Two new species of Columbellidae (Gastropoda: Buccinoidea) from the Cape Verde Archipelago

Dos especies nuevas de Columbellidae (Gastropoda: Buccinoidea) del archipiélago de Cabo Verde

Emilio ROLÁN* and Ángel A. LUQUE**

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ABSTRACT

A new species of *Anachis* and another one of *Mitrella* (Gastropoda: Columbellidae) from the Cape Verde Archipelago are described. The paucispiral protoconch of both of them indicates a non-planktotrophic development. The new species seem to have a distribution restricted to the Archipelago and are compared with other related West African columbellids.

RESUMEN

Se describen una nueva especie de *Anachis* y otra de *Mitrella* (Gastropoda: Columbellidae) del archipiélago de Cabo Verde. La protoconcha paucispiral de ambas indica un desarrollo larvario no planctotrófico. Las nuevas especies parecen tener una distribución geográfica restringida al archipiélago y se comparan con otras especies afines de columbélidos de la costa occidental de África.

KEY WORDS: Columbellidae, *Anachis*, *Mitrella*, Cape Verde Islands, new species.
PALABRAS CLAVE: Columbellidae, *Anachis*, *Mitrella*, Islas de Cabo Verde, nuevas especies.

INTRODUCTION

Numerous papers dealing with the marine molluscs from the Cape Verde Islands have been published during the last years (see BURNAY AND COSEL, 1987; FERNANDES AND ROLÁN, 1991, and ROLÁN AND RUBIO, 1999, for a list). Subsequently, PEÑAS AND ROLÁN (1999), ROLÁN AND LUQUE (2000) and AARTSEN, GITTENBERGER AND GOUD (1998, 2000) described new species for the archipelago. However, little attention has been recently paid to the family Columbellidae in the whole West African coast, except for the papers on *Columbella* by MOOLENBEEK AND HOENSELAAR (1991) and ROLÁN AND RYALL (1999a) and that on *Mitrella pallaryi* by ROLÁN AND TRIGO (2000).

GARCÍA-TALAVERA AND BACALLADO (1981) recorded three columbellid species for the Cape Verde Islands, and COSEL (1982) recorded 11 species, of which only two are confirmed to be common in the Islands: *Columbella adansoni* Menke, 1853, usually misidentified as *C. rustica* (Linnaeus, 1758), a different Mediterranean-Atlantic species, and *Mitrella ocellata* (Gmelin, 1791), someti-

* Cánovas del Castillo, 22, 36202 Vigo, España.
** Laboratorio de Biología Marina, Departamento de Biología, Universidad Autónoma de Madrid, 28049 Madrid, España.

mes recorded (viz. NICKLÈS, 1950; KNUDSEN, 1956) as *Pyrene cribraria* (Lamarck, 1822). The presence of three other species recorded by COSEL (1982), *Anachis denticulata* (Duclos, 1840), *Anachis parvula* (Dunker, 1847) and *Anachis rac* (Dautzenberg, 1891), have not been confirmed in the Archipelago, in spite of intensive sampling during last years. Other records based on older references, like those by LOCARD (1897) of *Mitrella minor* (Scacchi, 1836), *Mitrella gervillei* (Payraudeau, 1826) and *Columbella sagra* d'Orbigny, 1853, and that by DAUTZENBERG AND FISCHER (1906) of *Mitrella hidalgoi* Monterosato, 1889, are misidentifications, the latter of the new species of *Mitrella* to be described in the present paper. DAUTZENBERG AND FISCHER (1906) recorded *Mitrella profundi* Dall, 1889 (as *Columbella*) for the Cape Verde fauna, and described a new species, *Anachis richardi*, which has been collected by ourselves, but it is rare in shallow waters. Finally, KNUDSEN (1956) described *Mitrella verdensis* from the Cape Verde Islands, but no recent records of this species are known.

After the study of the material collected during more than twenty years of sampling in the Cape Verde archipelago, two unnamed species have been found and are described in the present paper.

Columbellid classification is still problematic because of lack of information for most of species, the lack of discrete characters useful for distinguishing species groups, the conchological and radular variation within the family and the geographically restricted basis of the most frequently used columbellid classifications (DEMAINTENON, 1999). This makes difficult the generic placement of species, and thus we tentatively use *Anachis* (in the sense of RADWIN, 1977a, supported by the results of DEMAINTENON, 1999) and *Mitrella* (a polyphyletic genus according DEMAINTENON, 1999), due to the similarity of each of the new species with the type species of both genera. In order to standardize the criteria for character descriptions we follow DEMAINTENON (1999) for descriptions of operculum and radula.

Abbreviations:

AMNH: American Museum of Natural History, New York.
BMNH: The Natural History Museum, London.
CER: Collection of E. Rolán, Vigo.
DBUA: Departamento de Biología, Universidad Autónoma, Madrid.
MNCN: Museo Nacional de Ciencias Naturales, Madrid.
MNHN: Muséum National d'Histoire Naturelle, Paris.
sp: live collected specimen.
s: empty shell.
j: juvenile shell.
f: fragment of shell.

RESULTS

Family COLUMBELLIDAE Swainson, 1840
Genus *Anachis* H. Adams and A. Adams, 1853

Type species: *Columbella scalarina* G. B. Sowerby II, 1832, from Panama (Chiriquí) by subsequent designation (TATE, 1868).
Diagnosis: RADWIN (1977a, p. 120).

Anachis valledori n. sp. (Figs. 1-8, 18)

Type material: Holotype (Fig. 1), 1 sp of 7.5 x 2.1 mm from Sal Rei, Boa Vista Island, Cape Verde Archipelago, 1-3 m depth (MNCN 15.05/29571). Paratypes in the following collections: AMNH (1), BMNH (1), MNHN (1), DBUA (12), CER (150), all sp from the type locality.

Other material studied: Sal: 1 f, Palmeira, 30 m. Boa Vista: 60 sp, 28 s, 25 j, Sal Rei, 5-10 m; 2 s, 15 f, Ilheu de Sal Rei, 8 m; 1 s, Baia da Gata, 5 m; 3 sp, Praia da Cruz, 8 m; 3 sp, Baia Teodora, 8 m; 4 s, Rife de Chaves, 8 m. Santiago: 1 s, Praia, 7 m. São Vicente: 1 s, Calhau, 2 m. Brava: 28 s, 10 j, Furna, 10-20 m.
Etymology: The specific name is dedicated to Arturo Valledor, physician and naturalist, for his contribution to divulgate Malacology and conservation of molluscs.

Description: Shell (Figs. 1-8) up to 8.3 mm length, broadly fusiform with a moderately high spire, solid. Protoconch (Fig. 19) of 1 1/2 whorls, and about 660 μm in maximum diameter, smooth and usually whitish or light brown in colour. Teleoconch of about 5 somewhat convex spiral whorls, with distinct suture and shouldered. Sculpture formed by axial ribs well defined subsuturally, in number of 18 to 22 on last whorl. Numerous spiral threads are visible only on the interspaces of the ribs, and more evident near the base, where the axial ribs disappear. Aperture narrow and axially elongate, usually white inside. Columella curved, like a S, with 5-7 small denticles in the lower part. In the inner part of the external lip there are about 6 denticles, the second being larger. The colour of the shell is very variable, usually lighter at the apex, and the most common pattern is that of a cream background colour with axial brown, reddish or orange stripes, which usually are placed in the interspaces of the ribs, reaching the base with ziczac forms. The shell may be totally dark brown in colour (Fig. 4), or the axial stripes can be reduced to short lineal spots (Figs. 6, 7), or be totally absent giving rise to whitish or cream shells (Fig. 8).

Periostracum thin, smooth and transparent.

Colour pattern of soft body unknown.

Operculum (Fig. 24) high oval, with antero-lateral nucleus and bilobed scar with medial keel from the nucleus to the center of the muscle scar.

Radula (Fig. 26): central tooth rectangular, wider than lateral tooth; lateral tooth with base narrower than tooth height, with one basal and two distal sharp cusps, the outermost larger.

Distribution: Known from Sal, Boa Vista, Santiago, São Vicente and Brava Islands.

Discussion: Anachis valledori n. sp. differs from other similar species of the West African coast. *Anachis atomella* (Duclos, 1840), originally non described, but figured without type locality, was recorded from the Canary Islands by NORDSIECK AND GARCÍA-TALAVERA (1979). It is smaller (up to 5 mm), has an oblique and undulate suture, 9-10 flat whitish axial ribs of the same width as the brown interspaces, colour pattern formed by irregular white bands at the suture and the periphery of the body whorl, and brown columella (NORDSIECK AND GARCÍA-TALAVERA, 1979). *Anachis freytagi* (Maltzan, 1884), from Senegal, has a smaller protoconch with only 1 1/4 whorls, less numerous axial ribs (16-18), more teeth (8) inside the external lip, and a different colour pattern (cream-yellowish ground with subsutural lighter blotches). *Anachis rac* (Dautzenberg, 1891) (= *Columbella strenella* Duclos, 1840), from the Canary Islands to Senegal and Guinea Conakry (KNUDSEN, 1956) is larger (up to 10 mm), with less marked or even absent axial ribs, usually without spiral threads in the interspaces, which only are evident at the base; the colour pattern is usually ocellated (NICKLÈS, 1950; KNUDSEN, 1956). *Anachis descendens* (von Martens, 1904), from Guinea Conakry to Congo, is higher (up to 14.5 mm), with 17-18 sharp axial varices, crossed by spiral ridges particularly distinct on the lower part of the body whorl and more or less obsolete, 5 denticles on the columellar side and 6 on the outer lip, colour pattern whitish with a rather regular brown reticulation (KNUDSEN, 1956). *Anachis bubakensis* (Lamy, 1923), from the Bissagos Islands, has interspaces wider than axial ribs, and the colour pattern is brown with a lighter band at the middle of the body whorl and white or yellowish spots (LAMY, 1923). *Anachis emergens* (Fischer-Piette and Nicklès, 1946) is wider, with 6 whorls, 25 axial ribs in body whorl, spiral sculpture more evident (cords at the base with deeper in-

terspaces), interior of the aperture violaceous-brown, and colour pattern usually formed by oblique brown blotches, although KNUDSEN (1956) described uniform brown shells. *Anachis aliceae* (Pallary, 1900) from the Western Mediterranean to Senegal, is wider, more solid, with reticulate-like sculpture due to coarser spiral cords, of pinkish or orange colour when fresh becoming yellowish, sometimes with poor defined whitish bands in subsutural position, at the center of the last whorl and at the base of the columella (NICKLÈS, 1950; KNUDSEN, 1956; MALDONADO, 1973; RUBIO AND BARRAJÓN, 1986; SABELLI AND SPADA, 1986). *Anachis richardi* (Dautzenberg and Fischer, 1906), from the Cape Verde Islands, is smaller (up to 5.2 mm), and more elongate, with two protoconch and 6 teleoconch whorls, fewer axial ribs (up to 10 on the last two whorls), three strong labial denticles, and a different colour pattern (brown with a white band at the middle of the whorls (DAUTZENBERG AND FISCHER, 1906).

Anachis avaroides Nordsieck, 1975, from the Canary, Selvagens and Madeira Islands, is wider (6-8 x 2.3-3.3 mm), with 12-18 axial ribs and wider interspaces between ribs, and the colour pattern is variable, but usually white in the subsutural region with triangular reddish-brown spots in an ascendent line (about four lines above a peripheral white band and 3-4 below) (NORDSIECK, 1975; NORDSIECK AND GARCÍA-TALAVERA, 1979).

The paucispiral protoconch of *Anachis valledori* n. sp. indicates a non-planktotrophic development.

Genus *Mitrella* Risso, 1826

Type species: *Murex scriptus* Linnaeus, 1758 (= *Mitrella flaminea* Risso, 1826), by subsequent designation of COX (1927).

Diagnosis: RADWIN (1977b, p. 337), but see remarks of the same author and DEMAINTENON (1999, p. 267)

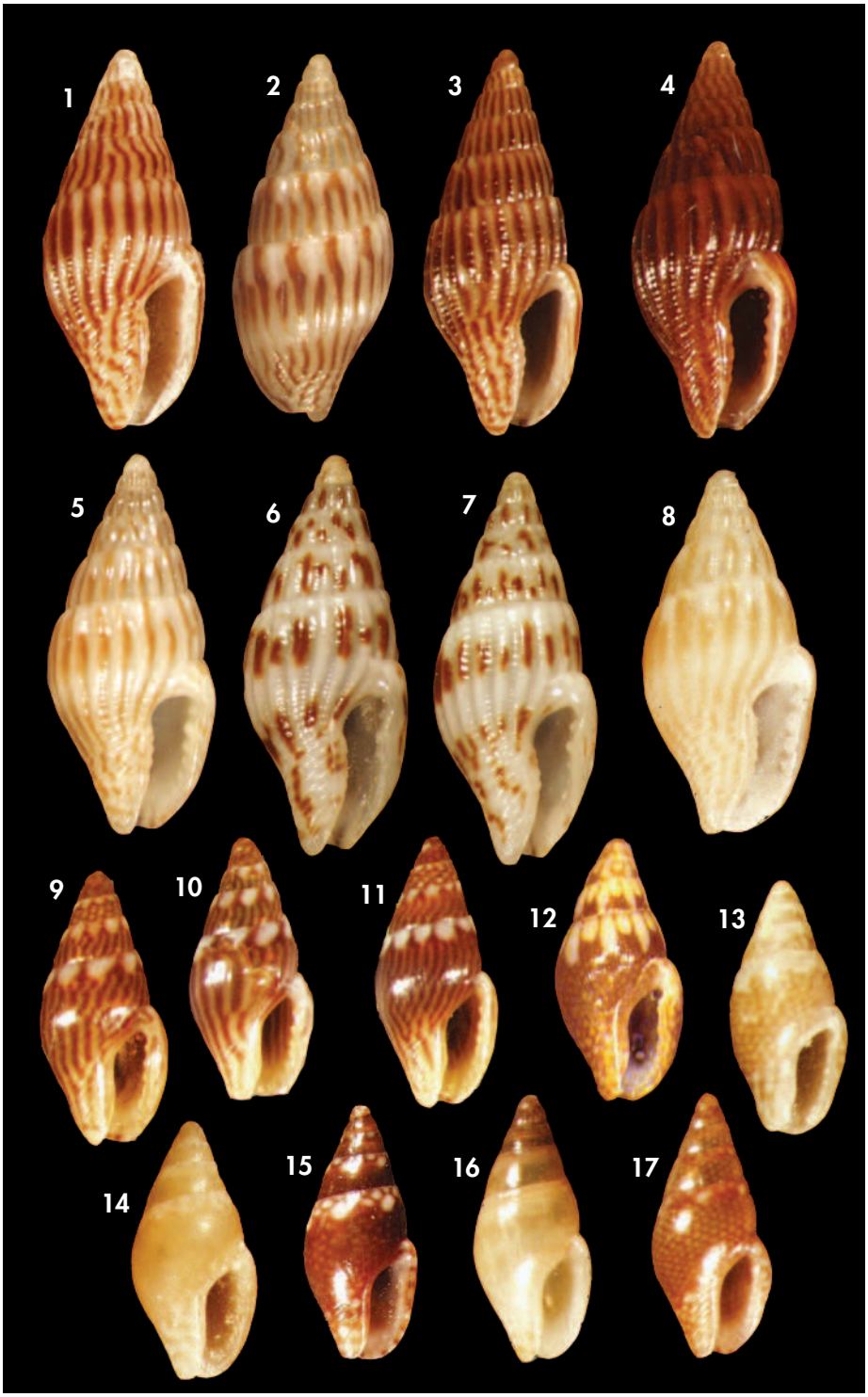
Mitrella alvarezi n. sp. (Figs. 9-17, 19-22)

Type material: Holotype (Fig. 9) 1 sp of 4.1 x 1.8 mm from Tarrafal, Santiago, Cape Verde Archipelago, 5-10 m depth (MNCN 15.05/44796). Paratypes in the following collections: AMNH (1), BMNH (1), MNHN (1), DBUA (1), CER (3), all sp from the type locality.

Other material studied: Sal: 3 s, Palmeira, 30 m. Boa Vista: 1 s, Baia Teodora, 4 m; 1 s, Morro de Areia, 2 m; 4 s, 15 j, Ilheu de Sal Rei, 10 m; 20 sp, 10 s, 3 j, 1 f, Sal Rei, 6-10 m; 1 s, Baia da Gata, 5 m; 3 sp, Praia da Cruz, 8 m. Maio: 2 sp, Galeão, 4 m. São Vicente: 3 s, Calhau, 4 m. Santiago: 1 s, 2 f, Prainha, Praia, 8 m. Brava: 10 s, 4 j, Furna, 8 m; 5 s, 5 j, Pedrinha, 5 m; 3 sp, 2 f, Porto do Ancião, 3-10 m.

Etymology: The specific name is dedicated to Dr. Julio Álvarez, first President of the Sociedad Española de Malacología.

(Right page) Figures 1-8. *Anachis valledori* n. sp. 1: holotype, 7.5 mm (MNCN); 2: paratype, 7.4 mm (MNHN); 3: paratype, 7.8 mm (AMNH); 4: paratype, 8.1 mm (CER); paratype, 7.5 mm (DBUA) (all from the type locality); 6-7: shells, 7.6, 7.3 mm, Calheta Fonda, Sal; 8: shell, 5.4 mm, Furna, Brava. Figures 9-17. *Mitrella alvarezi* n. sp. 9: holotype, 4.1 mm (MNCN); 10: paratype, 4.0 mm (MNHN); 11: paratype, 4.2 mm (AMNH); 12: paratype, 4.2 mm (CER) (all from the type locality); 13-17: shells, of 4.5, 4.2, 4.4, 4.4, 4.5 mm, respectively, from Furna, Brava.
(Página derecha) Figuras 1-8. Anachis valledori *n. sp. 1: holotipo, 7,5 mm (MNCN); 2: paratipo, 7,4 mm (MNHN); 3: paratipo, 7,8 mm (AMNH); 4: paratipo, 8,1 mm (CER); paratipo, 7,5 mm (DBUA) (todos de la localidad tipo); 6-7: conchas, 7,6 y 7,3 mm, de Calheta Fonda, Sal; 8: concha, 5,4 mm, de Furna, Brava. Figuras 9-17.* Mitrella alvarezi *n. sp. 9: holotipo, 4,1 mm (MNCN); 10: paratipo, 4,0 mm (MNHN); 11: paratipo, 4,2 mm (AMNH); 12: paratipo, 4,2 mm (CER) (todos de la localidad tipo); 13-17: conchas de 4,5, 4,2, 4,4, 4,4 y 4,5 mm, respectivamente, de Furna, Brava.*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Description: Shell (Figs. 9-17, 19) up to 4.8 mm length, fusiform, with a high spire, solid, apex blunt. Protoconch (Fig. 20) of 1 1/2 whorls, about 290 μm in nucleus diameter and 590 μm in maximum diameter, apparently smooth, but with a wrinkled microsculpture visible at higher magnification (Figs 21-22), and usually light brown or brown in colour. Teleoconch of about 4 somewhat convex spiral whorls, with shallow suture. The whorls are smooth, with about 10 spiral threads near the base. Aperture narrow and axially elongate, whitish or cream inside; siphonal canal short. Columella curved, smooth. In the inner part of the external lip there are between 6 and 9 denticles of similar size, the upper usually larger. The colour of the shell is very variable, with background colour usually variable between yellow and brown, usually with small lighter rounded spots with 6-18 larger spots in subsutural position, but sometimes without any pattern of spots (Fig. 16). In many shells, like the holotype (Fig. 9) and those of figures 10-11, there are a short number of axial brown stripes irregularly disposed or fused, which reach the base.

Periostracum thin, smooth and transparent.

Colour pattern of soft body unknown.

Operculum (Fig. 25) high oval, with antero-lateral nucleus and oval scar without medial keel.

Radula (Fig. 27): central tooth rectangular, wider than lateral tooth; lateral tooth with base narrower than tooth height, with one basal and two distal sharp cusps, the outermost larger.

Distribution: Known from Sal, Boa Vista, Maio, São Vicente, Santiago, Brava.

Discussion: The more related species to *M. alvarezi* n. sp. regarding shell shape and colour pattern, operculum and radula, is *Mitrella broderipi* (Sowerby, 1844), from the Western Mediterranean to Morocco and Canary Islands. However, the latter species is larger (up 7.1 mm), has a larger protoconch (2 1/3 whorls), 10-14 spiral striae, and 4-5 labial teeth, and usually there are three bands of large white spots (subsutural, central and basal) larger than the remaining spots, but never a striped colour pattern (LUQUE, 1986). Another similar species is *Mitrella denticulata* (Duclos, 1840) (= *Mitrella triangulifera* Maltzan, 1884, see FISCHER-PIETTE, 1942), from Senegal, but it is larger (6-7 mm) and wider (3-3.5 mm), has 2-6 columellar teeth and a similar colour pattern, but there are 5-8 triangular subsutural white spots at the body whorl and frequently a spiral band of white punctuations on the central and basal parts of the body whorl (FISCHER-PIETTE, 1942; NICKLÈS, 1950; KNUDSEN, 1956). *Mitrella ocellina* (Nordsieck, 1975), from the Canary, Madeira and Selvagens Islands, is also a similar species by size (up to 6 x 2.4 mm) and colour pattern (very variable), but the protoconch (Fig. 22) is higher (340 μm in nucleus diameter and 620 μm in maximum diameter) and smooth, the first of the six labial teeth is constantly more prominent, the three first whorls are dark brown, and the body whorl has two narrow whitish bands (subsutural and central) (NORDSIECK, 1975; NORDSIECK AND GARCÍA-TALAVERA, 1979; NORDSIECK, 1982). *M. alvarezi* n. sp., *M. broderipi, M. denticulata* and *M. ocellina* seems to form a complex of related species along the northwestern coast of Africa, with a similar species in the Eastern Atlantic (*Mitrella dichroa* Sowerby, 1844), and further studies are need to stablish their relationships.

Mitrella verdensis (Knudsen, 1956), from the Cape Verde Islands (holotype studied, Zoologiske Museum, Copenhagen) is a higher (9.4 mm), semi-transparent shell, with 15 spiral lines at the base of the body whorl, outer lip convex and somewhat thickened, a faintly reflected columellar callus and orange-red colour with oblique white spots at the suture and a spiral band of white spots around the middle of the body whorls (KNUDSEN, 1956).

Mitrella melvilli (Knudsen, 1956), from Guinea Conakry is also higher (8.9 mm), with a rather high spire, 5 columellar denticles and colour pattern brown with whitish rounded dots at the upper part of the shell, and orange with indistinct subsutural brown and whitish spots at the two lowest whorls.

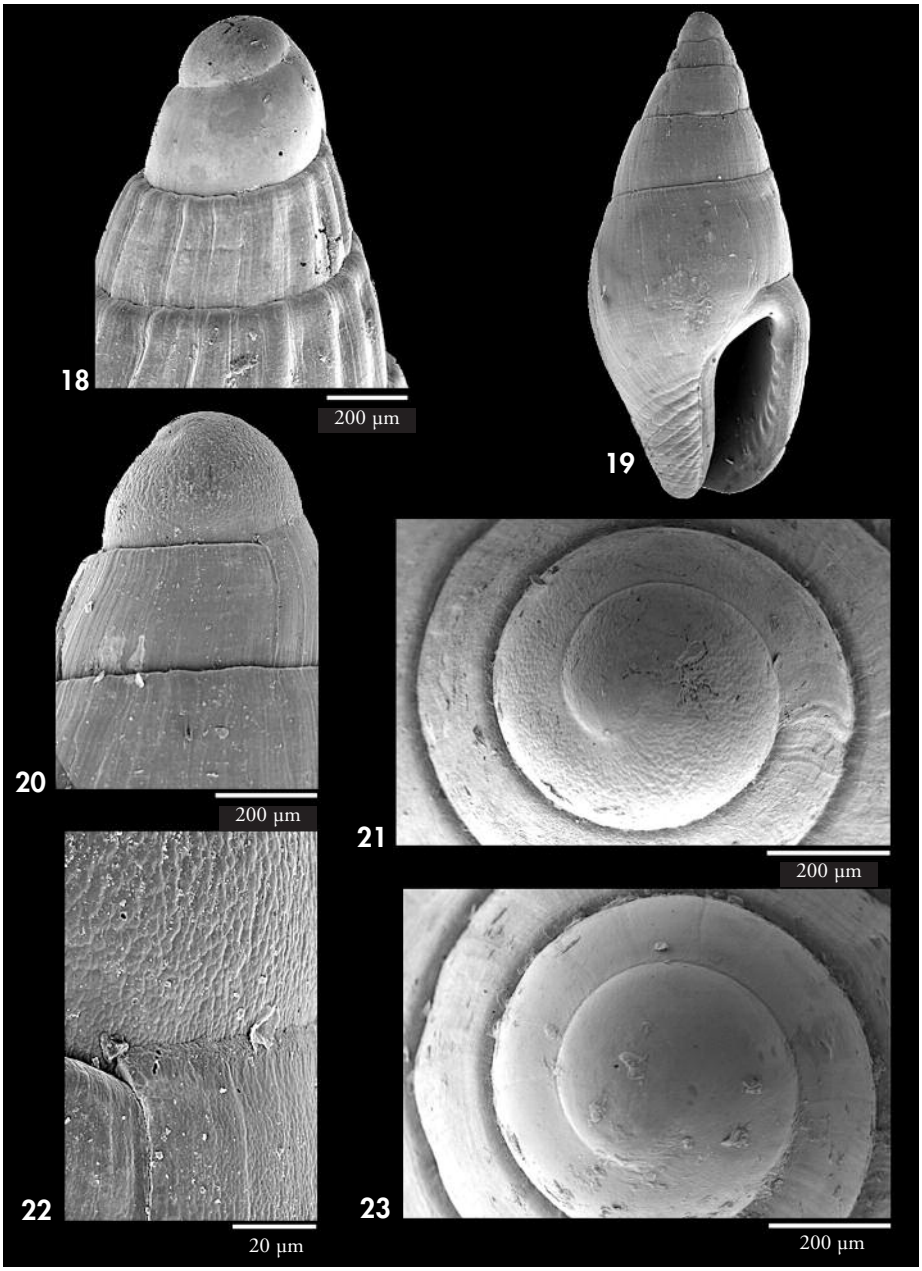

Figure 18. Protoconch of *Anachis valledori* n. sp. from Furna, Brava. Figures 19-22. *Mitrella alvarezi* n. sp. 19: shell, 4.5 mm. 20-21: protoconch. 22: detail of the protoconch microsculpture. Figure 23. Protoconch of *Mitrella ocellina* (Nordsieck, 1975), from Punta del Hidalgo, Tenerife, Canary Islands.

Figura 18. Protoconcha de Anachis valledori *n. sp. de Furna, Brava. Figuras 19-22.* Mitrella alvarezi *n. sp. 19: concha, 4,5 mm. 20-21: protoconcha. 22: detalle de la microescultura de la protoconcha. Figura 23. Protoconcha de* Mitrella ocellina *(Nordsieck, 1975), de Punta del Hidalgo, Tenerife, Islas Canarias.*

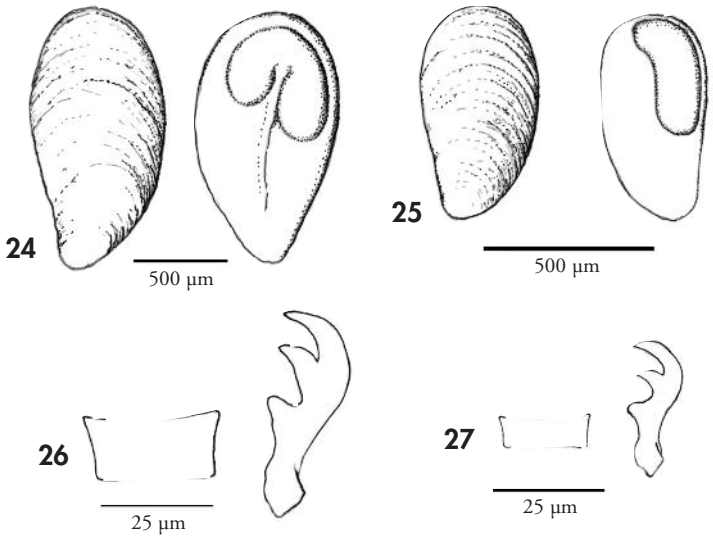

Figure 24. Operculum of *Anachis valledori* n. sp. Figure 25. Operculum of *Mitrella alvarezi* n. sp. Figure 26. Radula of *Anachis valledori* n. sp. Figure 27. Radula of *Mitrella alvarezi* n. sp.
Figura 24. Opérculo de Anachis valledori *n. sp. Figura 25. Opérculo de* Mitrella alvarezi *n. sp. Figura 26. Rádula de* Anachis valledori *n. sp. Figura 27. Rádula de* Mitrella alvarezi *n. sp.*

Mitrella maldonadoi Luque, 1984 (= *Mitrella bruggeni* Aartsen, Menkhorst and Gittenberger, 1984, see discussion of LUQUE, 1986), from the Mediterranean and the Atlantic coast of Morocco, has a similar, very variable colour pattern, but it is larger (up to 11.7 mm) and relatively wider, has a smaller protoconch (200-220 µm), more spiral striae (13-15) and 2-4 columellar teeth (LUQUE, 1986). The species recorded by NORDSIECK AND GARCÍA-TALAVERA (1979) from the Canary (Lanzarote), Selvagens and Cape Verde Islands and NW Africa as *Mitrella hidalgoi* Monterosato, 1889, seems to be *M. maldonadoi*, but we have not seen any specimens of the latter species from the Canary Islands.

Mitrella ocellata (Gmelin, 1791) (= *Buccinum cribrarium* authors non Lamarck, 1822), is known from both sides of the Atlantic, from Santa Maria (Azores) (Gofas, pers. com.), Madeira and the Canary and Cape Verde Islands to Mauritania (NICKLÈS, 1950; KNUDSEN, 1956; POPPE AND GOTO, 1991); a record from Angola (MARTENS, 1903) has not been confirmed by later research (ROLÁN AND RYALL, 1999b). In the western Atlantic it is found from the Caribbean to Trinidad and Panamá (RADWIN, 1977b) and Brazil (LEAL, 1991; OLIVEIRA AND OLIVEIRA, 1996). The eastern Pacific records of *Mitrella ocellata* (Central Gulf of California to Panamá, RADWIN, 1977b) probably correspond to a different species (*Mitrella guttata* (Sowerby, 1832), according KEEN, 1971), since Atlantic specimens have a paucispiral protoconch of about 2 whorls (LEAL, 1991), while the Pacific ones have a multispiral protoconch (about 3.5 whorls) of planktotrophic type (Costa, pers. com.). *Mitrella ocellata* is a higher and slender species (up to 13 mm, excluding top whorls, which are usually broken off), with almost flat-sided whorls, smooth columella, and very variable, but different colour pattern, with yellow or light brown to blackish brown background, sometimes with lighter spiral bands, covered by darker brown or white rounded small spots, respectively (NICKLÈS, 1950; KNUDSEN, 1956; RADWIN, 1977b). It has proved to be sig-

nificantly different anatomically from the Western Atlantic *Mitrella dichroa* (Sowerby, 1844) (DEMAINTENON, 1999), which as said before seems to be closely related to *M. alvarezi* n. sp.

Mitrella parvula (Dunker, 1847), known from Mauritania (ALTIMIRA, 1978) to Gabon (BERNARD, 1984), São Thomé (TOMLIN AND SHACKLEFORD, 1914), Congo (KNUDSEN, 1956) and Angola (Gofas, pers. com.), is larger (up to 6.8 mm, according KNUDSEN, 1956, and 9.5 mm, according BERNARD, 1984), has more whorls (5-6), a larger protoconch of 2 1/2 whorls, suture deeply incised, six faint columellar denticles and seven more distinct labial ones, and the colour pattern consists of a greyish-white ground colour, with a characteristic, reticulated, dark-brown design, which on the body whorl is mainly concentrated in a spiral band at some distance from the suture and another one near the base of the whorl; between the bands the reticulation is only faintly developed and on the upper whorls, the brown colour is more evenly distributed (KNUDSEN, 1956).

Mitrella dartevelli (Knudsen, 1956) from Gabon is larger (up to 9.5 mm), has a fine axial sculpture, a fine and regularly incised line on the body whorl which runs in continuation of the suture from the upper corner of the aperture to the lower part of the outer lip, a rather long siphonal canal, and a greyish brown colour with an indistinct darker brown reticulation (KNUDSEN, 1956; BERNARD, 1984).

The paucispiral protoconch of *Mitrella alvarezi* n. sp. may indicate a non-planktotrophic development.

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