrigona* (Carpenter, 1864), a species not present in any Galápagos material we have examined. The name *Marginella regularis* has also been applied to *Cystiscus politulus* (Dall, 1919), another species which apparently does not occur in the Galápagos Islands.

In late Pliocene material from Isla Baltra, examined through the kindness of Dr. Leo G. Hertlein, who assigned its age, *Granula insularum* is the most common marginellid species represented. The specimens show a similar range of variation to that observed in the type lot. The new species is apparently not present in the collection reported on by Hertlein and Strong (1939) from a late Pleistocene raised beach on Isla San Salvador (James). The specimens they recorded as "*Marginella minor* C. B. Adams" resemble Recent *Granula polita*.

The name proposed for the new species is Latin, meaning "of the islands" and is a noun in the genitive case.

Persicula (?) species.

(Figure 5.)

Small white specimens possibly belonging to this genus have been seen from two Galápagos localities and Panama. Three were apparently mature, with thickened outer lip, at a length of 3.5 mm. or less. Although the shells are small for the genus, the flat spire immersed in a pad of enamel and the pattern of callousing on the parietal wall are typical of *Persicula*.

REFERRED MATERIAL. One specimen, United States National Museum no. 509123, Panama, collected by James Zetek. One specimen, California Academy of Sciences locality no. 27221, Caleta Black, west of Tagus Cove, Isla Isabela, Galápagos Islands, collected by Leo G. Hertlein, 1932; one specimen, California Academy of Sciences locality no. 43261, north side of Bahía Academy, Isla Santa Cruz, on gorgonians, collected by André and Tui De Roy, 1964. A second, immature specimen from the last locality was broken in an unsuccessful attempt to remove the radula for study.

Two specimens from the late Pliocene of Isla Baltra, California Academy of Sciences locality 27249, are also tentatively referred here.

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