

## Five new *Barleeia* species (Caenogastropoda, Rissooidea) from the islands of the Gulf of Guinea (West Africa)

EMILIO ROLÁN

Museo de Historia Natural of the University, Parque Vista Alegre, Campus Norte, E-15782 Santiago de Compostela, Spain;  
erolan@emiliorolan.com

SANDRO GORI

Via Sarnesi 7, I-57123 Livorno, Italia; sandrogori@gmail.com

39

New material of the genus *Barleeia* from the islands of the Gulf of Guinea is studied, and five new species are described. Comparison is made with previously known species from this and adjacent areas.

Se estudia nuevo material del género *Barleeia* procedente de las islas del Golfo de Guinea, describiendo 5 nuevas especies. Se hace comparación de las mismas con otras especies previamente conocidas del área de estudio y próximas.

Keywords: Gastropoda, Barleeidae, taxonomy, Gulf of Guinea.

### INTRODUCTION

Very few species of the family Barleeidae Gray, 1857, were known up to the end of last century in the islands of the Gulf of Guinea, the oldest one being *Tropidorissoia taphrodes*

Tomlin & Shackleford, 1915. Then, Rolán & Templado (1994) described an additional species from São Tomé Island and Gofas (1995) made a revision of this family in the West African coast, describing 14 new species. Since this revision, only Rolán & Swinnen (2004) described a new species from Príncipe Island and Rolán & Hernández (2006) referred to the taxon *Barleeia minuscula* Monterosato, 1889, from Morocco, Mauritania and Senegal.

During recent trips to São Tomé Island samples were collected in Minerio (north of the island) by brushing stones and from sediments. As a result several morphs of barleeids were found. The study of this material is the object of the present work, which also includes material collected in Anobón Island during a trip made in 2000.

Abbreviations, collections: MHNS = Museo de Historia Natural de la Universidad, Santiago de Compostela; MNCN = Museo Nacional de Ciencias Naturales, Madrid; MNHN = Muséum national d'Histoire naturelle, Paris; CSG = private

colln Sandro Gori, Livorno, Italia; CPR = private colln Peter Ryall, Maria Rain, Austria. In descriptions: f = fragment; H/W = height/width ratio; j = juvenile; s = shell empty; sp = shell with soft parts.

SYSTEMATIC PART

*Barleeia* Clark, 1853

*Barleeia multicolor* spec. nov.

(Figs 1C-L, 3A-I, 5A-H, 6A-D, 8A-C, 8E-H)

Type material. – Holotype: MNHN (25872, sp, Figs 1C, 3A). Paratypes: MNHN (25873, 10 sp; 15.05/60089, 10 sp, Figs 1D-E, 3B-C); MHNS (100596, 150 sp, s); CSG (50 s). All from the type locality and with white shells.

Other material examined. – More than 100 sp, s and j (MHNS) from the white form; more than 500 of the brown form (Figs 1F-G) (MHNS); c. 100 banded (Figs 1K-L) and c. 120 light brown-orange (Figs H-J) (MHNS).

Type locality. – Minerio, 00°23'016"N, 06°46'228"E, N of São Tomé I, in 35-41 m, Republic of São Tomé and Príncipe.

Description. – Shell conical, dome-shaped, smooth, and solid. Protoconch with a nucleus of about 80 µm, 1¼ whorls and a diameter of about 330 µm. Its colour is the same of the shell, and the microsculpture is formed by 5-6 spiral cords that begin after the nucleus, and have very minute perforations forming spiral lines (about 22-25 rows). At the end of the protoconch there is a short smooth part. The teleoconch has between 3 and 4 almost flat whorls, which clearly increase in diameter; its surface is smooth. The suture is prominent but not deep. Aperture nearly ovoid with a fine peristome, which is in contact with the previous whorl only for a short distance and forms a prominent umbilicus, that is sometimes a little elongate. The colour is white in the holotype and paratypes. Other shells included in this taxon have different colours (dark brown, light brown or orange) and sometimes brown bands.

Radula (Figs 8A-C) typical of the genus, with a rachidian tooth presenting in the cutting edge a wide rectangular cusp, and two small cusps at each side; there is a sharp basal denticle on each side, both separated by a broad, hardly

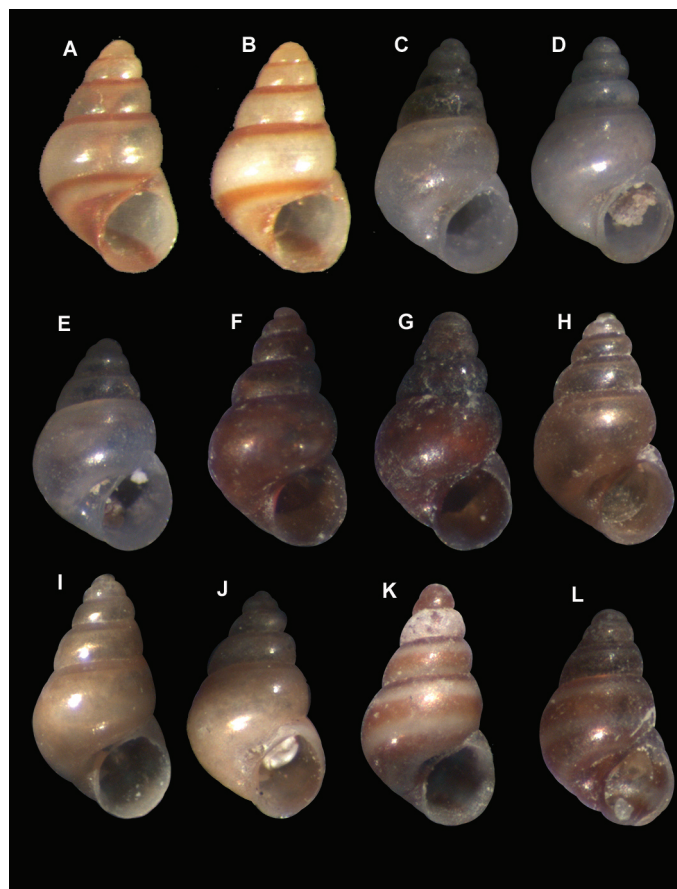
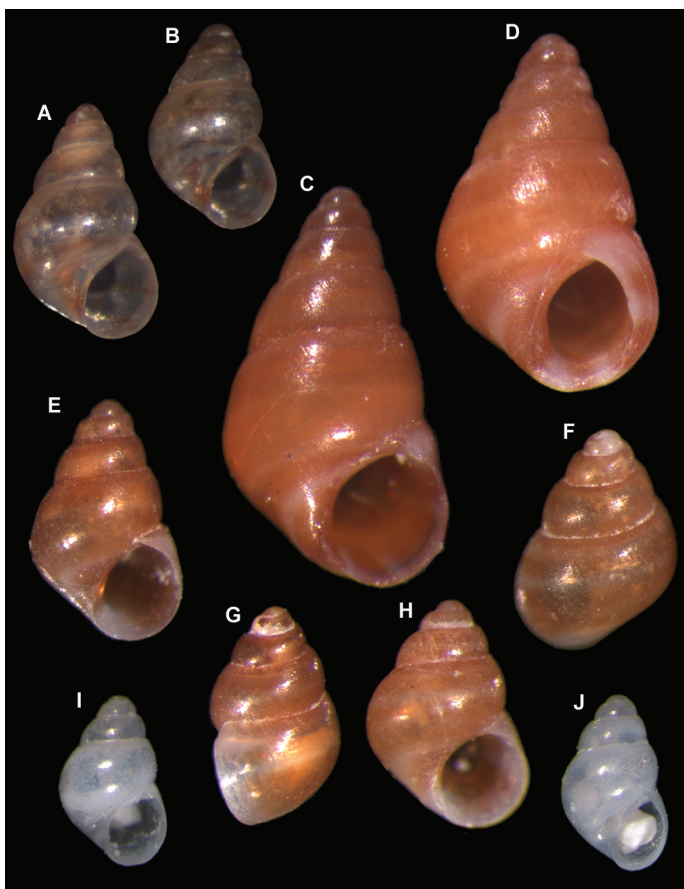


Fig. 1A-L. Barleeidae from São Tomé and Príncipe. A-B, *Barleeia lindae* Rolán & Swinnen, 2004. A, holotype, 1.7 mm (MMF), B, paratype, 1.9 mm (MHNS), Ilheu Bombom, Príncipe I. C-L, *Barleeia multicolor* spec. nov. C, holotype, 1.9 mm (MNHN); D-E, paratypes (white form), 1.7, 1.6 mm (MNCN); F-G, shell (brown form), 1.9, 1.9 mm (MHNS); H-J, shells (light brown), 1.9, 2.0, 1.7 mm (MHNS); K-L, shells (banded form), 1.9, 1.8 mm (MHNS), all from Minerio, 35 m, São Tomé Island.

prominent lamella; lateral tooth with a rather broad base, and with a rather prominent cusp flanked by 3 smaller, one internally and two externally; the inner marginal with five cusps and the external one elongate and narrow with few cusps.

Operculum (Figs 8E-H) brown, strong and with a promi-



**Fig. 2A-B.** *Barleeia translucens* spec. nov. **A**, holotype, 1.7 mm (MNHN); **B**, paratype, 1.5 mm (MNCN), both from Minerio, 41 m, São Tomé Island. **C-D**, *Barleeia procera* spec. nov. **C**, holotype, 2.9 mm (MNHN); **D**, paratype, 2.8 mm (MNCN), both from Annobón. **E-H**, *Barleeia fuscaexigua* spec. Nov. **E**, holotype, 1.7 mm (MNHN); **F-H**, paratypes, 1.8, 1.7, 1.8 mm (MHNS), Annobón. **I-J**, *Barleeia albicolor* spec. nov.. **I**, holotype, 1.2 mm (MNHN); **J**, paratype, 1.3 mm, Annobón (MNCN).

nent internal cusp.

Dimensions: the holotype is 1.9 mm.

Distribution. – Known from São Tomé, on rocks, in 35-41 m.

Habitat. – Most of the live collected material was found in sediments obtained by brushing stones with calcareous algae at 35 m.

Comparison. – Gofas (1995) used the genus *Pseudodiala* Ponder, 1967, to include three species from the West African coast. The characters of this genus are: "...narrowly umbilicate, generally white; spire whorls rather flat, body whorl with a faint peripheral keel... Radula: central cusp with blunt tip..." Our specimens are not in concordance with this generic description. There is no peripheral keel, the umbilicus is not narrow, the colour is variable and the radula is typical of a *Barleeia*, with a wide medium cusp in the rachidian tooth. The microsculpture of the protoconch is similar in the present case, but more attenuated in other species which are described below. For these reasons we have preferred to keep this species in the genus *Barleeia*.

Another problem that we had with this species is the presence of 4 colour morphs, viz. totally white, totally dark brown, brown with bands, and light brown-orange. Except for the last one that could show some intergradations with the brown morph, the others were consistent in colour and no intermediates were observed. The comparison of the operculum, radula, and microsculpture of the protoconch of all specimens showed a great similarity and for this reason we concluded that they are all conspecific. The type material was chosen among those with white morph.

*Barleeia tomensis* Gofas, 1995, and *B. taeniolata* Gofas, 1995, are also found in São Tomé in shallow water; their shells lack an umbilicus and the protoconch lacks spiral cords, while the coloured bands are constant and differ in shape from those of the new species, when at all present.

*Barleeia lindae* Rolán & Swinnen, 2006, is a rather similar species, collected in Príncipe, but that shell is transparent and the brown bands are consistently different from those of the new species. Besides, the perforations of the protoconch are more regular and distributed in rows and columns, that are better appreciable in lateral view.

Etymology. – The specific name refers to the great variability in the colour of the shell.

***Barleeia translucens* spec. nov.**

(Fig. 2A-B, 4A, 5I-J, 6H, 8I-J)

Type material. – Holotype: MNHN (25874, s; Fig. 2A). Paratypes: MNCN (15.05/60090, 1 s; Figs 2B, 4A); MHNS (100597, 20 sp, 10 j, 10 s),

CSG (1 sp, 2 j, 2 s).

Other material examined. – 5 sp were destroyed to study the radula.

Type locality. – Minerio, 00°23'016"N, 06°46'228"E, N of São Tomé, in 41 m, Republic of São Tomé and Príncipe.

Description. – Shell conical, dome-shaped, rather solid and shiny. Protoconch with a nucleus of about 90 µm, 1¼ whorls and a diameter of about 290 µm. Its colour is the same as the shell, and the microsculpture is formed by 6 much attenuated spiral cords that begin after the nucleus and have very minute perforations irregularly disposed. At the end of the protoconch there is a short smooth part. The teleoconch has between 3 and 4 almost flat whorls which clearly increase in diameter; its surface is smooth. The suture is prominent but not deep. Aperture nearly ovoid with a fine peristome, which is in contact with the previous whorl only for a short length and forms a prominent umbilicus, which is sometimes a little elongate. The shell is transparent with a very fine, red-brown, subsutural spiral band, another one in the middle of the whorl, a third one on the last whorl as continuation of the suture, and finally another, smaller one around the umbilicus.

Radula (Figs 8D) very similar to that of *Barleeia multicolor*.

Operculum (Figs 8I-J) similar to that of *B. multicolor*, with maybe the internal prominence slightly smaller.

Distribution. – Known from Minerio, between 35-43 m. Most of the material with remains of soft parts was collected in sand, contrary to the previous species, which was mostly collected by brushing rocks.

Habitat. – Most of the material, even the live collected specimens (with remains of soft parts inside), was collected in sandy sediments at 41 m.

Comparison. – The species lives sympatrically with *Barleeia multicolor* spec. nov., which is less transparent, the latter being more solid, a little larger, the protoconch slightly larger with the spiral cords more prominent, and the perforations of the protoconch more regularly ordered in rows and columns; the shell of *B. multicolor* with bands may be distinguished by being less transparent and having wider spiral bands.

*Barleeia lindae* Rolán & Swinnen, 2004 (Figs 1A-B, 4D),

from Príncipe not from São Tomé, is very similar, but the protoconch has a slightly larger diameter, its protoconch perforations are perfectly aligned (Fig. 6E-G), the brown bands are a little wider, whereas there is no band in the middle of the whorls, and the shell is less transparent. The difference in the banding and its distribution is constant in many hundreds of shells examined.

Etymology. – The specific name refers to the transparency of the shell.

*Barleeia procera* spec. nov.

(Figs 2C-D, 4B, 7A-B)

Type material. – Holotype: MNHN (25875, s; Fig. 2C). Paratypes: MNCN (15.05/60091, 1 s; Figs 2D, 4B); MHNS (100598, 25 s), CSG (3 s), CPR (3 s).

Other material examined. – About 50 s, f and j from the type locality.

Type locality. – San Antonio de Palé, in sediments at 2-3 m, Annobón I., Equatorial Guinea, in the Guinean Gulf.

Description. – Shell conical, very solid. Dome-shaped protoconch with 1¼ whorls, with a diameter of 400 µm, the nucleus with about 200 µm, covered by spiral rows of pits (c. 16-19). The teleoconch has about 4 whorls, smooth, almost flat, with a shallow but distinct suture. The colour is red brown with a white spiral band near the base, another at the level of the end of the suture, one in the middle of the whorl and one subsuturally. These light bands can be more conspicuous in the apertural border; they are light brown and not very marked. Aperture rounded, with a sharp peristome; on the upper part and near the base there are two thickened areas. No umbilicus.

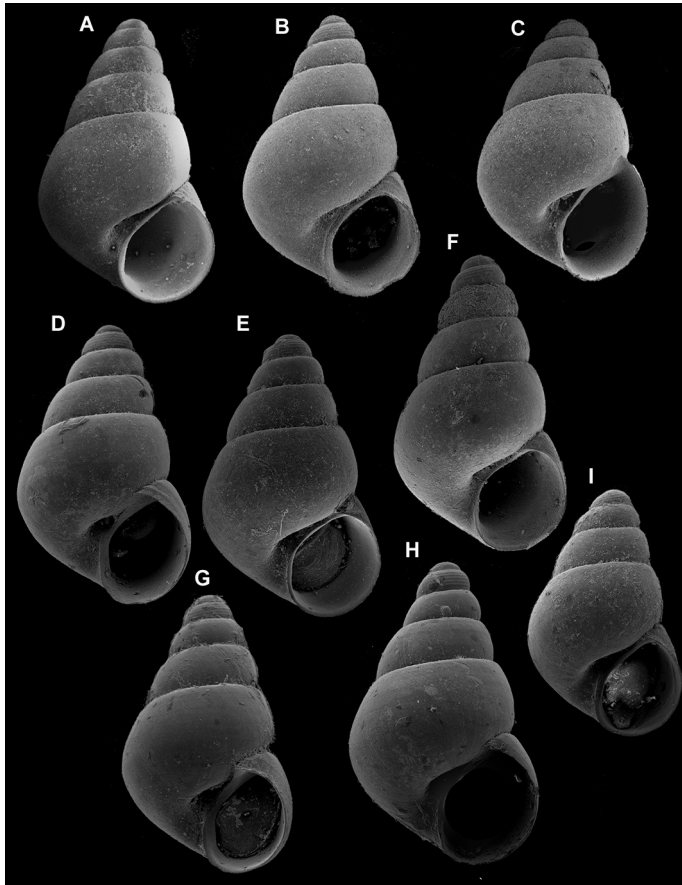
Dimensions: The holotype is 2.9 mm long.

Distribution. – Known only from Annobón, in shallow water. Habitat unknown.

Comparison. – Most of the species of this genus in the islands of the Guinean Gulf are smaller.

*Barleeia tomensis* Gofas, 1995, is similar, but smaller (usually up to 2.4 mm), the protoconch is smaller (up to 350 µm), and it has smaller pits in more rows (about 28). The colour is brown with two typical periumbilical, lighter, spiral bands.

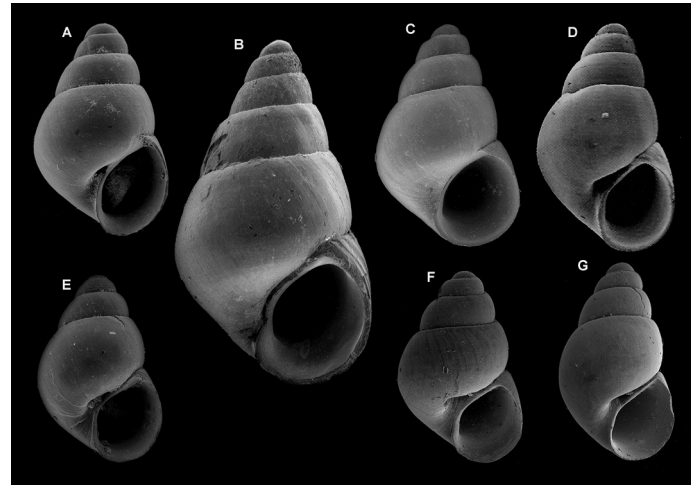
*Barleeia multicolor* spec. nov. in its banded or brown form,



**Fig. 3A-I.** *Barleeia multicolor* spec. nov. **A**, holotype, 1.9 mm (MNHN); **B-C**, paratypes (white form), 1.7, 1.6 mm (MNCN); **D-E**, shells, 1.9, 2.0 mm (light brown form) (MHNS); **F-G**, shells (banded form), 1.9, 1.7 mm (MHNS); **H-I**, shells (brown form), 1.9, 1.7 mm (MHNS).

is smaller (usually up to 2.0 mm), with a deep umbilicus, a protoconch that is smaller in diameter (330  $\mu\text{m}$ ) and a smaller nucleus (80  $\mu\text{m}$  versus 200 in *B. procera*); it has a microsculpture with pits, not spiral cords. In the banded form, the bands are more prominent and wider on the entire shell.

*Barleeia unifasciata* (Montagu, 1803) is a little larger; it is known from Europe, the Canary Islands and Mauritania (Gofas, 1995). The bands are not constant but when present there are three of them (subsutural, in the middle of the



**Fig. 4A-G.** **A**, *Barleeia translucens* spec. nov. paratype, 1.34 mm, Minerio, São Tomé (MNCN); **B**, *Barleeia procera* spec. nov. paratype, 2.8 mm, San Antonio de Palé, Annobón (MNCN); **C**, *Barleeia fuscaexigua* spec. nov., paratype, 1.6 mm, San Antonio de Palé, Annobón (MHNS); **D**, *Barleeia lindae* Rolán & Swinnen, 2004, paratype, 1.6 mm, Ilheu Bombom, Príncipe, (MNCN); **E**, holotype, 1.2, San Antonio de Palé, Annobón (MNHN); **F-G**, shells, 1.2, 1.4 mm, same locality.

whorl and periumbilical). The protoconch is larger (450-500  $\mu\text{m}$  in diameter) and has more rows of pits (about 26 versus 16-19).

*Barleeia gougeti* (Michaud, 1830) is larger (up to 6.1 mm) (Gofas, 1995), mostly brown only, with a periumbilical light area. Protoconch larger (500  $\mu\text{m}$ ), with up to 36 rows of pits.

**Etymology.** – The specific name is from the Latin world *procerus*, *-a, um*, which means: “elongate, large, high”, and it refers to the large size of the shell, which is unusual in this genus in the Guinean Gulf Islands.

***Barleeia fuscaexigua* spec. nov.**  
(Figs 2E-H, 4C, 6I-K, 7C-D)

**Type material.** – Holotype: MNHN (25876, s; Fig. 2E). Paratypes: MNCN (15.05/60092, 10 s), MHNS (100599, 70 s; Figs 2F-H, 4C), CSG (5 s), CPR (5 s).

**Other material examined.** – 20 s, f and j from the type locality.

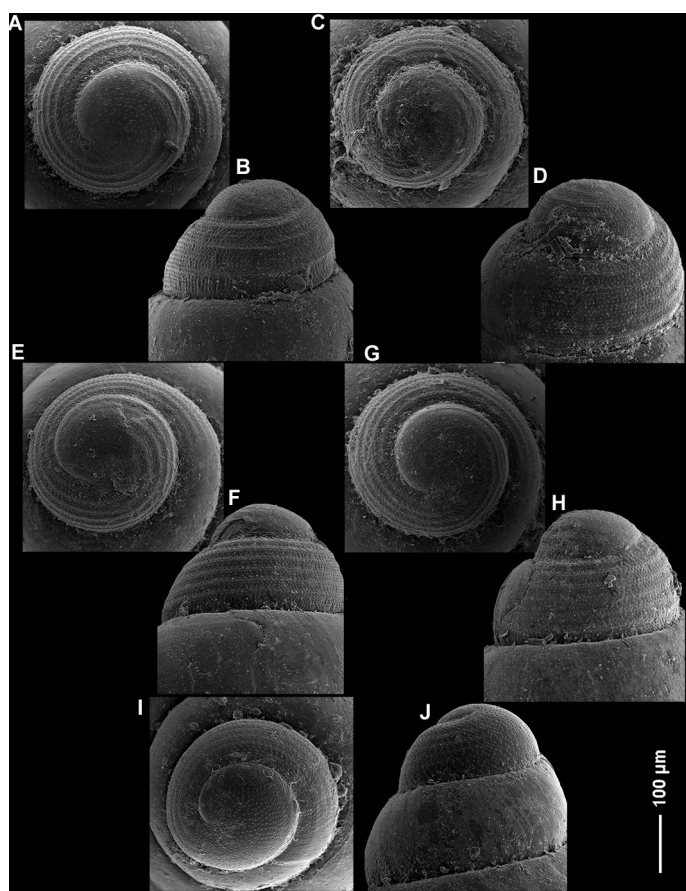


Fig. 5A-J. Protoconchs. A-H, *Barleeia multicolor* spec. nov. A-B, white shell; C-D, brown shell; E-F, light-brown-orange shell; G-H, banded shell. I-J, *Barleeia translucens* spec. nov.

Type locality. – San Antonio de Palé, 2-10 m, Annobón I., Equatorial Guinea.

Description. – Shell conical, solid. Dome-shaped protoconch with 1 ½ whorls, with a diameter of about 360 µm, the nucleus with about 100 µm, covered by spiral rows of pits (about 22-25). The teleoconch has about 3½ whorls, smooth, scarcely convex, with a shallow but distinct suture. The colour is red brown, with a white spiral band continuing at the end of the suture, another at the middle of the last whorl and a subsutural one, very close to the suture; the upper two

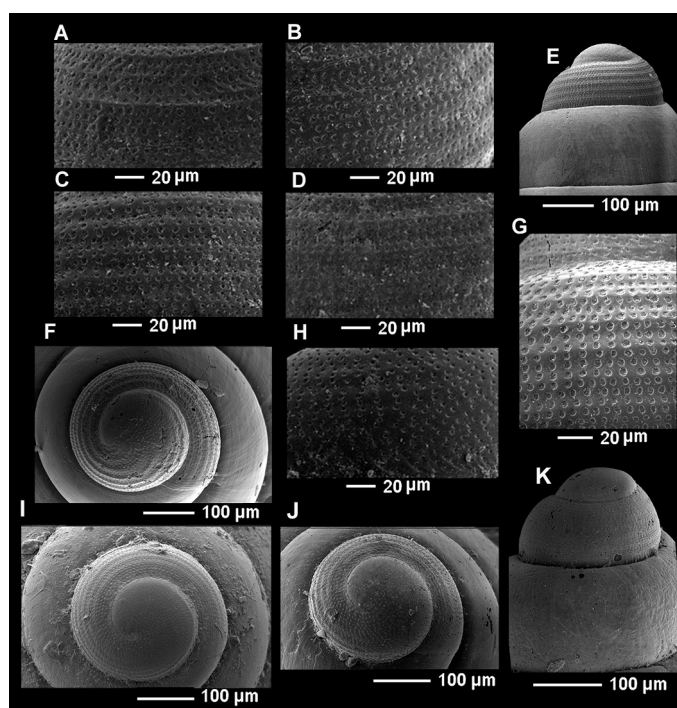


Fig. 6A-D. Microsculpture of *Barleeia multicolor* spec. nov. A, white; B, dark brown; C, light-brown-orange; D, with bands. E-G, *Barleeia lindae* Rolán & Swinnen, 2004 (after Gloria Maris 43[4]). E-F, protoconch; G, microsculpture. H, microsculpture of *Barleeia translucens* spec. nov. I-K, *Barleeia albicolor* spec. nov., protoconchs.

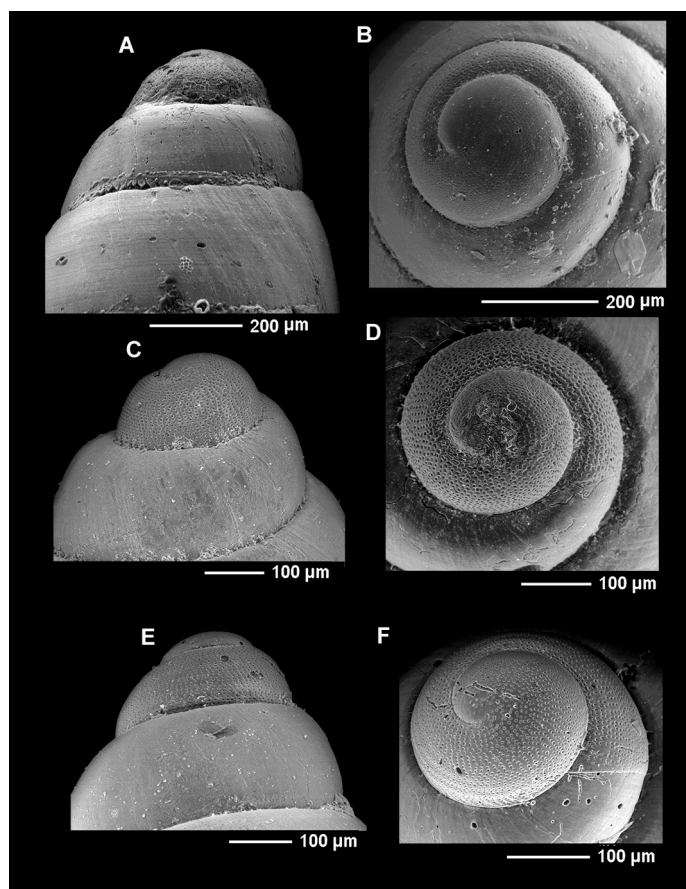
bands are most prominent near the apertural border. These bands are light brown and not very marked. Round aperture, peristome sharp, fused with the previous whorls in the contact area. No umbilicus.

Dimensions: the holotype is 1.7 mm long; a few paratypes are slightly larger.

Distribution. – Only known from Annobón Island.

Comparison. – For its small size this species can be distinguished from *B. unifasciata* and *B. gougeti*, which furthermore have their distribution range in northern Africa, far from this area.

*Barleeia taeniolata* Gofas, 1995, is a species with a shell with more convex whorls, translucent, with a protoconch with a smaller diameter and ¼ less whorls; it has three

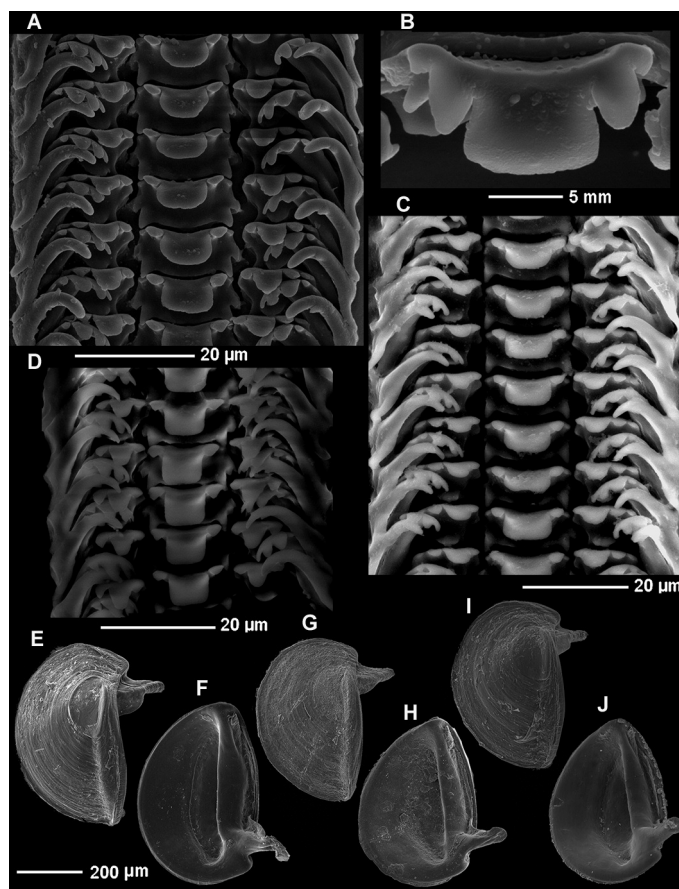


**Fig. 7A-F.** Protoconchs of *Barleeia* species from Annobón. **A-B**, *Barleeia procera* spec. nov.; **C-D**, *Barleeia fuscaexigua* spec. nov.; **E-F**, *Barleeia albicolor* spec. nov.

lighter spiral bands that are differently distributed: in *B. taeniolata* the upper band is in the middle of the whorl, the subsequent one is near the end of the suture and the lower one is below this level.

*Barleeia tomensis* Gofas, 1995, has a larger shell (up to 2.4 mm), the protoconch is similar in size, but has up to 28 rows of pits; the only two lighter bands are typically periumbilical.

*Barleeia multicolor* spec. nov. (the banded form) has cords on the protoconch and a prominent umbilicus. The light bands are wider, the upper two are situated near the sutures.



**Fig. 8A-D.** Radulae. **A**, *Barleeia multicolor* spec. nov., brown form; **B**, detail of the rachidian tooth; **C**, *Barleeia multicolor* spec. nov., white form; **D**, *Barleeia translucens* spec. nov. **E-J**, opercula of *Barleeia*. **E-H**, *Barleeia multicolor* spec. nov.; **E-F**, brown shell; **G-H**, white shell. **I-J**, *Barleeia translucens* spec. nov.

*Barleeia procera* spec. nov. has a larger shell with a wider protoconch, wider nucleus of the protoconch, smaller number of spiral rows of pits and four lighter bands with a very different distribution. Furthermore, both species live sympatrically without intergrades.

**Etymology.** – The specific name refers to the brown colour and small size.

Species	Distribution
<i>Barleeia aemilii</i> Gofas, 1995	CV
<i>Barleeia albicolor</i> spec. nov.	A
<i>Barleeia chefiae</i> Gofas, 1995	CV
<i>Barleeia cinguloides</i> Gofas, 1995	AN
<i>Barleeia fuscaexigua</i> spec. nov.	A
<i>Barleeia gougeti</i> (Michaud, 1830)	E,M,MA,S
<i>Barleeia lindae</i> Rolán & Swinnen, 2004	P
<i>Barleeia minuscula</i> Monterosato, 1889	M,MA,S
<i>Barleeia multicolor</i> spec. nov.	ST
<i>Barleeia pervulgata</i> Gofas, 1995	AN
<i>Barleeia picta</i> Gofas, 1995	AN
<i>Barleeia procera</i> spec. nov.	A
<i>Barleeia taeniolata</i> Gofas, 1995	ST
<i>Barleeia tomensis</i> Gofas, 1995	ST
<i>Barleeia translucens</i> spec. nov.	ST
<i>Barleeia unifasciata</i> (Montagu, 1803)	E,M,IC,MA
<i>Barleeia verdensis</i> Gofas, 1995	CV
<i>Lirobarleeia elata</i> Gofas, 1995	AN
<i>Lirobarleeia pupoides</i> Gofas, 1995	AN
<i>Lirobarleeia sublaevis</i> Gofas, 1995	AN
<i>Pseudodiala aequinoctialis</i> Gofas, 1995	EG
<i>Pseudodiala corollaria</i> Gofas, 1995	ST
<i>Pseudodiala niso</i> Gofas, 1995	S
<i>Tropidorissoia secunda</i> Rolán & Templado, 1994	ST,P,A
<i>Tropidorissoia taphrodes</i> Tomlin & Shackleford, 1915	ST,P,A

**Table I.** Barleeidae from the West Africa. E = Europa; M = Morocco; CI = Canary Islands; MA = Mauritania; S = Senegal; CV = Cape Verde islands; ST = São Tome; P = Príncipe I.; EG = Equatorial Guinea; A = Annobón; AN = Angola.

***Barleeia albicolor* spec. nov.**  
(Figs 2I-J, 4E-G, 6I-K, 7E-F)

Type material. – Holotype (MNHN 25877, s; Figs 2I, 4E). Paratypes: MNHN (25878, all s), MNCN (15.05/60093, 10 s, 5 j; Figs 2J); MHNS (100600, 50 s, 15 j); CSG (10 s); CPR (10 s).

Other material examined. – More than 100 s and j in sediments from the type locality.

Type locality. – San Antonio de Palé, 3-10 m, Annobón Island, Equatorial Guinea.

Description. – Shell small, white, fragile, smooth and shiny. Protoconch of 1¼ whorls, with a nucleus of 100 µm, with a diameter of 280 µm and a microsculpture formed by rows of pits (about 25), and small, spiral, depressed cords. Teleoconch of about 3 whorls, slightly convex. Last whorl large occupying 2/3 of the total height. Suture distinct but not deep. Aperture ovoid, peristome continuous, sharp, generally separated from the previous whorl. There is an umbilical fissure. Totally white in colour.

Dimensions: the holotype is 1.3 mm long. All the shells are similar in size.

Distribution. – Only known from Annobón I. In sediments at 6-12 m.

Comparison. – This species could be considered identical with the white form of *Barleeia multicolor* spec. nov. from São Tomé, but the shells of *B. albicolor* spec. nov. are always smaller than those of the brown *B. procera* and *fuscaexigua*. They occur sympatrically, while differing in their shells, so that they are considered different species. *Barleeia multicolor* spec. nov. is larger (about 1.9 mm versus 1.3), more solid, relatively more elongate (H/W = 1.8 versus 1.6 in *B. albicolor*), the protoconch is wider (330 µm instead 280), the spiral cords of the protoconch are more prominent and beginning closer to the nucleus, and the perforations in the nucleus and beginning of the protoconch are relatively larger, whereas the rows are less numerous (about 20-22 versus 25 spirals).

Etymology. – The specific name refers to the white colour of the shell.

#### CONCLUSIONS

The family Barleeidae is rather diverse in the islands of the Gulf of Guinea. There are three genera (*Barleeia*, *Pseudodiala* and *Tropidorissoia*) and 11 species: two in *Tropidorissoia*, one in *Pseudodiala* and eight in *Barleeia*.

Five species occur in Annobón, three in Príncipe, and seven in São Tomé. Most likely the higher number of species found in São Tomé, results from the fact that this island has been comparatively better sampled. It is quite well possible



that further collecting will result in more species being found also in the other two islands.

Along the whole West African coast the abundance of Barleeidae is also very high. Four genera are present (*Barleeia*, *Pseudodiala*, *Tropidorissoia*, and *Lirobarleeia*) and at least 25 species. Interestingly, only four of these species had been described before the year 1920; most of them have been described since 1994 (21 species).

Bellow we include a list of the West African known species of Barleeidae (in alphabetical order), with indication of their geographical distribution

#### ACKNOWLEDGEMENTS

Jesús Méndez and Inés Pazos made the SEM photographs in the Centro de Apoyo Científico y Tecnológico a la Investigación (CACTI) of the University of Vigo. Serge Gofas made important suggestions during the time of preparation of this manuscript. António A. Monteiro and Manuel Antonio E. Malaquias helped revising the English. The authors thank an anonymous reviewer for his comments.

#### REFERENCES

- GOFAS, S., 1995. A remarkable species richness of the Barleeidae (Gastropoda: Rissoacea) in the Eastern Atlantic. – *The Nautilus* 109(1): 14-37.
- ROLÁN, E. & HERNÁNDEZ, J.M., 2006. New records and new species of marine molluscs (Gastropoda; Caenogastropoda: Rissoidae: Cingulopsidae; Barleeidae; Tjaernoieiidae) from Mauritania and Senegal. – *Basteria* 70: 141-151.
- ROLÁN, E. & SWINNEN, F., 2004. A new *Barleeia* (Mollusca, Barleeidae) from Príncipe Islands. – *Gloria Maris* 43(4): 1-6.
- ROLÁN, E. & TEMPLADO, J., 1994. Una nueva especie del género *Tropidorissoia* (Mollusca: Gastropoda: Barleeidae) para la costa oesteaficana. – *Bollettino Malacologico* 29(9-12): 237-242.
- TOMLIN, J.R.B. & SHACKLEFORD, L.J., 1914-1915. The marine Mollusca of São Thome, I. – *Journal of Conchology* 14(9): 239-256, 267-276.