

## The subfamily Rissoiinae (Mollusca: Gastropoda: Rissoidae) in the Cape Verde Archipelago (West Africa)

### La subfamilia Rissoiinae (Mollusca: Gastropoda: Rissoidae) en el archipiélago de Cabo Verde (África Occidental)

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#### ABSTRACT

The subfamily Rissoiinae (Gastropoda, Rissoidae) is studied in the Cape Verde Archipelago. Twenty-nine species belonging to three genera have been found: *Rissoina* (*Rissoina*) *punctostriata* (Talavera, 1975), a species with planktotrophic development widely distributed along West Africa, and currently confused with the also planktotrophic Caribbean species *Rissoina* (*Rissoina*) *decussata* (Montagu, 1803); one new species of *Rissoina* (*Ailinzebina*); 26 new species of *Schwartziella* (*Schwartziella*), and one new species of *Zebina* (*Zebina*). The paucispiral protoconch of all the new species indicates a non-planktotrophic development and strongly suggest all them are endemic of the Cape Verde Archipelago. The new species are compared among them and with other related West African species. The high level of endemism, the geographical distribution of all the species in the Archipelago and the possible relationships of the Cape Verde Rissoiinae are also commented.

#### RESUMEN

Se estudia la subfamilia Rissoiinae en el Archipiélago de Cabo Verde. Se han encontrado 29 especies pertenecientes a tres géneros: *Rissoina* (*Rissoina*) *punctostriata* (Talavera, 1975), una especie con desarrollo larvario planctotrófico ampliamente distribuida a lo largo de la costa occidental africana y hasta ahora confundida con la especie caribeña *Rissoina* (*Rissoina*) *decussata* (Montagu, 1803), también de desarrollo planctotrófico; una nueva especie de *Rissoina* (*Ailinzebina*); 26 especies nuevas de *Schwartziella* (*Schwartziella*), y una especie nueva de *Zebina* (*Zebina*). La protoconcha paucispiral de todas las especies nuevas indica un desarrollo larvario no planctotrófico y sugiere que todas ellas son endémicas del archipiélago. Se comparan las nuevas especies descritas con otras del África occidental con las que están relacionadas, y entre sí. Se comentan el alto grado de endemismo, la distribución geográfica de todas las especies en el archipiélago y las posibles relaciones de los Rissoiinae de Cabo Verde.

KEY WORDS: Rissoiinae, *Rissoina*, *Zebina*, *Schwartziella*, new species, Cape Verde Islands, West Africa.

PALABRAS CLAVE: Rissoiinae, *Rissoina*, *Zebina*, *Schwartziella*, nuevas especies, Islas de Cabo Verde, África Occidental.

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## INTRODUCTION

Though many papers dealing with the marine gastropods of the Cape Verde Archipelago have been published during the last years (see BURNAY AND COSEL, 1987; FERNANDES AND ROLÁN, 1991, and ROLÁN AND RUBIO, 1999 for a list), several groups are still awaiting study. One of them is the subfamily Rissoininae (Rissoidae), revised at the generic level by PONDER (1985) and studied in other parts of the world (LEAL AND MOORE, 1989; SLEURS, 1989, 1991, 1993, 1994, 1996; FABER, 1990; SLEURS AND PREECE, 1994; ROLÁN, 1998). However, there are only a few papers dealing with Rissoininae from West Africa and neighbouring islands. WATSON (1873) described *Eulima paivensis* from the Selvagens Islands, which turned out to be the common species recorded from the Canary Islands as *Zebina browniana* (d'Orbigny, 1842) or *Z. vitrea* (C. B. Adams, 1850) by ODHNER (1932), NORDSIECK (1972) and GARCÍA-TALAVERA (1983) (see GOFAS, 1999). SMITH (1890) described five new species from St. Helena and erroneously recorded *Rissoina bryerea* (Montagu, 1803), a Caribbean species. DAUTZENBERG (1913) and TALAVERA (1975), described two new species: *Rissoina africana* from Senegal, and *Zebina punctostriata* from Mauritania, respectively. GOFAS (1999) studied *Rissoina punctostriata*, *Schwartziella africana* and described a new species of *Zebina*. ROLÁN AND RYALL (1999) recorded *Rissoina punctostriata* (Talavera, 1975) from Angola. A few probably erroneous records are sparse in different papers: *Rissoina elegantula* (Angas, 1880) from São Tomé (TOMLIN AND SHACKLEFORD, 1914), *Rissoina calia* Bartsch, 1915, from Senegal (NICKLÈS, 1947), *Zebina vitrea* (A. Adams, 1854) from Sahara, Mauritania (ALTIMIRA, 1978) and the Canary Islands (ALTIMIRA, 1978; NORDSIECK, 1982). FERNANDES AND ROLÁN (1994) recorded six amphiatlantic species of Rissoininae which actually have not been accepted.

The first record of a Rissoininae from the Cape Verde Islands is that of DAUTZENBERG AND FISCHER (1906) (*Rissoina decussata* (Montagu, 1803), see below under remarks of *R. punctostriata*). MARCHE-MARCHAD (1958) and SAUNDERS (1977) recorded *Rissoina africana* (Dautzenberg, 1913). GARCÍA-TALAVERA AND BACALLADO (1978) recorded *Rissoina bryerea* (Montagu, 1803), but this is a misidentification of a Caribbean species. COSEL (1982a, b, c) recorded *R. decussata* (Montagu, 1803), *R. africana* Dautzenberg, 1913, *Zebina* cf. *punctostriata* (Talavera, 1975) and other 2-3 probably undescribed species of *Rissoina*.

A preliminary revision of the subfamily Rissoininae from the Cape Verde Archipelago was presented by MORÁN, ROLÁN AND LUQUE (1989) to the 5th Symposium Fauna and Flora of the Cape Verde Islands (Leiden), and an updated checklist of the marine gastropods by ROLÁN, FERNANDES, LUQUE, ORTEA AND TEMPLADO (1993) to the First Symposium Fauna and Flora of the Atlantic Islands (Madeira). In both abstracts was referred the existence of seven or more undescribed species of Rissoininae. During recent years, a thorough revision of the material from different expeditions to the Cape Verde Islands has shown that the number of Rissoininae species in this archipelago has been greatly underestimated. A total of 29 species of three genera, 28 of which are new for the science, are described in the present paper.

## MATERIAL AND METHODS

About 2300 shells and specimens have been studied from almost all the Cape Verde Archipelago (Fig. 157). A part of this material was collected by the "I Expedición Científica Ibérica al Archipiélago de Cabo Verde" (1985), as well as in several trips of Spanish and Portuguese malacologists between 1978 and 1988, most of them with the partic-



ipation of the first author. A small part of the material was collected by dredging down to 100 m of depth, or by SCUBA diving down to 30 m, but most of the material was collected by skin diving down to 15 m. Additional material collected by the CANCAP Expeditions of the National Museum of Natural History of Leiden has been included in the present study, so as some new material collected in 1997 by the first author during the expedition "Macaronesia 2" of Las Palmas University. Some types housed in The Natural History Museum of London and the Muséum National d'Histoire Naturelle of Paris have been also studied.

Specimens are illustrated using SEM micrographs; the views of microsculpture were made at the middle part of the body whorl.

Abbreviations:

- AMNH: American Museum of Natural History, New York.  
 BMNH: The Natural History Museum, London.  
 DBUA: Departamento de Biología, Universidad Autónoma, Madrid.  
 MNCN: Museo Nacional de Ciencias Naturales, Madrid.  
 MNHN: Muséum National d'Histoire Naturelle, Paris.  
 NNM: Nationaal Natuurhistorisch Museum, Leiden.  
 CER: Collection of E. Rolán, Vigo.  
 The material with no indication of collection is from CER.  
 sp: live collected specimen.  
 s: empty shell.  
 j: juvenile shell.  
 f: fragment of shell.

RESULTS

Family RISSOIDAE J. E. Gray, 1847  
 Subfamily RISSOININAE Stimpson, 1865  
 Genus *Rissoina* d'Orbigny, 1840  
 Subgenus *Rissoina* s. s.

Type species: *Rissoina inca* d'Orbigny, 1840, by original designation.  
 Diagnosis: PONDER (1985, p. 78) and SLEURS (1993, p. 74).

*Rissoina (Rissoina) punctostriata* (Talavera, 1975) (Figs. 1-3, 6-8)

*Zebina punctostriata* Talavera, 1975. *Bol. Inst. Esp. Oceanog.*, 192: 3, pl. 1, fig. 1, pl. 4, fig. 7. [Type locality: SAHMAS-1, st. EO-8, Mauritania].

**Material studied:** Cape Verde Archipelago: Sal: 2 s, Palmeira; 2 sp, 8 s, Regona, 1-3 m; 1 sp, 5 s, Rabo de Junco, 3 m; 1 s, 3 f, Mordeira, 5 m; 3 f, off Palmeira, CANCAP Sta. 7.109, 16° 45' N, 22° 59' W, 31 m (31-VIII-86) (NNM); 2 j, 1 f, Santa Maria Bay, CANCAP Sta. 7.093, 16° 34' N, 22° 54' W, 42 m (29-VIII-1986) (NNM); 3 j, 1 f, Santa Maria Bay, CANCAP Sta. 7.094, 16° 34' N, 22° 54' W, 24 m (NNM). Brava: 8 f, 8 s, Furna, 8 m. Boa Vista: 15 s, 3 f, Sal Rei, 3-7 m; 2 s, Baia Teodora, 5 m; 4 s, Rife de Chaves, 12 m; 10 j, CANCAP Sta. 6.056, 15° 59' N, 22° 47' W, 25 m (12-VI-1982) (NNM); 6 s, 6 f, CANCAP Sta. 6.064, 15° 58' N, 22° 47' W, 29-32 m (12-VI-82) (NNM); 12 s, 1 j, Ilhéu Calheta do Velho, CANCAP Sta. 7.064, 16° 11' N, 22° 58' W, 25 m (NNM); 2 j, Ilhéu Calheta do Velho, CANCAP Sta. 7.068, 16° 11' N, 22° 59' W, (27-VIII-1986) (NNM); 1 s, 5 j, 2 f, CANCAP Sta. 7.075, 16° 08' N, 22° 58' W, 33 m (NNM); 1 j, 5 f, CANCAP Sta. 7.079, Ilhéu de Sal Rei, 16° 10' N, 23° 00' W, 60 m (28-VIII-1986) (NNM). Maio: 1 j, CANCAP Sta. 7.042, Ponta Inglez/Ponta Preta, 15° 07' N, 23° 14' W, 76 m (25-VIII-1986) (NNM). Santiago: 1 s, Praia Baixa, 5 m; 1 s, Cidade Velha, 4 m; 1 s, CANCAP Sta. 6.005, 14° 54' N, 23° 30' W, 75-68 m (5-VI-1982) (NNM); 1 s, 2 j, CANCAP Sta. 6.007, 14° 54' N, 23° 30' W, 70-88 m (5-VI-1982) (NNM); 2 j, CANCAP Sta. 6.015, 14° 53' N, 23° 30' W, 150 m (5-VI-1982) (NNM); 1 j, CANCAP Sta. 6.024, 15° 00' N, 23° 44' W, 540 m (7-VI-1982) (NNM); 1 s, CANCAP Sta. 6.054, 14° 54' N, 23° 30' W,

29-33 m (11-VI-1982) (NNM); 1 s, 1 j, CANCAP Sta. 7.120, 16° 36' N, 24° 37' W, 208 m (1-IX-1986) (NNM). São Vicente: 2 sp, Calhau, 3 m; 1 sp, 2 s, Mاتيota, 5-7 m; 1 s, Porto Mindelo, 12 m; 1 j, CANCAP Sta. 6.162, 16° 54' N, 25° 01' W, 38-45 m (21-VI-1982) (NNM). Santa Luzia: 1 s, Praia Francisca, 2 m. Ilhéu Razo: 1 s, 1 j, CANCAP Sta. 7.116, 16° 36' N, 24° 36' W, 75 m (1-IX-1986) (NNM). São Nicolau: 2 j, CANCAP Sta. 6086, 16° 34' N, 24° 22' W, 35 m (15-VI-1982) (NNM). Santo Antão: 1 s, W of Tarrafal, CANCAP Sta. 6.108, 16° 58' N, 25° 20' W, 10 m (6-VI-1982) (NNM). Mauritania: 3 s, Baie de l'Etoile, Nouadhibou, 3 m; 1 s, off Bank d'Arguin, 20° 01' N, 17° 32' W, 53 m (14-VI-1988) (NNM). Ghana: 7 s, 6 f, 3 j, Mianmia, 25-35 m; 2 s, Busua, 6 m; 3 s, 4 f, Takoradi, 1-4 m. Senegal: 4 s, Almadies, 30 m; 2 s, N'Gor, Dakar, 5 m; 2 s, Madeleines, Dakar. São Tomé and Príncipe: 1 s, Esprainha, 3 m; 1 s, Lagoa Azul, 4 m; 7 s, Praia Mutamba, 5 m; 2 s, 3 f, São Tomé city, 4 m. Angola: 4 sp, 18 s, Corimba, Luanda, 20 m; 2 s, Cacuaço, 7 m; 5 s, 10 f, off Luanda, 50 m; 5 s, 4 j, 4 f, Palmeirinhas, 30 m; 1 sp, 2 s, 3 j, Buraco, near Palmeirinhas, prov. Bengo; 3 s, Santa Maria, 15 m.

*Description:* See TALAVERA (1975). Shell (Figs. 1, 2) length 5-10 mm, width 2.5-3.5 mm, not solid, elongate-conical.

Protoconch (Fig. 3) of three spiral smooth whorls and about 400 µm of diameter of last whorl, of planktotrophic type. A spiral cord in the middle of the last quarter of the last whorl reaches the lower margin of the deep sinusigera notch.

Teloconch of 6-7 whorls; adapical 3-4 spire whorls angulated; subsequent whorls gradually convex; last whorls convex. Suture shallow, with a subsutural depression gradually better marked which gives a slightly undulated profile to the last whorls. Colour white.

Axial sculpture of adapical whorls consisting of somewhat prominent, rounded, narrow, closely spaced, slightly curved, opisthocline ribs, becoming gradually less prominent and more numerous (up to 30 weakly prominent ribs on the last whorl) (Figs. 1, 2). Spiral sculpture of about 8-10 prominent spiral cords on adapical whorls, up to more than 60 on the last whorl, those of the base more prominent; interspaces a little wider or of similar width. Microsculpture (Fig. 8) of fine spiral threads,

with interspaces of the same width or wider. Aperture D-shaped, large; inner lip thin, slightly concave; anterior channel short, shallow; outer lip with thin external varix, slightly opisthocline in profile.

Operculum (Fig. 7) yellowish, thick, pyriform, with a prominent and long inner peg.

Radula (Fig. 6): central tooth with two pairs of basal denticles, and a prominent central cusp with 3-4 small cusps at each edge; lateral teeth with 6-7 cusps on the inner and outer edge; inner marginal teeth with cusps on about distal one third of the outer edge; outer marginal teeth with cusps on about distal one third of the inner and outer edge.

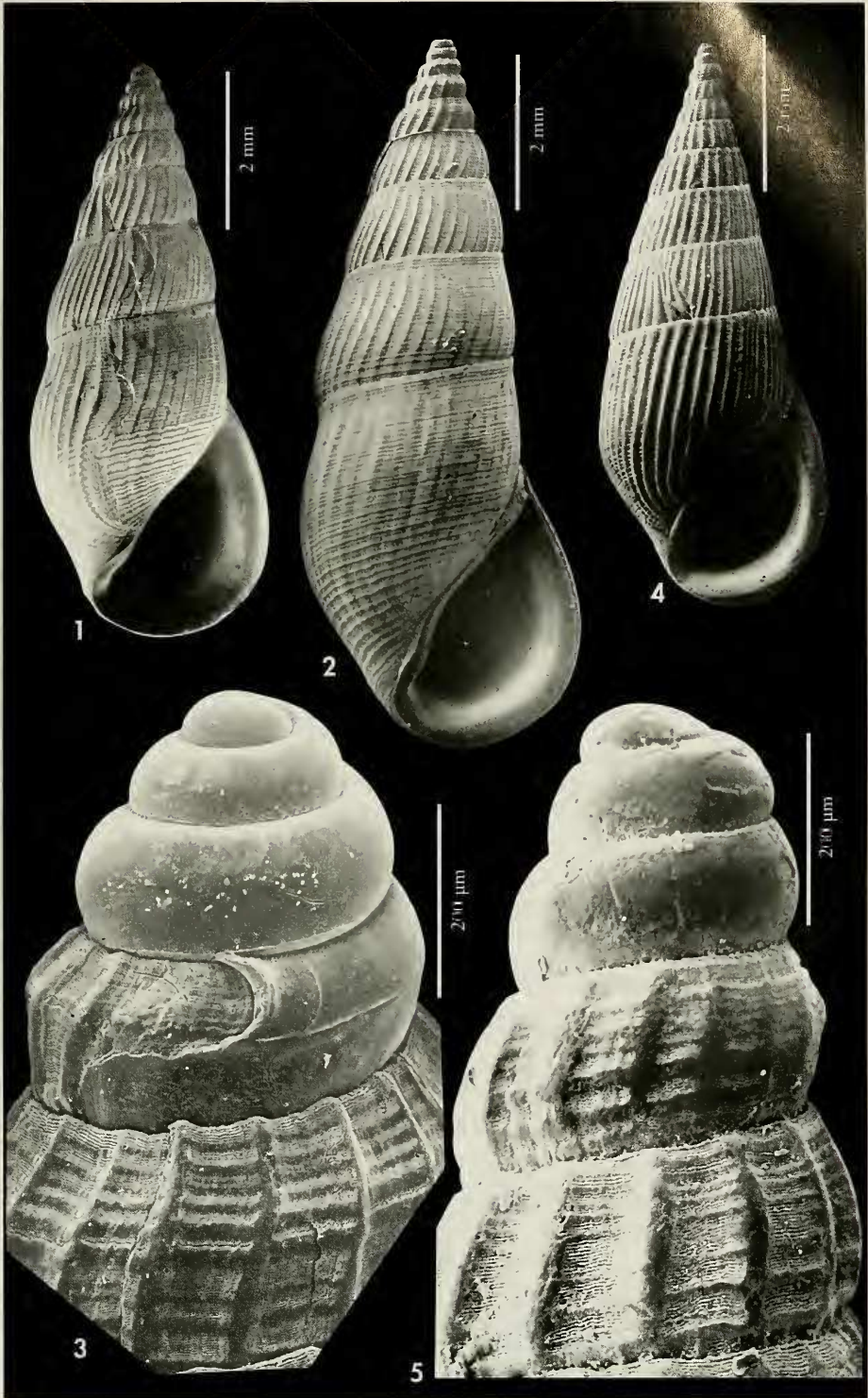
*Habitat:* Living specimens were collected at the base of rocks on sandy bottom.

*Distribution:* *R. punctostriata* is known from Mauritania (TALAVERA, 1975), Senegal, Ivory Coast, São Tomé, Gabon, Cameroon (GOFAS, 1999), Angola (GOFAS, 1999; ROLÁN AND RYALL, 1999), and Ghana and the Cape Verde Archipelago (pers. obs.).

*Remarks:* GARCÍA-TALAVERA (1983) considered this species a junior synonym

(Right page) Figures 1-3. *Rissoina (Rissoina) punctostriata* (Talavera, 1975). 1: shell from Corimba, Luanda, Angola; 2: shell from Sal Rei, Boa Vista, Cape Verde Archipelago; 3: protoconch of a shell from Regona, Sal. Figures 4-5: *Rissoina decussata* (Montagu, 1803), 4: shell from Los Canarreos Archipelago, Cuba; 5: protoconch of the same shell.

(Página derecha) Figuras 1-3. *Rissoina punctostriata* (Talavera, 1975). 1: concha de Corimba, Luanda, Angola; 2: concha de Sal Rei, Boa Vista, Archipiélago de Cabo Verde; 3: protoconcha de una concha de Regona, Sal. Figuras 4-5: *Rissoina decussata* (Montagu, 1803), 4: concha del Archipiélago de Los Canarreos, Cuba; 5: protoconcha de la misma concha.





of *Rissoina decussata* (Montagu, 1803) from the Caribbean, probably due to the shell similarity and the protoconch of planktotrophic type. But the comparative study of the shells and protoconchs (Figs. 1-5 and 8-9) of *R. decussata* from Cuba and *R. punctostriata* has showed enough differences to consider both them different species (Table I, see page 86). So, *R. decussata* is not an amphiatlantic species, and all the previous West African records of this species (Senegal, Gabon, Ivory Coast, São Tomé, Cameroon and Angola) should be attributed to *R. punctostriata*. The record of *Rissoina elegantula* (Angas, 1880), a similar species described from S Australia, from São

Tomé (TOMLIN AND SHACKLEFORD, 1914), must be also referred to *R. punctostriata*.

COSEL (1982a, c) recorded this species (as *Zebina* cf. *punctostriata*) from the Cape Verde Islands. The previous records of *Rissoina decussata* from Santa Luzia and Boa Vista (DAUTZENBERG AND FISCHER, 1906), and the more recent of COSEL (1982b), who cited the previous authors, should be attributed to *R. punctostriata*.

The study of the best preserved of two syntypes of each *R. decussata* (BMNH, no. 4239) and *R. striatocostata* (d'Orbigny, 1842) (BMNH 1854.10.4.209) has proved that the last name is a junior synonym of *R. decussata*.

### Subgenus *Ailinzebina* Ladd, 1966

Type species: *Zebina (Ailinzebina) abrardi* Ladd, 1966, by original designation.

Diagnosis: SLEURS (1993, p. 112).

### *Rissoina (Ailinzebina) onobiformis* n. sp. (Figs. 10-14, 158)

**Type material:** Holotype (Fig. 11) 1 s of 3.1 x 1.2 mm and 2 paratypes, 2 s, from Rabo de Junco, Sal Island, Cape Verde Archipelago, 6 m (MNCN 15.05/31713). Other paratypes: 4 s (Fig. 10, broken during the study), 3 f, from the type locality, 2 m (CER); 1 s, Derrubado, Boa Vista, 3 m (CER); 1 s, Pedrinha, Brava, 6 m (CER); 2 s, 2 f, 1 j, Furna, Brava, 20-30 m (CER); 1 s, Furna, Brava, 30 m (AMNH); 1 s, Sal Rei, Boa Vista, 6 m (NNM 58020); 1 s, South of Santiago, CANCAP Sta. 6.015, 14° 53' N, 23° 30' W, 50 m (5-VI-1982) (NNM 59417); 1 s, 5 m, Derrubado, Boa Vista (MNHN); 1 s, Cidade Velha, Santiago, 5 m (DBUA).

**Other material studied:** Boa Vista: 2 s, Morro de Areia, 1 m; 1 f, Baijos de João Valente, 20 m; 3 j, Baía Teodora, 4 m. Santiago: 1 f, Cidade Velha, 4 m; 1 f, South of Santiago, CANCAP Sta. 6.015, 14° 53' N, 23° 30' W, 50 m (5-VI-1982) (NNM). Brava: 2 s, Furna, 30 m; 6 s, Porto do Anciã, 6 m.

**Etymology:** The specific name alludes to the resemblance of the shell with that of the genus *Onoba*.

**Description:** Shell (Figs. 10, 11) length up to 3.5 mm, maximum width 1.4 mm, not solid, elongate, subcylindrical, with pupoid apex.

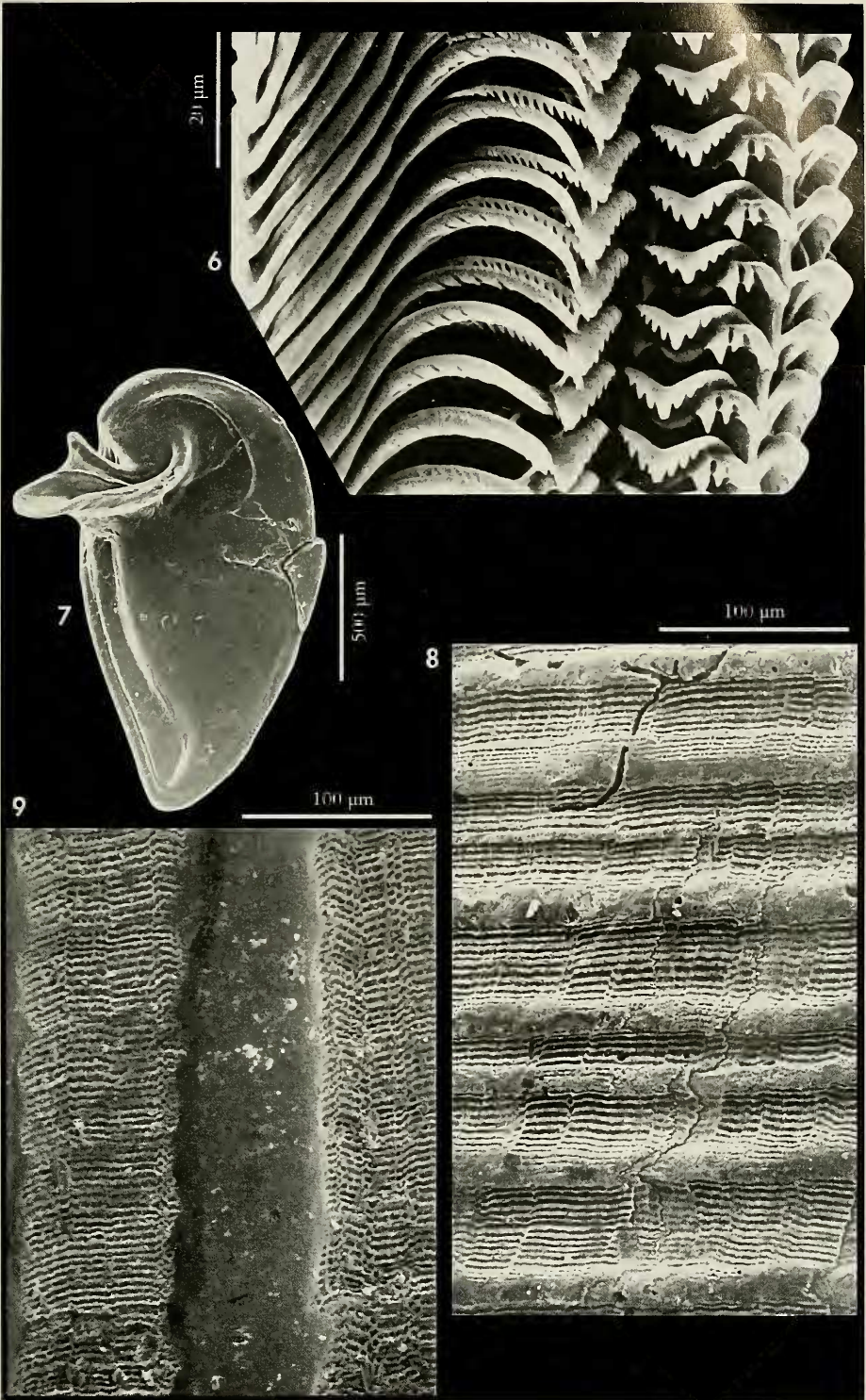
Protoconch (Figs. 12, 13) of a little more than one whorl and 360  $\mu$ m of

maximum diameter, of non-planktotrophic type; transition to teleoconch abrupt; surface smooth with some rather elevated marks like an Arabic writing.

Teleoconch of 4  $1/2$  whorls in holotype, but usually 4, weakly convex, not

(Right page) Figures 6-8. *Rissoina punctostriata* (Talavera, 1975). 6: radula of a specimen of Mordeira, Sal, Cape Verde Archipelago; 7: operculum of the same specimen; 8: teleoconch microsculpture of the shell of Figure 2. Figure 9. *Rissoina decussata* (Montagu, 1803), teleoconch microsculpture of the shell of Figure 4.

(Página derecha) Figuras 6-8. *Rissoina punctostriata* (Talavera, 1975). 6: rádula de un ejemplar de Mordeira, Sal, Archipiélago de Cabo Verde; 7: opérculo del mismo ejemplar; 8: microescultura de la teleoconcha del ejemplar de la Figura 2. Figura 9. *Rissoina decussata* (Montagu, 1803), microescultura de la teleoconcha del ejemplar de la Figura 4.



angulated below suture, but with a small angulation near the base; last whorl weakly convex; suture shallow. Colour cream-whitish.

Axial sculpture consisting of very weak, narrow, slightly opisthocline, distantly spaced axial ribs, gradually more closely spaced, 30-37 in the last whorl, a little prominent on the suture. Spiral sculpture very fine, appreciable at low magnification. Microsculpture (Fig. 14) formed by bands of 6-10 very fine threads between two irregular fine spiral cords.

Aperture D-shaped, relatively large, with an acute angulation on its upper part; inner lip thick; columellar side weakly concave; anterior channel almost absent; outer lip with a weak external varix; peristome wide and flat when well developed, with an internal and an external sharp rims; inner part with two small depressions, one on the anterior channel and other on the part corresponding to the anal sinus.

*Habitat:* Shells from sand sediments between 2 and 50 m.

*Distribution:* Sal, Boa Vista, Santiago, Brava (Fig. 158). This species probably will be found in all the islands of the Cape Verde Archipelago.

*Remarks:* PONDER (1985) considered *Ailinzebina* a synonym of *Rissoina* s. s., but SLEURS (1993) considered the radular and head-foot characters of *Rissoina* (*Ailinzebina*) *elegantissima* enough different from those of *Rissoina* s. s. to warrant a subgeneric status for *Ailinzebina*. SLEURS (1993) included in this subgenus four Pacific species and *Rissoina* (*Ailinzebina*) *elegantissima* d'Orbigny, 1842, from the Caribbean. Considering the distinctive shell features (and also the known anatomical ones, see SLEURS, 1993) of the species of this subgenus and its wide distribution, we think that *Ailinzebina* may be elevated to the generic level, but we prefer to do not any taxonomical change waiting for further anatomical information.

*Rissoina* (*Ailinzebina*) *elegantissima* is the only other known Atlantic species of this subgenus and it differs from *R. (A.) onobiformis* n. sp. by the planktotrophic type of protoconch (see LEAL AND MOORE, 1989, fig. 9, and SLEURS, 1993, fig. 41), the rather solid shell with strongly convex whorls, the more prominent and opisthocline axial ribs and the more densely spaced spiral cords. Moreover, the sculpture of the protoconch of *R. onobiformis* is different from any other known species of *Rissoina*.

## Genus *Schwartziella* Nevill, 1881

### Subgenus *Schwartziella* s. s.

Type species: *Rissoina orientalis* Nevill, 1881 (= *Rissoina triticea* Pease, 1861), by original designation. Diagnosis: PONDER (1985, p. 98-99).

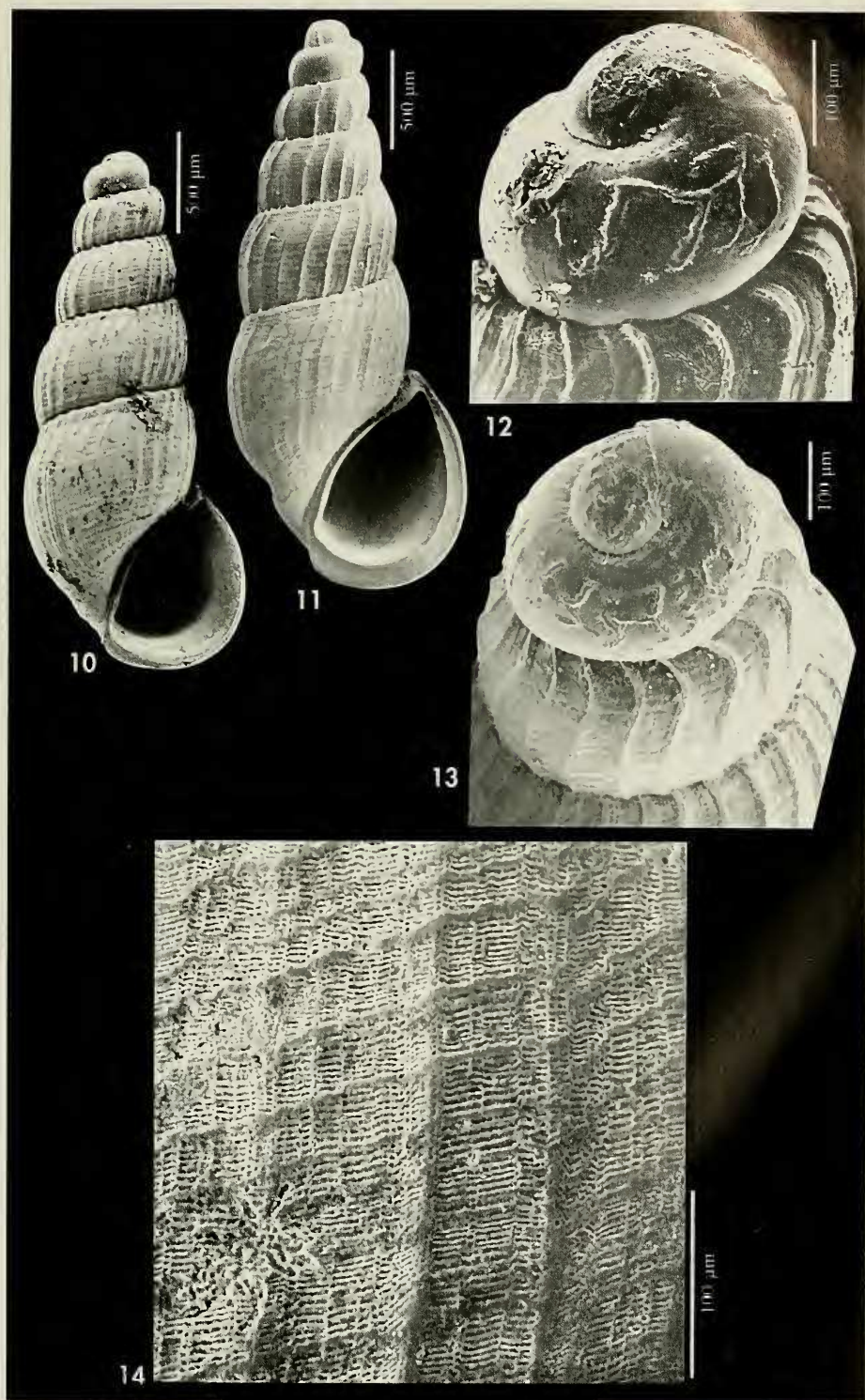
### *Schwartziella* (*Schwartziella*) *robusta* n. sp. (Figs. 15-19, 144, 148, 159)

Type material: Holotype (Fig. 15) 1 s of 3.7 x 1.9 mm, and 1 paratype, 1 s, Fiura, Sal Island, Cape Verde Archipelago (MNCN 15.05/31718). Other paratypes: 3 s, Regona, 10 m, and 3 s, Punta Preta

(Right page) Figures 10-14: *Rissoina* (*Ailinzebina*) *onobiformis* n. sp. 10: paratype (broken during study), Rabo de Junco, Sal (CER); 11: holotype, Rabo de Junco, Sal (MNCN 15.05/31713); 12-13: protoconchs of paratypes, Rabo de Junco, Sal (CER); 14: teleoconch microsculpture of a paratype, Furna, Brava (CER).

(Página derecha) Figuras 10-14: *Rissoina* (*Ailinzebina*) *onobiformis* spec. nov. 10: paratipo (roto durante su estudio), Rabo de Junco, Sal (CER); 11: holotipo, Rabo de Junco, Sal (MNCN 15.05/31713); 12-13: protoconchas de paratipos, Rabo de Junco, Sal (CER); 14: microescultura de la teloconcha de un paratipo, Furna, Brava (CER).





(DBUA); 1 s, Rabo do Junco, 4 m (AMNH); 1 s, Rabo do Junco, 3 m (NNM 58028); 4 s, Regona, 2-3 m, and 6 s, 1 f, Mordeira Bay, 5 m (CER); 1 s, Regona, 2 m (MNHN). All the type material from Sal. **Other material studied:** Sal: 2 sp, Mordeira Bay, 4 m (broken for radular study); 2 s, Regona. Boa Vista: 3 s, Sal Rei, 8 m; 8 s, Porto da Cruz, 4 m.

**Etymology:** The specific name alludes to the very solid shell.

**Description:** Shell (Figs. 15, 16) length up to 4.3 mm, maximum width 2.0 mm, very solid, elongate-conic.

Protoconch (Fig. 17) of 1 whorl and 400  $\mu$ m of maximum diameter, of non-planktotrophic type, with a spiral cord and a slight angulation below; transition to teleoconch abrupt. Microsculpture (Fig. 18) formed by numerous small pits.

Teleoconch of 5 whorls; two adapical spire whorls convex below sutures, subsequent spire whorls becoming gradually angulate only in subsutural part; suture evident; last whorl strongly convex. Colour whitish.

Axial sculpture consisting of prominent, strongly convex, rounded, almost orthocline, widely spaced axial ribs, slightly shouldered in their subsutural part, between 10-12 in the last whorl. Spiral sculpture inconspicuous. Microsculpture (Fig. 19) formed by very numerous fine spiral threads, with a wider one between each 5-13 fine threads, sometimes more evident in the subsutural region.

Aperture D-shaped, relatively small; inner lip thick; columellar side weakly concave; anterior channel shallow; outer lip opisthocline, with strong varix with several concentric lines towards the inner part of the aperture.

Operculum (Fig. 148) translucent, thin, paucispiral, with a very eccentric nucleus, and without any peg on inner side; the insertion area is elongate and close to the edge.

Radula (Fig. 144): central tooth with 1 pair of basal denticles, and a prominent central cusp with 3-4 small cusps at each side; inner marginal teeth finely denticulate; outer marginal teeth without any denticles on the external margin.

**Habitat:** Sandy sediments in shallow water.

**Distribution:** Only known from Sal and Boa Vista Islands (Fig. 159).

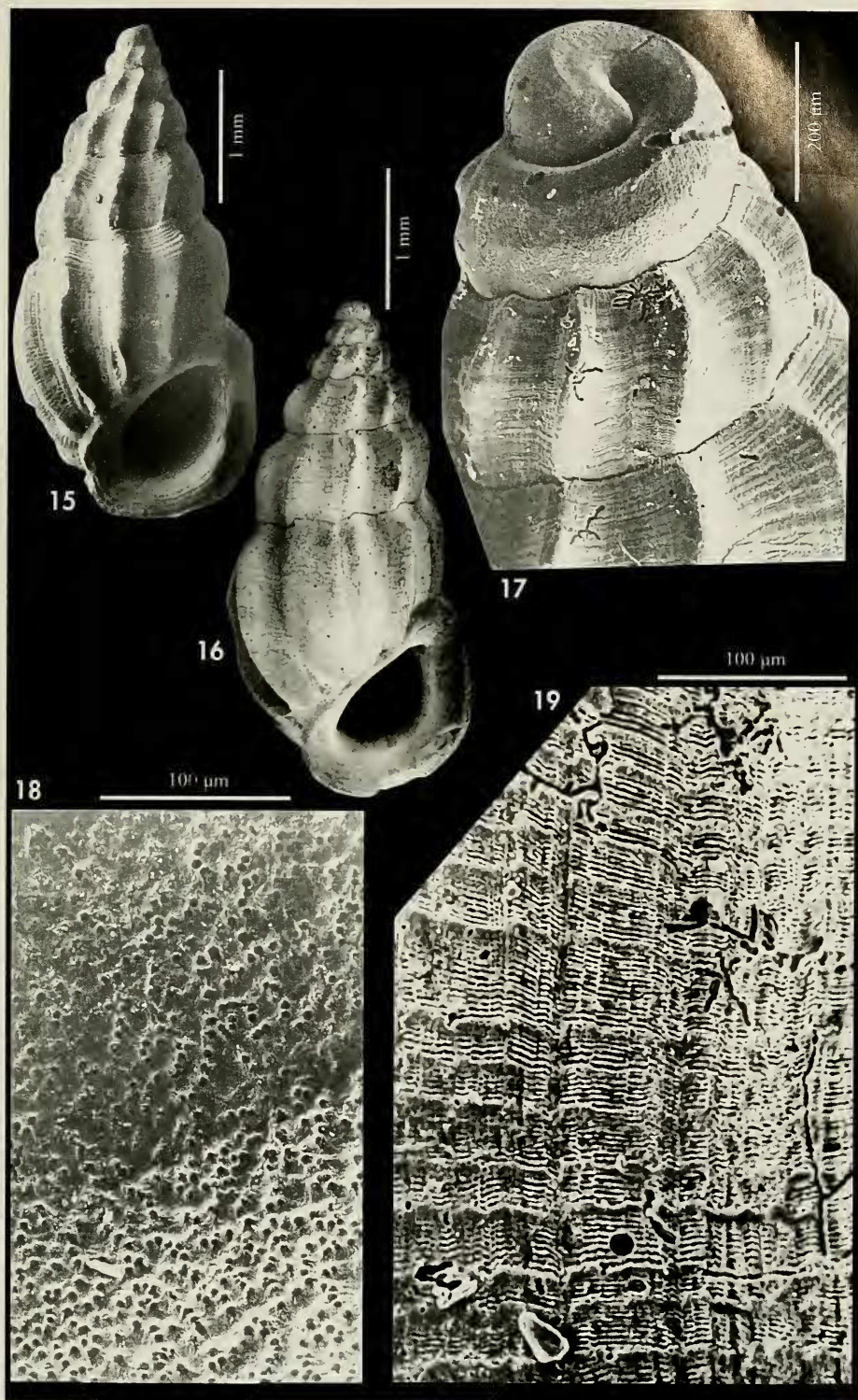
**Remarks:** The holotype of *Schwartziella africana* (Dautzenberg, 1913) (MNHN) from "Pointe de Bel-Air (baie de Hann)", Dakar (Senegal) lacks protoconch, but it is smaller (2.9x1.2 mm) than *S. robusta* n. sp., the whorls are not angulate, the axial ribs are 4-5 times narrower than interspaces and there are fine growth lines more evident at the subsutural region and very fine spiral threads more evident at the middle of the whorls. The sole specimen of *Rissoina africana* var. *crassior* (Dautzenberg, 1913), from the same locality (MNHN), is very different of the holotype in having an undulate suture between the penultimate and the last whorls (almost straight in the holotype), axial ribs only a little narrower than interspaces, and apparently no microsculpture. The protoconch is paucispiral (one whorl) and apparently smooth. It is also smaller (2.9x1.4 mm) than *S. robusta* n. sp.

The specimens described and illustrated by GOFAS (1999) under the name of *Schwartziella africana* from Senegal are also different from *S. robusta* n. sp.: they

(Right page) Figures 15-19: *Schwartziella (Schwartziella) robusta* n. sp. 15: holotype, Fiura, Sal (MNCN 15.05/31718); 16: paratype, Fiura, Sal (MNCN 15.05/31718); 17: protoconch of a paratype, Regona, Sal (CER); 18: protoconch microsculpture of the same paratype; 19: teleoconch microsculpture of the same paratype.

(Página derecha) Figuras 15-19: *Schwartziella (Schwartziella) robusta* spec. nov. 15: holotipo, Fiura, Sal (MNCN 15.05/31718); 16: paratipo, Fiura, Sal (MNCN 15.05/31718); 17: protoconcha de un paratipo, Regona, Sal (CER); 18: microescultura de la protoconcha del mismo paratipo; 19: microescultura de la teleoconcha del mismo paratipo.







are larger (up to 5.25x2.15 mm), with the whorls not angulate but convex, and the protoconch has no spiral cords but rounded spots. According to GOFAS (1999), *S. africana* is only known with certainty from a small stretch of coastline around Dakar, Senegal. The only shell recorded from Maio island (Cape

Verde Archipelago) must be regarded as an erroneous record, since no specimens of this species were found in the large material examined in this paper.

The differences of *S. robusta* with the other new species of *Schwartzziella* described below are given in the remarks of each species.

*Schwartzziella (Schwartzziella) obesa* n. sp. (Figs. 20-24, 160)

**Type material:** Holotype (Fig. 20) 1 s of 5.5 x 2.4 mm from Furna Bay, Brava Island, Cape Verde Archipelago, 15-20 m (MNCN 15.05/31712). Paratypes: 3 s (DBUA); 2 s (CER); 1 s (AMNH); 1 s (NNM 58019); 1 s (MNHN), all from the type locality.

**Other material studied:** Brava: 2 f, Furna, 30 m; 2 s, Pedrinha, 4 m; 1 s, Porto do Ancio, 30 m. Santiago: 1 s, Praia, 5 m; 1 sp, 5 s (Fig. 16), 4 f, Tarrafal, 3 m; 2 s, Cidade Velha, 5 m; 2 f, CANCAP Sta. 6.015, S of Santiago, 14° 53' N, 23° 30' W, 150 m (5-VI-1982) (NNM); 2 j, 1 f, CANCAP Sta. 6.024, 15° 00' N, 23° 44' W, 540 m (7-VI-1982) (NNM); 2 j, CANCAP Sta. 6.054, 14° 54' N, 23° 30' W, 29-33 m (11-VI-1982) (NNM); 1 j, CANCAP Sta. 7.008, 14° 54' N, 23° 38' W, 320 m (20-VIII-1986) (NNM). Fogo: 1 j, CANCAP Sta. 6.052, 14° 53' N, 24° 31' W, 85 m (10-VI-1982) (NNM). So Vicente: 1 s, Calhau, 4 m. Maio: 2 f, CANCAP Sta. 7.050, 15° 06' N, 23° 14' W, 380 m (25-VIII-1986) (NNM).

**Etymology:** The specific name alludes to the wide shell.

**Description:** Shell (Figs. 20, 21) length up to 7.0 mm, maximum width 2.8 mm, solid, elongate-conic, strongly scalariform.

Protoconch (Fig. 22) of 1 whorl and about 300 µm of maximum diameter, of non-planktotrophic type, with a spiral cord in its upper part; transition to teleoconch abrupt. Microsculpture formed by very small pits.

Teleoconch of 5-6 whorls; spire strongly scalariform, whorls with a prominent subsutural shoulder and rapidly enlarging; suture shallow but clearly visible. Colour whitish.

Axial sculpture consisting of prominent, sharp, narrow and widely spaced axial ribs, which are aligned across several whorls, slightly opisthoclinal on the first whorls and almost orthoclinal in

the body whorl, on where there are about 14-15 ribs, clearly arched to the base. Spiral sculpture formed by very fine cords. Microsculpture (Figs. 23, 24): all the surface of the shell is covered by very fine threads, both on the spiral cords and the interspaces.

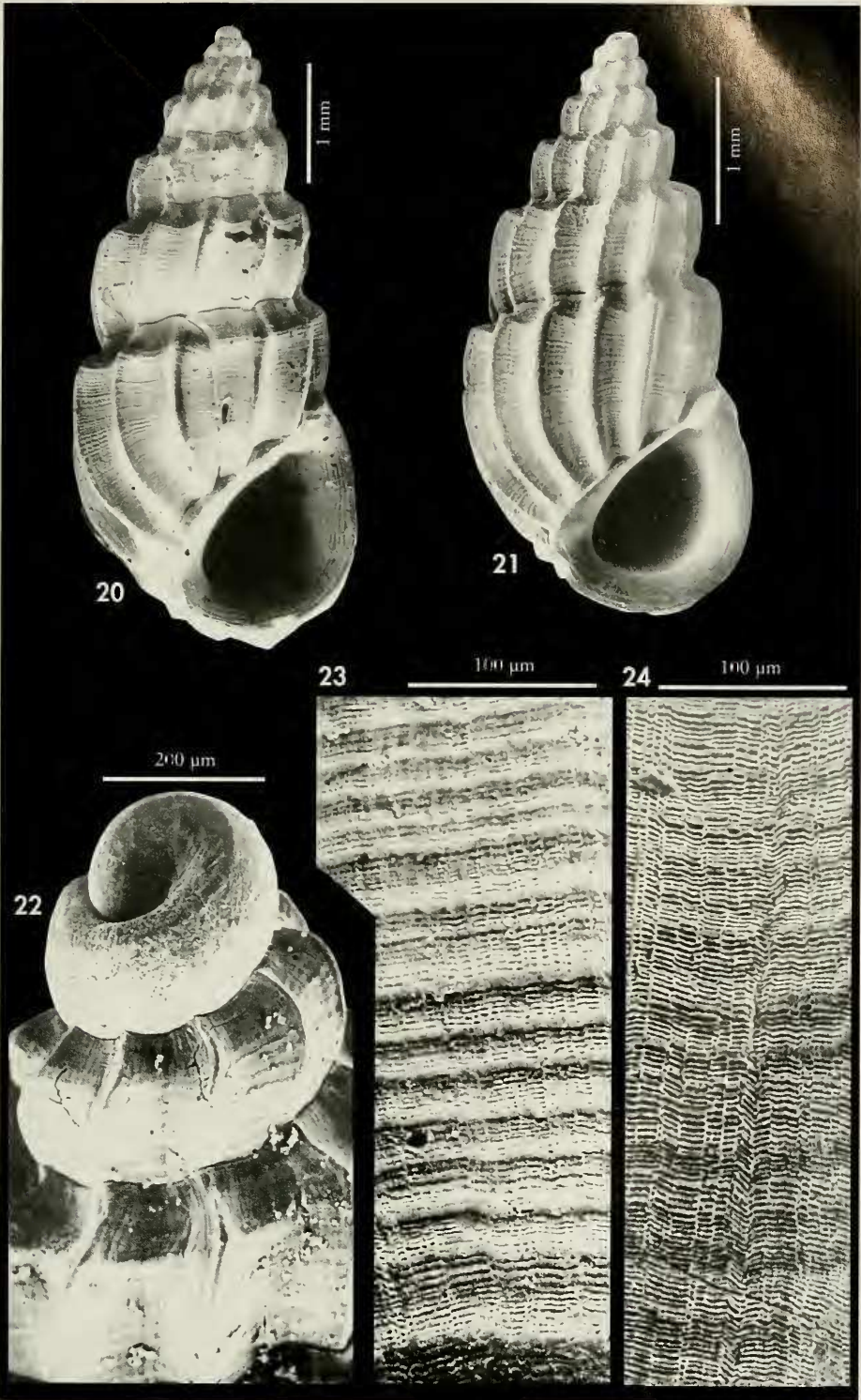
Aperture D-shaped, small; inner lip thick; columellar side strong, weakly concave; anterior channel shallow; outer lip opisthoclinal, with thick external varix, with about eight parallel lines towards the inner part of the aperture.

**Habitat:** Sandy sediments from 3 to 600 m.

**Distribution:** Known from the group of Brava-Santiago-Fogo Islands, but some fragments from Maio and one shell from So Vicente seem to be this species (Fig. 160).

(Right page) Figures 20-24: *Schwartzziella (Schwartzziella) obesa* n. sp. 20: holotype, Furna, Brava (MNCN 15.05/31712); 21: shell from Tarrafal, Santiago (CER); 22: protoconch of a shell from Tarrafal, Santiago (CER); 23: teleoconch microsculpture of the holotype; 24: teleoconch microsculpture of a shell from Tarrafal (CER).

(Pgina derecha) Figuras 20-24: *Schwartzziella (Schwartzziella) obesa* spec. nov. 20: holotipo, Furna, Brava (MNCN 15.05/31712); 21: concha de Tarrafal, Santiago (CER); 22: protoconcha de una concha de Tarrafal, Santiago (CER); 23: microescultura de la teleoconcha del holotipo; 24: microescultura de la teleoconcha de una concha de Tarrafal (CER).



**Remarks:** The shells of *Schwartzziella obesa* n. sp. from Brava seem to be a little different from those of Santiago and São Vicente: the latter are a little smaller, the axial ribs are a little closer, the subsutural angle is slightly more elevate and the spiral threads are more depressed (see Figs. 18, 19). All these differences seem to be not relevant in order to consider both populations to be not conspecific, and probably they are the expression of a difficult genetic flow between populations of different islands, but only more detailed studies on living specimens will clarify this matter.

*S. robusta* n. sp. also has a thick shell, but it lacks the subsutural angulation and the scalariform profile of *S. obesa*, the axial ribs are less numerous, sharper and more arched in its subsutural part and to

the base. The spiral threads of the subsutural part are more evident in *S. robusta*, whereas in *S. obesa* are more attenuated.

*S. africana* (Dautzenberg, 1913) and *S. africana* var. *crassior* (Dautzenberg, 1913) are smaller, their whorls are not angulate, and the axial ribs and the spiral sculpture and microsculpture are different. The protoconch of *S. africana* var. *crassior* is apparently smooth, without any spiral cord (see under remarks of *S. robusta*). The specimens of *Schwartzziella africana* described and illustrated by GOFAS (1999) from Senegal are also different: they are smaller, the whorls are not angulate, have a lower number of ribs on the body whorl (ca. 12), the protoconch has no spiral cords and its microsculpture consists of rounded spots.

### *Schwartzziella (Schwartzziella) corrugata* n. sp. (Figs. 25-29, 161)

**Type material:** Holotype (Fig. 25) 1 s of 5.6 x 2.1 mm from Furna, Brava Island, Cape Verde Archipelago, 30 m (MNCN 15.05/31703). Paratypes: 1 s (MNHN) and 3 s (CER) (Fig. 26), all from the type locality.

**Other material studied:** Brava: 2 s, 1 f, 2 j (1 broken), Pedrinha, 10 m; 1 s, 2 f, Porto do Ancião, 3 m; 1 s, Ilhéus do Rombo, 3 m.

**Etymology:** The specific name alludes to the sutural undulation formed by the axial ribs of the shell.

**Description:** Shell (Fig. 25) length up to 5.6 mm, maximum width 2.1 mm, very solid, elongate-conic.

Protoconch (Fig. 26) of 1 whorl and 360  $\mu$ m of maximum diameter, of non-planktotrophic type, with one spiral cord in its upper part and an angulation below; transition to teleoconch abrupt. Microsculpture (Fig. 29) formed by very small pits.

Teleoconch of 5 whorls, weakly convex, slightly angulated below su-

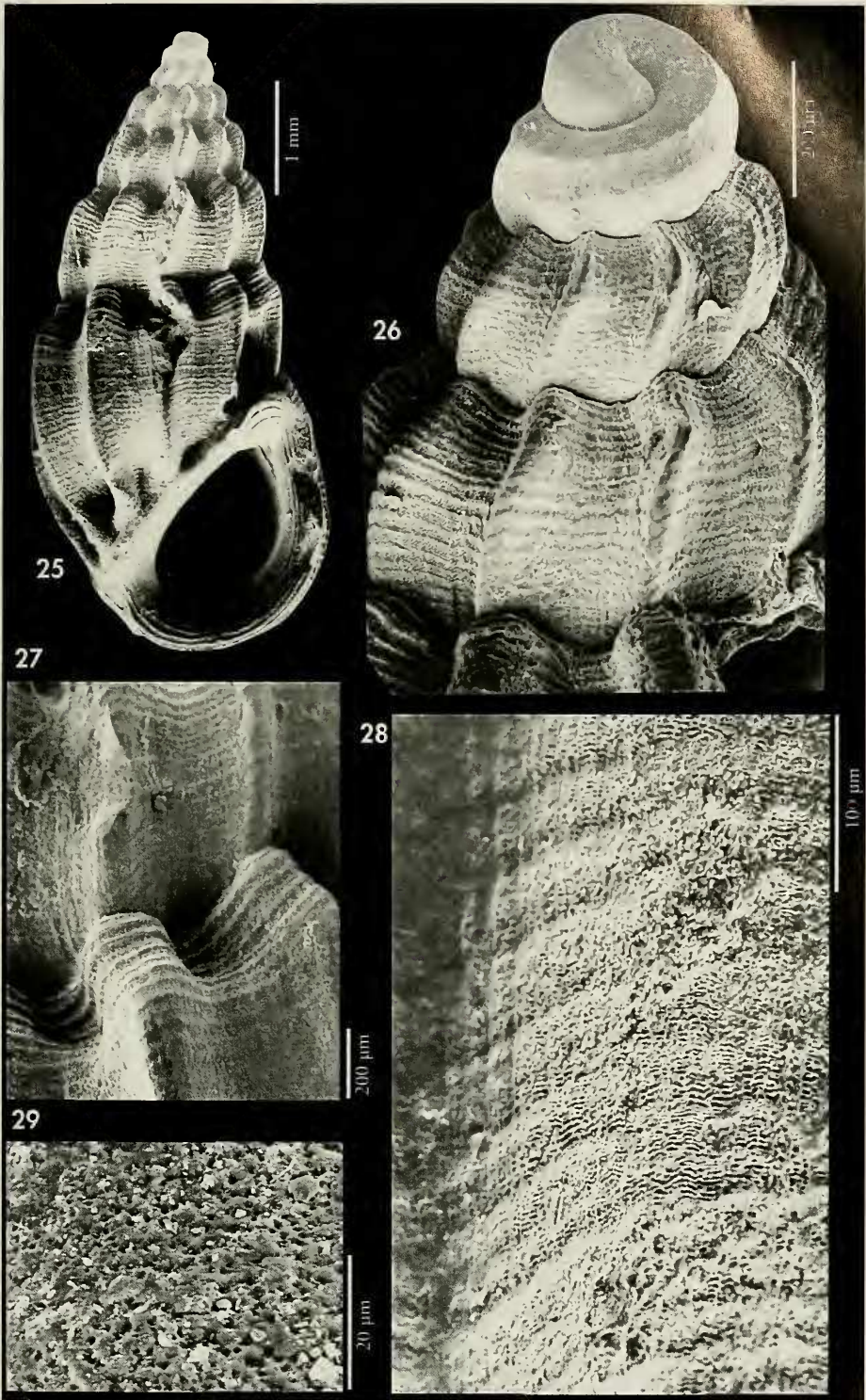
tures; last whorl weakly convex; suture (Figs. 26, 27) well marked and undulous due to the axial ribs. Colour whitish.

Axial sculpture consisting of prominent, rounded, spaced axial ribs, which are almost orthocone in the body whorl and opisthocone in previous whorls, curved subsuturally, and about 12 in last whorl. Near the base, the interspace between ribs is deep. Spiral sculpture formed by fine cords, visible at low magnification, and more evident in the

(Right page) Figures 25-29: *Schwartzziella (Schwartzziella) corrugata* n. sp. 25: holotype, Furna, Brava (MNCN 15.05/31703); 26: protoconch of a paratype, Furna, Brava (CER); 27: detail of the suture of a paratype, Furna, Brava (CER); 28: teleoconch microsculpture of a paratype, Furna, Brava (CER); 29: protoconch microsculpture of a paratype, Furna, Brava (CER).

(Página derecha) Figuras 25-29: *Schwartzziella (Schwartzziella) corrugata* spec. nov. 25: holotipo, Furna, Brava (MNCN 15.05/31703); 26: protoconcha de un paratipo, Furna, Brava (CER); 27: detalle de la sutura de un paratipo, Furna, Brava (CER); 28: microescultura de la teleoconcha de un paratipo, Furna, Brava (CER); 29: microescultura de la protoconcha de un paratipo, Furna, Brava (CER).





subsutural zone. Microsculpture (Fig. 28) formed by many irregular threads between and on the spiral cords.

Aperture D-shaped, relatively small; inner lip thick; columellar side weakly concave; anterior channel shallow; outer lip thick with external varix with about seven parallel lines towards the inner part of the aperture.

*Habitat:* The material studied was obtained from sand sediments between a few meters and 30 m deep.

*Distribution:* *S. corrugata* n. sp. is only known from Brava Island and Ilhéus do Rombo (Fig. 161).

*Remarks:* *S. corrugata* n. sp. has a shell as solid as the precedent ones (*S. robusta* and *S. obesa*), but it can be differentiated by its very undulous sutural line due to the stronger and elevated axial ribs and it lacks of the subsutural depression. *S. corrugata* and *S. robusta* have similar pro-

toconch and teleoconch microsculpture, and the allopatric distribution of both species point out to be different morphs (or subspecies) of an unique species distributed in different islands. Nevertheless, no intermediate forms between the marked undulous suture of *S. corrugata* and the linear suture of *S. robusta* were found in other islands, so we consider them as different species. *S. corrugata* is sympatric with *S. obesa* in Brava.

*Schwartziella africana* (Dautzenberg, 1913) is smaller, the whorls are not angulate, and the suture, axial and spiral sculpture and microsculpture are also different (see under remarks of *S. robusta*).

*S. africana* var. *crassior* (Dautzenberg, 1913) has an undulate suture, but it is also smaller, its axial ribs are wider, and apparently has no microsculpture both in protoconch and teleoconch.

### *Schwartziella (Schwartziella) sanmartini* n. sp. (Figs. 30-34, 146, 149-151, 156, 162)

**Type material:** Holotype (Fig. 30) 1 s of 4.8 x 2.0 mm, and paratypes, 2 s, from Mordeira Bay, Sal Island, Cape Verde Archipelago, 4 m (MNCN 15.05/31719). Paratypes: Paratypes: 3 s, Mordeira Bay, Sal, 5 m (CER); 4 sp, 6 s, Rabo de Junco, Sal, 4 m (CER); 2 sp, 1 s, Mordeira, Sal (DBUA); 2 s, Regona, Sal, 4 m (MNH); 1 s, Mordeira, Sal, 4 m (AMNH); 1 s, Mordeira, Sal, 4 m (NNM 58029).

**Other material studied:** Sal: 1 s, 6 j, Palmeira, 6 m; 6 s, 1 f, Mordeira, 5 m; 1 s, Rabo de Junco, 2 m; 1 s, Algodoeiro, 4 m. Boa Vista: 5 s, Sal Rei, 4 m; 2 sp, 2 s, Ilhéu de Sal Rei, 5 m; 1 s, Porto Ferreira, 5 m; 3 s, Porto da Cruz, 4 m; 2 s, 4 j, Baía Teodora, 5 m; 3 s, Derrubado, 5 m. Maio: 1 s, Navio Quebrado, 3 m.

**Etymology:** The specific name is dedicated to the zoologist Guillermo San Martín, companion of some research trips.

*Description:* Shell (Fig. 30) length up to 5.0 mm, maximum width 2.1 mm, relatively solid, elongate-conic.

Protoconch (Fig. 31) of 1 whorl and 360 µm of maximum diameter, of non-planktotrophic type, no spiral sculpture

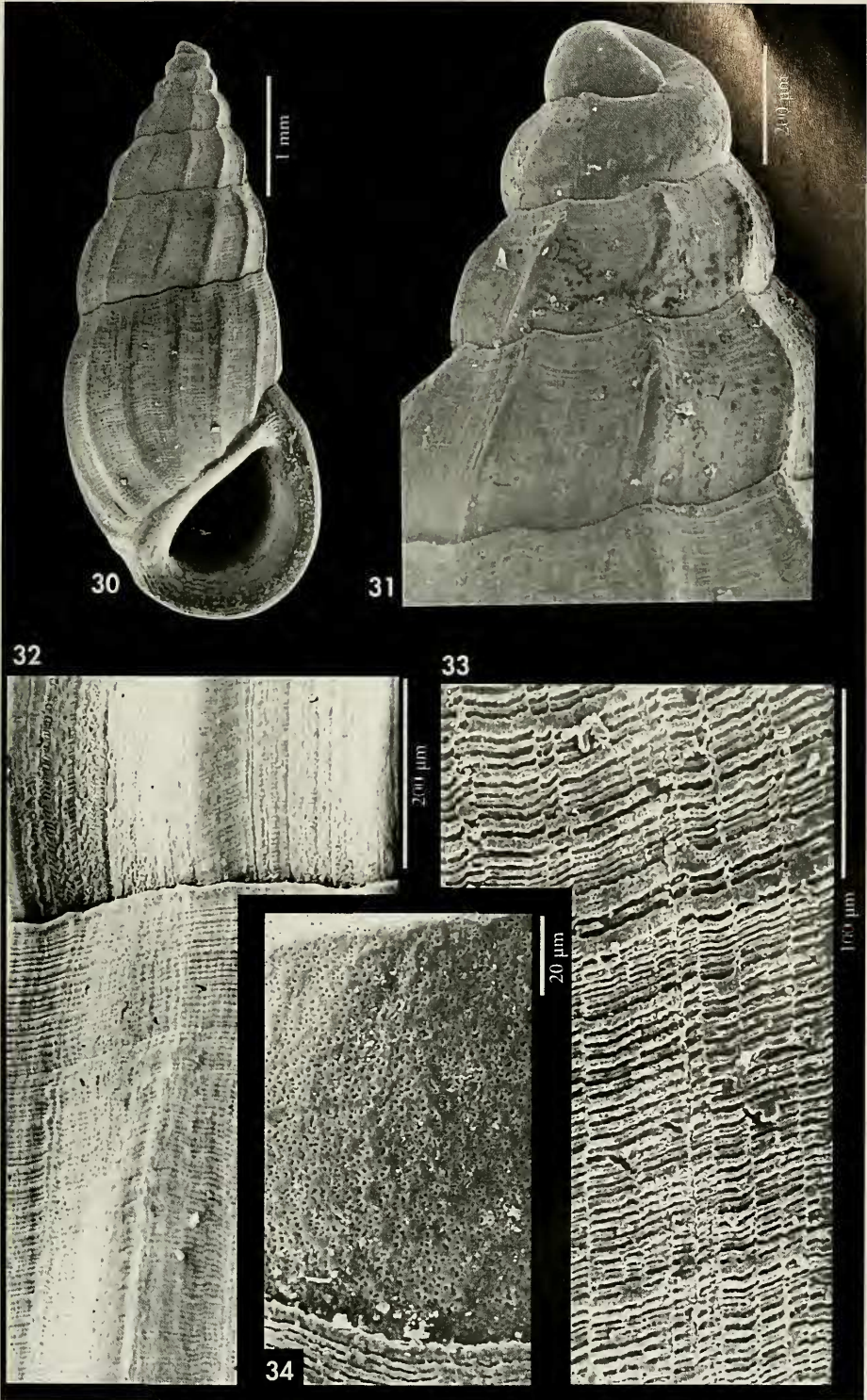
except by a very slight angulation in its upper part. Microsculpture (Fig. 34) formed by very small pits.

Teleoconch of about 5 whorls weakly convex, slightly angulated below sutures; last whorl large, weakly convex, repre-

(Right page) Figures 30-34: *Schwartziella (Schwartziella) sanmartini* n. sp. 30: holotype, Mordeira, Sal (MNCN 15.05/31719); 31: protoconch of the holotype; 32: detail of the suture of a paratype, Mordeira (CER); 33: teleoconch microsculpture of the same paratype; 34: protoconch microsculpture of the same paratype.

(Página derecha) Figuras 30-34: *Schwartziella (Schwartziella) sanmartini* spec. nov. 25: holotipo, Mordeira, Sal (MNCN 15.05/31719); 26: protoconcha del holotipo; 27: detalle de la sutura de un paratipo, Mordeira (CER); 28: microescultura de la teleoconcha del mismo paratipo; 34: microescultura de la protoconcha del mismo paratipo.







senting more than a half of the shell; suture shallow, slightly undulate due to the axial sculpture. Colour whitish.

Axial sculpture consisting of depressed, rounded, narrow, almost orthocline in last whorl and opisthocline in previous whorls, distantly spaced axial ribs, about 14 in last whorl. Spiral sculpture almost not appreciable at low magnification. Microsculpture (Figs. 32, 33) formed by very fine threads axially interrupted and modified by growth lines.

Aperture D-shaped, small; inner lip thick; columellar side weakly concave; anterior channel almost absent; outer lip with ample external varix with several parallel lines towards the inner of the aperture.

Operculum (Figs. 149-151) translucent, thin, paucispiral with the nucleus very eccentric and without any prominent peg on inner side.

Radula (Fig. 146): central tooth with one pair of basal denticles, a slightly prominent central cusp, and 3-4 smaller cusps at each side, the more basal ones very small; lateral teeth with 6-8 cusps on the inner edge and 4-5 on the outer edge; inner marginal teeth with many small denticles on both edges (serrated); outer marginal teeth without any denticle on the outer edge.

The animal (Fig. 156) examined in alcohol is apparently white. The penis has a cylindrical base; in the middle part it is curved ahead, and flattened and enlarged at its distal end; the margin of both sides of this terminal widening are denticulate and also two denticulate fringes appear close to the tip, with a short and sharp appendix towards the right part.

*Habitat*: The material studied was obtained in sand sediments between 3-6 m.

*Distribution*: Only known from Sal, Boa Vista and Maio (Fig. 162).

*Remarks*: *Schwartzziella sanmartini* n. sp. has a thinner shell than *S. robusta*, *S. obesa* and *S. corrugata*, and its axial ribs are more depressed and rounded and less elevate. Also it differs from *S. robusta* n. sp. by having more axial ribs, from *S. obesa* n. sp. by lacking of any subsutural angulation, and from *S. corrugata* by the slightly undulate suture.

*S. africana* y *S. africana* var. *crassior* are smaller; the first species has narrower ribs, fine growth lines more evident at the subsutural region and very fine spiral threads more evident at the middle of the whorls. *S. africana* var. *crassior* has an undulate suture, axial ribs only a little narrower than interspaces, and apparently no microsculpture.

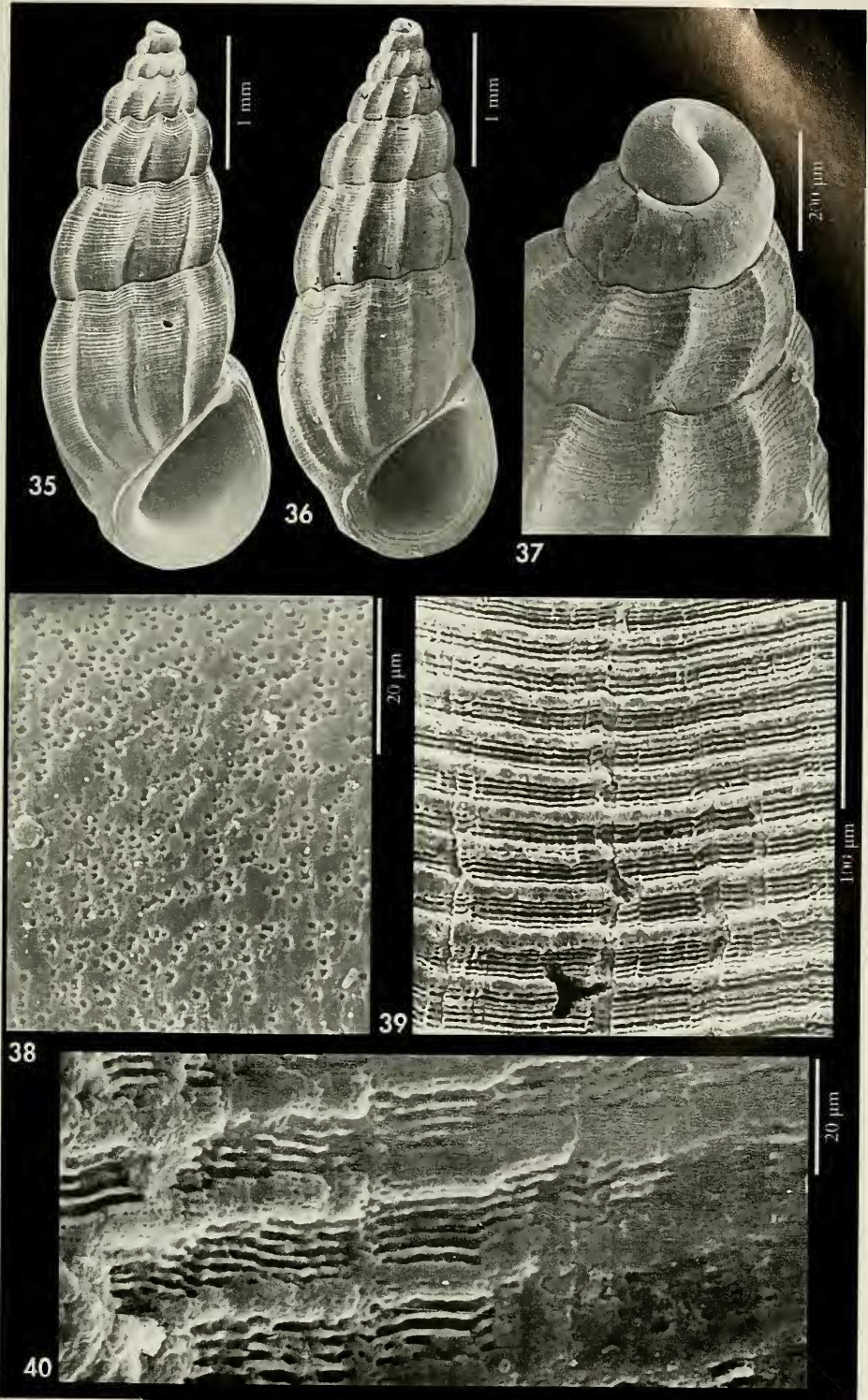
### *Schwartzziella (Schwartzziella) similiter* n. sp. (Figs. 35-40, 147, 152, 163)

**Type material**: Holotype (Fig. 35) 1 s of 5.6 x 2.1 mm and 5 paratypes, 5 s, Furna, Brava Island, Cape Verde Archipelago, 8-20 m (MNCN 15.05/31721). Other paratypes: 2 s from the type locality in each of MNHN, AMNH, DBUA, NNM (58031), and 42 s in CER.

**Other material studied**: Brava: 3 sp, 115 s, 41 f, 2 j, Furna, 8-20 m; 5 s, 8 j, Pedrinha, 4 m; 3 sp, 23 s, 14 j, 3 f, Porto do Ancião, 3 m; 6 s, 4 j, Ilhéus do Rombo, 3-5 m. Santiago: 31 s, 5 j, 6 f, Praia, Ilhéu de Santa Maria, 6 m; 8 s, 5 j, 1 f, Prainha, 5 m; 4 s, Cidade Velha, 4 m; 29 s, 2 j, Tarrafal, 4 m; 1 s, 1 j, 1 f, CANCAP Sta. 6024, 15° 00' N, 23° 44' W, 540 m (7-VI-1982) (NNM). São Vicente: 13 s, Calhau, 3 m; 1 s, Porto Mindelo, 15 m; 4 s, Salamança. Santa Luzia: 2 sp, 1 s, Praia Francisca, 3 m.

(Right page) Figures 35-40: *Schwartzziella (Schwartzziella) similiter* n. sp. 35: holotype, Furna, Brava (MNCN 15.05/31721); 36: shell from Tarrafal, Santiago (CER); 37: protoconch of a paratype, Furna (CER); 38: protoconch microsculpture of the same paratype; 39-40: teleoconch microsculpture of a shell from Furna.

(Página derecha) Figuras 35-40: *Schwartzziella (Schwartzziella) similiter spec. nov.* 35: holotipo, Furna, Brava (MNCN 15.05/31721); 36: concha de Tarrafal, Santiago (CER); 37: protoconcha de un paratipo, Furna (CER); 38: microescultura de la protoconcha del mismo paratipo; 39-40: microescultura de la teleoconcha de un ejemplar de Furna.





**Etymology:** The specific name alludes to the similarity of the shell of this species with other species of Cape Verde *Schwartzziella*.

**Description:** Shell (Figs. 35, 36) length up to 6.0 mm, maximum width 2.1 mm, relatively solid, elongate conic.

Protoconch (Fig. 37) of 1 whorl and about 300  $\mu$ m of maximum diameter, of non-planktotrophic type, with a spiral cord running along a keel on its upper part; transition to teleoconch abrupt. Microsculpture (Fig. 38) formed by very small pits.

Teleoconch of 5 whorls, regularly convex, not angulated below sutures, last whorl weakly convex; suture shallow, slightly undulate. Colour whitish.

Axial sculpture consisting of slightly prominent, rounded, narrow, almost orthocline in the last whorl and opisthocline in previous, distantly spaced axial ribs not regularly continued from whorl to whorl. Spiral sculpture appreciable with difficulty at small magnification. Microsculpture (Figs. 39, 40) consisting in very close relatively thick spiral threads interrupted by axial growth lines, with 2-5 thinner threads between each two of them which are interrupted in some places.

Aperture D-shaped, small; inner lip thick; columellar side weakly concave; anterior channel almost absent; outer lip with a thick varix; with about 5 parallel lines.

Operculum (Fig. 152) translucent, thin, paucispiral, with a very eccentric

nucleus and without any prominent peg on the inner side.

Radula (Fig. 147): central tooth with one pair of basal denticles, a few prominent central cusp and 3-4 small cusps at each side, those of the extremes very small; lateral teeth with 7-8 cusps on the inner edge and 4-5 on the outer edge inner marginal teeth with many small denticles; outer marginal teeth without denticles on the external edge.

**Habitat:** The material studied was obtained in sand sediments from 4 to 20 m. One sample was collected at 540 m.

**Distribution:** Santiago, Brava, São Vicente and Santa Luzia (Fig. 163).

**Remarks:** The shells from the northern (Santa Luzia and São Vicente) and the southern (Brava and Santiago) islands are very similar, with only small differences in size, and we consider them conspecific though both groups of islands are quite far for this species with non-planktotrophic development.

*S. similiter* n. sp. is similar to *S. sanmartini* n. sp., and the differences with other species mentioned in its remarks are not repeated here. *S. sanmartini* n. sp. is wider than *S. similiter* n. sp., has more axial ribs and these are more depressed; also, it has different microsculpture, with less marked and interrupted spiral threads, and a slightly smaller protoconch.

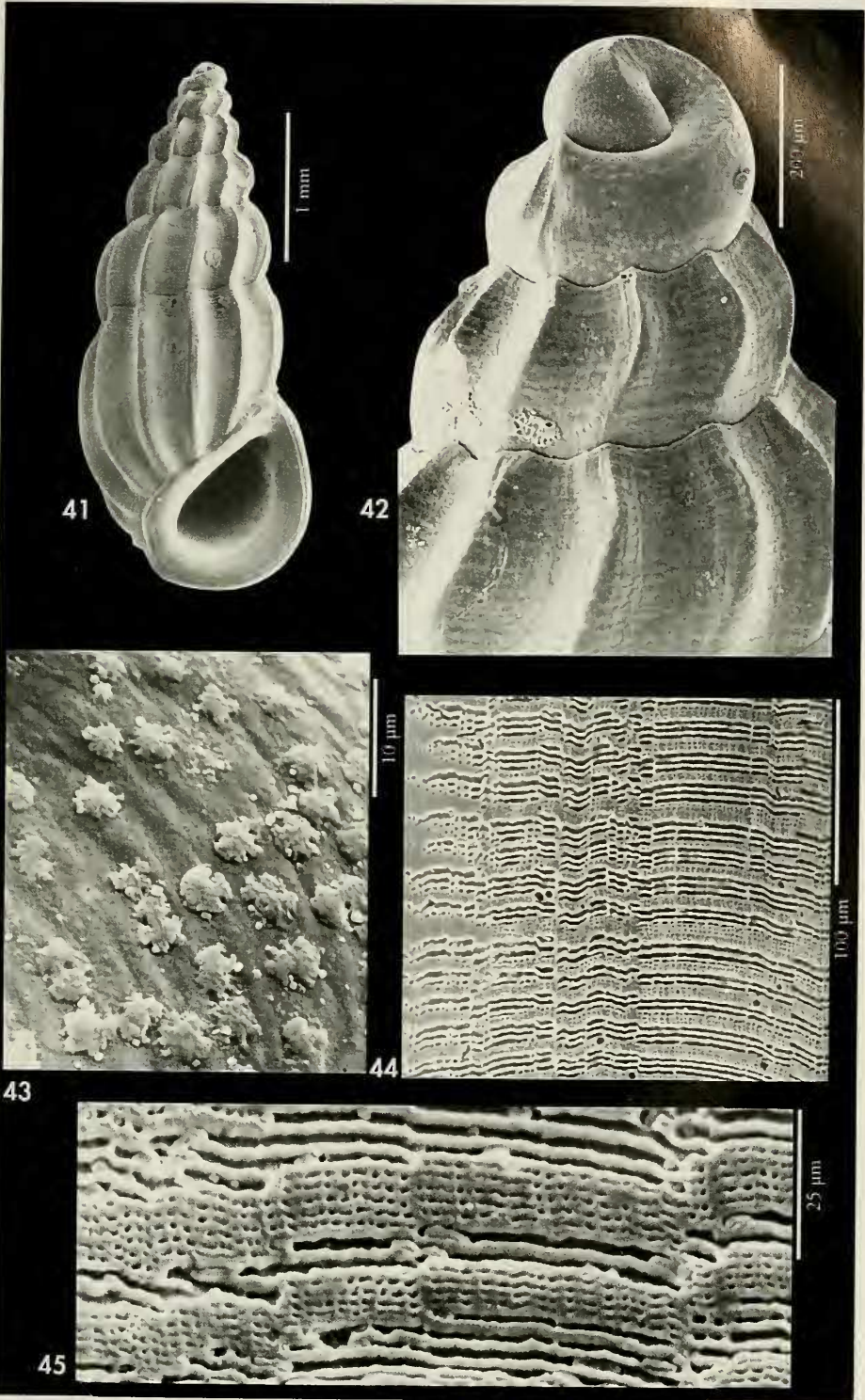
### *Schwartzziella (Schwartzziella) typica* n. sp. (Figs. 41-45, 142, 143, 145, 164)

**Type material:** Holotype (Fig. 41) 1 s of 3.8 x 1.6 mm and one paratype, 1 s, Palmeira, Sal Island, Cape Verde Archipelago, 6 m (MNCN 15.05/31705). Paratypes: 1 s from Monte Leste, Sal, in each of MNHN, AMNH, DBUA, NNM (58006), and 1 s, from Guincho do Ninho, 4 m; 2 s, from Palmeira, 6 m; 1 s, from Punta Preta, 3 m; 16 s, from Rabo de Junco, 6 m, and 4 s, from Regona, 10 m, all in CER. **Other material studied:** Sal: 5 s, Palhona, 1 m; 1 sp (broken for radular study), 3 s, 6 f, Monte Leste, 1 m; 4 s, Algodoeiro, 4 m; 4 s, Palmeira, 8 m; 4 s, Regona, 3 m; 3 s, 1 j, Mordeira, 5 m; 7 s, 3 j, 3 f,

(Right page) Figures 41-45: *Schwartzziella (Schwartzziella) typica* n. sp. 41: holotype, Palmeira, Sal (MNCN 15.05/31705); 42: protoconch of a paratype, Palmeira (CER); 43: protoconch microsculpture of the same paratype; 44-45: teleoconch microsculpture of the same paratype.

(Página derecha) Figuras 41-45: *Schwartzziella (Schwartzziella) typica* spec. nov. 41: holotipo, Palmeira, Sal (MNCN 15.05/31705); 42: protoconcha de un paratipo, Palmeira (CER); 43: microescultura de la protoconcha del mismo paratipo; 44-45: microescultura de la teleoconcha del mismo paratipo.





CANCAP Sta. 7.100, off Palmeira, 16° 45' N, 23° 01' W, 354 m (30-VIII-1986) (NNM); 2 j, off Palmeira, CANCAP Sta. 7.109, 16° 45' N, 22° 59' W, 31 m (31-VIII-1986) (NNM). Boa Vista: 6 s, 2 j, Sal Rei. São Nicolau: 17 s, 6 j, 6 f, São Jorge Bay, CANCAP Sta. 7.129, 16° 33' N, 24° 16' W, 405 m (2-IX-1986) (NNM); 13 s, 8 f, CANCAP Sta. 7.128, 16° 33' N, 24° 17' W, 400 m (2-IX-1986) (NNM).

**Etymology:** The specific name alludes to the typical aspect of the shell for the genus.

**Description:** Shell (Fig. 41) length up to 4.5 mm, maximum width 1.8 mm, solid, elongate-conic.

Protoconch (Fig. 42) of 1 whorl and about 290  $\mu$ m of maximum diameter, of non-planktotrophic type, with a depressed spiral cord running along a keel in its upper part; transition to teleoconch abrupt. Microsculpture (Fig. 43) formed by flat prominences with irregular edges on an undulated surface.

Teleoconch of about 5 whorls, strongly convex, not angulated below sutures; last whorl convex; suture shallow, but evident. Colour white.

Axial sculpture consisting of prominent, relatively rounded, narrow, almost orthocline in last whorl and opisthocline in previous ones, distantly spaced axial ribs; the ribs are slightly curved in most of spire, but less in the last whorl. Spiral sculpture not appreciable at low magnification. Microsculpture (Figs. 44, 45) formed by bands of 4-6 closely packed, very fine spiral threads with minute pits between each two of them and 1-3 fine threads between each two of these bands.

Aperture D-shaped, small; inner lip thick; columellar side weakly concave; anterior channel almost absent; outer lip with thick and ample varix, almost orthocline; with 5-6 lines towards the inner part of the aperture.

Operculum translucent, with very eccentric nucleus and without any prominent peg on the inner side.

Radula (Fig. 145): central tooth with one pair of basal denticles, a slightly prominent central cusp, and 3-4 cusps at each side, those of extremes very small; lateral teeth with 6-8 cusps on the inner edge and 4-6 on the outer edge; inner marginal teeth with many small denticles on both edges, outer marginal teeth without denticles on external edge.

**Habitat:** The material studied was obtained in sand sediments from 1 to 400 m.

**Distribution:** Sal, Boa Vista and São Nicolau Islands (Fig. 164).

**Remarks:** *S. typica* n. sp. is similar to *S. sanmartini* n. sp. and *S. similiter* n. sp., but it is smaller than *S. sanmartini* and *S. similiter*, has more elevated axial ribs, less evident spiral sculpture and different teleoconch and protoconch microsculpture. *S. africana* has a similar protoconch microsculpture (GOFAS, 1999), but differs by its oblique axial ribs.

One shell (Figs. 142, 143) found in Calhau, São Vicente, is similar to this species and has the same microsculpture, but has a more evident spiral sculpture; we provisionally consider it conspecific awaiting for further material.

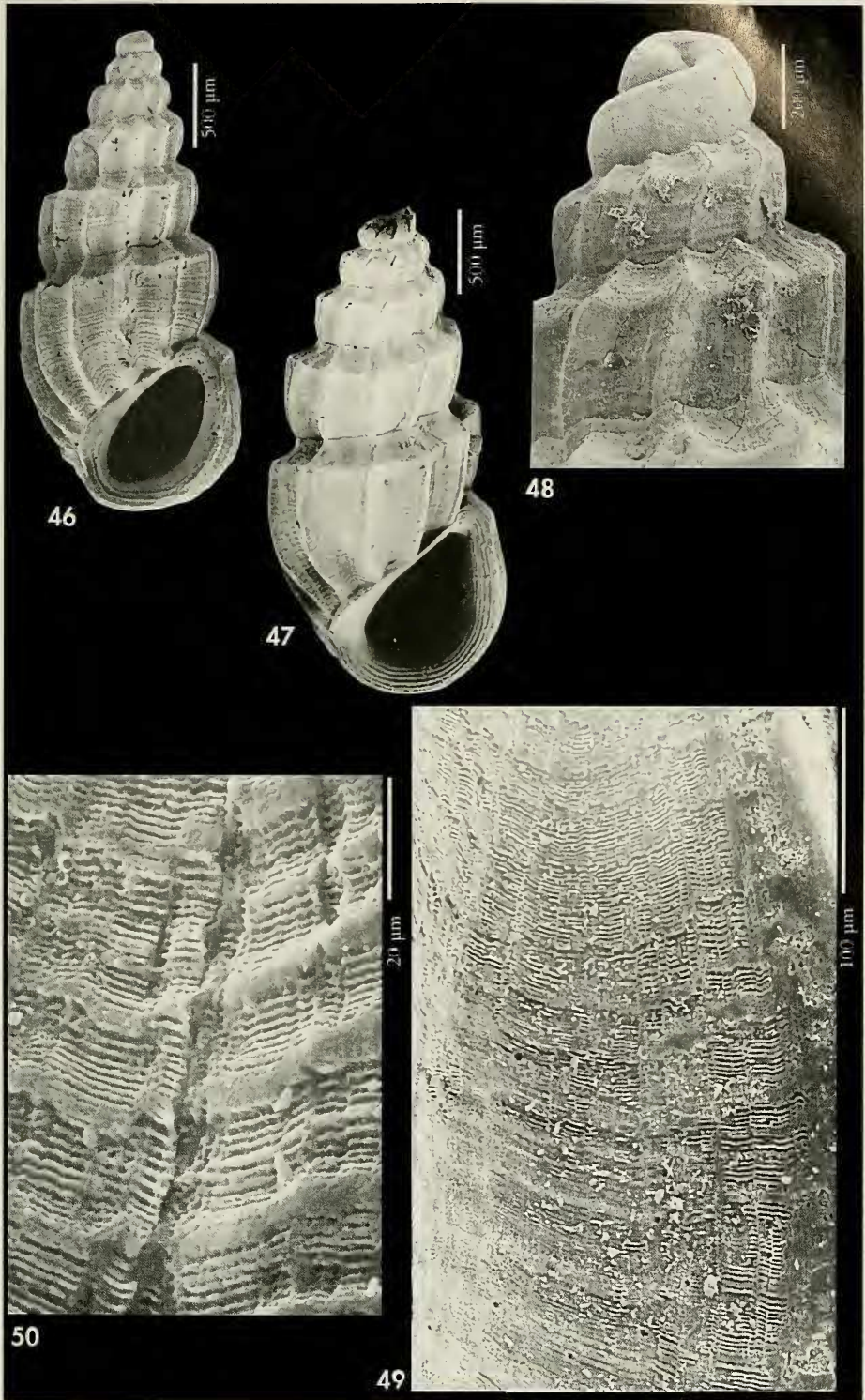
### *Schwartziella (Schwartziella) angularis* n. sp. (Figs. 46-50, 159)

**Type material:** Holotype (Fig. 46) 1 s of 2.9 x 1.3 mm from Rabo de Junco, Sal Island, Cape Verde Archipelago, 4 m (MNCN 15.05/31701). Paratypes: 1 s from the type locality in each of MNHN,

(Right page) Figures 46-50: *Schwartziella (Schwartziella) angularis* n. sp. 46: holotype, Rabo de Junco, Sal (MNCN 15.05/31701); 47: paratype, Rabo de Junco, Sal (CER); 48: protoconch of a paratype, Rabo de Junco (CER); 49-50: teleoconch microsculpture of the same paratype.

(Página derecha) Figuras 46-50: *Schwartziella (Schwartziella) angularis* spec. nov. 46: holotipo, Rabo de Junco, Sal (MNCN 15.05/31701); 47: paratipo, Rabo de Junco, Sal (CER); 48: protoconcha de un paratipo, Rabo de Junco (CER); 49-50: microescultura de la teleoconcha del mismo paratipo.







AMNH, DBUA, NNM (58000); further paratypes in CER: 3 s, Rabo de Junco, 4 m; 2 s, Pesqueiro do Aire, 1 m, and 2 s, Regona, 2 m.

**Other material studied:** Sal: 1 s, Rabo de Junco, 4 m; 2 f, CANCAP Sta. 7.110, 16° 46' N, 23° 02' W, 85 m (31-VIII-1986) (NNM). Boa Vista: 1 f, Sal Rei, 3 m.

**Etymology:** The specific name alludes the angulated subsutural shoulder of the shell.

**Description:** Shell (Figs. 46, 47) length up to 3.0 mm, maximum width 1.5 mm, relatively solid, elongate-conic, strongly scalariform.

Protoconch (Fig. 48) of 1 whorl and about 400  $\mu\text{m}$  of maximum diameter, of non-planktotrophic type, with only a faint spiral angulation on its upper part; transition to teleoconch abrupt.

Teleoconch of about 5 whorls, which are strongly scalaroid, with a prominent subsutural shoulder and rapid development. Suture shallow, but evident. Colour whitish.

Axial sculpture consisting of prominent, straight, sharp, narrow and spaced axial ribs, regularly continued from whorl to whorl, orthocone or slightly opisthocline in first whorls, and about 12 orthocone ribs in the last whorl. Spiral sculpture formed by very fine cords. Microsculpture (Figs. 49, 50)

formed by thick spiral threads with sparse very small pits, with 5-10 very thin threads between each two thick ones. The microsculpture almost disappears on the ribs.

Aperture D-shaped, small; inner lip thick; columellar side weakly concave; anterior channel very shallow; outer lip thick, strongly opisthocline, with wide external varix, with 5-6 parallel lines on the inner part.

**Habitat:** The material studied was obtained in sand sediments from 1 to 85 m of depth.

**Distribution:** Only known from Sal and Boa Vista Islands (Fig. 159).

**Remarks:** *S. angularis* n. sp. has a scalariform profile like *S. obesa* n. sp. and *S. gradata* n. sp. (see below), but *S. obesa* is larger, wider and more solid, and *S. gradata* is more slender and has a different protoconch sculpture.

### *Schwartzziella (Schwartzziella) luisi* n. sp. (Figs. 51-55, 153-155, 159)

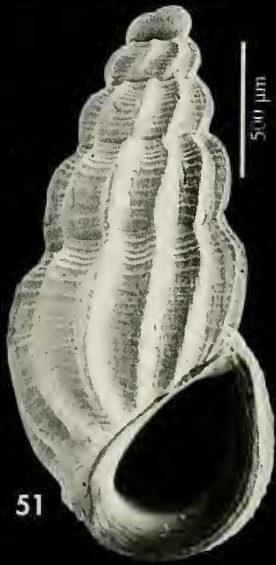
**Type material:** Holotype (Fig. 51) 1 s of 2.0 x 1.0 mm and 2 paratypes, 2 s, from Derrubado, Boa Vista Island, Cape Verde Archipelago, 2-4 m (MNCN 15.05/31722). Paratypes: 1 s in each of MNHN, AMNH, DBUA, NNM (58032), and 29 s in CER, all from the type locality.

**Other material studied:** Sal: 1 s, Praia do Cascalho, 1 m; 1 s, 3 j, Palmeira, 8 m; 3 s, Mordeira, 4 m; 1 j, CANCAP Sta. 7.100, off Palmeira, 16° 45' N, 23° 01' W, 354 m (30-VIII-1986) (NNM); 1 sp, 12 s, 2 f, Rabo do Junco, 2-5 m; 1 sp, 34 s, Regona, 2-10 m; 1 s, Palhona, 1 m; 1 sp, 8 s, 3 j, Mordeira, 4 m. Boa Vista: 18 s, 35 j, 16 f, Derrubado, 4 m; 2 sp, 4 s, Baia Teodora, 6 m; 1 sp, 7 s, Ilhéu de Sal Rei, 5 m; 52 s, 18 j, 8 f, Porto da Cruz, 6 m; 35 s, 7 f, 1 j, Sal Rei, 8 m; 9 s, Porto Ferreira, 6 m; 3 s, 2 j, Rife de Chaves, 6 m; 34 s, 2 j, 2 f, Morro de Areia, 4 m; 5 s, 1 j, Baijos de João Valente, 23 m.

**Etymology:** The specific name is dedicated to Luis Murillo, malacologist and Secretary of the Sociedad Española de Malacología, by his contribution to the development of Malacology in Spain.

(Right page) Figures 51-55: *Schwartzziella (Schwartzziella) luisi* n. sp. 51: holotype, Derrubado, Boa Vista (MNCN 15.05/31722); 52: protoconch of a paratype, Derrubado (CER); 53: protoconch microsculpture of the same paratype; 54-55: teleoconch microsculpture of the same paratype.

(Página derecha) Figuras 51-55: *Schwartzziella (Schwartzziella) luisi* spec. nov. 51: holotipo, Derrubado, Boa Vista (MNCN 15.05/31722); 52: protoconcha de un paratipo, Derrubado (CER); 53: microescultura de la protoconcha del mismo paratipo; 54-55: microescultura de la teleoconcha del mismo paratipo.



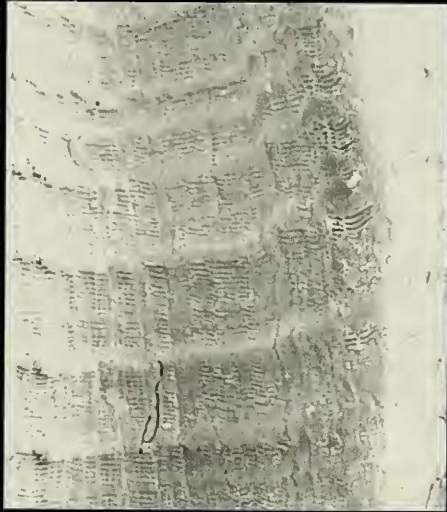
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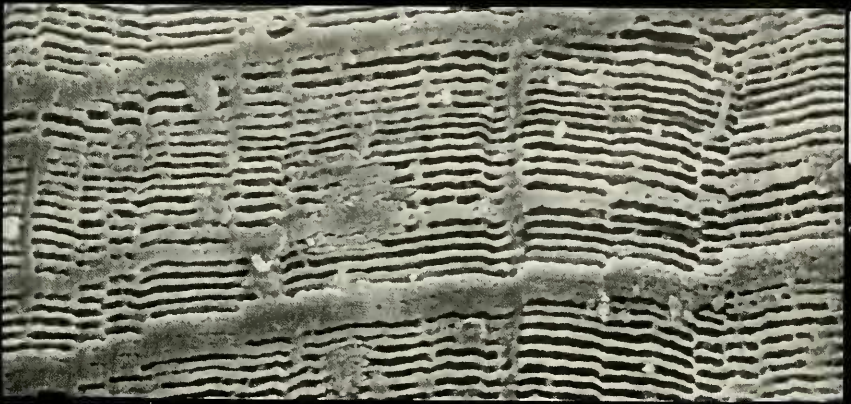
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54



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*Description:* Shell (Fig. 51) length up to 3.0 mm, maximum width 1.3 mm, not very solid, elongate-conic.

Protoconch (Fig. 52) of a little more than 1 whorl and about 280  $\mu\text{m}$  of maximum diameter, of non-planktotrophic type, with two spiral angulations, one on the upper part and other a little below; transition to teleoconch abrupt. Microsculpture (Fig. 53) formed by very small and irregular pits.

Teleoconch of 4 strongly convex whorls, not angulated below sutures; last whorl strongly convex; suture shallow but evident. Colour whitish.

Axial sculpture consisting of prominent, sharp, narrow, slightly curved, weakly opisthoclinal spaced axial ribs, which are continued from whorl to whorl. Spiral sculpture formed by prominent, widely spaced, very fine cords, visible under low magnification. Microsculpture (Figs. 54, 55) formed by small pits on the spiral cords, and 15-20 very fine threads between two cords.

Aperture D-shaped, medium sized; inner lip thick; columellar side weakly concave; anterior channel almost absent; outer lip opisthoclinal, with thick external varix; with several parallel lines towards the inner part of the aperture.

Operculum (Figs. 153-155) translucent, thin, paucispiral with the nucleus very eccentric and without any prominent peg on the inner side.

*Habitat:* The material studied was obtained in sand sediments between 2-10 m and at 354 m depth.

*Distribution:* Only known from Sal and Boa Vista Islands (Fig. 159).

*Remarks:* *S. luisi* n. sp. is smaller than any of the previously described species. Among the smallest of those, *S. angularis* n. sp. differs by having a subsutural angulation, and *S. typica* n. sp. has a different protoconch and teleoconch microsculpture. The differences with the other small species are discussed below.

### *Schwartziella (Schwartziella) minima* n. sp. (Figs. 56-60, 139, 159)

**Type material:** Holotype (Fig. 56) 1 s of 2.2 x 1.0 mm and 1 paratype, 1 s, from Regona, Sal Island, Cape Verde Archipelago, 2-4 m (MNCN 15.05/31711). Paratypes: 1 s in each of MNHN, AMNH, DBUA, NNM (58018), and 30 s in CER, all them from the type locality.

**Other material studied:** Sal: 5 s, 1 f, Palhona, 1 m; 1 s, Ponta do Cascalho, 2 m; 2 sp, 2 s, Rabo de Junco, 5 m; 8 s, Palmeira, 5 m; 4 s, Pesqueiro do Aire, 1 m; 3 s, 2 f, Mordeira, 4 m; 3 s, CANCAP Sta. 7.100, off Palmeira, 16° 45' N, 23° 01' W, 354 m (30-VIII-1986) (NNM); 1 s, CANCAP Sta. 7.109, off Palmeira, 16° 46' N, 22° 59' W, 31 m (31-VIII-1986) (NNM). Boa Vista: 1 s, Ilhéu de Sal Rei; 2 f, Derrubado, 4 m.

**Etymology:** The specific name alludes to the small size of the shell.

*Description:* Shell (Fig. 56) length up to 2.8 mm, maximum width 1.3 mm, relatively solid, elongate-conic.

Protoconch (Fig. 57) of 1 whorl and 320  $\mu\text{m}$  of maximum diameter, of non-planktotrophic type, without spiral

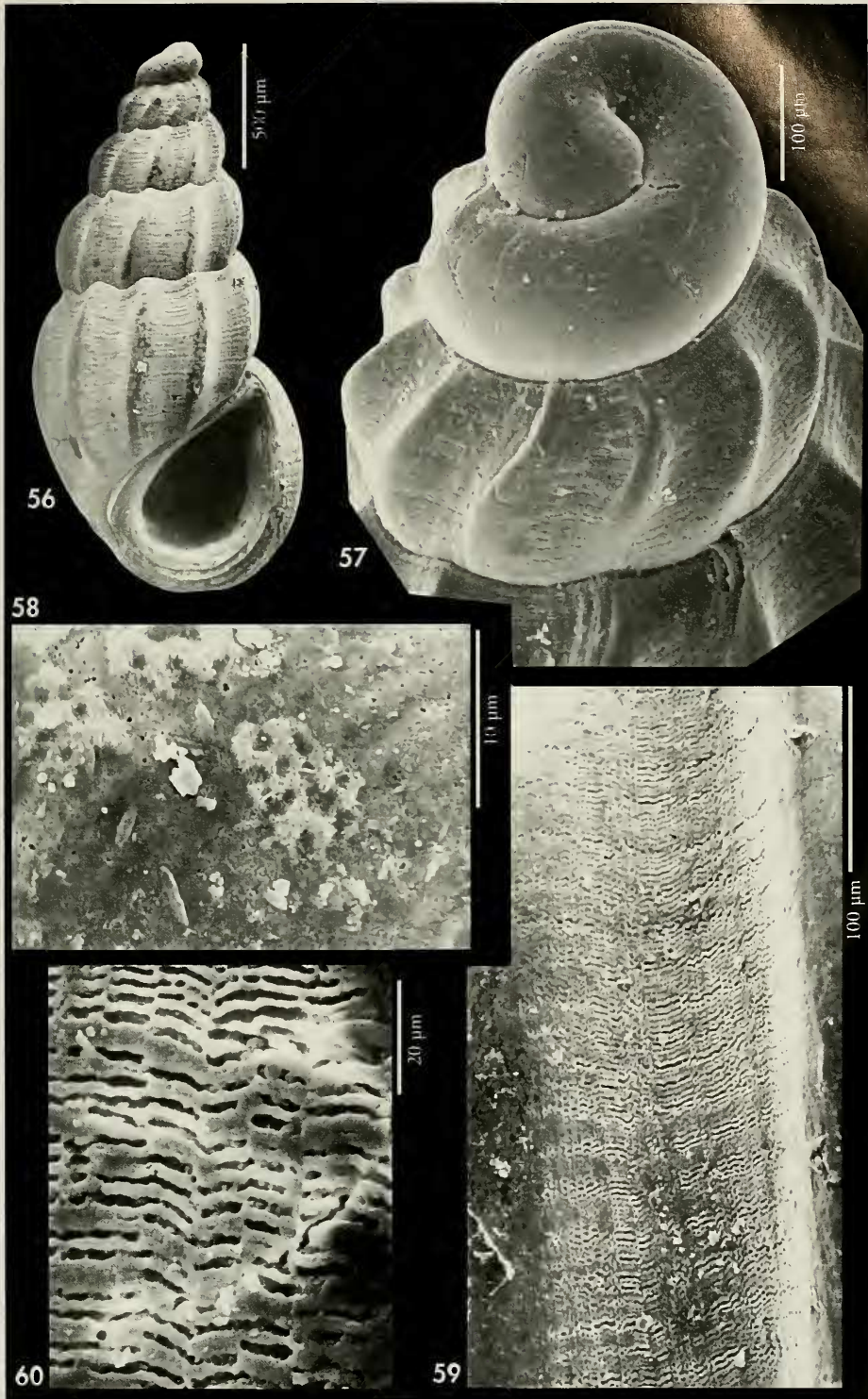
sculpture. Microsculpture (Fig. 58) formed by irregular flat prominences with some circular pits on an undulate surface.

Teleoconch of about 4 strongly convex whorls, not angulated below sutures,

(Right page) Figures 56-60: *Schwartziella (Schwartziella) minima* n. sp. 56: holotype, Regona, Sal (MNCN 15.05/31711); 57: protoconch of a shell from Regona, Sal; 58: protoconch microsculpture of a paratype, Regona (CER); 59-60: teleoconch microsculpture of the same paratype.

(Página derecha) Figuras 56-60: *Schwartziella (Schwartziella) minima spec. nov.* 56: holotipo, Regona, Sal (MNCN 15.05/31711); 57: protoconcha de una concha de Regona, Sal; 58: microscultura de la protoconcha de un paratipo, Regona (CER); 59-60: microscultura de la teleoconcha del mismo paratipo.





last whorl convex; suture shallow, but evident. Colour whitish.

Axial sculpture consisting of prominent, rounded, narrow, distantly spaced axial ribs, almost orthocline in last whorl and opisthocline in previous ones. Spiral sculpture formed by very fine cords. Microsculpture (Figs. 59, 60) formed by very fine and irregular spiral threads.

Aperture D-shaped, medium sized, inner lip thick; columellar side weakly concave; anterior channel almost absent; outer lip strongly opisthocline with thick varix; with about five parallel lines towards the inner part of the aperture.

*Habitat*: The material studied was obtained in sand sediments between 1 and 354 m.

*Distribution*: Only known from Sal and Boa Vista Islands (Fig. 159).

*Remarks*: *S. minima* n. sp. is smaller than any of the previously described species. Among the small species, *S. typica* n. sp. has a larger shell, different spiral microsculpture, and the irregular flat prominences which form the microsculpture of the protoconch of smaller size and without pits; *S. angularis* n. sp. has a subsutural angulation; *S. luisi* n. sp. has a different teleoconch and protoconch microsculpture.

One shell (Fig. 139) found in Calhau, São Vicente, is similar in size to this species, but it has more curved axial ribs, a slightly different teleoconch microsculpture and spiral sculpture in the protoconch. We prefer not to describe it as new awaiting further material.

### *Schwartziella (Schwartziella) fulgida* n. sp. (Figs. 61-65, 165)

**Type material**: Holotype (Fig. 61) 1 s of 2.4 x 1.1 mm, from Furna, Brava Island, Cape Verde Archipelago, 30 m (MNCN 15.05/31706). Paratypes: 1 s in each of MNHN, AMNH, DBUA, NNM (58007), and 6 s in CER, all from the type locality.

**Other material studied**: Brava: 4 f, Furna, 30 m; 2 s, 1 j, 1 f, Pedrinha, 6 m; 5 s, Ilhéus do Rombo, 6 m; 18 c, 1 f, Porto do Anciã, 3 m. Santiago: 1 s, 6 j, 5 f, Prainha, 5 m; 7 s, 1 f, Tarrafal, 4 m; 2 f, CANCAP Sta. 6.004, 14° 54' N, 23° 30' W, 58-63 m (5-VI-1982) (NNM); 4 s, CANCAP Sta. 6.010, 14° 52' N, 23° 30' W, 310 m (5-VI-1982) (NNM); 4 s, 1 f, CANCAP Sta. 6.015, S of the island, 14° 53' N, 23° 30' W, 150 m (5-VI-1982) (NNM); 1 s, CANCAP Sta. 6.024, 15° 00' N, 23° 44' W, 540 m (7-VI-1982) (NNM); 2 s, 3 f, CANCAP Sta. 7.008, Ponta Grande da Cidade, 14° 54' N, 23° 38' W, 700 m (20-VIII-1986) (NNM); 1 s, 2 j, 3 f, Cidade Velha, 6 m. Fogo: 2 s, CANCAP Sta. 6.040, 14° 55' N, 24° 31' W, 38-55 m (9-VI-1982) (NNM); 1 s, CANCAP Sta. 6.041, W of the island, 14° 55' N, 24° 31' W, 60 m (9-VI-82) (NNM).

**Etymology**: The specific name alludes to the apparently smooth shell, which gives it a shining appearance.

*Description*: Shell (Fig. 61) length up to 2.8 mm, maximum width 1.3 mm, solid, elongate-conic, shining.

Protoconch (Fig. 62) of 1 whorl and 300 µm of maximum diameter, of non-planktotrophic type, with only a very slight angulation at the upper part; tran-

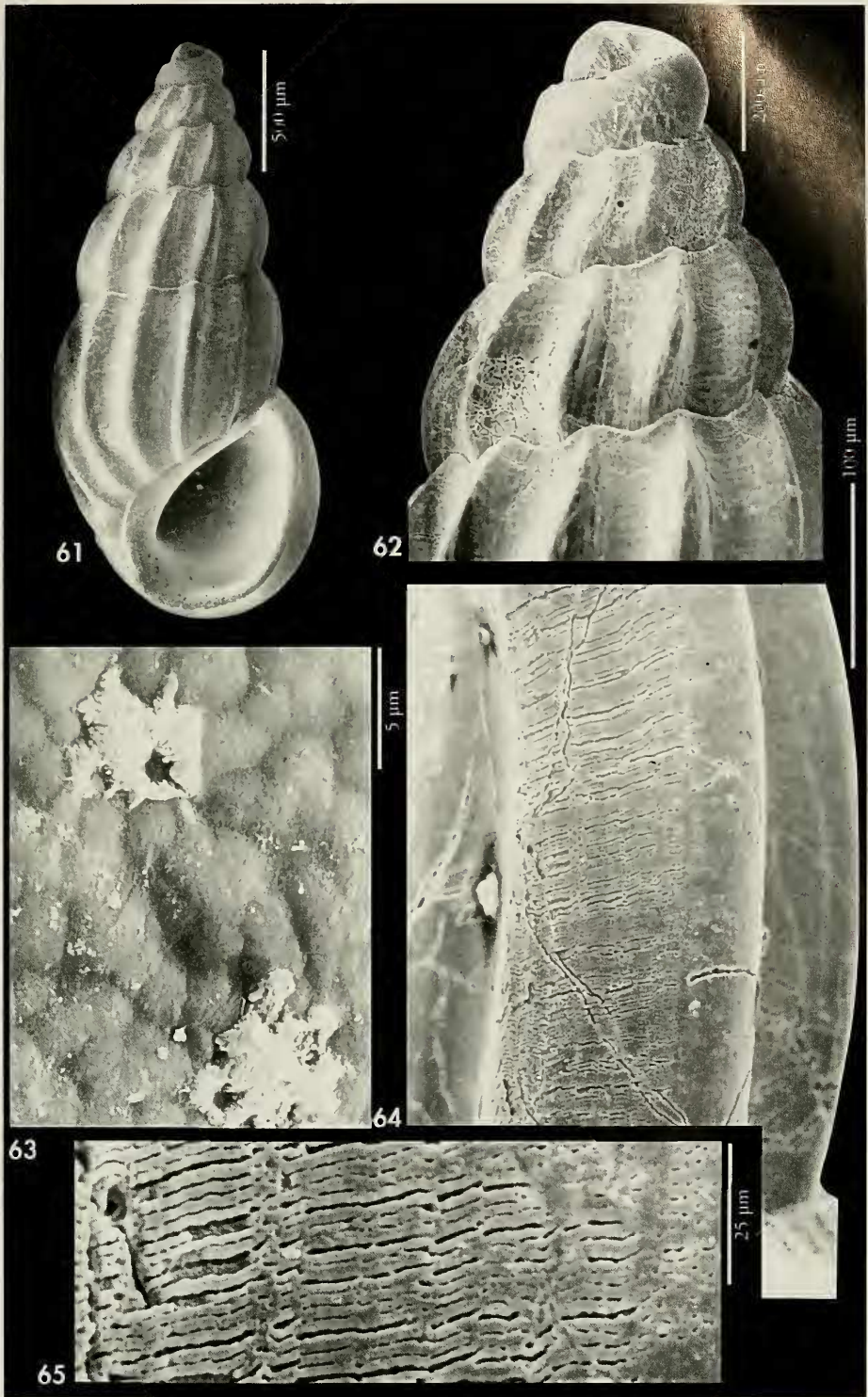
sition to teleoconch abrupt. Microsculpture (Fig. 63) shows irregular flat prominences with some circular pits on an undulate surface, but the studied protoconchs were poorly preserved.

Teleoconch of about 4 whorls, regularly convex, not angulated below

(Right page) Figures 61-65: *Schwartziella (Schwartziella) fulgida* n. sp. 61: holotype, Furna, Brava (MNCN 15.05/31706); 62: protoconch of the holotype; 63: protoconch microsculpture of the holotype.

(Página derecha) Figuras 61-65: *Schwartziella (Schwartziella) fulgida* spec. nov. 61: holotipo, Furna, Brava (MNCN 15.05/31706); 62: protoconcha del holotipo; 63: microescultura de la protoconcha del holotipo; 64-65: microescultura de la teleoconcha del holotipo.





sutures; sutures shallow but evident. Colour whitish.

Axial sculpture consisting of prominent, rounded, wide, spaced axial ribs, slightly opisthoclinal in last whorl and a little more on previous ones; about 14 in last whorl. At low magnification, apparently there is no spiral sculpture, but there is a fine microsculpture (Figs. 64, 65) of very fine threads on the interspaces between ribs, which disappears on the ribs.

Aperture D-shaped, medium sized; inner lip thick; columellar side weakly concave; anterior channel almost absent; outer lip opisthoclinal with a thick external varix. Peristome prominent in large specimens, with several parallel lines towards the inner part of the aperture.

*Habitat:* Sand sediments between 4 and 700 m.

*Distribution:* Only known from Fogo, Brava and Santiago (Fig. 165).

*Remarks:* *S. fulgida* n. sp. differs from the other small species of *Schwartzziella* previously described: *S. minima* n. sp. is smaller, with smaller and less numerous axial ribs and it has more evident spiral sculpture; *S. luisi* n. sp. also has a more evident spiral sculpture and the protoconch microsculpture formed by very small pits; *S. angularis* n. sp. has a subsutural angulation; *S. typica* n. sp. has a larger shell, and a fairly evident and different spiral microsculpture, uniform in *S. fulgida* and with two different alternate zones in *S. typica*.

### *Schwartzziella (Schwartzziella) depressa* n. sp. (Figs. 66-70, 164)

**Type material:** Holotype (Fig. 66) 1 s of 3.6 x 1.5 mm and 2 paratypes, 2 s, from Mordeira Bay, Sal Island, Cape Verde Archipelago, 4 m (MNCN 15.05/31704). Paratypes: 1 s in each of MNHN, AMNH, DBUA, NNM (58003), and 15 s, 2 f in CER, all from the type locality.

**Other material studied:** Sal: 1 s, Mordeira, 4 m; 24 s, 4 f, Palmeira, 8 m; 12 s, Regona, 1-3 m; 1 s, Algodoeiro, 4 m; 10 s, Rabo do Junco, 2 m; Boa Vista: 1 sp, 14 s, 3 f, Sal Rei, 5 m; 2 s, 1 f, Ilhéu de Sal Rei, 3 m; 10 s, 7 f, Porto da Cruz, 6 m; 9 s, 3 j, 9 f, Derrubado, 4 m; 5 s, Rife de Chaves, 8 m; 1 s, Baijos de João Valente, 23 m. São Nicolau: 13 s, 7 f, CANCAP Sta. 7.128, 16° 33' N, 24° 17' W, 400 m (2-IX-1986) (NNM); 21 s, 11 f, São Jorge Bay, CANCAP Sta. 7.129, 16° 33' N, 24° 16' W, 405 m (2-IX-1986) (NNM).

**Etymology:** The specific name alludes to the unusual subsutural depression of the shell.

*Description:* Shell (Fig. 66) length up to 4.0 mm, maximum width 1.6 mm, relatively solid, elongate-conic.

Protoconch (Fig. 67) of 1 whorl and about 300 µm of maximum diameter, of non-planktotrophic type, with a prominent spiral cord on its upper part; transition to teleoconch abrupt. Microsculpture (Fig. 68) formed by irregular flat prominences with small pits on an undulous surface.

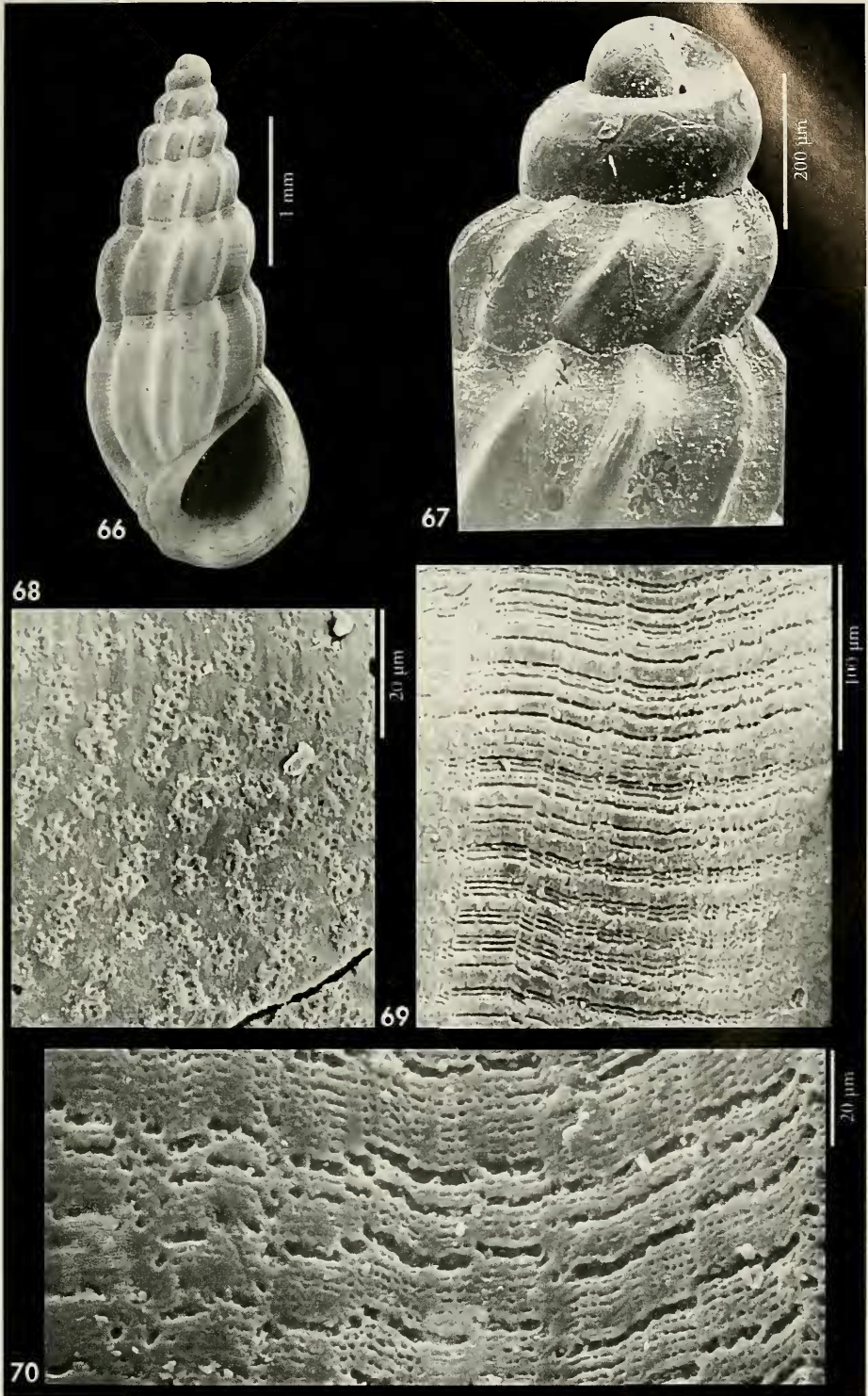
Teleoconch of 5 whorls, strongly convex, last whorl weakly convex; suture shallow, with a slight subsutural depression. Colour whitish.

Axial sculpture consisting of prominent, rounded, wide, slightly opisthoclinal axial ribs, with interspaces of similar size, a little reduced in the subsutural depression specially in the last two whorls; about ten axial ribs in last whorl. At low magnification, appa-

(Right page) Figures 66-70: *Schwartzziella (Schwartzziella) depressa* n. sp. 66: holotype, Mordeira, Sal (MNCN 15.05/31704); 67: protoconch of the holotype; 68: protoconch microsculpture of the holotype; 69: teleoconch microsculpture of the holotype; 70: teleoconch microsculpture of a shell from Mordeira, Sal.

(Página derecha) Figuras 66-67: *Schwartzziella (Schwartzziella) depressa* spec. nov. 66: holotipo, Mordeira, Sal (MNCN 15.05/31704); 67: protoconcha del holotipo; 68: microscultura de la protoconcha del holotipo; 69: microscultura de la teleoconcha del holotipo; 70: microscultura de la teleoconcha de una concha de Mordeira, Sal.





rently there is no spiral sculpture, but there is a fine microsculpture of bands with small pits and 1-3 fine and irregular threads between each two bands on the interspaces between ribs, which disappear on the ribs (Figs. 69, 70).

Aperture D-shaped, relatively small; inner lip thick; columellar side weakly concave; anterior channel shallow; outer lip with thick external varix; with about 6 lines towards the inner part of the aperture.

*Habitat*: The material studied was obtained from sand sediments between 1-8 and to 400-405 m.

*Distribution*: Only known from Sal, Boa Vista and São Nicolau Islands (Fig. 164).

*Remarks*: The shells from deep water off São Nicolau are similar in size and sculpture to those from shallow waters of Sal and Boa Vista, but the subsutural depression is less evident.

*S. depressa* n. sp. differs from *S. similiter* n. sp. by its smaller shell, less marked spiral sculpture, narrower interspaces between axial ribs, and different microsculpture of the protoconch and teleoconch. *S. typica* n. sp. has a wider shell, lacking subsutural depression. *S. angularis* and *S. luisi* have more evident spiral sculpture. *S. minima* and *S. fulgida* n. sp. have smaller shells without subsutural depression; *S. minima* also has a more evident spiral sculpture and lacks spiral sculpture on the protoconch.

### *Schwartzziella (Schwartzziella) gradata* n. sp. (Figs. 71-75, 161)

**Type material**: Holotype (Fig. 71) 1 s of 3.1 x 1.3 mm and 1 paratype, 1 s, Furna, Brava Island, Cape Verde Archipelago, 30 m (MNCN 15.05/31708); 1 paratype in NNM (58010) from the type locality. **Other material studied**: Brava: 2 s, 3 j, Pedrinha, 5 m.

**Etymology**: The specific name alludes to the scalariform profile of the shell.

*Description*: Shell (Figs. 71, 72) length up to 3.1 mm, maximum width 1.3 mm, slightly solid, elongate-conic and relatively narrow.

Protoconch (Fig. 73, 74) of 1 whorl and 270  $\mu$ m of maximum diameter, of non-planktotrophic type, with an apical spiral cord and two narrower cords at both sides, and small and irregular axial threads on the interspaces between cords; transition to teleoconch abrupt. The rest of the surface of the protoconch have irregular flat prominences with small pits on a smooth surface.

Teleoconch of about 5 whorls weakly convex, with a strong subsutural angulation. Colour whitish.

Axial sculpture consisting of prominent, sharp, narrow, slightly opisthoclinal, distantly spaced axial ribs, about 12 in last whorl. Spiral sculpture formed by very fine cords. Microsculpture (Fig. 75) formed by very numerous spiral threads, which disappear on the cords and continue on the ribs.

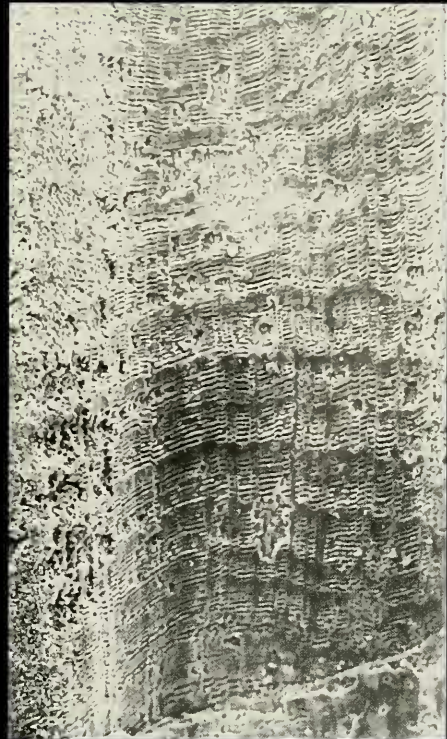
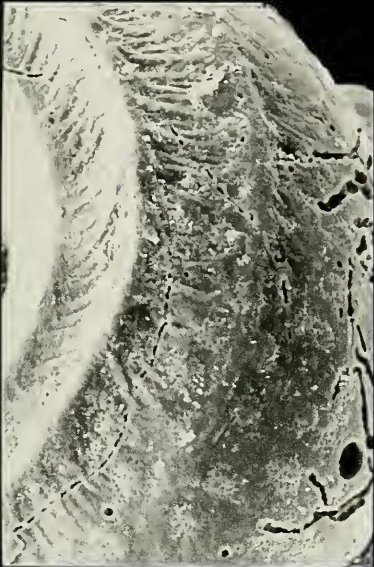
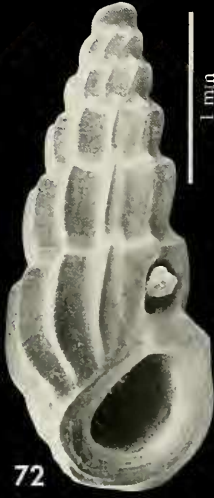
Aperture D-shaped, small; inner lip thick; columellar side weakly concave; anterior channel absent, with a depression in the zone; outer lip opisthoclinal with thick external varix, with 5-6 parallel lines towards the inner part of the aperture.

*Habitat*: The material studied was obtained from sand sediments between 5 and 30 m.

(Right page) Figures 71-75: *Schwartzziella (Schwartzziella) gradata* n. sp. 71: holotype, Furna, Brava (MNCN 15.05/31708); 72: paratype, Furna, Brava (NNM 58010); 73: protoconch of a paratype, Furna (CER); 74: detail of the protoconch of the same paratype; 75: teleoconch microsculpture of the same paratype.

(Página derecha) Figuras 71-75: *Schwartzziella (Schwartzziella) gradata* spec. nov. 71: holotipo, Furna, Brava (MNCN 15.05/31708); 72: paratipo, Furna, Brava (NNM 58010); 73: protoconcha de un paratipo, Furna (CER); 74: detalle de la protoconcha del mismo paratipo; 75: microescultura de la teloconcha del mismo paratipo.





*Distribution:* Only known from Brava Island (Fig. 161).

*Remarks:* *S. gradata* n. sp. differs from any other species of *Schwartzziella* of the Cape Verde Islands by the protoconch sculpture. From other species with subsutural angulation, the sympatric *S.*

*obesa* n. sp. is larger, and *S. angularis* is smaller and relatively wider (length/width ratio 2.12-2.23, and 2,32-2,44 in *S. gradata*), with only a spiral angulation in the upper part of the protoconch, instead of three spiral cords and irregular axial threads in *S. gradata*.

### *Schwartzziella (Schwartzziella) pavita* n. sp. (Figs. 76-79, 162)

**Type material:** Holotype (Fig. 76) 1 s of 3.3 x 1.3 mm and 1 paratype, 1 s, from Sal Rei, Boa Vista Island, Cape Verde Archipelago, 5 m (MNCN 15.05/31714). Other paratypes: 1 s (NNM 58022), 1 s (MNHN) and 1 s (CER), all from the type locality; 11 s from Porto da Cruz, north of Sal Rei (CER).

**Other material studied:** (in poor condition) Boa Vista: 2 s, 1 f, Ilhéu de Sal Rei, 6 m; 1 s, Sal Rei, 6 m; 1 s, Baía Teodora, 4 m; 1 s, Derrubado, 4 m. Sal: 1 s, Mordeira, 4 m. Maio: 1 s, Pau Seco, 5 m.

**Etymology:** The specific name derives from the Latin verb *pavio* which means "to level" by the depressed axial ribs of the shell.

*Description:* Shell (Fig. 76) length up to 3.3 mm, maximum width 1.3 mm, relatively solid, elongate-conic.

Protoconch (Fig. 77) of 1 whorl, about 300  $\mu$ m of maximum diameter, in poor condition in all the material studied, of non-planktotrophic type, apparently without spiral sculpture.

Teloconch of about 5 whorls, almost flat-sided; last whorl weakly convex; suture shallow. Colour whitish.

Axial sculpture consisting of rounded, not prominent, wide, slightly opisthocline, distantly spaced axial ribs, about 12 in last whorl. Spiral sculpture of fine spiral cords densely spaced. Microsculpture (Figs. 78, 79) formed by one or two very fine irregular spiral threads between each cord.

Aperture D-shaped, small, inner lip thick; columellar side weakly concave; anterior channel almost absent; outer lip opisthocline with thick external varix, with about 3-4 parallel lines.

*Habitat:* The material studied was obtained from sand sediments between 4 and 6 m.

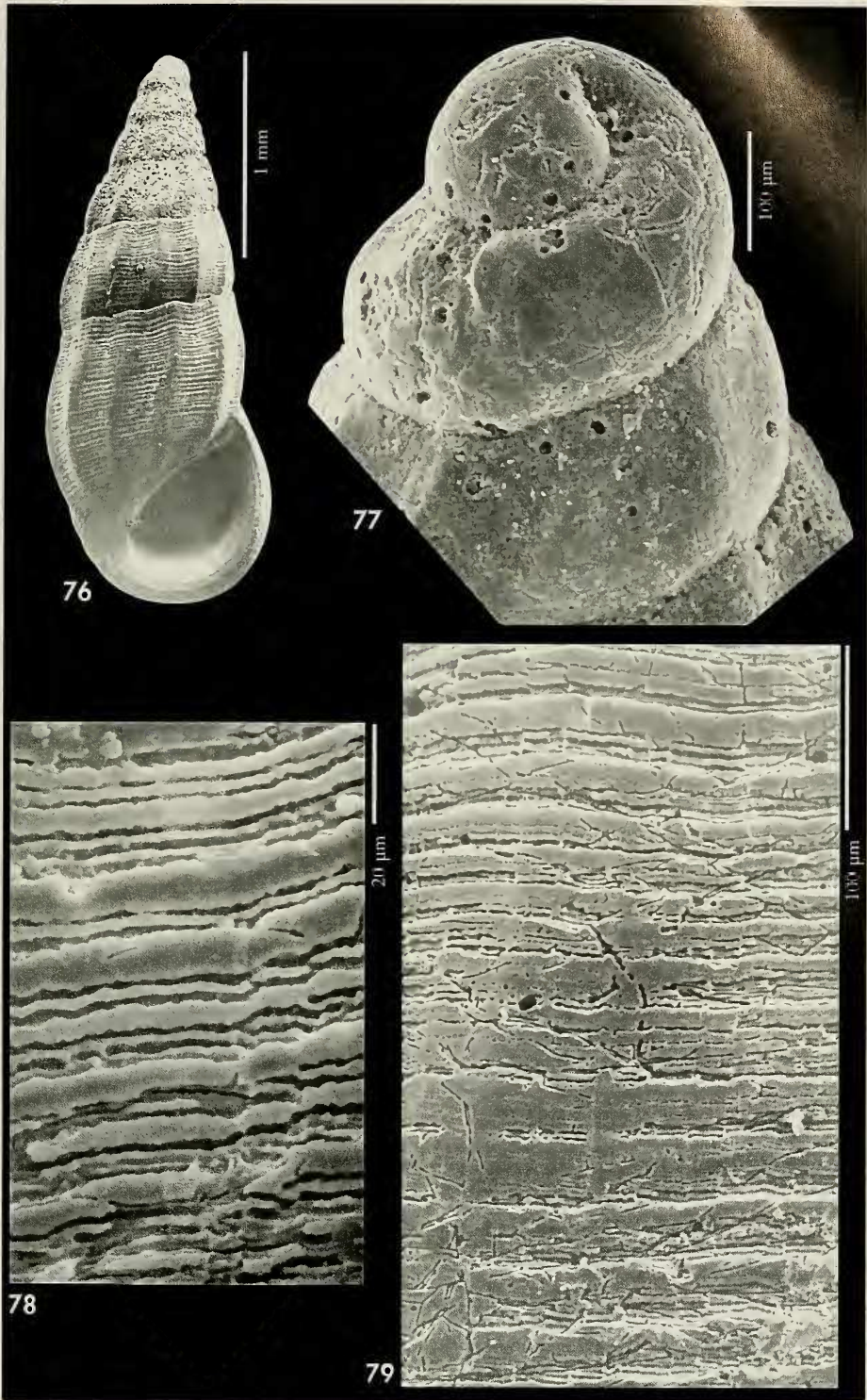
*Distribution:* Only known from Sal, Boa Vista and Maio Islands (Fig. 162).

*Remarks:* *S. pavita* n. sp. differs from other Cape Verde species of *Schwartzziella* by the very depressed axial ribs and the microsculpture with densely spaced spiral cords and only one-two threads between cords. The sympatric *S. sanmartini* n. sp. also has non-prominent axial ribs, but it has a larger and wider shell, with a teloconch microsculpture formed only by very fine threads. *S. similiter* n. sp. and *S. typica* n. sp. have the axial ribs more prominent and a different teloconch microsculpture. *S. minima* n. sp. and *S. fulgida* n. sp. are smaller and both have more prominent axial ribs and microsculpture formed almost exclusively by very fine threads.

(Right page) Figures 76-79: *Schwartzziella (Schwartzziella) pavita* n. sp. 76: holotype, Sal Rei, Boa Vista (MNCN 15.05/31714); 77: protoconch of a shell from Sal Rei, Boavista; 78: teloconch microsculpture of a shell from Sal Rei, Boavista; 79: teloconch microsculpture of the holotype.

(Página derecha) Figuras 76-79: *Schwartzziella (Schwartzziella) pavita* spec. nov. 76: holotipo, Sal Rei, Boa Vista (MNCN 15.05/31714); 77: protoconcha de una concha de Sal Rei, Boavista; 78, microscultura de la teloconcha de una concha de Sal Rei, Boavista; 79: microscultura de la teloconcha del holotipo.





*Schwartziella (Schwartziella) cancapae* n. sp. (Figs. 80-84, 165)

**Type material:** Holotype (Fig. 80) 1 s of 3.8 x 1.5 mm (NNM 58001) and 6 paratypes (5 f), CANCAP Sta. 6.009, S of Santiago, Cape Verde Archipelago, 14° 54' N, 23° 30' W, 175 m (5-VI-1982) (NNM 58002). Other paratypes: 1 s (MNCN 15.05/31702) and 1 s (CER), Praia, Santiago, 10 m; 9 s, CANCAP Sta. 6.006, S of Santiago, 14° 54' N, 23° 30' W, 150 m (5-VI-1982) (NNM 59409).

**Other material studied:** Santiago: 1 s, 1 f, CANCAP Sta. 6.005, S of the island, 14° 54' N, 23° 30' W, 175 m (5-VI-1982) (NNM); 3 f, CANCAP Sta. 6.010, 14° 52' N, 23° 30' W, 310 m (5-VI-1982) (NNM); 2 s, 18 f, CANCAP Sta. 6.015, S of the island, 14° 53' N, 23° 30' W, 150 m (5-VI-1982) (NNM); 1 s, 3 j, CANCAP Sta. 6.024, 15° 00' N, 23° 44' W, 540 m (7-VI-1982) (NNM); 1 s, 4 f, CANCAP Sta. 7.004, 14° 54' N, 23° 38' W, 320 m (21-VIII-1986) (NNM); 1 s, CANCAP Sta. 7.005, 14° 54' N, 23° 38' W, 235 m (21-VIII-1986) (NNM); 3 s, 5 f, CANCAP Sta. 7.007, 14° 54' N, 23° 38' W, 420 m (20-VI-1986) (NNM); 1 s, 7 j, CANCAP Sta. 7.008, 14° 54' N, 23° 38' W, 700 m (20-VIII-1986) (NNM); 1 s, 7 j, CANCAP Sta. 7.014, Ponta Grande da Cidade, 14° 54' N, 23° 38' W, 450-600 m (21-VIII-1986) (NNM). Fogo: 1 j, São Felipe, 20 m. Brava: 2 s, 1 f, Furna, 30 m.

**Etymology:** The specific name alludes to the CANCAP expeditions in which has been collected most of the material of this species and part of the material studied in this paper.

**Description:** Shell (Fig. 80) length up to 4.0 mm, maximum width 1.6 mm, not solid, elongate-conic.

Protoconch (Fig. 81) of 1 whorl and 400  $\mu$ m of maximum diameter, of non-planktotrophic type, without spiral sculpture; transition to teleoconch abrupt. Microsculpture (Fig. 82) formed by a rough surface with many small pits.

Teleoconch of about 5 whorls, weakly convex; last whorl weakly convex; suture shallow but evident. Colour whitish.

Axial sculpture consisting of prominent, rounded, narrow, slightly opisthoclinal, distantly spaced axial ribs, 13 in last whorl; the ribs are continued from whorl to whorl, except in first whorls. Spiral sculpture appreciable with difficulty at low magnification. Microsculpture (Figs. 83, 84) of threads with a few parallel lines of minute pits, and more separated, sometimes paired irregularly interrupted striae.

Aperture D-shaped, medium-small, inner lip thick; columellar side weakly concave; anterior channel almost absent;

outer lip opisthoclinal with thick external varix, peristome narrow with a few parallel lines.

**Habitat:** Some shells of this species were collected in relatively shallow water (20-30 m), but most of material comes from 60-200 m in depth in sand and shell gravel bottom.

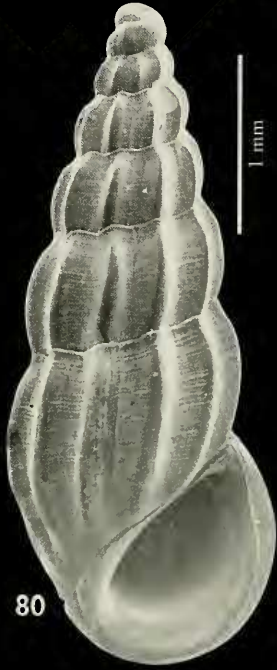
**Distribution:** Only known from Santiago, Fogo and Brava (Fig. 165).

**Remarks:** *S. cancapae* n. sp. differs from most of the species described before by its protoconch lacking spiral sculpture and larger than most of Cape Verde *Schwartziella* species. The more similar species are: *S. depressa* n. sp., with a more evident subsutural depression, and an evident spiral cord and different microsculpture in the protoconch; *S. fulgida* n. sp. is smaller, almost smooth, with different microsculpture in the teleoconch and protoconch; *S. typica* n. sp. is smaller and has different protoconch microsculpture, and *S. similiter* n. sp. is larger, wider, and with more evident spiral sculpture. *S. cancapae* is quite similar to *S. africana*, but the latter species has strongly opisthoclinal axial

(Right page) Figures 80-84: *Schwartziella (Schwartziella) cancapae* n. sp. 80: holotype, Santiago (NNM 58001); 81: protoconch of the holotype; 82: protoconch microsculpture of the holotype; 83-84: teleoconch microsculpture of the holotype.

(Página derecha) Figuras 80-84: *Schwartziella (Schwartziella) cancapae* spec. nov. 80: holotipo, Santiago (NNM 58001); 81: protoconcha del holotipo; 82: microescultura de la protoconcha del holotipo; 83-84: microescultura de la teleoconcha del holotipo.





80

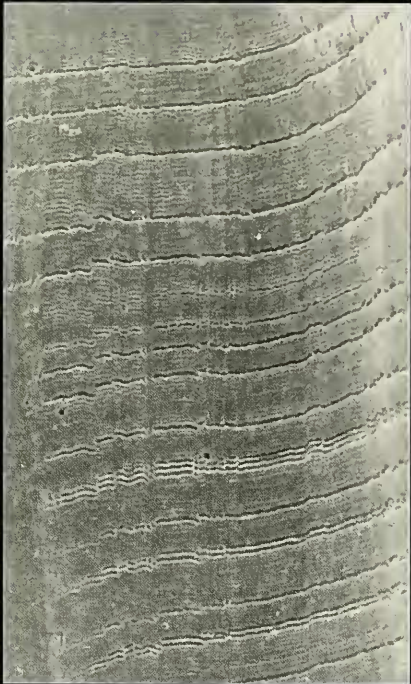


81

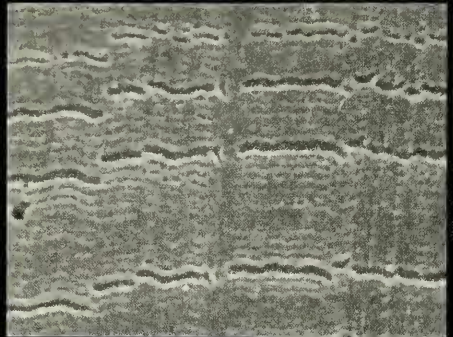
82



20 μm



100 μm



20 μm

83

84

ribs, different protoconch and teleoconch microsculpture (see GOFAS, 1999). Previous records or *S. africana* from the

Cape Verde Islands (MARCHE-MARCHAD, 1958; SAUNDERS, 1977) could be referred to this species.

*Schwartziella (Schwartziella) puncticulata* n. sp. (Figs. 85-87, 140-141, 166)

**Type material:** Holotype (Fig. 85, NNM 58023) 1 s of 4.0 x 1.6 mm and 2 paratypes (NNM 58024), 2 f, CANCAP Sta. 7.119, S of Ilhéu Razo, 16° 36' N, 24° 36' W, Cape Verde Archipelago, 140-160 m (1-IX-1986). Paratypes: 1 s (MNCN 15.05/31715) and 1 s (CER), both from the type locality; 7 s, 11 f, CANCAP Sta. 7.028, Ilhéu de Cima, 14° 57' N, 24° 39' W, 225 m (23-VIII-1986) (NNM 59414).

**Other material studied:** Sal: 6 f, CANCAP Sta. 7.100, off Palmeira, 16° 45' N, 23° 01' W, 354 m (30-VIII-1986) (NNM). Maio: 6 f, CANCAP Sta. 7.050, 15° 06' N, 23° 14' W, 380 m (25-VIII-1986) (NNM). Santiago: 1 s, 12 j, Cidade Velha, 6 m; 10 j, Prainha, 5 m; 6 s, 3 f, CANCAP Sta. 6.095, 16° 35' N, 24° 37' W, 930 m (15-VI-1982) (NNM). Fogo: 9 s, 6 f, CANCAP Sta. 6.041, W of the island, 14° 55' N, 24° 31' W, 60 m (9-VI-82) (NNM). Brava: 12 j, Pedrinha, 6 m; 7 j, Furna, 30 m. Ilhéu de Cima: 2 s, 5 f, CANCAP Sta. 7.037, 14° 57' N, 24° 38' W, 350-385 m (24-VIII-1986) (NNM); 1 s, 2j, CANCAP Sta. 7.038, 14° 57' N, 24° 38' W, 410-460 m (24-VIII-1986) (NNM); 1 s, 6 j, CANCAP Sta. 7.031, 14° 57' N, 24° 38' W, 75 m (23-VIII-1986) (NNM); 2 s, CANCAP Sta. 7.037, 14° 57' N, 24° 38' W, 385-350 m (24-VIII-1986) (NNM). São Vicente: 1 s, CANCAP Sta. 6.147, 16° 48' N, 25° 06' W, 99 m (20-VI-1982) (NNM); 4 s, 1 j, 4 f, CANCAP Sta. 6.149, 16° 47' N, 25° 06' W, 293 m (20-VI-1982) (NNM). Ilhéu Razo: 1 s, 5 j, CANCAP Sta. 6.093, 16° 36' N, 24° 37' W, 400-430 m (15-VI-1982) (NNM); 3 s, 10 j, 9 f, CANCAP Sta. 7.119, S of Ilhéu Razo, 16° 36' N, 24° 36' W; 140-160 m (1-IX-1986); 7 s, 21 f, CANCAP Sta. 7.121, 16° 36' N, 24° 37' W, 200-230 m (1-IX-1986) (NNM). Santa Luzia: 9 f, CANCAP Sta. 6.103, 16° 43' N, 24° 46' W, 102 m (16-VI-1982) (NNM); 1 s, 6 f, CANCAP Sta. 6.105, SSW of the island, 16° 43' N, 24° 47' W, 204 m (16-VI-1982) (NNM). São Nicolau: 1 s, 3 j, CANCAP Sta. 6.085, 16° 34' N, 24° 22' W, 100 m (14-VI-1982) (NNM).

**Etiymology:** The specific name alludes to the microsculpture of this species, formed by undulated rows of small pits.

**Description:** Shell (Fig. 85) length up to 4.5 mm, maximum width 1.7 mm, relatively solid, elongate-conic.

Protoconch (Fig. 86) of 1 whorl and 360  $\mu\text{m}$  of maximum diameter, of non-planktotrophic type; no spiral sculpture; transition to teleoconch abrupt. Microsculpture formed by irregular flat prominences on a smooth surface, with some pits.

Teleoconch of 4-5 whorls, strongly convex, and more convex in the subsutural part of the ribs; last whorl regularly convex; suture a little deep. Colour whitish.

Axial sculpture consisting of prominent, rounded, narrow, a little opisthoclinal distantly spaced axial ribs, which are continued from whorl to whorl. Spiral sculpture not visible at low magnification. Microsculpture (Fig. 87) formed by very fine, densely packed undulated threads with intermediate rows of small pits.

Aperture D-shaped, small; inner lip thick; columellar side weakly concave;

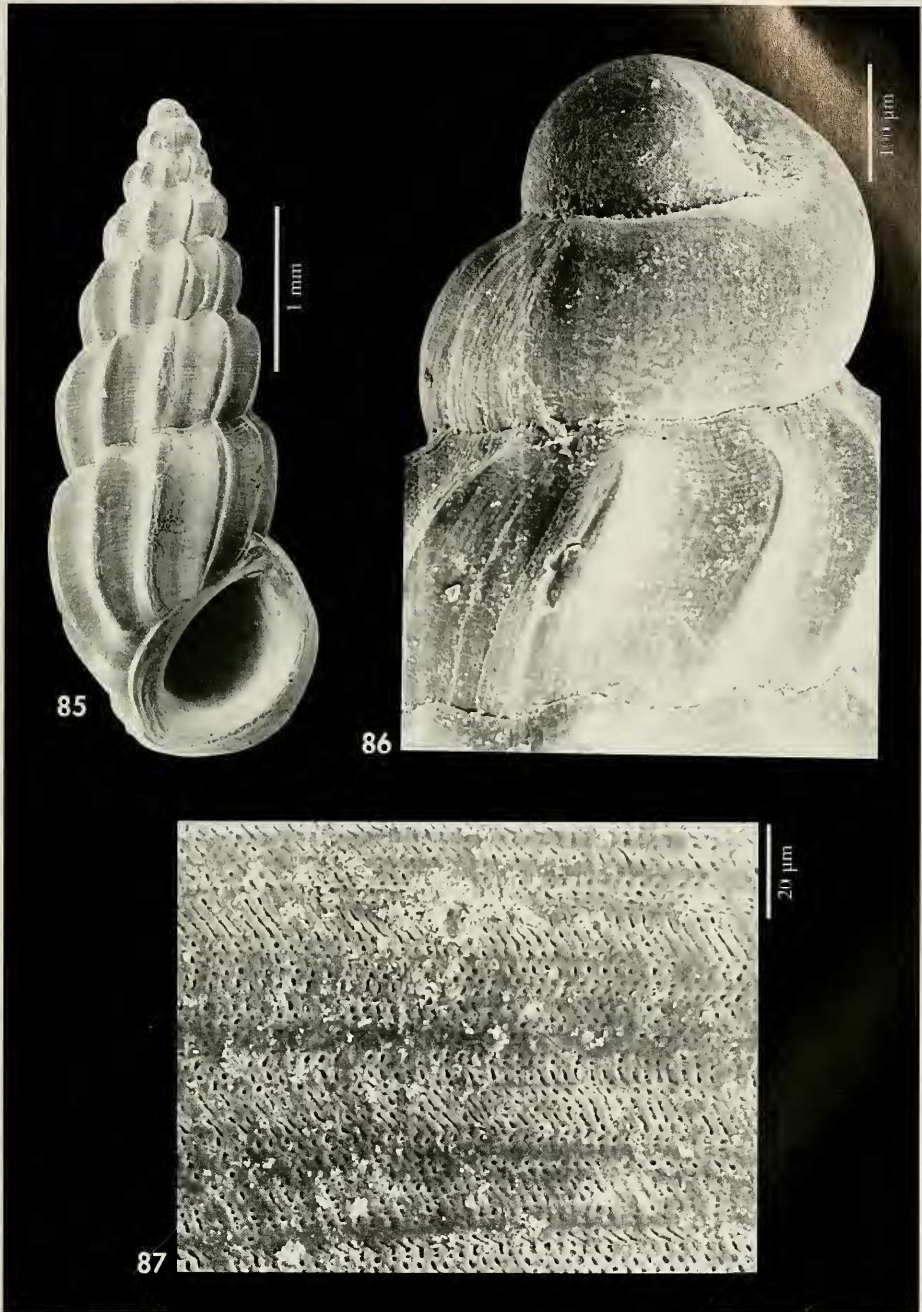
anterior channel shallow; outer lip strongly opisthoclinal with a very thick external varix, peristome with a prominent edge and some parallel lines towards the inner part.

**Habitat:** Sand sediments, between 6 and 930 m.

**Distribution:** Sal, Maio, Santiago, Fogo, Brava, Ilhéu de Cima, São Vicente, Santa Luzia, Ilhéu Razo and São Nicolau (Fig. 166). Probably this species is present in all the archipelago, but it is frequent in some islands and uncommon in others.

**Remarks:** *S. puncticulata* n. sp. differs from the following similar species: *S. similiter* n. sp. has no subsutural shoulder and a different protoconch and teleoconch microsculpture; *S. typica* n. sp. is smaller, less elongate, uniformly convex and with different teleoconch microsculpture; *S. fulgida* n. sp. is also smaller, with the whorls less convex, and the teleoconch microsculpture more lineal; *S. depressa* n. sp. is smaller, with a





Figures 85-87: *Schwartziella (Schwartziella) puncticulata* n. sp. 85: holotype, Ilhéu Razo (NNM 58023); 86: protoconch of a paratype, Ilhéu Razo (NNM 58024); 87: teleoconch microsculpture of the holotype.

*Figuras 85-87: Schwartziella (Schwartziella) puncticulata spec. nov. 85: holotipo, Ilhéu Razo (NNM 58023); 86: protoconcha de un paratipo, Ilhéu Razo (NNM 58024); 87: microescultura de la telococha del holotipo.*

spiral cord on the protoconch and a subsutural depression on the teleoconch; *S. cancapae* n. sp. has a more regular curvature of the whorls, a larger protoconch, and a different protoconch and teleoconch microsculpture.

One shell (Figs. 140, 141) found in São Vicente, CANCAP Sta. 6.145, 16° 48' N, 25° 06' W) is smaller, stouter and the axial ribs are less convex, but we provisionally consider it conspecific since it has identical microsculpture.

*Schwartziella (Schwartziella) hoenselaari* n. sp. (Figs. 88-92, 167)

**Type material:** Holotype (Fig. 88) 1 s of 2.3 x 1.1 mm (NNM 58011) and 26 paratypes (NNM 58012), 26 s, S of Santiago, CANCAP Sta. 6.001, 14° 54' N, 23° 30' W, 15-20 m (4-VI-1982). Other paratypes: 13 s, CANCAP Sta. 6.014, 14° 54' N, 23° 29' W, 18 m (5-VI-1982) (NNM 59415); 1 s (MNCN 15.05/31709) and 1 s (CER), both from the type locality; 1 s, Prainha, 5 m (CER).

**Other material studied:** Santiago: 16 s, 2 j, Tarrafal, 4 m; 4 s, CANCAP Sta. 6.003, 14° 54' N, 23° 30' W, 15-21 m (5-VI-1982) (NNM); 3 s, CANCAP Sta. 6.004, 14° 54' N, 23° 30' W, 58-63 m (5-VI-1982) (NNM); 2 f, CANCAP Sta. 6.006, S of the island, 14° 54' N, 23° 30' W, 150 m (5-VI-1982) (NNM); 3 s, 2 j CANCAP Sta. 6.007, 14° 54' N, 23° 30' W, 70-88 m (5-VI-1982) (NNM); 1 s, CANCAP Sta. 6.008, 14° 54' N, 23° 30' W, 120 m (5-VI-1982) (NNM); 6 s, 1 f, CANCAP Sta. 6.010, 14° 52' N, 23° 30' W, 310 m (5-VI-1982) (NNM); 6 s, 3 j, CANCAP Sta. 6.015, S of the island, 14° 53' N, 23° 30' W, 150 m (5-VI-1982) (NNM); 4 s, 1 f, CANCAP Sta. 6.024, 15° 00' N, 23° 44' W, 540 m (7-VI-1982) (NNM); 1 s, 1 j, CANCAP Sta. 6.025, 15° 00' N, 23° 45' W, 728 m (7-VI-1982) (NNM); 2 s, CANCAP Sta. 7.005, 14° 54' N, 23° 38' W, 235 m (21-VIII-1986) (NNM); 2 f, CANCAP Sta. 7.007, 14° 54' N, 23° 38' W, 420 m (20-VI-1986) (NNM); 3 s, 2 f, Ponta Grande da Cidade, CANCAP Sta. 7.015, 14° 54' N, 23° 38' W, 450-600 m (21-VIII-1986) (NNM); 2 f, CANCAP Sta. 7.020, 14° 45' N, 23° 29' W, 0-2200 m (21-22-VIII-1986). Fogo: 2 s, 1 f, in front of São Felipe, 20 m; 6 s, 3 j, CANCAP Sta. 6.040, 14° 55' N, 24° 31' W, 38-55 m (9-VI-1982) (NNM). Ilhéu de Cima: 2 s, CANCAP Sta. 7.028, 14° 57' N, 24° 39' W, 225 m (23-VIII-1986) (NNM); 1 s, CANCAP Sta. 7.037, 14° 57' N, 24° 38' W, 350-385 m (24-VIII-1986) (NNM). Santa Luzia: 1 s, 1 f, CANCAP Sta. 6.103, 16° 43' N, 24° 46' W, 102 m (16-VI-1982) (NNM); 2 s, CANCAP Sta. 6.107, 16° 44' N, 24° 46' W, 50 m (16-VI-1982) (NNM). Ilhéu Razo: 1 s, CANCAP Sta. 7.120, 16° 36' N, 24° 37' W, 208 m (1-IX-1986); 1 s, CANCAP Sta. 7.121, 16° 36' N, 24° 37' W, 200-230 m (1-IX-1986) (NNM). São Nicolau: 2 s, 6 f, CANCAP Sta. 7.128, São Jorge Bay, 16° 33' N, 24° 17' W, 400 m (2-IX-1986) (NNM); 6 s, 3 f, São Jorge Bay, CANCAP Sta. 7.129, 16° 33' N, 24° 16' W, 405 m (2-IX-1986) (NNM). Sal: 2 s, Palhona, 2 m.

**Etymology:** The specific name is dedicated to Hink J. Hoenselaar, Dutch malacologist who begun the study of the Rissoininae material from the CANCAP Expeditions.

**Description:** Shell (Figs. 88, 89) length up to 3.0 mm, maximum width 1.4 mm, relatively solid, elongate-conic.

Protoconch (Fig. 90) of 1 whorl and about 300 µm of maximum diameter, of non-planktotrophic type, with no spiral sculpture; transition to teleoconch abrupt. Microsculpture (Fig. 92) formed by ir-

regular flat prominences with some pits on an undulate surface.

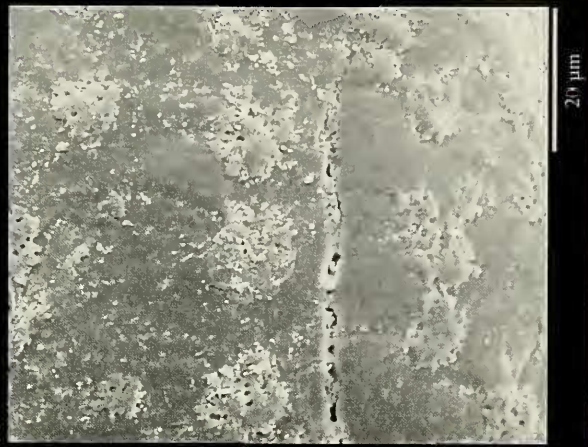
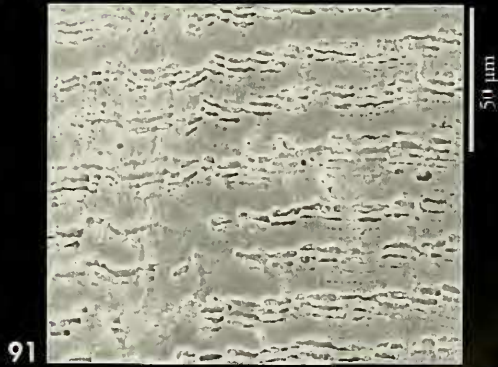
Teleoconch of 4-5 whorls, clearly convex, not angulated below suture; last whorl convex; suture shallow, but evident. Colour whitish.

Axial sculpture consisting of prominent, rounded, narrow, almost orthocline

(Right page) Figures 88-92: *Schwartziella (Schwartziella) hoenselaari* n. sp. 88: holotype, Santiago (NNM 58011); 89: paratype, Santiago (NNM 58012); 90: protoconch of a paratype, Santiago (NNM 58012); 91: teleoconch microsculpture of a paratype, Santiago (NNM 58012); 92: protoconch microsculpture of a paratype, Santiago (NNM 58012).

(Página derecha) Figuras 88-92: *Schwartziella (Schwartziella) hoenselaari* spec. nov. 88: holotipo, Santiago (NNM 58011); 89: paratipo, Santiago (NNM 58012); 90: protoconcha del paratipo, Santiago (NNM 58012); 91: microscultura de la teleoconcha del paratipo, Santiago (NNM 58012); 92: microscultura de la protoconcha del paratipo, Santiago (NNM 58012).





(slightly opisthoclinal on first whorls), very distantly spaced axial ribs; being 9-11 in the last whorl. Spiral sculpture almost unappreciable at low magnification. Microsculpture (Fig. 91) with zones with 2-3 fine threads irregularly distributed, alternating with wider threads with spiral rows of small pits.

Aperture D-shaped, small-medium sized; inner lip thick; columellar side weakly concave; anterior channel absent; outer lip strongly opisthoclinal with a very thick external varix; peristome narrow with about 5 parallel lines towards the inner part of the aperture.

*Habitat:* The material studied was collected from 2 to 728 m of depth.

*Distribution:* Sal, Santiago, Fogo, Ilhéu de Cima, Santa Luzia, Ilhéu Razo, São Nicolau (Fig. 167).

*Remarks:* *Schwartzziella hoenselaari* n. sp. differs from most of the Cape Verde species of the genus by having less axial ribs. It differs from the following species with similar shape and protoconch lacking spiral sculpture: *S. puncticulata* n. sp. has a larger protoconch, a sub-sutural curvature of the whorls, and the teleoconch microsculpture lacks continuous threads; *S. cancapae* n. sp. has a smaller protoconch, a more pointed shell, with different protoconch and teleoconch microsculpture; *S. depressa* n. sp. and *S. typica* n. sp. have a similar shape, but the protoconch of both species has spiral sculpture and the microsculpture of the teleoconch is different. Differences with the similar *S. paucicostata* n. sp. are discussed under remarks of this species.

### *Schwartzziella (Schwartzziella) paucicostata* n. sp. (Figs. 93-96, 168)

**Type material:** Holotype (Fig. 93) 1s of 3.1 x 1.3 mm (NNM 58004), and 2 paratypes, 2 s (NNM 58005), CANCAP Sta. 7.105, off Palmeira, 16° 45' N, 23° 01' W, 123-142 m. Other paratypes: 1 f, CANCAP Sta. 7.093, Ilhéu Razo, 16° 34' N, 33° 54' W, 42 m (29-VIII-1986) (NNM 59410); 1 s, 1 j, CANCAP Sta. 7.095, Ilhéu Razo, 16° 34' N, 22° 53' W, 30-50 m (29-VIII-1986) (NNM 59411); 1s, 1 j (MNCN 15.05/34277), 3 s, 1 j (CER) Pau Seco, Maio, 30 m.

**Other material studied:** Sal: 1 s, CANCAP Sta. 7.088, Ponta do Leme Velho, 16° 34' N, 22° 54' W, 59 m (29-VIII-1986) (NNM). Maio: 2 s, 1 f, CANCAP Sta. 7.050, 15° 06' N, 23° 14' W, 380 m (25-VIII-1986) (NNM). Santiago: 1 s, CANCAP Sta. 6.017, 14° 53' N, 23° 30' W, 380 m (5-VI-1982).

**Etymology:** The specific name alludes to the low number of axial ribs of the shell.

*Description:* Shell (Fig. 93) length up to 3.3 mm, maximum width 1.4 mm, relatively solid, elongate-conic.

Protoconch (Fig. 94) of 1 whorl and 270  $\mu$ m of maximum diameter, of non-planktotrophic type, without spiral sculpture, smooth.

Teleoconch of about 5 whorls, strongly convex; last whorl a little less convex; suture shallow. Colour whitish.

Axial sculpture consisting of prominent, sharp, very distantly spaced (4 times narrower than the interspaces) axial ribs, almost orthoclinal in last whorl and opisthoclinal in previous whorls; only 6-7 axial ribs in last whorl. Spiral sculpture almost unappreciable at low magnification. Microsculpture (Figs. 95, 96) formed by bands of interrupted and irregularly disposed fine spiral

threads and wider threads without sculpture.

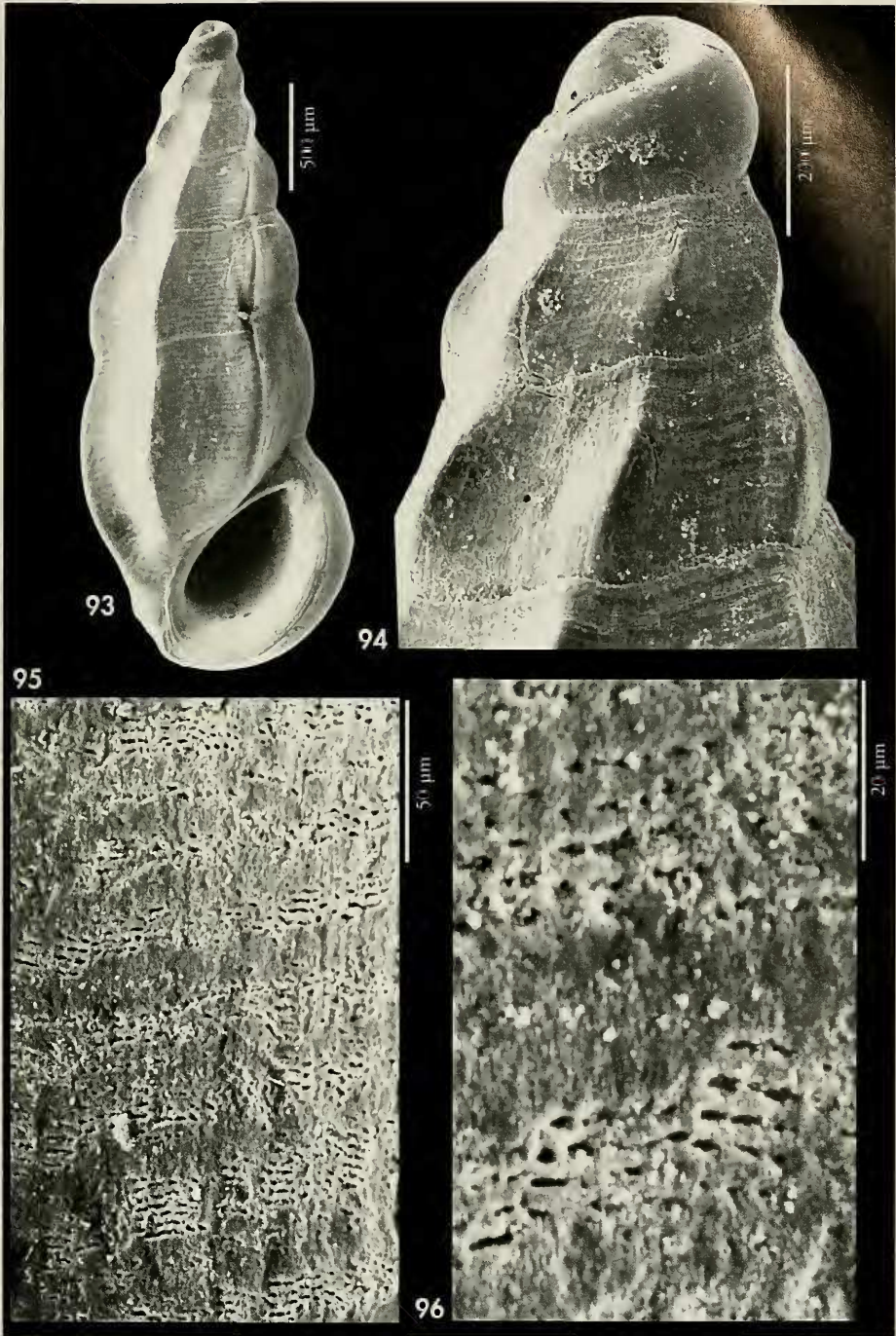
Aperture D-shaped, small; inner lip thick; columellar side weakly concave; anterior channel almost absent; outer lip with thick external varix; peristome narrow with several parallel lines towards the inner part of the aperture.

*Habitat:* The material studied was collected in sand bottom between 30 and 380 m.

*Distribution:* Sal, Maio, Santiago and Ilhéu Razo (Fig. 168).

*Remarks:* *S. paucicostata* n. sp. differs from any other of the previously described species of Cape Verde *Schwartzziella* by its smooth protoconch and the few and distant axial ribs. The similar *S. hoenselaari* n. sp. has a wider protoconch with microsculpture, and more numerous axial ribs.





Figures 93-96: *Schwartziella (Schwartziella) paucicostata* n. sp. 93: holotype, Sal (NNM 58004); 94: protoconch of the holotype; 95-96: teleoconch microsculpture of the holotype.  
Figuras 93-96: *Schwartziella (Schwartziella) paucicostata* spec. nov. 93: holotipo, Sal (NNM 58004); 94: protoconcha del holotipo; 95-96: microescultura de la teloconcha del holotipo.

*Schwartzziella (Schwartzziella) sulcostriata* n. sp. (Figs. 97-101, 169)

**Type material:** Holotype (Fig. 91) 1 s of 3.1 × 1.2 mm (NNM 58033), and 3 paratypes, 3 s (NNM 58034), CANCAP Sta. 7.100, off Palmeira, 16° 45' N, 23° 01' W, 354 m (30-VIII-1986). Other paratypes: 1 s, CANCAP Sta. 7.101, off Palmeira, Sal, 16° 45' N, 23° 01' W, 262-280 m (30-VIII-1986) (NNM 59421); 2 s, 2 f, CANCAP Sta. 7.120, 16° 36' N, 24° 37' W, Ilhéu Razo, 208 m (1-IX-1986) (NNM 59422).

**Other material studied:** Sal: 2 f, CANCAP Sta. 7.110, 16° 46' N, 23° 02' W, 85 m (31-VIII-1986) (NNM). São Nicolau: 2 s, São Jorge Bay, CANCAP Sta. 7.129, 16° 33' N, 24° 16' W, 405 m (2-IX-1986) (NNM); 1 s, CANCAP Sta. 7.128, São Jorge Bay, 16° 33' N, 24° 17' W, 400 m (2-IX-1986) (NNM).

**Etyymology:** The specific name alludes to the microsculpture of the teleoconch.

**Description:** Shell (Fig. 97) length up to 3.1 mm, maximum width 1.2 mm, not very solid, strongly elongate-conic.

Protoconch (Fig. 98) of 1 whorl and 340 µm of maximum diameter, of non-planktotrophic type, no spiral sculpture; transition to teleoconch not very abrupt. Microsculpture (Fig. 101) formed by irregular flat prominences with some pits on a smooth surface.

Teleoconch of 5 whorls, weakly convex, not angulated below suture but a little on suture; suture shallow, slightly undulate. Colour whitish.

Axial sculpture consisting of not prominent, rounded, narrow, slightly opisthocline, distantly spaced axial ribs, not always coincident from whorl to whorl. Spiral sculpture appreciable with difficulty at low magnification. Microsculpture (Figs. 99, 100) only observable among the spiral ribs and formed by smooth spiral bands separated by furrows with 2-3 spiral striae.

Aperture D-shaped, small; inner lip thick; columellar side weakly concave;

anterior channel almost absent; outer lip with thick external varix, peristoma narrow and with a few parallel lines towards the inner part of the aperture.

**Habitat:** Collected in sand sediments between 85 and 405 m.

**Distribution:** Known from Sal, Ilhéu Razo and São Nicolau (Fig. 169). Probably it is present in all the islands of the northern group.

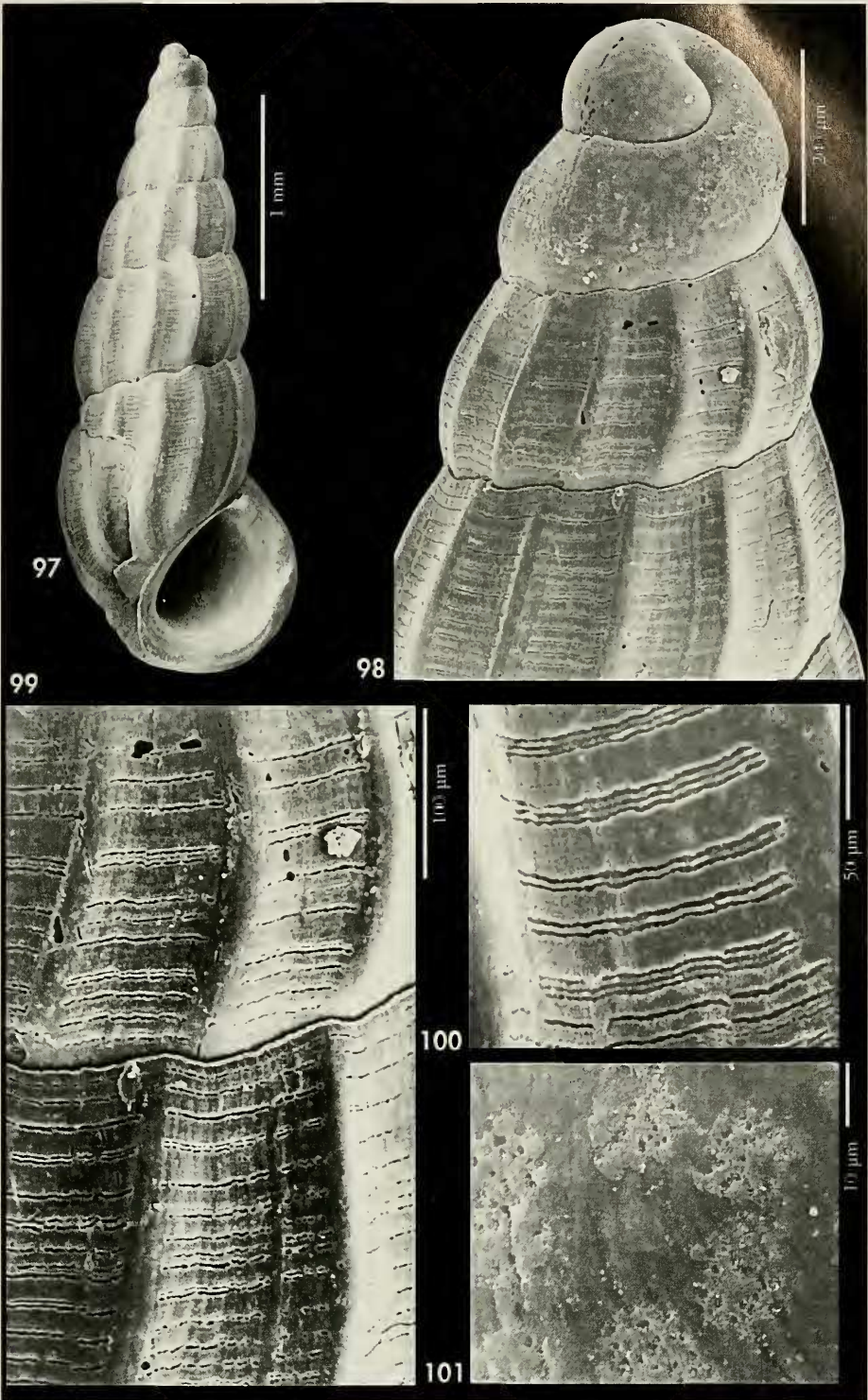
**Remarks:** *S. sulcostriata* n. sp. is more elongated than most of the previously described species and it also differs from any other by the spiral sculpture of the teleoconch, formed by alternate smooth bands and striated furrows. *S. similiter* n. sp. has a spiral cord on the top of the protoconch, rectilinear profile and a different microsculpture of the protoconch. *S. pavita* n. sp. has more depressed axial ribs. *S. depressa* n. sp. has a spiral cord on the top of the protoconch and a subsutural depression; *S. cancapae* n. sp. has stronger axial ribs and a wider protoconch with different microsculpture.

*Schwartzziella (Schwartzziella) gibbera* n. sp. (Figs. 102-106, 170)

**Type material:** Holotype (Fig. 102) 1 s of 3.7 × 1.3 mm (NNM 58008), and 3 paratypes, 3 s (NNM 58009), CANCAP Sta. 7.079, W of Ilhéu de Sal Rei, Boa Vista, Cape Verde Archipelago, 16° 10' N, 23° 00' W, 60 m (28-VIII-1986). Other paratypes: 5 j, Ilhéu de Sal Rei, CANCAP Sta. 7.080, 16° 10' N, 23° 01' W, 74 m (28-VIII-1986) (NNM 59412); 2 s (Fig. 103), 4 j, off Palmeira, Sal, CANCAP Sta.

(Right page) Figures 97-101: *Schwartzziella (Schwartzziella) sulcostriata* n. sp. 97: holotype, Palmeira, Sal (NNM 58033); 98: protoconch of the holotype; 99: detail of the spire of the holotype; 100: teleoconch microsculpture of the holotype; 101: protoconch microsculpture of the holotype. (Página derecha) Figuras 97-101: *Schwartzziella (Schwartzziella) sulcostriata* spec. nov. 97: holotipo, Palmeira, Sal (NNM 58033); 98: protoconcha del holotipo; 99: detalle de la espira del holotipo; 100: microescultura de la teleoconcha del holotipo; 101: microescultura de la protoconcha del holotipo.





7.101, 16° 45' N, 23° 01' W, 262-280 m (30-VIII-1986) (NNM 59413); 1 j, (MNCN 15.05/31707) and 1 j, both from Boa Vista (CER).

**Other material studied:** Boa Vista: 43 j, 25 f, CANCAP Sta. 6.066, 15° 53' N, 23° 00' W, 53 m (13-VI-1982) (NNM). Sal: 2 j, off Palmeira, 16° 46' N, 23° 01' W, 165 m (30-VIII-1986) (NNM). Santiago: 1 f, 4 m, Tarrafal; 1 s, 5 f, CANCAP Sta. 6.008, 14° 54' N, 23° 30' W, 120 m (5-VI-1982) (NNM); 11 s, 6 f, CANCAP Sta. 6.010, 14° 52' N, 23° 30' W, 310 m (5-VI-1982) (NNM).

**Etymology:** The specific name alludes to the subsutural hump on the axial ribs of the shell.

*Description:* Shell (Figs. 102, 103) length up to 3.7 mm, maximum width 1.3 mm, relatively solid, strongly elongate-conic.

Protoconch (Fig. 104) of 1 whorl and about 325  $\mu$ m of maximum diameter, of non-planktotrophic type, without spiral sculpture. Microsculpture formed by irregular flat prominences with some pits on a smooth surface.

Teleoconch of about 6 strongly convex whorls; there is a short depressed space below suture, followed by an evident shoulder on the axial ribs; last whorl strongly convex; suture shallow, but evident. Colour whitish.

Axial sculpture consisting of prominent, sharp, narrow, scarcely opisthocline, distantly spaced axial ribs, about 12 in last whorl. Spiral sculpture almost unappreciable at low magnification. Microsculpture (Figs. 105, 106) shows groups of 6-9 threads, interrupted by the

growth lines, alternating with bands with only pits.

Aperture D-shaped, relatively small; inner lip thick; columellar side weakly concave; anterior channel almost absent; outer lip opisthocline with thick external varix; peristome with 4-5 parallel lines towards the inner part of the aperture.

*Habitat:* In sandy and muddy bottom, between 53 and 310 m.

*Distribution:* Known from Sal, Boa Vista and Santiago Islands (Fig. 170).

*Remarks:* *Schwartzziella gibbera* n. sp. differs from the previously described species by its elongate shell and subsutural hump. *S. puncticulata* n. sp. also has a subsutural shoulder, but it has a smaller and not so elongate shell and different teleoconch microsculpture. *S. sulcostrata* n. sp. is also elongate, but it lacks subsutural hump and has a different teleoconch microsculpture.

### *Schwartzziella (Schwartzziella) irregularis* n. sp. (Figs. 107-109, 171)

**Type material:** Holotype (Fig. 107) 1 s of 3.8 (1.4 mm, CANCAP Sta. 7.042, Ponta Inglez/Ponta Preta, SW of Maio, 15° 07' N, 23° 14' W, 76 m (25-VIII-1986) (NNM 58014). Paratypes: 1 s, CANCAP Sta. 7.050, SW of Maio, 15° 06' N, 23° 14' W, 380 m (25-VIII-1986) (NNM 58015); 1 s, CANCAP Sta. 7.101, off Palmeira, Sal, 16° 45' N, 23° 01' W, 262-280 m (30-VIII-1986) (NNM 59416).

**Etymology:** The specific name alludes to the irregular distribution of the axial ribs on the shell.

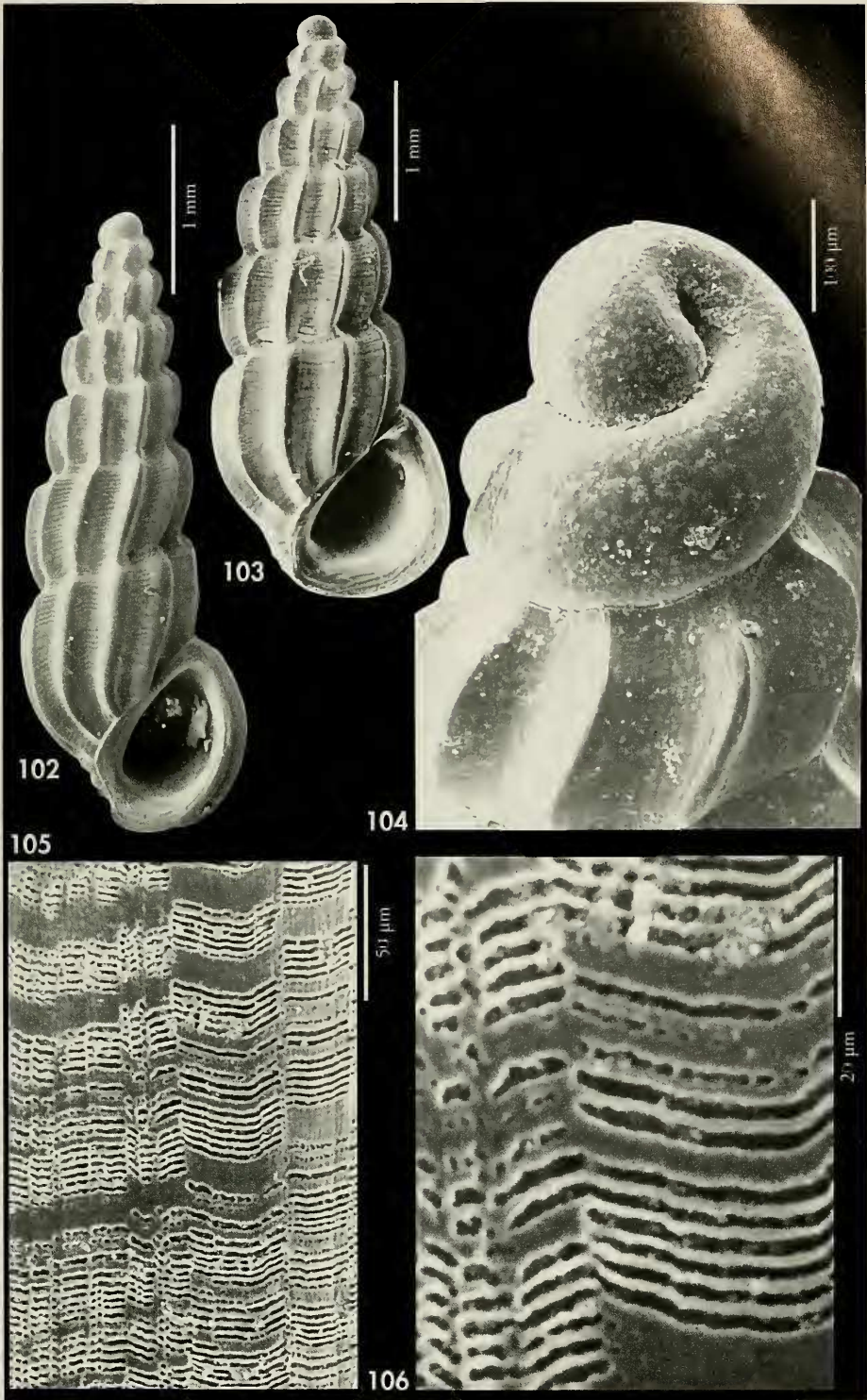
*Description:* Shell (Fig. 107) length up to 3.8 mm, maximum width 1.4 mm, not solid, narrowly elongate-conic.

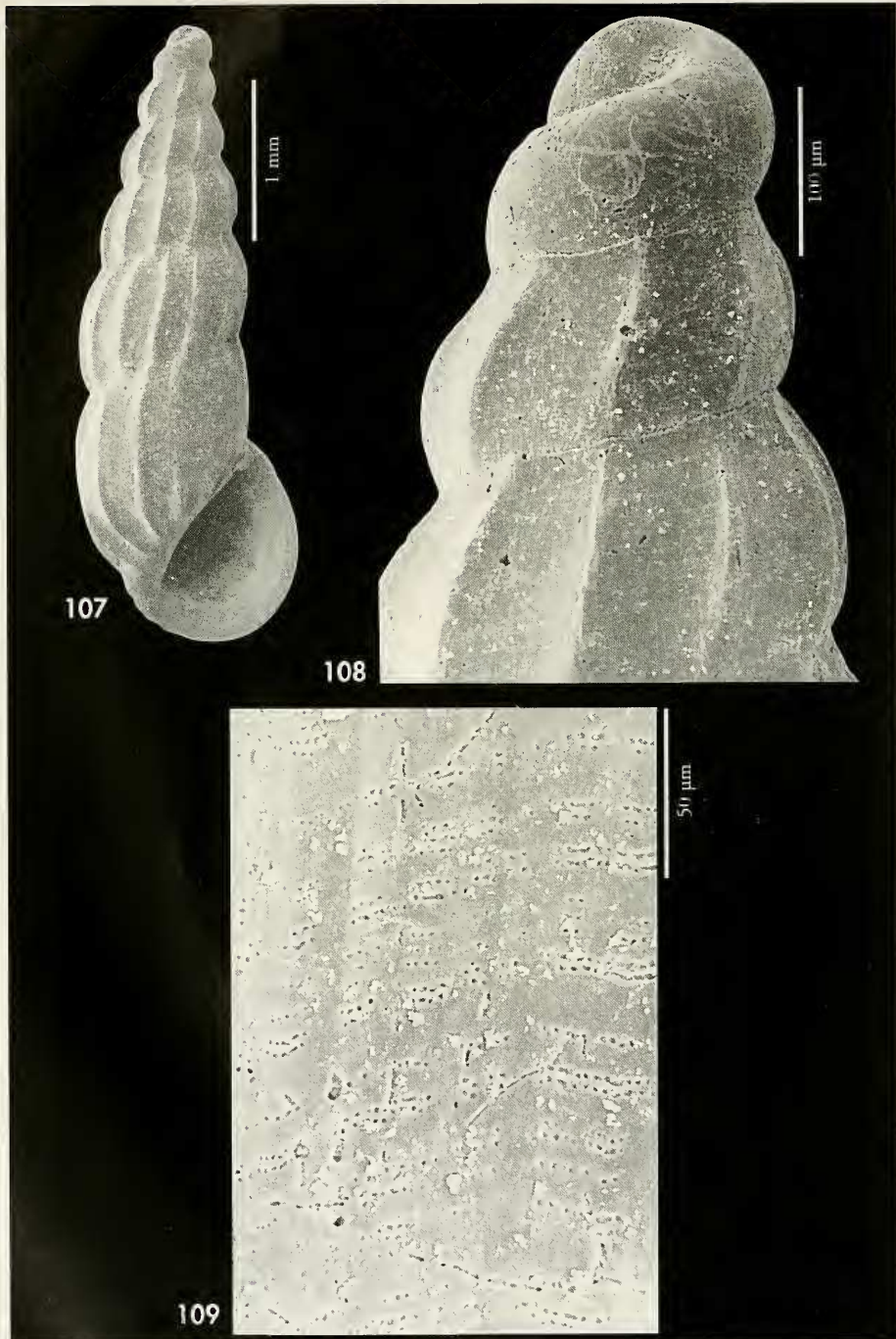
Protoconch (Fig. 108) of 1 whorl and about 175  $\mu$ m of maximum diameter, of non-planktotrophic type, smooth.

(Right page) Figures 102-106: *Schwartzziella (Schwartzziella) gibbera* n. sp. 102: holotype, Ilhéu de Sal Rei, Boa Vista (NNM 58008); 103: paratype, off Palmeira, Sal (NNM 59413); 104: protoconch of a paratype, Sal Rei, Boavista (NNM 58009); 105-106: teleoconch microsculpture of the holotype.

(Página derecha) Figuras 102-106: *Schwartzziella (Schwartzziella) gibbera spec. nov.* 102: holotipo, Ilhéu de Sal Rei, Boa Vista (NNM 58008); 103: paratipo, Palmeira, Sal (NNM 59413); 104: protoconcha de un paratipo, Sal Rei, Boavista (NNM 58009); 105-106: microscultura de la telocóncha del holotipo.

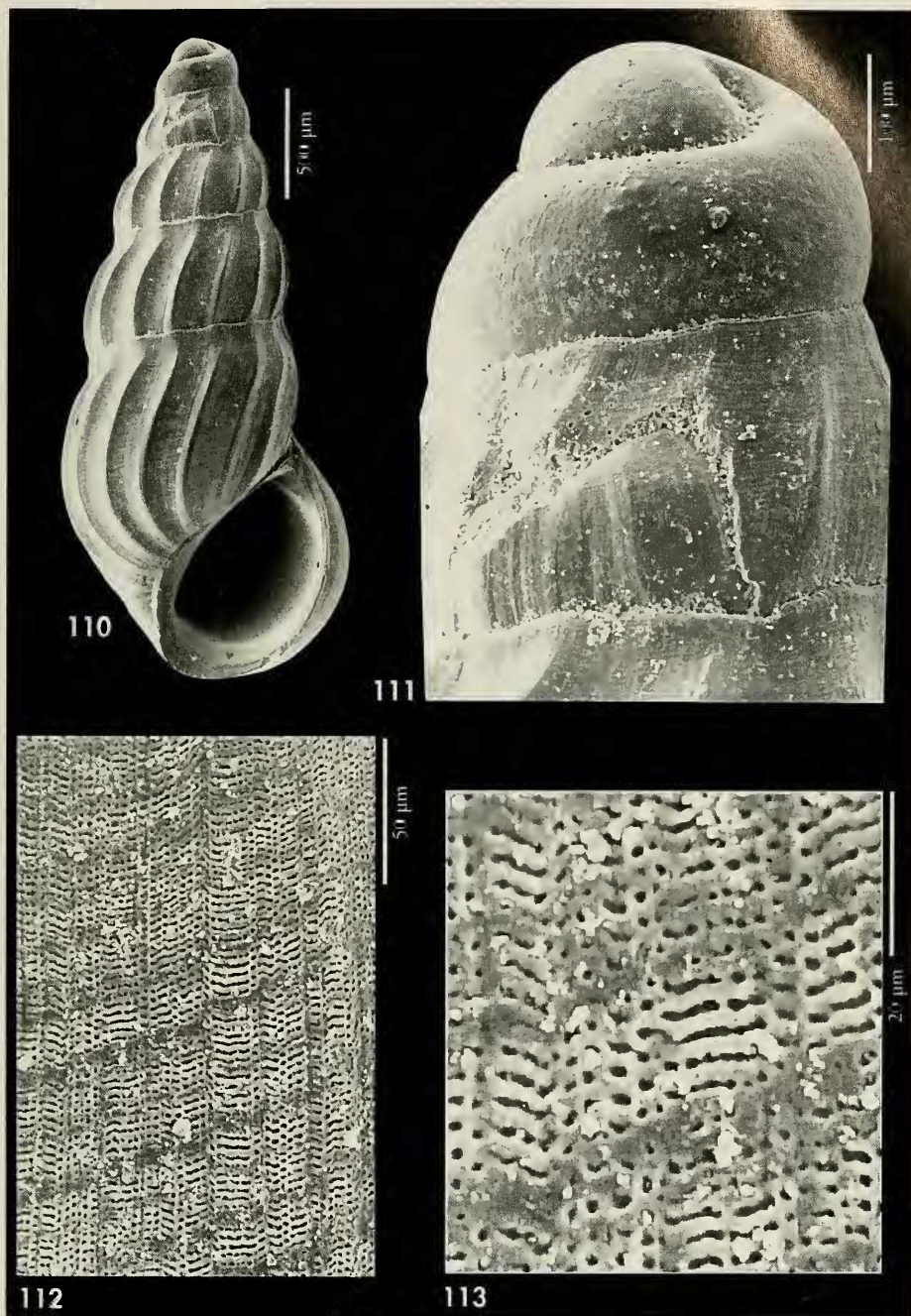






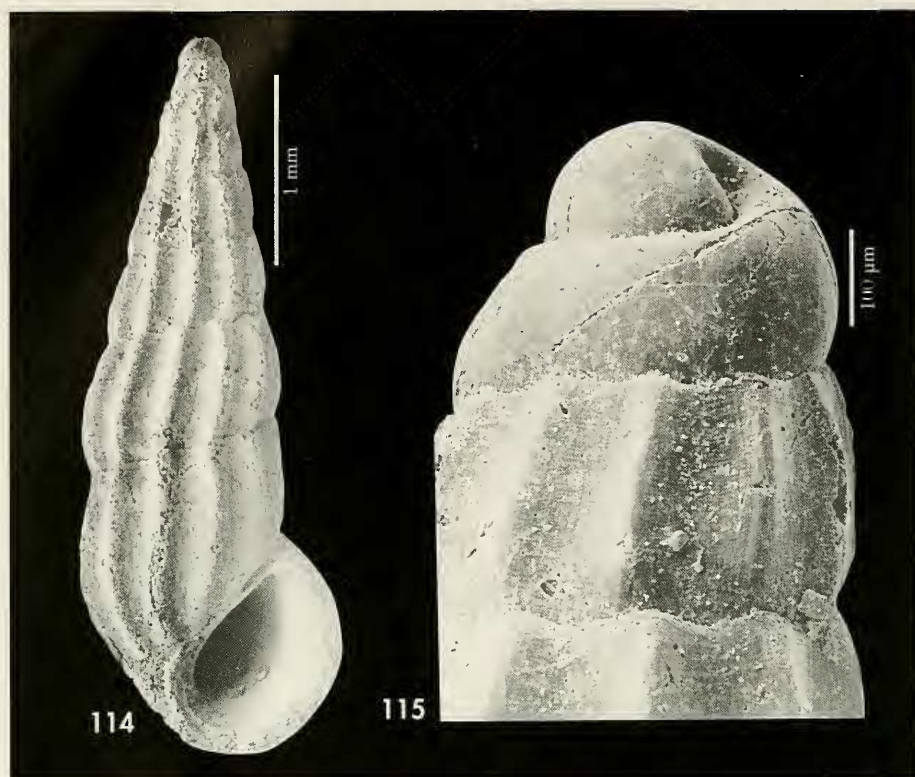
Figures 107-109: *Schwartziella (Schwartziella) irregularis* n. sp. 107: holotype, Ponta Inglez/Ponta Preta, Maio (NNM 58014); 108: protoconch of the holotype; 109: teleoconch microsculpture of the holotype.  
Figuras 107-109: *Schwartziella (Schwartziella) irregularis* spec. nov. 107: holotipo, Ponta Inglez/Ponta Preta, Maio (NNM 58014); 108: protoconcha del holotipo; 109: microescultura de la teleoconcha del holotipo.





Figures 110-113: *Schwartziella* (*Schwartziella*) *abundata* n. sp. 110: holotype, off Palmeira, Sal (NNM 57998); 111: protoconch of the holotype; 112-113: teleoconch microsculpture of the holotype.

*Figuras 110-113: Schwartziella* (*Schwartziella*) *abundata* *spec. nov.* 110: *holotipo*, *Palmeira*, *Sal* (NNM 57998); 111: *protoconcha del holotipo*; 112-113: *microescultura de la teloconcha del holotipo*.



Figures 114-115: *Schwartzziella (Schwartzziella) rectilinea* n. sp. 114: holotype, Ilhéu Razo (NNM 58026); 115: protoconch of a paratype from type locality (NNM 58027).

Figuras 114-115: *Schwartzziella (Schwartzziella) rectilinea* spec. nov. 114: holotipo, Ilhéu Razo (NNM 58026); 115: protoconcha de un paratipo de la localidad tipo (NNM 58027).

Teleoconch of 5 whorls, weakly convex, not angulated below sutures, last whorl weakly convex; suture shallow. Colour whitish.

Axial sculpture consisting of few prominent, sharp, narrow, slightly opisthoclinal, distantly spaced axial ribs, 10 in last whorl, which have not a regular correspondence from whorl to whorl. Spiral sculpture not

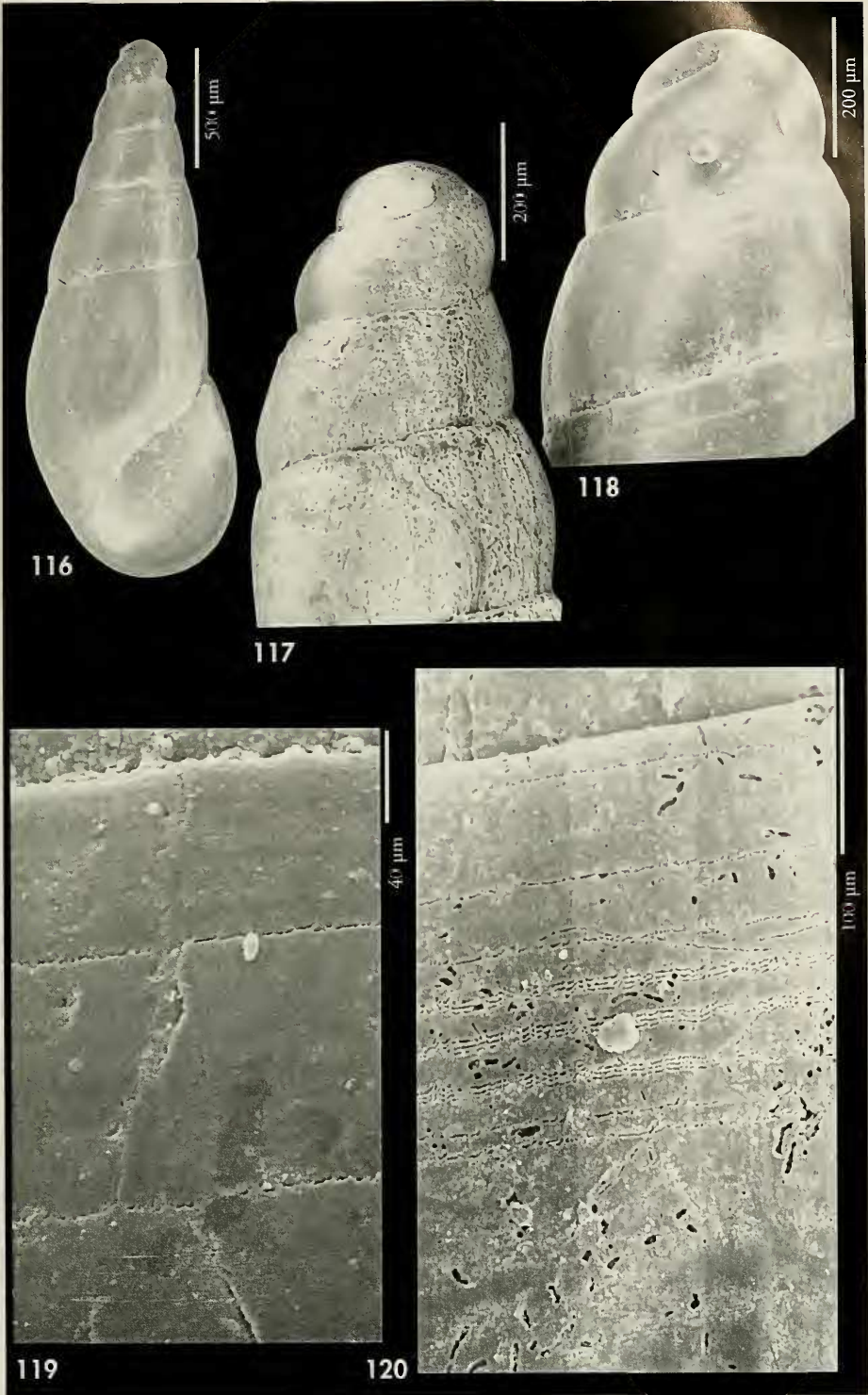
visible at low magnification. Microsculpture (Fig. 109) only formed by irregular spiral rows of small pits.

Aperture D-shaped, small sized; inner lip thin; columellar side weakly concave; anterior channel almost absent; outer lip opisthoclinal with thick external varix; peristoma simple with a second elevation in the inner part.

(Right page) Figures 116-120: *Schwartzziella (Schwartzziella) rarilineata* n. sp. 116: holotype, Rabo de Junco, Sal (MNCN 15.05/31716); 117: protoconch of a paratype; 118: protoconch of the holotype; 119-120: teleoconch microsculpture of a paratype, Rabo de Junco (CER).

(Página derecha) Figuras 116-120: *Schwartzziella (Schwartzziella) rarilineata* spec. nov. 116: holotipo, Rabo de Junco, Sal (MNCN 15.05/31716); 117: protoconcha del paratipo; 118: protoconcha del holotipo; 119-120: microescultura de la teleoconcha de un paratipo, Rabo de Junco (CER).





*Habitat:* Collected in sandy sediments between 76 and 380 m.

*Distribution:* Only known from Sal and Maio (Fig. 171).

*Remarks:* *S. irregularis* n. sp. differs from the previously described species of *Schwartziella* by the narrow and elongated shell, small protoconch, axial ribs irregularly disposed and the very faint

microsculpture with only small perforations. By its elongate shape it is similar to *S. gibbera* n. sp., but this species has a larger protoconch, a subsutural hump, axial ribs continued over adjacent whorls and a more marked microsculpture. *S. sulcostriata* n. sp. also has a larger protoconch and different protoconch and teleoconch microsculpture.

### *Schwartziella (Schwartziella) abundata* n. sp. (Figs. 110-113, 171)

**Type material:** Holotype (Fig. 110) 1 s of 2.9 x 1.4 mm (NNM 57998) and 2 paratypes, 2 s (NNM 57999), CANCAP Sta. 7.100, off Palmeira, Sal, 16° 45' N, 23° 01' W, 262-280 m (30-VIII-1986).

**Other material studied:** Maio: 4 j, 1 f, CANCAP Sta. 7.050, 15° 06' N, 23° 14' W, 380 m (25-VIII-1986) (NNM).

**Etymology:** The specific name is derived of the Latin *abundo* (to surpass), alluding to the numerous axial ribs of this species, more than in any other Cape Verde *Schwartziella*.

*Description:* Shell (Fig. 110) length up to 2.9 mm, maximum width 1.4 mm, not solid, elongate-conical.

Protoconch (Fig. 111) of 1 whorl and 420  $\mu$ m of maximum diameter, of non-planktotrophic type, without spiral sculpture; transition to teleoconch abrupt. Microsculpture formed by irregular flat prominences with some perforations on a smooth surface.

Teleoconch of 4 strongly convex whorls, not angulated below suture; last whorl strongly convex; suture shallow. Colour whitish.

Axial sculpture consisting of scarcely prominent, narrow, opisthoclinal, distantly spaced axial ribs, absent just below the suture; about very curved 15-16 ribs on

the last whorl. Spiral sculpture not visible at low magnification. Microsculpture (Figs. 112, 113) formed by fine threads separated by rows of small pits.

Aperture D-shaped, relatively large; inner lip thick; columellar side weakly concave; anterior channel shallow; outer lip opisthoclinal with thick external varix; peristome sharp.

*Habitat:* Muddy bottom between 260 and 380 m.

*Distribution:* Only known from Sal and Maio (Fig. 171).

*Remarks:* *S. abundata* n. sp. has a larger protoconch than any other of the Cape Verde species of *Schwartziella*, and also more numerous and curved axial ribs, and a subsutural area without axial sculpture.

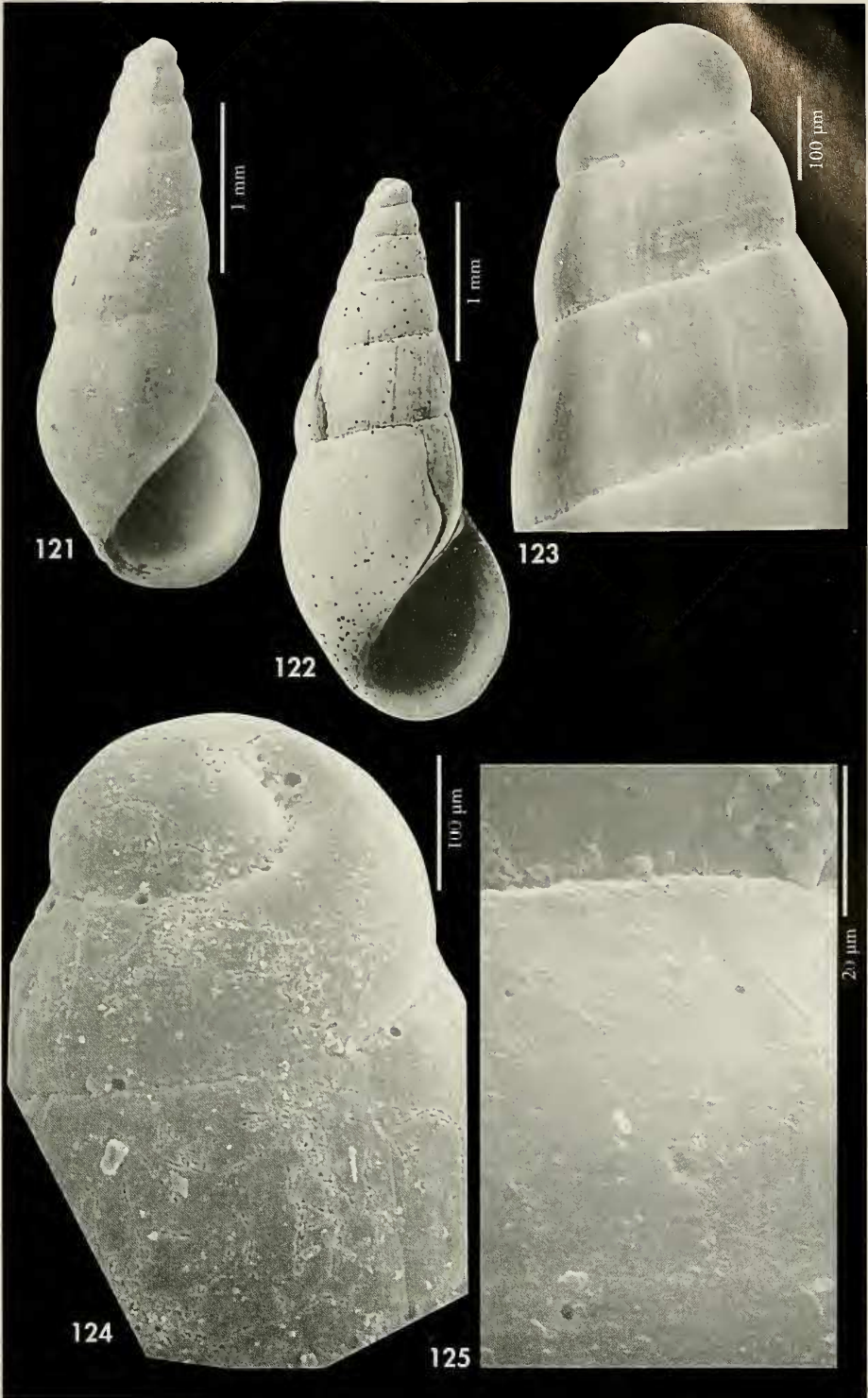
### *Schwartziella (Schwartziella) rectilinea* n. sp. (Figs. 114, 115, 172)

**Type material:** Holotype (Fig. 114) 1 s of 3.8 x 1.4 mm (NNM 58026), and 16 paratypes, 16 j (NNM 58027), CANCAP Sta. 7.121, Ilhéu Razo, 16° 36' N, 24° 37' W, 200-230 m (1-IX-1986). Other paraty-

(Right page) Figures 121-125: *Schwartziella (Schwartziella) inscripta* n. sp. 121: holotype, Palmeira, Sal (MNCN 15.05/31710); 122: shell from Maio (broken during the study); 123, protoconch of a paratype, Rabo de Junco, Sal (CER); 124: protoconch of a shell from Palmeira, Sal; 125: detail of the suture in last whorl of the same shell.

(Página derecha) Figuras 121-125: *Schwartziella (Schwartziella) inscripta* spec. nov. 121: holotipo, Palmeira, Sal (MNCN 15.05/31710); 122: concha de Maio (rota durante su estudio); 123, protoconch of a paratype, Rabo de Junco, Sal; 124: protoconcha de una concha de Palmeira, Sal; 125: detalle de la sutura en la última vuelta de la misma concha.





pes: 1 j (MNCN 15.05/31717) and 1 s (CER), both from the type locality; 19 j, CANCAP Sta. 7.119, S of Ilhéu Razo, 16° 36' N, 24° 36' W, 140-160 m (1-IX-1986) (NNM 59418); 1 s, CANCAP Sta. 6.095, S of Ilhéu Razo, 16° 35' N, 24° 37' W, 930 m (15-VI-1982) (NNM 59419); 1 s, CANCAP Sta. 7.120, S of Ilhéu Razo, 16° 36' N, 24° 36' W, 208 m (1-IX-1986) (NNM 59420).

**Other material studied:** São Nicolau: 25 j, 1 f, São Jorge Bay, CANCAP Sta. 7.129, 16° 33' N, 24° 16' W, 405 m (2-IX-1986) (NNM).

**Etymology:** The specific name alludes to the right profile of the whorls of the shell.

**Description:** Shell (Fig. 114) length up to 3.8 mm, maximum width 1.4 mm, relatively solid, elongate-conical.

Protoconch (Fig. 115) of 1 whorl and 380  $\mu$ m of maximum diameter, of non-planktotrophic type, without spiral sculpture, transition to teleoconch attenuated.

Teleoconch of 7 whorls, almost flat-sided, specially the first ones; last whorl weakly convex; suture shallow. Colour cream-whitish.

Axial sculpture consisting of prominent, narrow, scarcely opisthocline, distantly spaced axial ribs; the ribs are continued from whorl to whorl. Spiral sculpture unappreciable at low magnification. Microsculpture formed by spiral rows of very small pits on the first whorls. Due to poor condition of the adult shells no microsculpture could be

observed on the last whorl except for growth lines.

Aperture D-shaped, relatively small; inner lip thick; columellar side weakly concave; anterior channel absent; outer lip opisthocline with thick external varix.

**Habitat:** Found in muddy and calcareous sand between 140 and 930 m.

**Distribution:** Ilhéu Razo and São Nicolau (Fig. 172).

**Remarks:** *S. rectilinea* n. sp. is very elongate, and it differs from the following similar species with elongate shell: *S. irregularis* n. sp. has more convex spire whorls and smaller protoconch; *S. gibbera* n. sp. has very prominent axial ribs and a subsutural hump; *S. sulcostriata* n. sp. has a smaller protoconch, a more curved profile of the spiral whorls, and a more marked teleoconch microsculpture.

### *Schwartziella (Schwartziella) rarilineata* n. sp. (Figs. 116-120, 173)

**Type material:** Holotype (Fig. 116) 1 s of 2.3 (1.0 mm, Rabo de Junco, Sal, Cape Verde Archipelago, 6 m (MNCN 15.05/31716). Paratypes: 1 s, Palmeira, Sal, 8 m (MNH); 1 s, Regona, Sal, 2 m (NNM 58025); 1 s, São Vicente, CANCAP Sta. 7.161, 16° 54' N, 24° 54' W, 95 m (NNM 59428); 2 s, 2 f, Rabo de Junco, Sal, 6 m (CER); 1 j, Baía Teodora, Boa Vista, 4 m (CER); 1 s, Sal Rei, Boa Vista, 4 m (AMNH). **Other material studied:** Sal: 2 s, 1 j, 1 f, Palmeira, 8 m; 4 s, Regona, 10 m; 2 s (eroded), 1 j, Rabo de Junco, 4 m. São Nicolau: 1 s (eroded), São Jorge Bay, CANCAP Sta. 7.129, 16° 33' N, 24° 16' W, 405 m (2-IX-1986) (NNM).

**Etymology:** The specific name alludes to the teleoconch microsculpture formed by a few lines.

**Description:** Shell (Fig. 116) length up to 2.5 mm, maximum width 1.1 mm, shining, relatively solid, elongate-conic.

Protoconch (Figs. 117, 118) of 1 whorl and about 320  $\mu$ m of maximum diameter, of non-planktotrophic type, smooth, transition to teleoconch not abrupt.

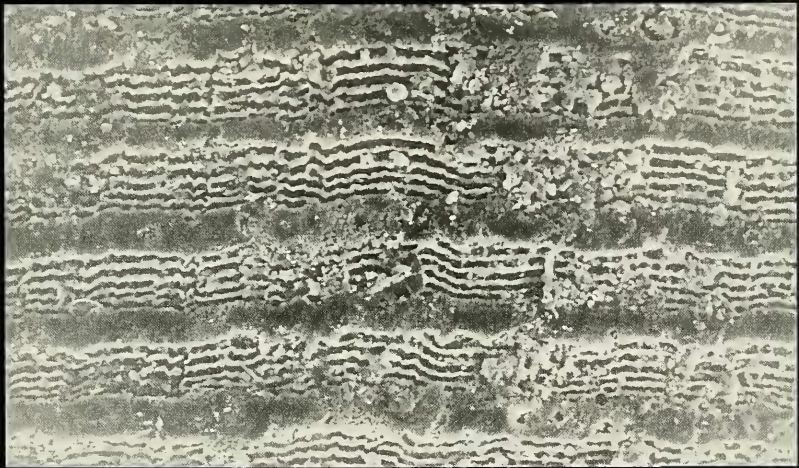
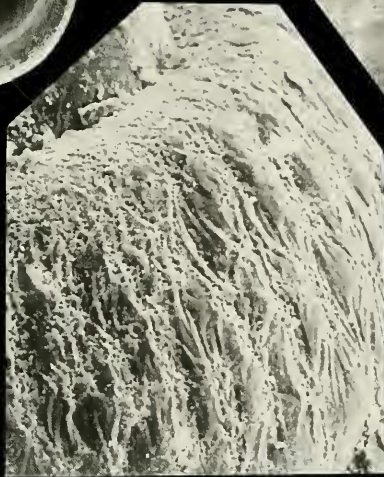
(Right page) Figures 126-129: *Schwartziella (Schwartziella) sculpturata* n. sp. 126: holotype, Palmeira, Sal (MNCN 15.05/31720); 127-128: protoconchs of two paratypes, Rabo de Junco, Sal (CER); 129: teleoconch microsculpture of the holotype.

(Página derecha) Figuras 126-129: *Schwartziella (Schwartziella) sculpturata spec. nov.* 126: holotipo, Palmeira, Sal (MNCN 15.05/31720); 127-128: protoconchas de dos paratipos, Rabo de Junco, Sal (CER); 129: microescultura de la teleoconcha del holotipo.





127



Teleoconch of 4 whorls, almost flat-sided, last whorl weakly convex; suture shallow. Colour translucent white.

No axial sculpture. Spiral sculpture (Fig. 116, 119) formed only by few spiral bands, composed by groups of 2-3 very fine threads with intermediate striae on subsutural areas (Fig. 120).

Aperture D-shaped, relatively large; inner lip thin; columellar side weakly concave; anterior channel almost absent; outer lip slightly opisthoclinal with thin external varix; peristome narrow, rounded.

*Habitat*: Sand sediments, in shallow water (2-6 m), except for two shells

dredged from 95 and 405 m, respectively.

*Distribution*: Sal, Boa Vista, São Nicolau and São Vicente (Fig. 173).

*Remarks*: *Schwartzziella rarilineata* n. sp. differs from any of the previously known Eastern Atlantic species of the genus by its teleoconch without axial ribs, almost smooth and shining, like a *Zebina*. Nevertheless, we include it in the genus *Schwartzziella* because it lacks of tubercles inside of the outer lip, unlike other Atlantic species of *Zebina* (*Z. paivensis*, *Z. browniana*, *Z. robustior*, see GOFAS, 1999, and below under *Zebina villenai*).

### *Schwartzziella (Schwartzziella) inscripta* n. sp. (Figs. 121-125, 174)

**Type material**: Holotype (Fig. 121) 1 s of 3.4 x 1.4 mm, Palmeira Bay, Sal Island, Cape Verde Archipelago, 6 m (MNCN 15.05/31710). Paratypes: 1 s, Matiota, São Vicente, 4 m (NNM 58013); 1 s, Pau Seco, Maio (AMNH); 1 s, Rabo de Junco, Sal (MNHN); 1 s, Rabo de Junco, Sal (CER); 1 s, 2 f, Ilhéu de Sal Rei, Boa Vista (CER); 1 s, 1 f, Porto da Cruz, Boa Vista, 4 m (CER).

**Other material studied**: Sal: 2 s (1 destroyed during study), 2 j, 1 f, Palmeira, 8 m; Boa Vista: 1 f, Sal Rei, 5 m; Maio: 1 s (Fig. 121, destroyed during study), Pau Seco; São Vicente: 1 f, Porto Mindelo, 15 m.

**Etymology**: The specific name alludes the presence of striae on the first whorl of the shell.

*Description*: Shell (Figs. 121, 122) length up to 3.5 mm, maximum width 1.5 mm, relatively solid, shining, elongate-conic.

Protoconch (Figs. 123, 124) of 1 whorl and about 310  $\mu$ m of maximum diameter, of non-planktotrophic type, smooth; transition to teleoconch not conspicuous.

Teleoconch of 5 whorls, weakly convex; suture very shallow. Colour translucent whitish. Axial sculpture absent. Spiral sculpture only present on the first whorl of the teleoconch (Fig.

123), formed by 4-5 spiral striae, which disappear immediately (Fig. 125).

Aperture D-shaped, relatively large; inner lip thin; columellar side weakly concave; anterior channel almost absent; outer lip opisthoclinal, with thick external varix; peristome simple, rounded.

*Habitat*: Sand sediments from shallow water (4-15 m).

*Distribution*: Sal, Boa Vista, Maio, São Vicente (Fig. 174).

*Remarks*: *S. inscripta* n. sp. has a larger shell than *S. rarilineata* n. sp., and the spiral striae only appear on the first whorl.

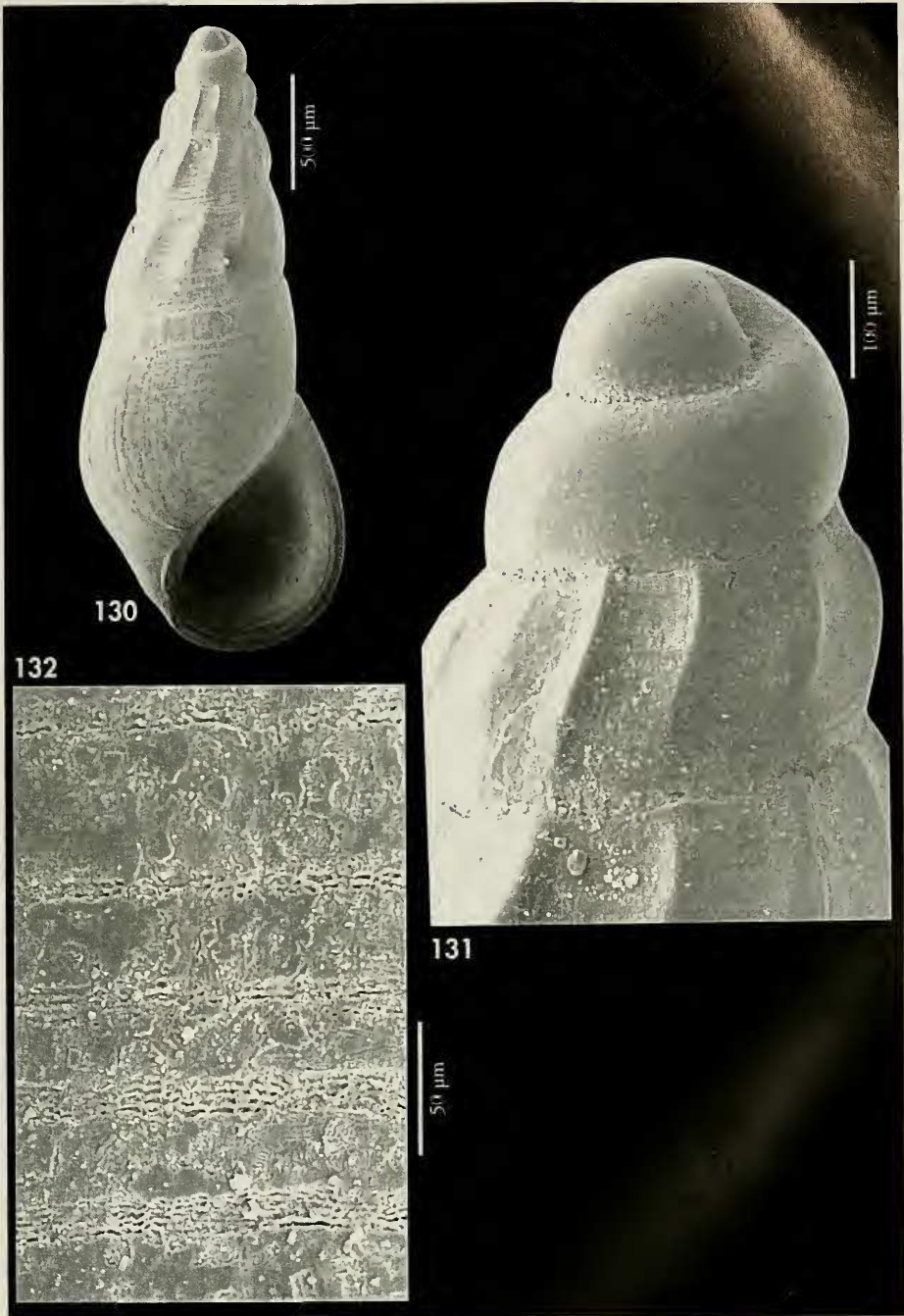
### *Schwartzziella (Schwartzziella) sculpturata* n. sp. (Figs. 126-129, 175)

**Type material**: Holotype (Fig. 126) 1 s of 2.1 x 1.0 mm, Palmeiras, Sal Island, Cape Verde Archipelago, 10 m (MNCN 15.05/31720). Paratypes: 1 s (NNM 58030), 1 s (MNHN), 3 s (CER), all from the type locality; 2 s, 2 f, Sal Rei, Boa Vista (CER); 3 s, Rabo de Junco, Sal, 4 m (CER).

**Other material studied**: Sal: 2 s (1 broken during the study), 2 f, Rabo de Junco, 4 m; 2 s, Palmeira, 10 m; 6 s, 1 f, Regona, 10 m. Santiago: 1 s, Cidade Velha, 4 m; 1 s, Praia, 5 m. Brava: 1 s, Furna, 30 m; 1 s, Porto do Ancião, 3 m. São Vicente: 1 s, Porto Mindelo, 15 m.

**Etymology**: The specific name alludes to the presence of axial and spiral sculpture.





Figures 130-132: *Schwartziella (Schwartziella) paradoxa* n. sp. 130: holotype, São Vicente (NNM 58021); 131: protoconch of the holotype; 132: teleoconch microsculpture of the holotype.  
Figuras 130-132: *Schwartziella (Schwartziella) paradoxa* spec. nov. 130: holotipo, São Vicente (NNM 58021); 131: protoconcha del holotipo; 132: microscultura de la teleoconcha del holotipo.

*Description:* Shell (Fig. 126) length up to 2.1 mm, maximum width 1.0 mm, not solid, elongate-conic.

Protoconch (Figs. 127, 128) of 1 whorl and 270  $\mu\text{m}$  of maximum diameter, of non-planktotrophic type, without spiral sculpture; transition to teleoconch abrupt. Microsculpture (Fig. 128) shows a rough surface formed by small depressions with many irregular threads.

Teleoconch of 4 whorls, weakly convex; suture shallow. Colour cream-whitish.

Axial sculpture consisting of weakly prominent, narrow, almost orthocline, distantly spaced axial ribs, only on the first 2-3 whorls of teleoconch, disappearing on the last whorl. Spiral sculpture very regular, formed by fine spiral cords, about 15 on penultimate and 35 on last whorl.

Microsculpture (Fig. 129) formed by spiral bands of 4-5 threads alternating with furrows.

Aperture D-shaped, medium sized; inner lip thin; columellar side weakly concave; anterior channel absent; outer lip opisthocline with a thin external varix; peristome simple with a pair of parallel lines towards the inner part of the aperture.

*Habitat:* Sandy sediments from shallow water (3-30 m).

*Distribution:* Known from Sal, Boa Vista, Santiago, Brava, São Vicente (fig. 175). Probably it can be found in the entire archipelago.

*Remarks:* *S. sculpturata* n. sp. differs from *S. rarilineata* n. sp. and *S. inscripta* n. sp. by its evident teleoconch and protoconch sculpture.

*Schwartziella (Schwartziella) paradoxa* n. sp. (Figs. 130-132, 137, 138, 176)

**Type material:** Holotype (Fig. 130) 1 s of 2.7  $\times$  1.1 mm, Baia das Gatas, São Vicente, CANCAP Sta. 7.161, 16° 54' N, 24° 54' W, 95 m (NNM 58021).

**Etymology:** The specific name alludes to the shell characters intermediate between *Schwartziella* and *Zebina*.

*Description:* Shell (Fig. 130) length 2.7 mm, width 1.1 mm, not solid, elongate-conic.

Protoconch (Fig. 131) of 1 whorl and 320  $\mu\text{m}$  of maximum diameter, of non-planktotrophic type, without spiral sculpture and smooth; transition to teleoconch not abrupt.

Teleoconch of 4 whorls, weakly convex; suture shallow. Colour whitish.

Axial sculpture of adapical spire whorls consisting of few prominent, sharp, narrow, opisthocline, slightly undulate and distantly spaced axial ribs, which begin on the suture and disappear a little below the middle of the whorl;

axial ribs absent on the last whorl. Spiral sculpture visible at low magnification in all the whorls, except on the inferior part of the last whorl. Microsculpture (Fig. 132) formed by groups of few spiral threads separated by wider rough spaces.

Aperture D-shaped, relatively large; inner lip thin; columellar side weakly concave; anterior channel absent; outer lip opisthocline with a not too thick external varix; peristome simple with some parallel lines towards the inner part of the aperture.

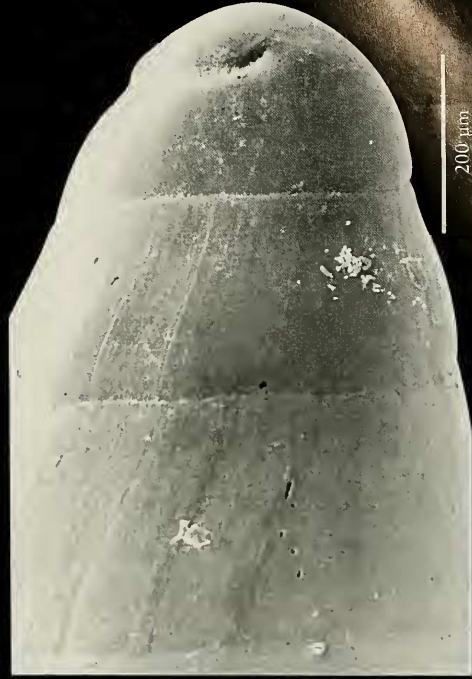
*Habitat:* Muddy bottom, at 95 m.

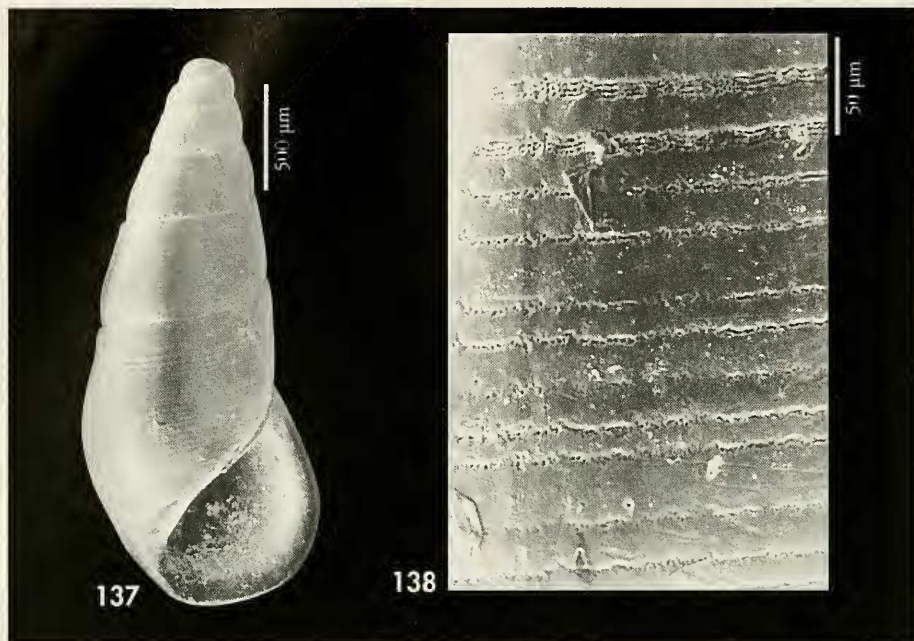
*Distribution:* Only known from the type locality (Fig. 176).

(Right page) Figures 133-136: *Zebina (Zebina) villenai* n. sp. 133: holotype, S of Ilhéu Razo (NNM 58016); 134: protoconch of the holotype; 135: shell of smaller size, S of Ilhéu Razo (NNM 58017); 136: protoconch of the same shell.

(Página derecha) Figuras 133-136: *Zebina (Zebina) villenai* spec. nov. 133: holotipo, Sur de Ilhéu Razo (NNM 58016); 134: protoconcha del holotipo; 135: concha de pequeño tamaño, Sur de Ilhéu Razo (NNM 58017); 136: protoconcha de la misma concha.







Figures 137, 138: *Schwartzziella (Schwartzziella) cf. paradoxa*. 137: shell from Rabo de Junco, Sal (CER); 138: teleoconch microsculpture.

Figures 137, 138: *Schwartzziella (Schwartzziella) cf. paradoxa*. 1. 137: concha de Rabo de Junco, Sal (CER); 138: microescultura de la teleoconcha.

*Remarks:* *Schwartzziella paradoxa* n. sp. differs from any other species of Cape Verde *Schwartzziella* by having prominent axial ribs on first whorls of teleoconch, which are absent on last whorl. *S. sculpturata* n. sp., which also has weak axial ribs on the first 2-3 whorls, is less elongate, has more evident spiral sculpture and a different protoconch microsculpture.

One shell (Figs. 137, 138) of 3.0 x 1.0 mm, found in Rabo de Junco, Sal, is similar to that of *Schwartzziella paradoxa* n. sp. but it lacks totally of axial ribs and has more spiral sculpture in the last whorl. We think that it is probably a different species, but we prefer do not describe it awaiting for further material.

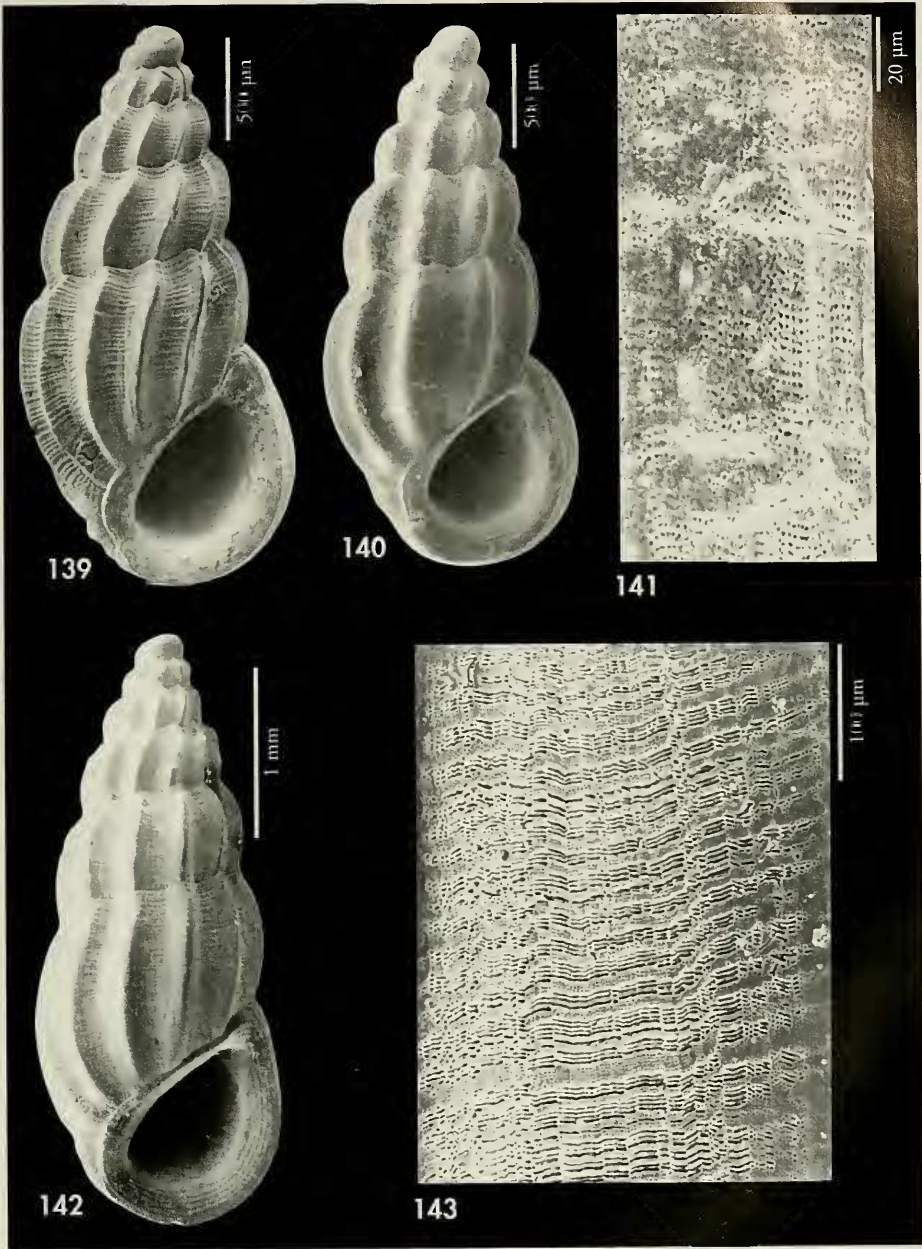
Genus *Zebina* H. and A. Adams, 1854  
Subgenus *Zebina* s. s.

Type species: *Rissoina semiglabrata* A. Adams, 1854, by subsequent designation (REHDER, 1980).  
Diagnosis: PONDER (1985, p. 85).

*Zebina (Zebina) villenai* n. sp. (Figs. 133-136, 172)

**Type material:** Holotype (Fig. 133) 1 s of 4.2 (1.8 mm (NNM 58016) and 1 paratype, 1 s (NNM 58017), CANCAP Sta. 7.119, S of Ilhéu Razo, 16° 36' N, 24° 36' W, 140-160 m (1-IX-1986). Other paratypes: 1 s, CANCAP Sta. 7.122, S of Ilhéu Razo, 16° 36' N, 24° 35' W, 100 m (1-IX-1986) (NNM 59423); 1 s, CANCAP Sta. 6.093, SW of Ilhéu Razo, 16° 36' N, 24° 37' W, 400-430 m (15-VI-1982)





Figures 139-143: Shells of dubious species of *Schwartziella* (*Schwartziella*) from the Cape Verde Islands. 139: *Schwartziella* (*Schwartziella*) cf. *minima*, Calhau, São Vicente. 140, 141: *S. (S.)* cf. *puncticulata*. 140: shell, CANCAP Sta. 6145, São Vicente; 141: microsculpture of the same shell. 142, 143: *S. (S.)* cf. *typica*; 142: shell from Calhau, São Vicente; 143: microsculpture of the same shell.  
 Figuras 139-143: Conchas de especies dudosas de *Schwartziella* (*Schwartziella*) de Cabo Verde. 139: *Schwartziella* (*Schwartziella*) cf. *minima*, Calhau, São Vicente. 140, 141: *S. (S.)* cf. *puncticulata*. 140: concha, CANCAP Sta. 6145, São Vicente; 141: microescultura de la misma concha; 142, 143: *S. (S.)* cf. *typica*; 142: concha de Calhau, São Vicente; 143: microescultura de la misma concha.

(NNM 59424); 1 s, 1 j, CANCAP Sta. 7.128, São Jorge Bay, São Nicolau, 16° 33' N, 24° 17' W, 400 m (2-IX-1986) (NNM 59425).

**Other material studied:** Ilhéu Razo: 2 s (Fig. 134), CANCAP Sta. 7.116, S of Ilhéu Razo, 16° 36' N, 24° 36' W, 75 m (1-IX-1986) (NNM).

**Etymology:** The specific name is dedicated to Miguel Villena, who manages the type collection of molluscs at the MNCN, for his kind cooperation.

**Description:** Shell (Figs. 133, 135) length up to 4.2 mm, maximum width 1.8 mm, very solid, elongate-conic.

Protoconch (Figs. 134, 136) of 1 whorl and about 430  $\mu\text{m}$  of maximum diameter, of non-planktotrophic type, without spiral sculpture; transition to teleoconch appreciable with difficulty.

Teleoconch of about 5 flat-sided whorls; last whorl strongly convex at the lower part; suture shallow. Colour whitish. Axial and spiral sculpture lacking. Surface smooth and shining.

Aperture D-shaped, relatively small; inner lip thin; columellar side weakly concave; anterior channel almost absent; peristome simple, with some parallel lines towards the inner part of the aperture; two tubercles not always evident on an interior elevation of the aperture.

**Habitat:** Coarse calcareous sand, gravel and stones, between 75 and 430 m.

**Distribution:** Ilhéu Razo and São Nicolau (Fig. 172).

**Remarks:** *Zebina villenai* n. sp. is similar to *Z. paivensis* (Watson, 1873) from the Canary and Selvagens Islands, a species confused with the Caribbean species *Z. browniana* (d'Orbigny, 1842) or *Z. vitrea* (C. B. Adams, 1850) by authors (ODHNER, 1932; NORDSIECK, 1972; GARCÍA-TALAVERA, 1983; see GOFAS, 1999), but *Z. paivensis* has a smaller protoconch (340  $\mu\text{m}$ ) and more convex whorls. *Z. browniana* and *Z. vitrea* have protoconchs of planktotrophic type. *Z. robustior* Gofas, 1999, from Southern Morocco to Senegal is larger than *Z. villenai* (up to 5.3 mm) and its protoconch is smaller (about 350  $\mu\text{m}$ , measurements from figure 80 of GOFAS, 1999).

A few shells from Ilhéu Razo are of small size (Fig. 135), but the protoconch (Fig. 136) shows no differences.

## CONCLUSIONS

Twenty-nine species of the subfamily Rissoininae belonging to three genera and four subgenera have been found in the Cape Verde Archipelago. Only one of them, the sole species with a protoconch of planktotrophic type (*Rissoina* (*Rissoina*) *punctostriata*) has a wide distribution along the West African coast, whereas the other 28 species, 1 belonging to the genus *Ris-*

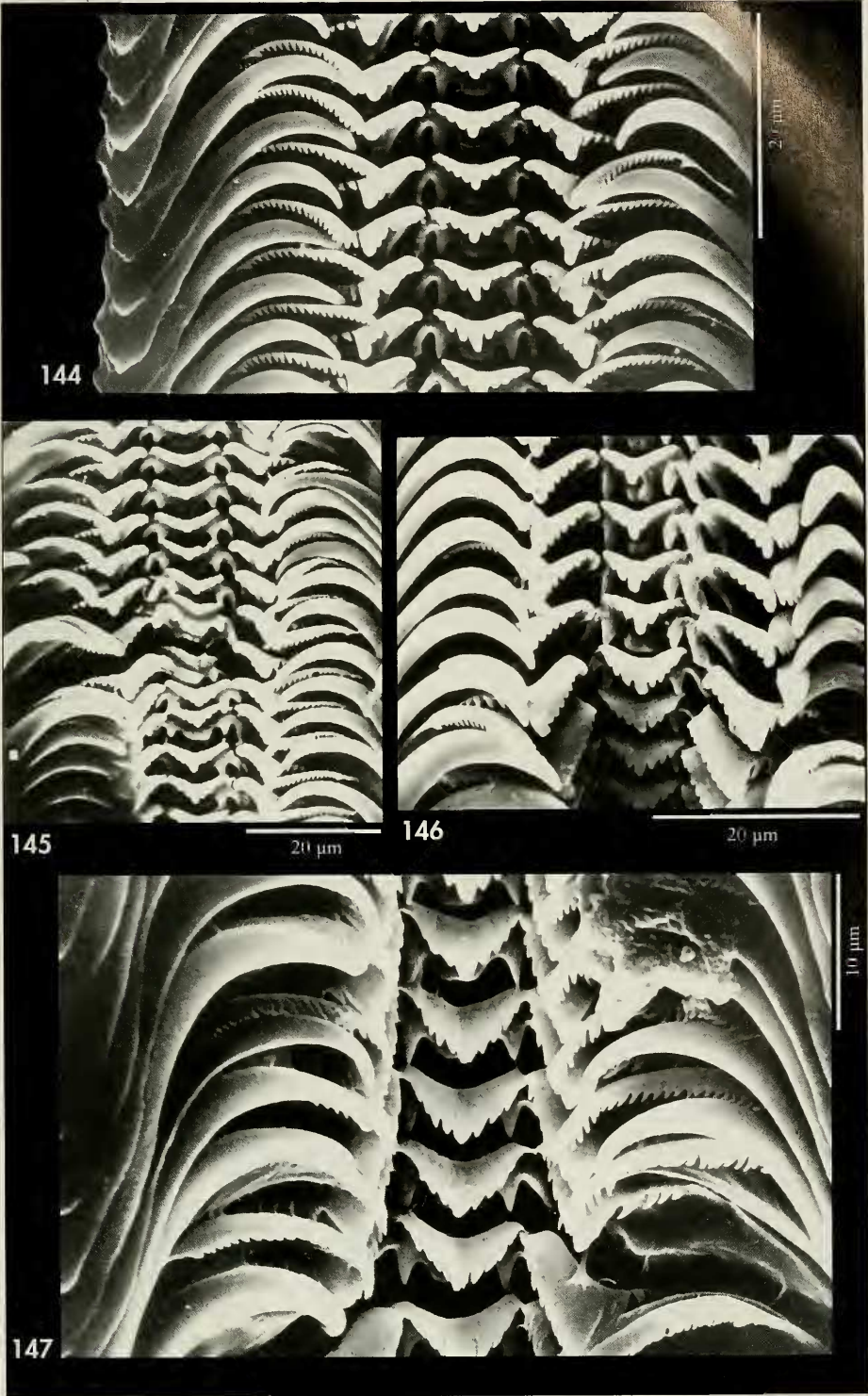
*soina* (*Ailinzebina*), 26 to *Schwartzziella* (*Schwartzziella*), and 1 to *Zebina* (*Zebina*) should be considered endemic of the archipelago on the basis of their non-planktotrophic type of protoconch and the absence of records from the neighbouring continental coasts (Senegal).

The high percentage of endemism of the Cape Verde Rissoininae (96,5%) is comparable to that of other Cape Verde

(Right page) Figures 144-147: Radulae of *Schwartzziella* (*Schwartzziella*) from the Cape Verde Islands. 144: radula of *Schwartzziella* (*Schwartzziella*) *robusta* n. sp., Sal; 145: radula of *S. (S.) typica* n. sp., Sal; 146: radula of *S. (S.) sanmartini* n. sp., Boa Vista; 147: radula of *S. (S.) similiter* n. sp., Brava.

(Página derecha) Figuras 144-147: Rádulas de *Schwartzziella* (*Schwartzziella*) de las islas de Cabo Verde. 144: rádula de *Schwartzziella* (*Schwartzziella*) *robusta* spec. nov., Sal; 145: rádula de *S. (S.) typica* spec. nov., Sal; 146: rádula de *S. (S.) sanmartini* spec. nov., Boa Vista; 147: rádula de *S. (S.) similiter* spec. nov., Brava.







rissoideans, like *Alvania* (16 endemic species from a total of 19, viz. 84,2%; MOOLENBEEK AND ROLÁN, 1988, HOENSELAAR AND GOUD, 1998), *Manzonia* (7 of 7, 100%; ROLÁN, 1987a), *Crisilla* (6 of 6, 100%; TEMPLADO AND ROLÁN, 1994), *Barleeia* (3, 100%; GOFAS, 1995). Similar high percentages of endemic rissoids were found in other Macaronesian Islands: *Alvania* (Canary Islands, 14 of 20, 70%; Madeira, 10 of 14, 71,4%; HOENSELAAR AND GOUD, 1998), and *Manzonia* (Canary Islands, 9 of 10, 90%; Madeira, 6 of 7, 85,7%; MOOLENBEEK AND FABER, 1987a, b, c). Other gastropod genera also show high percentages of endemic species in the Cape Verde Islands, like *Eatonina* (2, 100%, MOOLENBEEK, 1985-86; ROLÁN AND TEMPLADO, 1993), *Ammonicera* (7 species, 100%, ROLÁN, 1992), *Euthria* (7, 100%; COSEL, 1982d; COSEL AND BURNAY, 1983; ROLÁN, 1985, 1987b), *Conus* (45 of 48, 93,7%) (ROLÁN, 1990, 1991) and *Volvarina* (9 of 9, 100%) (MORENO AND BURNAY, 1999). From our own preliminary data, which will be discussed in a forthcoming paper, the number of endemic species of Cape Verde marine gastropods reaches 193, from a total of 588 identified species, i. e., a general percentage of 32,8% of endemism. This high percentage of endemic species is comparable with other even more isolated oceanic islands (Galapagos, Easter Is., Hawaii), and requires special research and conservation efforts. Considering only data referring to Rissoininae, Pitcairn Islands, which are 390 km from the nearest islands, have 12 species, with a maximum of three endemic ones, all them with non-planktotrophic proto-

conch (SLEURS AND PREECE, 1994). Only four species of Rissoininae are reported from the Galapagos Islands, which are 1000 km off the nearest continental mainland, two of which are probably endemic; the Galapagos Rissoininae fauna is very impoverished compared to the rather rich tropical eastern Pacific (SLEURS, 1989). In contrast, there are four species, three of them endemic in Guadalupe Island which is only 260 km off the coast of northern Baja California (SLEURS, 1989).

The occurrence of the studied species in each one of the islands of the archipelago is showed in Figures 158-176 and Table II. The currently available information is insufficient to know the actual geographical patterns of distribution of all the species in the archipelago. We have studied only a few samples from deep water from Santo Antão and Ilhéus do Rombo, and from shallow water from Fogo, Ilhéu Branco, Ilhéu Razo, Santa Luzia and São Nicolau. Moreover, it is also possible that the original distribution of the species could have been altered by the accidental introduction of species in some islands due to the human activities. Anyway, we can be sure that some species are not uniformly distributed along the archipelago but they are only present in some islands, because we commonly found them in one or two islands and not at all in the rest. Nothing can be said in species in which little material has been studied, like *Schwartziella paradoxa*. In these cases, we are not sure of its presence in other islands. Sal and Boa Vista are the islands with a higher number of species (20 and 14, respectively), and this

Figures 148-155: Opercula of *Schwartziella* (*Schwartziella*) from the Cape Verde Islands. 148: *S. (S.) robusta*, Sal, inner part; 149: *S. (S.) sanmartini*, Sal, inner part; 150: *S. (S.) sanmartini*, Boa Vista, outer part; 151: *S. (S.) sanmartini*, Sal, inner part; 152: *S. (S.) similiter*, Brava, inner part; 153: *S. (S.) luisi*, Palhona, Sal, inner part; 154: *S. (S.) luisi*, Palhona, Sal, outer part; 155: *S. (S.) cf. luisi*, Calhau, São Vicente.

Figures 148-155: Opérculos de *Schwartziella* (*Schwartziella*) de las islas de Cabo Verde. 148: *S. (S.) robusta*, Sal, parte interna; 149: *S. (S.) sanmartini*, Sal, parte interna; 150: *S. (S.) sanmartini*, Boa Vista, parte externa; 151: *S. (S.) sanmartini*, Sal, parte interna; 152: *S. (S.) similiter*, Brava, parte interna; 153: *S. (S.) luisi*, Palhona, Sal, parte interna; 154: *S. (S.) luisi*, Palhona, Sal, parte externa; 155: *S. (S.) cf. luisi*, Calhau, São Vicente.

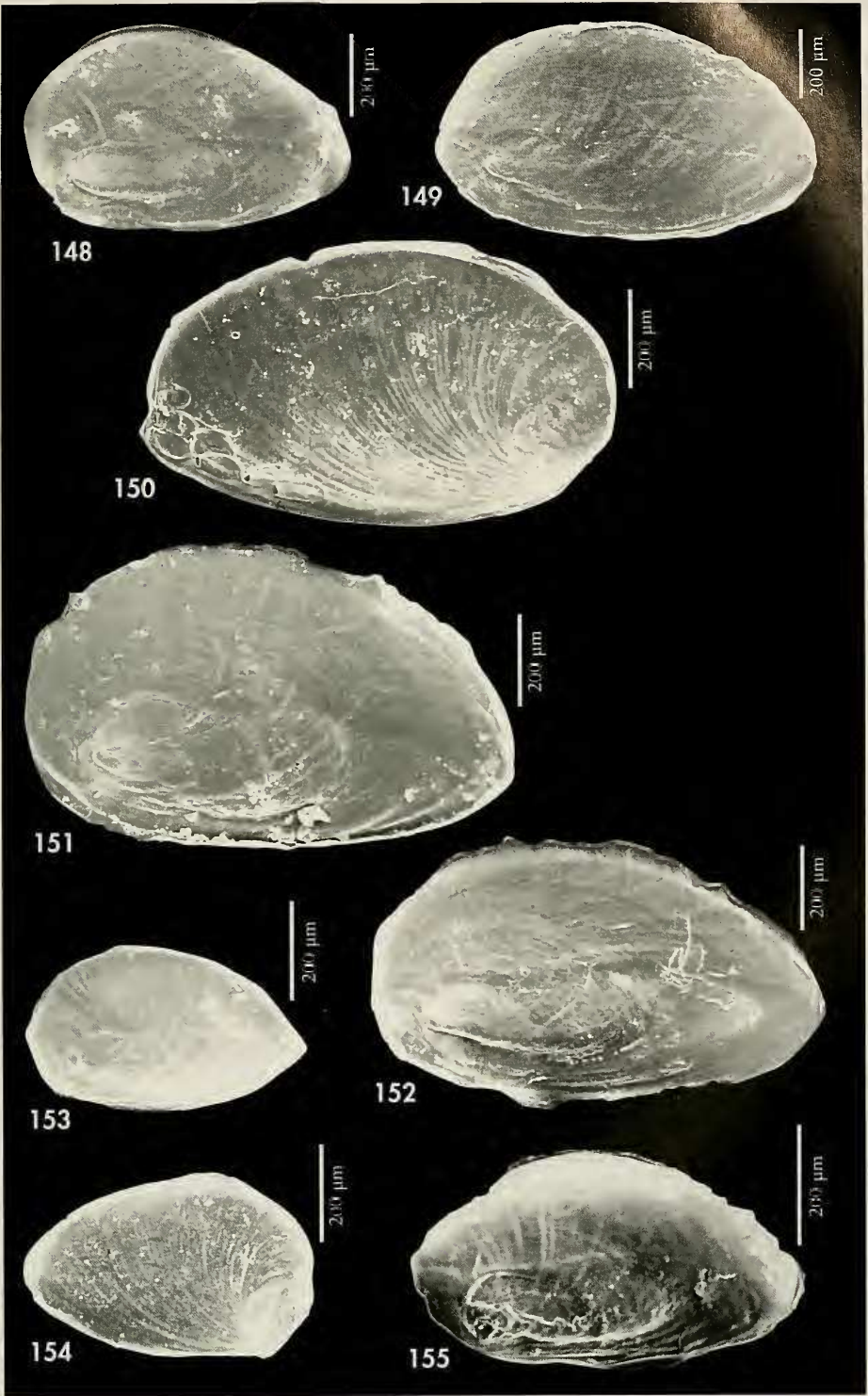


Table I. Differences between *Rissoina (Rissoina) punctostriata* and *R. (R.) decussata*.  
 Tabla I. Diferencias entre *Rissoina (Rissoina) punctostriata* y *R. (R.) decussata*.

	<i>Rissoina punctostriata</i>	<i>Rissoina decussata</i>
size	up to 10 mm	usually up to 7 mm
profile	slightly undulated in the last whorls by the subsutural depression	almost rectilineal
adapical whorls of teleoconch	angulated	not angulated
axial ribs	apisthoclinal and slightly curved; weakly prominent on the last whorl	almost orthoclinal; rectilineal; prominent on the last whorl
subsutural part of last whorls	depressed; axial ribs almost disappear	not depressed; axial ribs well marked
protoconch	3 whorls, diameter increases rapidly	2 1/2 whorls, diameter increases slowly
sinusigera notch	deep	absent

could be related with its older origin as ROLÁN (1991) pointed for the species of the genus *Conus*, but also with the fact that these islands were the most sampled, as well as Santiago (11 species), São Vicente (8) and Brava (9). Some species have been found in several close islands of a group and not in the rest. Probably these species are restricted to this group of islands, which is compatible with their non-planktotrophic development and the isolation of islands, as was mentioned by ROLÁN (1991) in the Cape Verde species

of *Conus* with non-planktotrophic development. More than a half of *Schwartzziella* species (15) apparently have a wide bathymetric distribution, since they were found between shallow water and bathyal depths. Nevertheless, only shells were collected of most of species or were found at deep water, and they are probably transported from shallow to deeper bottoms along the abrupt shelf of the islands. Only *S. cancapae* are mainly represented by shells collected below 60 m, and *S. irregularis*, *S. abundata*, *S. rectili-*

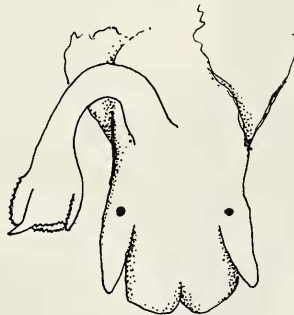


Figure 156: Drawing of the anterior part of a male of *Schwartzziella (Schwartziella) sanmartini*, showing the penis.

Figura 156: Esquema de la parte anterior de un macho de *Schwartzziella (Schwartziella) sanmartini*, mostrando el pene.



Table II. Distribution of the species in the archipelago. Abbreviations: S, Sal; BV, Boavista; M, Maio; ST, Santiago; F, Fogo; B, Brava; IR, Ilhéus do Rombo ou Secos; C, Ilhéu de Cima; SA, Santo Antão; SV, São Vicente; SL, Santa Luzia; R, Ilhéu Razo; SN, São Nicolau.

Tabla II. Distribución de las especies en el archipiélago. Abreviaturas: S, Sal; BV, Boavista; M, Maio; ST, Santiago; F, Fogo; B, Brava; IR, Ilhéus do Rombo ou Secos; C, Ilhéu de Cima; SA, Santo Antão; SV, São Vicente; SL, Santa Luzia; R, Ilhéu Razo; SN, São Nicolau.

	S	BV	M	ST	F	B	IR	C	SA	SV	SL	R	SN
<i>R. punctostriata</i>	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>R. onobiformis</i>	+	+		+		+							
<i>S. robusta</i>	+	+											
<i>S. obesa</i>			+	+	+	+	+			+			
<i>S. corrugata</i>						+							
<i>S. sanmartini</i>	+	+	+										
<i>S. similiter</i>				+		+				+	+		
<i>S. typica</i>	+	+											+
<i>S. angularis</i>	+	+											
<i>S. luisi</i>	+	+											
<i>S. minima</i>	+	+											
<i>S. fulgida</i>				+	+	+							
<i>S. depressa</i>	+	+											+
<i>S. gradata</i>							+						
<i>S. pavita</i>	+	+	+										
<i>S. cancapae</i>				+	+	+							
<i>S. punctulata</i>	+		+	+	+	+		+		+	+	+	+
<i>S. hoenselaari</i>	+			+	+			+			+	+	+
<i>S. paucicostata</i>	+		+	+								+	
<i>S. sulcostriata</i>	+											+	+
<i>S. gibbera</i>	+	+		+									
<i>S. irregularis</i>	+		+										
<i>S. abundata</i>	+		+										
<i>S. rectilinea</i>												+	+
<i>S. rarilineata</i>	+	+								+			+
<i>S. inscripta</i>	+	+	+							+			
<i>S. sculpturata</i>	+	+		+		+				+			
<i>S. paradoxa</i>										+			
<i>Z. villenai</i>												+	+

*nea*, *S. paradoxa* and *Zebina villenai* are exclusively represented by shells collected below 75 m of depth. Since only a small part of the studied material was collected alive and the sampling effort was quite different on different islands and depths, a lot of work remains to be done for knowing the basic ecological information of almost all the species (actual habitat, relative abundance, etc.)

The sole species with planktotrophic type of protoconch (*Rissoina punctostriata*) was found in all the islands. Eight species

of *Schwartziella* were only known from the North-east group of islands: two of them from Sal, Boa Vista and Maio (*S. sanmartini* and *S. pavita*, Fig. 162), four only from Sal and Boavista (*S. robusta*, *S. angularis*, *S. luisi* and *S. minima*, Fig. 159), and two other only from Sal and Maio (*S. irregularis* and *S. abundata*, Fig. 169). Three species were known only from the North-west group: two from São Nicolau, Ilhéu Razo and Ilhéu de Cima (*S. rectilinea* and *Zebina villenai*, Fig. 172), and one only from São Vicente (*S. paradoxa*,

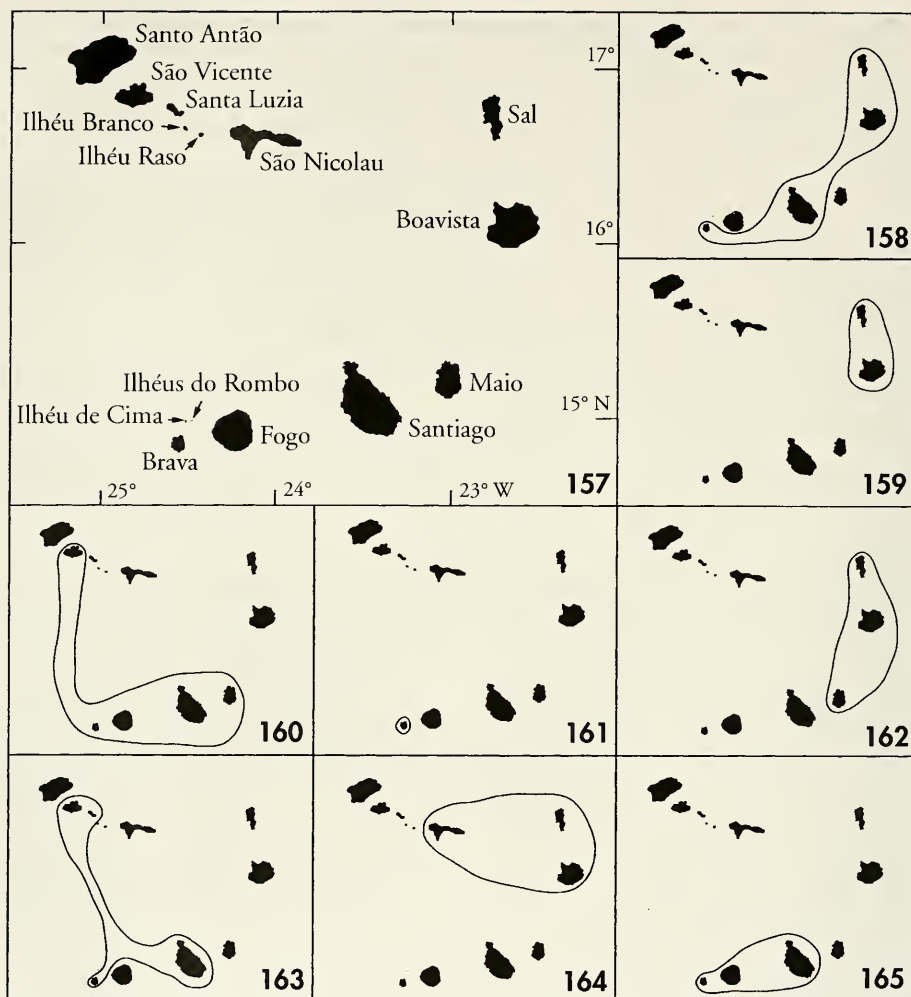
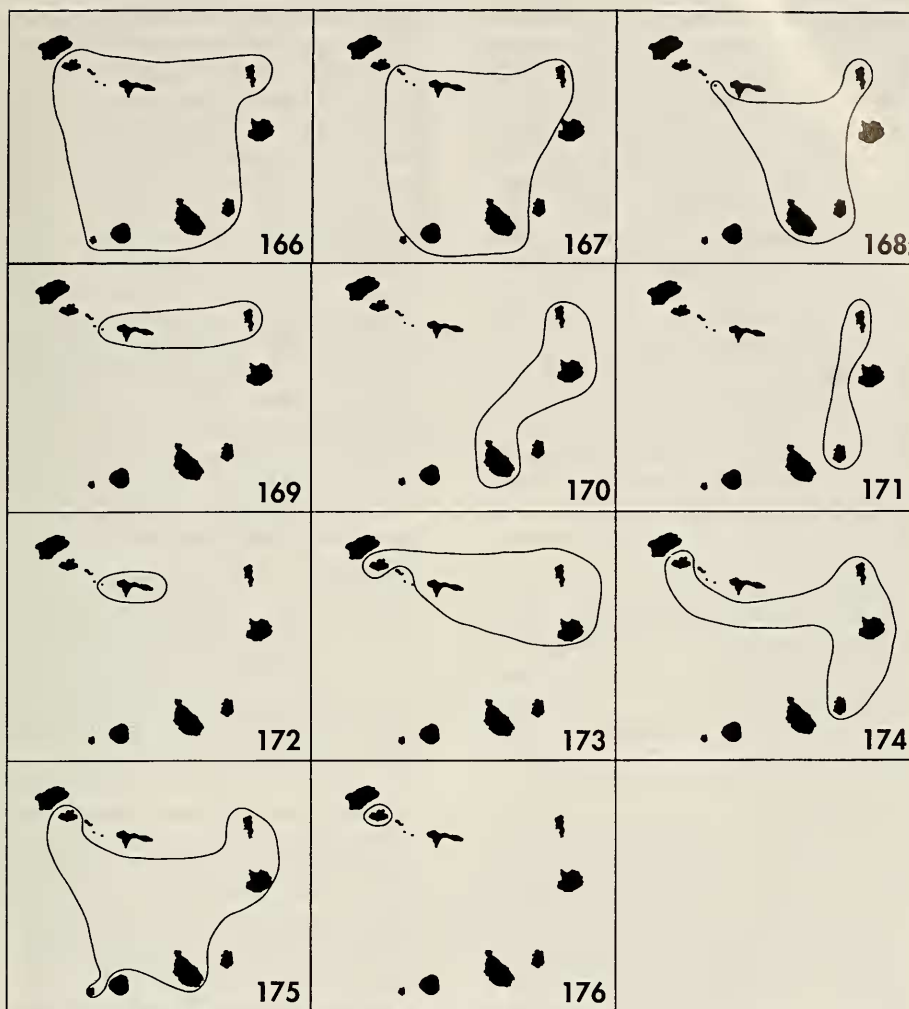


Figure 157. Map of the Cape Verde Archipelago. Figures 158-165: Distribution areas. 158: *Rissoina (Ailinzebina) onobiformis*; 159: *Schwartziella (Schwartziella) robusta*, *S. (S.) angularis*, *S. (S.) luisi* and *S. (S.) minima*; 160: *S. (S.) obesa*; 161: *S. (S.) corrugata* and *S. (S.) gradata* (only Brava); 162: *S. (S.) sanmartini* and *S. (S.) pavita*; 163: *S. (S.) similiter*; 164: *S. (S.) typica* and *S. (S.) depressa*; 165: *S. (S.) fulgida* and *S. (S.) cancapae*.

Figura 157. Mapa del Archipiélago de Cabo Verde. Figuras 158-165. Áreas de distribución. 158: *Rissoina (Ailinzebina) onobiformis*; 159: *Schwartziella (Schwartziella) robusta*, *S. (S.) angularis*, *S. (S.) luisi* y *S. (S.) minima*; 160: *S. (S.) obesa*; 161: *S. (S.) corrugata* y *S. (S.) gradata* (sólo Brava); 162: *S. (S.) sanmartini* y *S. (S.) pavita*; 163: *S. (S.) similiter*; 164: *S. (S.) typica* y *S. (S.) depressa*; 165: *S. (S.) fulgida* y *S. (S.) cancapae*.

Fig. 176). Four species were known only from the South-west group of islands: two (*S. fulgida* and *S. cancapae*, Fig. 165)

from Santiago, Fogo and Brava, and two (*S. corrugata* and *S. gradata*, Fig. 161) only from Brava. Finally, five species (*Schwartz-*



Figures 166-176. Distribution areas. 166: *S. (S.) puncticulata*; 167: *S. (S.) hoenselaari*; 168: *S. (S.) paucicostata*; 169: *Schwartziella (Schwartziella) sulcostrata*; 170: *S. (S.) gibbera*; 171: *S. (S.) irregularis* and *S. (S.) abundata*; 172: *S. (S.) rectilinea* and *Zebina (Zebina) villenai*; 173: *S. (S.) rarilineata*; 174: *S. (S.) inscripta*; 175: *S. (S.) sculpturata*; 176: *S. (S.) paradoxa*.

*Figuras 166-176. Áreas de distribución.* 166: *S. (S.) puncticulata*; 167: *S. (S.) hoenselaari*; 168: *S. (S.) paucicostata*; 169: *Schwartziella (Schwartziella) sulcostrata*; 170: *S. (S.) gibbera*; 171: *S. (S.) irregularis* y *S. (S.) abundata*; 172: *S. (S.) rectilinea* y *Zebina (Zebina) villenai*; 173: *S. (S.) rarilineata*; 174: *S. (S.) inscripta*; 175: *S. (S.) sculpturata*; 176: *S. (S.) paradoxa*.

*ziella obesa*, *S. puncticulata*, *S. hoenselaari*, *S. paucicostata* and *S. sculpturata*) were found in the three groups of islands, other five in the NE and NW groups (*S. typica*, *S. depressa*, *S. sulcostrata*, *S. rariline-*

*ata* and *S. inscripta*), and three other in the NW and SW groups (*S. similiter*, *S. gibbera* and *Rissoina (Ailinzebina) onobiformis*).

Since Rissoiinae species do not differ markedly in anatomical features,



except for the morphology of the penis, species identification is usually based on shell characters only (PONDER, 1985; SLEURS, 1993, 1994). However, shell characters seem to be strongly subject to parallelism, and this makes identification of the apomorphic conditions extremely difficult (SLEURS, 1994). Only a thorough revision of the genera of Rissoiinae, including teleoconch microsculpture, protoconch morphology, anatomy (and especially the penial characters) and the fossil record, may give us an accurate idea of the phylogenetic relationships of the species. Nevertheless, in the absence of sufficient systematic and distributional data, we point out in the following lines some considerations about the Cape Verde species of Rissoiinae that will need further research.

*Rissoina punctostriata* seems to form with *R. decussata* from the Caribbean and *R. elegantula* (Angas, 1880) from South Australia a group of closely related species. The holotype of *R. elegantula* (BMNH 1881.4.29.4, Aldinga Bay) has similar shell size (6.6 x 2.8 mm), shape and sculpture to the two Atlantic species, and it also has a protoconch of planktrophic type with sinusigerous discontinuity. As we will say below, this is not the only group of species with an apparently disjoint Atlantic-Pacific distribution.

The subgenus *Rissoina* (*Ailinzebina*) comprises at least five Recent species, of which four are apparently distributed only in the Western Pacific, and one (*R. (A.) elegantissima*) has a tropical western Atlantic distribution (SLEURS, 1993). The second Atlantic species described here, *Rissoina (Ailinzebina) onobiformis* n. sp., seems to be more closely related by its size, subcylindrical and thin shell, axial and spiral sculpture and non-planktrophic type or protoconch to the western Pacific species *R. (A.) abrardi* (Ladd, 1966). The shell of the western Atlantic *R. (A.) elegantissima* is also similar in size, shape and sculpture, but it is rather solid and the protoconch is of planktrophic larval type. The remaining three Pacific species of this subgenus clearly differ from the precedent "group" of species in shell

shape or size and sculpture (see SLEURS, 1993). It should be considered a vicariant origin of the two non-planktrophic species of this "group" from a widely distributed Tethyan planktrophic ancestor (may be *R. (A.) elegantissima?*), a hypothesis proposed by LEAL AND MOORE (1989) for two other related species of *Rissoina* (*Rissoina indiscreta* Leal and Moore, 1989, from Brazil, and *R. turricula* Pease, 1861, from the Indo-Pacific). Nevertheless, species of the subgenus *Ailinzebina* are rather uncommon, and therefore more biogeographical and anatomical information is needed to establish reliable relationships. The oldest known fossils of this subgenus date from the Early Tertiary of France and the Lower Miocene of Bikini (SLEURS, 1993), and this supports such hypothesis. These matter deserves further detailed research, since similar groups of closely related species distributed in one (or both) sides of the Atlantic and the Indo-Pacific were recorded in several families, viz. the genus *Luria* (Cypraeidae), with a pair of related species (*Luria lurida* from the Eastern Atlantic and *L. pulchra* from the Red Sea, Gulf of Oman and Persian Gulf) (ALVARADO AND ÁLVAREZ, 1964), the *Conus venulatus* group from the Cape Verde Islands and *Conus suturatus* from Central Indo-West Pacific and Australia (ROLÁN, 1991), and the genus *Volvarina* (Marginellidae), with Western and Eastern Atlantic and Red Sea related species (MORENO AND BURNAY, 1999).

The high number of species of Cape Verde *Schwartziella* is surprising, since only one species of this genus (*S. africana*) has been recorded from the neighbouring West African coast, and as far as we know, there are no endemic species of this genus in the islands of São Tomé and Príncipe and the Canary Islands. The five species of *Schwartziella* from St. Helena Island described by SMITH (1890) also have paucispiral protoconch and seem to be endemic. The loss of a planktrophic larval stage and the isolation of Cape Verde islands seem to be the main factors of speciation, but there is yet much work to do on the isolation mechanisms within the archipelago that has led to such a high specia-

tion. The present knowledge does not allow to establish if such a radiation is due to one or more colonizations of the archipelago, followed by isolation and speciation. The scarce information on Atlantic *Schwartziella*, especially regarding protoconch characters, teleoconch microsculpture and penial anatomy, makes very difficult to establish relationships based solely on the available

data. It is possible that the non-planktrophic Atlantic *Schwartziella* derived from a widespread Atlantic species with planktotrophic development, but only a revision of the Atlantic recent and fossil species could give solid cues about the speciation of the genus.

On the basis of the shell characters used in the descriptions we present a key for the Cape Verde species of *Schwartziella*.

1. - Shell with axial sculpture on all whorls . . . . . 2  
 - Shell without axial sculpture or with weak axial sculpture not present on all whorls . . . . . 23
2. - Shell with a strong subsutural angulation . . . . . 3  
 - Shell lacking strong subsutural angulation . . . . . 5
3. - Shell longer than 3 mm . . . . . *S. obesa*  
 - Shell length up to 3 mm . . . . . 4
4. - Shell relatively wide (l/w ratio 2.12-2.20); protoconch with only a spiral angulation in its upper part . . . . . *S. angularis*  
 - Shell relatively narrow (l/w ratio 2.32-2.44); protoconch with three spiral cords and irregular axial threads . . . . . *S. gradata*
5. - Suture markedly undulous due to the axial ribs . . . . . *S. corrugata*  
 - Suture rectilinear or slightly undulous . . . . . 6
6. - Shell very solid and strong . . . . . *S. robusta*  
 - Shell not so solid . . . . . 7
7. - Shell showing aperture with 8 axial ribs visible in last whorl . . . . . 8  
 - Shell showing aperture with less than 8 axial ribs visible in last whorl . . . . . 9
8. - Adult shells longer than 3 mm; protoconch diameter about 360  $\mu\text{m}$  . . . . . *S. sanmartini*  
 - Adult shells length up to 3 mm; protoconch diameter about 420  $\mu\text{m}$  . . . . . *S. abundata*
9. - Shell showing aperture with less than 6 axial ribs visible in last whorl . . . . . 10  
 - Shell showing aperture with 6 or more axial ribs visible in last whorl . . . . . 11
10. - Shell showing aperture with 5 axial ribs visible in last whorl; protoconch with sculpture, of about 300  $\mu\text{m}$  of diameter . . . . . *S. hoenselaari*  
 - Shell showing aperture with 4 axial ribs visible in last whorl; protoconch smooth, of about 270  $\mu\text{m}$  of diameter . . . . . *S. paucicostata*
11. - Axial ribs more convex in the subsutural part . . . . . 12  
 - Axial ribs not more convex in subsutural part . . . . . 13
12. - Teleoconch microsculpture formed by undulated rows of punctae . . . . . *S. puncticulata*  
 - Teleoconch microsculpture formed by groups of 6-9 spiral threads interrupted by the growth lines, alternating with bands with only pits . . . . . *S. gibbera*
13. - Spiral sculpture of the teleoconch visible at low magnification . . . . . 14  
 - Spiral sculpture of the teleoconch not visible at low magnification . . . . . 19
14. - Shell length up to 3 mm . . . . . 15  
 - Shell longer than 3 mm . . . . . 16

15. - Shell with evident and separate spiral threads . . . . . *S. luisi*  
 - Shell with finer and closer spiral threads . . . . . *S. minima*
16. - Shell with not prominent axial ribs . . . . . *S. pavita*  
 - Shell with prominent axial ribs . . . . . 17
17. - Protoconch with a spiral cord . . . . . *S. similiter*  
 - Protoconch lacking spiral sculpture . . . . . 18
18. - Axial ribs not very prominent; protoconch diameter about 400  $\mu\text{m}$  . . . *S. sulcostriata*  
 - Axial ribs prominent; protoconch diameter about 340  $\mu\text{m}$  . . . . . *S. cancapae*
19. - Shell with rectilinear profile, specially in first whorls . . . . . *S. rectilinea*  
 - Shell with convex whorls . . . . . 20
20. - Axial ribs not regularly disposed; protoconch diameter < 200  $\mu\text{m}$  . . . *S. irregularis*  
 - Shell with regular ribs; protoconch diameter > 200  $\mu\text{m}$  . . . . . 21
21. - Shell shining . . . . . *S. fulgida*  
 - Shell not shining . . . . . 22
22. - Shell with a slight subsutural depression . . . . . *S. depressa*  
 - Shell lacking subsutural depression . . . . . *S. typica*
23. - Shell with spiral sculpture only . . . . . 24  
 - Shell with spiral and axial sculpture . . . . . 25
24. - Shell with spiral striae on first whorl only . . . . . *S. inscripta*  
 - Shell with spiral sculpture on all whorls . . . . . *S. rarilineata*
25. - Shell with uniform spiral sculpture in all the shell . . . . . *S. sculpturata*  
 - Shell without spiral sculpture at the base . . . . . *S. paradoxa*

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