Columbellidae (Gastropoda, Neogastropoda) of the gulf of Guinea with the description of eight new species

Columbellidae (Gastropoda, Neogastropoda) del Golfo de Guinea con la descripción de ocho especies nuevas

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ABSTRACT

The species of the family Columbellidae found in West Africa are studied. Five genera are represented: *Columbella* (1 species), *Anachis* (1), *Mitrella* (11), *Cotonopsis* (1) and *Strombina* (1). Of the 15 species mentioned, 8 are described as new. The genus *Strombina* is employed by first time for a West African species.

RESUMEN

Se estudian las especies de la familia Columbellidae encontradas en África occidental. Cinco géneros están representados en el área de estudio: *Columbella* (1 especie), *Anachis* (1), *Mitrella* (11), *Cotonopsis* (1) y *Strombina* (1). De las 15 especies mencionadas 8 se describen como nuevas para la ciencia. El género *Strombina* es empleado por vez primera para una especie oeste africana.

KEY WORDS: Columbellidae, *Columbella, Anachis, Mitrella, Cotonopsis, Strombina,* West Africa, Guinean Gulf, new species.

PALABRAS CLAVE: Columbellidae, *Columbella, Anachis, Mitrella, Cotonopsis, Strombina,* África occidental, golfo de Guinea, especies nuevas.

INTRODUCTION

The Columbellidae of the West Africa have been seldom studied in recent years. For most of the West African species, we can only find some descriptions and records in species lists, included in older works such those of DUCLOS (1835-40), MENKE (1853), MALTZAN (1884), MARTENS (1904), DAUTZENBERG AND FISCHER (1906), DAUTZENBERG (1910, 1927), FISCHER-PIETTE (1942a, b), NICKLÈS (1950) and KNUDSEN (1956).

More recently, isolated records have been mentioned for São Tomé, in FERNANDES AND ROLÁN (1993), and Angola, in GOFAS, PINTO AFONSO AND BRANDÃO (1985), with some new records in ROLÁN AND RYALL (1999a, b) and ROLAN AND TRIGO (2000); also for Gabon, in BERNARD (1984).

The Mediterranean species of the family have been revised in some recent papers: SCHIRÒ (1979), SABELLI AND SPADA (1981), LUQUE (1984), VAN AARTSEN, MENKHORST AND GITTENBERGER (1984), MIFSUD (2000), CHIARELLI, MICALI AND QUADRI (2003), GIANNUZZI-SAVELLI, PUSATERI, PALMERI AND EBREO (2003). The Canary Islands species are treated in NORDSIECK AND GARCÍA-TALAVERA (1979) and in HERNÁNDEZ AND BOYER (2005) and

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those from the Cape Verde Islands in the publications of BURNAY AND MONTEIRO (1977), COSEL (1982a, b, c), ROLÁN AND LUQUE (2002) and ROLÁN (2002, 2004). The Senegal species are revised by PELORCE AND BOYER (2005).

Columbellid classification is still problematic because of insufficient information for most species, lack of discrete characters useful for distinguishing species groups, conchological and radular variation within the family and the geographically restricted basis of the most frequently used columbellid classifications (PACE, 1902 and DEMAINTENON, 1999). This makes the generic placement of species difficult, and thus we tentatively use here *Anachis* (in the sense of RADWIN, 1977a, b, supported by the results of DEMAINTENON, 1999) and *Mitrella* (a polyphyletic genus according to DEMAINTENON, 1999), due to the resemblance of each of the new species with the type species of both genera.

In this paper, which complements the study of Dakar species by Pelorce and Boyer (this volume), we consider the Gulf of Guinea in a broad sense from south of Dakar to the south of Angola.

MATERIAL AND METHODS

Most the material studied is in the author's collection, constituted during many expeditions to West Africa and by diving, dredging, and sorting of sediment. Besides, material was loaned by the MNHN, some types by ZMUC, and other material was also studied from the private collections mentioned in Acknowledgements.

In order to standardize the criteria for character descriptions we follow DEMAINTENON (1999) for descriptions of operculum and radula.

The radular terminology is based on BANDEL (1984).

Abbreviations

AMNH American Museum of Natural History, New York.
BMNH The Natural History Museum, London.
MNCN Museo Nacional de Ciencias Naturales, Madrid.
MNHN Muséum National d'Histoire Naturelle, Paris.
SMF Senckenberg Museum, Frankfurt.
ZMUC Zoologisk Museum, Kobenhavn.
ZSM Zoologische Staatsammlung Muenchen, Munich.
CCS collection of C. Schroenherr, Luanda.
CER collection of E. Rolán, Vigo.
CFB collection of Franck Boyer, Sevran.
CJH collection of José María Hernández, Gran Canaria.
CJP collection of Jacques Pelorce, Le Grau du Roi.
CJT collection of Juan Trigo, A Coruña.
CHD collection of Juan Horro-Ana Delgado, Vigo.
CPH collection of Jean Paul Hattenberger, France.
sp: live collected specimen.
s: empty shell.
j: juvenile shell.
f: fragment of shell.

RESULTS

Genus *Columbella* Lamarck, 1799

Type species: *Voluta mercatoria* Linné, 1758. Recent, Caribbean. Designated by Lamarck, *Mém. Soc. Hist. Nat. Paris*: 70.

Columbella adansoni Menke, 1853 (Figs. 1-14, 149, 160)

Columbella adansoni Menke, 1853. *Zeitschr. Malakozool.*, 10 (5-6): 74-75. [Type locality: São Vicente Island, Cape Verde archipelago].
Columbella rufa Menke, 1853. *Zeitschr. Malakozool.*, 10 (5-6): 75.

Columbella rustica auct. non (Linnaeus, 1758).
Columbella spongiarium Duclos *sensu* ROCHEBRUNE (1881a).
Columbella rustica striata (Duclos) *sensu* PÉREZ SÁNCHEZ AND MORENO BATET (1991).

Type material: Lectotype, designated by MOOLENBEEK AND HOENSELAAR (1991), in SMF.
Other material examined: Many shells and specimens from Madeira; Canaries; Azores; Cape Verde Islands; Ghana; São Tomé; Angola.

Description: See NORDSIECK AND GARCÍA-TALAVERA (1979, as *Columbella rustica striata*). Shell (Figs. 1-11) solid, with a large and wide last whorl, and a conical pointed spire with 4-6 whorls.

Protoconch (Figs. 12-14) of several whorls. Colour of teleoconch very variable, pink, orange, brown, usually with blotches of several colours frequently with small oval light spots disposed spirally. Aperture elongate, straightened at the middle by an enlargement of the external lip.

Dimensions: Up to 21 mm, many populations composed by smaller specimens of about 8-12 mm only.

Soft parts pigmented but variable according to shell colour.

Radula (Fig. 149) with a central tooth four times as wide as long and with very acute posterior corners. Lateral teeth about three times as long as wide, with twisted base; cutting edge of laterals with the basal cusp low and long, the central cusp wide and not sharpened, and the apical cusp acute and wide.

Operculum (Fig. 160) light brown, ovoid-elongate, with an ovoid mark of insertion with a small prominence in the middle.

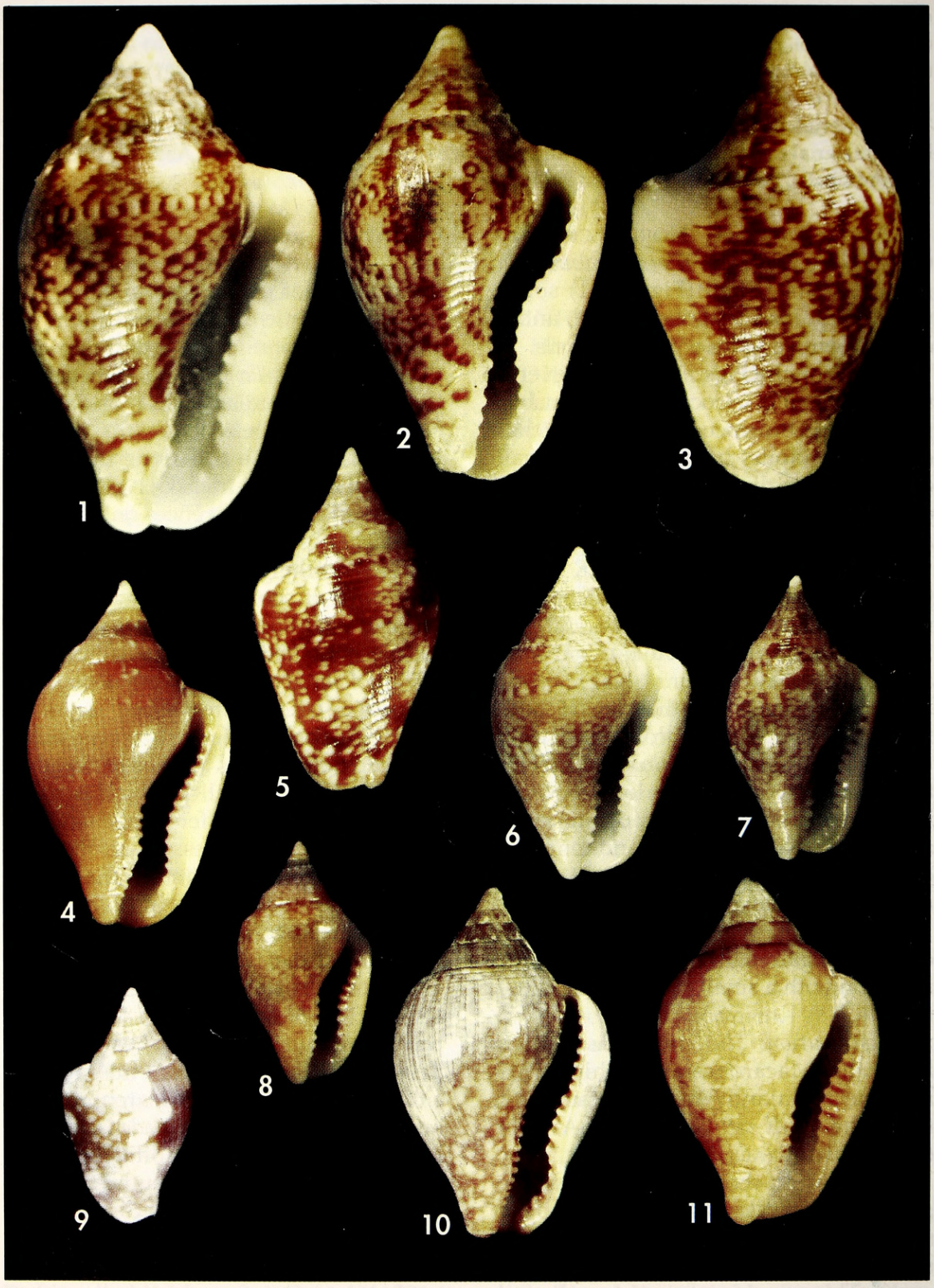
Distribution: The species is known from the Macaronesian archipelagos and the mainland West African coast from the Gulf of Guinea to Angola (ROLÁN AND RYALL, 1999a).

Remarks: In the Gulf of Guinea, the genus *Columbella* is represented by a single species, whose shells, of medium size, and abundant in shallow water areas. This species was confused until recently with *C. rustica* (Linné, 1758), so references to *C. rustica* for the area (NICKLÈS, 1950 or BERNARD, 1984, among others) must be considered to belong to *C. adansoni* Menke, 1853.

MOOLENBEEK AND HOENSELAAR (1992) established the differences between both species, based on protoconch and radula. These authors also explained the reasons for their distribution, on the basis of oceanic currents and interspecific competition. They concluded that the first, *Columbella adansoni*, is present in the Macaronesian archipelagos and the second, *Columbella rustica*, in the Mediterranean Sea and along the northern coast of West Africa. OLIVERIO (1995) confirmed these differences on allozyme based studies. ROLÁN AND RYALL (1999a) established the geographic range of distribution of both species along the African coast. In the present work the radula (Fig. 148) and operculum (Fig. 159) of *Columbella rustica* are illustrated to point out the differences.

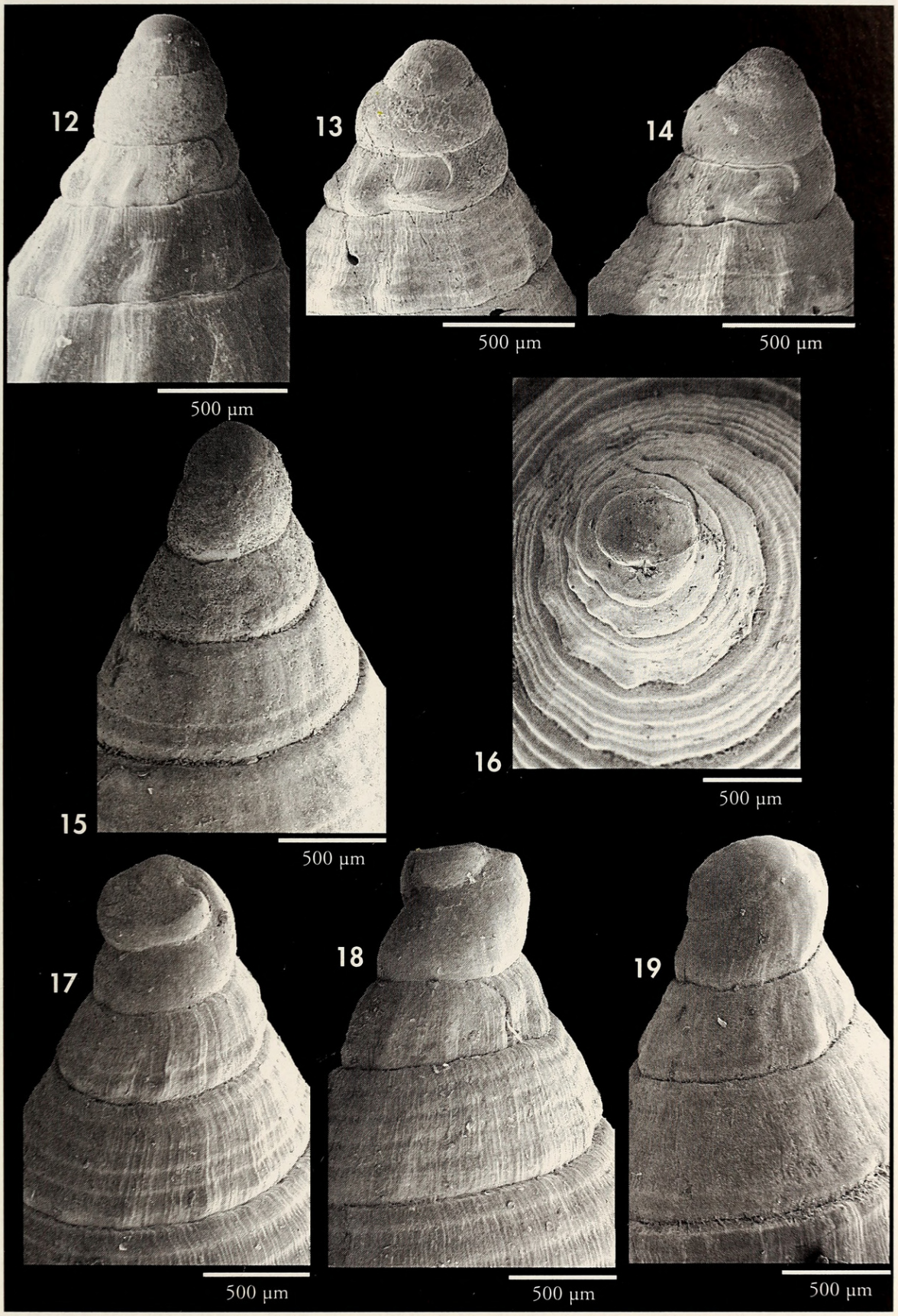
The reasons for the confusion between both species are due to the great intraspecific variability which is more important than the differential characters between the two species. Therefore, with the simple observation of the shells without protoconch is impossible to know to which taxon correspond and from where they come from. The protoconch of *C. rustica* is paucispiral (Figs. 15-19). The planktotrophic multispiral protoconch of *C. adansoni* supposes a pelagic larval development making feasible a distribution along archipelagos and main coast. *Columbella adansoni* has a larger larval dispersal ability ranging from from the Azores to South Angola, a geographical range of distribution greater than that of *C. rustica*.

C. adansoni is very variable in different habitats. One form has shells with a very prominent aperture, while another has very small one; the colour can be uniform or spotted. Sometimes the shells are minute, in other places double the size. In the Cape Verde archipelago, specimens of different size often live together.



Figures 1-11. *Columbella adansoni.* 1-3: shells, 20.7, 19.1, 19.1 mm, Lanzarote, Canary Is.; 4-6: shells, 14.6, 14.5, 13.4, mm, Mordeira, Sal, Cape Verde Islands; 7, 8: shells, 11.7, 10.0 mm, Sal Rei, Boavista, Cape Verde Islands; 9: shell, 10 mm, Praia Amelia, Angola; 10, 11: shells, 14.5, 14.4 mm, Luanda, Angola (all from CER).

Figuras 1-11. Columbella adansoni. *1-3: conchas, 20,7, 19,1, 19,1 mm, Lanzarote, Islas Canarias; 4-6: conchas, 14,6, 14,5, 13,4, mm, Mordeira, Sal, Islas de Cabo Verde; 7, 8: conchas, 11,7, 10,0 mm, Sal Rei, Boavista, Islas de Cabo Verde; 9: concha, 10 mm, Praia Amelia, Angola; 10, 11: conchas, 14,5, 14,4 mm, Luanda, Angola (todas de la CER).*



Figures 12-14. Protoconchs of *C. adansoni*, Cape Verde Islands. Figures 15-19. Protoconchs of *C. rustica*. 15, 16: L'Etoile, Nouadhibou, Mauritania; 17-19: Cullera, Valencia, Spain (all from CER). *Figuras 12-14. Protoconchas de* C. adansoni, *Islas de Cabo Verde. Figuras 15-19. Protoconchas de* C. rustica. *15, 16: L'Etoile, Nouadhibou, Mauritania; 17-19: Cullera, Valencia, España (todas de la CER).*

Genus *Anachis* H. Adams and A. Adams, 1853

Type species: *Columbella scalarina* G. B. Sowerby II, 1832, from Panama (Chiriquí), by subsequent designation (TATE, 1869).
Diagnosis: RADWIN (1977a, p. 120).

Anachis ryalli spec. nov. (Figs. 20-27)

Type material: Holotype (Fig. 20) in MNHN. Paratypes: AMNH (1, Fig. 21), MNCN (1, 15.05/46628, Fig. 22), BMNH (1, Fig. 23), ZSM (1, Fig. 24), CJP (3), CJH (3), CFB (6), CER (5), CPR (137), all from the type locality.
Type locality: Off Sekondi, Ghana, trawled around 40 m.
Etymology: The species is named after Peter Ryall, malacologist who lived for many years in Ghana and collected the type material.

Description: Shell solid (Figs. 20-24), up to 8.3 mm in length, broadly fusiform with a moderately high spire.

Protoconch (Figs. 26, 27) of 1 1/4 whorls, sharply pointed, and about 500 µm in maximum diameter, smooth and usually whitish in colour but cream on the upper part.

Teleoconch of 4-4 1/2 hardly convex spiral whorls, with distinct suture and small subsutural shelf. Sculpture formed by axial ribs, well defined subsuturally, between 18 and 22 on the last whorl. Many spiral threads visible only in the interspaces of the ribs, but more evident near the base, where the axial ribs disappear.

Aperture narrow and axially elongate, usually white inside. Columella curved, S-shaped, with 5-6 small denticles in the lower part, the uppermost being the most prominent. Inner part of external lip with about 7-8 denticles, the second one larger than the others.

Shell colour uniformly cream or whitish. Periostracum thin, smooth and transparent.

Soft parts, operculum and radula unknown.

Distribution: Only known from the type material, from Ghana.

Remarks: *A. ryalli* most resembles the Senegalese species *A. aurantia* (Lamarck, 1822) (= *A. cancellata* Gaskoin, 1851) but the latter is larger, with a wider and darker shell. Also it may be differentiated from *A. freytagi* Maltzan, 1884 [= *Columbella* (*Anachis*) *bubakensis* Lamy, 1923], from Senegal and Bissagos Islands, because its shell is smaller and narrower, uniformly subhyaline, light tan colour or brownish, with a narrow aperture and a contracted base. Even samples of *A. freytagi* with lighter colour and almost erased colour pattern, retain the typical colour in the first whorls and have a more rectilinear profile.

Anachis cuspidata Marrat, 1877 (= *A. emergens* Fischer and Nicklès, 1946), from Senegal, is wider and has a more colourful shell.

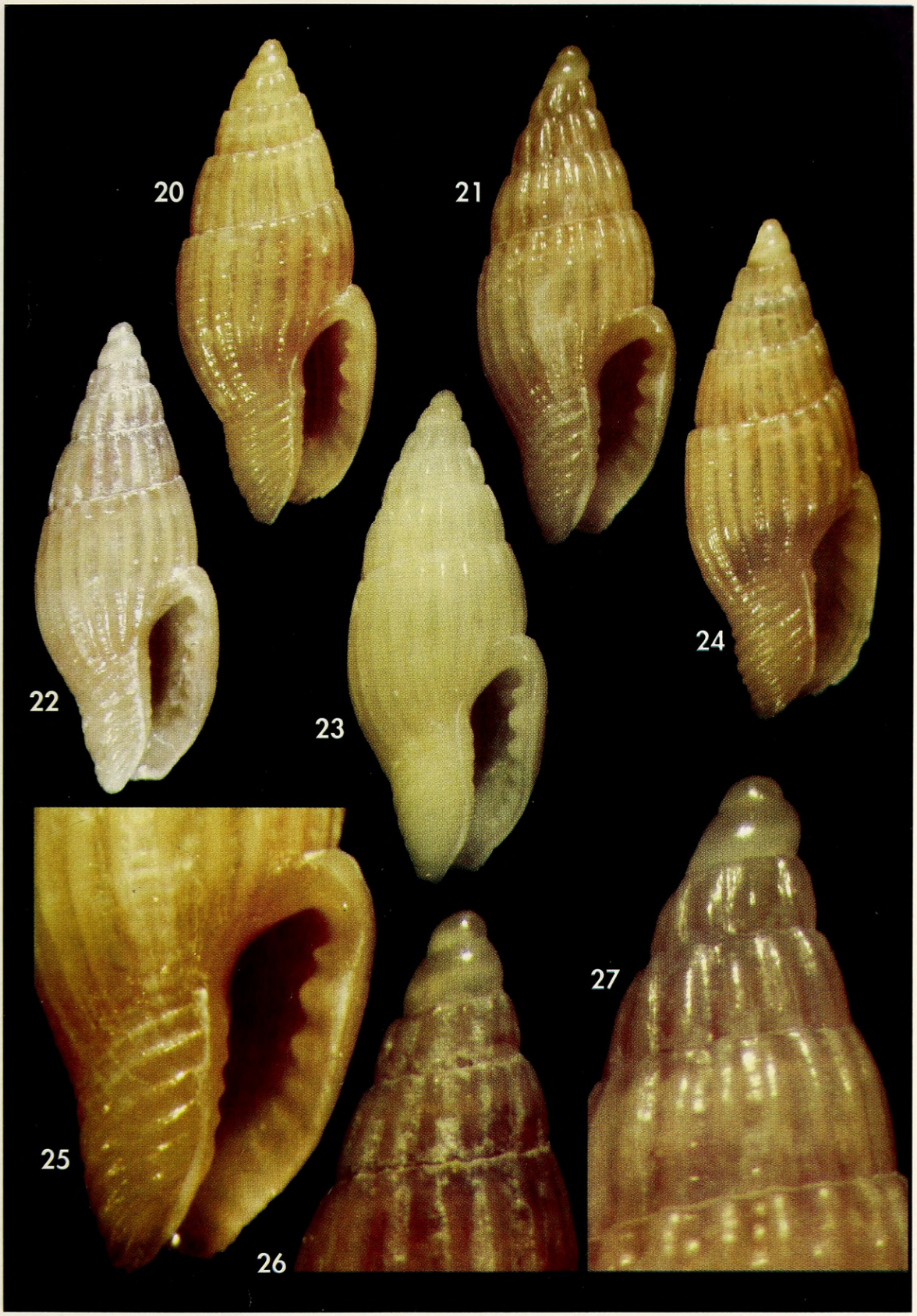
Anachis turbita (Duclos, 1840) (= *rac* Dautzenberg, 1891), from Senegal and Canary Islands, is more colourful, has a wider shell and its protoconch is not so pointed.

Anachis ryalli may be differentiated from *A. valledori* Rolán and Luque, 1999, from the Cape Verde Islands, because the latter species has a smaller and narrower shell, is uniformly light in colour without brown axial lines, has a narrow aperture, and the protoconch is evidently more elevated and whitish.

Anachis avaroides Nordsieck, 1975, from the Canary and Selvagens Islands, is wider, has constant colouration of axial bands and ocelli, and lacks spiral sculpture, except at the base.

Genus *Mitrella* Risso, 1826

Type species: *Murex scriptus* Linnaeus, 1758 (= *Mitrella flaminea* Risso, 1826), by subsequent designation of MÖRCH (1859).



Figures 20-27. *Anachis ryalli* spec. nov. 20: holotype, 6.2 mm; 21-24: paratypes, 6.5 (AMNH), 6.0 (MNCN), 6.4 (BMNH) and 6.7 mm (ZSM), Sekondi, Ghana, 40 m. 25: detail of the aperture; 26, 27: detail of the protoconch of paratypes of Figures 21 and 24.

Figuras 20-27. Anachis ryalli *spec. nov. 20: holotipo, 6,2 mm; 21-24: paratipos, 6,5 (AMNH), 6,0 (MNCN), 6,4 (BMNH) y 6,7 mm (ZSM), Sekondi, Ghana, 40 m. 25: detalle de la abertura; 26, 27: detalle de la protoconcha de los paratipos de las Figuras 21 y 24.*

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

Mitrella pallaryi (Dautzenberg, 1927) (Figs. 28-34, 152, 163)

Columbella (Mitrella) vulpecula Pallary. 1900 ex Monterosato ms. *Coq. Mar. litt. Dép. d'Oran. J. Conchyl.*, 48(3): 279, pl. 6. fig. 8 (also var. *minor* Pallary and var. *albida* Pallary). [Type locality: Oran, Algeria].

Pyrene pallaryi Dautzenberg, 1927. nom. nov. pro *Columbella vulpecula* Pallary, 1900 non C. B. Sowerby, 1844. *Res. Camp. Sci. Albert I*, 72: 89.

Type material: Not examined.

Other material examined: Atlantic: Spain: Galicia: 75 sp, 10 s, several j, from numerous localities (CJT, CHD). Portugal: 4 sp, between Salema and Praia da Luz, Algarve, 37° 00' N, 08° 45' W, 70 m (MNHN); 1 s, N/O Faial, 37° 01.3' N, 09° 05.7W, 135 m (MNHN). Mediterranean: Spain: Mar de Alborán, Almería: 30 sp and s, 100-130 m (CER); 16 sp, Almería Bay (CER); Málaga: 4 sp, Marbella, 50 m (CER). Algeria: 5 s, near Orán, diving, 10 m (CER); 5 s, Orán, (MNHN). Malta: 6 s, 40 m (CER). Morocco: 6 s, Tangiers, expiscis *Lepidotrigla* (MNHN); 3 sp, dredgings, 60-100 m (CER). Sahara: 25 sp, and s (CER). Azores archipelago: 2 c, 37° 03' N, 25° 09' W, N Santa Maria, 110 m (MNHN); 1 s, 38° 03' 40"N, 30° 55' W, 98 m (MNHN). Bay of Biscay: 2 s, 43° 46.51' N, 02° 00.58' W, 165 m (MNHN). Madeira: N/O "Jean Charcot ZARCO, St. 21, 33° 00.7' N, 16° 25.5W, 220-290 m (MNHN). Canary Islands: 2 s, La Palma, nets, 100-150 m (CER); 4 sp, La Palma, nets, 100-200 m (MNHN); 40 sp, 5 s, Tasaente, La Palma, 150-200 m (CER); 1 s, Tenerife, 100-150 m (CER); 1 s, Gran Canaria (CER). Mauritania: continental plateau, 18° 18' N, 16° 31' W, 134 m (MNHN); 1 s, "N'Diago" Stn. 306, 19° 6' N, 16° 40' W, 93 m (MNHN). Senegal: 7 s, Gorée (CFS); 4 s, Cap Manuel, 50 m (MNHN); 3 s, Cap de Naza, 50 m (MNHN). Congo: 2 sp, Pointe Noire, Plage Mendame (CPH). Angola: 1 sp, 2 s, Ilha de Luanda, 75-90 m (MNHN); 2 sp, Luanda, 20 m (CCS); 4 s, Luanda, dragados, 60 m (CER); 1 sp, 1 s, Mussulo, Luanda, 90-100 m (MNHN); 10 s, Palmeirinhas (CER); 5 s, Saco Mar (CER).

Description: For shell description and colour pattern of the head-foot, protoconch and operculum, see LUQUE (1986: 236, pl. 2, figs. 9, 15). Shell (Figs. 28-33) elongate, solid, sharply pointed, smooth, shiny and with a curved profile of the whorls.

Protoconch (Fig. 34) of about three whorls, also illustrated with SEM in ROLÁN AND TRIGO (2000, figs. 6, 7).

Radula (Fig. 152, see also LUQUE, 1986, pl. 3, fig. g, and ROLÁN AND TRIGO, 2000, fig. 8), with a central tooth four times as wide as long and with acute posterior corners. Lateral teeth about four times as long as wide; with twisted base; cutting edge of laterals with the basal cusp short and prominent, and both central and apical cusps narrow and acute.

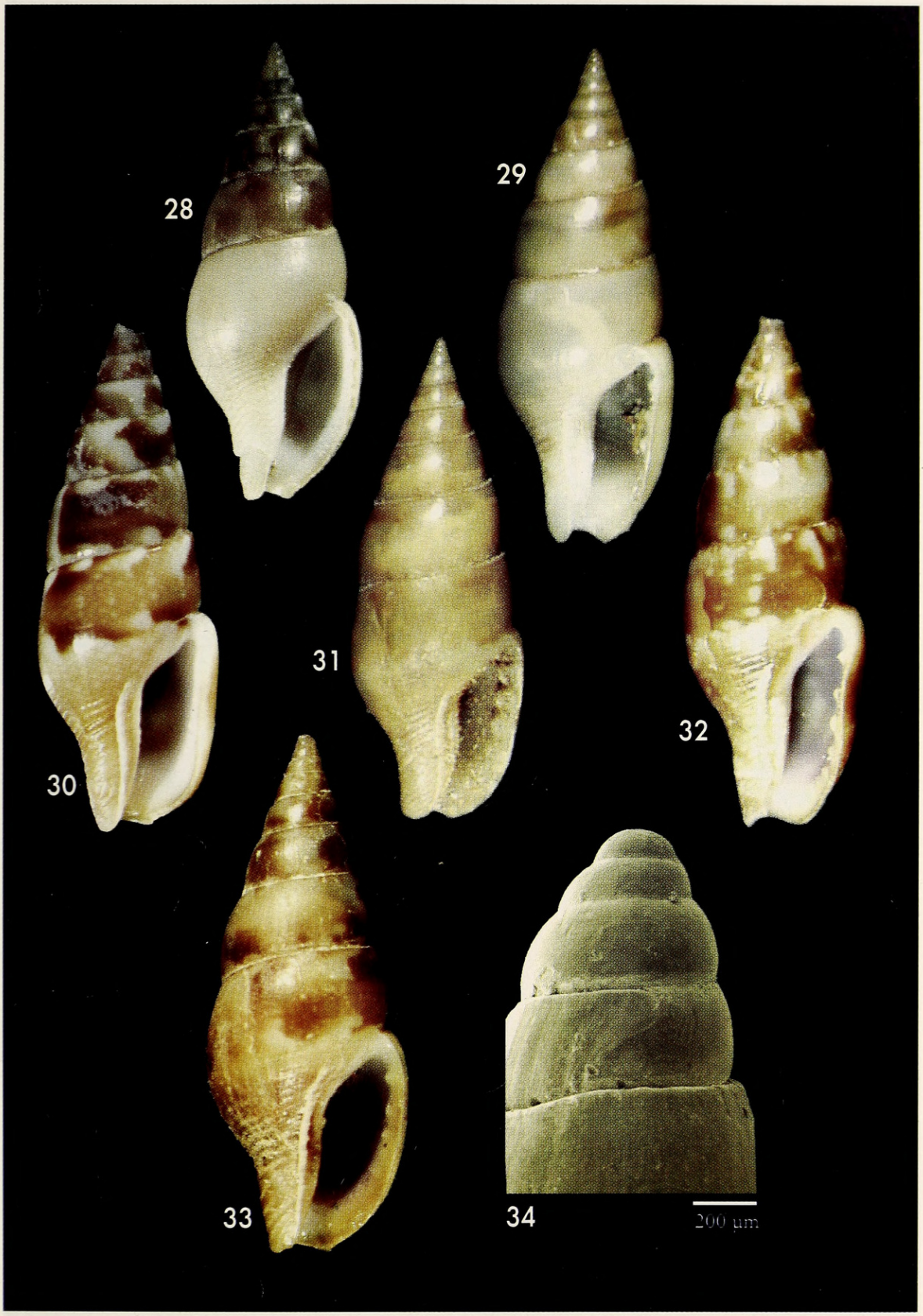
Operculum (Fig. 163) light brown, ovoid, almost circular with an ovoid mark of insertion, which is almost divided in two by an elongate prominence at the middle part.

Distribution: Described from the Mediterranean (Oran) by PALLARY (1900, as *Columbella vulpecula*), also cited by SABELLI, GIANNUZZI-SAVELLI AND BEDULLI (1990) and CHIARELLI, 2002; in Europa by BOUCHET, LE RENARD AND GOFAS (2001), DAUTZENBERG (1927) recorded it from Azores, PASTEUR-HUMBERT (1962) from Casablanca, Morocco, NORDSIECK (1968) from Orán, and SCHIRÓ (1979) from Alboran Sea.

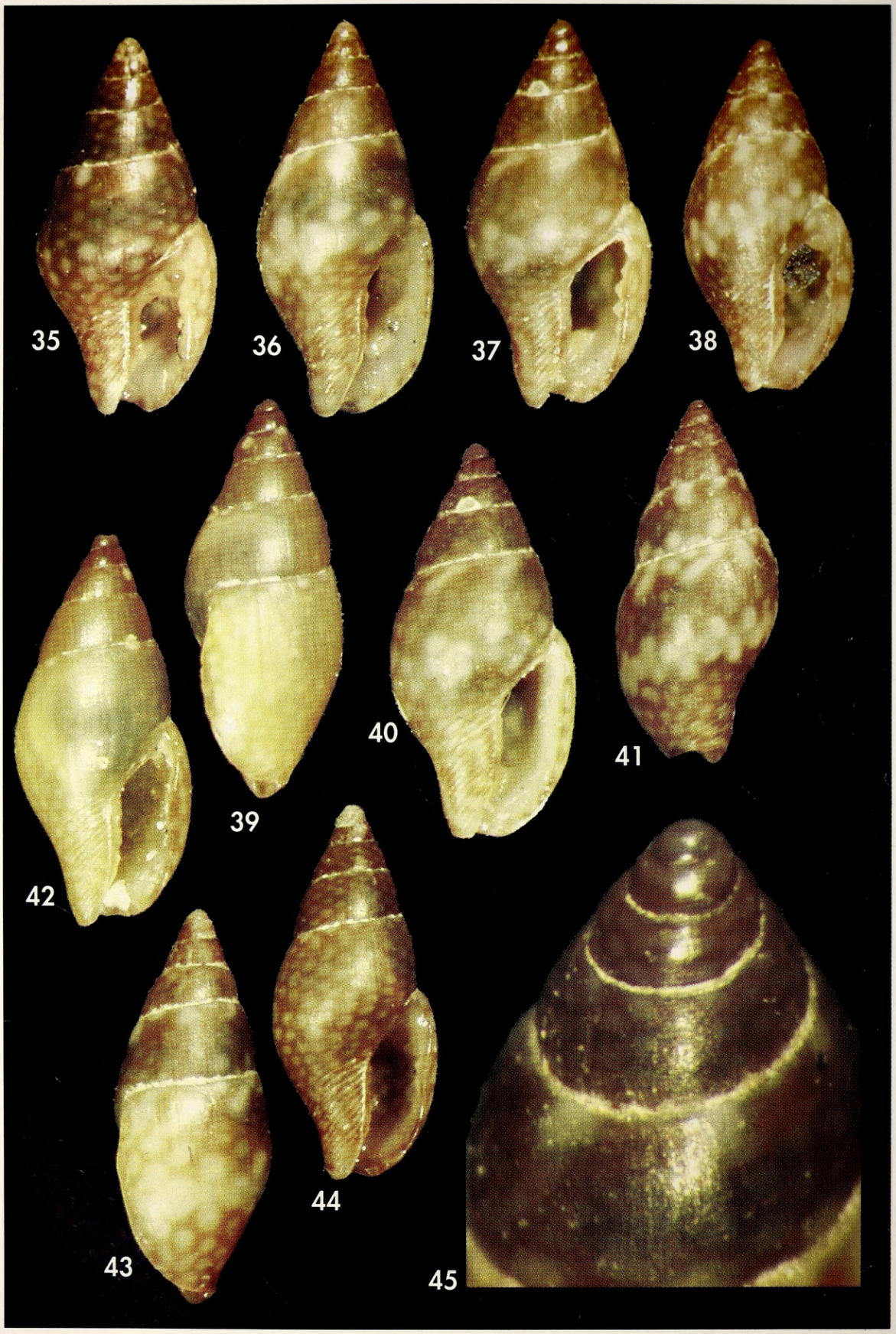
MACEDO, MACEDO AND BORGES (1999) also recorded it from Portugal. In Spain it has been found by SIERRA, GARCÍA AND LLORÍS (1978) and SABELLI AND SPADA (1981) from the Canaries, Gibraltar and other places in South Spain. CECALUPO AND GIUSTI (1989) mention it for Capraia, at 400-440 m. POPPE AND GOTO (1991: 152, pl. 31, fig. 6) mention those records already known.

ROLÁN AND RYALL (1999b) and ROLÁN AND TRIGO (2000) recorded it for Angola.

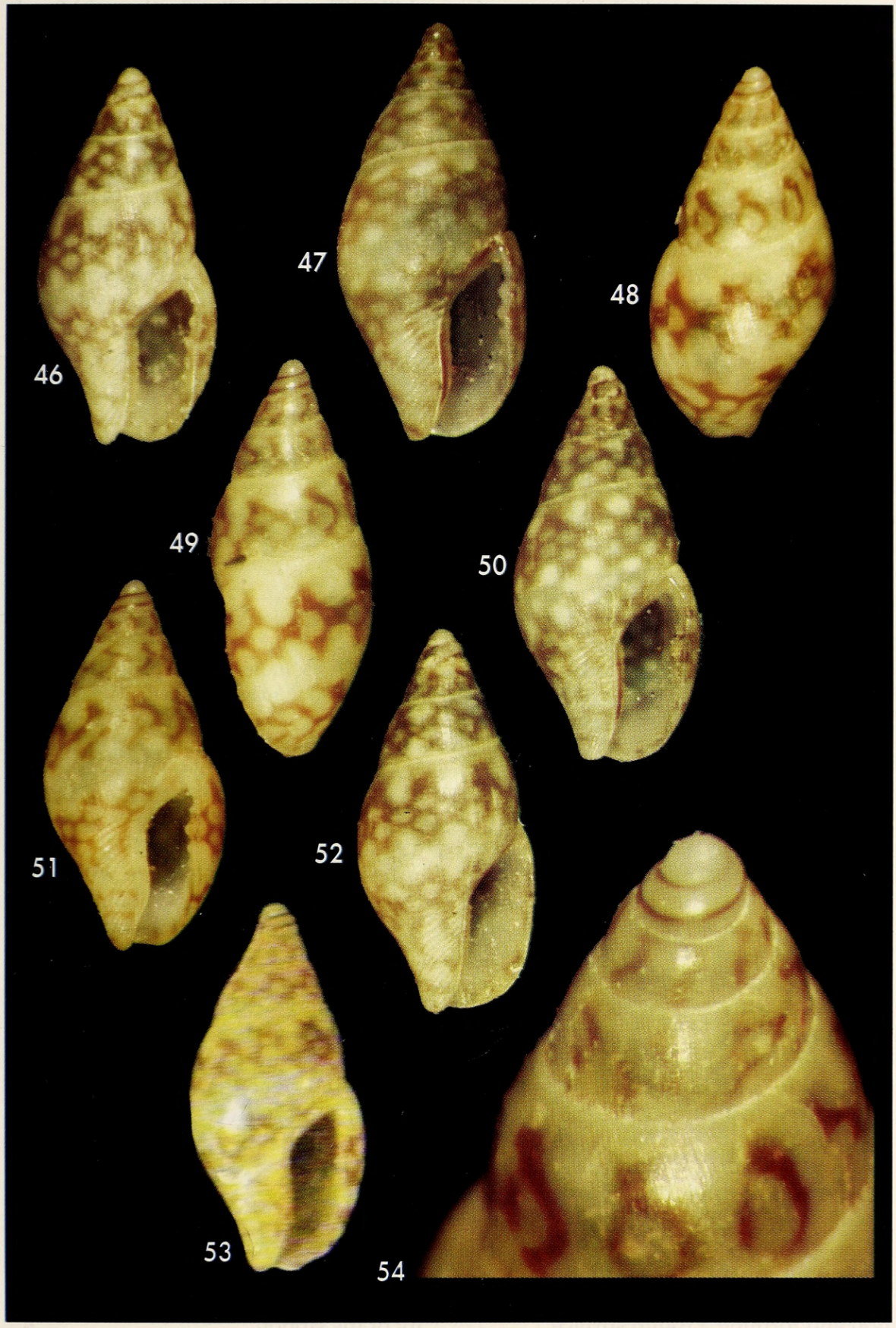
Mitrella pallaryi has a multispiral protoconch indicating planktotrophy. Its distribution area is large and includes the whole Mediterranean, the Atlantic



Figures 28-34. *Mitrella pallaryi.* 28, 29: 17.0, 14.5 mm, Camariñas, Galicia, Spain (CER); 30: 14.7 mm, Oran, Algeria (CER); 31: 16.1 mm, La Palma, Canary I. (CER); 32: 17.3 mm, Luanda, Angola (CER); 33: 15.5 mm, A Guarda, Galicia, Spain; 34: protoconch, Luanda, Angola.
Figuras 28-34. Mitrella pallaryi. *28, 29: 17,0, 14,5 mm, Camariñas, Galicia, España (CER); 30: 14,7 mm, Orán, Algeria (CER); 31: 16,1 mm, La Palma, Islas Canarias (CER); 32: 17,3 mm, Luanda, Angola (CER); 33: 15,5 mm, A Guarda, Galicia, España; 34: protoconcha, Luanda, Angola.*



Figures 35-45. *Mitrella psilla*. 35-44: shells, between 4.6 and 5.0 mm (CER). Baia de l'Etoile, Mauritania, intertidal; 45: protoconch.
Figuras 35-45. Mitrella psilla. *35-44: conchas, entre 4,6 y 5,0 mm (CER). Bahía de l'Etoile, Mauritania, intermareal; 45: protoconcha.*



Figures 46-54. *Mitrella psilla*. 46-52: shells, 4.7, 5.3, 4.8, 4.8, 4.9, 4.1, 4.3 mm, Sacomar, Angola, 4-11 m (CER); 53: 4.6 mm, Baia das Pipas, Angola; 54: protoconch, Sacomar.
Figuras 46-54. Mitrella psilla. *46-52: conchas, 4,7, 5,3, 4,8, 4,8, 4,9, 4,1, 4,3 mm, Sacomar, Angola, 4-11 m (CER); 53: 4.6 mm, Baia das Pipas, Angola; 54: protoconcha, Sacomar.*

up to north Spain, Archipelagos of Azores and Canaries, and Angola. Curiously there are no records for the west African coast of the Gulf of Guinea.

Remarks: In the present work we include photographs of specimens from Galicia, north Spain, Camariñas, (Figs. 28, 29) and A Guarda, (Fig. 33), Oran, Algeria (Fig. 30), Canary Islands (Figs. 31), Angola (Fig. 32), and the protoconch of another shell from the Sahara (Fig. 34), some of these previously figured in ROLÁN AND TRIGO (2000). All of them show a similar form and even colour pattern within some population variability. The wide distribution of *M. pallaryi* is explained if we consider the multispiral protoconch. The species is variable in colour and pattern, but the main characters are similar in shells from distant localities.

The lack of collecting records in some areas may be due to its peculiar habitat, in deep and rocky bottoms, and probably this species will be collected in other localities from West Africa which are still scarcely sampled. Anyway, up to now it was not collected between Senegal and Angola and may have a bipolar distribution.

Mitrella psilla (Duclos, 1846) (Figs. 35-54, 132-135, 143, 156, 165, 169)

Colombella psilla Duclos, 1846. Hist. natur...Genre *Colombelle*, pl. 15, fig. 5-6. [no type locality].
Colombella japix Duclos, 1850. Hist. natur...Genre *Colombelle*, pl. 22, fig. 13-14. [no type locality].

Type material: Syntypes of *C. psilla* and *C. japix* in MNHN.
Other material examined: Mauritania: 30 s, 50 j, Baie de L'Etoile, intertidal (MNHN); 217 sp, 14 s, 38 j, Baie de l'Etoile, intertidal, in algae (CER); 16 s, Banc d' Arguin, in beach sediment (CER). Senegal: 200 sp, 8 c, Region de Dakar (MNHN). Congo: 1 s, Pointe Indienne, 1 m (CPH). Angola: 3 sp, Lobito, 4 m (CER); 63 sp, 4 s, 8 j, Sacomar, 4-11 m (CER); 4 sp, Limagens, 5 m (CER); 1 s, Santiago, 5 m (CER); 53 sp, 10 s, 10 j, Praia Amelia, 5-11 m (CER); 1 sp, 15 c, 6 j, Praia Amelia, Namibe (MNHN); 3 j, Ponta de Noronha (MNHN); 5 j, Baia de Lucira (Bissonga), Namibe (MNHN); 2 sp, 1 c, 3 j, Baia do Cesar, intertidal (CER); 8 s, 2 j, Chapeu Armado, 5 m (CER); 10 s, 4 j, Baia das Pipas, 2-10 m (CER); 5 j, São Nicolau, Namibe (MNHN); 1 s, Bentiava [formerly São Nicolau], Namibe (CER);3 sp, 2 c, Praia das Conchas, Namibe (MNHN).

Description: As there are different populations, this description is general for all of them. The differences are pointed out below.

Shell (Figs. 35-44, 46-53) ovoid elongate, solid, with a last whorl larger than half the height.

Protoconch (Figs. 45, 54, 132, 133) apparently smooth, with 1 $^{1}/_{4}$ spiral whorls, clearly demarcated from the beginning of the teleoconch, diameter about 600 µm with nucleus 260 µm. Colour light with a dark brown spiral band, except in the Mauritanian population which is totally dark brown. Microsculpture of protoconch (Figs. 134, 135) only visible with high magnification and forming a rough surface.

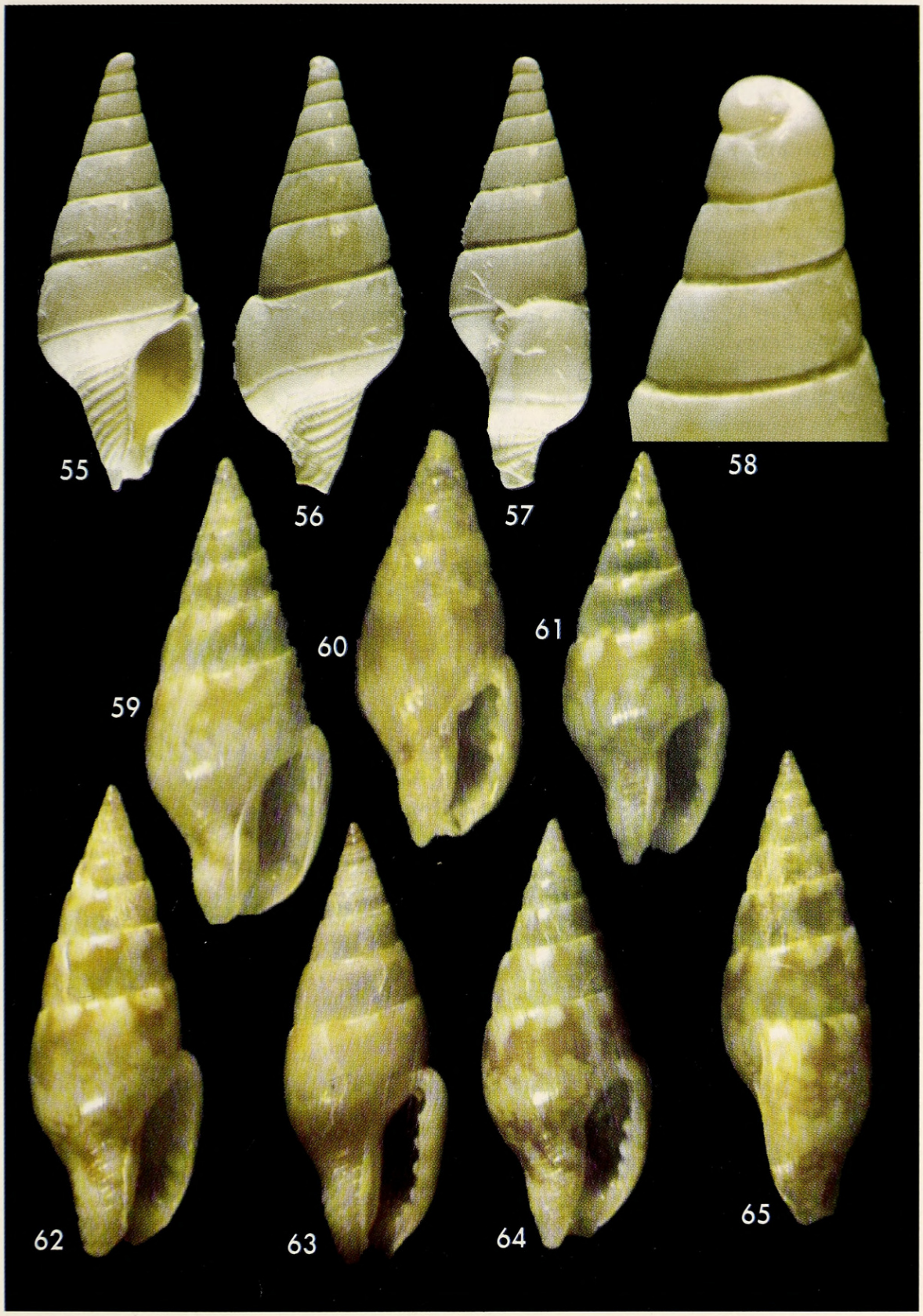
Teleoconch with 4 whorls, shiny, suture not impressed, with whorl profile scarcely convex, without any sculpture. Aperture relatively elongate with small teeth on the columella and about 4-5 denticles on the inner part of the outer lip.

Colour light brown to yellowish on background, lighter near the suture and with a band in the middle of the last whorl; numerous, whitish or cream ocellate patterns superimposed on this background all over the surface. Aperture elongate and narrow. External lip wide, thicker externally.

Dimensions: Usually between 4.5 and 5.3 mm.

Soft parts in Mauritanian population (Fig. 169) creamy-white, with numerous circular grey ocelli and dark rings in the middle of the tentacles and the extremity of the siphon.

Radula (Fig. 156) studied in specimens from l'Etoile, Mauritania and Sacomar, Angola, with central tooth



Figures 55-58. *Mitrella dartevellei*. 55-57: holotype, 8.9 mm, Gabon, (ZMC) ; 58: protoconch. Figures 59-65. *Mitrella melvilli*. 59-61: shells, 8.5, 7.2, 7.4 mm, Palmeirinhas (CER); 62-65: shells, 10.7, 10.3, 9.8, 10.7 mm, off Luanda, 40-60 m (CER).
Figuras 55-58. Mitrella dartevellei. *55-57: Holotipo, 8,9 mm, Gabón, (ZMC) ; 58: Protoconcha. Figuras 59-65.* Mitrella melvilli. *59-61: conchas, 8,5, 7,2, 7,4 mm, Palmeirinhas (CER); 62-65: conchas, 10,7, 10,3, 9,8, 10,7 mm, Luanda, 40-60 m (CER).*

three times as wide as long with hardly acute posterior corners. Lateral teeth about three times as long as wide, with strongly twisted base; cutting edge of laterals with basal cusp relatively wide at the base and blunt distally, central cusp narrow and sharpened, apical cusp longer and acute.

Operculum (Figs. 143, 165) corneous, ovoid, light brown, with the insertion partially divided by a prominence.

Distribution: *M. psilla* is known from Mauritania, Senegal and Angola.

It is curious that we have not found shells of the present species in the area located between Senegal and Angola, mainly in Ghana, well sampled by Peter Ryall (pers. comm.) and by the author, neither is it referred to by BERNARD (1984) in his book on Shells of Gabon. The presence of this species in some parts of this poorly known area is very probable, but also possibly the species has a bipolar distribution.

Remarks: The shells from Mauritania (Figs. 35-44) are frequently darker in colour, more translucent, and with an evanescent colour pattern, in which the circles are not well delimited; sometimes these shells are almost without any pattern. The colour of the protoconch and the first whorls is dark brown.

The shells from Dakar are similar but the colour pattern of circles is usually well marked and evident.

The shells from Angola (Sacomar and Praia Amelia) (Figs. 46-52) are more defined in colour and in ocellate pattern; the colour of the protoconch is light yellow with a darker sutural band; the shells from Baia das Pipas are similar but more translucent (Figs. 53).

In spite of the differences found between populations from Mauritania, Senegal and Angola, the comparison of the characters of the shell, size, protoconch, microsculpture of the protoconch and radula did not show differences. We therefore consider all these populations conspecific.

This species has been synonymized with doubts by WAGNER AND ABBOTT (1978) with *Mitrella baccata* (Gaskoin, 1852), from the Caribbean, but this species is different, with only some similarities in the shell.

Mitrella broderipi (G.B. Sowerby, 1844), described from Alborán Sea but present in north Africa, is larger and wider, more solid, has a wider protoconch (see Figs. 131 and 132), and different radula (Figs. 155 and 156) and operculum (Figs. 142 and 143).

M. alvarezi Rolán and Luque, 2001, from the Cape Verde Islands, is another small species and sometimes has ocelli, but is smaller and the radulae (Figs. 151 and 156) and operculum (Figs. 162 and 165) are also different.

Mitrella denticulata (Duclos in Chenu, 1840), living in Senegal, is similar but larger, darker, with ocelli only in few bands, larger light blotches below the suture and a light apex.

Mitrella dartevellei (Knudsen, 1956) (Figs. 55-58)

Pyrene dartevelli Knudsen, 1956. *Atlantide Report*, 4: 31, plate 2, figs. 8, 9. [Type locality: Stn. 123, 2° 03'S, 9° 05'E, 50 m off Gabon].

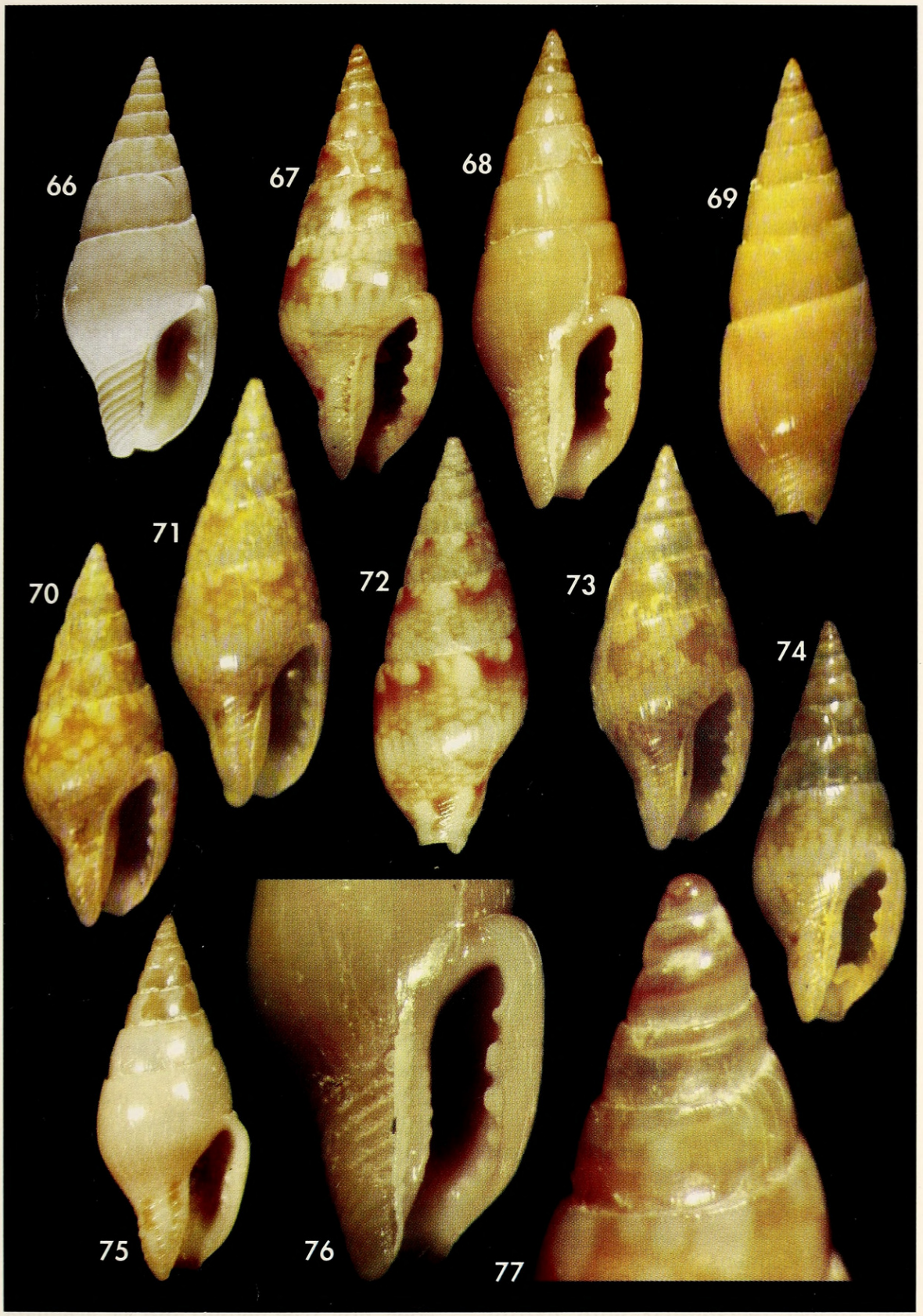
Type material: Holotype in ZMUC (Figs. 55-58).
Other material examined: Gabon: 2 s, "N' kondo" oilfield, 2° 34.1' S, 9° 00' E, 120 m (MNHN).

Description: See KNUDSEN (1956). Shells have been illustrated in KNUDSEN (1956) and in BERNARD (1984). The protoconch is paucispiral (Fig. 58).

Dimensions: Type material 8.9 to 9.3 mm in length.

Distribution: Only known from Gabon, where it is probably endemic.

Remarks: The narrow base, the deep suture and the peripheral groove, always very evident, are diagnostic characters that clearly differentiate it from other species of the area of study.



Figures 66-77. *Mitrella melvilli*. 66: holotype, 8.9 mm (ZMUC); 67-75: shells, 9.5, 11.0, 11.0, 8.6, 9.4, 9.5, 10.0, 9.6, 8.9 mm, Corimba, Luanda, 20 m (CER); 76: detail of the aperture; 77: protoconch.

Figuras 66-77. Mitrella melvilli. 66: holotipo, 8,9 mm (ZMUC); 67-75: conchas, 9,5, 11,0, 11,0, 8,6, 9,4, 9,5, 10,0, 9,6, 8,9 mm, Corimba, Luanda, 20 m (CER); 76: detalle de la abertura; 77: protoconcha.

Mitrella melvilli Knudsen, 1956 (Figs. 59-77, 140, 158, 167)

Pyrene melvilli Knudsen, 1956. *Atlantide Report*, 4: 33, pl. 2, fig. 11. [Type locality: Stn. 145, 9° 20'N, 14° 15'W, 32 m, Guinea Conakry].

Type material: Holotype (Fig. 66) of *Mitrella melvilli* in ZMUC.
Other material examined: Senegal: 1 s, Dakar, 14° 23.5' N, 17° 24.5' W, 65-70 m (MNHN). Ivory coast: 7 s, Abidjan region (MNHN). Nigeria: 2 s, 04° 03' N, 06° 12' E (MNHN). Congo: 1 s, Pointe Noire, Plage Mardamie (CPH). Angola: 56 sp, 10 s, Corimba, Luanda, 10-20 m (MNHN); 106 sp, 12 s, 23 j, Corimba, Luanda, 20 m (CER); 12 s, 26 j, Mussulo (MNHN); 24 sp, 4 s, 2 j, Ilha de Luanda, 40-60 m (MNHN); 10 sp, 5 s, 6j, off Mussulo, Luanda, 90-100 m (MNHN); 2 s, Palmeirinhas, Luanda (MNHN); 20 sp, 19 s, 10 j, Palmeirinhas, Luanda, 4-8 m (CER); 4 s, 6 j, Piambo, 3 m (CER); 1 s, Punta das Lagostas, 5-20 m (MNHN); 10 sp, 3 s, Luanda, 10 m (CER); 3 sp, 10 s, 5 j, off Luanda, 40-60 m (CER); 8 sp, 6 s, 8 s, Praia Amelia, 5 m (CER).

Description: See also KNUDSEN (1956). Shell (Figs. 59-75) rather solid, elongate and sharply pointed.

Protoconch (Figs. 77, 140) with 3 1/4 smooth spiral whorls, scarcely convex with a nucleus of about 130 µm and a diameter of about 650 µm, difficult to measure because the protoconch and the beginning of the teleoconch are not clearly demarcated. Colour of protoconch light brown, sometimes with a more evident spiral band.

Teleoconch with about 6-7 spiral whorls which are smooth, shiny, almost flat in profile, with a superficial suture, and a narrow shelf.

Aperture (Fig. 76) narrow, columella curved with very small tubercles, about 6 in number. External lip with about 6 teeth, the second and the third from the upper part larger than the rest.

Colour pattern consisting of a cream background and yellowish or light brown irregular ovoid figures, forming a net, larger below the suture. In some parts this pattern changes to one of brown blotches.

Dimensions: holotype 8.9 mm; largest shells studied 11.5 mm.

Soft parts unknown.

Radula (Fig. 158), studied in Angolan specimens, with a central tooth two and a half times as wide as long and almost rectangular with hardly acute posterior corners. Lateral teeth about three times as long as wide, with strongly twisted base; cutting edge of laterals with basal cusp wide in the base and rounded distally, central cusp short and sharpened, and apical cusp much longer and acute.

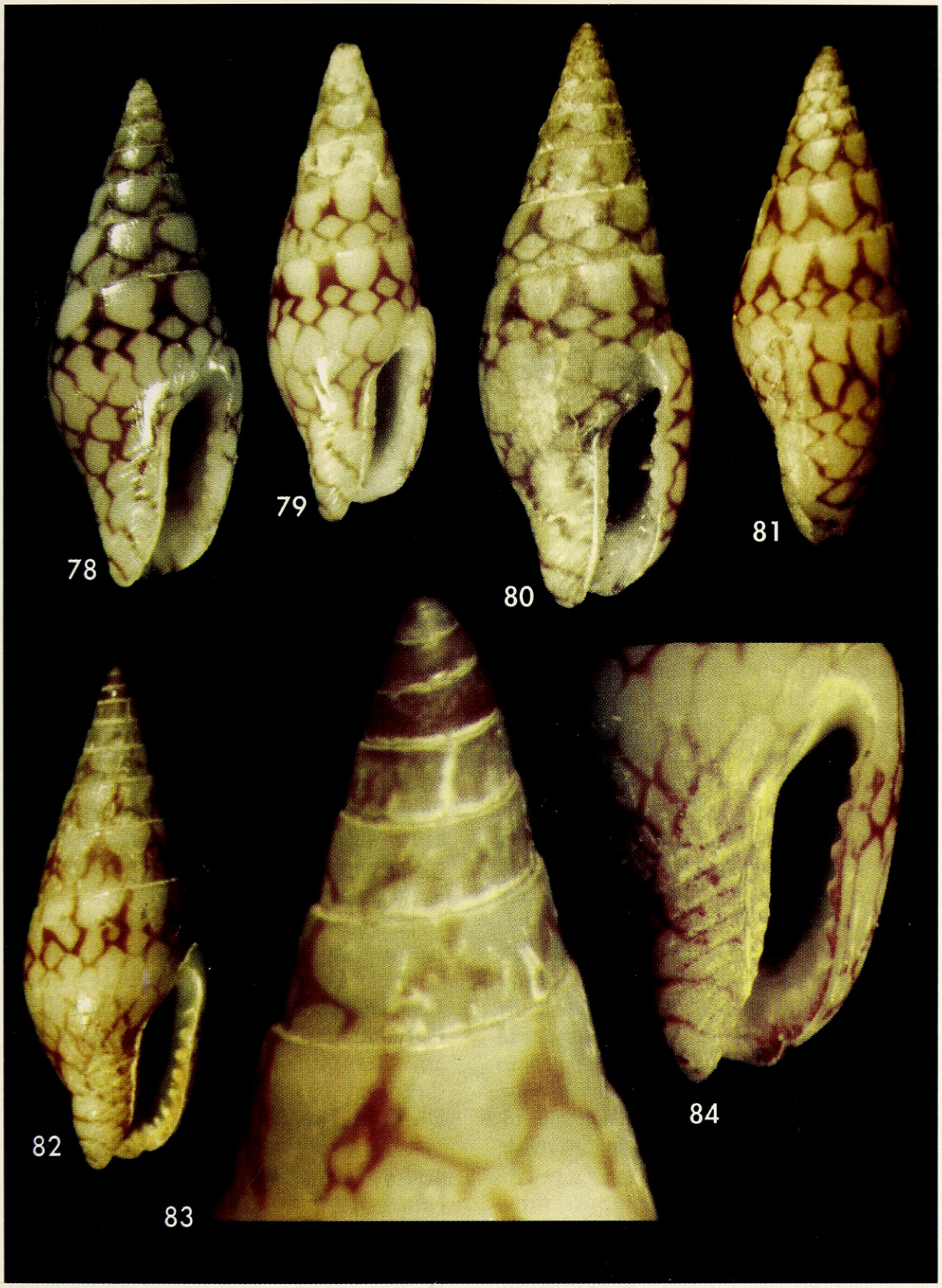
Operculum (Fig. 167) ovoid and somewhat elongate, light brown, almost transparent, with an ovoid mark of insertion which has an angular prominence in the middle.

Distribution: Described from Guinea Conakry, this species is also known from Senegal, Ivory Coast, Nigeria and Angola. Probably not present in islands of the Gulf of Guinea (São Tomé, Principe, Annobon) never found in spite of many samplings.

Remarks: The holotype of *M. melvilli* is a slightly faded shell but it still retains the typical pattern of the species in the first whorls.

HEDLEY (1899) described a *Columbella melvilli* from Micronesia (Funafuti). Hedley's species is not a true *Columbella* and if it is indeed a *Mitrella* this could mean that the name for the African species is pre-occupied. The characters of the Hedley species probably fit better within *Pyrenola* Iredale, 1918, which was considered a subgenus of *Mitrella*, but may be a true valid genus. For this reason, and pending of further study, we keep the name *M. melvilli* for the African species.

The closest species are *M. africana* spec. nov. (see below) and *M. aemulata* spec. nov. (see below for differences). *M. africana* has a multispiral protoconch, but is different in colouration, and lives sympatrically in some areas; *M. aemulata* has a paucispiral protoconch.



Figures 78-84. *Mitrella africana* spec. nov. 78: holotype, 8.8 mm, Palmeirinhas, Luanda, Angola (MNCN); 79: shell, 7.5 mm, Miamia, Ghana (CER); 80, 81: shells 9.1, 7.9 mm, Mbini, Equatorial Guinea (CER); 82: shell, 7.9 mm, Palmeirinhas, Angola (CER); 83: protoconch of the shell of the Figure 82; 84: detail of the aperture, shell of the Figure 82.

Figuras 78-84. Mitrella africana *spec. nov. 78: holotipo, 8,8 mm, Palmeirinhas, Luanda, Angola (MNCN); 79: concha, 7,5 mm, Miamia, Ghana (CER); 80, 81: conchas 9,1, 7,9 mm, Mbini, Equatorial Guinea (CER); 82: concha, 7,9 mm, Palmeirinhas, Angola (CER); 83: protoconcha de la concha de la Figura 82; 84: detalle de la abertura, concha de la Figura 82.*

Mitrella africana spec. nov. (Figs. 78-84, 141, 157, 164, 168)

Type material: Holotype (Fig. 78) in MNCN (15.05/46629). Paratypes in the following: AMNH (1), BMNH (1), MNHN (1), ZSM (1), CJH (1), CFB (1), CER (8), CPR (1), all from the type locality.
Other material examined: Senegal: 5 s, Region de Dakar (MNHN); 1 s, Fleuve Casamance, Zinguinchor, 3-4 m (MNHN). Guinea Conakry: 3 s, Mission Gruvel (MNHN); 3 s, Iles Bissagos, Mission Gain (MNHN); 15 sp, 47 s, 10 j, Ile de Los, 8-18 m (MNHN). Ivory Coast: 3 s, drag. continental shelf (MNHN). Ghana: 8 s, Miamia, 8-12 m (CER); 5 sp, 3 s, Takoradi, 4-8 m (CER); 1 sp, Busua, between the beach and Abokwa Islet, 5 m (CER). Equatorial Guinea: 3 s, Mbini, intertidal (CER). Gabon: 4 sp, Cap Esterias, 0-3 m (MNHN). São Tomé e Principe: 4 s, Baia de Santo Antonio, Principe, 8 m (CER). Congo: 1 sp, 12 s, ORSTOM beach, Pointe Noire, 5-7 m (MNHN). Angola: 3 s, region Ambrizete 07° 17.49' N, 12° 53.05' E (MNHN); 40 sp, 68 s, 27 j, Barra do Dande, Bengo, infralitoral rocks (MNHN); + 300 sp, + 100 s, Cacuaco, Bengo, infralittoral rocks (MNHN); 1 s, off Luanda, 40-60 m (CER); 1 sp, Cacuaco, Luanda, 2-6 m (CER); 2 s, Cabo Ledo, Luanda, 40 m (MNHN); 1 sp, Morro dos Veados, intertidal (CER); 1 s, 1 j, Palmeirinhas, 3-6 m (CER).
Type locality: Luanda, Angola.
Etymology: The name reflects the widespread distribution of this species along the West African coast.

Description: Shell (Figs. 78-82) solid, lanceolate, with a pointed spire.

Protoconch (Figs. 83, 141) smooth, of about 2 1/2 slightly convex spiral whorls, with a diameter of about 520 µm and a nucleus of 120 µm, difficult to measure because the protoconch and the beginning of the teleoconch are not clearly demarcated. Colour of protoconch light brown or cream, sometimes with a more evident dark, spiral band.

Teleoconch with about 6 spiral whorls which are smooth, shiny, almost flat in profile, with a superficial suture, almost smooth.

Aperture (Fig. 84) narrow, columella curved with very small, inconspicuous tubercles. External lip with about 6 teeth of similar size in the upper part, and smaller ones in the lower part.

Colour pattern formed by a whitish-cream background and a reddish reticulation forming ovoid figures from which the subsutural are larger.

Dimensions: Holotype 8.8 mm, largest shell studied 10 mm.

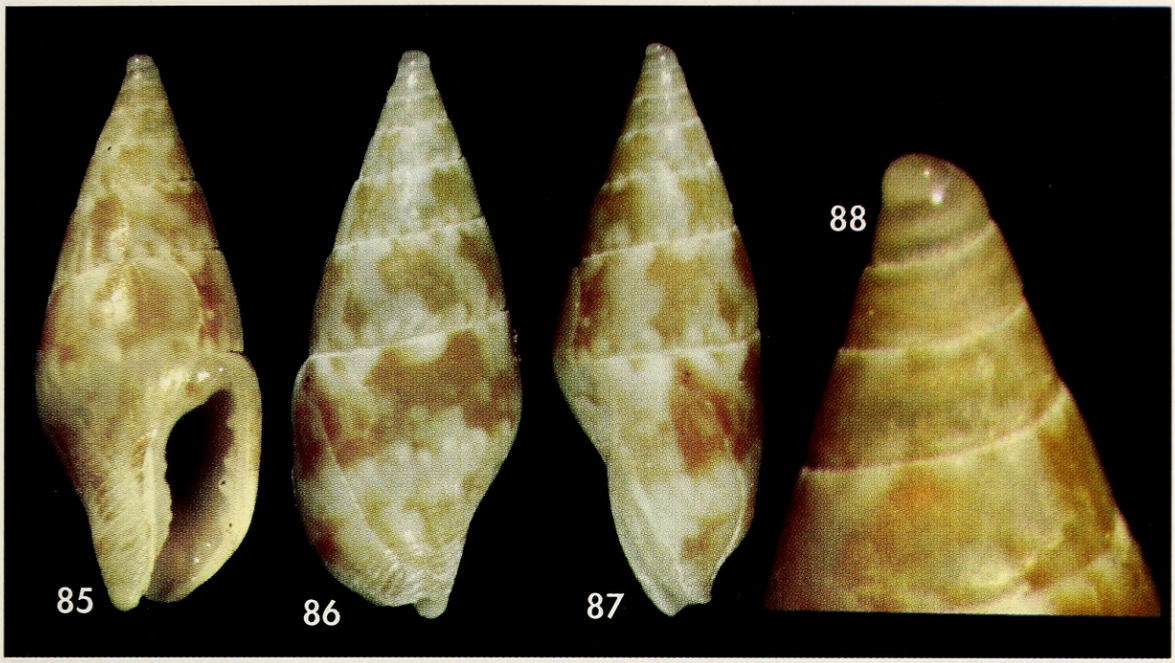
Animal (Fig. 168) drawn from material collected in Ghana: background colour cream with small yellowish spots; irregular blotches of violet-reddish (similar to that of the shell) along the lateral sides of the foot, on the tentacles, behind the eyes and on the siphon, with a ring of this colour near the tip.

Radula (Fig. 157) with a central tooth three times as wide as long and with hardly acute posterior corners. Lateral teeth about three times as long as wide, with strongly twisted base; cutting edge of laterals with basal cusp relatively wide basally and blunt distally, placed close to the central one, which is close to the apical, both being short and acute.

Operculum (Fig. 164) light brown, ovoid, rather transparent, with a mark of insertion of similar form, which is almost divided in two by an elongate prominence along the middle part of the longer axis.

Distribution: From Senegal to Angola, including the islands of the Guinean Gulf.

Remarks: This species has been illustrated from Gabon in KNUDSEN (1956) and BERNARD (1984) as *Pyrene parvula* (Dunker, 1847). The taxon *M. parvula* Dunker, 1847 is (after RIOS, 1985) a synonym of *M. argus* (Orbigny, 1842) and this species is considered by DE JONG AND COOMANS (1977) synonym of *M. dichroa* Sowerby, 1844. The type locality mentioned in the original description is "Ind. occid.?" and this is commented in PACE (1902) and in VAN AARTSEN *ET AL.* (1984). The type material is not known. The description of this taxon is not corresponding clearly with any West African species and so we agree with van AARTSEN *ET AL.* (1984) considering it *nomen dubium*. Furthermore, this name probably is pre-occuped by *Fusus bucci-*



Figures 85-88. *Mitrella aemulata* spec. nov. 85-87: holotype, 7.7 mm, Annobon (MNHN); 88: protoconch.
Figuras 85-88. Mitrella aemulata *spec. nov. 85-87: holotipo, 7,7 mm, Annobón (MNHN); 88: protoconcha.*

noides var. *parvula* Grateloup, 1833 and by *Buccinum columbelloides* var. *parvula*, Grateloup, 1847. The American shell of *M. dichroa* is similar but a little smaller and the brownish spiral part among the ocelli is on the lower part of the whorls instead to be subsutural.

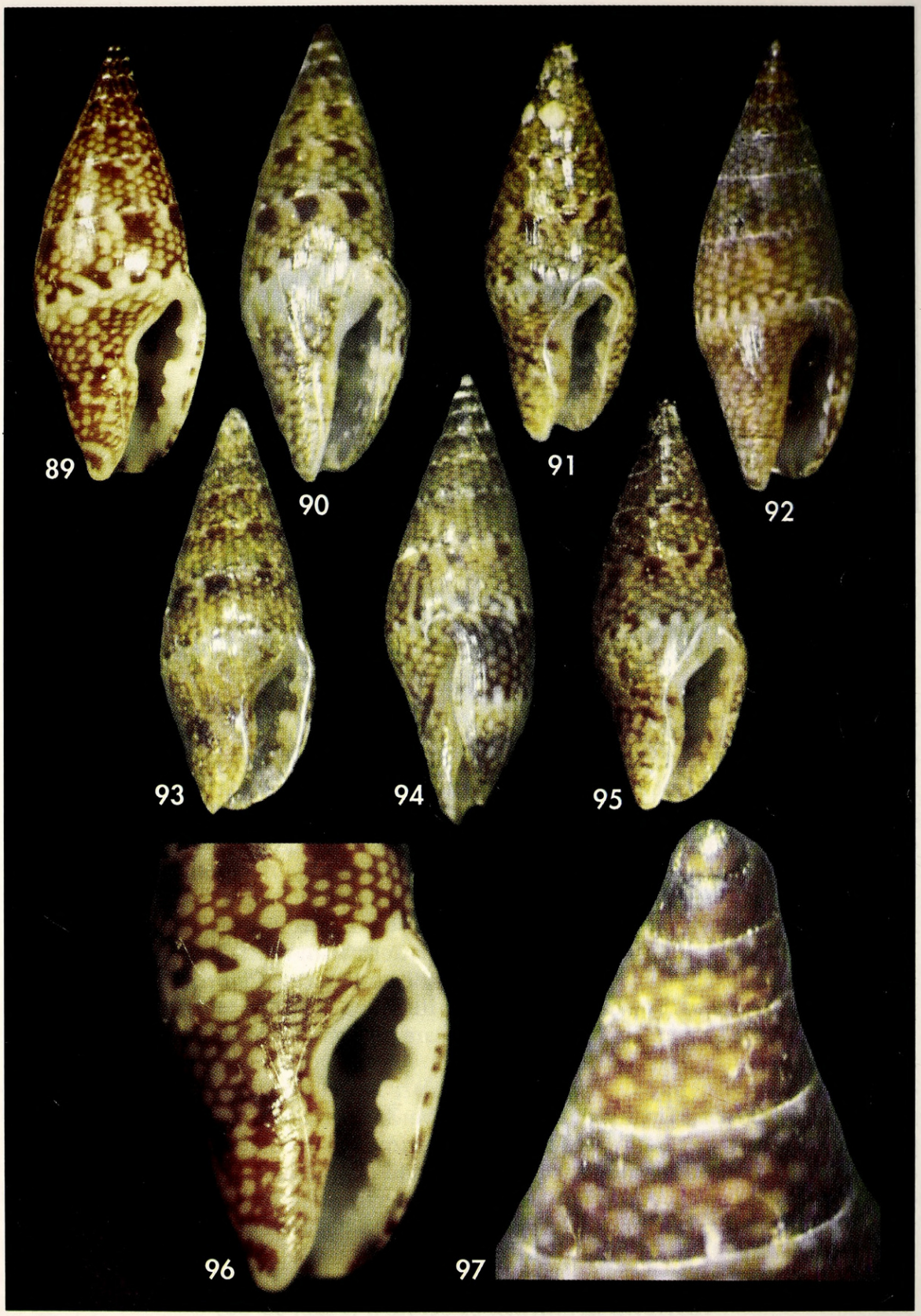
The West African closest species to *M. africana* is the sympatric *M. melvilli* Knudsen, 1956 which is similar in size and pattern, both having a multispiral protoconch. *M. africana* has only about 2 1/2 whorls of protoconch, while *M. melvilli* has 3 1/4 (see Figs. 140, 141). The colour is yellowish in *M. melvilli* but reddish in *M. africana*. Finally, the colour pattern is similar, but better differentiated in *M. africana* where the subsutural oval figures are always very well marked, and more constant, while in *M. melvilli* it may even disappear, being more variable, with parts bearing only light brown blotches. The apertural tubercles on the external lip are different, the second-third are larger in *M. africana*. In Angola, both species live sympatrically in several places.

M. ocellata Gmelin, 1791, from the north of the West African coast, has a pattern with ocelli but its size is larger, the ocelli more uniform, and the operculum (see Figs. 144 and 164) and radulae are different (see Figs. 153, 154 and 157).

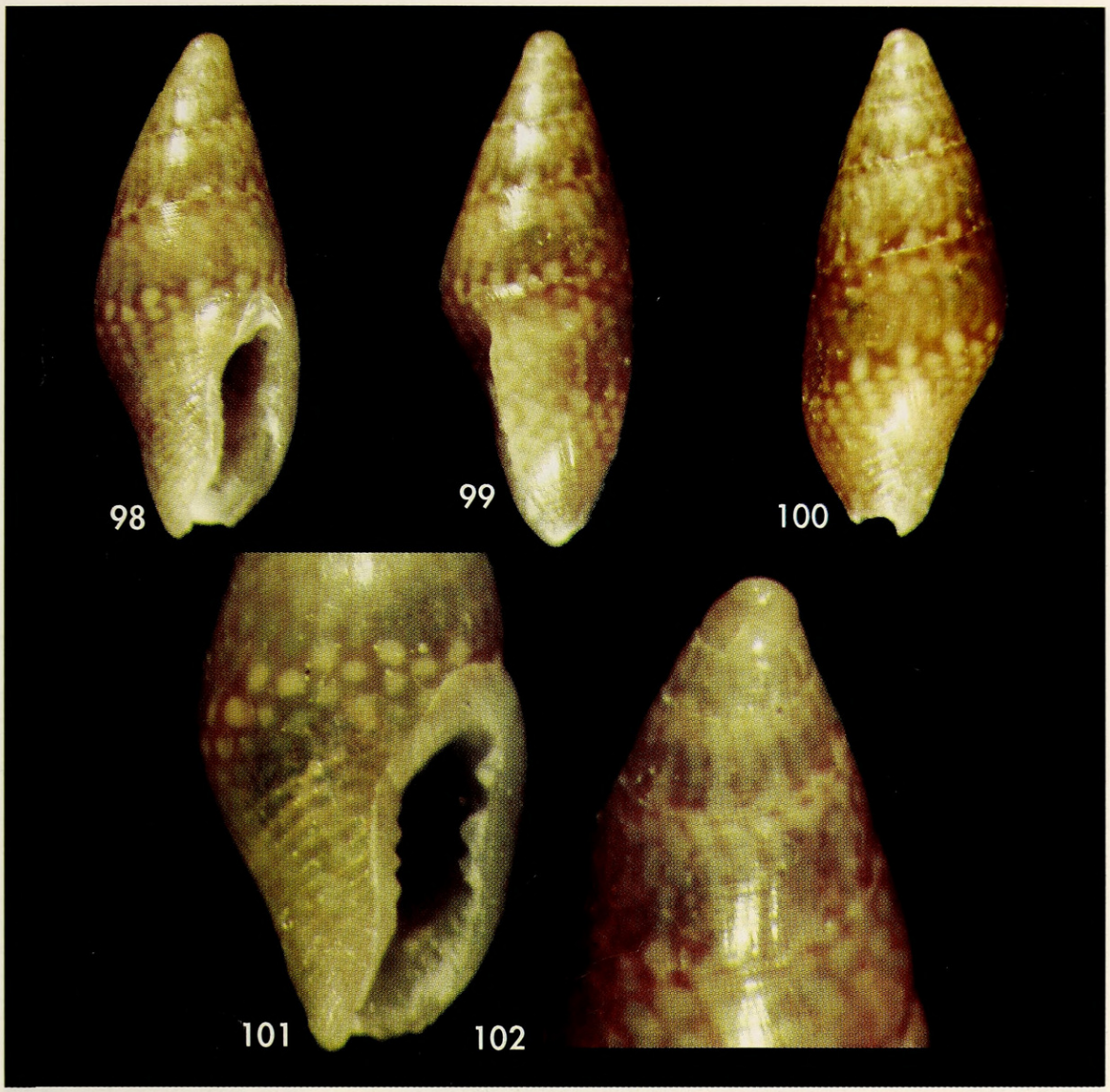
Some colour forms of *Anachis valledori* Rolán and Luque, from the Cape Verde Islands, may be confused with *M. africana*, but that species always has axial ribs, a paucispiral protoconch and differences in radula (see Figs. 150 and 157) and operculum (Figs. 161 and 164).

Mitrella aemulata spec. nov. (Figs. 85-88)

Type material: Holotype (Figs. 85-87) in MNHN (from A. Crosnier coll.).
Other material examined: Equatorial Guinea: 3 f, 1 j, San Antonio de Palé, Annobon (CER), 2-3 m.
Type locality: Equatorial Guinea, Annobon, 1° 26′ S, 5° 37′ 30″E, 20-40 m.
Etymology: The specific name is derived from the latin word "aemulatus" which means "imitate", and makes allusion to the similarity of this species with *M. melvilli*.



Figures 89-97. *Mitrella inesitae* spec. nov., Esprahinha, São Tomé. 89: holotype, 10.0 mm (MNCN); 90-95: paratypes: 10.8 (MNHN), 9.6 (BMNH), 10.5 (AMNH), 10.1 (ZSM), 10.5 (CER) and 9.4 mm (CER); 96: detail of the aperture of the holotype; 97: protoconch of the holotype.
Figuras 89-97. Mitrella inesitae *spec. nov., Esprahinha, Santo Tomé. 89: holotipo, 10,0 mm (MNCN); 90-95: paratipos: 10,8 (MNHN), 9,6 (BMNH), 10,5 (AMNH), 10,1 (ZSM), 10,5 (CER) y 9,4 mm (CER); 96: detalle de la abertura del holotipo; 97: protoconcha del holotipo.*



Figures 98-102. *Mitrella saotomensis* spec. nov. 98-100: holotype, 4.4 mm, Praia Mutamba, São Tomé (MNCN); 101: detail of the aperture of a paratype (CER); 102: protoconch of the holotype. *Figuras 98-102.* Mitrella saotomensis *spec. nov. 98-100: holotipo, 4,4 mm, Praia Mutamba, Santo Tomé (MNCN); 101: detalle de la abertura de un paratipo (CER); 102: protoconcha del holotipo.*

Description: Shell (Figs. 85-87) ovoid elongate, solid, with a last whorl more than half the height.

Protoconch (Fig. 88)) with only one smooth spiral whorl, with a diameter of about 750 µm. Colour of protoconch light brown with two dark bands above and below the suture.

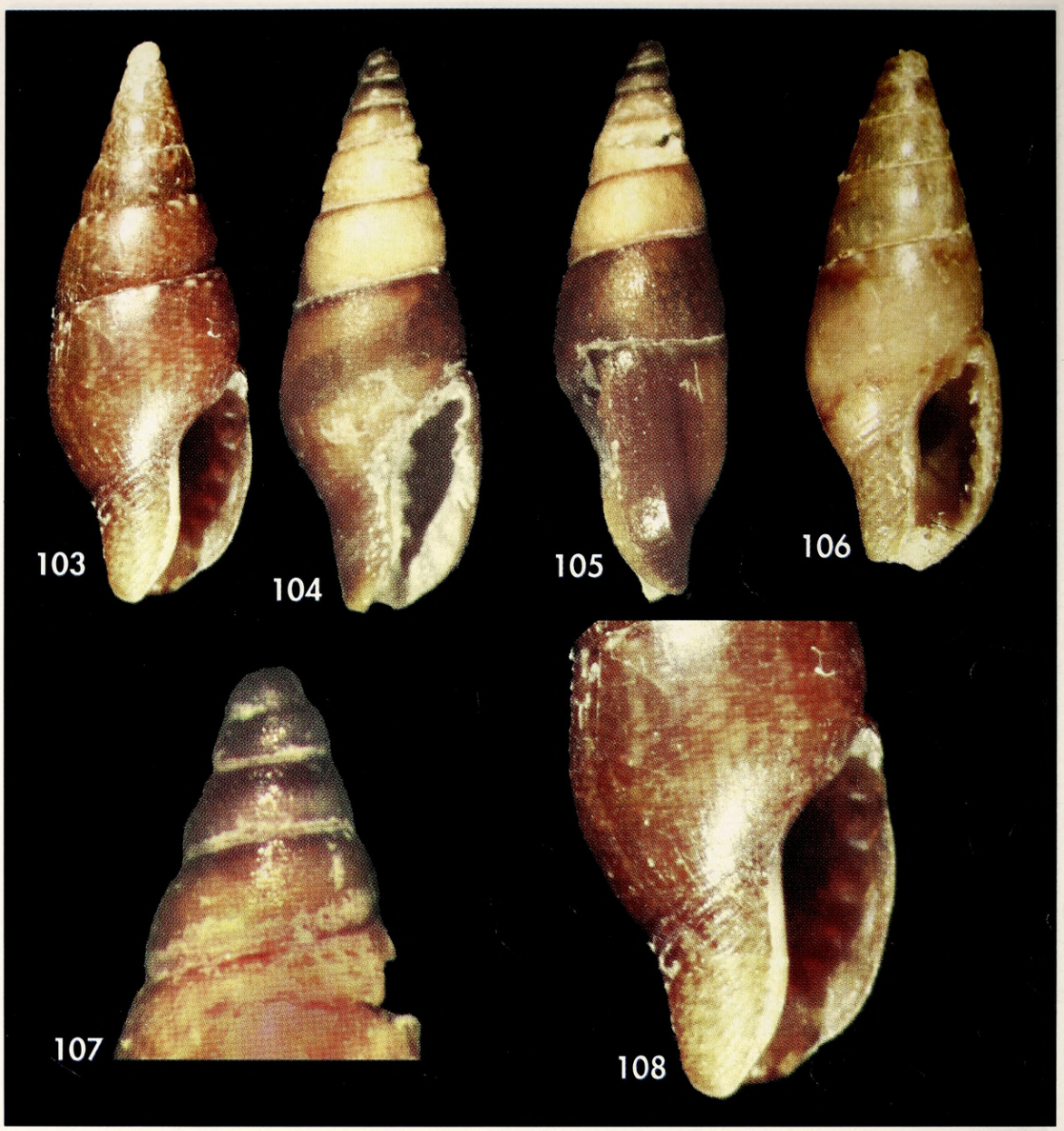
Teleoconch with about 5 spiral whorls which are smooth, shiny, almost flat in profile, with a superficial suture.

Aperture narrow, columella S-shaped with very small tubercles, about 5 in number. External lip, with about 6 teeth, the second and third from the top being a little larger than the rest.

Colour pattern formed by a cream background and a yellowish or light brown irregular reticulation forming ovoid figures, which are larger below the suture, with a suprasutural spire band formed by small, white, axial blotches.

Dimensions: Holotype 7.7 mm in length.

Distribution: Only known from the holotype and some fragments from



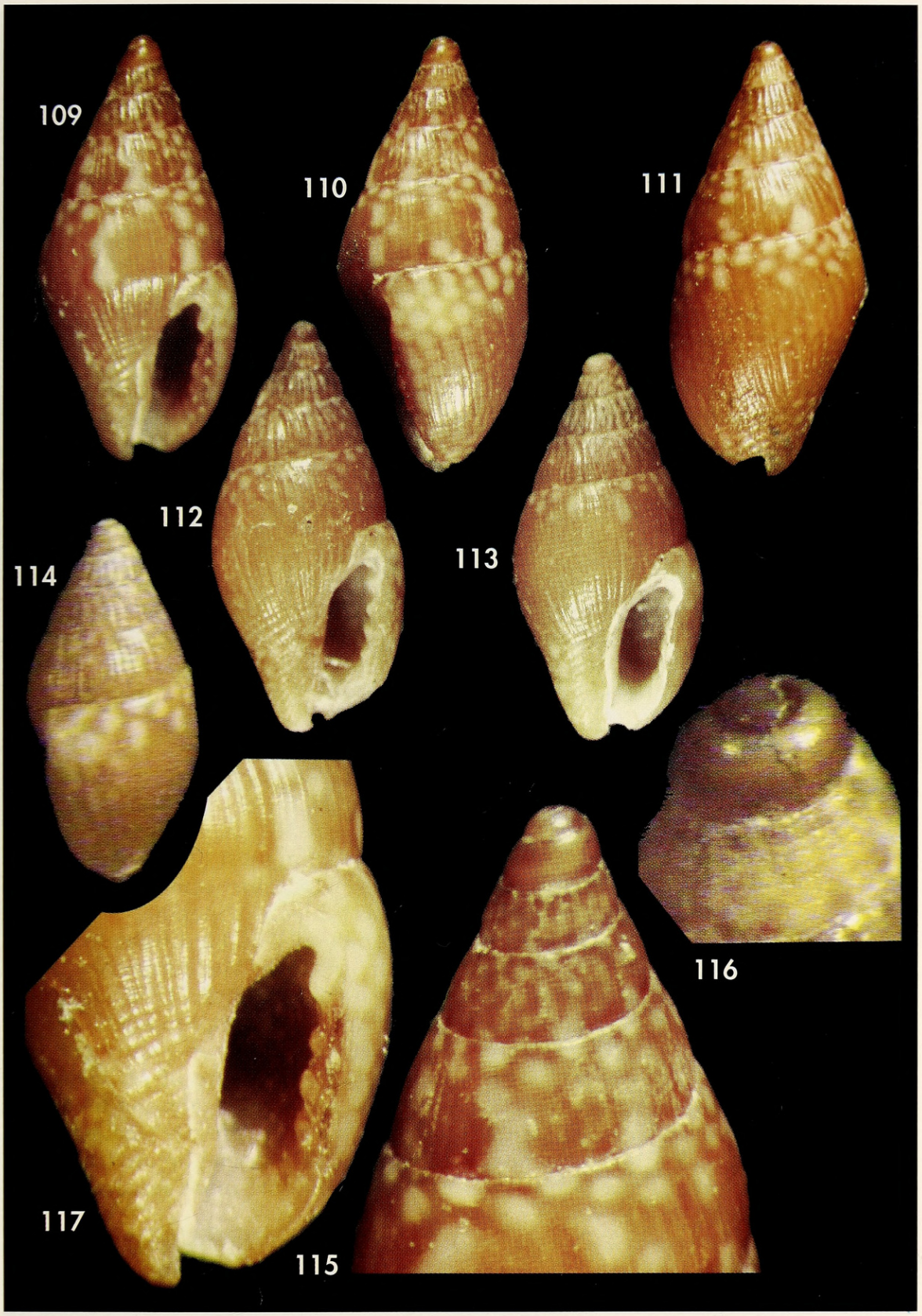
Figures 103-108. *Mitrella tenebrosa*. 103: holotype, 8.4 mm, Esprainha, São Tomé (MNCN); 104, 105: paratype, 8.0 mm, (CPR); 106: paratype, 7.6 mm, (MNHN); 107: protoconch; 108: detail of the aperture.

Figuras 103-108. Mitrella tenebrosa. *103: holotipo, 8,4 mm, Esprainha, Santo Tomé (MNCN); 104, 105: paratipo, 8,0 mm, (CPR); 106: paratipo, 7,6 mm, (MNHN); 107: protoconcha; 108: detalle de la abertura.*

Annobon island, from where it is probably endemic.

Remarks: The most similar species to *M. aemulata* is *M. melvilli*, from continental Gulf of Guinea, but the protoconch of this latter species is multispiral, while that of *M. aemulata* is paucispiral with only one spiral whorl. It is probable that this species originated from a common ancestor with *M. melvilli* and, living in isolated conditions in an insular area, evolved from a planktotrophic to a lecitotrophic larval development.

Mitrella bruggeni van Aartsen, Menkhorst and Gittenberger, 1984, from the Mediterranean and Canary Islands, has a similar aspect but is larger and wider, with a more ovoid aperture and more denticles on the outer lip.



Figures 109-117. *Mitrella annobonensis*. 109-111: holotype, 4.8 mm, San Antonio de Palé, Annobon, Guinea Equatorial (MNCN); 112-114: paratypes: 4.7 mm (MNHN), 4.5 mm (AMNH), 4.0 mm (CER), all from type locality; 115, 116: protoconch; 117: detail of the aperture. *Figuras 109-117.* Mitrella annobonensis. *109-111: holotipo, 4,8 mm, San Antonio de Palé, Annobón, Guinea Equatorial (MNCN); 112-114: paratipos: 4,7 mm (MNHN), 4,5 mm (AMNH), 4,0 mm (CER), todas de la localidad tipo; 115, 116: protoconcha; 117: detalle de la abertura.*

Mitrella inesitae spec. nov. (Figs. 89-97, 136, 145-147, 166)

Type material: Holotype (Fig. 89) deposited in the MNCN (15.05/46630). Paratypes in the following: AMNH (1, Fig. 92), BMNH (1, Fig. 91), MNHN (1, Fig. 90), ZSM (1, Fig. 93), CJH (4), CFB (10), CER (75, Figs. 94, 95), CPR (1), all from the type locality.
Other material examined: Equatorial Guinea: 12 f, 7 j, San Antonio de Palé, Annobon, 10-15 m (CER). São Tomé: 1 s, Morro Peixe (MNHN); 8 j, Praia Mutamba, infralittoral rocks (MNHN); 3 s, Calypso, st. 14 40° 34' N, 08° 32' W (MNHN); 20 sp, 21 s, 19 j, Esprainha (Neves), infralitoral (MNHN); 136 sp, 14 s, 41 j, Lagoa Azul, 4-8 m (CER); 37 sp, 6 s, 37 j, Esprainha, 6-10 m (CER); 8 s, Praia Mutamba, 4-8 m (CER).
Type locality: Esprainha, east coast of São Tomé, Republic of São Tomé and Principe.
Etymology: The specific name is after the author' s niece Inés Álvarez Torres, of Trubia, Oviedo, Spain, companion on many collecting trips.

Description: Shell (Figs. 89-95) fusiform, solid, with a last whorl larger than half the height.

Protoconch (Figs. 97, 136) short, smooth, difficult to distinguish from the beginning of the teleoconch, with about one and a half whorls, yellowish in colour, sometimes darker, scarcely lighter in the suture, about 620 µm in diameter with nucleus about 230 µm.

Teleoconch with 6-7 whorls, smooth, shiny, suture not impressed, profile almost flat.

Aperture (Fig. 96) elongate and narrow. External lip thickened externally, internally with some teeth present, the first one standing out alone and separated from the second. Second tooth largest, sometimes seeming to be formed by the fusion of two, third tooth a little smaller and the remaining three or four down to the base, very small. Inner lip with small tubercles on its lower part. Siphonal canal short and wide.

Background colour brown, with numerous yellowish or cream ocellate patterns overall, which are small and a little elongated spirally. Subsutural area frequently with larger brown blotches and between them areas with white or cream colour. In some shells, another similar band in the middle of the last whorl, partially visible above the suture of spire whorls. Basal area with 12-16 spiral cords.

Dimensions: Most shells between 9.00 and 11.0 mm, holotype 10.0 mm in height.

Soft parts unknown.

Radula (Fig. 147) with a central tooth two times as wide as long and with rounded corners. Lateral teeth about three times as long as wide with strongly twisted base; cutting edge of laterals with basal cusp wide basally and blunt distally, central and apical cusps narrow and acute.

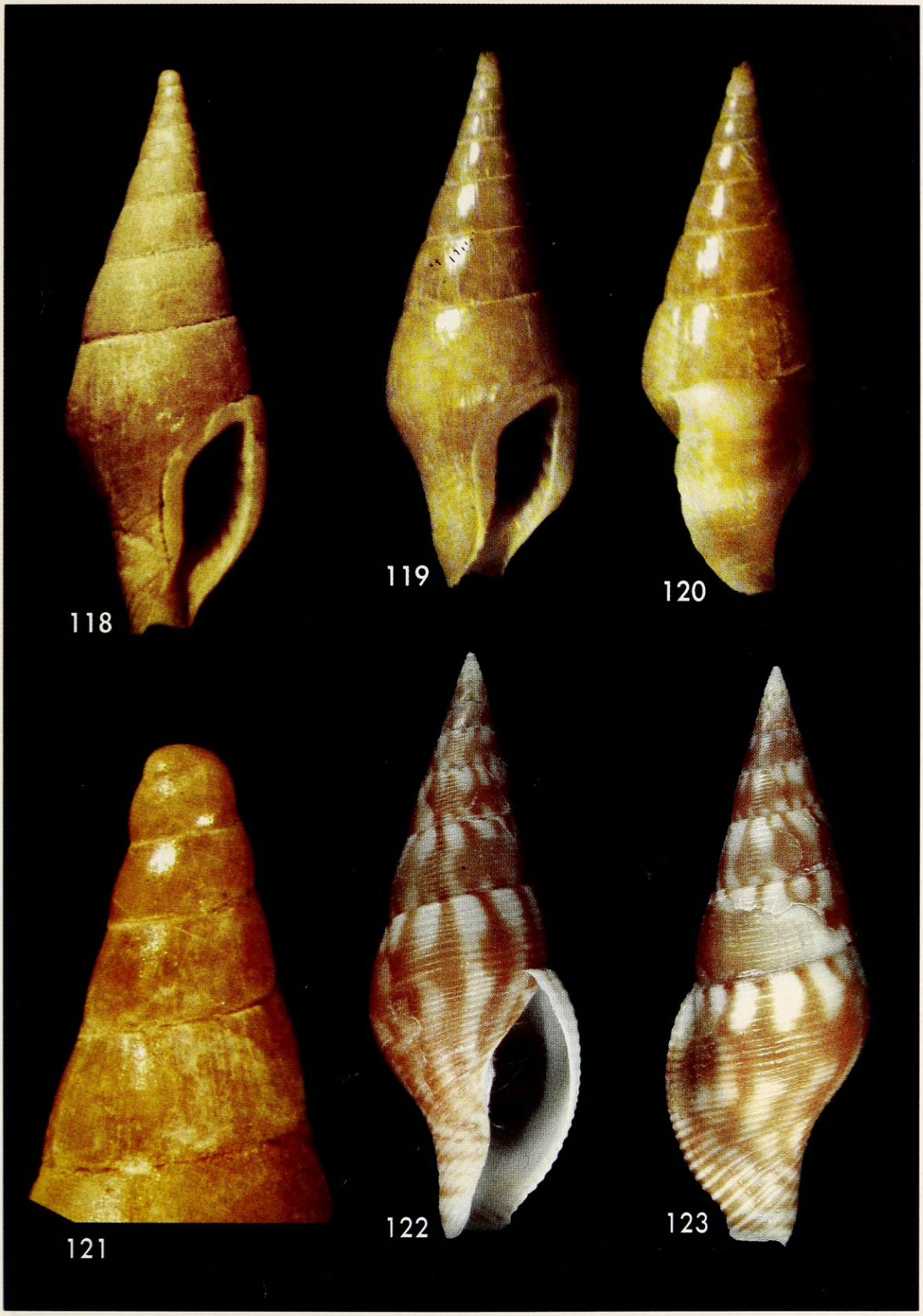
Operculum (Fig. 145, 146, 166) corneous, ovoid, light brownish, with the insertion mark also ovoid elongate and with a very small prominence at the middle.

Distribution: Only known from São Tomé from where it is probably endemic.

Remarks: *Mitrella inesitae* spec. nov. is different from most of the west African species which are smaller, except *M. pallaryi* which is wider, has a multispiral protoconch and a different pattern. The most similar Mediterranean species is *M. scripta* (Linné, 1758) which is larger and with a more variable colour pattern. They can be differentiated because the aperture of *M. inesitae* is relatively more elongate, and the tubercles on the columella are smaller, while those on the external lip are larger, the upper one being more separated from the second.

Mitrella lanceolata (Locard, 1886), from the Mediterranean, is more elongate, with a wider and relatively shorter aperture and a simpler colour pattern.

Some elongate specimens of the Mediterranean *M. gervillii* (Payraudeau, 1826) may have a similar aspect, but they are very large, with a wider aperture and smaller denticulation in it.



Figures 118-121. *Mitrella condei* spec. nov. 118: holotype, 16.5 mm, Santa María, Angola (MNHN); 119-120: paratype, 16.2 mm, Santa Maria, Angola (MNCN); 121: protoconch of the holotype. Figures 122, 123. *Cotonopsis molfinsi*, 40 mm, (CJH).
Figuras 118-121. Mitrella condei *spec. nov. 118: holotipo, 16,5 mm, Santa María, Angola (MNHN); 119-120: paratipo, 16,2 mm, Santa Maria, Angola (MNCN); 121: protoconcha del holotipo. Figuras 122, 123.* Cotonopsis molfinsi, *40 mm, (CJH).*

Mitrella saotomensis spec. nov. (Figs. 98-102, 137)

Type material: Holotype (Figs. 98-100) in MNCN (15.05/46631); paratypes: CER (1 s, without apex, Fig. 101), CJH (2 s).
Other material examined: São Tomé: 14 f, Praia Mutamba, 3-8 m (CJH); 1 f, Praia Mutamba, 2-8 m (CER); 15 f, Lagoa Azul (CHD).
Type locality: Praia Mutamba, São Tomé, 5 m, Republic of São Tome and Principe.
Etymology: The specific name is after the island where the species was collected.

Description: Shell (Figs. 98-100) fusiform, solid, with a last whorl larger than half the height.

Protoconch (Figs. 102, 137) short, smooth, with 1 1/4 spiral whorls, clearly differentiated from the beginning of the teleoconch, because the spiral striation appears, diameter about 500 µm with nucleus 250 µm. Colour of protoconch yellowish with a darker sutural band, and a dark point in the apex.

Teleoconch with 4 whorls, shiny, suture not impressed, whorl profile almost flat. Spiral striae appearing at the beginning of the teleoconch, respectively, 6 in the first whorl, 10 in the second, 16 in the following and more that 60 on the last whorl; very small and closely spaced, except at the base of the shell, where the 17 lower ones are wider and define small spiral cords.

Aperture (Fig. 101) elongate and narrow. External lip widely thickened externally, internally with some teeth, the uppermost standing out alone separated from the upper extreme and from the second one. Second tooth largest, the following one a little smaller, the remaining four teeth, down to the base, very small. Inner lip with 5 small tubercles on its lower part. Siphonal canal short and wide.

Colour yellowish brown on background, darker near the suture with a band on the last whorl which continues the suture; this background covered by numerous yellowish or cream ocelli overall.

Dimensions: Holotype 4.5 mm in height.

Distribution: Only known from São Tomé Island, from where it is probably endemic.

Remarks: The main differences with the most similar species are the following:

Mitrella broderipi (Sowerby, 1844) and *M. bruggeni* van Aartsen, Menkhorst and Gittenberger, 1984, from the Alboran Sea, are larger, wider and with a wider aperture with smaller denticulation.

Mitrella alvarezi Rolán and Luque, 2001, from Cape Verde Islands, is larger, darker, with a more irregular pattern with parts without ocelli, and a totally smooth surface.

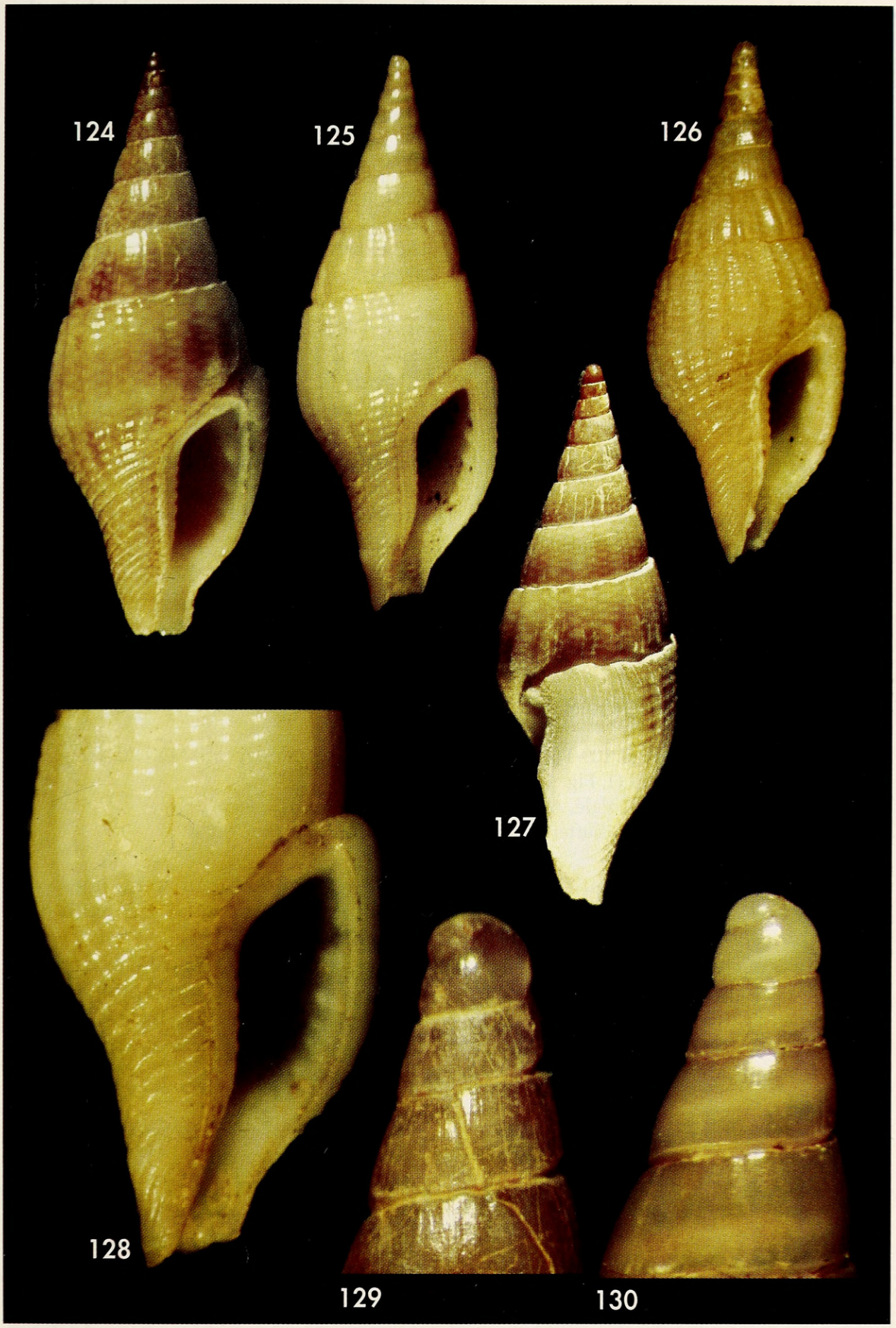
Mitrella psilla, from West Africa, is similar in size or slightly larger, but the shell is wider; its pattern is formed by larger ocelli, the aperture is wider, the teeth of the outer lip are regularly spaced, and it lacks the evident tubercles on the columella.

Mitrella tenebrosa spec. nov. (Figs. 103-108)

Type material: Holotype (Fig. 103) in MNCN (15.05/46632). Paratypes: CER (1), CPR (1, Fig. 104, 105), both from the type locality; MNHN (1, Fig. 106) from Neves, São Tomé.
Type locality: Esprainha, São Tomé, Republic of São Tome and Principe.
Etymology: The specific name alludes to its dark colour.

Description: Shell (Figs. 103-106) fusiform, solid, with a last whorl larger than half the height.

Protoconch (Fig. 107) studied in few shells and not in good condition; apparently short, smooth, perhaps with 1 1/4 to 1 1/2 spiral whorls, but difficult to distinguish from the beginning of teleoconch; diameter about 600 µm with nucleus about 250 µm. Colour of proto-



Figures 124-130. *Strombina descendens*, 124-127: shells of 20.2, 18.8, 20.2, 17.7 mm, Praia Amelia, Namibe, 40-60 m (MNHN); 128: Detail of the aperture; 129, 130: protoconch.
Figuras 124-130. Strombina descendens, *124-127: conchas de 20,2, 18,8, 20,2, 17,7 mm, Praia Amelia, Namibe, 40-60 m (MNHN); 128: detalle de la abertura; 129, 130: protoconcha.*

conch dark brown in the best preserved specimen.

Teleoconch with 4-6 smooth and hardly convex whorls, shiny, with suture impressed. Basal area with 8-10 spiral cords.

Aperture (Fig. 108) elongate and narrow. External lip slightly thickened externally. Internally, 6 strong teeth with a regular separation among them. Inner lip with 6 small tubercles on its lower part. Columella straight in the middle and curved at the extremes. Siphonal canal short and wide.

Background colour dark brown, darker near the suture and with very numerous small oval ocelli overall; in other shells this pattern is not seen because of erosion.

Dimensions: Holotype 8.4 mm in height, other shells slightly smaller.

Distribution: Only known from São Tomé, deeper than 15-20 m. As some crabbed material was collected in Esprainha, it is supposed that the species lives in deeper water.

Remarks: The closest species to *M. tenebrosa* and their main differences are the following:

Mitrella inesitae is sympatric, but its shell is larger, more elongate, wider, and with a more colourful pattern. The aperture is narrower and the upper teeth on the external lip are larger and more separated.

Mitrella pallaryi, from the European and West African coast, is a larger species with a multispiral protoconch.

Mitrella saotomensis is sympatric, and it has a smaller shell and its pattern is formed by circular ocelli. The teeth on the external lip are not regular.

Mitrella africana and *M. melvilli*, from the West African continental coast, have multispiral protoconch, are lighter in colour and the teeth on the external lip are different in size, the upper ones being larger.

Mitrella annobonensis spec. nov. (Figs. 109-117, 138, 139)

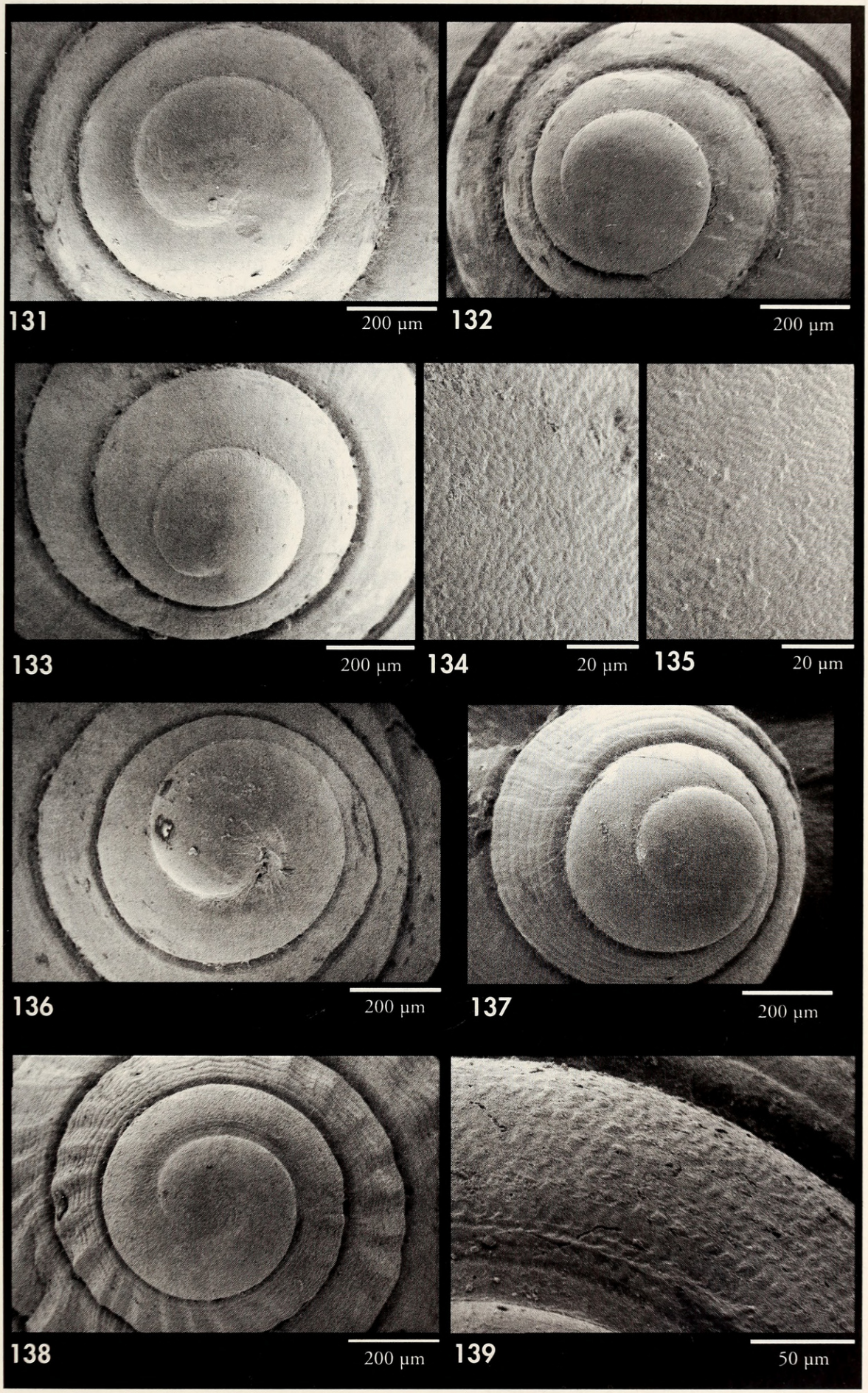
Type material: Holotype (Figs. 109-111) in MNCN (15.05/46633); paratypes in MNHN (1, Fig. 112), AMNH (1, Fig. 113) and CER (1, Fig. 114).
Type locality: San Antonio de Palé, Annobon, 10-15 m, Equatorial Guinea.
Etymology: The specific name is after the island where the species was found.

Description: Shell (Figs. 109-114) ovoid-conical, very solid, with a last whorl which represents 2/3 of the height.

Protoconch (Figs. 116, 138), short, with 1 1/4 whorls, brown in colour, darker along the suture, diameter of about 520 µm with nucleus 230 µm, apparently smooth, but spiral lines with irregular nodules can be seen with high magnification (Fig. 139).

Teleoconch with about 4 whorls, shiny, suture not impressed, whorl profile almost flat. Termination of protoconch well defined because spiral striae appear at the

(Right page) Figures 131-139. Protoconchs and microsculpture. 131: *Mitrella broderipi*, l'Etoile, Nouadibou, Mauritania; 132: *Mitrella psilla*, l'Etoile, Nouadibou, Mauritania; 133: *Mitrella psilla*, Sacomar, Angola; 134: microsculpture of the protoconch of *M. psilla*, Sacomar; 135: microsculpture of the protoconch of *M. psilla*, L'Etoile; 136: *Mitrella inesitae* sp. nov., Lagoa Azul, São Tomé; 137: *Mitrella saotomensis* sp. nov., Praia Mutamba, São Tome; 138: *Mitrella annobonensis* sp. nov., San Antonio de Palé, Annobon; 139: microsculpture of the protoconch of *M. annobonensis* sp. nov.
(Página derecha) Figuras 131-139. Protoconchas y microsculpture. 131: Mitrella broderipi, *l'Etoile, Nouadibou, Mauritania; 132:* Mitrella psilla, *l'Etoile, Nouadibou, Mauritania; 133:* Mitrella psilla, *Sacomar, Angola; 134: microscultura de la protoconcha de* M. psilla, *Sacomar; 135: microscultura de la protoconcha de* M. psilla, *L'Etoile; 136:* Mitrella inesitae *sp. nov., Lagoa Azul, Santo Tomé; 137:* Mitrella saotomensis *sp. nov., Praia Mutamba, Santo Tome; 138:* Mitrella annobonensis *sp. nov., San Antonio de Palé, Annobón; 139: microscultura de la protoconcha de* M. annobonensis *sp. nov.*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beginning of the teleoconch, 8 on the first whorl, 17 on the second, 27 on the following and very numerous and difficult to count on the last whorl. Spiral striae very small and very attenuated in some places. Basal area with about 15 well defined spiral cords. Irregular axial ribs present on all the whorls, about 15 on the first whorl and 25 on the following, less noticeable on the last whorl.

Aperture (Fig. 117) elongate and narrow. External lip widely thickened externally, internally with about 7 teeth, the uppermost being the largest, and the lower smaller. Inner lip with no tubercles. Siphonal canal short and wide.

Background colour reddish brown with numerous yellowish or cream ocelli overall, sometimes less marked on the convexity of the last whorl.

Dimensions: Holotype 4.8 mm in height.

Soft parts, operculum and radula unknown.

Distribution: Only known from Annobon, Equatorial Guinea, from where it is probably endemic.

Remarks: This species may be differentiated from any of the other known West African species of the genus because it is a very solid, short and relatively wider shell, with narrow aperture, and spiral striae:

Mitrella alvarezi Rolán and Luque, 2001 is larger, more fragile, darker, with a more variable pattern partially without ocelli, and a totally smooth surface.

Mitrella psilla is of similar size, but less solid and globose, the aperture is wider and the colour lighter, yellowish, with larger ocelli.

Mitrella broderipi (G. B. Sowerby, 1844) is larger, relatively wider, more fragile, the pattern is formed by larger ocelli, the aperture is wider, the teeth of the outer lip are regularly distant, and lacks tubercles on the columella.

Mitrella condei spec. nov. (Figs. 118-121)

Type material: Holotype (Fig. 118) in MNHN. Paratypes: 1 s, Baia de Lucira (Bissonga), Namibe, Angola (MNHN); 1 s, Santa Maria, Angola, (MNCN 15.05/46634).
Type locality: Praia Amelia, Namibe, Angola.
Etymology: The species is dedicated to the Spanish malacologist Javier Conde, Associate Editor of Iberus, for his continuous help in our work.

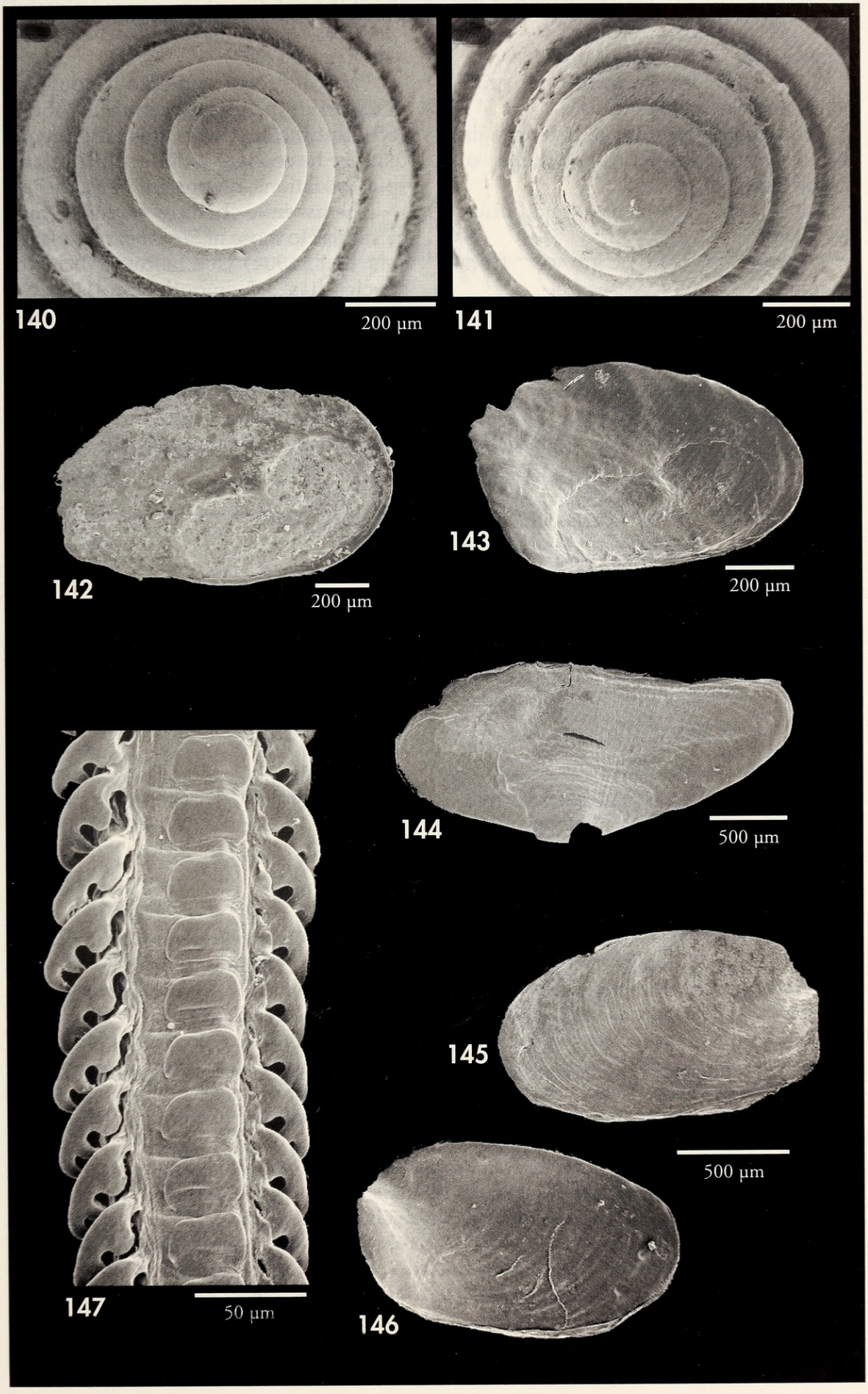
Description: Shell (Figs. 118-120) solid, conical elongate, smooth, with a large last whorl.

Protoconch (Fig. 121) difficult to see due to the lack of separation from teleoconch, probably of about 1 whorl, with diameter about 700 µm.

Teleoconch of about 7 whorls, totally flat, with suture incised but not deep. Last whorl large, with the same height as the spire, and with a peripheral angulation; from this angulation the profile of the shell is concave, the last whorl ending in a narrow base presenting 13 narrow spiral ribs.

Aperture rhomboidal, columella with its central part in the same direction as the axis of the shell, deviated above and below

(Right page) Figures 140, 141. Protoconchs. 140: *Mitrella melvilli*, Luanda, Angola; 141: *Mitrella africana*, Palmeirinhas, Angola. Figures 142-147. Opercula. 142: *Mitrella broderipi*, l'Etoile, Mauritania; 143: *Mitrella psilla*, Sacomar, Angola; 144: *Mitrella ocellata albine*. Dakar, Senegal; 145, 146: *Mitrella inesitae* sp., Lagoa Azul, São Tomé. Figure 147. Radula of *Mitrella inesitae* sp. nov. A. Lagoa Azul, São Tome.
(Página derecha) Figuras 140, 141. Protoconchas. 140: Mitrella melvilli, *Luanda, Angola; 141:* Mitrella africana, *Palmeirinhas, Angola. Figuras 142-147. Opercula. 142:* Mitrella broderipi, *l'Etoile, Mauritania; 143:* Mitrella psilla, *Sacomar, Angola; 144:* Mitrella ocellata albine. *Dakar, Senegal; 145, 146:* Mitrella inesitae *sp., Lagoa Azul, São Tomé. Figure 147. Rádula de* Mitrella inesitae *sp. nov. A. Lagoa Azul, São Tome.*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forming an open S. On the external lip there are 8 teeth continued by lirae, number 2 and 3 being the largest.

Colour light brown formed by small oval ocelli oriented spirally.

Dimensions: Holotype 16.5 mm in height, other known specimens of similar size.

Soft parts, radula and operculum unknown.

Distribution: Only known from Angola.

Remarks: We consider that this species has similarity with *Mitrella minor* Scacchi, 1836, type species of the subgenus *Columbellopsis*, due the characteristic profile and the narrow base. At present, there is not complete agreement about the validity of the genus *Columbellopsis*, as is commented on by BOYER AND ROLÁN (2005).

From its form and size it could be included in the genus *Strombina* Mörch, 1852, but the species of this latter genus usually have clear axial sculpture and spiral striations, no present in *M. condei*.

The juvenile shells of *M. condei* may be similar to those of *Strombina descendens* (Martens, 1904) (see below) since this species has 3-5 smooth whorls and a similar pattern of small oval ocelli. They can be differentiated because *S. descendens* have a wider protoconch (about 150-200 µm more); also the suture is shallow in *M. condei* while it is very deep in *S. descendens* and with an evident separation.

Genus *Cotonopsis* Olsson, 1942

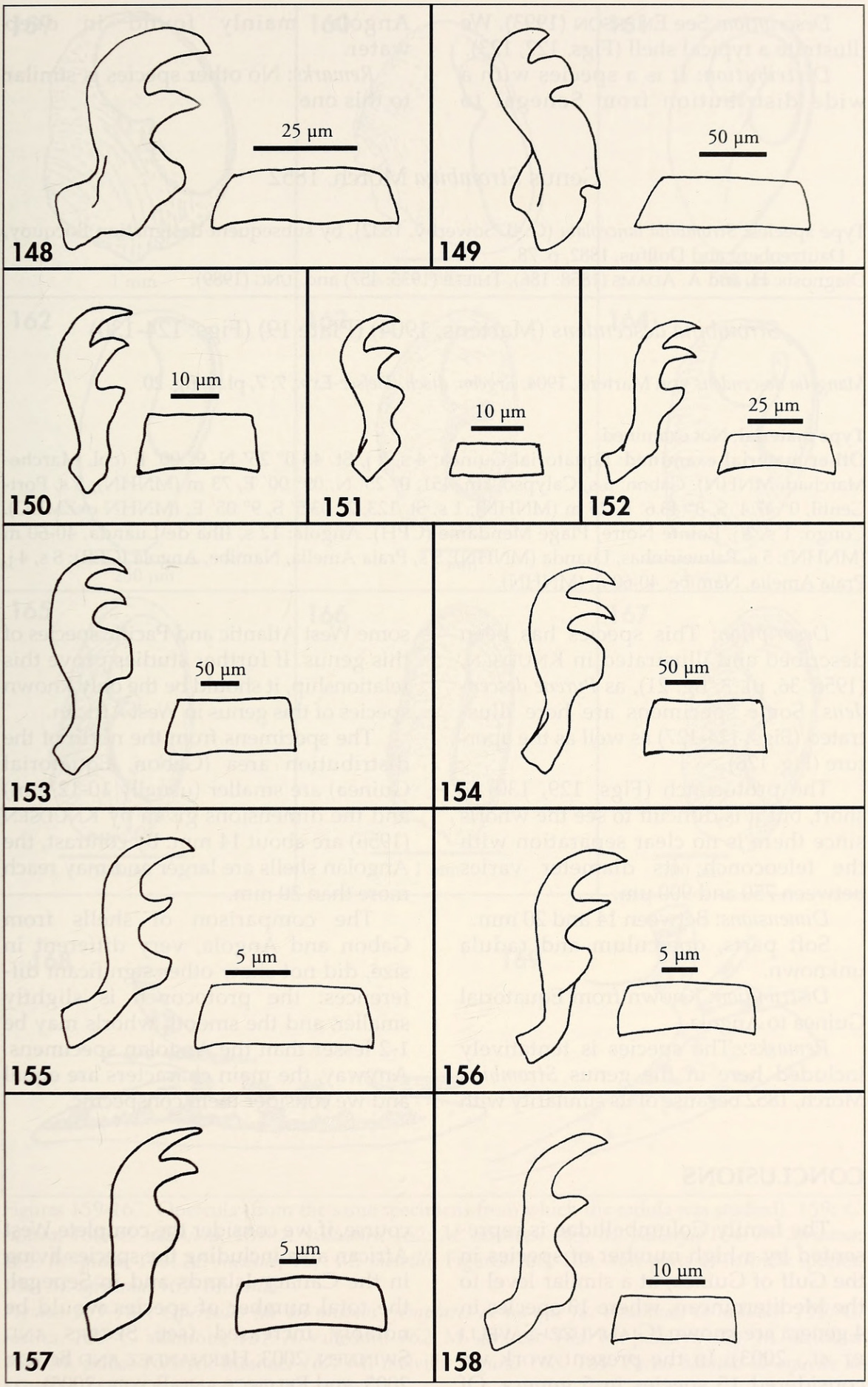
Type species: *Strombina* (*Cotonopsis*) *panacostariceus* Olsson, 1942. [Type locality: Pliocene of Burica Peninsula, Costa Rica, Charco Azul Formation]. By original designation.

Cotonopsis monfilsi Emerson, 1993 (Figs. 122, 123)

Cotonopsis monfilsi Emerson, 1993. *The Nautilus*, 106 (4): 147. [Type locality: off St. Louis (16° 02'N 16° 30'W), Senegal, 300 m.]

Type material: Not examined.
Other material examined: Senegal: 2 s, "Louis Sauger" at 600-1000 m (CJH). Guinea Conakry: 3 s, from 40-50 m (CJH); 15 s, Saint Louis, 300-1000 m (MNHN); 3 s, Senegal, 250-300 m (MNHN); Angola: 2 s, from South Angola fishermen (MNHN).

(Right page) Figures 148-158. Radulae of Columbellidae. 148: *Columbella rustica*, Antalya, Turky, shell of 18.6 mm; 149: *Columbella adansoni*, Lanzarote, Canary islands, shell of 19.5 mm; 150: *Anachis valledori*, Sal Rei, Boavista, Cape Verde Is., shell of 6.8 mm; 151: *Mitrella alvarezi*, Sal Rei, Boavista, Cape Verde Islands, shell of 4.0 mm; 152: *Mitrella pallaryi*, Camarinas, Galicia, shell of 14.5 mm; 153: *Mitrella ocellata*, N'gor, Dakar, Senegal, shell of 11.0 mm (decolate); 154: *Mitrella ocellata* albine form, Dakar, Senegal, shell of 11.8 mm (not decolate); 155: *Mitrella broderipi*, Baie de l'Etoile, Nouadhibou, Mauritania, shell of 7.5 mm; 156: *Mitrella psilla*, Sacomar, Angola, shell of 4.0 mm; 157: *Mitrella africana*, Rio Muni, Equatorial Guinea, shell of 8.6 mm; 158: *Mitrella melvilli*, Corimbo, Luanda, shell of 9.5 mm.
(Página derecha) Figuras 148-158. Radulas de Columbellidae. 148: Columbella rustica, *Antalya, Turquía, concha de 18,6 mm; 149:* Columbella adansoni, *Lanzarote, Islas Canarias, concha de 19,5 mm; 150:* Anachis valledori, *Sal Rei, Boavista, Islas de Cabo Verde, concha de 6,8 mm; 151:* Mitrella alvarezi, *Sal Rei, Boavista, Islas de Cabo Verde, concha de 4,0 mm; 152:* Mitrella pallaryi, *Camariñas, Galicia, concha de 14,5 mm; 153:* Mitrella ocellata, *N'gor, Dakar, Senegal, concha de 11,0 mm (decapitada); 154:* Mitrella ocellata *forma albina, Dakar, Senegal, concha de 11,8 mm (no decapitada); 155:* Mitrella broderipi, *Bahía de l'Etoile, Nouadhibou, Mauritania, concha de 7,5 mm; 156:* Mitrella psilla, *Sacomar, Angola, concha de 4,0 mm; 157:* Mitrella africana, *Río Muni, Guinea Ecuatorial, concha de 8,6 mm; 158:* Mitrella melvilli, *Corimbo, Luanda, concha de 9,5 mm.*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Description: See EMERSON (1993). We illustrate a typical shell (Figs. 122, 123).

Distribution: It is a species with a wide distribution from Senegal to Angola, mainly found in deep water.

Remarks: No other species is similar to this one.

Genus *Strombina* Mörch, 1852

Type species: *Strombina lanceolata* (G. B. Sowerby, 1832), by subsequent designation Bucquoy, Dautzenberg and Dollfus, 1882, p. 78.
Diagnosis: H. and A. ADAMS (1858: 186), THIELE (1935: 457) and JUNG (1989).

Strombina descendens (Martens, 1904) (Plate 19) (Figs. 124-130)

Mangelia descendens von Martens, 1904. *Ergebn. dtsch. Tiefsee-Exp.*, 7: 7, pl. 3, fig. 20.

Type material: Not examined.
Other material examined: Equatorial Guinea: 4 s, 2 j, St. 45 0° 25′ N, 9° 00′ E (col. Marche-Marchad, MNHN). Gabon: 6 s, Calypso, stn. 451, 0° 25′ N, 09° 00′ E, 73 m (MNHN); 3 s, Port-Gentil, 0° 47.4′ S, 8° 43.6′ E, 25 m (MNHN); 1 s, St. 123, 2° 03.5′ S, 9° 05′ E, (MNHN exZMUC). Congo: 1 s, 3 j, Pointe Noire, Plage Mendame (CPH). Angola: 12 s, Ilha de Luanda, 40-60 m (MNHN); 5 s, Palmeirinhas, Luanda (MNHN); 5 s, Praia Amelia, Namibe, Angola (CER); 8 s, 4 j, Praia Amelia, Namibe, 40-60 m (MNHN).

Description: This species has been described and illustrated in KNUDSEN, (1956: 36, pl. 3, fig. 21), as *Pyrene descendens*. Some specimens are here illustrated (Figs. 124-127) as well as the aperture (Fig. 128).

The protoconch (Figs. 129, 130) is short, but it is difficult to see the whorls since there is no clear separation with the teleoconch; its diameter varies between 750 and 900 µm.

Dimensions: Between 14 and 20 mm.

Soft parts, operculum and radula unknown.

Distribution: Known from Equatorial Guinea to Angola.

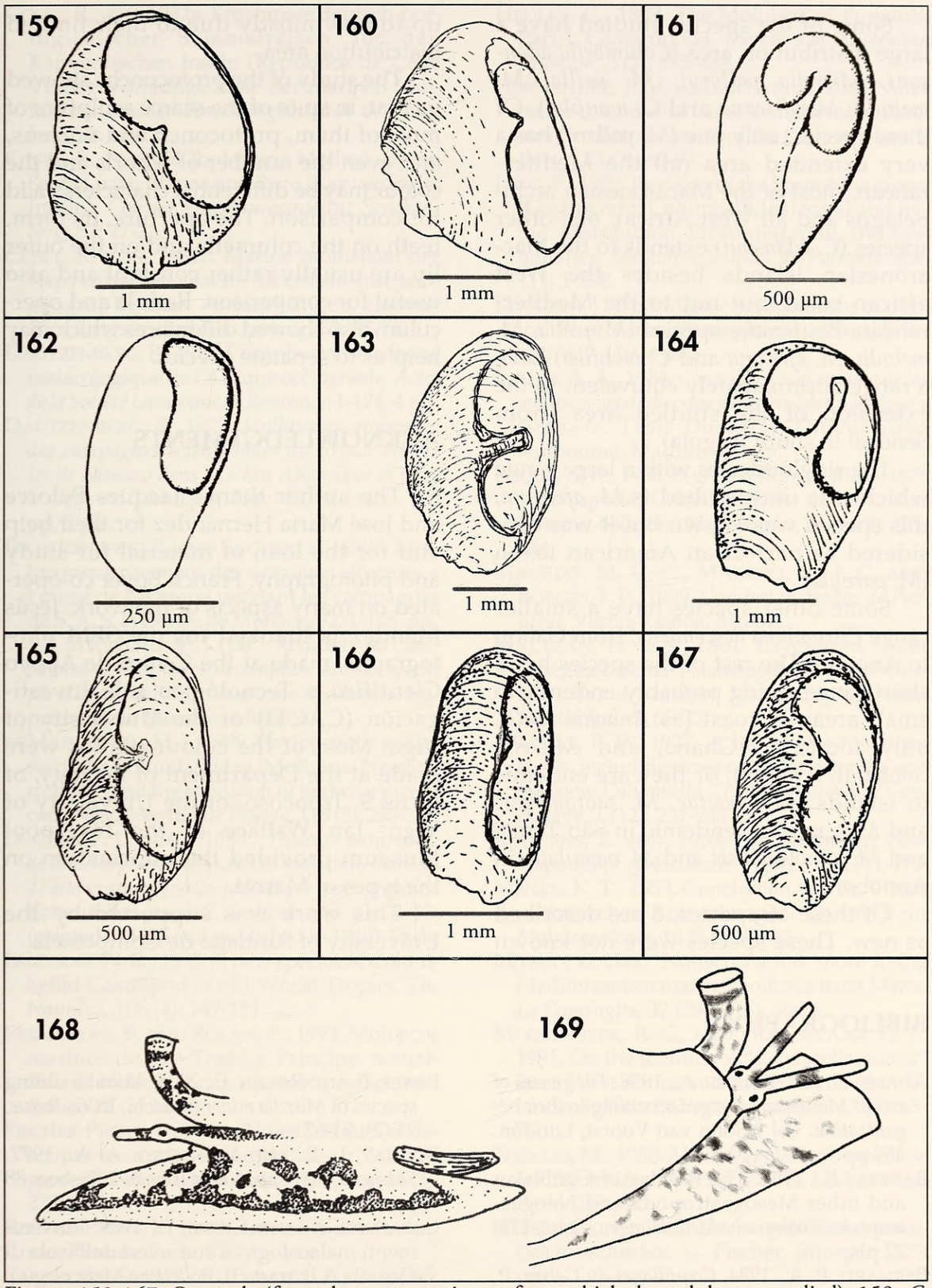
Remarks: The species is tentatively included here in the genus *Strombina* Mörch, 1852 because of its similarity with some West Atlantic and Pacific species of this genus. If further studies prove this relationship, it should be the only known species of this genus in West African.

The specimens from the north of the distribution area (Gabon, Equatorial Guinea) are smaller (usually 10-12 mm) and the dimensions given by KNUDSEN (1956) are about 14 mm. By contrast, the Angolan shells are larger and may reach more than 20 mm.

The comparison of shells from Gabon and Angola, very different in size, did not show other significant differences: the protoconch is slightly smaller, and the smooth whorls may be 1-2 lesser than the Angolan specimens. Anyway, the main characters are equal and we consider them conspecific.

CONCLUSIONS

The family Columbellidae is represented by a high number of species in the Gulf of Guinea, at a similar level to the Mediterranean, where 13 species in 4 genera are known (GIANNUZZI-SAVELLI *ET AL.*, 2003). In the present work we considered 15 species in 5 genera. Of course, if we consider the complete West African area including the species living in the Canary Islands and in Senegal, the total number of species would be notably increased (see SEGERS AND SWINNEN, 2003, HERNANDEZ AND BOYER, 2005, and PELORCE AND BOYER, 2005).



Figures 159-167. Opercula (from the same specimens from which the radula was studied). 159: *C. rustica*; 160: *C. adansoni*; 161: *A. valledori*; 162: *M. alvarezi*; 163: *M. pallaryi*; 164: *M. africana*; 165: *M. psilla*; 166: *M. inesitae*; 167: *M. melvilli*. Figures 168, 169. Soft parts of *Mitrella* species. 168: *M. africana*; 169: *M. psilla*.

Figuras 159-167. Opérculos (de los mismos ejemplares de los que fue estudiada la radula). 159: C. rustica*; 160:* C. adansoni*; 161:* A. valledori*; 162:* M. alvarezi*; 163:* M. pallaryi*; 164:* M. africana*; 165:* M. psilla*; 166:* M. inesitae*; 167:* M. melvilli. *Figuras 168, 169. Partes blandas de especies de* Mitrella. *168:* M. africana*; 169:* M. psilla.

Some of the species studied have a large distribution area (*Columbella adansoni, Mitrella pallaryi, M. psilla, M. melvilli, M. africana* and *C. monfilsi*). Of these species, only one (*M. pallary*) has a very extended area (all the Mediterranean, most of the Macaronesian archipelagos and all West Africa); one other species (*C. adansoni*) extends to the Macaronesian islands besides the West african coast, but not to the Mediterranean. Four more species (*M. psilla, M. melvilli, M. africana* and *C. monfilsi*) have a range approximately equivalent to the extension of the studied area (from Senegal to south Angola).

The single species with a large range which was undescribed is *M. africana*; this species was known but it was considered as part of an American taxon (*M. parvula*).

Some other species have a smaller range (*Strombina descendens*, from Gabon to Angola). The rest of the species has a short range, being probably endemic to small areas of coast (as *Anachis ryalli*, only found in Ghana, and *Mitrella condei*, in Angola); or they are endemic to islands (*M. inesitae, M. saotomensis* and *M. tenebrosa*, endemic in São Tomé, and *M. annobonensis* and *M. aemulata*, in Annobon).

Of these 15 species, 8 are described as new. These species were not known up to now mostly due to their limited distribution area.

The study of the protoconchs showed us that, in spite of the scarce sculpture of most of them, protoconch and nucleus, and even the number of whorls and the colour may be differential characters valid for comparison. The aperture, its form, teeth on the columella and on the outer lip are usually rather constant and also useful for comparison. Radula and operculum also showed differences which may help us to separate species.

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