

A new endemic species of *Voluta* from Aruba

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ABSTRACT A new species of volute endemic to Aruba is named from the *Voluta musica* complex. The Aruban *Voluta* population has been recognized as geographically isolated, morphologically distinct, and is compared with the mainland species *Voluta musica* and *Voluta damula* from Curaçao.

KEY WORDS Volutidae, *Voluta*, *Voluta caquetio*, *V. musica*, *V. damula*, biogeography, direct developers, barriers to dispersal

INTRODUCTION

Voluta musica Linnaeus, 1758 is a well-known tropical western Atlantic volute which has been reported from the “West Indies”, from the northern coast of South America, east across the coastline of Venezuela, then northwards up the Lesser Antilles Arc (Weaver & DuPont, 1970). *Voluta musica* is known to have direct development, with an encapsulated veliger stage that is unable to disperse until after metamorphosis into a crawl-away hatchling snail. These tiny volutes measure 6.4 to 8.6 mm, have a small complete shell, and a pigmented foot and siphon (Penchaszadeh & Miloslavich, 2001; Rangel *et al.* 2011). *Voluta musica* was previously described as inhabiting a relatively shallow habitat range in the littoral zone to approximately 5 fathoms, or 9.1 meters in depth (Weaver & DuPont, 1970). Recently, detailed ecological studies have shown that *V. musica* lives in shallow waters on sand and coralline-lime bottoms often associated with “turtle grass” *Thalassia testudinum* K.D. Koenig, 1805, and prefer to lay their eggs on valves of the Pen Shells *Atrina seminuda* (Lamarck, 1819), *Pinna carnea* Gmelin, 1791, and the Ark Shell *Anadara floridiana* (Conrad,

1869) in shallow water turtle grass beds (von Cosel, 1976; Flores, 1978; Rangel *et al.* 2011). These animals are direct developers and are subject to bathymetric barriers to dispersal (Berschauer 2024).

During interglacial times and the associated eustatic highs during the Neogene (Petuch, 1981; Carlson, 2011), populations of *V. musica* became geographically isolated on offshore islands both along the coast of South America, and some of the southernmost islands of what are now known as the Lesser Antilles. Those isolated *V. musica* populations have become genetically isolated, and have had the opportunity to evolve into closely related allopatric species over the last million years (Petuch, 1981). From the Pliocene to the present, with significant sea level fluctuations over geological time, populations of ancestral *V. musica* have become physically isolated on offshore islands, and those populations became genetically isolated, and evolved into closely related allopatric species. (Berschauer 2024)

Voluta musica, sensu stricto, is found from Santa Marta, Colombia eastward along the Venezuelan coast to just south of Trinidad (the

Venezuelan Subprovince), and this species exhibits the greatest variability in morphology, pattern, and color of all taxa in the *Voluta musica* complex. (Berschauer 2024). This is the largest contiguous population of any taxon in the complex, and these facts are consistent with Gibson-Smith's hypothesis that *V. musica*'s ancestral population evolved off the Venezuelan coast (Gibson-Smith, 1973). The *Voluta musica* complex has four species, including: *Voluta musica* Linnaeus, 1758, *V. carneolata* Lamarck, 1811, *V. thiarella* Lamarck, 1811, *V. damula* Dall, 1907, *V. typica* Dall, 1907; and three recognized morphological forms or subspecies *V. musica laevigata* Lamarck, 1811, *Voluta musica guiniaca* Lamarck, 1811, and *Voluta musica plicata* Dillwyn, 1817. (Berschauer 2024) These taxa are differentiated based upon distinctive morphology, color and pattern, and isolated geographic locations, due to their ecology and dispersal capabilities.

The island of Aruba is located on the continental shelf of South America, 27 kilometers north of the Venezuelan coast. The marine fauna of Aruba differs significantly from its neighboring Grenadine Subprovince islands Curaçao and Bonaire (together sometimes referred to as the ABC islands) because of its proximity to the coast of Venezuela and the shallow waters surrounding the island (Petuch 2013; Berschauer & Ros 2014; Petuch & Berschauer, 2021). By way of comparison, the waters off the coasts of Curaçao and Bonaire extend to 1,000 m deep whereas the waters between Aruba and Venezuela range between 135 to 200 m in depth (Smith *et al.* 2002). Given the ecology of these organisms, even the relatively shallow depth of the waters between Aruba and the mainland constitutes an insurmountable barrier to dispersal for these organisms. The Aruban *Voluta* population is recognized by the authors

as being geographically isolated, morphologically distinct, and is named herein. The holotype bears a Natural History Museum of Los Angeles type number, denoted "LACM" herein.

SYSTEMATICS

Class	Gastropoda Cuvier, 1795
Subclass	Sorbeoconcha Ponder and Lindberg, 1997
Order	Prosobranchia Milne-Edwards, 1848
Infraorder	Neogastropoda Wenz, 1938
Superfamily	Volutoidea Rafinesque, 1815
Family	Volutidae Rafinesque, 1815
Subfamily	Volutinae Rafinesque, 1815
Genus	<i>Voluta</i> Linnaeus, 1758

Voluta caquetio Berschauer and Ros,
new species

(Plate 1 Figures A-B, Plate 2 Figures A-I)

Description. Shell average size for genus between 45 to 65 mm in length, body whorl approximately two-thirds of total length, with 6 to 7 low ribs terminating in large stout shoulder knobs; protoconch large, highly elevated, consisting of 3 to 3½ whorls, glossy, dark-brown with clear-white terminal end; teleoconch consisting of 3 whorls, strongly knobbed at shoulders, suture slightly impressed, irregular, following curvature of shoulder knobs; aperture long, widest at midpoint of thickened outer lip, interior pale creamy-tan, columella thin, glazed, transparent creamy peach-tan with 6 to 7 strong plicae, posterior 3 plicae alternating with thin short plicae in between; base color pale creamy-tan ornamented with intricate design consisting of 2 spiral bands; upper band in middle of body whorl with light gray-tan base overlain by 4 to 5 thin medium brown parallel spiral lines resembling music bar lines crossed by irregular

vertical fringe-like lines resembling stacked bricks; lower band at bottom of body whorl consisting of 3 to 4 thin medium brown parallel spiral lines crossed by irregular vertical fringe-like lines; spiral music bar bands framed by bands of irregular thick dark-brown to black blotches; remainder of base pattern consisting of small dark-brown specks or dots; tips of shoulder knobs on teleoconch pale creamy-tan; operculum elongated oval, gold-tan, translucent, thin with concentric growth lines.

Type Material. HOLOTYPE - 63.5 mm in length, 40.8 mm in width, from Malmok, Aruba, LACM No. 3983 (Plate 1, Figures A-B). PARATYPES - 7 paratypes in the Berschauer Research Collection measuring 65.7 mm, 55.2 mm, 53.1 mm, 54.1 mm, 48.9 mm, 61.4 mm, and 49.0 mm in length respectively; and 7 paratypes in the Ros Collection measuring 32.8 (sub-adult), 57.1 mm, 48.4 mm, 56.1 mm, 51.2 mm, 54.6 mm, 49.5 mm in length respectively.

Type Locality. Malmok, Aruba.

Distribution. Endemic to the western coast of Aruba, which is the leeward side of the island and supports the ecological habitat of the species.

Ecology. Found in shallow waters between 2 meters to 9 meters in depth on sand and coralline-lime bottoms, buried in sand under broken coral slabs, or among "turtle grass" *Thalassia testudinum* K.D. Koenig, 1805.

Etymology. Named for the Caquetío Indians, the indigenous people of Aruba and northwestern Venezuela. The Caquetío Indians' prehistoric occupation of the island spanned thousands of years, and mollusks provided an important natural resource and was heavily integrated in their culture. (Dijkhoff & Linville 2004) The name is proposed as a noun in apposition, referring to the Caquetío Indian tribe.

Discussion. *Voluta caquetio* differs from the nominate species *Voluta musica* in that it is

proportionality broader at the shoulder, has a distinctive highly elevated protoconch, has more numerous columellar plicae, a pale creamy-tan base color, a higher contrast color pattern and heavier more distinct bands of irregular thick dark-brown to black blotches on either side of the music bar bands. The lectotype of *V. musica* was selected by Olsson from the Linnaean Collection, Linnean Society of London, specimen No. 370, which measures 38.0 mm in length. (Olsson 1965) The lectotype of *V. musica* is illustrated herein for comparison as Figure 1, Figures C, D.

Voluta caquetio has significant morphological differences from the nearest island *Voluta* populations, *V. damula* in Curaçao (Plate 1, Figures E, F), and the yet unstudied population in Bonaire (Plate 1, Figures G, H). Deep water oceanic trenches separate the islands of Aruba, Curaçao, and Bonaire, creating marked bathymetric barriers to dispersal of these volutes between these islands despite their otherwise apparent proximity. *Voluta damula* in comparison to *V. caquetio* has a shorter, more rounded, peach-colored protoconch (Plate 3, Figure C), is narrower at the shoulder with subdued smaller shoulder knobs, is paler in color and has less intense markings and a markedly subdued color pattern.

The shells from the yet unnamed population from Bonaire has a squat, rounded, inflated, domed, pale-yellow protoconch (Plate 3, Figure D). More specimens with reliable locality data from Bonaire are needed to properly study that population. Finally, *Voluta caquetio* is similar to *V. typica* from Tobago in that it has a broader shoulder and larger shoulder knobs than the mainland species *V. musica*. However *V. caquetio* has a much higher and narrower protoconch than *V. typica* (see Berschauer 2024, Plate 10, Figure C). Plate 2 illustrates an egg capsule of *V. caquetio*, together with a juvenile

specimen, sub-adult specimens, and some of the paratypes to show the variability of the intricate markings and color pattern in this new species. For a comparison of the different protoconchs of *V. caquetio*, the mainland species *V. musica*, and some of the other insular species see Plate 3.

There was no type locality listed when *V. musica* was named by Linnaeus, accordingly the authors hereby designate Cumaná, Venezuela as the type locality for *V. musica*. Cumaná was founded in 1510, and is one of the first cities founded by Spain in the mainland Americas. Additionally, Cumaná is located in the middle of the biogeographic range of the coastal species *V. musica* (as its range was described in Berschauer 2024), was regularly visited by European scientists in the 18th century, and is the oldest continuously inhabited city established by European settlers in South America.

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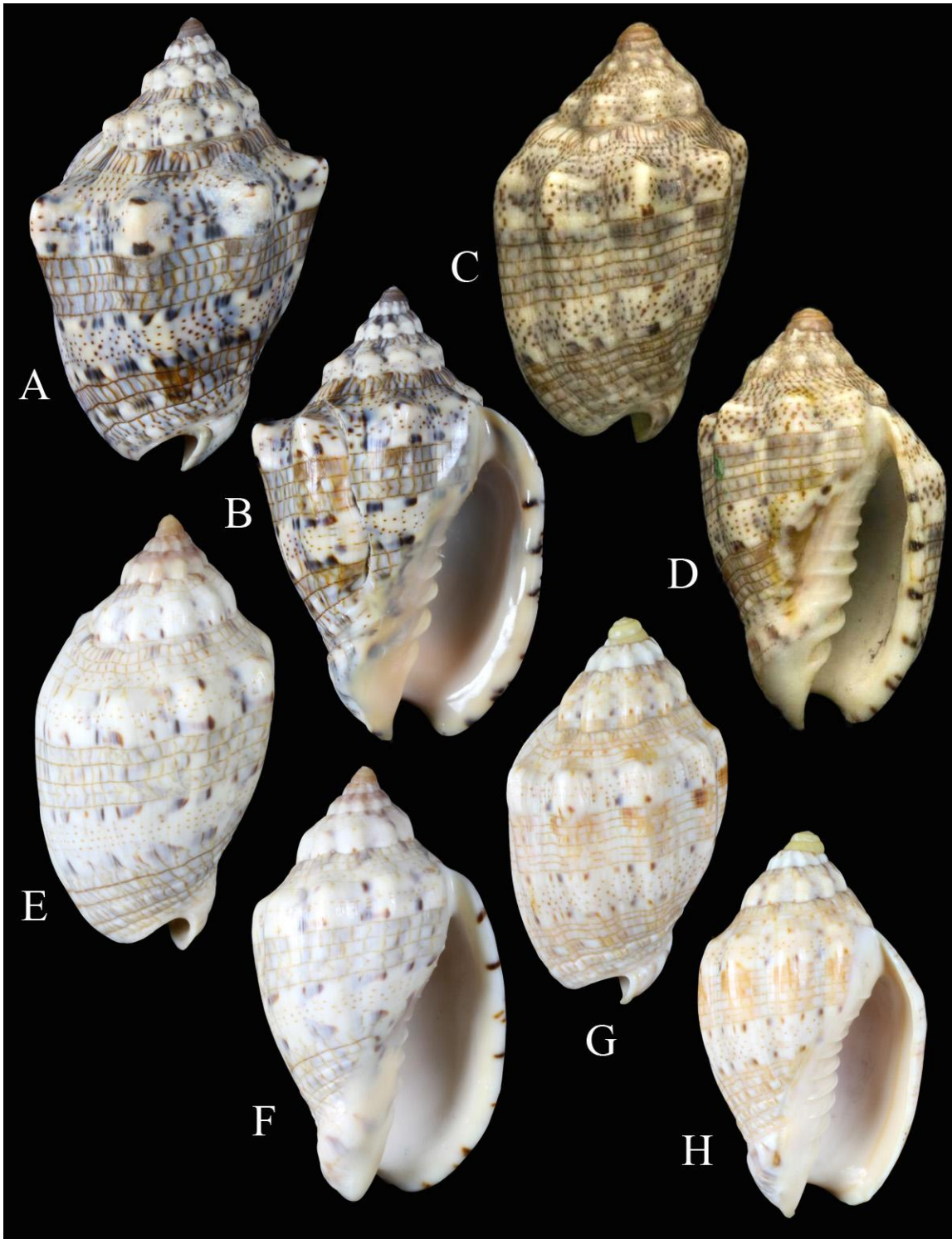


Plate 1. *Voluta caquetio* compared with *V. musica*, *V. damula*, and the yet unnamed Bonaire taxon.

A, B= *Voluta caquetio*, holotype measuring 63.5 mm in length, 40.8 mm in width, from Malmok, Aruba, LACM No. 3983; **C, D=** *V. musica* lectotype from the Linnaean Collection, measuring 38.0 mm in length, type locality designated by the authors herein as Cumaná, Venezuela; **E, F=** *V. damula*, measuring 57.3 mm in length, from Sint Michiel, Curaçao; and, **G, H=** cf. *V. musica*, measuring 51.0 mm in length, from Kralindijk, Bonaire.

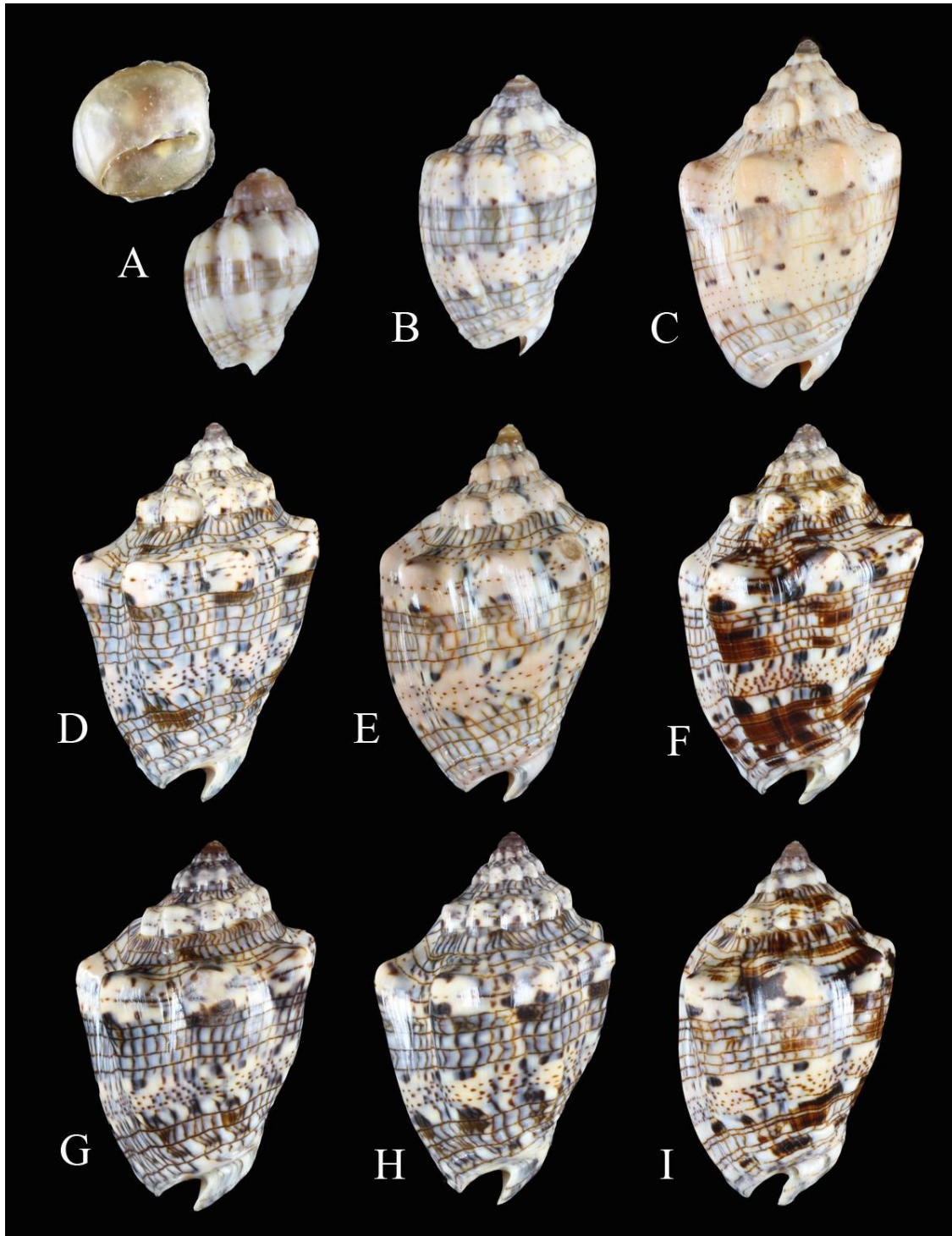


Plate 2. Egg capsule, juvenile, sub-adult, and adult specimens of *V. caquetio*.

A= Egg capsule measuring 13.5 mm, and juvenile specimen measuring 16.1 mm in length (in the Berschauer Collection); **B=** sub-adult specimen, measuring 26.4 mm in length (in the Berschauer Collection); **C=** sub-adult specimen measuring 32.8 mm in length (paratype in the Ros Collection); and the following adult specimen paratypes in the Ros Collection: **D=** 57.1 mm in length; **E=** 48.4 mm in length; **F=** 56.1 mm in length; **G=** 51.2 mm in length; **H=** 54.6 mm in length; **I=** 49.5 mm in length. All illustrated specimens from the general vicinity of Malmok, Aruba.

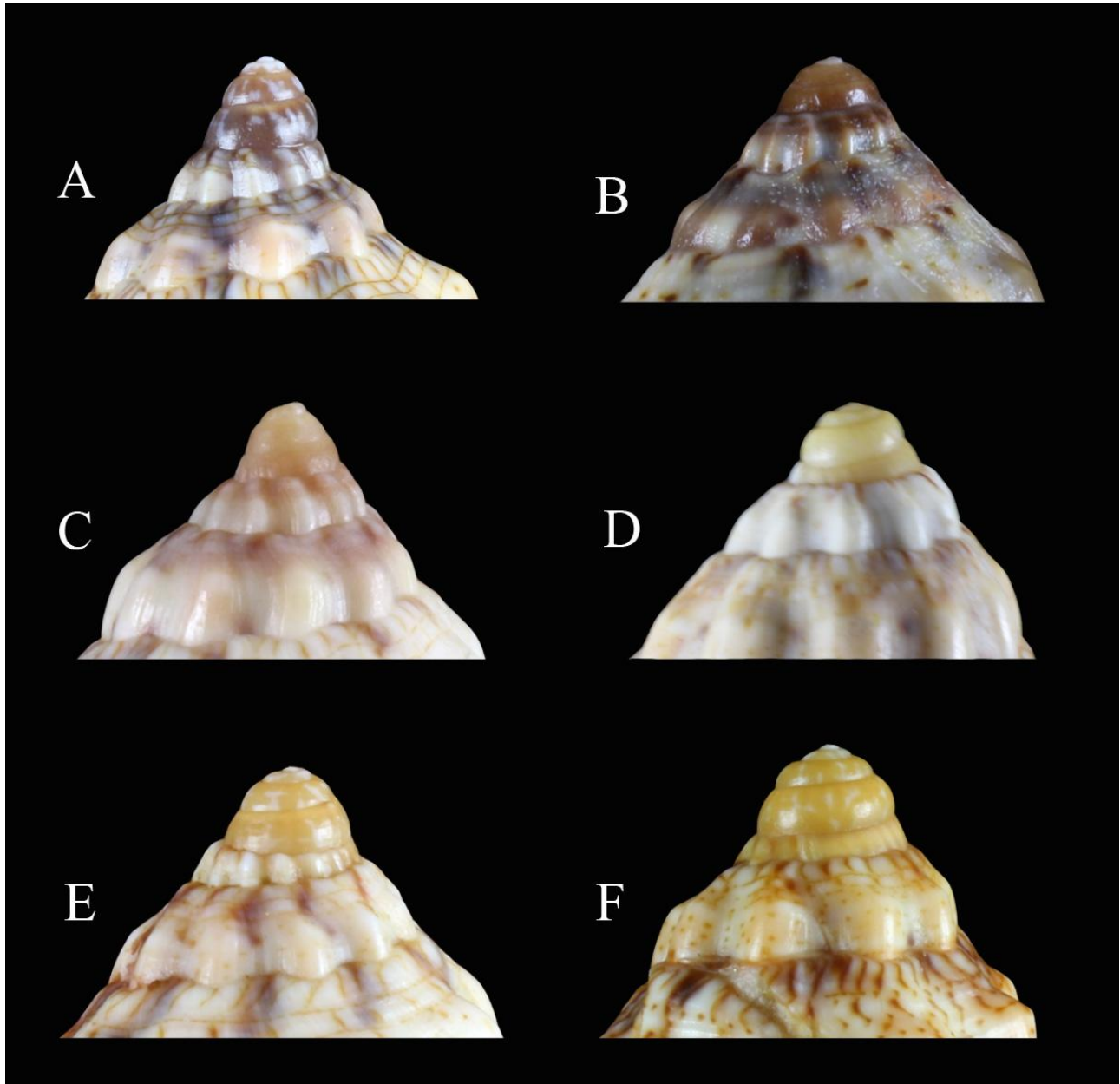


Plate 3. Comparison of protoconch of *Voluta caquetio* compared with *V. musica*, and other insular species.

A= *Voluta caquetio* new species, from Malmok, Aruba; **B=** *V. musica* Linnaeus, 1758 from Punta de Piedras, Venezuela; **C=** *V. damula* Dall, 1907 from Martha Bay, Curaçao; **D=** cf. *V. musica* from Kraelindijk, Bonaire; **E=** *V. carneolata* Lamarck, 1811 from Sandy Lane, Barbados; **F=** *V. thiarella* Lamarck, 1811 from Bay of Diamont, Martinique.