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Harpa amouretta (Röding, 1798)

Gulf of Aqaba.

Photo: Moti Kovalis

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**The family Colubrariidae Dall, 1904 in the western Atlantic,
including the description of two new species**

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Abstract: The Recent species belonging to the genus *Colubraria* Schumacher, 1817 and the genus *Cumia* Bivona-Bernardi, 1838 that occur in the western Atlantic region are discussed. *Colubraria harryleei* and *Colubraria margarethae* are introduced as new to science and compared with their closest congeners. *Colubraria antillana* Sarasúa, 1978 is transferred to the genus *Cumia*. Species commonly considered as *Colubraria*, but in fact belonging to other families are mentioned for completeness' sake, but are beyond the scope of the present article.

Introduction: The western Atlantic is host to 5 known species of **Colubrariidae**: *Colubraria antillana* Sarasúa, 1978, *Cumia clavula* Watters, 2009, *Colubraria kathiewayana* Fittkau & Parth, 1993, *Cumia sunderlandi* (Petuch, 1995) and *Colubraria testacea* (Mørch, 1852). All of these are poorly understood: *Colubraria antillana* because of its rarity and the difficult accessibility of its distributional range (Cuba), *Cumia sunderlandi* and *C. clavula* because of their rarity, and both *Colubraria kathiewayana* and *C. testacea* because of the confusion with *C. obscura* (Reeve, 1844). For a detailed

discussion of the confusion with *C. obscura*, we refer to Parth (1992) and Monsecour & Monsecour (2004). In order to reach a better understanding of all western Atlantic species of **Colubrariidae**, we hereby present a detailed discussion of all known species.

The genus *Cumia* Bivona-Bernardi, 1838 was long considered a synonym of *Colubraria*, but is now widely considered a valid genus within the family **Colubrariidae**, with well-known representatives like the European *Cumia intertexta* (Helbling, 1779) (= "*Colubraria*" *reticulata* (De Blainville, 1826)) and the Australian *Cumia janlochi* (Parth, 1991), which was likewise originally described within *Colubraria*. *Cumia* stands out from *Colubraria* by the protoconch which arises as a small, papillate point from the teleoconch. For a more detailed discussion, we refer to Watters (2009).

While studying worldwide **Colubrariidae**, we acquired two specimens of a *Colubraria* species from Venezuela in May 2008 and May 2009. A close comparison with the three western Atlantic species mentioned above lead to the conclusion that we were dealing with an undescribed species. It is hereby introduced as *Colubraria margarethae* sp. nov. During the search for the true identity of *Cumia sunderlandi*, we established contact with Dr. Harry G. Lee (Jacksonville, Florida, USA), who kindly provided us with a specimen of this taxon for study, as well as further material from his private collection, amongst which more specimens of *C. margarethae* sp. nov. were found, together with 3 samples of another, yet unidentified species. We hereby introduce the latter as *Colubraria harryleei* sp. nov.

Abbreviations:

- BMSM: Bailey-Matthews Shell Museum, Sanibel, Florida, USA.
 FLMNH: Florida Museum of Natural History, University of Florida, Gainesville, Florida, USA.
 MNHN: Muséum National d'Historie Naturella, Paris, France.
 NHMUK: The Natural History Museum, London, United Kingdom.
 DM: private collection David Monsecour.
 HGL: private collection Harry G. Lee, Jacksonville, Florida, USA.
 ICZN: International Commission on Zoological Nomenclature.

Systematic part:

Family COLUBRARIIDAE Dall, 1904

Genus *Colubraria* Schumacher, 1817

Type species by subsequent designation (Harris, 1897): *Colubraria granulata* Schumacher, 1817 (= *Buccinum muricatum* Lightfoot, 1786 = *Murex maculosus* Gmelin, 1791). Recent, Indo-West Pacific. For a detailed discussion of the type species designation, we refer to Beu & Maxwell (1987).

Colubraria harryleei sp. nov.

Type material: Holotype FLMNH: 23.5 x 8.3 mm; Paratype 1 HGL (from type locality): 28.2 x 10.2 mm; Paratype 2 NHMUK (from type locality): 19.5 x 7.0 mm; Paratype 3 HGL (La Parguera, SW Puerto Rico. In shallow water): 17.0 x 6.4 mm.

Material studied: Apart from the type material, a dead-taken shell from Playa de Ponce, Puerto Rico (DM, *ex* HGL) was studied

Type locality: St. Georges Parish, Bermuda. In drift from dredge spoil.

Range: Known from Bermuda (type locality) and Puerto Rico (La Parguera, SW Puerto Rico and Playa de Ponce, south central Puerto Rico). Probably also elsewhere in the Caribbean, especially in adjacent islands and intervening waters.

Description: Shell small-sized for the genus (largest specimen known: 28.8 mm, paratype 1), slender, elongate. Protoconch multispiral, consisting of $2^{3/4}$ very bulbous, semi-translucent whorls adorned with microscopic pits. Transition to teleoconch clearly visible, marked by a thickened rim and the appearance of both axial and spiral sculpture. Teleoconch consisting of $8^{1/2}$ -9 whorls, rapidly increasing in size towards the body whorl. Spiral sculpture consisting of 4 fine cords on first teleoconch whorl, a fifth one appears in the lower suture of the second teleoconch whorl, 5-6 on further teleoconch whorls, sometimes with most adapical one or most abapical one partly hidden under the suture, 8-9 on the penultimate whorl, and 17-19 on the last whorl, including the basal cords. Axial sculpture of 12 strong varices (including the final one), rapidly increasing in strength. Last varix situated at 360° from penultimate varix, at 270° intervals on the preceding 3-4 teleoconch whorls, and at about 180° on the uppermost 3-4 teleoconch whorls. Further axial sculpture of fine axial cords, forming low, rounded, beadlike chains on the intersections with the spiral sculpture: 17-18 on first teleoconch whorl, increasing in number towards 30-32 on penultimate whorl and last whorl. Axial varices adorned with very fine axial grooves and the continuation of the whorl's spiral sculpture. Siphonal canal short, narrow, with only the utmost tip slightly recurved. Columella with 16-19 fine, pustulous lirae along its entire length. Parietal shield almost straight, thickened, attached to final whorl, but demarcated by a very strong, thickened rim. Lip with 12 inner denticles, slightly extending into the aperture. Aperture elongate.

Shell colour light golden brown to tan with darker patches at about midwhorl. Varices darker, usually with one, occasionally two off-white bands on the final varix. Protoconch off-white to pale tan. Lip with tiny brown dots in line with the inner denticles. Aperture off-white.

Operculum and soft parts unknown.

Comparison: *Colubraria harryleei* sp. nov. stands out from its sympatric congeners by the number of teleoconch whorls (about 9 as opposed to 8 in *C. kathiewayana* and 10 in both *C. margarethae* and *C. testacea*), the very bulbous protoconch consisting of $2^{3/4}$ whorls (conical and with 3-3^{1/2} whorls in *C. kathiewayana*, the closest congener), and the number of axial varices (the only species with 12 strong axial varices). It shares the pustulous lirae on the columella with *C. testacea*, but they are less strong, yet stronger than in *C. kathiewayana*.

Etymology: This species is named in honour of Dr. Harry G. Lee (Jacksonville, Florida, USA) because he allowed us to study unidentified *Colubraria* specimens in his collection and kindly donated the holotype.



Fig. A: protoconch of *Colubraria harrylei*



Fig. B: protoconch of *Colubraria kathiewayana*

Colubraria kathiewayana Fittkau & Parth, 1993

Type material: Holotype in the Zoologische Staatssammlung München, Germany; 2 paratypes: 1 in coll. Fittkau and 1 in coll. Parth.

Material studied: Holotype (Zoologische Staatssammlung München, Germany); Brazil: Barra, Salvador, Bahia State, Brazil (4 shells, 20-24 mm), DM; Alcobaça City, Bahia State, Brazil (1 shell, 19 mm), DM; Natal, Brazil (1 shell, 22 mm), DM.

Range: From Natal and Bahia state, Brazil northwards to the Gulf of Mexico (Lee, 2009: 107).

Diagnosis: Shell small-sized for the genus (adult size 17-ca 30 mm), elongate. Protoconch multispiral, consisting of 3-3^{1/2} smooth whorls. Transition to teleoconch clearly visible, marked by a strong, smooth varix. Teleoconch of about 8-8^{1/2} slightly convex whorls. Spiral sculpture consisting of 3-4 strong cords on first two teleoconch whorls, 5-6 on the next whorls, 7 on the penultimate, and 8-10 strong primary cords on the last whorl. Secondary spiral cords only visible on last whorl, exactly in the middle of the interspaces between the primary spiral cords. Axial sculpture of 10 strong varices (including the final one), rapidly increasing in strength. Last varix situated at 360° from penultimate varix, at 270° intervals on the preceding 2-3 teleoconch whorls, and at about 180° intervals on the uppermost 3-4 teleoconch whorls. Further axial sculpture of numerous strong axial cords, forming beadlike chains on the intersections with the spiral sculpture: 10-11 on first teleoconch whorl, slightly increasing in number and strength towards 19-22 on penultimate whorl, where they are strongest, and 29-32 on last whorl. Two or three very fine axial grooves between axial cords on final half of last whorl. Axial varices with many fine axial lines and stronger spiral cords. Siphonal canal short, slightly turned backwards. Columella with 4-5 faint abapical lirae, the lowest two ending in a pustule, and 1-2 stronger lirae near the onset of the upper lip; parietal shield almost straight, abapical half not attached to final whorl and extending towards about midwhorl of the final whorl. Lip somewhat ovate, with a sharp turn towards the siphonal canal and with 9-10 inner denticles, slightly extending into the aperture. Aperture smooth.

Shell colour golden yellow to dark reddish brown, often with a spiral band of darker or lighter blotches at about midwhorl, sometimes with an extra band just below the suture. Protoconch pale pink to reddish brown. Varices paler, almost white, with a darker band, except on the final varix on the outer lip, where a second and sometimes even a third paler band is present. Lip with small dark brown dots at the end of the spiral cords. Aperture creamy to dark beige.

Colubraria margarethae sp. nov.

Type material: Holotype MNHN 23348: 64.8 x 21.1 mm; Paratype 1 DM (los Taques, Paraguana peninsula, Venezuela. In muddy sand at 90 m): 72.8 x 23.6 mm; Paratype 2 FLMNH (S. Castle Roads, SE Bermuda. In trap at about 450 m): 53.8 x 18.1 mm; Paratype 3-4 HGL (same locality): 59.2 x 20.2 mm and 61.3 x 21.1 mm; Paratype 5 HGL (off St. James, Barbados. In trap at about 100 m): 41.8 x 14.7 mm.

Material studied: Limited to the type material.

Type locality: Venezuela, Paraguana peninsula, off Cabo Romana. In muddy sand at 40-60 m.

Range: Caribbean Province: known from Paraguana Peninsula, Venezuela (type locality), Barbados and Bermuda.

Description: Shell rather large for the genus (largest specimen known: 72.8 mm, paratype 1), slender, elongate. Protoconch multispiral, consisting of $2^{1/2}$ - $2^{3/4}$ smooth, bulbous whorls. Transition to teleoconch clearly visible, marked by a strong axial varix. Teleoconch of 10 whorls, rapidly increasing in size towards the body whorl. Spiral sculpture consisting of 4 fine cords on first teleoconch whorl, a fifth one appears in the lower suture of the second teleoconch whorl, 6-7 on further teleoconch whorls, sometimes with most adapical one or most abapical one partly hidden under the suture, 8 on the penultimate whorl, of which the abapical 4 are hardly raised and 10 on the last whorl, likewise diminishing in strength in abapical direction. No spiral sculpture below midwhorl of body whorl, except for 4-5 basal cords. Axial sculpture of 17 strong varices (including the final one), rapidly increasing in strength. Last varix situated at 360° of penultimate varix, at 270° intervals on the preceding 4 teleoconch whorls, and at about 180° intervals on the uppermost 3-4 teleoconch whorls. Further axial sculpture of fine axial cords, forming low, rounded, beadlike chains on the intersections with the spiral sculpture: 17-18 on first teleoconch whorl, slightly increasing in number towards 29-30 on penultimate whorl and 23 on last whorl. Axial sculpture increasing in strength until the sixth teleoconch whorl and then diminishing in strength, leaving the ventral side of the final whorl without axial sculpture. Axial varices adorned with very fine axial grooves and the continuation of the whorl's spiral sculpture, with the 4 most adapical spiral cords on every varix especially raised along the entire varix (less visible on final varix of holotype). Siphonal canal rather short, half-open, slightly turned backwards. Columella with one strong adapical rim, rest provisionally smooth, but with up to 9 microscopic lirae in abapical half. Parietal shield almost straight, strongly thickened, abapical half not attached to final whorl. Lip with 12 inner denticles, slightly extending into the aperture. Aperture elongate, ovate, smooth.

Shell colour beige to light brown with some white patches and with a pale band adorned with brown blotches just below midwhorl of the final whorl and a row of darker brown blotches just below the suture. Varices darker brown with usually one, but sometimes 3 off-white bands on the final varix. Raised spiral sculpture on varices white. Protoconch off-white to pale yellowish. Lip with tiny brown dots aligned with the inner denticles. Aperture off-white. Operculum and soft parts unknown.

Comparison: *Colubraria margarethae* sp. nov. stands out from its sympatric congeners by its size, the slenderer overall shape, the number of varices (17 as compared to 13-14 in *C. testacea*, its closest sympatric congener), the smoother and more thickened columella, the general number of spiral and axial cords, which render a much less reticulate effect than in both *C. kathiewayana* and *C. testacea* due to the diminishing strength of the axial sculpture from the sixth whorl onwards, the lack of spiral sculpture on the anterior half of the body whorl, and the broader siphonal canal.

Yet, its closest congener is *Colubraria canariensis* Nordsieck & Talavera, 1979, which occurs from Funchal Bay (Madeira) southwards along the West African coasts down to northern Angola (Monsecour & Monsecour, 2006 and Monsecour & Ryall, 2008). This eastern Atlantic species differs by its smaller size (average adult size about 42 mm), the paler colour, the smaller number of varices (up to 15 as compared to 17 in *C. margarethae* sp. nov.), the less bulbous whorls with shallower suture, and the more conical, reddish brown protoconch consisting of 3-3^{1/2} whorls.



Fig. C: protoconch of
Colubraria canariensis



Fig. D: protoconch of
Colubraria margarethae

Etymology: This species is named in honour of the late Margaretha Van Hove, the authors' grandmother.

Colubraria testacea (Mørch, 1852)

Type material: unknown.

Material studied: Alcobaça City, Bahia, Brazil (1 subadult shell, 22 mm), DM; Barra, Salvador, Bahia, Brazil (3 shell, 32-42 mm), DM; off Cartagena, Colombia (3 shells, 26-47 mm), DM; southern Roatan Island, Honduras (1 shell, 37 mm), DM; Cap Salomon, Martinique (3 shells, 43-56 mm), HGL; Panama (1 shell, 33 mm), DM; Boca Raton, Florida, USA (1 shell, 42 mm), DM; Boynton Beach, Palm Beach County, Florida, USA (2 shells, 27-38 mm), DM.

Range: From North Carolina throughout the Caribbean and eastern South America southwards to Bahia State, Brazil. Bermuda records need confirmation.

Diagnosis: Shell of average size for the genus (adult size 25-55 mm). Protoconch consisting of $2^{1/4}$ to $2^{1/2}$ bulbous, semi-translucent whorls, adorned with microscopic pits. Transition to teleoconch clearly visible, marked by a weak varix and the appearance of the axial sculpture. Teleoconch of 10 convex whorls, the penultimate whorl clearly more swollen than the last whorl. Spiral sculpture consisting of 4 fine cords on first 2 teleoconch whorls, 5 on the next teleoconch whorls, 6-7 on the penultimate and 15 on the last whorl. Axial sculpture of 13-14 strong varices (including the final one), rapidly increasing in strength. Last varix situated at 360° from the penultimate varix, further varices at 270° intervals on the 4-5 preceding teleoconch whorls, and at intervals of about 180° on the uppermost 3-4 teleoconch whorls. Further axial sculpture of numerous fine axial cords, forming beadlike chains on the intersections with the spiral sculpture: 12-15 on first teleoconch whorl, slowly increasing in number and strength towards 29-34 on penultimate whorl and 36-40 on last whorl. Varices adorned with many very fine axial grooves and the continuation of the whorls' spiral sculpture, yet weaker. Siphonal canal rather short, slightly turned backwards. Columella with 9-12 rows of granules or lirae along the siphonal canal and extending into the aperture and 3 lirae near the onset of the outer lip of which the one in the middle is the strongest. Parietal shield almost straight, abapical half not attached to final whorl and only leaving a non-thickened glossy area on the ventral side of the last whorl. Lip with 10-12 inner denticles, extending over a short distance into the aperture. Aperture smooth.

Shell colour creamy or beige with randomly placed darker brown patches. Protoconch pale yellowish. Three off-white bands on the final varix and one off-white band on other varices. Lip with tiny brown dots aligned with the inner denticles. Aperture creamy.



Fig. E: protoconch of *Colubraria testacea*

Remarks: Even though Mørch (1877) already clearly described the differences from the Indo-Pacific species *C. obscura* (Reeve, 1844), shells from the Caribbean are often identified as such. They can most easily be distinguished by means of the columella: the columella in *C. obscura* is completely smooth, whereas it is granulous and lirate in *C. testacea*.

Family COLUBRARIIDAE Dall, 1904

Genus *Cumia* Bivona-Bernardi, 1838

= *Fusus* Helbling, 1779 (rejected name, see Petit & Wilson, 1991 and ICZN, 1994)

Type species by original designation: *Cumia decussata* Bivona-Bernardi, 1838 (= *Murex intertextus* Helbling, 1779). Recent, Mediterranean Province.

Cumia antillana (Sarasúa, 1978) **comb. nov.**

Type material: Holotype and 1 paratype, both in Poeyana Instituto de Zoología, academia de ciencias de Cuba.

Material studied: 2 shells in the coll. Sarasúa (through photographs made available by Raúl Fernández-Garcés).

Range: Only known from Cuba (La Habana Province), where it lives at a depth of about 20 m.

Diagnosis: Shell of average size for the genus: 17-25 mm. Protoconch consisting of about 1 ½, translucent whorl with a fine radial cord appearing from about half of the first whorl onwards, extending on the first teleoconch whorl for about 50% of this whorl. Transition to teleoconch clearly visible by a strong axial varix and the appearance of the axial sculpture. Teleoconch of about 8 slightly convex whorls, regularly increasing in size. First teleoconch whorl semi-translucent, bulbously flattened. Spiral sculpture consisting of hardly visible cords on first teleoconch whorl, 7 very fine cords on next 2 teleoconch whorls of which the most abapical one is the strongest one, 8-10 on following whorls and 23 on the last whorl. Axial sculpture of 8 strong varices (including the final one), rapidly increasing in strength. Last varix situated at 360° of penultimate varix, the antepenultimate one at 270° and at about 180° and 270° alternatively on the preceding teleoconch whorls. Further axial sculpture of numerous fine axial cords, forming beadlike chains on the intersections with the spiral sculpture: 6 translucent, wavy cords on first teleoconch whorl, then rapidly increasing in number and strength to about 45 on last whorl. Axial varices likewise adorned with spiral cords: many fine cords on the final varix on the outer lip, and 6-8 cords on further teleoconch varices. Siphonal canal straight, short, half-open and slightly turned backwards. Columella with 2-3 microscopic abapical lirae, smooth centre and 5 hardly raised, microscopic abapical lirae. Parietal shield straight, attached to final whorl, but marked by a distinct rim. Lip with 15 slightly extended inner denticles. Aperture smooth.

Shell colour beige to golden brown with a few darker brown flammules ranging from just below the suture to about midwhorl. Varices with white bands: 1 central white band on all varices, except for the final varix, which bears 2 white bands and has a darker band at midwhorl. Lip with tiny brown spots on the edge. Aperture off-white.

Discussion: Even though this species was described in the genus *Colubraria* and Sarasúa (1978) described the protoconch as “propia del subgénero *Colubraria*” [characteristic for the subgenus *Colubraria*], the shape of the protoconch, the transition to the teleoconch, the wavy axial cords on the first teleoconch whorl and the overall sculpture turn it into a perfect example of the genus *Cumia* (see Watters (2009)). We hereby transfer *Colubraria antillana* to the genus *Cumia*: ***Cumia antillana* comb. nov.**

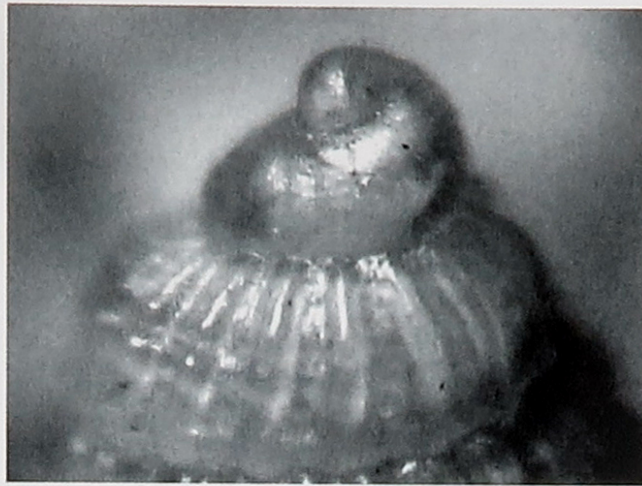


Fig. F: protoconch of *Cumia antillana* comb. nov.
(photo: Raúl Fernández-Garcés)

Cumia clavula Watters, 2009

Type material: Holotype FLMNH: UF 341080. Paratypes: 1 in BSM and 1 in HGL.

Material studied: No material was available for study. The present diagnosis is based on Watters (2009).

Range: Only known from Costa Rica (type locality: Moín Bay, Limon Province) and the Dominican Republic, where it lives in shallow water.

Diagnosis: Shell rather small-sized for the genus (adult size up to about 18 mm). Protoconch consisting of 1.5 papillate whorls. Transition to teleoconch marked by a distinct rim. Teleoconch of 8 convex whorls. Spiral sculpture on final whorl consisting of about 25 fine spiral threads. Axial sculpture of 7 strong varices (including the final one), rapidly increasing in strength, the penultimate one at 360° from the terminal varix, and the more adapical ones 270° apart. Further axial sculpture of numerous axial cords on all whorls, with about 50 cords on final whorl and 35-60 on penultimate whorl. Siphonal canal short, open, almost straight, with a weak denticle delimiting the canal on the outer lip. Columella smooth. Outer lip with 17 denticles that do not extend into the aperture .

Shell colour tan with a paler band below the periphery and vague spots below the suture. Protoconch pale tan-coloured. Varices white with tan bands: 3 on terminal varix and usually only one above suture of lower whorl in later whorls. Lip, columella and aperture off-white.

Cumia sunderlandi (Petuch, 1995)

Type material: Holotype in the Florida Museum of Natural History, Gainesville, Florida, USA. Catalogue number UF225165. Two paratypes in the Sunderland collection.

Material studied: Tryall Reef, Jamaica (1 shell, 18 mm), DM (*ex* HGL).

Range: Only known from Jamaica (Montego Bay, Tryall Reef).

Diagnosis: Shell of average size for the genus (adult size up to about 27 mm). Protoconch consisting of 1^{1/2}-2 high, semi-translucent whorls adorned with microscopic growth lines. Transition to teleoconch gradual, faintly marked by the appearance of the first fine axial cords. Teleoconch of 8-8^{1/2} convex whorls; first 3 whorls equally wide, further whorls rapidly increasing in size towards final whorl. First teleoconch whorl semi-translucent, bulbously flattened. Spiral sculpture always weak, consisting of very fine spiral threads: 5 on first teleoconch whorl, 6 on 3 further whorls, 10 on fifth whorl, 12 on sixth whorl, 15 on penultimate whorl and about 45 on last whorl, including the basal cords. Axial sculpture of 7-8 strong varices (including the final one), rapidly increasing in strength, all situated at 360° from each other in the holotype, but sometimes at 360° for the lowest 3 varices and earlier varices more randomly placed. Further axial sculpture of numerous axial cords: 15 translucent, wavy cords on first teleoconch whorl, straight and less sharp on all other whorls. Number rapidly increasing up to about 50 on final whorl. Siphonal canal short, slightly turned backwards. Columella mostly smooth, but with 1 microscopic rim ending in a small pustule adapically and 5-6 elongated granules extending into the aperture abapically. Two more prominent lirae on beginning of siphonal canal. Parietal shield almost straight, with a very strong, sharp rim at the edge. Inner lip with 18 lirae extending over a short distance into the aperture.

Shell colour brownish orange with a paler band at about midwhorl on the final whorl. All teleoconch whorls with subsutural band of light brown flammules. Protoconch yellowish creamy. Three white bands on the final varix and just one band on other varices. Lip and columella off-white. Inside of aperture pale brownish, because of translucent nature of the shell (external shell colour showing through).

Discussion: Even though this species was described in the genus *Colubraria*, the shape of the protoconch, the transition to the teleoconch, the wavy axial cords on the first teleoconch whorl, the structure of the first teleoconch whorls, which do not grow in size and the overall sculpture turn it into a perfect example of the genus *Cumia*. For more information on the genus *Cumia*, we refer to Watters (2009).

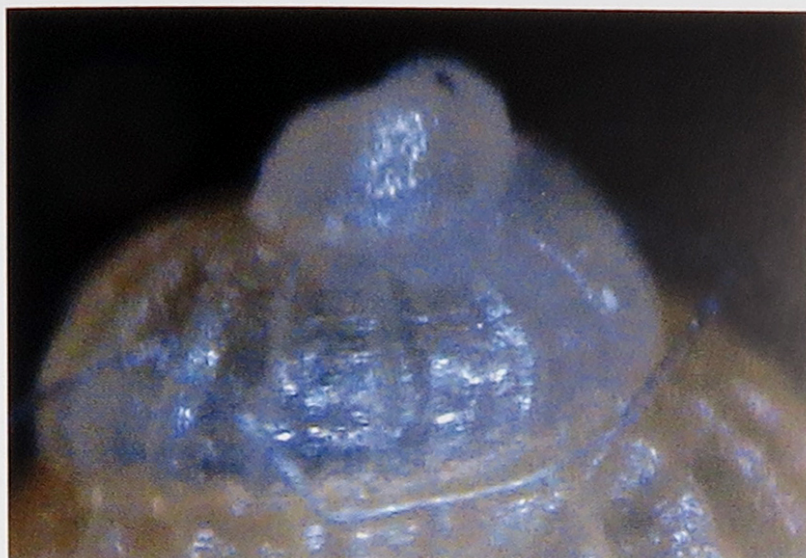


Fig. G: protoconch of *Cumia sunderlandi*

Non-*Colubraria* species

Other species often considered as belonging to *Colubraria* or described as *Colubraria* in fact belong to other genera and families. For the western Atlantic, these include *Minibraria monroei* (McGinty, 1962) (**Muricidae**), *Colubraria swifti* (Tryon, 1881), in fact a junior synonym of *Monostolium tessellatum* (Reeve, 1844) (**Buccinidae**), *Tritonoharpa bayeri* (Petuch, 1987) *T. cubapatriae* (Sarasúa, 1975), *T. lanceolata* (Menke, 1828), and *T. leali* Harasewych, Petit, and Verhecken, 1992 (**Cancellariidae**).

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Plate 1: *Colubraria harryleei* sp. nov. and *Colubraria margarethae* sp. nov.

1-6: *Colubraria harryleei* sp. nov.

1-2: Holotype, FLMNH. 23.5 x 21.1 mm. St. Georges Parish, Bermuda. In drift from dredge spoil. [ex HGL]

3-4: Paratype 1, HGL. 28.2 x 10.2 mm. St. Georges Parish, Bermuda. In drift from dredge spoil.

5-6: Paratype 3. HGL. 17.0 x 6.4 mm. La Parguera, SW. Puerto Rico. In shallow water.

7-12: *Colubraria margarethae* sp. nov.

7-8: Holotype, MNHN. 64.8 x 21.1 mm. Off Cabo Romana, Paraguana peninsula, Venezuela. In muddy sand at 40-60 m. [ex DM]

9-10: Paratype 1, DM. 72.8 x 23.6 mm. Los Taques, Paraguana peninsula, Venezuela. In muddy sand at 90m.

11-12: Paratype 2, FLMNH. 53.8 x 18.1 mm. S. Castle Roads, SE Bermuda. In trap at about 450 m. [ex HGL]

Plate 2: *Colubraria* and *Cumia* in the western Atlantic

1-2: *Colubraria harryleei* Holotype, FLMNH. 23.5 x 21.1 mm. St. Georges Parish, Bermuda. In drift from dredge spoil. [ex HGL]

3-4: *Colubraria kathiewayana* Fittkau & Parth, 1993. DM. 22.0 x 12.4 mm. Barra, Salvador, Bahia State, Brazil. Under rocks at 10-15 m.

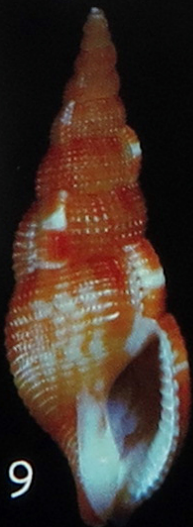
5-6: *Colubraria margarethae* Holotype, MNHN. 64.8 x 21.1mm. Off Cabo Romana, Paraguana Peninsula, Venezuela. In muddy sand at 40-60 m. [ex DM]

7-8: *Colubraria testacea* (Mørch, 1852). DM. 38.2 x 15.2 mm. Barra, Bahia, Brazil. On mud at 4-5 m.

9-10: *Cumia antillana* (Sarasúa, 1978). Coll. Sarasúa in Poeyana Instituto de Zoología, Academia de Ciencias de Cuba. 17.3 x 7.0 mm. Bahia de Cienfuegos, Cuba.

11-12: *Cumia clavula* Watters, 2009. Holotype FLMNH: UF 341080. 18.1 mm. Moín Bay, Limon Province, Costa Rica. After Watters (2009). Photo by courtesy of Dr. Watters and Dr. Leal, editor of *The Nautilus*.

13-14: *Cumia sunderlandi* (Petuch, 1995). DM (ex HGL). 17.2 x 6.6 mm. Tryall Reef, Jamaica. By SCUBA-diving.



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**A new, distinct endemic *Africonus* species (Gastropoda, Conidae)
from São Vicente Island, Cape Verde Archipelago, West Africa**

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Keywords: CONIDAE, *Africonus denizi*, new species, Cape Verde Archipelago.

Abstract: *Africonus denizi* sp. nov. is described from shallow water in São Vicente Island in the Cape Verde Archipelago, West Africa. It is characterized by a small shell size from 8 to 13 mm, an unmistakable olive-green background shell colour with 3 interrupted spiral bands formed by white blotches, 9-10 spiral grooves on the lower body whorl and dark brown markings on the anterior tip in the siphonal canal. The radular tooth is of the vermivorous type, showing a basal spur reduced in size. The new species is compared to *Africonus miruchae* (Röckel, Rolán & Monteiro, 1980) and *Africonus grahami* (Röckel, Cosel & Burnay, 1980), from which it can easily be separated based upon distinct shell and radular features.

Introduction: São Vicente Island, located on the northwest tip of the Cape Verde Archipelago's windward island group, is characterized by fewer endemic Cone species and populations when compared to geologically older islands like Sal, Boavista and Maio (Cunha *et al.*, 2005; Cunha *et al.* 2008; Duda & Rolán, 2005). São Vicente Island was a matter of intense study and sampling during the 70s and 80s, with several researchers

and amateur collectors carrying out surveys in many coastal locations along the island's coast (Röckel *et al.*, 1980; Röckel *et al.*, 1985; Rolán, 1990a; Rolán, 1990b; Rolán, 1992; Rolán, 2005). It is interesting to note that most of the endemic Cone species were described during this period. Only one species, *Africonus lugubris* (Reeve, 1849), was described much earlier. In spite of the relatively easy access that São Vicente Island offers, its endemic Cone populations have not been as thoroughly studied as in other islands of the Archipelago such as Sal or Boavista (Afonso & Tenorio, 2004). Most of the localities in São Vicente Island which were almost inaccessible by land years ago are easier to reach now. Recent field trips by the first author to this island have revealed several new endemic populations not yet cited in the most recent literature dealing with the West African **Conidae** fauna (Monteiro *et al.*, 2004; Rolán, 2005). These deserve a more thorough study. One of these is a well-defined species which is a new member of the Cape Verde Island endemic genus *Africonus* (Petuch, 1975).

The taxonomy used in the present article follows Tucker & Tenorio (2009). For the description of the shell morphometry we use the terminology established in Röckel, Korn & Kohn (1995).

Abbreviations:

Museums and institutions

MNCN: Museo Nacional de Ciencias Naturales de Madrid, Spain.

NMHUK: Natural History Museum, London, United Kingdom.

MNHN: Muséum National d'Histoire Naturelle, Paris, France.

CMLA: Carlos M. L. Afonso collection

MJT: Manuel J. Tenorio collection

Shell morphometry

L maximum shell length

RD relative diameter

RSH relative spire height

HMD height of the maximum diameter

PMD relative position of the maximum diameter

LC/DR shell length/radular tooth size

Radular morphometry

DR/PA radular tooth size/apical portion length

DR/APA radular tooth size/apical portion width

100F/PA 100 x blade length/apical portion length

BW/L base width/radular tooth size

Other

coll. collection

SYSTEMATICSFamily **CONIDAE** Fleming, 1822Subfamily **PUNCTICULINAE** Tucker & Tenorio, 2009Genus *Africonus* Petuch, 1975*Africonus denizi* sp. nov.

(Plate 1, Figs 1-8)

Previously figured in:Rolán, 2005: plate 50; figure 761, as *Conus* sp.Robin, 2008: page 145; figure 14, as *Conus* cf. *lugubris*

Type material: Holotype, 11.6 x 6.3 mm (Plate 1, Figs 2a-2b), deposited in the MNCN-15.05/60000 Madrid; Paratype 1, 11.0 x 6.0 mm (Plate 1, Fig. 5), MNHN 23775-Paris; Paratype 2, 10.7 x 5.9 mm (Plate 1, Fig. 7), NHMUK-London; Paratype 3, 13.3 x 7.5 mm (Plate 1, Figs 1a-1b), coll. CMLA; Paratype 4, 12.4 x 6.9 mm (Plate 1, Figs 3a-3b), coll. CMLA; Paratype 5, 11.8 x 6.6 mm (Plate 1, Fig. 6), coll. CMLA; Paratype 6, 11.8 x 6.5 mm (Plate 1, Figs 4a-4b), coll. CMLA; Paratype 7, 13.0 x 7.2 mm (Plate 1, Fig. 8), coll. MJT.

Additional paratypes in the coll. of Carlos M.L. Afonso (Algarve, Portugal), Manuel J. Tenorio (Jerez, Spain), Francisco Deniz Guerra (Gran Canaria, Spain), David Pirinhas (Algarve, Portugal), António Monteiro (Lisbon, Portugal), Paul Kersten (Hoornar, Holland), Alexander Medvedev (Moscow, Russia), Giancarlo Paganelli (Rimini, Italy).

Other material examined: 21 additional specimens from the type locality were studied.

Type locality: Praia Grande, Calhau, northeast coast of São Vicente Island, Cape Verde Archipelago.

Distribution and habitat: To date, specimens have only been found at the type locality. No other endemic species have been found living in sympatry with the new species. The species was found in rock crevices and sea urchin holes in heavy wave action areas from 0.5 m to 1.5 metre depth.

Description of the shell: Morphometric parameters: $L = 8.7-13.5$ mm; average $L = 11.7$ mm; $RD = 0.65-0.69$; $RSH = 0.15-0.20$; $PMD = 0.78-0.81$. The shell is very small, and it is one of the smallest of the endemic species found in the Cape Verde Islands. General profile is ventricosely conical, somewhat elongated with a rounded shoulder. Spire moderate, straight to slightly convex with 4-5 well defined cords on the flat to slightly convex sutural ramps. Sides of the last whorl are straight or slightly convex. Body whorl is smooth except for 8-10 spiral grooves that occupy almost the entire anterior third of the body whorl. Spire is predominantly white with alternating dark brown axial blotches. Last whorl is olive-green to light olive-green, normally with 3 interrupted spiral bands formed by well-defined white blotches (occasionally arranged in zigzag or chevron shaped) tinged with brown to dark brown markings. Tip of anterior portion of last whorl is tinged with brown to very dark brown. Aperture is purplish-brown in fresh specimens with 2 distinct whitish bands: one located near mid-body and another, not so evident, just below the shoulder. Inner lip has a yellowish colour.

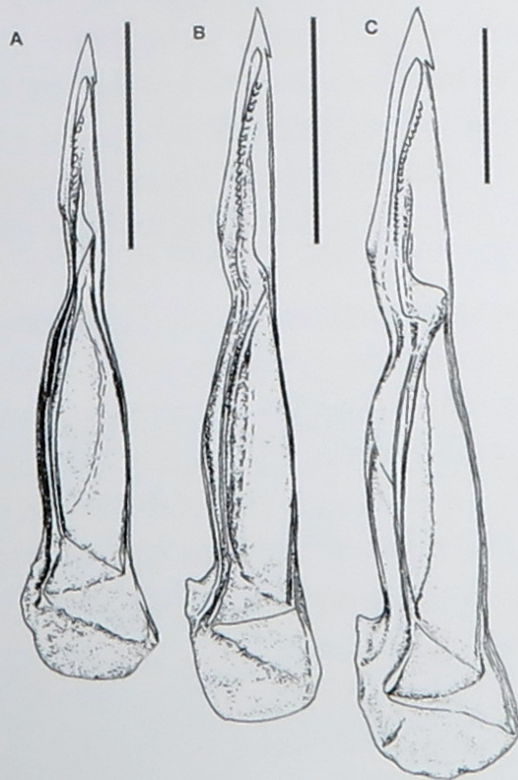
Periostracum is thin, yellow, smooth and translucent.

Living animal and radula: The animal is dark reddish-grey (Text Fig. 1). Radular tooth is of the vermivorous type (Text Fig. 2A). For the description of the radular morphology, we use the terminology established in Rolán (1992) and in Rolán & Rayabudi-Massilia (1994). There are 35 to 42 teeth in the radular sac; $LC/DR = 41$ to 42. Waist is evident, and well above the midpoint of total length of the radular tooth: $DR/PA = 2.57$ to 2.77. Apical part of the tooth is rather narrow: $DR/APA = 12.5$ to 14.3. Small apical barb is present. Blade is not very well marked, ending close to the waist. $100F/PA = 77$ to 86. Narrow serrations are present, with 10-12 small denticles that are arranged in one row, but absent in the apical portion. Cusp is present. Base broad $BW/L = 0.21$ to 0.28. The basal spur is present, but is reduced in size compared to basal spurs in radular teeth of other *Africonus* species (i.e. compare with teeth of *Africonus miruchae* (Röckel, Rolán & Monteiro, 1980), Fig. 2B, or *Africonus grahami* (Röckel, Cosel & Burnay, 1980), Fig. 2C). In fact, the basal spur is a radular feature difficult to observe in the teeth of *A. denizi* sp. nov., and it must be specifically searched for in order to account for its presence.

Next page:

Text Fig. 1: *Conus denizi* sp. nov. alive in natural habitat, crawling beneath a sea urchin (photo credit: Gonçalo Rosa, Portugal).

Text Fig. 2: Radular teeth of A) *Africonus denizi* sp. nov. (shell length 11.5 mm, from the type locality); B) *Africonus miruchae* (Röckel, Rolán & Monteiro, 1980) (shell length 12.0 mm, from Terrinha Fina, North of Sal Island); C) *Africonus grahami* (Röckel, Cosel & Burnay), 1980 (shell length 18.7 mm, from Calhau, Sao Vicente). Scale bars represent 0.1 mm.



Etymology: The species is named after Francisco Deniz Guerra, a Spanish amateur collector, who has dedicated many years of his life to the study of the West African molluscan fauna. He has contributed with his knowledge, and has helped many scientists and researchers throughout the years.

Discussion: *Africonus denizi* sp. nov. can be separated from other endemic species found in the Cape Verde.

Only *A. miruchae* (Plate 1, Fig. 11) from the north coast of Sal Island shares some external morphological resemblance with *A. denizi* sp. nov. However, *A. miruchae* has a much thicker and proportionally wider shell with a black to very dark green background colour with white blotches or a central white blotched band. It also has a thick black inner lip and a much more angulated shoulder. The black to blackish-grey coloured animal of *A. miruchae* also differs from that of *A. denizi* sp. nov.

We can also compare it to *A. grahami* (Plate 1, Fig. 9), another species from São Vicente Island, which lives near the known range of *A. denizi* sp. nov. The shell of *A. grahami* is larger in size, but it shares some resemblances in shell shape and in the presence of an olive green colour. However, the pattern in the shell of *A. grahami* is different from that of *A. denizi* sp. nov., particularly with respect to the extension and arrangement of the white blotches. Moreover, the aperture of *A. grahami* is white in the inner part, and its columella light-coloured with a soft purplish tinge, whereas in *A. denizi* sp. nov. both aperture and columella are much darker brown.

The reduced basal spur also separates *A. denizi* sp. nov. from other species. *A. grahami* has a more robust tooth, broader, with more denticles (18 to 22) and with a wider posterior fold. *A. miruchae* also has more denticles in the row of serration (15 to 22) than *A. denizi* sp. nov. and *A. grahami*. The preferred habitat for each of these two species is also different: *A. denizi* sp. nov. usually appears exposed on rocks, mainly in sea urchin holes (see Fig. 1), whereas *A. grahami* is found buried in sand among rocks.

We have performed a morphometric analysis on shell parameters of samples of *A. denizi* sp. nov., *A. grahami* and *A. miruchae*. An analysis of covariance (ANCOVA) using maximum diameter (MD) as variable, species as factor, and shell length (L) as covariate yielded statistically significant differences (F-score = 7,66, $p = 0,0016$). An analogous test using spire height (SH) as variable did not yield statistically significant differences (F-score = 3,15, $p = 0,0540$). The values of the least-squares means for the morphometric parameters and their corresponding standard errors are listed in Table 1.

| Taxon | N | MD | SH | HMD |
|------------------------|----|-------------|-------------|--------------|
| <i>denizi</i> sp. nov. | 14 | 8,76 (0,10) | 3,00 (0,13) | 10,44 (0,18) |
| <i>grahami</i> | 14 | 8,82 (0,16) | 2,97 (0,20) | 10,70 (0,27) |
| <i>miruchae</i> | 15 | 9,15 (0,09) | 3,31 (0,12) | 10,28 (0,16) |

Table 1: Least-squares means and standard error (in parentheses) for the morphometric parameters of *A. denizi* sp. nov., *A. grahami* and *A. miruchae*. N indicates the number of specimens included in the study.

The least-squares mean maximum diameters and 95% Bonferroni intervals for *A. denizi* sp. nov., *A. grahami* and *A. miruchae* are shown in Fig. 3. The plot (Fig. 4) of maximum diameter versus shell length shows the differences in relative maximum diameter and shell length.

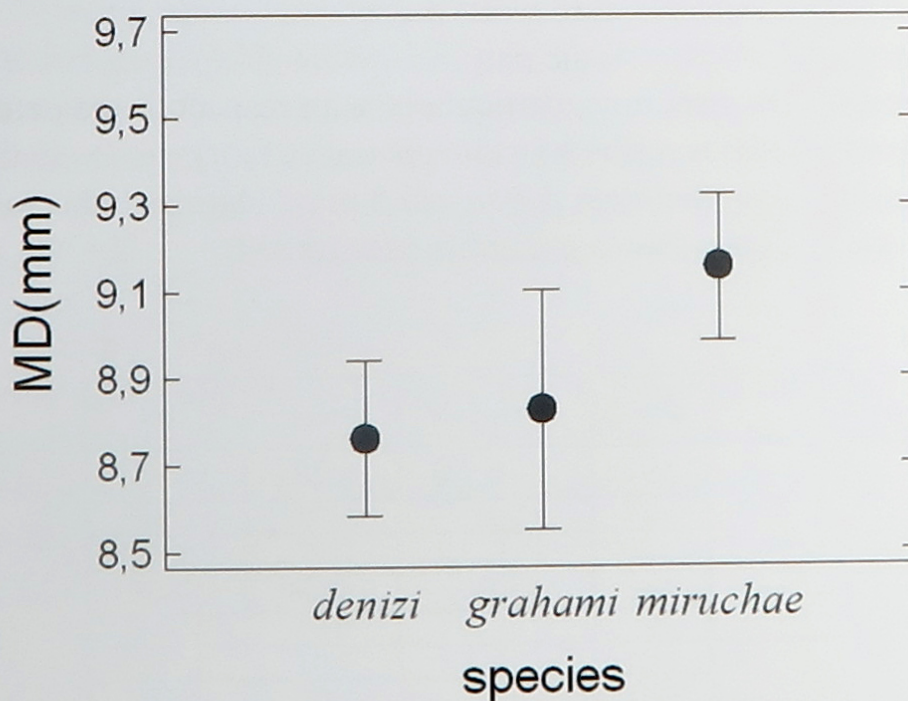


Fig. 3: Least-squares mean maximum diameters and 95 % Bonferroni intervals for *A. denizi* sp. nov., *A. grahami* and *A. miruchae*.

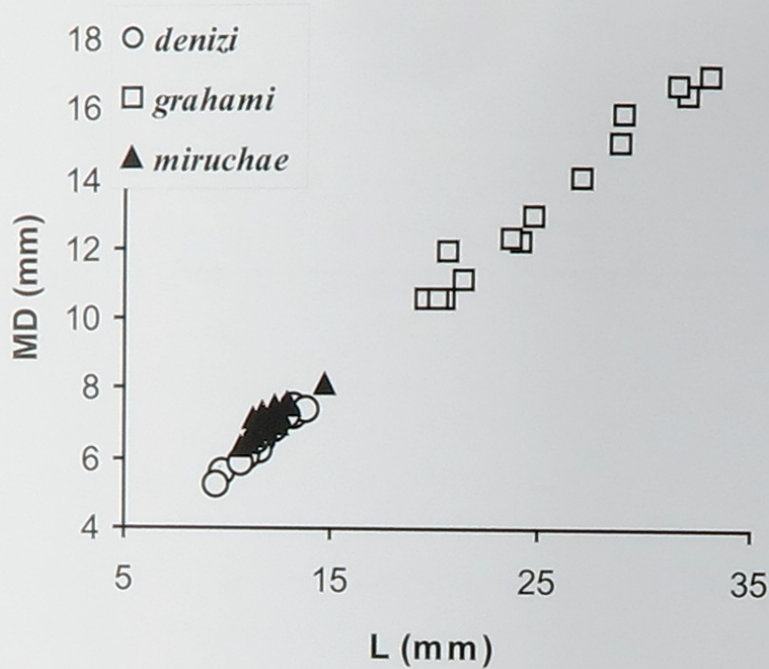


Fig. 4: Plot of maximum diameter versus shell length for *A. denizi* sp. nov. (○), *A. grahami* (□) and *A. miruchae* (▲), showing the differences in relative maximum diameter and shell length.

We carried out pairwise ANCOVA tests on morphometric parameters. These significantly differ between *A. denizi* sp. nov. and either *A. grahami* or *A. miruchae*. Given the fact that the spire in these species is most often eroded, we have also performed these tests using aperture height (AH) as covariate. One-way ANOVA was used for testing differences in shell lengths. Results appear summarized in Table 2.

| Taxa pair | Trait | Covariate | F-score | <i>p</i> |
|---|-------|-----------|---------|----------|
| <i>denizi</i> sp. nov.- <i>miruchae</i> | MD | L | 31,91 | 0,0000* |
| | MD | AH | 64,98 | 0,0000* |
| | SH | L | 12,87 | 0,0014* |
| | SH | AH | 14,14 | 0,0009* |
| | L | - | 0,89 | 0,3549 |
| <i>denizi</i> sp. nov.- <i>grahami</i> | MD | L | 0,01 | 0,9398 |
| | MD | AH | 0,06 | 0,8014 |
| | SH | L | 0,01 | 0,9092 |
| | SH | AH | 0,25 | 0,6209 |
| | L | - | 108,02 | 0,0000* |

Table 2: Results of the pairwise comparison of morphometric parameters using ANCOVA (for comparison of MD and SH) or ANOVA (for comparison of L). The asterisk (*) indicates statistically significant differences at 95 % probability level.

There are statistically significant differences between *A. denizi* sp. nov. and *A. miruchae* in MD and in SH. These differences remain significant irrespective of the covariate, either L or AH. Interestingly, the spire height for *A. miruchae* is larger than in *A. denizi* sp. nov.. There is no significant difference in shell length between these two species. In the case of *A. grahami*, there are no statistically significant differences in MD or SH with *A. denizi* sp. nov. once corrected for differences in either L or AH, suggesting analogous shell morphometry for both species. However, there is a clear and significant difference in shell length that allows immediate separation of these two taxa.

Apparently, the range of *Africonus denizi* sp. nov. seems to be restricted to the type locality. New prospections and sampling along the São Vicente coast might possibly reveal that this species extends its geographical distribution to the south of the island due to the very similar habitat conditions. The possibility of this species occurring in the neighbouring island of Santa Luzia is also plausible. An *Africonus* sp. specimen of 9.8 mm from the locality Curral, Santa Luzia Island, illustrated in Rolán, 2005 (plate 50; figure 761) might in fact be assigned to *A. denizi* sp. nov. The new species also appears figured in Robin, 2008 (page 145; figure 14) as *Conus* cf. *lugubris* (size 7 mm). Here, no specific locality data are given further than "Cape Verde". The figured specimen cannot be assigned to *A. lugubris*, since this species has a dark brown to black coloured shell with three lighter reticulated bands (Plate 1, Fig. 10). As most researchers and amateur collectors are well aware, quite a few populations of cones from the Cape Verde Islands have not yet been fully characterized. The authors are confident that the continuous study of existing material and the sampling in areas which have been insufficiently surveyed, or not surveyed at all, will reveal interesting results in the future.

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Plate:

1-8: *Africonus denizi* sp. nov.

All specimens from type locality: Praia Grande, Calhau, São Vicente Island, Cape Verde.

1a-b: Paratype 3. ventral and dorsal views, CMLA collection, 13.3 mm.

2a-b: Holotype. dorsal and ventral views, MNCN, Madrid, 11.6 mm.

3a-b: Paratype 4. dorsal and ventral views, CMLA collection, 12.4 mm.

4a-b: Paratype 6. dorsal and ventral views, CMLA collection, 11.8 mm.

5 : Paratype 1. MNHN 23775, Paris, 11.0 mm.

6 : Paratype 5. CMLA collection, 11.8 mm.

7: Paratype 2. NHMUK, London, 10.7 mm.

8: Paratype 7. MJT collection, 13.0 mm.

9: *Africonus grahami*. MJT collection, 19.9 mm, Calhau, São Vicente.

10: *Africonus lugubris*. MJT collection, 14.5 mm, Matiota, São Vicente.

11: *Africonus miruchae*. MJT collection, 12.9 mm, Terrinha Fina, N of Sal.



1a



2a



2b



3a



1b



3b



4a



5



4b



6



7



8



9



10



11

| | | | |
|--------------|----------|----------|--------------------------|
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**The variability of *Harpa amouretta* (Röding, 1798)
(Gastropoda: Harpidae) in the Gulf of Aqaba (Red Sea)**

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Keywords: MOLLUSCA, GASTROPODA, HARPIDAE, *Harpa amouretta*, Red Sea, Gulf of Aqaba, variability.

Abstract: The characteristic features and variability of *Harpa amouretta* (Röding, 1798), the sole representative of the family **Harpidae** in the Red Sea are discussed, especially for specimens originating from the Gulf of Aqaba.

Introduction: *Harpa amouretta* can be found in the entire Indo-Pacific. Yet, specimens from the Red Sea differ from Indo-Pacific specimens by a considerably smaller size and a thickened outer lip, which lead to the common use of *H. amouretta* (forma) *crassa* 'Philippi' Krauss, 1848 for Red Sea specimens, as well as for specimens from eastern Africa through India with the same features. Yet, Buijse & Verbinnen (2008) showed that it is not possible to maintain this forma name for Red Sea specimens, due to the enormous intraspecific variability of *H. amouretta*. This variability is also present in specimens from the Gulf of Aqaba, which are the subject of the present survey.

Material: The present study is based on 39 specimens exclusively found by local collectors on East Sinai coasts from the northern point in the City of Elat to Sharm-El-Sheikh, the southern point of the Gulf of Aqaba.

Discussion: The average measurements of the studied specimens are 33/20 mm, Some specimens reaching 48/29 mm were found in the southern part of the Gulf of Aqaba. These larger specimens are more elongated, with 11-17 axial ribs. The last axial rib forms the markedly thickened outer lip present in all specimens, a feature which long served as a characteristic feature for the forma *H. amouretta* forma *crassa* (Fig. 3). Additional characteristic features are the three apertural blotches (Fig. 2), which are present in all studied specimens. The siphonal blotch is always very small.

Thus, this study confirms the two main characteristic features of *H. amouretta* specimens from the Gulf of Aqaba (and elsewhere in the Red Sea), which are the thickened outer lip and the three apertural blotches. Yet, the morphological variability in pattern and colour or even size is very wide and confirms the study by Buijse & Verbinnen (2008). It is a fact that the population in the Gulf of Aqaba is considerably smaller than the population outside the Red Sea. This may possibly be explained by the unique position of the Gulf of Aqaba: it is the northernmost sea-arm of the Indo-Pacific region and marine life rapidly changes in northern direction. This is possibly due to changing habitats: the southern coasts of the Gulf of Aqaba consist of close lagoons and soft sandy beaches, whereas there are no lagoons in the northern part of Gulf. Further reasons may possibly be found in the water becoming less rich with marine food in northern direction, the weaker tidal movements and currents in the northern part of the Gulf and the degree of pollution (the northern tip of the Gulf is home to Elat (Israel) and Aqaba (Jordan), two cities with oil terminals, ship ports and a strong tourist sector, whereas the rest of Gulf is almost untouched). This may also explain why many other species such as *Conus textile* Linnaeus, 1758, *Conus geographus* Linnaeus, 1758, *Cypraea pantherina* Solander, 1786, *Canarium fasciatum* (Born, 1778), to name but a few, suddenly reach their distributional limit in a certain place and can no longer be found further northwards.

H. amouretta is not common in the Gulf of Aqaba and becomes rarer towards the north: it is very rare near Elat, Taba and Aqaba.

As no specimens from the southern Red Sea or the Arabian Sea (where the species lives sympatrically with *Harpa cabriti* (Fischer, 1860)) were studied, a comparison with populations from these areas was not made.

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Plate:

1-8: *Harpa amouretta* (Röding, 1798)

1a-b: live specimens from Taba, Sinai.

2a-b: Dahab, Sinai, Gulf of Aqaba. 48 x 29mm.

3a-b: Nuweba, Sinai, Gulf of Aqaba. 48 x 28mm.

4: specimen with irregular, narrow ribs. Taba, Sinai.

5: specimen with irregular wide rib spacing. Taba, Sinai.

6-7: ventral view showing the typical, thickened outer lip as found in Red Sea specimens. Taba, Sinai, Gulf of Aqaba.

8: upper whorls and protoconch of *H. amouretta*. Taba, Sinai.



1a



1b



2a



2b



4



3a



3b



6



5



8



7

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