Attenuiconus marileeae, a new species of cone (Gastropoda: Conidae: Puncticulinae) from Curaçao

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ABSTRACT
Attenuiconus marileeae new species is described from deep reefs off southeastern Curaçao. It resembles A. attenuatus, A. honkeri, and A. aureonimbosus in size and general proportion of the shell, but is readily distinguished on the basis of its distinctive color pattern, which consists of a vivid orange-red base color with three bands of irregular, white flammules. Attenuiconus marileeae was collected at substantially greater depths than any of its Caribbean congeners. Only A. aureonimbosus, from the northeastern Gulf of Mexico, inhabits comparable depths. Like all species of Attenuiconus, nearly all specimens A. marileeae have one or more major repaired breaks indicative of unsuccessful attacks by crustaceans.

Additional Keywords: Deep Reef, Curasub, bottles, predation

INTRODUCTION
Over the past several years, sampling off southern Curaçao and adjacent islands using the manned submersible CURASUB as part of the Deep Reef Observation Project (DROP), a collaboration between the Smithsonian and Substation Curaçao, has greatly enriched our knowledge of the deep-reef faunas of the region and led to the discovery of range extensions and new species in multiple phyla. Among the many mollusks collected is a new species of Attenuiconus, a genus of conids endemic to the tropical western Atlantic (Petuch, 2013; Tucker and Tenorio, 2013). Several specimens were among the hundreds of molluscan shells found in multiple glass bottles recovered from the ocean floor at depths ranging from 130–168 m. The age of the bottles ranged from mid-19th century to modern. Although nearly all these specimens were dead collected, they nevertheless provide insights into the molluscan biodiversity of the region, and include multiple range extensions and several new taxa. Many of the shells had at least one drill hole, and were likely brought into the bottles as food by small octopuses.

This new species is described and compared to Attenuiconus attenuatus (Reeve, 1844), the type species of Attenuiconus, a wide ranging species that occurs in southeastern Florida and throughout the Caribbean, including Curaçao, as well as to specimens of Sandericonus sanderi (Wils and Moolenbeck, 1979), the type species of Sandericonus, which was also present in the bottle samples.

SYSTEMATICS
Family Conidae Fleming, 1822
Subfamily Puncticulinae Tucker and Tenorio, 2009
Genus Attenuiconus Petuch, 2013
Attenuiconus Petuch, 2013: 212–213. Type species: Conus attenuatus Reeve, 1844, by original designation.

Diagnosis: “Shell small to average size for subfamily, very elongated, with straight sides and narrow, straight apertures; spires low or flattened, with projecting, mammilate protoconchs of 2 or 3 whorls; spire whorls may be flattened, or slightly canaliculated; shells generally smooth and polished, but some species have coarse sculpture of fine spiral threads; shells generally colored in yellows or oranges arranged in wide bands, but may be colored pink, salmon, reddish-orange with brown or white longitudinal flammules.” (Petuch, 2013: 212–213).

Remarks: In addition to the type species, which ranges from southern Florida throughout the Caribbean, Petuch (2013: 213) included within Attenuiconus: A. eversoni (Petuch, 1987) from Honduras, A. honkeri (Petuch, 1988) from Venezuela, A. ignotus (Cargile, 1998), from Honduras, Nicaragua and Colombia, as well as A. poulosi (Petuch, 1988) from Venezuela and Colombia. He noted that these species had previously been included in Dauciconus Cotton, 1945 by Tucker and Tenorio (2009), but that Attenuiconus may be distinguished from Dauciconus on the basis of its much

**Attenuiconus marileeae** new species (Figures 12–18)

**Description:** Shell (Figures 12–16) of moderate size for genus (to 23 mm), with solid, narrow (L/W ≈ 2.1), straight-sided, conical, low-conical spire, projecting protoconch, and narrow aperture. Protoconch (Figures 17–18) tall, conical, increasing in diameter from 291 μm to 850 μm in 3/4 evenly rounded, pitted glassy whorls. Protoconch forms a broad, smooth varix prior to transition to teleoconch (Figures 17, 18, arrows), marked by development of strongly tuberculate shoulder (17 tubercles on first teleoconch whorl, tubercles becoming weaker in subsequent whorls, absent by 5th whorl). Teleoconch with up to 8 sharply shouldered, straight-sided whorls. Suture adpressed in early whorls, may become shallowly impressed in later whorls. Sutural ramp narrow, weakly concave to flat, with 4–6 rounded cords between suture and shoulder. Last whorl smooth except for 5–6 broad, rounded spiral cords near anterior margin of shell. Aperture long, narrow (L/W≈11) with parallel sides, deflected from shell axis by 11–14°. Shell base color golden orange to orange red, with three bands of irregular white markings: one at and below the shoulder, one at mid-whorl, and one near the anterior margin of the shell. Band below shoulder broadest, consisting of very irregular, vaguely sigmoidal white flammules, which may be divided. White flammules extend over shoulder onto sutural ramp, but rarely reach suture. White blotches in relatively narrow band at mid-whorl range from small and compact (Figure 8) to large and amorphous (Figure 10), while flammules near anterior margin tend to form diffuse, oblique lines. Aperture color white. Radula, operculum, and periostracum unknown.

**Type Material:** Holotype, USNM 1195478. Paratypes 1–4, USNM 1240622, all from the type locality. Paratype 5, Petuch collection, also from the type locality.

**Type Locality:** Off the Sea Aquarium, Bapor Kibra, Willemstad, Curacao, at depths of 130–168 m. Nearly all specimens have broken lips as well as one or more major repaired breaks, the latter indicative of prior, severe but unsuccessful attacks by crustaceans.

**Etymology:** This new species is named in honor of Marilee McNeilus in recognition of her longstanding interest in mollusks and her support of research. She participated in the submersible dives and assisted with the specimen sorting that led to the discovery of this new species.

**Comparative Remarks:** Attenuiconus marileeae resembles A. attenuatus, a wide-ranging species that occurs in southern Curacao at shallower depths (Figures 1–3), in the size and proportions of the shell, but differs in having a more concave spire profile and more prominent spiral sculpture between the shoulder and suture. Attenuiconus marileeae is most readily distinguished from all its congeners by its bright orange-red color and the large and distinctive patterns of white flammules that occur in three bands. The color patterns in A. attenuatus (Figures 1–5) and A. honkeri (Figures 6–7) usually take the form of fairly well-defined, parallel-sided bands of color. Both A. eversoni (Figures 10–11) and A. poulosi are easily distinguished from A. marileeae by their flatter spires and more pointed early whorls, as well as by their more uniformly salmon-colored shells. Attenuiconus aureonimbosus (Figures 8–9) is similar to A. marileeae in shell shape and proportion. It shares a similar pattern of irregular, nebulous white flammules, but is much paler in color. However, this species and A. eversoni tend to have a series of very fine spiral brown bands of spots, most evident between the shoulder and mid-whorl that are not present in A. marileeae.

Attenuiconus marileeae is easily separated from Sandericonus sanderi, a species of similar size and base color that also occurred among the specimens collected from the bottles. Sandericonus sanderi (Figures 14–18) has a broader shell with a flatter, more concave spire, a sharper shoulder, and a broad whitish band with nebulous margins at mid-whorl.

**DISCUSSION**

Conus, one of the original Linnean genera (Linnaeus, 1758), had, until recently, been considered to be the most species-rich modern marine genus, with more than 500 extant and several hundred extinct species (e.g., Röckel, Korn and Kohn, 1995; Duda, Kohn and Palumbi, 2001). Subsequent studies, which included information on radular morphology and molecular data, have partitioned the 743 cone species known at the time among three families, five subfamilies, and 114 living genera, an arrangement that is more in line with those of several other toxoglossan families (Tucker and Tenorio, 2013: 3). These authors note that the numbers are expected to increase, and the relationships among the taxa at all levels will continue to be refined as more data become available.

Within this new paradigm of conoidae systematic, Attenuiconus represents a small, poorly known genus limited to the western Atlantic, with greatest diversity in the southwestern Caribbean. The majority of species burrow in sandy bottoms at depths ranging from 10 to 50 m, although some of the SW Caribbean species and have been reported to live on sponge reefs (Petuch,
2013: 213). Only A. aureonimbosus from the northeastern Gulf of Mexico was reported from depths as great as 70–150 m. The depth at which A. marileeae has been collected (130–168 m) is significantly greater than the bathymetric range for most *Attenuiconus*, but similar to that of *A. aureonimbosus*. As all available specimens of *A. marileeae* were dead collected, it is possible that this species inhabits somewhat shallower waters, and that the shells may have rolled downslope and become occupied by hermit crabs prior to being brought into the bottles. However, other species of cones collected from the same bottles ([i.e., *Sandericonus sanderi* (Wils and Moolenbeek, 1979), *Conasprelloides villepinii* (P. Fischer and Bernardi, 1857), and *Dalliconus mazei* (Deshayes, 1874)] are all known to inhabit the depths at which the bottles were collected (Rosenberg, 2009).

Living specimens of *Sandericonus sanderi* (Figures 19–23) were collected nearby, but at substantially greater depths (297 m).

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LITERATURE CITED


