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## THE GENUS *VOLUTA* (MOLLUSCA: GASTROPODA) IN VENEZUELA, WITH DESCRIPTION OF TWO NEW SPECIES \*

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### INTRODUCTION

Two species of the genus *Voluta*, one fossil and the other living, have been recorded, so far, from Venezuela: *V. vautrini* Jung occurs in the Middle Miocene at Cantaure, Paraguaná Peninsula, and *V. musica* Linné is reported by several authors from the north coast and islands. *V. carneolata* Lamarck is said to have the same distributional range as *V. musica* but it is judged to be synonymous. *V. musica* is found fossil in the Pleistocene of Barbados and the Pleistocene, or Holocene, of Aruba; its occurrence in the Pleistocene of Venezuela is now recorded. Two new fossil species are described: *V. cantaurana* and *V. cubaguaensis*. Finally, the results of a study of the egg capsules and young of *V. musica* are reported.

### RECENT SPECIES

*Voluta musica* Linné. Pl. 1, figs. 1-3.  
1758 *Voluta musica* Linné, *Syst. Nat.*, ed. 10, p. 733.

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- 1811 *Voluta carneolata* Lamarck, *Ann. Mus. d'Hist. Nat. Paris*, vol. 17, p. 393.  
1961 *Voluta musica* Linné, *Warmeke & Abbott, Carib. Seashells*, p. 126, pl. 22r.  
1962 *Voluta musica* Linné, *Weisbord, Bull. Amer. Paleont.*, vol. 42, N° 193, p. 396, pl. 84, figs. 1-3.  
1964 *Voluta musica* Linné, *Clench & Turner, Johnsonia*, vol. 4, N° 43, p. 140, pl. 84, figs. 1-3.  
1965 *Voluta carneolata* Lamarck, *Olsson, Bull. Amer. Paleont.*, vol. 49, pp. 658, 660, pl. 80, figs. 3, 3a; pl. 83, fig. 7.

In their review of the genus *Voluta* in the Western Atlantic, *Clench & Turner* (1964, p. 140) included in the synonymy of *V. musica* eight species, or subspecies, determined by Lamarck (1811); one of these was *V. carneolata*. In the following year *Olsson* (1965) reviewed Lamarck's type specimens and came to the conclusion that, "*V. carneolata* is a valid species distinguished easily from *V. musica* by its

sculpture of strong spiral cords, shape and colour design". These spiral cords he noted as occurring, "in the sutural zone and round the base" and he gave the colour as, "a delicate, creamy rose, the markings a rich brown." He did not elaborate upon the difference in shape but remarked that, "The protoconch is large like that of *V. musica*" and noted that there are 10 columellar plaits in both species. More importantly, he stated that both species have the same distributional range and recorded that *V. musica*, "is common at favorable stations, especially along the north coast of Venezuela, and some of its off-shore islands such as Margarita and Coche near Cumaná".

The range of *V. musica* is given by Clench and Turner (1964, p. 143) as, "From Hispaniola south through the Lesser Antilles and south to British Guiana." Their specimens included examples from the Netherlands Antilles, the north coast of Venezuela and the Venezuelan islands of La Orchila, Los Testigos and Margarita. Flores (1968, p. 97) and Work (1969, p. 677) found the species in the archipelagos of Las Aves and Los Roques, respectively, whilst Pilsbry and Olsson (1954, p. 30) reported it as far west as the Colombian side of the Goajira Peninsula. A curious gap may be noted within this range: the species is rare in Puerto Rico according to Warmke and Abbott (1961, p. 126), was not found on adjacent St. Croix by Ustick (1959) nor on Aves Island (120 miles south southeast of St. Croix) by either the present author (1972) or Wagenaar Hummelinck whose collection was reported by Coomans (1958).

In the author's collection of Recent molluscs of Venezuela there are some 250 specimens of the genus *Voluta* which, despite the variety in form and colour, comprise a single suite of what

is undoubtedly *V. musica*. These specimens are divided between broader, heavily spined forms averaging 7 axial costae in the adult (females?) and slimmer, weakly ribbed forms with 8 costae (males?). They have been collected mainly along the northern coast between Paraguaná Peninsula in the west and Puerto La Cruz, Sucre State, in the east. Others come from the islands of Los Roques, Margarita and Coche; two are from Curaçao (kindly donated by C. de Jong) and two, occupied by hermit crabs, were taken in a fish trap in 50 fathoms off Farallón Centinela Island which lies 20 miles to the north of Cape Codera, Miranda State. One of these last is larger than usual having a height of 102 mm, as against a maximum of 88 mm reported by Clench and Turner (1964, p. 140). The colour of the suite varies from ivory in the island specimens (toning with the coral sand bottoms) through cream overlaid with bluish grey\*, lighter and darker flesh tints ("creamy rose") to pale terracotta in the case of the large specimen. Within the suite, many examples have the characteristics of *V. carneolata* except, perhaps, in one particular, namely, that of the strong spirals on the ramp. Nevertheless, some specimens do have up to 4 weak cords in this area and, without exception, all have from 3 to 7 cords around the base. The interspaces of all these cords are occupied by brown, spiral lines. It is relevant that, with regard to the one specimen of *V. musica* available to him, Weisbord (1962, p. 397) commented that, "Among the varietal forms of *V. musica* illustrated

\* This colour form was illustrated in the 1972 calendar of Compañía Shell de Venezuela Ltd. "Moluscos Marinos de Venezuela", by F. Gibson-Smith. Institutions may obtain a copy from the writer.

by Maxwell Smith (1942, pl. 1) my single Recent specimen is closest to *V. m. carneolata* Lamarck in form and markings." There can be no doubt that *V. carneolata* falls within the varietal range of *V. musica* and cannot be regarded as a valid species.

Clench and Turner (1970, p. 369) described the egg case and young of *V. musica* and concluded that, "the young are ready to feed immediately upon emerging from the case." The egg capsules are commonly found deposited inside dead shells of other species, e.g. *Atrina seminuda* Lamarck. Inside these partially open shells as many as 14 capsules have been found adhering to the valves (pl. 1, fig. 3), each containing 3 or 4 young. The capsule is hemispherical, measures about 18 mm in diameter and seems to have been formed in two unequal parts, the join being visible along one side (pl. 1, figs. 1, 2). As the young mature, a slit opens along the crest of the join allowing oxygenated water and food to enter the capsule. At the time they leave the capsule the young shell consists of 3 to 3 3/4 protoconch whorls, brown in colour, and a half-whorl of the conch proper with typical colour pattern and sculpture and 3 columellar folds. Jagged holes the empty cases suggest that the young emerge by "eating" their way out rather than by forcing an exit through the slit.

#### FOSSIL SPECIES

*Voluta musica* Linné. Pl. 2, figs. 1, 2.

Some 40 specimens (Nº UCVG 4362) of this species are to hand from the Punta Piedras Member of the Tortuga Formation on Tortuga Island; the formation is Late Pleistocene in age (Patrick 1959, p. 94; Bermúdez 1966, p. 360; Maloney and Macsotay 1967).

The specimens are indistinguishable from Recent examples.

The species is not found in an older Pleistocene unit, the Cumaná Formation (or its equivalents) which occurs at several localities (Stratigraphic Lexicon of Venezuela 1969, p. 186, 187) and which is typified by the presence of the giant *Lyropecten arnoldi* (Ague-revere):

Cumaná Formation, type locality (Pérez Nieto 1965, p. 11);

Playa Grande Formation, Cabo Blanco (Weisbord 1962);

Cerro Gato Formation, Tortuga Island (Maloney and Macsotay 1965, table II, p. 276);

"Barrigon Formation", Araya Peninsula (Macsotay 1965, p. 37);

El Manglillo Formation, Margarita Island (Lorenz in Bermúdez 1966, p. 354).

That these two species are, apparently, mutually exclusive may be attributed to the fact that *V. musica* is a warm water species which, today, is found only as far north as Hispaniola (Clench and Turner 1964, p. 143), whereas *L. arnoldi* is associated with a cold water foraminiferal assemblage described by Bolli and Bermúdez (1965, pp. 127, 128, 134). These authors remark that, "the zonal markers point to a colder water influx that is unusual for these latitudes, probably reflecting one or more of the periods of increased glaciation." Stainforth (1969, p. 83) accepted this as additional evidence for a Pleistocene age, as indicated by the work of Cati et al (1968), rather than the mooted Pliocene age of Bolli and Bermúdez (op. cit.). The presence of *V. musica* in the Punta Piedras Member indicates that these beds were deposited during a warm, interglacial episode. According to Weisbord (1962,

p. 397), *V. musica* also occurs in the Pleistocene of Barbados and the Pleistocene, or Holocene, of Aruba.

***Voluta cubaguaensis* n. sp.** Pl. 3, figs. 1, 2, 3.

Shell solid and relatively large. Spire occupying just over one-quarter of total height, tip drawn out and narrow. Two-and-a-half protoconch whorls remaining (initial turn missing). Sculptured whorls 5 1/2 with 8 strong axial costae on the second and later conch whorls but with indications of many more on the first whorl. On the third conch whorl the costae develop nodes at the shoulder which develop into blunt spines on the body whorl where the costae are obsolescent on the ramp and die out anteriorly. The suture is adpressed, lies at the base of the shoulder spines except over the last one-eighth of a turn of the body whorl where it traverses upwards to be level with the top of the spines; thus the aperture is higher than the body whorl proper. Visible remaining spiral sculpture consists of 2 cords around the base above the prominent anterior fasciole. Aperture wide and oblique, outer lip thickened, everted and with nodular thickenings (some paired) along its edge at wide intervals. Columella with 5 strong plicae and 3 lirations on the parietal area, all rather evenly spaced.

**Holotype.** Geol. Dept., Central University of Venezuela, Caracas, N° UCVG 6732.

**Dimensions of Holotype.** Height 80.6 mm, greatest diameter 52 mm.

**Type locality.** Type section of the Cubagua Formation, La Caldera canyon, Cubagua Island, Nueva Esparta State, the age of which is Mio-Pliocene

(Stratigraphic Lexicon of Venezuela, p. 179).

**Remarks.** The material consists of 4 specimens of which only the holotype is essentially complete, although degradation of the surface has removed any finer sculptural details. The paratypes do not adequately represent the species and have not been distributed.

**Comparisons.** It most respects *V. cubaguaensis* closely resembles *V. musica* Linné; the high aperture is entirely similar with nodular thickenings along the edge of the outer lip and it also has the same number of axial ribs in the adult. It differs in having a slightly higher, more acuminate spire and protoconch and in having 8 folds on the columella and parietal region as against 9 to 12 (average 10) in *V. musica*. In the latter, furthermore, the blunt shoulder spines are more massively developed and less sharp. The essential difference between *V. cubaguaensis* and *V. alfaroi* Dall (1912, p. 8), from the Miocene of Costa Rica, *V. vautrini* Jung (1965, p. 545) and *V. cantaurana* n. sp. (described hereafter), both from the Miocene of the Paraguana Peninsula, is that these have cylindrical, not conical, protoconches.

***Voluta cantaurana* n. sp.** Pl. 2, figs. 3, 4, 5.

1965. *Falsilyria* sp. indet. Jung? Bull. Amer. Paleont., vol. 49, N° 223, p. 547.

Shell relatively large and solid. Spire high, comprising one-third of total height. Protoconch of 2 whorls, apical tip minute, inclined and inset; first turn expanding rapidly, second large and bulbous, wider and higher than first conch whorl. Number of conch

whorls 7 to 8. As in *V. musica* Linné, sculpture begins on the last turn of the protoconch with barely discernible, low, rounded axial ribs crossing from suture to suture; these strengthen on the first conch whorl and number 15, reducing to 12 on the second. On the third whorl they are still fewer but stronger, becoming noded at the shoulder. On the body whorl there remain 6 to 9 (average 8) rounded axial ribs, absent over the concave ramp, noded at the shoulder and becoming obsolescent anteriorly. Spiral sculpture weak, some 7 slightly stronger threads equally spaced between shoulder and prominent siphonal fasciole, with crowded, microscopic spirals in the interspaces and on the ramp. Outer lip everted and somewhat thickened, columella and parietal area heavily glazed and bordered by strong solution groove. Columella with 5 to 7 strong plicae and 3 to 5 fine lirae on the parietal area, the latter being both interrupted along their length and off-set vis-a-vis earlier sets of lirae; total number of folds from 9 to 12 (average 10).

**Holotype.** Geological Department, Central University of Venezuela, Caracas, N° UCVG 1280.

**Dimensions of holotype.** Height 32.8 mm, greatest diameter 17.9 mm.

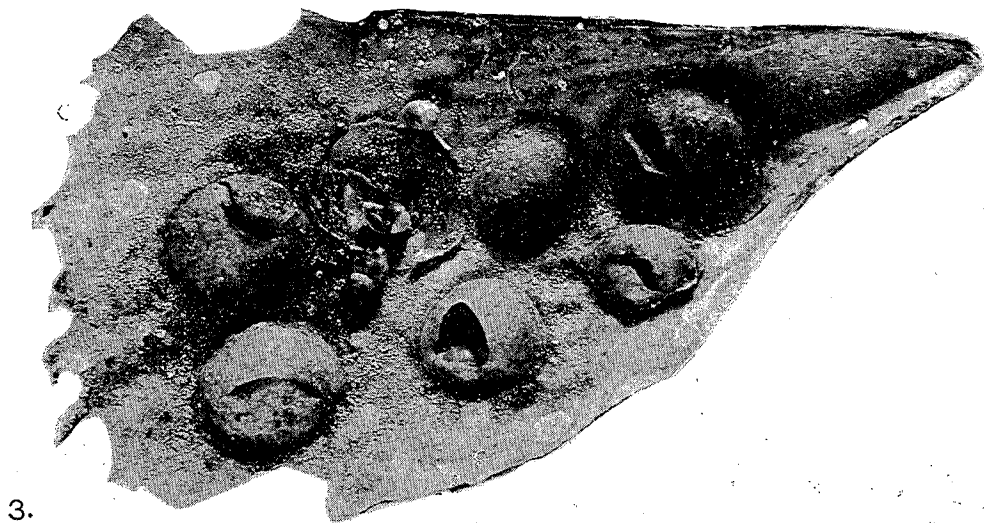
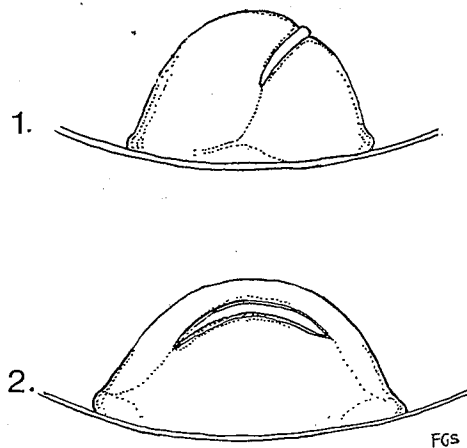
**Type locality.** Cantaure Formation, Cantaure, Paraguana Peninsula (Jung 1965).

**Remarks.** The description is based on 6 specimens, 4 of which were collected in 1929 by S. E. Aguerrevere and the other 2 recently. The largest measures: height 72.7 mm, diameter 37.9 mm. Only the holotype is with protoconch. Paratypes deposited with the Paleontological Research Institution, Ithaca, N. Y.; the British Museum

(N.H.) and the Basel Museum (N.H.), Switzerland.

**Comparisons.** *V. cantaurana* is closely related to *V. alfaroi* Dall (loc. cit.), from the Miocene of Costa Rica, judging from the descriptions and illustrations of Olsson (1922, p. 99, pl. 8, fig. 2; 1965, p. 663, pl. 82, fig. 4, pl. 83, figs. 4, 4a) and Pilsbry and Olsson (1954, pl. 2, fig. 2). The protoconch and form are the same but *V. alfaroi* is smaller, has more, and less regularly developed, folds on the columella and parietal area; has 12 axial ribs in the adult and may have stronger spiral sculpture, particularly on the ramp. Another species from the Cantaure Formation is *V. vautrini* Jung (1965, p. 546) regarding which the author notes that, while its protoconch approaches that of *V. alfaroi* it is still distinct and hence, therefore, distinct also from *V. cantaurana*; moreover, its broader form, more stepped spire and more strongly noded axial ribs are all notably different. *V. cantaurana* differs from *V. musica* principally in having a cylindrical, as opposed to a conical, protoconch; it is also slimmer, the aperture narrower and it has a much smaller and less indented siphonal notch; nor is the aperture higher than the body whorl as in *V. musica*. Both have the same number of columella and parietal folds and axial ribs. The heightened aperture is said by Pilsbry and Olsson (1954, p. 14) to be characteristic of the sub-family *Volutinae* but it is not seen in any of the *V. cantaurana* specimens.

In his description of *Falsilyria spec. ind.*, Jung (1965, p. 547) reports it as, "badly preserved...strongly rolled...its generic assignment to *Falsilyria*...somewhat doubtful." It may be a specimen of *V. cantaurana*.



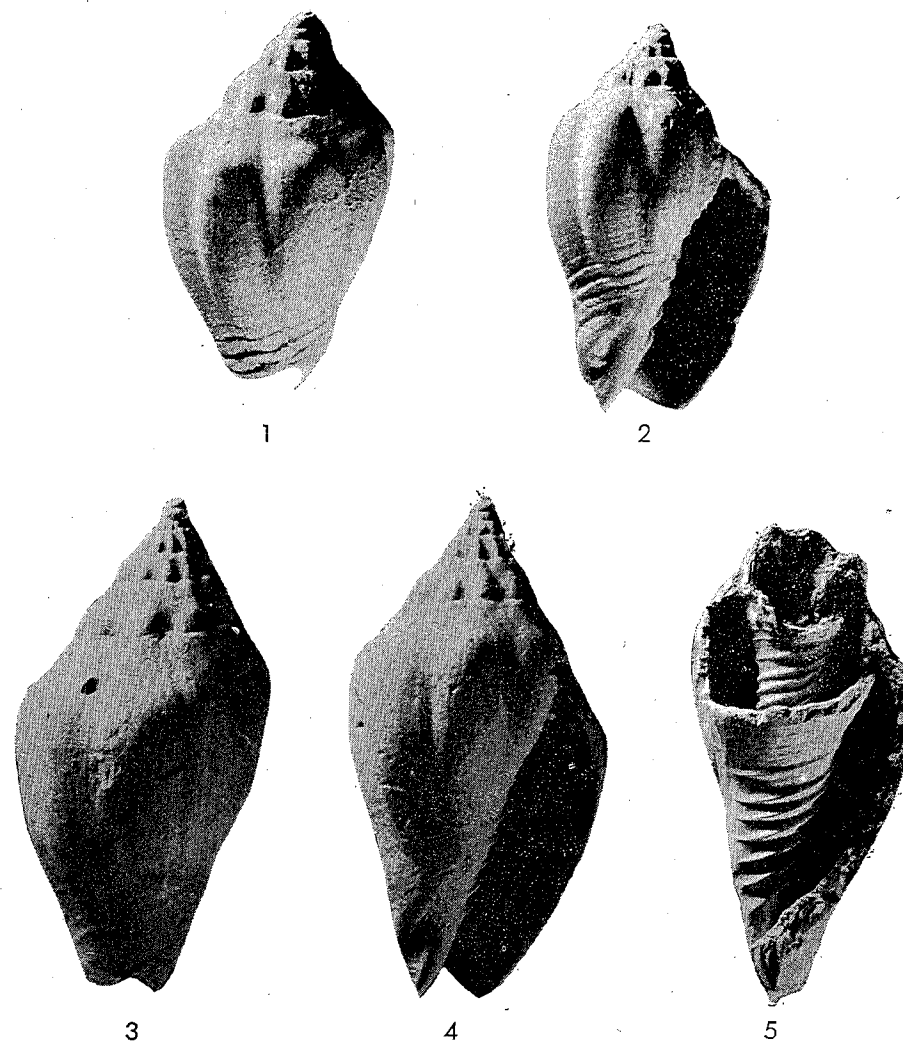
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Plate 1. Egg capsules of *Voluta musica* Linné.

Fig. 1. Showing join in the two parts of the capsule. x 2.

Fig. 2. Showing split developed in the join. x 2.

Fig. 3. Seven capsules attached to inner surface of valve of *Atrina seminuda* with young shells visible through slits and three already emerged.



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Plate 2. *Voluta musica* Linné. Punta Piedras Member, Tortuga Island, Venezuela.

Figs. 1, 2. Juvenile specimen. Height 33 mm, diameter 20,2 mm. x 1 1/2.

*Voluta cantaurana* n. sp. Cantaure Formation, Paraguaná Peninsula, Venezuela.

Figs. 3, 4. Holotype, N° UCVG N° 1280. Height 32,8 mm, diameter 17,9 mm. x 2.

Fig. 5. Paratype, N° UCVG 1280f. To show columella. Height (incomplete) 62 mm. x 1.

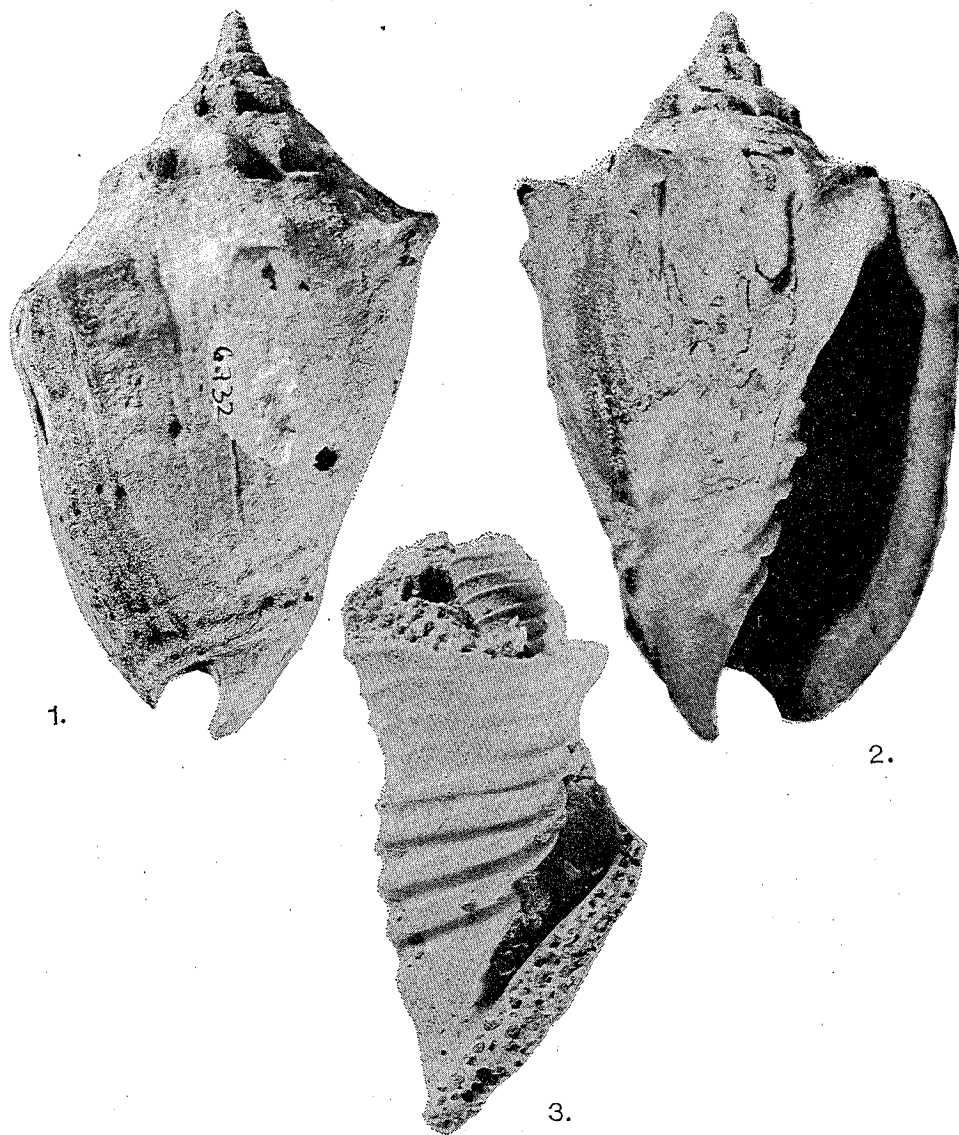


Plate 3. *Voluta cubaguaensis* n. sp. Cubagua Formation, La Caldera canyon, Cubagua Island, Venezuela.

Figs. 1, 2. Holotype, N° UCVG 6732. Height 80,6 mm, diameter 52 mm. x 1.  
 Fig. 3. Paratype, N° UCVG 6732c. Columella only of two turns. Height 61,8 mm.

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