

# Notes on the Deep Water Calliostomas of the Panamic Province with Descriptions of Six New Species

BY

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(Plate 62)

THE PANAMIC SPECIES of the trochid genus *Calliostoma* may be grouped by depth of occurrence: one group of species occurs at low tide in rocky sublittoral zones, and on shallow offshore bottoms to depths of 20 fathoms, while another group of species is dredged only at depths of 30 fathoms and deeper. Only 2 deep water species have previously been known in the Panamic province. A third species known from the Peruvian province is added to the list and 6 new species are here described, based on a relatively small amount of material. In comparison to the numerous species of *Calliostoma* in the tropical western Atlantic (CLENCH & TURNER, 1960), the number of species in the eastern Pacific is relatively sparse. The comparative lack of extensive deep dredging in the eastern Pacific may account for the paucity of known species. A more nearly equivalent number of species may eventually be known.

Sources of the new species described herein are as follows: The Templeton Crocker Expedition of 1936 produced one of the species. Three result from the Allan Hancock Pacific Expeditions and are part of the Allan Hancock Pacific Foundation Collection, now on loan to the Los Angeles County Museum of Natural History. Two result from recent dredging at Santa Cruz Island, Galápagos Islands, by André and Jacqueline DeRoy, the original specimens of which were kindly forwarded to me by Mr. Anthony D'Attilio of the San Diego Natural History Museum. I am grateful to the institutions and collectors mentioned for the opportunity to work with this material.

Abbreviations for institutions cited in the text are as follows:

AHF Allan Hancock Foundation (collection on loan to LACM)  
CAS California Academy of Sciences, San Francisco

LACM Los Angeles County Museum of Natural History  
SDNHM San Diego Natural History Museum  
SSB S. Stillman Berry Collection, Redlands, California  
SU Stanford University Collection, Stanford, California  
USNM United States National Museum

No attempt has been made at this time to assign any of the eastern Pacific species of *Calliostoma* to subgenera. CLENCH & TURNER (1960) recognized three subgeneric groups based on radular and jaw morphology. In establishing new subgeneric taxa they failed to consider other generic units in the subfamily Calliostomatinae, many of which have been used in a full generic sense by workers in other parts of the world. My own radular studies on the eastern Pacific species are in progress.

Three of the 8 species treated here are recorded from San Jaime Bank off Cape San Lucas and a 4<sup>th</sup> from the Gorda Banks in the same vicinity. Further dredging at these banks should prove productive.

*Calliostoma iridium* DALL, 1896

(Plate 62, Figure 1)

*Calliostoma iridium* DALL, 1896, p. 7; - 1902 p. 552, pl. 39, fig. 3; - 1908, p. 348, pl. 19, fig. 5

**Diagnosis:** Whorls flat sided, spiral cording consisting of 2 strong, beaded cords at the periphery and one below the suture, the area between these nearly smooth on the early whorls but with 7 finely beaded cords increasing in prominence on later whorls; base imperforate, sculptured with numerous, weakly beaded spiral threads. Color, yellowish pink with radiating flammules, with bronze pink irides-

cence strongest on the early whorls. Height, 21.5, diameter, 19.2 mm (holotype).

**Type Material:** Holotype, USNM 122957; 7 paratypes, USNM 122957a; 1 paratype, SSB 16962. Type locality: USFC station 3387, Gulf of Panama, 127 fms.

**Distribution:** Gulf of Panama. In addition to the type lot consisting of 9 specimens, there is 1 specimen, USNM 122956, USFC sta. 3391, Gulf of Panama, 153 fms.

**Discussion:** *Calliostoma iridium* may be distinguished from other eastern Pacific species by the near absence of sculpture between the subsutural and the 2 peripheral cords on the early whorls.

*Calliostoma nepheloide* DALL, 1913

(Plate 62, Figures 2 to 5)

*Calliostoma nepheloide* DALL, 1913, p. 592; - 1925, p. 9, plt. 24, figs. 2-3; - KEEN, 1958, p. 256, fig. 46 (upper figure only, copy DALL); - PARKER, 1964, p. 151

**Diagnosis:** Whorls flat sided, final whorl slightly convex, spiral cording consisting of a strong, projecting, beaded peripheral cord and about 12 fine beaded cords between it and the suture on the final whorl. Base imperforate, defined by a broad, unbeaded cord below the peripheral cord, base with about 18 weakly beaded cords, more broadly spaced near the columella. Color, olive green with darker flammules, basal cords with alternating light and dark markings. Height, 25, diameter, 22 mm (holotype).

**Type Material:** Holotype, USNM 96637. Type locality: USFC sta. 2804, Panama Bay, 47 fms. The holotype has the lip broken back about  $\frac{1}{3}$  of a whorl. DALL's 1925 illustration reconstructed the position of the lip.

**Distribution:** Point Abreojos to Cape San Lucas, Baja California; Mazatlan, Sinaloa, Mexico to Gulf of Panama. Records: AHF 1711-49, 30 mi. S. Pt. Abreojos, Baja California, 52 fms.; AHF 618-37, San Jaime Bank, off Cape San Lucas, 75 fms. (Plate 62, Figure 5); off Mazatlan, Sinaloa, Mexico, 88-92 fms. (PARKER, 1964); AHF 273-34, Tenacatita Bay, Jalisco, Mexico, 45 fms.; SDN HM 39799, off Manzanillo, Colima, Mexico, 52 fms. (Plate 62, Figures 3, 4); LACM, Gulf of Tehuantepec, Chiapas, Mexico, leg. D. Shasky, 45 fms.; CAS 17986, Gulf of Chirqui, Panama, 35-40 fms. The species is as yet unknown from the Gulf of California.

**Remarks:** The 2 immature specimens from San Jaime Bank off Cape San Lucas differ from the others in having

the immediate subsutural cord more strongly beaded than the others. This is the only significant feature of variation in the material examined. The olive coloration of the species is distinctive.

*Calliostoma fonkii* (PHILIPPI, 1860)

(Plate 62, Figures 6, 7)

*Trochus fonkii* PHILIPPI, 1860, p. 185, plt. 7, fig. 22  
*Calliostoma fonkii* (PHIL.) - PILSBRY, 1889, vol. 11, p. 371, plt. 57, fig. 48 (copy PHILIPPI). - DALL, 1909, p. 240.

**Diagnosis:** Whorls flat sided, final whorl slightly convex; spiral cording consisting of a smooth peripheral cord, the lower part of which is covered by succeeding whorls, and 3 prominent cords per whorl, the 2 uppermost coarsely beaded, narrow raised ridges between major cords appearing on the final whorls; base imperforate, with up to 11 evenly spaced unbeaded cords. Color tan, with darker cording. Height, 17.5, diameter, 16.2 mm (AHF 802-38).

**Type Material:** Holotype, not located. Type locality uncertain: "Between Chiloë and the mainland of Peru" (PILSBRY, 1889).

**Distribution:** Galápagos Islands; Peru south to Chiloé Island, Chile (43° S). Records: AHF 802-38, NW of Charles (Santa Maria) Island, Galápagos Islands, Ecuador (1°09' S, 90°35' W), 250 fms. (Plate 62, Figure 6); AHF 371-35, Independencia Bay, Peru (14°15' S), 5 fms. (Plate 62, Figure 7). The two specimens here reported are believed to be the first specimens known since the original description.

**Remarks:** Although the 2 specimens are from widely separated localities and vastly different depths, no essential points of difference are apparent. The Galapagan specimen is colorless and the nacre is slightly leached, while the smaller Peruvian specimen was live-taken and is tan with brownish ribs.

Little can be said of the distribution and occurrence of this species until more material is known. It may perhaps not be a characteristically deep water species, judging at least from its shallow occurrence in Peru.

*Calliostoma gordanum* McLEAN, spec. nov.

(Plate 62, Figures 8 to 10)

"*Calliostoma nepheloide* DALL." - KEEN, 1958, fig. 46 (lower figure only).

**Diagnosis:** Whorls slightly convex, spiral cording con-

sisting of 2 peripheral cords with a finer intercalary cord between; 7 - 8 strong beaded cords between sutures on final whorl, secondary threading between cords on final whorl; base imperforate, with 17 - 20 beaded cords. Color whitish, with radiating light tan maculations, base unmarked. Height, 19.6, diameter, 20.0 mm (holotype).

**Description of Holotype:** Shell of moderate size for the genus, light, rather fragile. Postnuclear whorls 7, slightly convex. Periphery rounded but defined by 2 somewhat stronger spiral cords with a finer intercalary cord between. Fifth postnuclear whorl with a strongly beaded subsutural cord and 6 thin, raised, unbeaded cords between it and the upper peripheral cord. By the 5<sup>th</sup> whorl the intermediate cords are finely beaded and fine intercalary threads have appeared. By the 7<sup>th</sup> and final whorl the intercalary threads have increased in size and are beaded as are the primary cords. Base imperforate with 17 cords, intercalary threads between the outermost cords, those nearer the columella more broadly spaced and beaded in a radiating pattern. Color whitish tan with brownish flammules, aperture iridescent with pink and green, base unmarked.

**Type Material:** Holotype, CAS 13271; 3 paratypes, CAS 13272; 1 paratype, LACM 1268; 1 paratype, USNM 679551; 3 paratypes, SDNHM 40041; 1 paratype, SU 9985. Type locality: Gorda Banks, off southeastern Baja California, CAS locality 17752. According to Dr. Leo G. Hertlein, this station represented 26 hauls made by Crocker and Beebe on the Templeton Crocker Expedition of 1936 in the vicinity of the Gorda Banks, approximately 23°02' N, 109°31' W, probable depth, 70 fms. Seven specimens, originally identified by A. M. Strong as *Calliostoma nepheloide*, were in this lot. Three additional specimens, evidently from the same lot, were found in the Strong collection at the San Diego Museum.

**Referred Material:** One additional lot is known: AHF 531-36, San Francisquito Bay, Baja California (28°26' N, 112°53'30" W), 10 fms., 2 specimens (Plate 62, Figure 10). The illustrated specimen from this lot is 13 mm in height and has slightly more prominent spiral cording but is otherwise typical. The relatively shallow depth record of 10 fathoms for this lot may be anomalous. Dredging off the tip of Baja California should produce additional material of this species.

**Discussion:** *Calliostoma gordanum* may be separated from *C. nepheloide* by its light color, its near absence of spiral markings on the basal cords, and in having 2 rather than 1 major peripheral cords.

*Calliostoma sanjaimense* McLEAN, spec. nov.

(Plate 62, Figure 11)

**Diagnosis:** Whorls flat sided, spiral cording consisting of 2 strong, beaded peripheral cords, a strong subsutural cord, and 5 strongly beaded intermediate cords; base imperforate, with 11 broad, nearly smooth spiral cords. Color yellow brown with light and darker markings particularly on the peripheral cords. Height, 20.0, diameter, 18.4 mm (holotype).

**Description of Holotype:** Shell of moderate size, sturdy, flat sided. Postnuclear whorls 7. Periphery angulate, defined by 2 prominent beaded cords with a narrow intercalary cord between. A strong, beaded subsutural cord is prominent on later whorls. On the 3<sup>rd</sup> whorl there are 3 cords of equal strength; other cords arise as intercalary threads that eventually become beaded and assume full size, until in the final whorl there are 5 beaded cords and 4 intercalary threads between the subsutural and the uppermost peripheral cord. Base imperforate, with 17 broad, low cords, interspaces of nearly equal width, the 3 cords close to the columella faintly beaded. Color yellow brown with light and darker maculations especially on the peripheral cords.

**Type Material:** Holotype, LACM-AHF 1269; 2 paratypes, LACM-AHF 1270, 1 paratype, USNM 679552.

**Type Locality:** San Jaime Bank, west of Cape San Lucas, Baja California, Mexico, 22°50'30" N, 110°15' W, 75 fms., *Velero III* station 618-37, 3 March 1937. The 3 paratypes are all immature, the largest specimen measuring 10.3 mm in height. No additional material is known.

**Discussion:** *Calliostoma sanjaimense* is most closely related to *C. iridium* but has a sturdier shell, has strongly beaded cords on the early whorls, which are lacking in *C. iridium*, and has fewer and more prominent basal cords. The immature paratype specimens show brilliant metallic iridescence of green and yellow on the smooth narrow interspaces between the spiral cords of the early whorls, but this luster has evidently faded in the holotype.

*Calliostoma veleroae* McLEAN, spec. nov.

(Plate 62, Figure 12)

**Diagnosis:** Whorls concave, spiral cording consisting of a projecting peripheral cord and 6 evenly beaded cords on the last whorl; base imperforate, but with a shallow depression, base with about 18 low cords, beaded near the columella. Color yellowish with brown flammules, basal

cords with alternating light and dark markings. Height, 15.9, diameter, 17.0 mm (holotype).

**Description:** Shell of moderate size, sturdy, sides of whorls concave, imparting a concave slope to the sides of the shell. Postnuclear whorls 8, periphery sharply angulate, projecting, actually composed of 3 finely beaded cords, 2 at the edge of the periphery and 1 just above. Strong subsutural cord lacking. There are 3 beaded intermediate cords on the 3<sup>rd</sup> whorl, increasing by the addition of intercalary threads that gradually increase in size and become beaded until there are 6 cords and an equal number of intercalary threads on the final whorl. Base slightly convex, imperforate but with a hollow excavation near the columella; base with 18 low spiral cords, the interspaces of nearly equal width; innermost cords faintly beaded in a radial pattern of growth. Color yellowish with brown flammules, basal cords with alternating light and dark markings.

**Type Material:** Holotype, LACM-AHF 1271.

**Type Locality:** Three miles south of Isla Ladrones, Panama, 7°49' N, 82°23'30" W, 54 fms., *Velero III* station 943-39, 27 March 1939. The holotype, the only known specimen, has a broken lip and a hole in the base of the shell; the color is evidently somewhat faded.

**Discussion:** *Calliostoma veleroae* stands alone among west American species in having a concave outline and a sharply carinate periphery. It also differs from most of the species discussed here in lacking a relatively strong sub-

sutural cord. A species of somewhat similar proportions in the Caribbean fauna is *Calliostoma aurora* DALL, 1888, but that species has a smooth, nearly concave base.

*Calliostoma veleroae* is named in honor of the *Velero III*, the vessel of the late Captain G. Allan Hancock, whose collecting expeditions formed the basis of the rich molluscan material in the Allan Hancock Foundation collection.

*Calliostoma keenae* McLEAN, spec. nov.

(Plate 62, Figures 13 to 16)

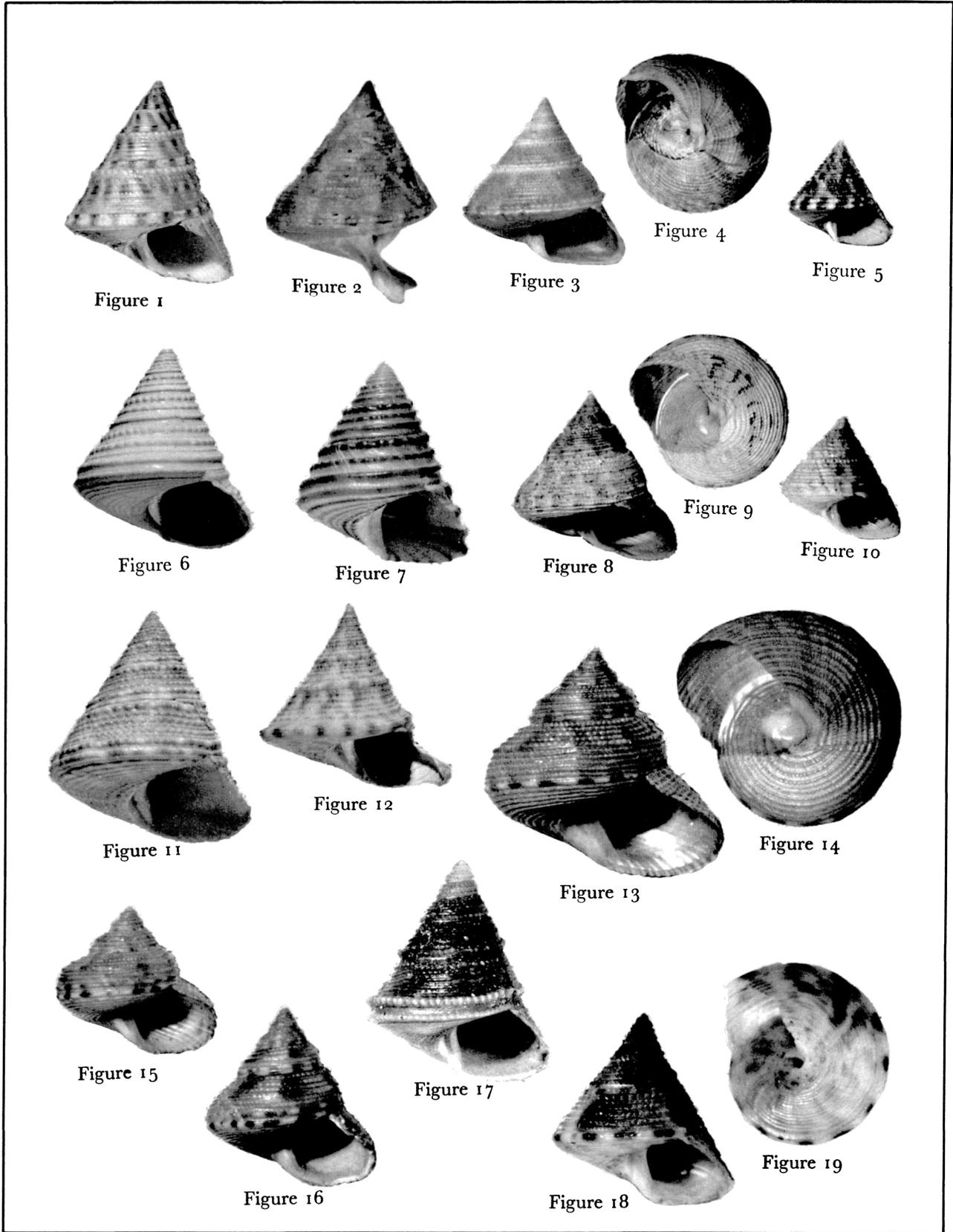
**Diagnosis:** Whorls and periphery rounded, spiral cording unbeaded until the 4<sup>th</sup> whorl, final whorl with numerous raised, finely beaded spiral cords, interspaces of equal width; base imperforate, with about 12 low, weakly beaded cords. Color, drab green or yellow brown with brown flammules. Height, 14.9, diameter, 15.5 mm (holotype).

**Description of Holotype:** Shell of medium size, whorls markedly convex, base of shell delimited by a thicker spiral rib, postnuclear whorls 7. Sculpture of first to 3<sup>rd</sup> postnuclear whorls consisting of 3 raised cords, a trace of beading appearing on the uppermost cord on the 4<sup>th</sup> whorl; the middle of the 3 original cords persists as a slightly more prominent cord on all succeeding whorls. Additional cords arise from intercalary threads until, on the final whorl, there are 15 cords between the basal cord and the suture; interspaces are about as wide as the cords and the uppermost cords are the more strongly

### Explanation of Plate 62

Figure 1: *Calliostoma iridium* DALL, 1896. Holotype, USNM 122957. Gulf of Panama. Height, 21.5, diameter, 19.2 mm. × 1.5  
 Figure 2: *Calliostoma nepheloide* DALL, 1913. Holotype, USNM 96637. Panama Bay. Height, 25, diameter, 22 mm. × 1.5  
 Figures 3 and 4: *Calliostoma nepheloide*. SDNHM 39799. Manzanillo, Mexico. Height, 20, diameter, 20 mm. × 1.5  
 Figure 5: *Calliostoma nepheloide*. AHF 618-37. San Jaime Bank, Mexico. Height, 11.7, diameter, 11.6 mm. × 1.5  
 Figure 6: *Calliostoma fonkii* (PHILIPPI, 1860). AHF 802-38. Charles Island, Galápagos. Height, 17.5, diameter, 16.2 mm × 2  
 Figure 7: *Calliostoma fonkii*. AHF 371-35. Independencia Bay, Peru. Height, 9.1, diameter, 8.0 mm. × 4  
 Figures 8 and 9: *Calliostoma gordanum* McLEAN, spec. nov. Holotype, CAS 13271. Gorda Banks, Mexico. Height, 19.6, diameter, 20.0 mm. × 1.5  
 Figure 10: *Calliostoma gordanum*. AHF 531-36. San Francisco Bay, Mexico. Height, 13.2, diameter, 13.3 mm. × 1.5

Figure 11: *Calliostoma sanjaimense* McLEAN, spec. nov. Holotype, LACM-AHF 1269. San Jaime Bank, Mexico. Height, 20.0, diameter, 18.4 mm. × 2  
 Figure 12: *Calliostoma veleroae* McLEAN, spec. nov. Holotype, LACM-AHF 1271. Isla Ladrones, Panama. Height, 15.9, diameter, 17.0 mm. × 2  
 Figures 13 and 14: *Calliostoma keenae* McLEAN, spec. nov. Holotype, LACM-AHF 1272. Off Laguna Beach, California. Height, 14.9, diameter, 15.5 mm. × 3  
 Figure 15: *Calliostoma keenae*. AHF 618-37. San Jaime Bank, Mexico. Height, 8.7, diameter, 8.9 mm. × 3  
 Figure 16: *Calliostoma keenae*. AHF 921-39. Clarion Island, Mexico. Height, 10.5, diameter, 10.1 mm. × 3  
 Figure 17: *Calliostoma jacuelinae* McLEAN, spec. nov. Holotype, SDNHM 51299. Santa Cruz Island, Galápagos. Height, 11.3, diameter, 10.0 mm. × 3  
 Figures 18 and 19: *Calliostoma santacruzianum* McLEAN, spec. nov. Holotype, SDNHM 51301. Santa Cruz Island, Galápagos. Height, 7.0, diameter, 6.9 mm. × 5



beaded. Base imperforate, basal cords about 12, interspaces slightly wider than cords, particularly near the columella where the cords are broader and more widely spaced. Color, yellow brown with slightly darker flammules, more pronounced darker and lighter areas at the basal cord, base uniform yellow brown.

**Type Material:** Holotype, LACM-AHF 1272.

**Type Locality:** 58 Fathom Bank, 12 miles off Laguna Beach, Orange County, California, 33°23'47" N, 117°59'47" W, 58-60 fms., *Velero IV* station 1680-49, 12 February 1949.

**Referred Material:** Seven lots as follows: AHF 1254-41, 8 miles SW of Cedros Island, Baja California, 65 fms.; AHF 1253-41, 8 miles W of Cedros Island, 65 fms.; AHF 1261-41, 4 miles N of Dewey Channel (Cedros Island), 24-25 fms.; AHF 618-37, San Jaime Bank, off Cape San Lucas, Baja California (Plate 62, Figure 15); LACM A375, Clarion Island, Revillagigedo Islands, Mexico, 30 fms.; AHF 918-39, Sulphur Bay, Clarion Island, 45-60 fms.; AHF 921-39, N of Clarion Island, 35-56 fms. (Plate 62, Figure 16). Two specimens are in the lot from San Jaime Bank, but the other lots consist of a single specimen each. The holotype is the largest specimen. Only the holotype and the 2 specimens from San Jaime Bank were live-collected. *Calliostoma keenae* ranges from Laguna Beach, California (33°12' N) to the Revillagigedo Islands, Mexico (18°18' N). It is chiefly a species of the Californian province since its distribution encompasses the entire outer coast of Baja California.

**Discussion:** *Calliostoma keenae* differs chiefly from eastern Pacific *Calliostoma* species of similar proportion in having strong spiral cords on the early whorls that are nearly devoid of beading. *Calliostoma supragranosum* CARPENTER, 1864, a shallow water species of the California province, differs in having a greater number of ribs that are strongly beaded on the early whorls. *Calliostoma leanum* (C. B. ADAMS, 1852) has thicker, more strongly beaded spiral cording. *Calliostoma turbinum* DALL, 1896, an offshore species of southern California, has fewer spiral cords and has a brassy metallic luster not shown in *C. keenae*.

*Calliostoma keenae* is dedicated to Dr. Myra Keen of Stanford University, whose warm and friendly manner has been an inspiration to all workers in malacology.

*Calliostoma jacqueliniae* McLEAN, spec. nov.

(Plate 62, Figure 17)

**Diagnosis:** Whorls flat sided, spiral cording consisting of 2 strong peripheral cords, a strong subsutural cord and about 8 intermediate cords of varying strength, base imperforate, with numerous fine cords, the 4 cords near the columella more prominent. Color light tan, all surfaces highly opalescent with lavender and green. Height, 11.3, diameter, 10.0 mm (holotype).

**Description of Holotype:** Shell relatively small for the genus, thin, whorls flat sided, showing numerous growth scars. Postnuclear whorls 7; periphery defined by 2 strongly projecting, heavily beaded cords with a thin intercalary thread between; immediate subsutural cord stronger than other cords of the body whorl; on the 2<sup>nd</sup> and 3<sup>rd</sup> postnuclear whorls there are 3 spiral cords and faint axial sculpture producing a cancellate pattern, the axial cords become obsolete by the 4<sup>th</sup> whorl and intercalary cords arise so that there is a total of 7 cords between the subsutural cord and the 1<sup>st</sup> peripheral cord; these cords are of varying strength and spacing, some are weakly beaded and others are nearly smooth. On the imperforate base there are 4 prominent, slightly beaded cords near the columella and about 15 fine irregular unbeaded cords between these 4 cords and the lower peripheral cord defining the base.

**Type Material:** Holotype, SDNHM 51299, 1 paratype, SDNHM 51300, 1 paratype, LACM 1274, 1 paratype, USNM 679553.

**Type Locality:** South Academy Bay, Santa Cruz Island, Galápagos Islands, Ecuador, 0°45' S, 90°20' W, 150 m [82 fms.], dredged by André and Jacqueline DeRoy, 39 May and 10 June, 1969.

**Discussion:** *Calliostoma jacqueliniae* with its opalescent surface devoid of color pattern and its 2 strong peripheral cords is distinct from all other eastern Pacific species. *Calliostoma schroederi* CLENCH & AGUAYO, 1938, in the Caribbean province, resembles this species but lacks sculpture other than the 2 peripheral cords.

The species is dedicated to Mrs. Jacqueline DeRoy whose collecting has done much to increase our knowledge of Galápagos Islands mollusks.

*Calliostoma santacruzatum* McLEAN, spec. nov.

(Plate 62, Figures 18, 19)

**Diagnosis:** Whorls flat sided, final whorl slightly convex, base narrowly umbilicate, spiral cording consisting of 8 beaded intermediate cords, a strong peripheral cord and numerous unbeaded basal cords. Height, 7.0, diameter 6.9 mm (holotype).

**Description of Holotype:** Shell relatively small, post-nuclear whorls 7, base narrowly umbilicate, base defined by a single peripheral cord. On the first 3 postnuclear whorls there are 3 strongly beaded spiral cords. Intercalary cords arise between these cords resulting in 8 beaded cords of slightly variable size on the final whorl; the immediate subsutural cord is slightly more prominent. On the base only the cord bordering the umbilicus is beaded, adjacent to it are 3 broad cords, followed by 12 narrow cords, separated by incised grooves. Color light tan with broad brownish maculations, strongly marked along the peripheral cord, green and yellow iridescence showing on the smooth areas between the cords on the early whorls. Whorls flat sided, although a slight concavity is evident at the third whorl and the final whorl shows a slight convexity.

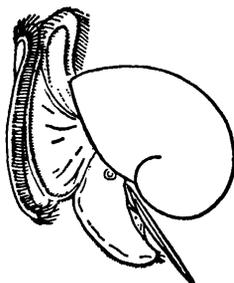
**Type Material:** Holotype, SDNHM 51301.

**Type Locality:** South Academy Bay, Santa Cruz Island, Galápagos Islands, Ecuador, 0°45' S, 90°20' W, 25 fms., dredged by André and Jacqueline DeRoy, 10 June 1968. Efforts to obtain additional material have so far been unsuccessful.

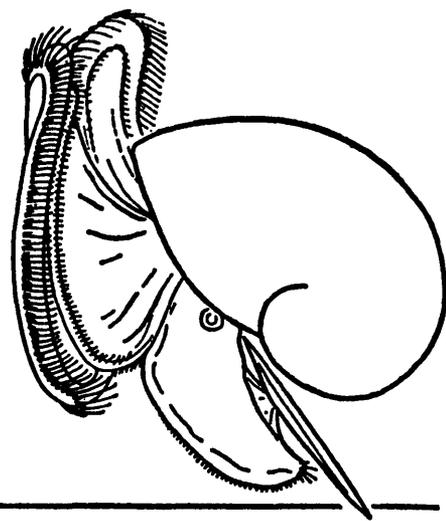
**Discussion:** Although only one specimen is known, which is probably immature, *Calliostoma santacruzatum* is easily distinguished from other eastern Pacific species. It is the only umbilicate species other than the low-spired, broadly umbilicate *C. rema* STRONG, HANNA & HERTLEIN, 1933.

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**Note:** The various taxa above species are indicated by the use of different type styles as shown by the following examples, and by increasing indentation.

ORDER, Suborder, DIVISION, Subdivision, SECTION,  
SUPERFAMILY, FAMILY, Subfamily, *Genus*, (*Subgenus*)  
*New Taxa*

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