Description of *Drillia annielonae*, a new species closely related to *Drillia angolensis* Odhner, 1923 (Mollusca: Gastropoda: Drilliidae)

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Keywords: GASTROPODA, DRILLIIDAE, *Drillia annielonae, Drillia angolensis,* new species, introduction lectotype, Angola.

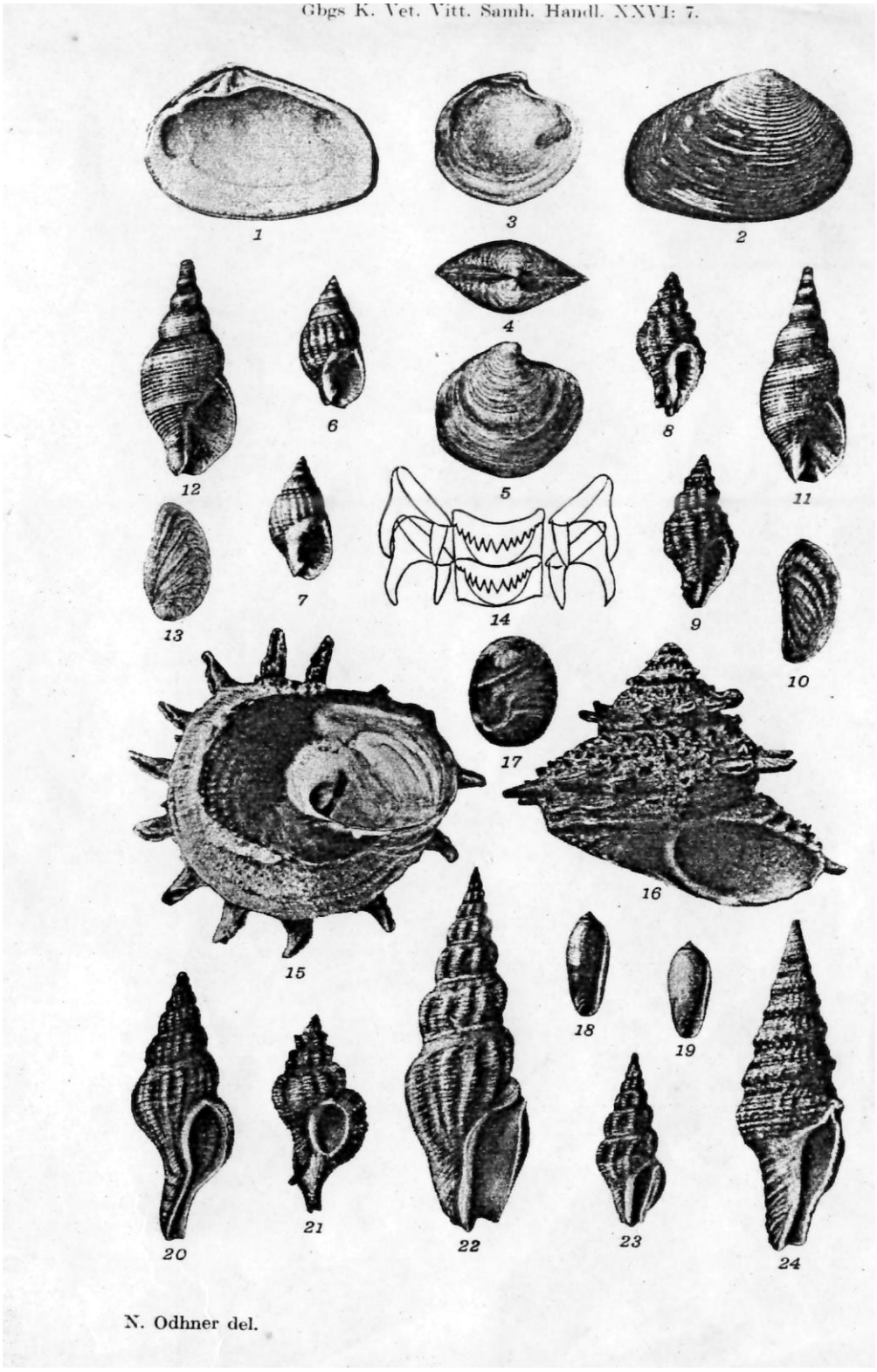
Abstract: In the last decade a number of shells have been offered as '*Drillia angolensis* Odhner, 1923'. In fact it rarely happens one of them is really that species. The shells are at present known from a somewhat restricted area off Luanda, Angola. Specimens of the new species *Drillia annielonae* present a certain similarity to *D. angolensis*, but are more elongated. They are uniformly white coloured or provided with brown colour between the white oblique costae.
Furthermore, a lectotype for the controversial species *D. angolensis* is introduced.

Abbreviations:
FN: Private collection of Frank Nolf.
FS: Private collection of Frank Swinnen.
JV: Private collection of Johan Verstraeten.
PEMARCO: Pêche maritime du Congo.
PR: Private collection of Peter Ryall.
RBINS: Royal Belgian Institute for Natural Sciences.
ZMC: Universitets Zoologisk Museum, Copenhagen, Denmark.

Introduction: In 1923 N. Odhner described a new species, *Drillia angolensis*, from Porto Alexandre (South Angola). Later on more shells were found and especially fishermen of PEMARCO were able to trawl several of them from a depth of 70-100 m in the north of Angola, off the mouth of the Congo-river (Nolf & Verstraeten, 2006). Like many other representatives of the families TURRIDAE and DRILLIIDAE this species seems to be rather variable in form. In fact, Odhner illustrated two different shells. His description of *D. angolensis* agrees very well with figure 22, but the smaller illustrated one (fig. 23) is apparently a specimen of *Drillia recordata* Sykes, 1905. Efforts were undertaken to study the type material, but the Museum of Göteborg has never answered our request to send specimens or photographs. Since Odhner did not indicate a holotype and two different species are involved in his figures, we hereby select the largest illustrated shell (fig. 22) as lectotype for the purpose of preserving the stabilisation of nomenclature.
We refer to our paper on the upgrading of *Drillia consociata* Smith, var. *recordata* Sykes, 1905 to the rank of species (Nolf & Verstraeten, 2006) for a detailed comparison between *D. angolensis* and *D. recordata.*

Designation of lectotype for *D. angolensis*:

We hereby repeat the first part of the original description of *D. angolensis* by Odhner (1923): '*Shell turriform, with convex whorls, slightly channelled below the suture; aperture about the third of the shell height, canal very short; columellar margin reflected, thick, forming an umbilical rime near the end and a projecting callus at the upper sinus, which is very deep; outer lip simple. Sculpture: 2 apical whorls smooth, the subsequent with thick, oblique longitudinal costae (their number 10 on the penultimate whorl) and revolving cords alternating with thinner threads in the lower whorls; subsutural band with some spiral threads only, and flexuous lines of growth.'*
To avoid any confusion with the related *D. recordata* Sykes, 1905 we add the following characteristics to this description: 'The last whorl is provided with 11-12 narrow, rather flattened oblique costae, which are creamish white and alternate with a resistant olive periostracum in the intersections. The colour is uniformly greyish olive and the interior of the aperture is white or bluish grey'.
Odhner mentions two samples, both from Porto Alexandre: one from 40 fms '*(11/8 1912), many sps.*' and the second one from 16 fms *'(21/7) 4 sps., max. h. 27 mm (overgrown with a Suberites).*' Fig. 22 corresponds to the dimensions mentioned as '*Max. dimensions: h. 41.5, aperture h. 18, br. 14 mm; whorls 11.*' from the first sample (40 fms) and is hereby designated as lectotype. The remaining specimens in the same sample (Porto Alexandre, Angola - 40 fms - 11 August 1912) evidently become paralectotypes. Apparently these shells were trawled at the same depth as those from the Belgian fishermen (PEMARCO) operating in the north of Angola.



Text-figure from: Odhner, N. Hj., 1923. Contribution to the Marine Molluscan Faunas of South and West Africa. *Meddelanden fran Göteborgs Musei Zoologiska Avdelning*, **23**, 1-39, pl. 1.

Figs 22, 23. *Drillia angolensis* x 1.3

Fig. 24. *Clavatula filograna* Nat. size

Fig. 23 is without doubt a specimen of *D. recordata* Sykes, 1905. The measured height of this shell is 26.56 mm, which matches the maximum height mentioned in the text on p. 17 as being 27 mm, without using the ratio (x 1.3) mentioned in the 'Explanation of the Plate'. The latter probably only applies to fig. 22. *D. recordata* is indeed a slightly smaller shell measuring from 18 to 35 mm (adult shells). Our specimens from off Luanda and Farol das Lagostas were also dredged at the same depth, namely about 40 m. *D. angolensis* prefers deeper water (about 70-75 m).

It is clear from the figures that two different shells are involved, the smaller one possessing 10-11 axial costae on the body whorl, which are broader, distinct and well developed. In general this shell is more globose, while *D. angolensis* has a more slender appearance. Probably the statement '*sometimes with 1-3 obscure revolving bands, often with upper part of body-whorl grayish, lower one white*' refers to the shell figured as number 23, in fact a specimen of *D. recordata*.
In fresh condition this shell is of a creamy white to an olive-green tint, with a darker brown – or rarely a paler - area either covering the larger and lower portion of the last whorl or confined to a small region at the base. This zone is exceptionally restricted to a dark band in the middle of the last whorl. The periostracum is of a dark olive-brown colour. These characteristics correspond to the colour described by Odhner, being '*often with upper part of body-whorl grayish, lower one white*'. Probably this feature only applies to specimens of the second sample (fig. 23). Moreover, we found *Suberites* is typically present on *D. recordata*.

Further data on the lectotype of *Drillia angolensis*:

Type locality: Porto Alexandre (South Angola).
Size: 41.5 mm; height of aperture: 18 mm and breadth: 14 mm.
Collection: Nils Hj. Odhner (Sweden).
Depth: 40 fms.

Type material of *D. annielonae* sp. nov.:

Holotype: Farol das Lagostas, north of Luanda, Angola, West Africa. Dredged by fishermen at a depth of 40-45 m, in a muddy bottom. 17.30 mm. ZMC.

Paratypes:

1. 17.21 mm (FN). Farol das Lagostas, north of Luanda, Angola, West Africa. Dredged by fishermen at a depth of 40 m.
2. 18.61 mm (FN). Farol das Lagostas, north of Luanda, Angola, West Africa. Dredged by fishermen at a depth of 40 m.
3. 18.73 mm (FN). Farol das Lagostas, north of Luanda, Angola, West Africa. Dredged by fishermen at a depth of 40 m.
4. 20.34 mm (FN). Off Corimba, Angola. Dredged at a depth of 25-30 m. 1993.
5. 14.47 mm (JV). Farol das Lagostas, north of Luanda, Angola, West Africa. Dredged by fishermen in a muddy bottom at a depth of 40-45 m.
6. 16.31 mm (JV). Farol das Lagostas, north of Luanda, Angola, West Africa. Dredged by fishermen in a muddy bottom at a depth of 40-45 m.
7. 15.01 mm (JV). Farol das Lagostas, north of Luanda, Angola, West Africa. Dredged by fishermen at a depth of 40 m.
8. 16.54 mm (JV). Farol das Lagostas, north of Luanda, Angola, West Africa. Dredged by fishermen at a depth of 40 m.
9. 23.10 mm (JV). 30 km south of Luanda, Angola. Trawled at a depth of 40-70 m.
10. 15.60 mm (FS). Off Luanda, Angola. Dredged in sand at 50-60 m. 17 March 1994.
11. 16.47 mm (FS). Off Luanda, Angola. Dredged in sand at 50-60m. 17 March 1994.
12. 13.35 mm (PR). Farol das Lagostas, Angola. Dredged at a depth of 40 m.
13. 14.58 mm (PR). Farol das Lagostas, Angola. Dredged at a depth of 40 m.

Description:

Drillia annielonae sp. nov.
(Plate I, Figs 1-8; Plate II, Figs 9-16; Plate III, Figs 17-24)

Turriform shell, with convex whorls, slightly channelled below the suture. The aperture is less than one third of the whole shell height; the siphonal canal is very short to nearly absent. The columellar margin is reflected and thick, ending in a projecting callus at the upper sinus, which is very deep. Elegant shell, with (8-9) rather swollen whorls and pointed spire. The last whorl takes half the length of the shell. The protoconch consists of 2 smooth whorls. On the whorls below the protoconch a sculpture consisting of oblique longitudinal costae is present: 8-10 on the last whorl, 7-9 on the penultimate whorl. This structure is crossed by revolving cords, 13-17 on the last whorl and 7-9 on the penultimate whorl. There are no secondary threads except between the highest four cords of the last whorl. Underneath the suture there is a relative strong cord. The anal sinus is well developed behind a sinuous lip on the parietal wall of the inner lip. There is a very slight stromboid notch.

The colour is uniformly white to creamy white or shaded brown between the white axial costae in some specimens. There are traces of an olive-brown periostracum.

Measurements: From 15 to 23 mm in length.

Derivation of name: The species name '*annielonae*' refers to Mrs. Annie Lone Vedelsby, curator of seashells in the Museum of Copenhagen, who kindly provided us with so many samples from the ZMC in the past two years. For convenience sake the last vocal '*e*' in '*Annie Lone*' has been omitted.

	D. annielonae	*D. angolensis*
number of whorls	8-9	9-10
number of oblique costae on body whorl	8-10; well defined	11-12; narrow
number of oblique costae on penultimate whorl	8	10-11
number of primary cords on last whorl	13-17; rounded	20-25; angular
number of primary cords on penultimate whorl	7-9	10-12
other characteristics	spire narrow and elongate	broader spire; often with resistant yellowish brown periostracum
colour	white, creamy white or shaded brown between the white costae	greyish or olive-brown between the white costae; upper part of body whorl with a darker revolving band, lower one creamy white
geographic range	off Luanda, North Angola	Angola: from Moita Seca to Porto Alexandre
size	15-23 mm	17-41 mm

Table I: Comparison between a few characteristics of *D. annielonae* and *D. angolensis*

Habitat: In muddy sand at a depth of 40-70 m.

Locus typicus: Farol das Lagostas, Angola.

Geographic range: At present known from Farol das Lagostas, north of Luanda to some 50 km south.

Discussion: *D. annielonae* can only be confused with *Drillia angolensis* (Plate IV, Figs 25-30). *Drillia annielonae* mainly differs from *D. angolensis* by its more slender form and its smaller shell.

Unlike its neighbour, *D. annielonae* is usually completely white or occasionally shaded with brown between the white axial costae, the number of them (8-10) always being smaller than in *D. angolensis* (11-12). The primary cords on the body whorl are rounded and only in the upper part of the whorl they are separated by secondary threads. Their number (13-17) is small compared to *D. angolensis* (20-25) whose primary cords are angular and alternate with finer threads over the whole surface of the whorls.

As the real status of *Drillia ballista* von Maltzan, 1883 is in discussion, we prefer to avoid a comparison with that species known from Senegal, Liberia and Ghana. In a future paper concerning *D. ballista* and *D. tripter* we will comment in detail on both species.

Acknowledgements: We are grateful to Peter Ryall (Maria Rain, Austria) and to Frank Swinnen (Lommel, Belgium) for the loan of specimens and to David Monsecour (Rillaar, Belgium) for carefully reading the text.

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Distributional map:

Drillia annielonae ***Drillia angolensis***

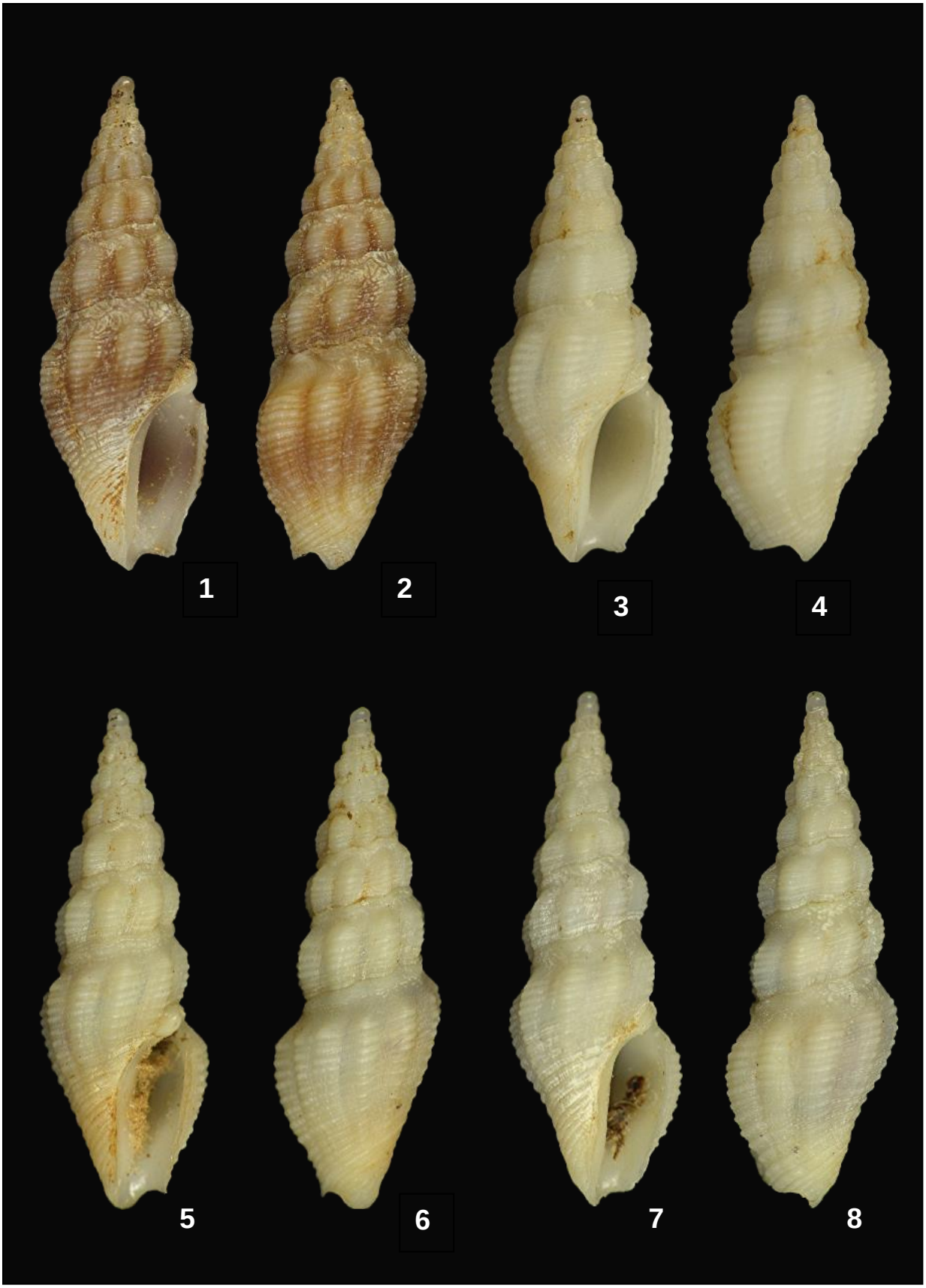

Plate I. Figs 1-8: *Drillia annielonae*. Farol das Lagostas, Angola. Dredged by fishermen at a depth of 40 m; 1-2: paratype 1 (FN; 17.21 mm); 3-4: paratype 8 (JV; 16.54 mm); 5-6. paratype 2 (FN; 18.61 mm); 7-8: paratype 3 (FN; 18.73 mm).

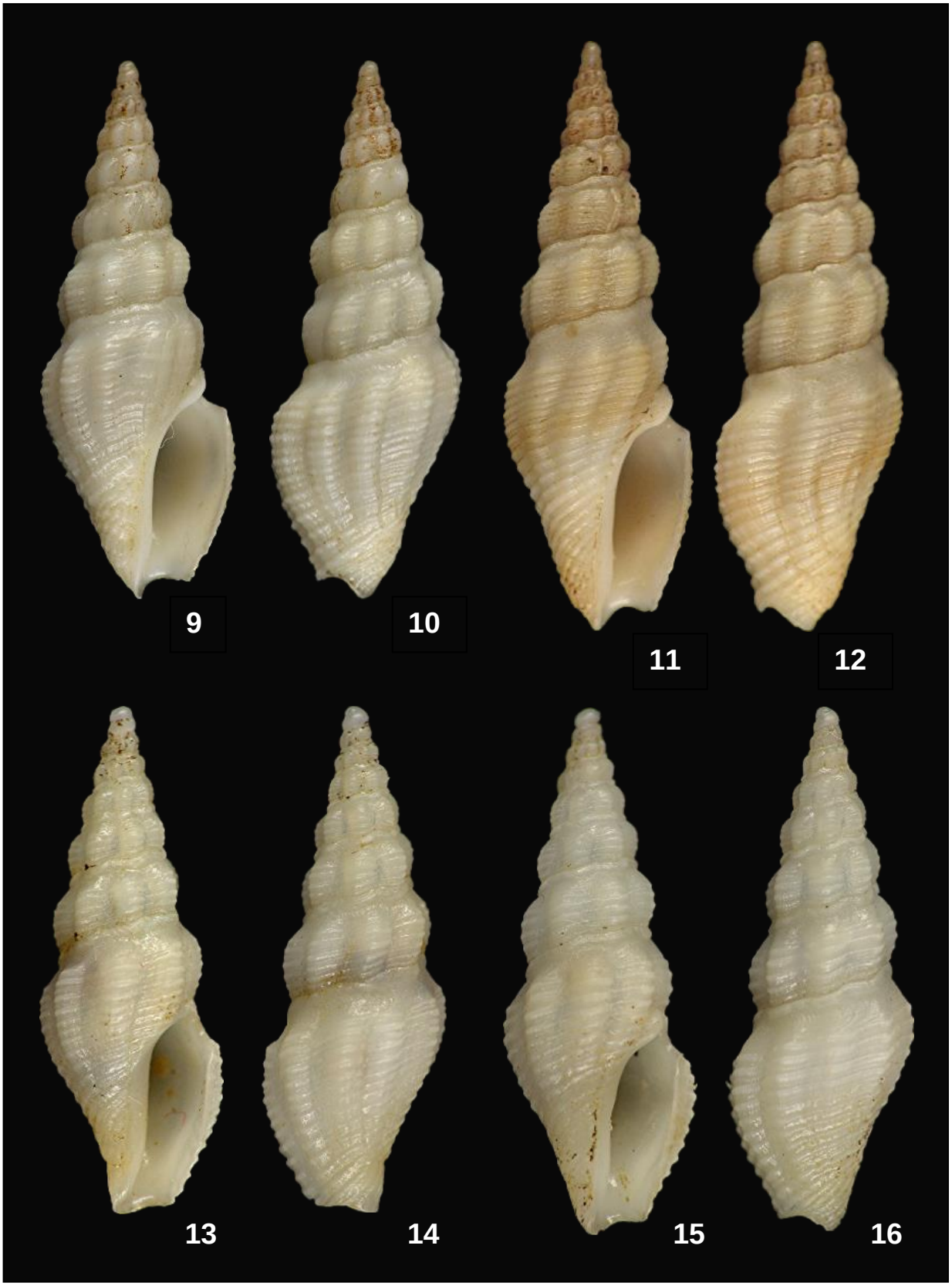

Plate II. Figs 9-16: *Drillia annielonae*. 9-10: off Corimba, Angola. Dredged by fishermen at a depth of 40 m. Paratype 4 (FN; 20.34 mm); 11-12: 30 km south of Luanda, Angola. Trawled at a depth of 40-70 m. Paratype 9 (JV; 23.10 mm); 13-14: Farol das Lagostas, north of Luanda, Angola. Dredged by fishermen in a muddy bottom at a depth of 40-45 m. Holotype (RBINS; 17.30 mm); 15-16: 18.61 mm (FN). Farol das Lagostas, north of Luanda, Angola. Dredged by fishermen at a depth of 40 m. Paratype 2 (FN; 18.61 mm).

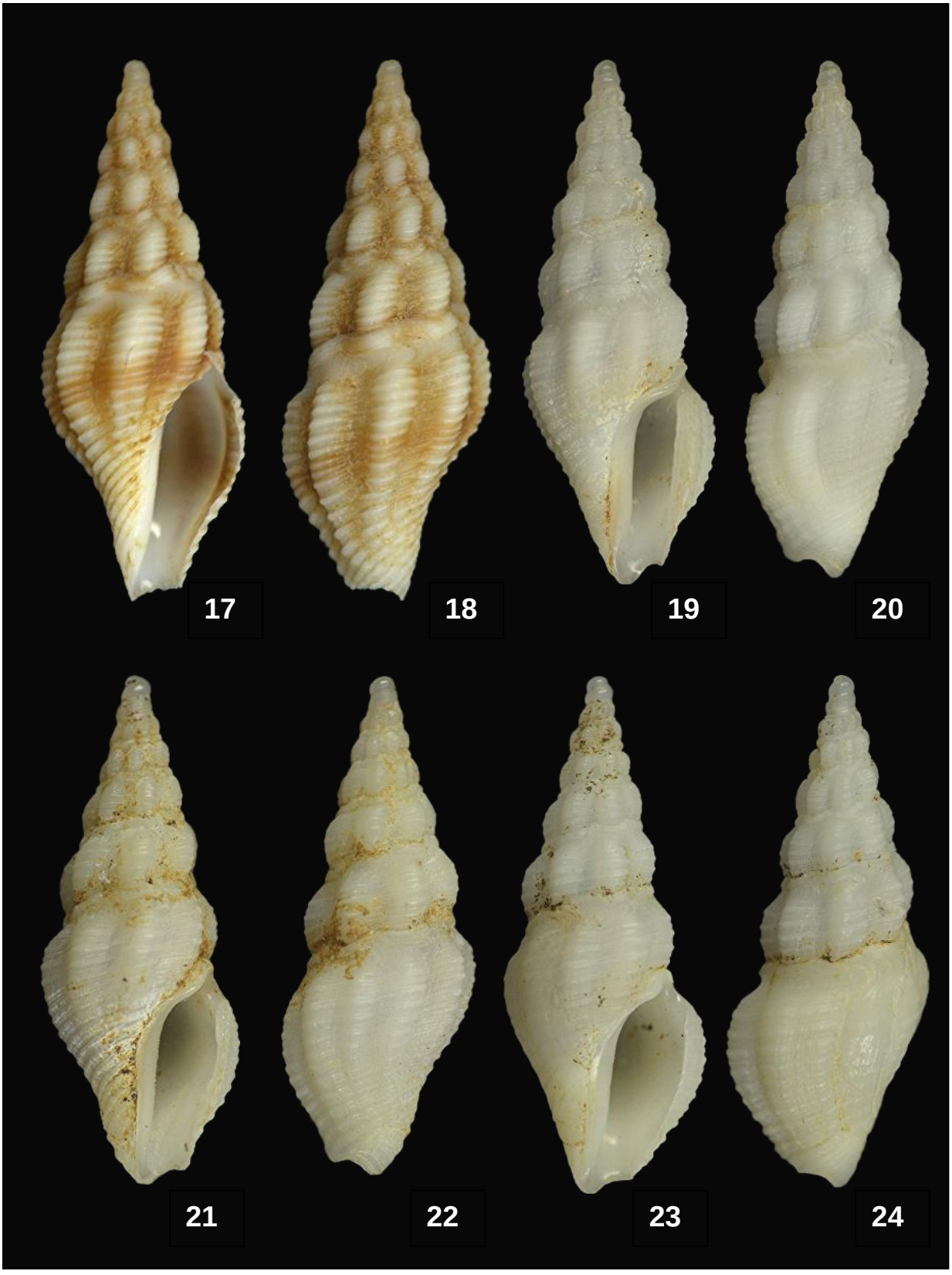

Plate III. Figs 17-24: *Drillia annielonae*. 17-20: off Luanda, Angola. Dredged in sand at 50-60 m. 17 March 1994; 17-18: paratype 10 (FS; 16.47 mm-juvenile); 19-20: paratype 11 (FS; 15.60 mm (FS); 21-24: Farol das Lagostas, off Luanda, Angola. Dredged at a depth of 40 m; 21-22: paratype 12 (PR; 13.35 mm); 23-24: paratype 13 (PR; 14.58 mm).

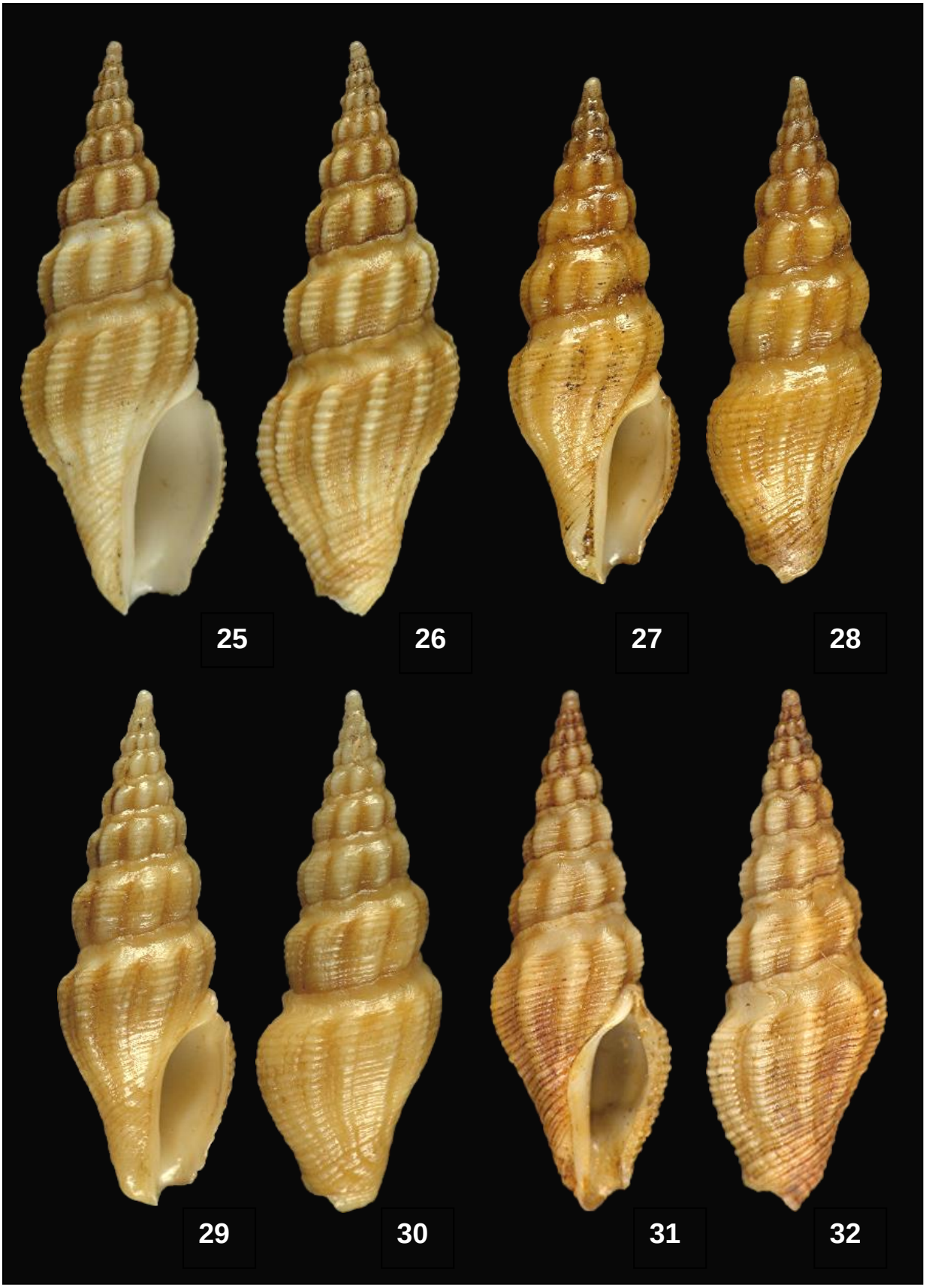

Plate IV. Figs 25-32: *Drillia angolensis* Odhner, 1923; 25-30: Moita Seca, Angola. Trawled (PEMARCO) by Belgian fishermen at 72 m. 1973; 25-26: 31.89 mm (FN); 27-28: 26.12 mm (FN); 29-30: 29.92 mm (FN); 31-32: 30 km south of Luanda, Angola. Trawled at a depth of 40-70 m. 22.76 mm (JV).

Clavatula knudseni (Mollusca: Gastropoda: Clavatulidae): a new turrid species from West Africa

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Keywords: GASTROPODA, CLAVATULIDAE[3], *Clavatula knudseni,* new species, Senegal.

Abstract: A new turrid species, apparently similar to *Clavatula mystica* and *C. regia,* is described from Senegal, Gambia and Ivory Coast. The species is dark orange or olive-brown coloured and is provided with a large number of oblique ribs on the last whorl of a small shell.

Abbreviations:
FN: Private collection of Frank Nolf.
JV: Private collection of Johan Verstraeten.
PEMARCO: Pêche maritime du Congo.
ZMC: Universitets Zoologisk Museum,
Copenhagen, Denmark.

Introduction: Recently a lot of shells from Senegal containing several orange coloured turrids have been offered to us. These specimens were identified as *Clavatula mystica* (Reeve, 1843). As the specimens of this species are never uniformly orange we were in doubt about the correct identification of the turrid-sample. We compared these specimens with two shells from Abidjan (Ivory Coast) which were labelled *Clavatula*. cfr. *mystica* in our collections. They were similar and if one knows that shells brought in at the harbour of Abidjan are often trawled north off Senegal, we presumed they belonged to just one species. In fact, we detected a few small differences between the two samples (see this paper, p. 12) later on. All the specimens from Senegal, Gambia and Abidjan have the same brilliant uniform orange or olive-brown colour. Careful comparison with *C. mystica* and other *Clavatula*-species from different localities made us conclude that it concerned a separate species with different characteristics. According to Boyer & Hernández, the genus *Clavatula* has never been revised as a whole and it might probably be a polyphyletic group, since the West African littoral species seem to be very variable compared to other turrids.

Material:
The shells from Senegal were obtained from Mr. Sylvain Leturque (Senegal) and Patrick Cazalis (Henon, France), two shells from Gambia were trawled by Carl Rusco (UK), whereas those from Abidjan (Ivory Coast) came from the French shell collector A. Levy (coll. FN, 1976).

Type material:

Holotype: Dredged at a depth of 20 m off St. Louis area, North Senegal, W. Africa. 2006. 20.11 mm. ZMC.

Paratypes:
1. 19.37 mm (FN). North Senegal, W. Africa. Dredged at a depth of 15 m. 2006.
2. 22.45 mm (FN). Gorée Island, off Dakar, Senegal, W. Africa. Dived at 10-15 m.
3. 26.95 mm (FN). NE side of Gorée Island, off Dakar, Senegal, W. Africa. By diving, amongst black rocks at a depth of 5 m.
4. 16.55 mm (FN). Off Abidjan, Ivory Coast, W. Africa. 1976.
5. 18.35 mm (FN). Off Abidjan, Ivory Coast, W. Africa. 1976.
6. 17.66 mm (JV). St. Louis area, North Senegal, W. Africa. Dredged at a depth of 20 m.
7. 17.68 mm (JV). St. Louis area, North Senegal, W. Africa. Dredged at a depth of 20 m.
8. 21.55 mm (JV). St. Louis area, North Senegal, W. Africa. Dredged at a depth of 20 m.
9. 24.25 mm (JV). Gorée Island, off Dakar, Senegal, W. Africa. Dived at a depth of 10-15 m.
10. 19.78 mm (JV). NE side of Gorée Island, off Dakar, Senegal, W. Africa. By snorkel diver, amongst black rocks at a depth of 2-3 m.
11. 19.85 mm (JV). NE side of Gorée Island, off Dakar, Senegal, W. Africa. By snorkel diver, amongst black rocks at a depth of 2-3 m.
12. 20.59 mm (JV). NE side of Gorée Island, off Dakar, Senegal, W. Africa. By snorkel diver, amongst black rocks at a depth of 2-3 m.

[3] 'Clavatulidae recognized as family based on cladistic analysis by Rosenberg (1998), although it is not differentiated morphologically and is regarded as a subfamily of Turridae by Kantor (pers. comm.) and Syssoev (pers. comm.)' (according to Bouchet & Rocroi, 2005).

13. 25.24 mm (JV). NE side of Gorée Island, off Dakar, Senegal, W. Africa. By snorkel diver, amongst black rocks at a depth of 2-3 m.
14. 27.37 mm (JV). Gorée Island, Dakar, Senegal, W. Africa. Dredged at a depth of 10-15 m.
15. 20.95 mm (JV). Off Sanyang, Southern Gambia. Locally fished in shallow water. 6 April 2002.
16. 21.04 mm (JV). Off Sanyang, Southern Gambia. Locally fished in shallow water. 6 April 2002.

Description:

Clavatula knudseni sp. nov.
(Pl. I, Figs 1-4; Plate II, Figs 5-10; Plate III, Figs 11-14)

Shell small to medium sized, 15-30 mm; very solid, buccinoid, slightly obliquely and spirally sculptured; with a moderately tall spire and a slightly truncated body whorl, as high as the spire, terminated in a weak notched anterior canal. Protoconch relatively small consisting of 1½ smooth whorls. Adult shells with about 9 whorls. The sculpture of the last whorl consists of 28-33 parallel oblique ribs (18-20 in the smaller Abidjan-representatives) on the carina crossed by a row of small elongated knobs and below crossed by 9-12 spiral rows of tiny pustules alternating with weak grooves. The suture is obsolete and embedded between two ranks of well-spaced nodules. This is the only ornamentation on the spire, except the tiny parallel spiral grooves on the surface of the whorls.
The aperture is mauve or bluish grey to white or tan with shades of orange. The colour of the whorls is uniform deep orange to olive-brown in adult specimens. No traces of flammules nor shades of brown patches or spots. Fresh specimens are covered with a dark olive-brown periostracum. Operculum ovate-lunate with a medio-lateral nucleus. The animal has not been studied.

Etymology: The name '*knudseni*' honours the efforts of Jørgen Knudsen (ZMC) to unravel the difficult puzzle of many West African turrid-species.

Habitat: Among infralittoral black rocks, to a depth of 15-20 m.

Locus typicus: Gorée Island, off Dakar, North Senegal, from 2-3 m to 20 m.

Geographic range: From North Senegal extending to Ivory Coast.

Discussion:
The new species *C. knudseni* can easily be distinguished from most western African *Clavatula*-species by its typical constant orange colour and the lilac aperture, its smaller size (max. 30 mm), its general outline, the spire being as long as the last whorl, the constant number of parallel oblique ribs crossed by small elongated knobs on the carina and the spiral rows of tiny pustules on the surface of the body whorl. Nevertheless, it has a certain affinity with some related *Clavatula*-species living in the same area, such as (in alphabetical order): *C. bimarginata* (Lamarck, 1822), *C. diadema* (Kiener, 1840) *C. filograna* Odhner, 1923, *C. mystica* (Reeve, 1843) and *C. regia* (Röding, 1798)[4] [(= *C. conica* (Lamarck, 1816); = C. *muricata* (Lamarck, 1822); = *C. coronata* (Mörch, 1852)]. Following is – in alphabetical order- a short comment on the species it can be confused with:

- *C. bimarginata* (Lamarck, 1822) (Plate VIII, Figs 40-44):
C. bimarginata is similar to *C. mystica*, regarding the carinated outline, the shape of the siphonal canal, the outer lip and the labial sinus. The first whorls of *C. bimarginata* look like those of *C. regia* and the protoconch is smaller than in *C. mystica*. The upper part of the last whorl is more elevated than in *C. mystica* and much more than in *C. knudseni*. Compared to the latter the spire is more elongate and larger than the body whorl. Yet, the background of the whorls is also orange coloured, but it is covered with darker brownish orange encircling bands and an olive-dark brown periostracum through which the creamish brown knobs become visible. It tends to form a rank of long axial nodules, the spines are missing and the spiral cords are thicker and less numerous. Together with *C. filograna*, *C. bimarginata* is the largest of all the species involved, from 30 to 65 mm.
Geographic range: Mauritania and Senegal. Angola and South Africa (Nicklès, 1950). We presume Nicklès confused shells of *C. bimarginata* from Senegal with the equivalent *C. filograna* from Angola. Both are two clearly different species, most probably living in a typical separate area.

- *C. diadema* (Kiener, 1840) (Plate VII, Figs 33-36):
This species was considered as a synonym of *C. regia* by Tucker (2004). His statement is based upon the opinion of Tryon (1884), who figured a broad specimen of *C. diadema* on plate 8, fig.18.

[4] The name *Clavatula regia* is applied after the study of Rosenberg & Petit (2003).

This illustration is completely different from fig. 27 of *C. regia* on the same plate.
As usual in his monumental work Tucker (2004) never offered arguments for his classification.
C. diadema generally has a slender, elegant and light shell, with a long siphonal canal. It bears typical sharp spines just below the suture, whereas *C. knudseni* has a ridge with many, yet blunt knobs. Both have the series of small regular granules on the lower part of the last whorl. Knudsen (1952) too presumed *C. diadema* and *C. mystica* are two different distinct species. Geographic range: from Senegal to Gabon and Angola (Nicklès, 1950; Knudsen, 1952; coll. FN & JV).

- *C. filograna* Odhner, 1923 (Plate VII, Figs 37-39):
A less known and rare species, with an elongated turriform shell, a short and broad siphonal canal and a deep sinus above a narrow pear-shaped aperture. The suture is enclosed between a subsutural band with a series of comma-like knobs below and a prominent ridge of rather confluent coarse granules above. The colour is dark brown, due to the thick periostracum covering the shell. This is the largest (50-70 mm) and heaviest of all the *Clavatula*-species involved. In fact it has little to do with the new species *C. knudseni*, which is much smaller and very different in outline. It is only known from Angola, whereas *C. knudseni* lives off Senegal, Gambia and Ivory Coast. At present their specific geographic ranges seem very restricted and separated. *C. filograna* is mentioned here only because of its affinity with the similar *C. bimarginata*. Both are the two largest *Clavatula*-species in West Africa.

- *C. mystica* (Reeve, 1843) (Plate IV, Figs 15-20):
This species has the same protoconch consisting of 1½ smooth whorl and in the adult stage there are also 9 whorls. The main difference is the structure of the last whorl which shows a pyramidal outline formed by a pronounced carina situated at its upper part. In the middle of the last whorl, a second less prominent carina appears under the upper one. Several spiral cords of small to obsolete irregular nodules are present along the basal part of the shell. The nodules just under the suture often change into short spines. Gerontic shells (Plate IV, Fig 18) have a wide callous around the large umbilicus. The sinus is broad and situated at some distance from the suture. The length of adult shells ranges from 18 to 47 mm, sporadically up to 65 mm.
This species lives from Mauritania, Western Sahara and Gambia to Senegal, and also in the Canary Islands. We refer to our paper on the possible extension of the geographic range (Ivory Coast and Angola) (see this magazine, p. 24-31). Shells from Senegal show a squatter and more angular outline, sometimes with sharper peripheral nodules, whereas those from Mauritania, Western Sahara and the Canaries are slenderer, with a less pronounced carina and more obsolete peripheral nodules. These shells show a variety of ground colours, from cream-white to grey, orange, brown or black. The peripheral nodules are always black and the first whorls are milky white or grey coloured. Shells from the northern area show lighter background colours going from cream-white to dull yellowish orange or light brown.

- *C. regia* (Röding, 1798) (Plate V, Figs 21-26; Plate VI, Figs 27-32):
This is an even more very variable species, with a lot of synonyms as a consequence. The general outline is more inflated, rounded and faintly carinated. The spire in *C. regia* is taller and the solid body whorl ends in a relatively short reflected and deeply notched anterior canal, which is backed by a ridge-marginated fasciole, encircling a false umbilical cavity. The well-defined cord-like rings of axially oriented nodules form a noticeable squared pattern on four fifths of the last whorl. Simple ranks of well-spaced nodules are situated at the base of the other whorls, like in *C. knudseni*. Growth lines just under the suture of the three last whorls generally form protuberant spines. The protoconch of *C. regia* consists of 2-3 smooth whorls. The first whorls are much more shouldered than those of *C. knudseni* and *C. mystica*, the central and the upper part of these whorls do not bear nodules and are almost smooth. The suture is typically at the top of a wide, broadly rounded fold which clasps high on the preceding whorl and half envelopes the peripheral carina. The shell illustrated on Plate V, Figs 24-25 has a certain affinity with *C. knudseni*, but this pinkish-cream coloured specimen has the typical incised suture of *C. regia* surrounded with small spines instead of the many regular nodules as in *C. knudseni*. This shell is by accident a freak specimen with an aberrant umbilicus, so the real relationship between the spire and the last whorl is not clear at first glance. Nevertheless, a good observer will remark the typical larger spire like in *C. regia*. The var. *conica* (Lamarck, 1816) (Plate VI, Figs 31-32) has a more elongated spire and rather smooth whorls, due to the absence of spiral rows consisting of small granulations, except for two main rows of large blunt nodules, one just below the suture and the second one on the carina. *C. regia* lives from the Canary Islands and Senegal to Angola.

Acknowledgements:
We want to express our gratitude towards Mrs. Annie Lone Vedelsby (ZMC) for the loan of specimens and to David Monsecour (Rillaar, Belgium) for improving the English text of this paper.

Conclusion:
By introducing this new species we hope to partially solve the problems in establishing the real status of species like *Clavatula bimarginata* (Lamarck, 1822), *C. diadema* (Kiener, 1840), *C. filograna* Odhner, 1923, C*. mystica* (Reeve, 1843) and *C. regia* (Röding, 1798). There are enough constant characteristics to separate *C. knudseni* from similar species: its smaller size (max. 30 mm), the general buccinoid outline, the moderately tall spire, the number of parallel oblique ribs (about 30) crossed by small elongated knobs on the carina and about 10 spiral rows of tiny pustules on the surface of the body whorl, the uniform orange colour of the shell and the light tan or lilac aperture.

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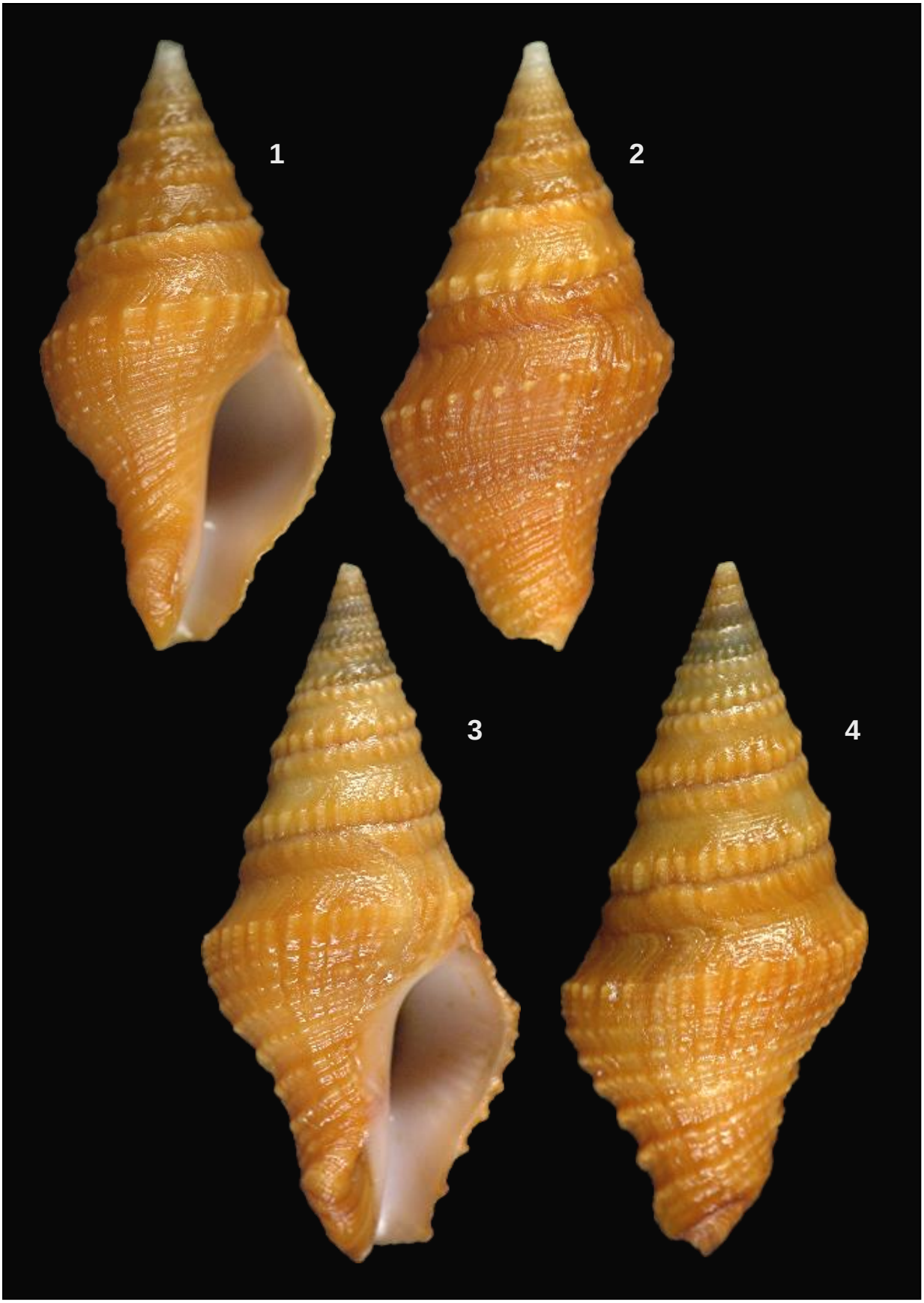

Plate I. Figs 1-4: *Clavatula knudseni*; 1-2: St. Louis area, North Senegal, W. Africa. Dredged at a depth of 20 m. 20.11 mm. Holotype (RBINS); 3-4: Gorée Island, Dakar (Senegal, W. Africa). Dived at a depth of 10-15 m. 27.37 mm. Paratype 14 (JV).

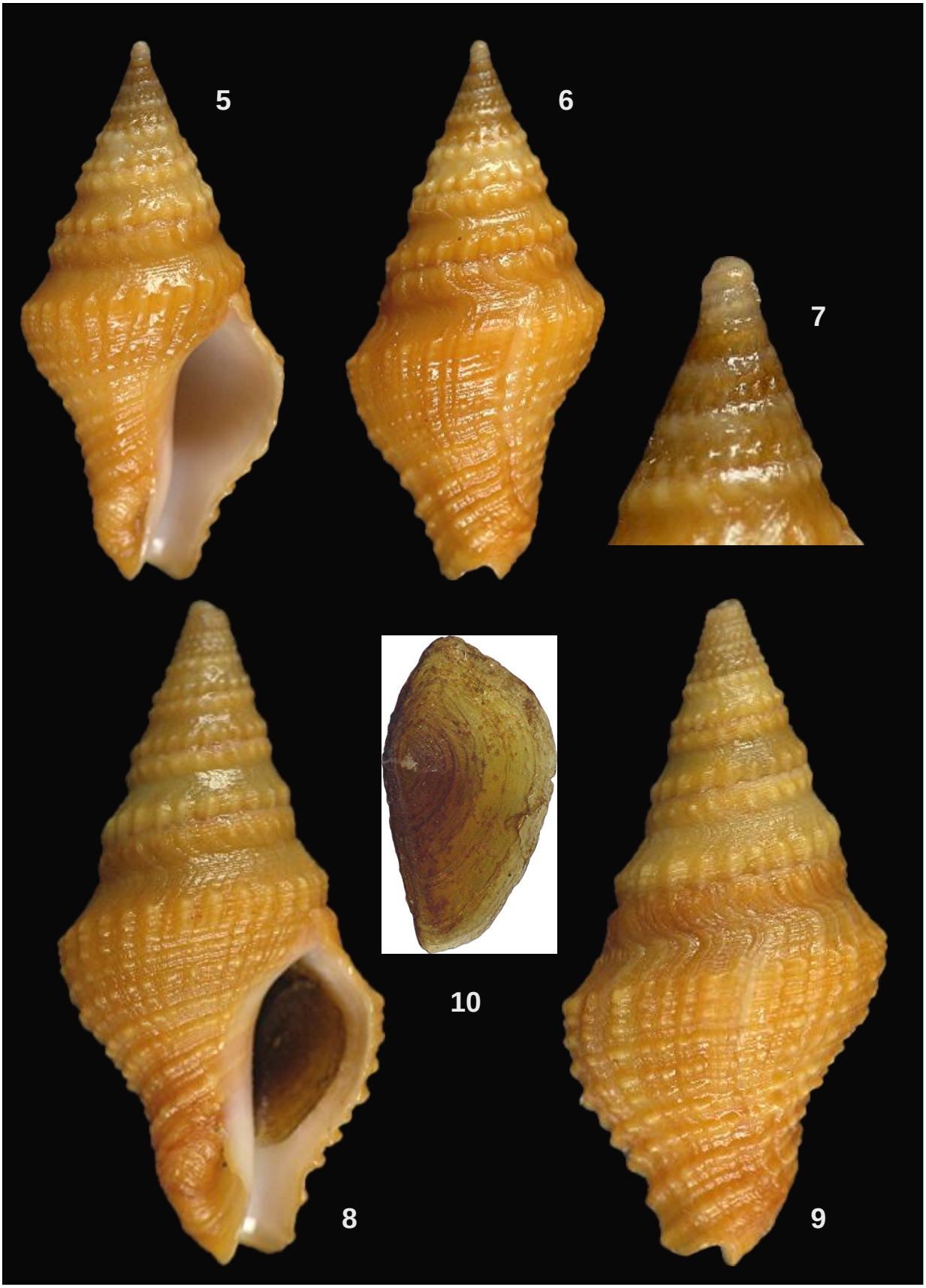

Plate II. Figs 5-10: *Clavatula knudseni*; 5-6: Gorée Island, Senegal, W. Africa. Dived at a depth of 10-15 m. 22.45 mm. Paratype 2 (FN); 7: Protoconch; 8-9: NE side of Gorée Island (Senegal, W. Africa). Amongst black rocks at 5 m. By diver. 26.95 mm. Paratype 3 (FN); 10: operculum.

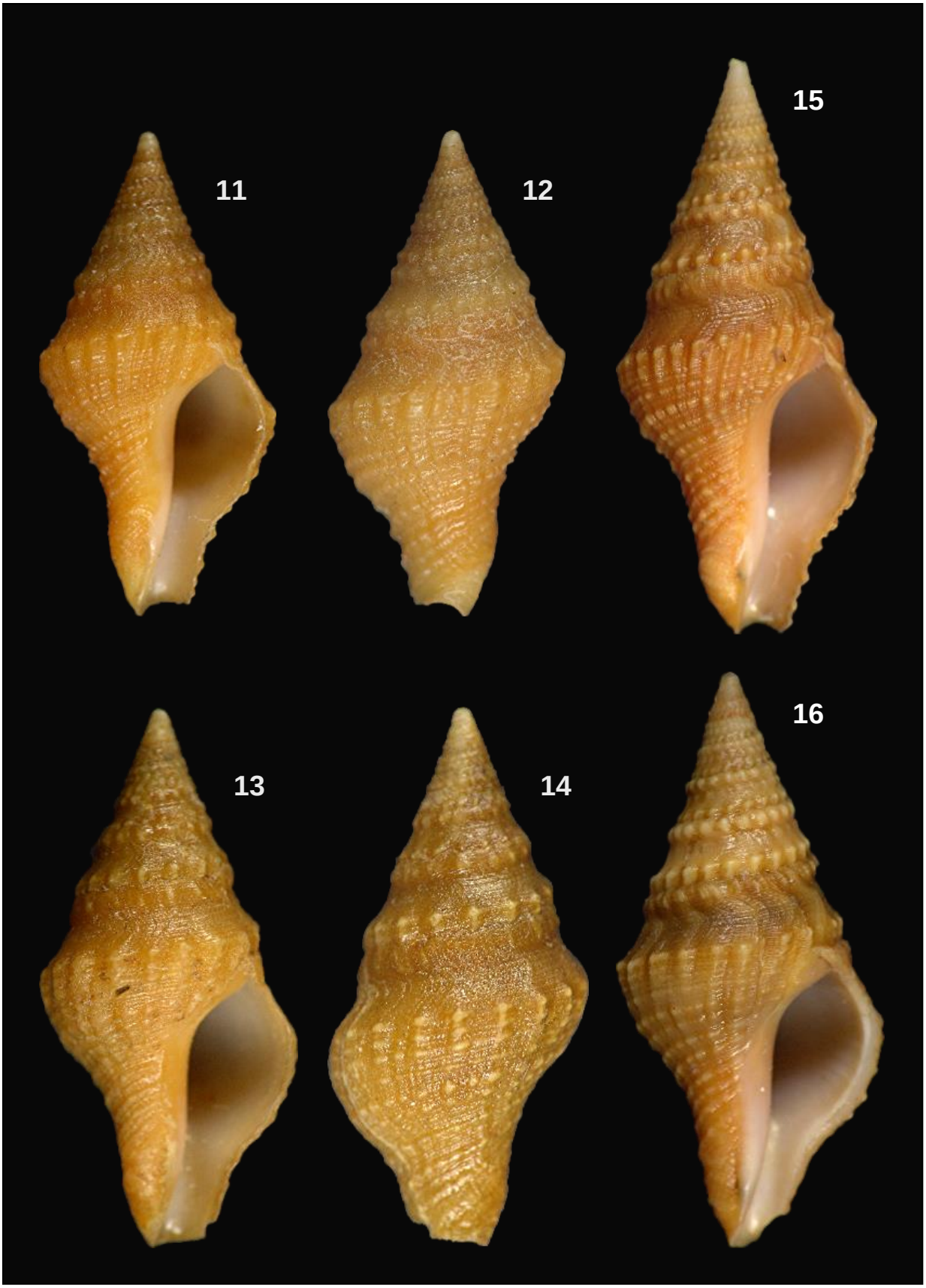

Plate III. Figs 11-16: *Clavatula knudseni*; 11-14: Off Abidjan, Ivory Coast, W. Africa. 1976; 11-12: 16.55 mm. Paratype 4 (FN); 13-14: 18.35 mm. Paratype 5 (FN); 15-16: Sanyang, Southern Gambia. Fished in shallow water. 6 April 2002; 15: 20.95 mm. Paratype 15 (JV); 16: 21.04 mm. Paratype 16 (JV).

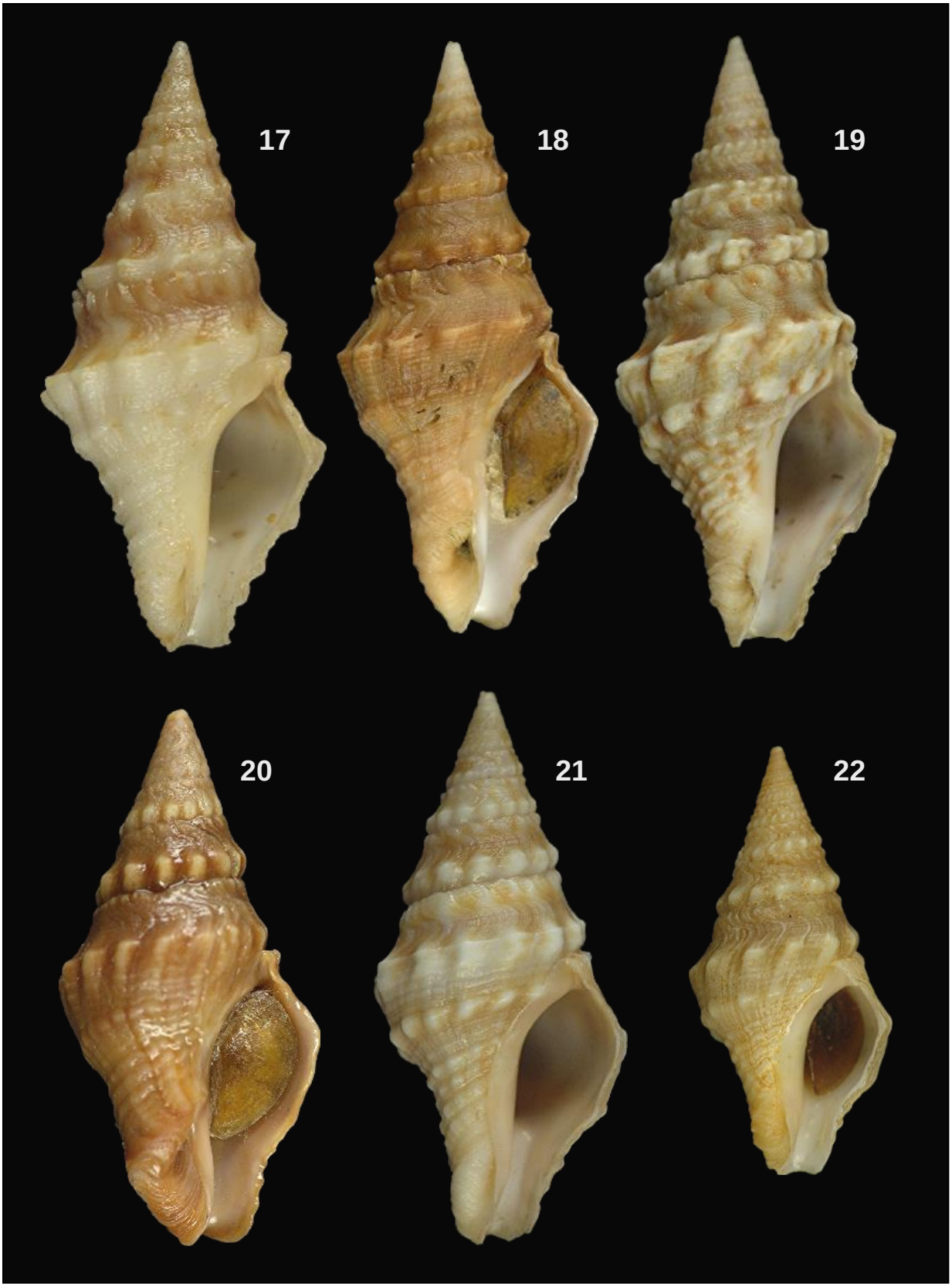

Plate IV. Figs 17-22: *Clavatula mystica* (Reeve, 1843). FN; 17: Senegal, W. Africa. Dredged by fishermen. 35.87 mm; 18: Bay of Gorée, Dakar (Senegal, W. Africa). By SCUBA-diver, under stones in rocky area at a depth of 9 m. 15 March 1978. 35.67 mm; 19: Dakar (Senegal, W. Africa). Dredged. 29.70 mm; 20: Western Sahara, W. Africa. Trawled by Spanish fishermen. 2000. 27.25 mm; 21: Lanzarote, Canary Islands. June 1973. 28.34 mm; 22: Nouadibou, Mauritania, NW Africa. Trawled by fishermen. 22.89 mm.

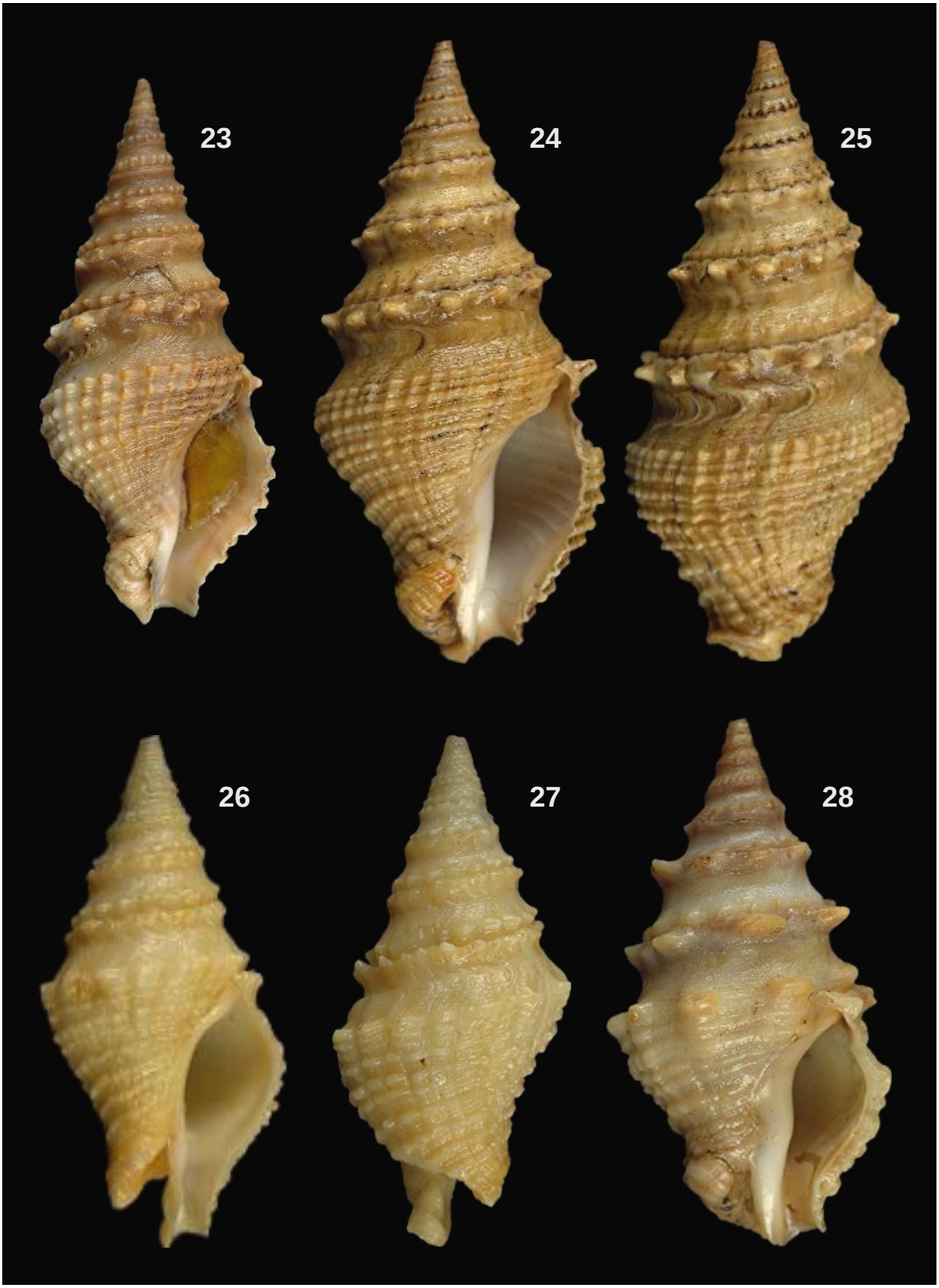

Plate V. Figs 23-28: *Clavatula regia* (Röding, 1798). FN; 23-25: Dredged off Abidjan (Ivory Coast, W. Africa). 1976; 23: 39.60 mm; 24-25: 45.68 mm; 26-27: Dredged at a depth of 5 m in Bay of Gorée, Dakar (Senegal, W. Africa). June 1977. 35.54 mm; 28: Guinea Bissau (W. Africa). Trawled by fishermen at a depth of 17 m. October 1978. 37.56 mm.

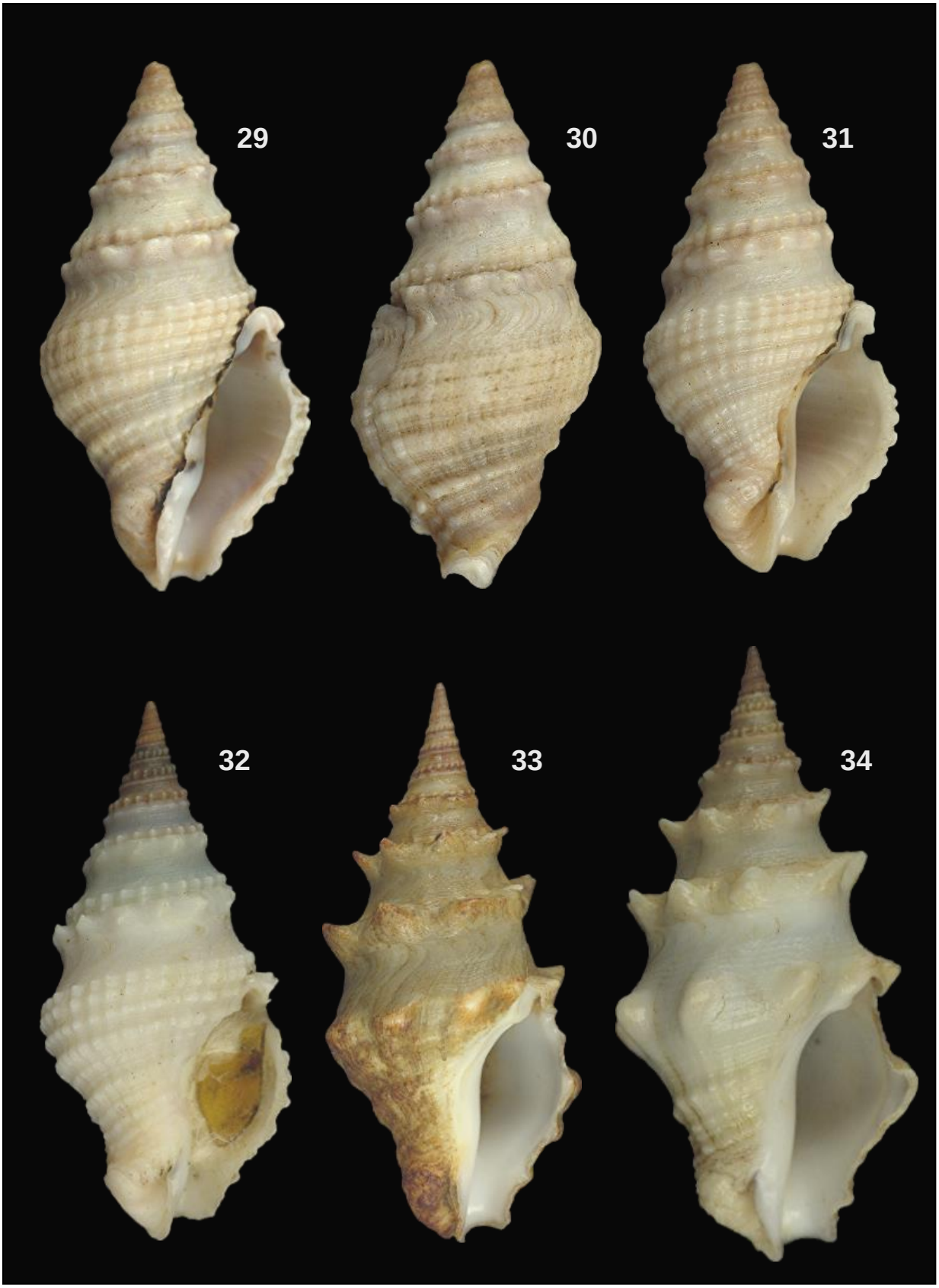

Plate VI. Figs 29-32: *Clavatula regia* (Röding, 1798). FN; 29-31: Trawled off Ambriz (Angola, W. Africa). By Belgian fishermen (PEMARCO) at a depth of 92 m. 1972; 29-30: 29.99 mm; 31: 28.32 mm; 32: Off Libreville (Gabon, W. Africa). Trawled by shrimper at a depth of 30 m. February 1979. 39.85 mm. Figs 33-34: *C. regia* var. *conica* (Lamarck, 1816). Dredged south of Luanda (Angola). Among stones at a depth of 3 m. 17 August 1996; 33: 34.27 mm; 34: 39.85 mm.

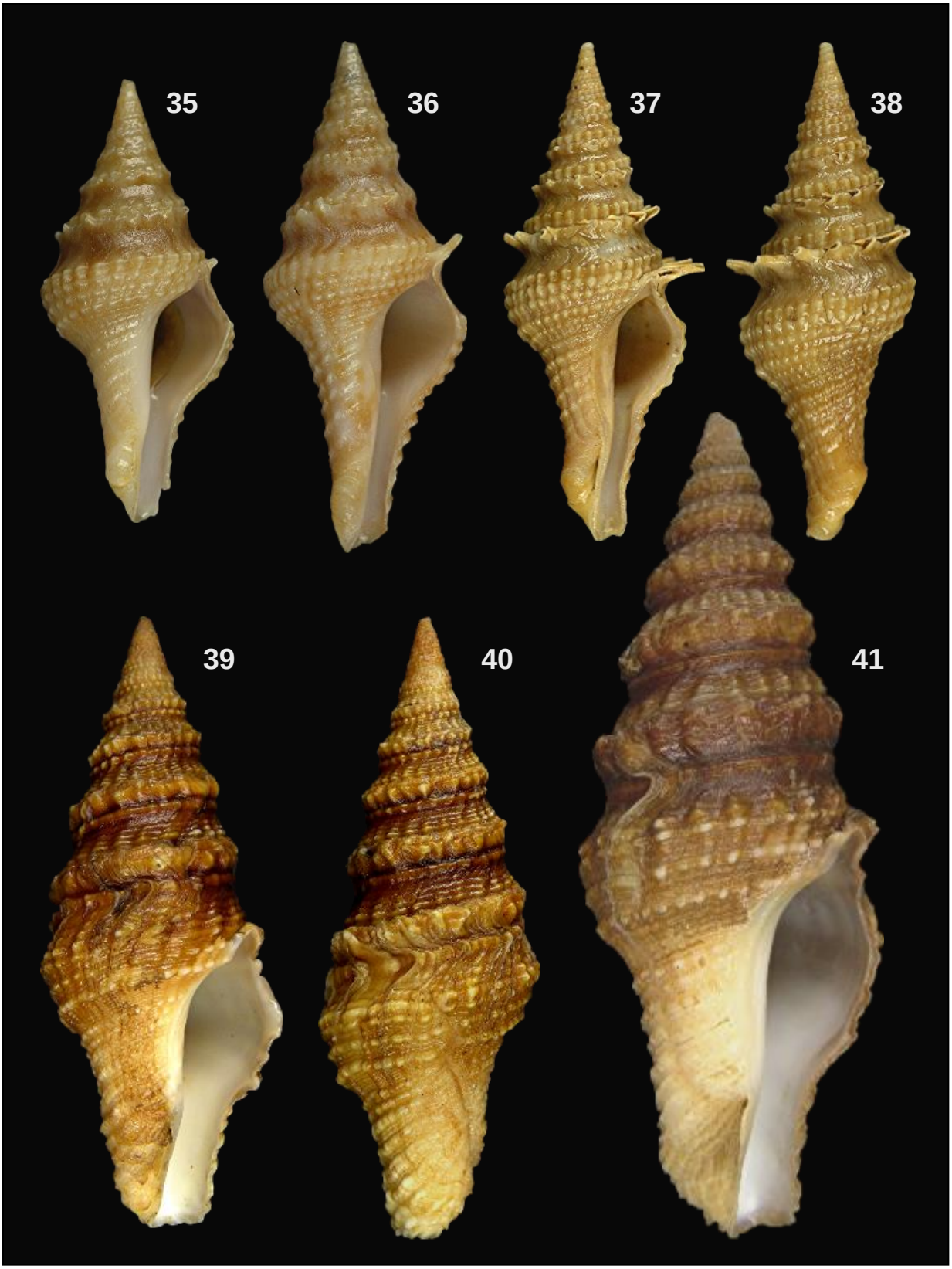

Plate VII. Figs 35-38: *Clavatula diadema* (Kiener, 1840). Dredged at a depth of 6 m in Bay of Gorée, Dakar (Senegal, W. Africa). August 1977. FN; 35: 23.55 mm; 36: 30.44 mm; 37-38: off Libreville (Gabon, W. Africa). Dredged 60 km offshore at a depth of 25 m. 28.96 mm.
Figs 39-41: *Clavatula filograna* Odhner, 1923. FN; 39-40: Dredged off Luanda (Angola) at a depth of 80 m. 51.81 mm; 41: Moita Seca (North Angola). Trawled by Belgian fishermen (PEMARCO) at a depth of 73 m. 1973. 70.52 mm.

Plate VIII. Figs 42-46: *Clavatula bimarginata* (Lamarck, 1822). Casamance (Senegal, W. Africa). Dredged in muddy sand. FN; 42-43: 41.21 mm; 44-45: 40.83 mm; 46: 51.92 mm.

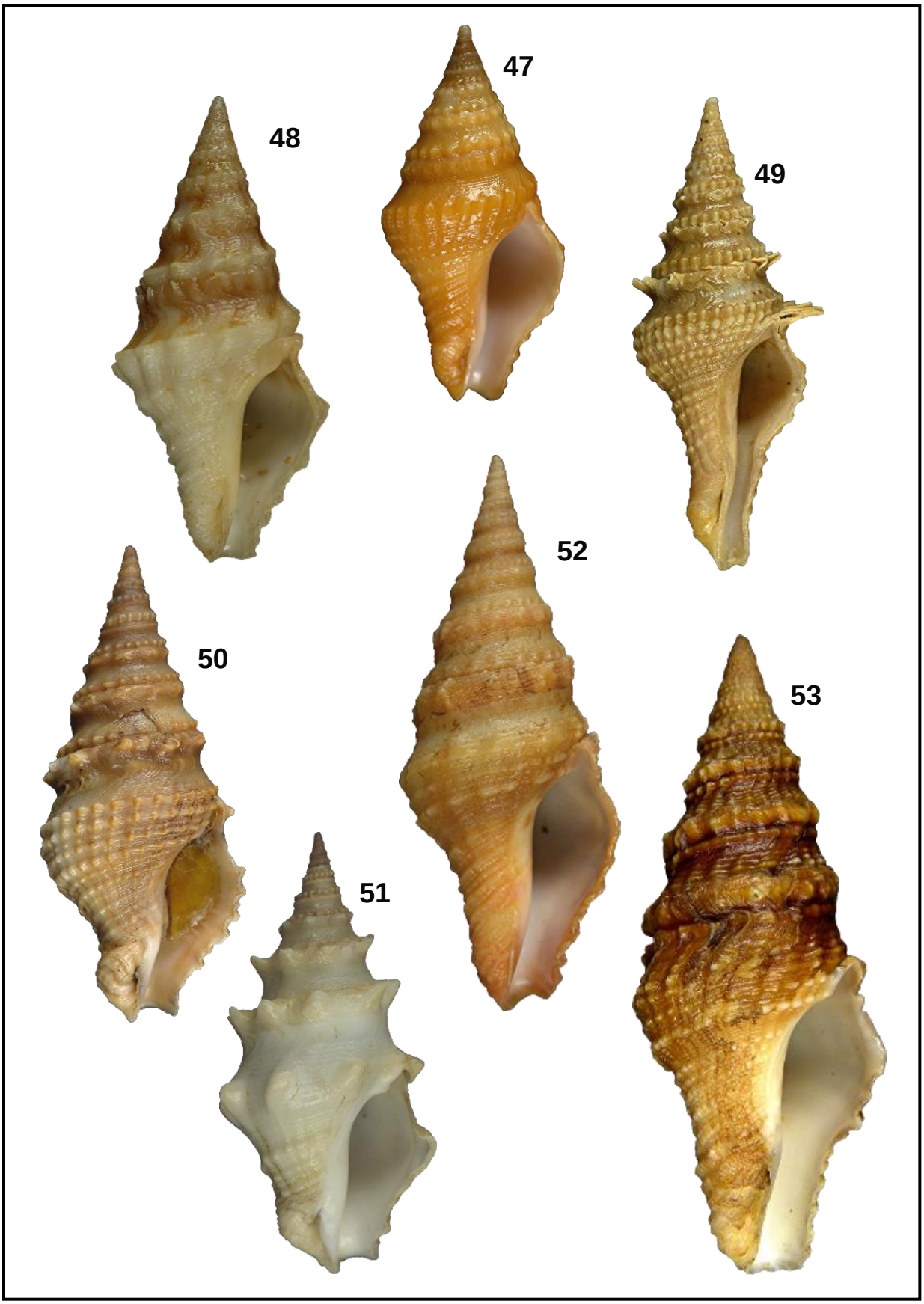

Plate IX. Fig. 47: *Clavatula knudseni* Nolf & Verstraeten, 2007; Fig. 48: *C. mystica* (Reeve, 1843); Fig. 49: *C. diadema* (Kiener, 1840); Fig. 50: *C. regia* (Röding, 1798); Fig. 51: *C. regia* var. *conica* (Lamarck, 1816); Fig. 52: *C. bimarginata* (Lamarck, 1822); Fig. 53: *C. filograna* Odhner, 1923.

About a possible further range extension for *Clavatula mystica* (Reeve, 1843) (Mollusca: Gastropoda: Clavatulidae)

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Keywords: GASTROPODA, CLAVATULIDAE[1], *Clavatula mystica*, range extension, Ivory Coast, Angola.

Abstract: Typical specimens of *Clavatula mystica* (Reeve, 1843) have been found in Abidjan (Ivory Coast) and Ambriz (North Angola), which means a serious range extension compared to the geographic distribution described by other authors (Boyer & Hernández, 2004). These individuals are completely similar to those from NW Africa, but as no other specimens have been described from the Gulf of Guinea until now, only a provisional expansion of the real distribution of this species can be stated at present.

Abbreviations:
FN: Private collection of Frank Nolf.
PEMARCO: Pêche maritime du Congo.
RBINS: Royal Belgian Institute for Natural Sciences.
ZMC: Universitets Zoologisk Museum, Copenhagen, Denmark.

Introduction: During the study of the new species *Clavatula knudseni* two specimens of *Clavatula mystica* from Abidjan (Ivory Coast) were recovered (see this paper, p. 10-22) and compared with *C. mystica*-specimens from other localities. They are similar with those trawled off Senegal and I am sure they belong to only one distinct species. Another sample contained three specimens trawled by Belgian fishermen (PEMARCO) off Ambriz (Angola) at a depth of 73 m. The latter are very different from those from Abidjan and Senegal and look like specimens found in the Canaries and Mauritania. It is remarkable that no other specimens from the Gulf of Guinea, nor from Angola are mentioned in literature. Boyer & Hernández (2004) studied the distribution of *C. mystica*, showing the variability in shell morphology. These authors state the geographic range of *C. mystica* is restricted to an area ranging from the Canaries to Senegal.

Material:
- Two specimens of a sample dredged off Abidjan (Ivory Coast) in 1976: 25.91 mm and 29.02 mm (Plate II, Figs 7-9).
- Three specimens trawled by Belgian fishermen (PEMARCO) off Ambriz (North Angola) at a depth of 75 m in 1975: 22.61 mm (live caught, with operculum), 28.18 mm and 29.70 mm (Plate III, Figs 13-18).

Discussion:
As can be deduced from its name, *Clavatula mystica* is a rather mysterious species in the sense of being very variable in appearance. Both the identification and naming of *C. mystica* have always been subject to great confusion in literature. First of all, the names *Pleurotoma mystica* and *P. sacerdos*, both Reeve, have been confused. The species *P. mystica* described by Reeve in 1843 was considered to be a variety of Reeve's species *P. sacerdos*, by von Maltzan (1883) and Dautzenberg (1891) shared the same opinion. Knudsen (1952) sent a specimen trawled by the "*Atlantide*" Expedition to the British Museum for comparison with Reeve's type of *C. mystica*. Dr. G.L. Wilkins compared it with *C. sacerdos* and was able to draw the following conclusions (in litt.) "*The species seems to be variable according to examples in our collection, differing mainly in the size of the nodules on the whorls. I have compared your specimens with the type of mystica Rve. and sacerdos Rve. Both of which are more mature but the sculpture of the spire agrees. I feel inclined to regard sacerdos Rve. as only a form of mystica Rve*." (Knudsen, 1952). So, Knudsen concluded that *C. mystica* Reeve should be considered a variety or perhaps a juvenile form of *C. sacerdos* Reeve. Furthermore, this author consolidated his arguments by comparison with the figure of C*. sacerdos* found in Nicklès (1950) and stated that the specific name *mystica* has priority over *sacerdos*. Reeve illustrated a squat wide form under the name *C. mystica* in 1843 whereas the type figure of *C. sacerdos*, which was published two years later, shows a slender shell.

[1] 'Clavatulidae recognized as family based on cladistic analysis by Rosenberg (1998), although it is not differentiated morphologically and is regarded as a subfamily of Turridae by Kantor (pers. comm.) and Syssoev (pers. comm.)' (according to Bouchet & Rocroi, 2005).

The latter illustration gives a better idea of the shells commonly found in Gambia and Senegal. Confusion arose when von Maltzan quoted *C. sacerdos* and *C. sacerdos* var. *mystica* separately. Under these circumstances von Maltzan (1883) took the taxon *C. sacerdos* as the better representative of the species. So, he indirectly recognized the synonymy between both names, even if he was not following the correct order of seniority that should prevail, introducing the custom of alternatively using both names for the same species and thus leading to a confusing taxonomic status.

Maltzan (1883, pl. 3, fig. 10) figured a gerontic specimen of *C. mystica*. Both von Maltzan (1883) and Dautzenberg (1891) considered Adanson's species *Purpura farois* ('Le Farois') identical with *C. mystica*. Unfortunately, the shell labelled as 'Le Farois' is a specimen of *C. bimarginata* (Lamarck, 1822). Judging from the figure of Fischer-Piette (1942, p. 238) Knudsen thought that the two species, *C. bimarginata* (Lamarck, 1822) and *C. mystica*, could eventually prove to be '*identical*'. Fischer-Piette (1942) admitted that Adanson's description is ambiguous and may well be based on both *C. bimarginata* and *C. sacerdos*. We think that these two species are indeed '*closely related*' but clearly different. Knudsen added several characteristics to the description of *C. mystica* by using the specimens trawled off Bathurst (Gambia) by the "*Atlantide*" Expedition. Nicklès (1950) showed a representative shell of *C. mystica* under the name of *C. sacerdos*.

We have to remark that Knudsen identified three specimens from Mr. Harry Madsen (ZMC), found in Dakar (Senegal), as *Clavatula colini* von Maltzan, 1883. Yet, it only concerns juvenile forms of *Clavatula mystica* (Plate I, Figs 5-6). The specimen (Hupfer leg.) illustrated on Pl. II, fig. 8 by Knudsen (1952) was not provided by the ZMC. Maybe it was no more available for loan. Nevertheless, from comparing both photographs it is clear that this specimen is a juvenile shell of *C. mystica* (height about 18 mm), too. The characteristics mentioned by Knudsen are typical of young specimens of this species: '*a broad brown band on the subsutural band and a somewhat more indistinct one on the lower part of the body whorl. Both these bands can be seen inside the aperture*'. *C. colini* is another mysterious species, whose real identity is contested. It might be a junior synonym of *C. mystica* or *C. rubrifasciata* (Reeve, 1845).

Characteristics[2] of *C. mystica*:

The protoconch consists of 1½ smooth, slightly bulging whorl. In the largest specimens it is followed by 9 whorls at the adult stage. An axial sculpture consisting of numerous close-set, somewhat flexuous ribs is present on the first 4 whorls following the protoconch. The upper part of the last whorl and the spire show a pyramidal outline formed by a pronounced carina situated on the upper part of the last whorl and at the base of the other whorls. This carina is bordered by rows (12-18) of spiral nodules, which develop downward undulated axial ribs. In the middle of the last whorl, a less prominent carina appears under the upper one; it is bordered by smaller and more rounded nodules. This set of two main rings is a typical characteristic of *C. mystica*. Several spiral cords of small to obsolete nodules are present along the basal part of the shell. The nodules just under the suture often change into short spines. The spiral sculpture cannot be detected on the whorls nearest to the protoconch, but gradually becomes distinct as the axial sculpture becomes less prominent.

A relatively deep notch is present at the top of the labrum. The first whorls are not carinated and show a sculpture of dextrally oriented chevrons, sometimes divided into two spiral ranks of oblique nodules, separated by one spiral rank of smaller rounded ones. Gerontic shells have a wide callous around the large umbilicus. Aperture oviform. Columella reflected. Sinus broad and situated at some distance from the suture. Length of adult shells ranges from 18 to 47 mm, sporadically up to 65 mm.

Geographic range: Mauritania, Western Sahara, Gambia, Senegal, Canary Islands, Ivory Coast, Angola.

Shells from Senegal (Plate I, Figs 1-6; Plate II, Figs 10-12) show a squatter and more angular outline, sometimes with sharper peripheral nodules, whereas those from Mauritania (Plate IV, Fig. 24), Western Sahara (Plate IV, Figs 19-21) and the Canaries (Plate IV, Figs 22-23) are slenderer, have a less pronounced carina and more obsolete peripheral nodules. These shells show a variety of ground colours, from cream-white to grey, orange, brown or black. The peripheral nodules are always creamy white and the first whorls are milky white or grey coloured. Shells from the northern area show lighter background colours going from cream-white to dull yellow-orange or light brown.

C. mystica seems to have a continuous geographic distribution from Northern Mauritania to Casamance (Senegal). No specimens are known from Guinea-Bissau, in spite of the occurrence of many other *Clavatula*-species in this region. The species is probably not present in the Gulf of Guinea (pers. comm. Peter Ryall, Maria Rain, Austria).

[2] mainly based upon Boyer & Hernández (2004).

Knudsen only mentions specimens from Gambia and Senegal and no specimens were caught in the numerous other stations of the "*Atlantide*" Expedition situated southward.
Nevertheless, two specimens that are very similar to those from Senegal were obtained from Abidjan, Ivory Coast (Plate II, Figs 7-9). Again according to Peter Ryall it is possible that fishermen from Abidjan caught these shells off the coast of Senegal and brought them to Ivory Coast, where a local shell collector bought them. So, this locality might be doubtful but what to say about the find of three specimens from Ambriz, North Angola (Plate II, Figs 13-18) which were trawled by PEMARCO at a depth of 73 m in 1973. Locality data offered by these Belgian fishermen often proved to be very reliable. Many new species (e.g. *Bolma christianeae*, *Clavatula nathaliae*, *Clavatula quinteni*, *Clavatula xanteni*, *Nucula mariae*) were found by this fishery in the vicinity of the Congo-river in the north of Angola. It is remarkable that these specimens show the same outline as those from Mauritania or the Canaries. Yet, the length, 22 to 30 mm, is relatively large compared to specimens from the northern area. This report has to be confirmed by finding more specimens from Angola or adjacent waters in the future. At present, it can only be explained by the presence of the same ecological habitat and the fact that so little material has always been gathered from the Gulf of Guinea (Congo, Cameroon, Gabon, Nigeria, Benin, Togo) till now. At last it must be said that the results from the "*Atlantide*" Expedition were rather poor. It is noticeable that so few molluscs were dredged at all. Moreover most specimens were dead caught and often only fragments were brought up.

Acknowledgements: Thanks goes out to Mrs. Annie Lone Vedelsby (ZMC) for the loan of specimens of *Clavatula colini*, to Peter Ryall (Maria Rain, Austria) and Johan Verstraeten (Oostende, Belgium) for partly, respectively completely discussing the content of this paper. Finally to David Monsecour for a careful control of the English text.

Conclusion: The geographic distribution of *C. mystica* should to be extended through the Gulf of Guinea to North Angola. Provisionally only two specimens from Ivory Coast and three specimens from Ambriz (Angola) are known. More material from this area has to be obtained before we can conclude *C. mystica* is a species living along the complete West African coast, from Mauritania to Angola, or whether it concerns isolated populations.

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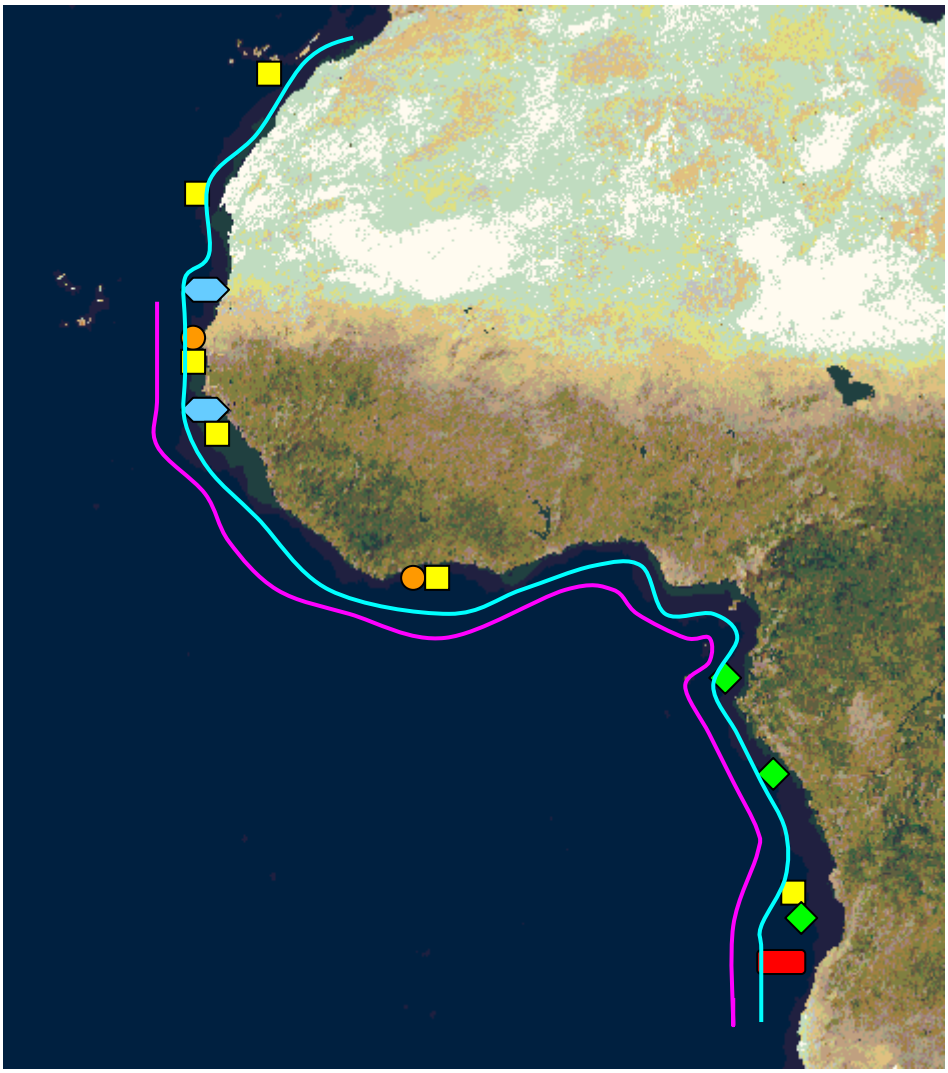

Geographic distribution of several *Clavatula*-species in West Africa

Clavatula knudseni **Nolf & Verstraeten**

C. bimarginata **(Lamarck, 1822)**

C. diadema **(Kiener, 1840)**

C. filograna **Odhner, 1923**

C. mystica **(Reeve, 1843)**

C. regia **(Röding, 1798)**

C. regia **var. *conica*** **(Lamarck, 1816)**

Plate I. Figs 1-6: *Clavatula mystica.* FN; 1-2: Senegal, W. Africa. Dredged by fishermen. 35.87 mm; 3-4: Bay of Gorée, Dakar (Senegal, W. Africa). By SCUBA-diver, under stones in rocky area at a depth of 9 m. 15 March 1978. 35.67 mm; 5-6: Dakar (Senegal, W. Africa). 14 April 1927. Coll. Harry Madsen in ZMC. 18.26 mm.

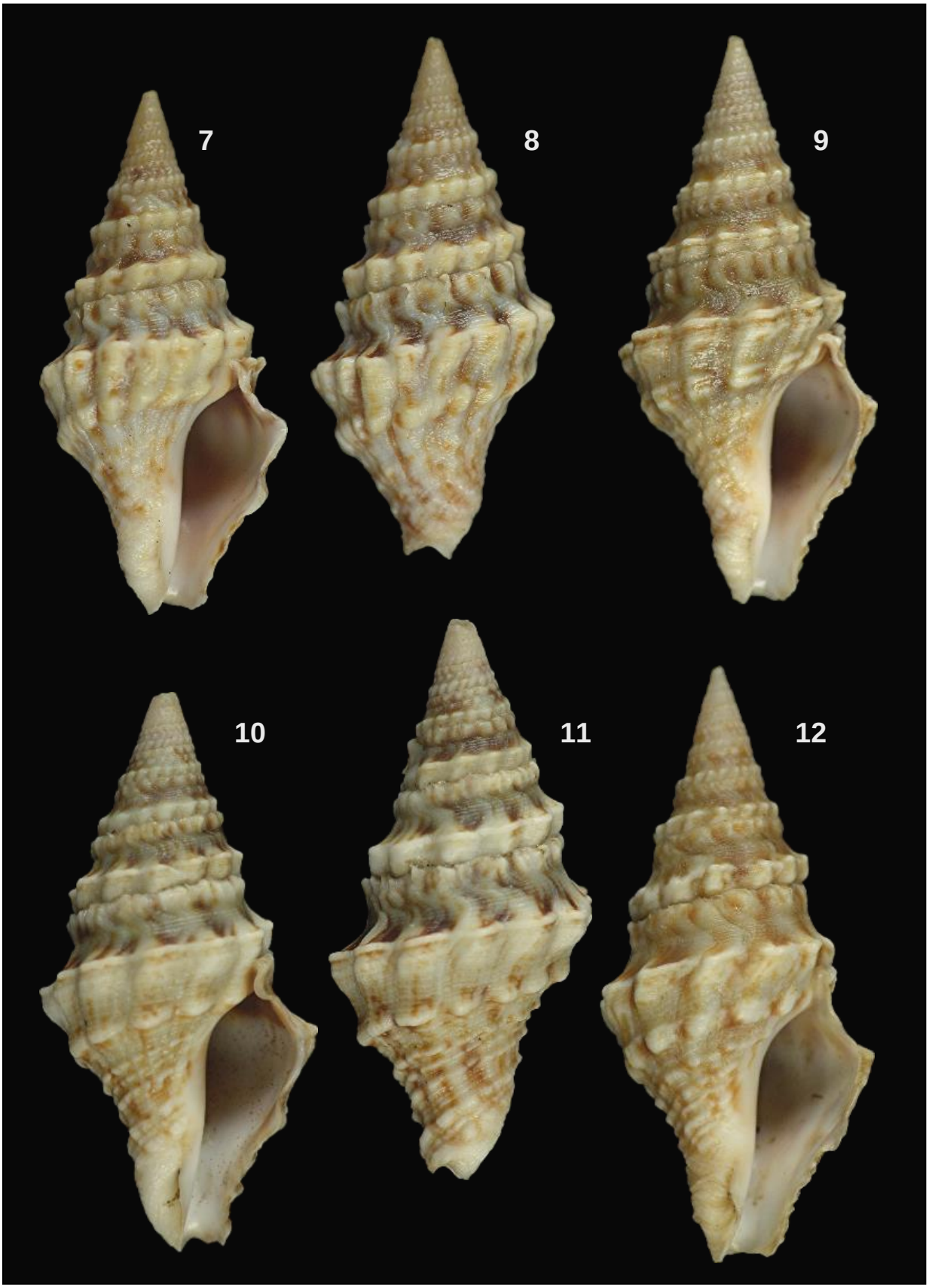

Plate II. Figs 7-12: *Clavatula mystica.* FN; 7-9: Dredged off Abidjan (Ivory Coast, W. Africa). 1976; 7-8: 25.91 mm; 9: 29.02 mm; 10-12: Dakar (Senegal, W. Africa). By SCUBA-diver, under stones in rocky area at a depth of 9 m. 15 March 1978; 10-11: 27.96 mm; 12: 29.70 mm.

Plate III. Figs 13-18: *Clavatula mystica.* Off Ambriz, Angola, W. Africa. Trawled by Belgian fishermen (PEMARCO) at a depth of 73 m 1973. FN ; 13-14: 22.61 mm; 15-16: 28.18 mm; 17-18: 29.70 mm.

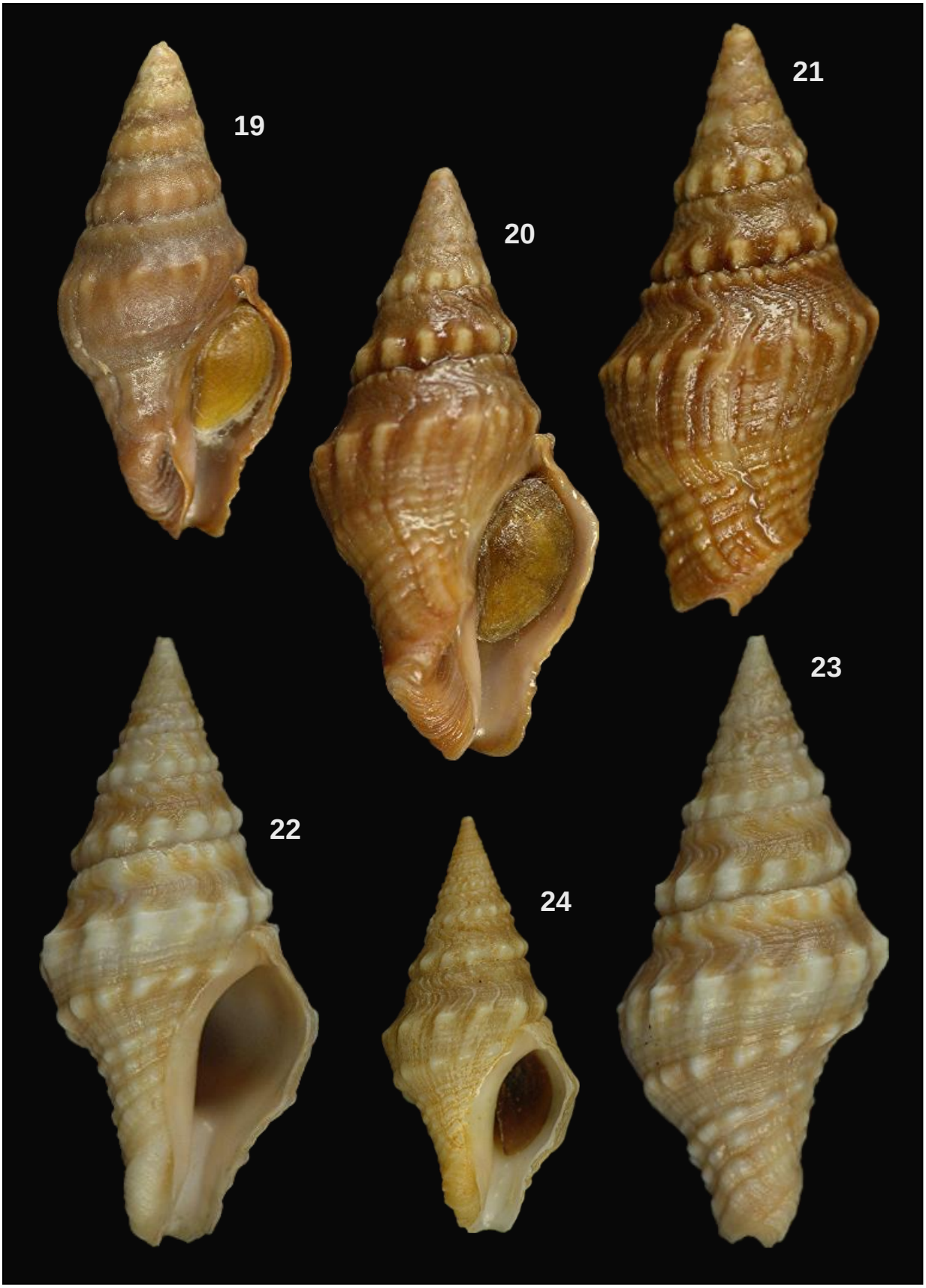

Plate IV. Figs 19-24: *Clavatula mystica.* FN. 19-21: Western Sahara, W. Africa. Trawled by Spanish fishermen. 2000; 19: 25.16 mm; 20-21: 27.25 mm; 22-23: Lanzarote, Canary Islands. June 1973. 28.34 mm; 24: Nouadibou, Mauritania, NW Africa. Trawled by fishermen. 22.89 mm.