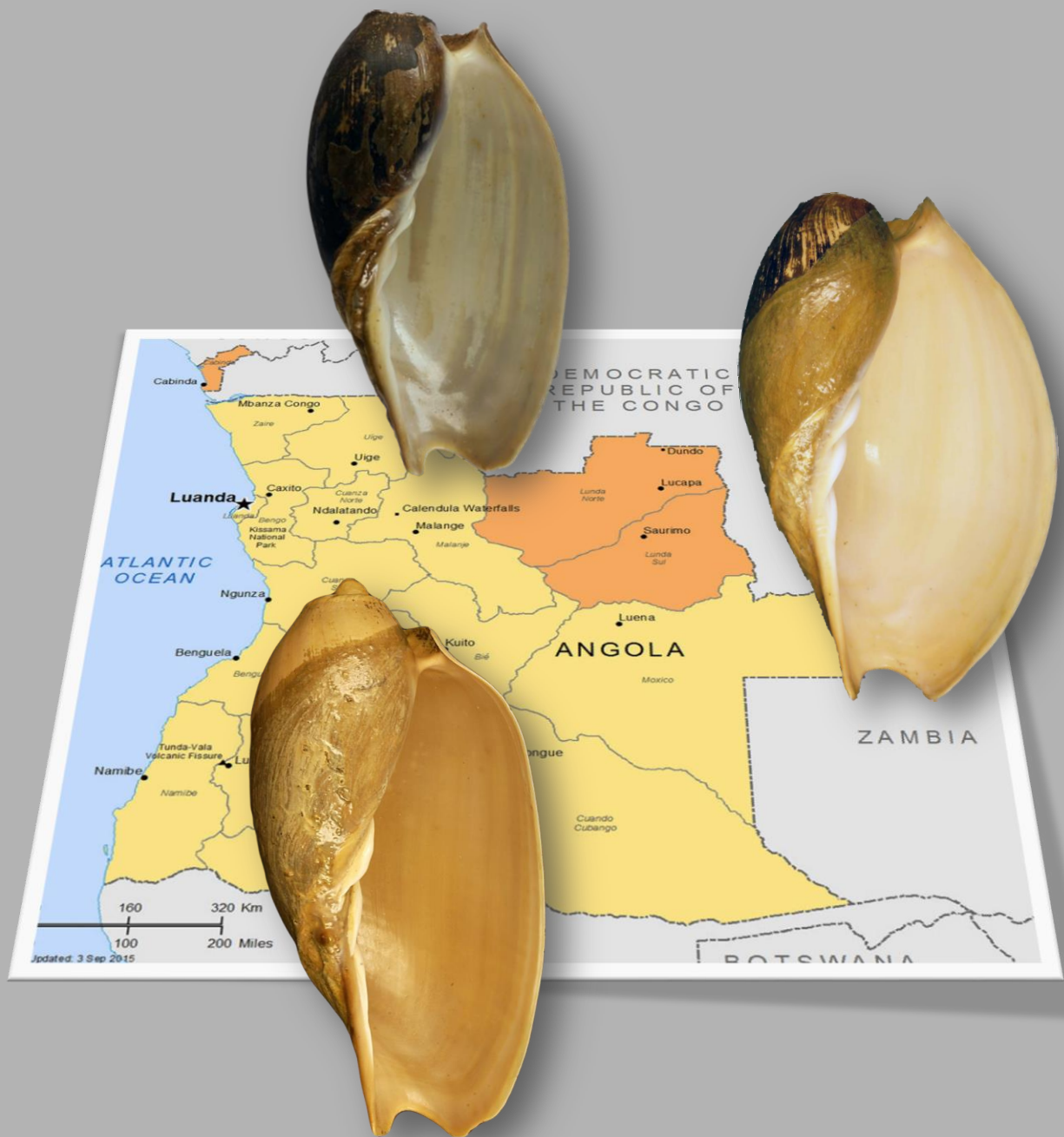


NEPTUNEA

vol.14, n°3 December 2017



Kon.B.V.C. Section Coast
is a branch of the
'Koninklijke Belgische Vereniging voor Conchylologie' (Kon.B.V.C.)
(Royal Belgian Society for Conchology)

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Layout: Frank Nolf

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'NEPTUNEA' is a publication of B.V.C. Section Coast,
issued four times a year on irregular basis

Responsible editor: Frank Nolf, Pr. Stefanieplein 43 B8, B-8400 Oostende, Belgium

Legal deposit: BD 52.109

The distribution of species belonging to the genus *Cymbium* (Mollusca: Gastropoda: Volutidae) in Angolan waters and the description of a new species

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Keywords: *Cymbium*, VOLUTIDAE, Gastropoda, Mollusca, new species, Angola, Congo-Kinshasa,

Abstract: The present paper deals with the distribution of species within the genus *Cymbium* (Gastropoda: VOLUTIDAE) along the coasts of Angola from the mouth of the Congo River in the north to the mouth of the Cunene River in the south. Two known species occur in that area and a third, new one is described from the mouth of the Congo River, where it lives in a restricted distribution range.

Abbreviations:

CFN: Private collection of Frank Nolf (Oostende, Belgium)

PEMARCO: Pêche maritime du Congo

RBINS: Royal Belgian Institute for Natural Science (Brussels, Belgium)

ZSM: Zoologische Staatssammlung München, Germany

NHMUK: Natural History Museum (London, UK)

Introduction: Hundreds of interesting shells were gathered by A. Coenye, a Belgian navigating officer of PEMARCO, when he operated off the coasts of Congo-Kinshasa and Angola in the years 1960-1973. The late Mrs. Kermarrec-Labisse (1908-1992) obtained most of his collecting efforts which are now part of the author's collection. Between Cabinda (Angola) and the mouth of the Cunene River (the border between Angola and Namibia, SW Africa) a lot of new or uncommon species were trawled: *Acesta angolensis* Adam & Knudsen, 1955; *Adinopsis skoogi* Odhner, 1923; spectacular specimens of *Aporrhais pesgallinae* Barnard, 1963; *Clavatula quinteni* Nolf & Verstraeten, 2006; *Clavatula xanteni* Nolf & Verstraeten, 2006; *Cymbium patulum* (Broderip, 1830); *Europicardium nolfi* Swinnen, 2010; *Fusinus albinus* A. Adams, 1856; giant specimens of *Fusinus caparti* Adam & Knudsen, 1955; *Glycymeris rafaelmesai* Nolf & Swinnen, 2013; large specimens of *Latirus mollis* G.B. Sowerby III, 1913; *Nucula mariae* Nolf, 2005; *Phenacovolva patriciae* Nolf 2008;

Pteropurpura dearmatus fairiana (Houart, 1979); *Xenophora testigera digitata* von Martens, 1878 and many others in the families MARGINELLIDAE, MURICIDAE, TURRIDAE, CLAVATULIDAE and DRILLIIDAE.

Among all these shells hundreds of *Cymbium* specimens were present. Most of them have been kept in the collections of the late Mrs. Kermarrec-Labisse and the present author for more than fifty years waiting for comparison with as much material from other sources as possible making the description of a new species appropriate and justified.

Genus *Cymbium* Röding, 1798

Type taxon: *Cymbium cymbium* (Linnaeus, 1758) (type by absolute tautonomy)

Synonyms: *Cymba* Broderip, 1826; *Yetus* Bowdich, 1822.

The thirteen known species - and the additional new one, described in this paper - in the genus *Cymbium* are geographically distributed from the western end of the Mediterranean Sea and the coast of Portugal and then southward to West Africa ending at the border of Angola and Namibia (range extension herein). In contrast to what is generally believed the presence of *Cymbium* species on the Canary Islands is very doubtful. *Cymbium* shells, handled by dealers and shell collectors and labeled as coming from the Canaries, are most probably brought in by Spanish fishermen dredging off the coasts of Mauritania and Morocco.

Cymbium species have a bathymetric range from the littoral to about 50 m, but a few species also occur in deeper waters from 100 to 180 m.

Animals of *Cymbium* are voracious predators on other molluscs by enveloping their victims with their giant foot before consumption.

They are ovoviviparous: the extremely small eggs are kept in a pedal gland which assumes the role of an incubation pocket. The embryos develop and become the exact replicas of their parents. They attain a shell length of 30-55 mm and are then expelled via the foot of the mother.

Most *Cymbium* prefer a habitat of mud and sand bottoms in quiet bays or lagoons from the littoral to about 50-75 m.

In spite of their relatively large dimensions and solid appearance the West African species of the genus *Cymbium* belong to a taxonomically not fully defined group within the family VOLUTIDAE. The genus *Cymbium* has often been subject of a thorough study in ancient and recent literature: Broderip (1830), Pallary (1930), Weaver & DuPont (1970), Tripodi (1972), Bruynseels (1975), Marche-Marchad (1977), Marche-Marchad & Rosso (1978), Fittkau & Stürmer (1980 & 1985), Poppe & Goto (1992). A few new species were described in the previous decades, other species redescribed because they were confused with similar species or forgotten by lack of recently collected material, despite the limited number of species. Many authors tried to revise the genus *Cymbium* but most attempts failed since the material studied was obtained from unreliable sources and often data or conclusions were copied from each other. Descriptions often refer to wrong figures and otherwise pictures are accompanied by incorrect captions. Top of the bill is the illustration by Eisenberg (1981) of eight different species of *Cymbium* on Plate 93 of which none was correctly identified.

The main problem is the lack of accurate locality data, certainly since most specimens are obtained from fishermen and are intended for food purposes or processed as utensils. On the other hand the material used in the present study was gathered by a Belgian fishermen who got the assignment to pay attention to detailed information about localities, depth and habitat.

An important difficulty when studying shells of the genus *Cymbium* is the individual variability and above all the scarce number of morphological characteristics that can be used in the diagnosis, the standardised shape and the absence of sculpture in this kind of shells, the relative small differences in colour and general outline between most species, the possible influence of habitat conditions and sexual dimorphism creating a more bulbous last whorl and a wider aperture in female specimens.

In this study the following conchological characteristics are taken into consideration: general shape of shells, number of columellar folds, condition of protoconch, internal and external colour of shell, aspects of enameled layer, periostracum. Particular attention was paid to the condition of the sutural ramp, the protoconch and its possible callus, the adapical siphonal notch, the extension of the shoulder, the periostracum and at last the colour inside the aperture. First it was checked whether the differences are constant within a certain species.

In a preliminary step, it is very important to use at least three parameters to decide if a species can be separated from similar species in a conchological way. A final diagnosis can appear later on, after comparison of the shell characteristics with the shape of the radula, the aspect and the colour of the newborn larva, the number of larvae per birth, the pigmentation or pattern of the soft parts and finally the results of DNA barcoding research.

There is certainly need for a complete revision of this genus by means of extensive field work along the West African coasts. Up to now the molluscan fauna of the Angolan waters has still not been fully studied. I hope that this paper can result in a better comprehension of the differences among some of the *Cymbium* species living from the north to the south of the Angolan coasts, especially with regard to the study of *Cymbium fragile*, *C. pachyus* and *C. patulum*, so often confused in the past.

***Cymbium coenyei* nov. sp.**

Pl. VI, Figs 18-21; Pl. VII, Figs 22-25; Pl. VIII, Figs 26-29; Pl. IX, Figs 30-33; Pl. X, Figs 34-37; Pl. XI, Figs 38-41; Pl. XII, Figs 42-45; Pl. XIII, Figs 46-49; Pl. XIV, Figs 50-53; Pl. XV, Figs 54-57; Pl. XVI, Figs 58-61; Pl. XVII, Figs 62-65.

Type material: 15 specimens from a total of 58 specimens.

Holotype: off the mouth of the Congo River, near the lighthouse between Banana and Cabinda, Democratic Republic of the Congo. 05°59' S/ 12°21' E. Trawled by Belgian fishermen (PEMARCO) from a muddy bottom at a depth of ca 20 m. 1967. RBINS (IG 33588, MT 3618). 121.23 mm.

Paratypes: All from the type locality and housed in the collection of the author (CFN).

Paratype 1: 152.79 mm

Paratype 2: 135.29 mm

Paratype 3: 146.62 mm

Paratype 4: 113.69 mm

Paratype 5: 138.59 mm

Paratype 6: 139.91 mm

Paratype 7: 114.33 mm

Paratype 8: 125.89 mm

Paratype 9: 115.92 mm

Paratype 10: 139.76 mm

Paratype 11: 90.39 mm

Paratype 12: 118.75 mm

Paratype 13: 117.35 mm

Paratype 14: 118.92 mm

Type locality: off the mouth of the Congo River, near the lighthouse between Banana and Cabinda, Democratic Republic of the Congo. 05°59' S/ 12°21' E.

Description: Shell heavy and solid. Slender in outline with a rather straight outer lip, only slightly globose. Protoconch is sunken into the apical cavity and nearly completely covered by a brown callus. Only the sutural incision of the body whorl is visible. Sutural ramp rather broad, weakly curved and gradually declining from the border of the body whorl. The vertical position of the protoconch compared to the shoulder's ridge is variable and is not a constant feature to differentiate this species from similar *Cymbium* species.

Posterior shoulder ridge of the body whorl carinated and somewhat reflected outwards. Columella with three folds, occasionally a very obscure fourth plait, all variably white, creamish white, brown or grey coloured. The adapical part is bluish grey, a typical characteristic in the species. Adapical area is narrow and rather small with nearly straight parallel borders, only slightly globose in female specimens.

The interior of the aperture is light brown coloured with streaks of grey with a brown border near the aperture's edge, the outer surface is greyish brown. Periostracum very thin and olive-brown coloured, usually for $\frac{1}{4}$ covered by a bluish-grey callus. Nearly all specimens show incorporated oil residues or mud particles in the periostracum. After removal of parts of it a number of parallel lines from the microsculpture becomes visible, a characteristic also present in some specimens of *C. fragile* and *C. patulum*. Siphonal notch slightly flattened and not as wide and deepened as in *C. patulum*. It is uniformly brown coloured.

Animal: Unknown.

Etymology: The name *Cymbium coenyei* refers to the Belgian navigating officer André Coenye who operated in the Angolan waters from 1960-1973, but is now retired. A. Coenye has contributed to our present knowledge of the West-African molluscan fauna in a very important way by offering us shells with accurate locality data, which is not so evident as far as fishermen are concerned.

Habitat: On a muddy bottom at a depth of 20 m.

Measurements: from 90 to 153 mm.

Geographic distribution: At present, specimens are only known from the type locality, but it is quite possible that more specimens can be found in other West-African areas, certainly as this species was often confused with *Cymbium patulum* (Broderip, 1830) in the past.

Discussion: At the beginning of this investigation, thirty years ago, I first considered *C. coenyei* as merely a form or a subspecies of *C. patulum*. Although my specimens of *C. coenyei* were collected in a rather limited area – the mouth of the Congo River – they did not come from isolated waters. Therefore, the subspecies hypothesis could be rejected. It can be supposed that several specimens labeled, figured and described as '*C. patulum*' in literature came from the same locality (the mouth of the Congo River) or a similar habitat namely the mouth of any other West African river. At present I do not know of any other localities, but I would not be surprised if more material appeared later on. The supposition of a local phenotype also has to be rejected since all specimens of that area are similar and no intergrades with *C. patulum* have been found. The differences with *C. patulum* are too constant to consider the new species merely a variety of it. As more and more material became available during this study, it became clear *Cymbium coenyei* is a separate species. It has a lot of specific characteristics but the most important one is the position of the protoconch which is sunken and completely covered by a thick brown callus. There is no sutural incision visible in contrast with *C. patulum*. Other characteristics are the narrow adapical region and the bluish-grey colour of the adapical area, the light-brown mouth with grey streaks and a brown border near the edge.

Cymbium fragile is a more fragile and lighter shell, mostly very slender, with a raised protoconch extending above the shoulder ridge, not covered by a callus, with a sharp outer lip and a very narrow deeply incised sutural ramp with the shoulder ridge curved inwards. The adapical notch is very narrow.

Table I resumes all the parameters used to separate the three species. It is clear they can easily be differentiated from each other.

Cymbium coenyei was already illustrated by Bruynseels (1975) on PL. IV, fig. 3 (labeled '*Cymbium patulum*') and by Poppe (1992) on Pl. 84, figs 1-2 (also labeled '*Cymbium patulum*').

***Cymbium patulum* (Broderip, 1830)**

Pl. I; Pl. II, Figs 1-4; Pl. III, Figs 5-8; Pl. IV, Figs 9-12; Pl. V, Figs 13-17.

Type: One syntype can be found in the NHMUK.

Original description by Broderip: '*Shell tumid, gibbous towards the outer lip, brownish red, covered with a brownish epidermis, partially coated, as in the last species [= C. tritonis*

(Broderip, 1830)], with an enamel-like glaze. The spire is excavated and open, the rounded apex partly apparent, and the upper border of the body-whorl carinated, and somewhat reflected. The pillar, which has four plaits, is straighter than that of *Cymba Neptuni* [= *Cymbium pepo* (Lightfoot, 1786)] and *Cymba Tritonis*, and the aperture from the gibbous extension of the outer lip is very wide. The shells of all the individuals of this species seen by the author have the appearance of being full-grown, and are very much inferior in size to the two species last described [*Cymbium pepo* (Lightfoot, 1786) and *Cymbium tritonis* (Broderip, 1830)].

Pallary (1930) refers to a specimen in the Dautzenberg collection (RBINS) with the same characteristics: a cream-orange coloured interior side of the aperture and white columellar folds.

Description: Shell light and tumid, gibbous towards the sharp outer lip, brownish red, covered with a brownish epidermis, partially coated with an enamel-like glaze. Protoconch slightly raised and not covered by a callus. The spire is excavated and open. The sutural incision in adult specimens runs over a distance of 450° to 540° from the apex to the edge of the body whorl. Posterior shoulder ridge of the body whorl carinated and somewhat reflected outwards. Columella with three plaits and a fourth weaker fold; it is rather straight and the aperture from the gibbous extension of the outer lip is very wide in female specimens. The interior colour of the aperture is creamish white with streaks or blotches of salmon orange.

Periostracum dark olive brown in colour with a silky appearance and about ¼ of it is concealed by a callus. This layer often contains small particles gathered by the animal's mantle from a sandy-mud or gravel bottom. As with other species in the same region specimens may show traces of oil pollution but to a lesser degree than in *Cymbium coenyei*.

Type locality: 'Oceano Africano' (sic).

Habitat: Trawled between 70 and 100 m (off Luanda, Morro, Quicombo), or 170-180 m (off the border between Angola and Namibia). Lives on a muddy bottom.

Measurements: From 85 to 170 mm in length.

Geographic distribution: At present it is not appropriate to state that specimens of *C. patulum* live north off the border between Congo-Kinshasa (Democratic Republic of the Congo) and Angola. I presume that many juvenile specimens of *Cymbium senegalensis* Marche-

Marchad, 1978 were considered as *C. patulum* in the past, resulting in an extension of the distribution area of the latter from Angola to Senegal, without checking if this species could also be found between Senegal and Cameroon. G.T. Poppe was one of the authors involved but recently he was so honest to confess on the website of Conchology, Inc. that he copied the information from the booklet of K. Bruynseels (1975) and mentioned 'from Senegal to Angola'.

Discussion:

Weaver & DuPont (1970) considered this species as a junior synonym of *Cymbium pepo* (Lightfoot, 1786) without further explanation. They even treated *Cymbium pachyus* as the most southernmost *Cymbium* species, and so they neglected all reports of any *Cymbium* south of Cameroon. This is astonishing, taking into consideration that at the time of publication of 'The Living Volutes' hundreds of *Cymbium* specimens from Angola were handled and exchanged by André Coenye and the late Mrs. A. Kermarrec-Labisse all over the world. The latter shell collector made no differences among the three species: *C. patulum* and *C. fragile* – *C. coenyei* (both not yet described at that time – 1963-1973) and she labeled all her specimens as '*Cymbium patulum* – Angola'. Later on I came into contact with the fisherman himself and I could obtain more accurate information on the exact localities: mouth of the Congo River as far as *C. coenyei* is concerned and 'Luanda, Ambriz, Morro, Quicombo and mouth of the Cunene River' in case of *C. patulum* and *C. fragile*. A. Coenye was the first to remark that we were dealing with a separate species, but he did not distinguish *C. fragile* from the other species.

According to Bruynseels (1975) *C. patulum* lives 'from Senegal to southern Angola'. This is a very doubtful statement since his illustrations and probably even his conclusions are based on wrong identifications: P. IV, fig.1 is *C. fragile*, fig.2 is probably also a *C. fragile*, fig.3 is *C. coenyei* and finally fig.4 is indeed a *C. patulum*. Fortunately, the latter shell was used by Bruynseels to make his personal description of *C. patulum*. Even more, this shell (ex coll. R. Vanwalleghem) was also originally dredged by a Belgian fishermen (PEMARCO) in Angolan waters.

The '*Cymbium patulum*' figured by Ardovalini & Cossignani (2004) is most probably *Cymbium cucumis* Röding, 1798. The description of *C. patulum* by Poppe (1992) refers to both *C. patulum* and *C. coenyei* and the specimen illustrated on Plate 84, figs 1-2 is *C. coenyei*.

C. patulum can readily be distinguished from *C. coenyei* by the following characteristics: the

lighter and more globose shell, the sutural incision over a distance of 450° to 540° compared to the absence of it in *C. coenyei*, the creamish white to salmon-orange coloured mouth, the wider adapical notch and the broader adapical area.

***Cymbium fragile* Fittkau & Stürmer, 1985**

Pl. XXI, Figs 84-87; Pl. XXII, Figs 88-91; Pl. XXIII, Figs 92-95; Pl. XXIV, Figs 96-99; Pl. XXV, Figs 100-105; Pl. XXVI, Figs 106-110.

Type: Holotype ZSM nr. 1787 – Benin, 162 mm; 53 paratypes are dispersed in ZSM, RBINS (unfortunately no single specimen could be retrieved by the present author during a visit to the RBINS), Fittkau coll., Stürmer coll.

Most of the studied material was obtained from fishermen or purchased on fish markets in Togo. A smaller number of 20 specimens was trawled in the western Mediterranean Sea. In fact this sample was obtained from a shell collector who could guarantee these shells were dredged off the coast of northern Morocco.

Type locality: Benin.

Description: A thin light shell. Slender with an oval outline. Microsculpture of the outer surface shows fine growth marks and is still partially visible under the periostracum. Growth marks partly bleached. Sometimes the body whorl is transversed by a series of more than fifty dark-brown parallel lines. The protoconch is elevated, clearly visible and not covered by a callus. The parietal area from the umbilicus to the shoulder is covered with a glazy callus for 1/3 of the surface of the last whorl. The shoulder is strongly curved over the narrow deep slope of the sutural platform. No callus visible at the interior side of the very narrow sutural platform.

The edge of the mouth is sharp and thin, except of course in older specimens. Number of columellar plaits: 3-4, sometimes 5. Siphonal notch broad and not deeply incised.

Periostracum thin, red to blackish-brown or olive-brown coloured, sometimes brown with a weak olive-green tint, darker in the siphonal region. Inside of the shell is orange-cream or reddish-brown coloured.

Fittkau & Stürmer (1985) mention a 'slender' and a 'broad' form. The first one is wider in the apical and the second one is broader in the siphonal region or in the middle. I agree with G.T. Poppe (1992) that this difference may be attributed to sexual dimorphism, a phenomenon also observed in other *Cymbium* species such as *C. patulum* and *C. coenyei* nov. sp.

Habitat: In sandy mud at a depth of 100 m (Ambriz, Cape Morro, off Luanda in Angola) and at ca 180 m (off Cape Fria, Namibia). Specimens have often accumulated oil residues in the callus and the periostracum of the body whorl, giving it a partially dark brown appearance.

Measurements: Between 80 and 200 mm.

Geographic distribution: Ivory Coast, Ghana, Togo, Benin, Nigeria, Gabon, Angola (the mouth of the Cunene River as the southern limit is a range extension in this paper).

Fittkau & Stürmer report specimens from the Mediterranean coast of Morocco. This locality seems not very reliable since Spanish fishermen frequently fish along the West African coast and, besides their catches of tons and tons of langoustines, also sell shells to collectors in Morocco and Spain. They are certainly not concerned with providing accurate locality information on a small sample of shells. It would be very surprising that there was a gap in the distribution range and that no specimens are reported from Senegal to the north of Morocco.

Discussion: Bernard (1984) illustrates *Cymbium fragile* on Pl. 35, figs 146 ('*Cymbium glans*') & 147 ['*Cymbium patulum*' (sic)]. Bruynseels (1975) shows it on PL. IV, fig. 1 and PL.V, figs 5-6 (ex coll. F. Nolf) identified as the rejected *C. caputvelatum* Bruynseels, 1975.

Cymbium senegalensis Marche-Marchad, 1978 is larger, also more globose and the apex is not elevated. The shell of *C. senegalensis* is much thicker and heavier.

C. fragile is different from the other *Cymbium* species by its protoconch extending above the shoulder and its very slender form, except for female specimens which have a more globose appearance. *C. patulum* is generally smaller. It has a more globose last whorl with a flatter and wider sutural ramp compared to *C. fragile* with its deeper very small sutural incurvation. The aperture in *C. fragile* is mostly brown coloured in contrast with the creamish-orange mouth of *C. patulum*.

I thought it was also useful to compare the three species discussed before with one of their closest neighbours:

***Cymbium pachyus* (Pallary, 1930)**

Pl. XVIII, Figs 66-69; Pl. XIX, Figs 70-76; Pl. XX, Figs 77-83.

Type: Holotype and 1 paratype, designated by M. Nicklès in 1951, Dautzenberg Coll., RBINS.

Original description by Pallary (1930):

'Coquille de taille moyenne, à mamelon saillant, entouré d'une rampe plan-concave, très peu excavée, bordée par une arête émoussée. Bord externe épais, très dilaté un peu au-dessous de la partie médiane, sinus supérieur profond, sinus inférieur très peu incurvé. Bord columellaire orné de trois plis forts et d'un quatrième inférieur très petit.'

Pallary (1930) made a description of this shell based upon two specimens in the collection Ph. Dautzenberg (RBINS) (with the inscription '*C. patulum*', see Pl. XVIII, Figs 66-69). A third shell was illustrated by Pallary on Pl. 1, fig. 3 in Révision du genre *Yétus*. *Annales du Musée d'Histoire Naturelle de Marseille*, 22: Mém. 3, and was named *Yetus pachyus* var. *minor*. However, the latter is most probably a specimen of *C. patulum* since the protoconch extends above the shoulder edge and the general outline is more dilate. M. Nicklès identified both specimens as *C. pachyus* in 1951 and he claimed they were identical to both drawings of *Yetus pachyus* in Pallary's work.

It can be supposed that both were originally entirely covered by a glazy callus since remains of this layer are visible on the posterior shoulder ridge and on the external side of the siphonal notch. Both specimens still have a callus on the columella side, which was only partly sketched by Pallary (1930) in fig. 2, p.26-74 and not at all in fig. 3, p.27-75. The shells are relatively heavy. The dilation is almost equally spread over the total length of the shell, from the top downwards. Most authors who have treated the genus *Cymbium* paid excessive attention to the wideness of the aperture in the different species. Pallary too had this in mind when naming his new species '*pachyus*' from the Greek word '*pachy* = wide' and the Latin '*os* = mouth'. All species however can produce specimens without or with a widened aperture due to sexual dimorphism and perhaps habitat circumstances.

Type locality: Douala, Cameroon.

Description: Shell of medium size and rather heavy. It is irregularly ovate, with a low, projecting spire. Protoconch is globose, covered by a thick beige-coloured callus, raised and

surrounded by an almost flat area bordered by a blunt ridge at the outer edge of the shoulder of the adult body whorl. Sutural platform rather broad and creamish-orange coloured often with shades of grey. The teleoconch has about two smooth, glazed-over whorls with occasional pustules formed by sand particles trapped under the glaze. Body whorl completely covered by the thick callus with an enamel-like appearance, partially lost in older specimens. Aperture wide and dilated below the midsection. Outer lip thickened and simple. Columella arched, with three strong, oblique plaits and a fourth very weak anterior fold. Siphonal notch deep; fasciole strong. Base colour is a strong uniform reddish brown. The horizontal area between the protoconch and the shoulder ridge is similar to that found in *Cymbium cymbium* (Linnaeus, 1758).

Habitat: From the littoral to about 10 m.

Measurements: Adult specimens are 85 to 120 mm in length.

Geographic distribution: From Benin, Togo, Nigeria to the coasts of Cameroon.

Discussion: *Cymbium pachyus* can be distinguished from similar species by the nearly flat sutural ramp [not as wide as in *C. cymbium* (L., 1758)], the presence of a glazy callus all over the surface of the body whorl, the shoulder ridge extending above the protoconch in most specimens and the uniform brown colour of the aperture. *Cymbium souliei* Marche-Marchad, 1974 is a similar species but it differs by the number of columellar folds (3 instead of 4 in *C. pachyus*). The latter has a darker colouration, glazed-over whorls and a remarkable flat wide platform around the protoconch.

Acknowledgements:

Thierry Backeljau (RBINS) was so kind as to give me the opportunity to study specimens of the genus *Cymbium* in the collection of Ph. Dautzenberg (RBINS). Johan Verstraeten (Oostende, Belgium) was a critical reader of the manuscript and David Monsecour (Aarschot, Belgium) carefully corrected the English text.

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Geographic distribution of the different species in Angolan waters

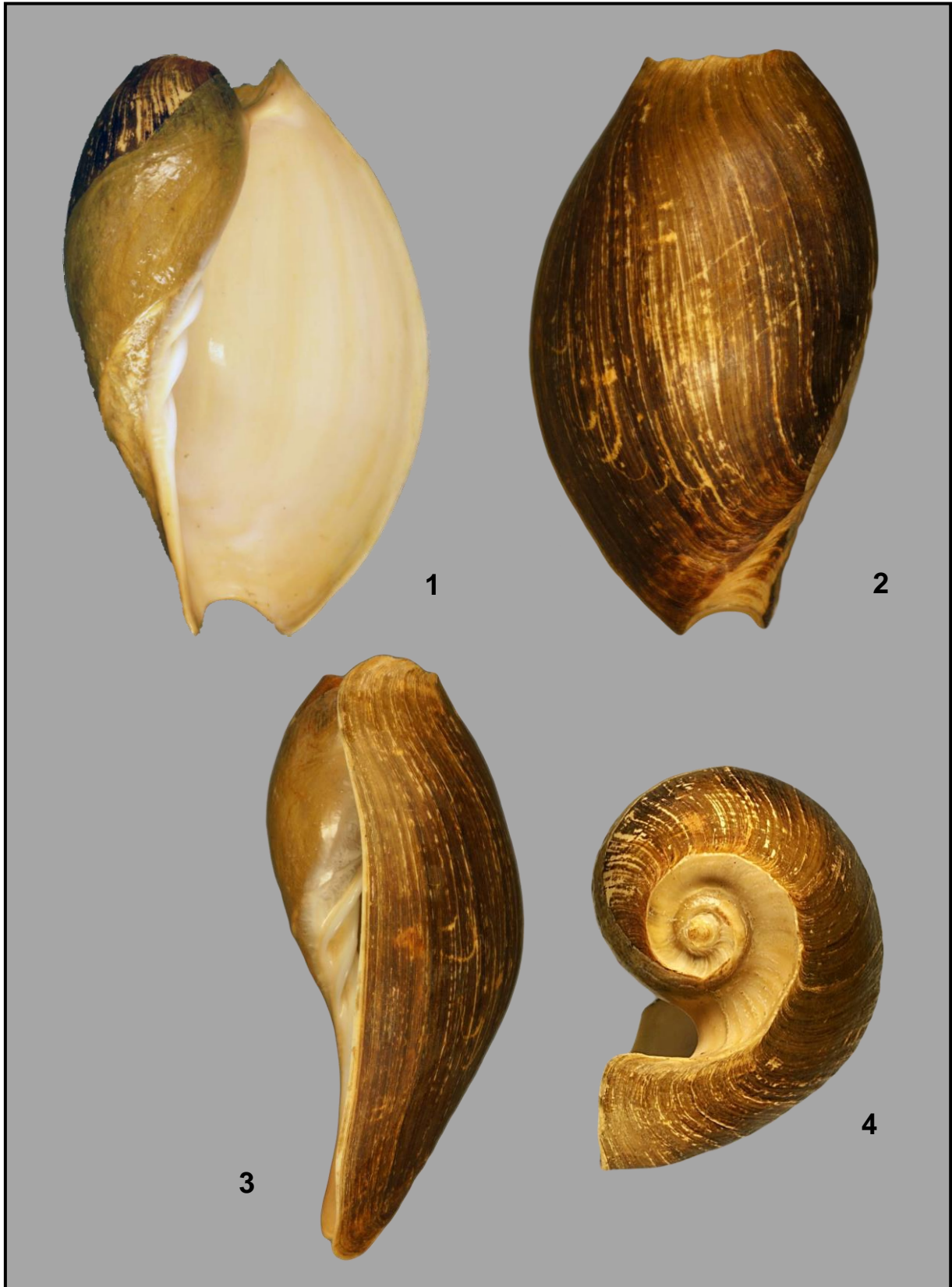
Cymbium coenyei  *Cymbium fragile*  *Cymbium patulum* 

	<i>Cymbium coenyei</i>	<i>Cymbium fragile</i>	<i>Cymbium patulum</i>
Shell	solid and heavy	thin and light, large, sharp edges	light and tumid; sharp outer lip
Outline	slender , outer lip rather straight	slender and oval , except in female specimens	bulbous
Protoconch	sunken in the apical cavity, and nearly completely covered by a brown callus	almost very raised, not covered by a callus	slightly raised, not covered by a callus
Sutural ramp	rather broad, weakly curved; only the sutural incision of the body whorl visible	very narrow, very deeply incised, shoulder edge curved inwards	excavated; incision runs over a distance of 450°-540°
Outside colour	greyish brown	brown	brownish red
Colour of mouth	light brown with grey streaks + brown border	creamish or brown	creamish white with streaks of salmon orange
Adapical area	narrow with nearly straight parallel bords; colour: bluish grey	narrow , greyish brown	broader than in <i>Cymbium coenyei</i> ; creamish brown
Adapical notch	narrow	very narrow	broader than in <i>Cymbium coenyei</i>
Siphonal notch	shallow; not as wide and deep as in <i>C. patulum</i>	broad and not deeply incised	more curved than in <i>Cymbium coenyei</i>
Columellar folds	3; white, brown or grey	3-4, sometimes 5; white	3 + 1 weaker plait; white
Periostracum	very thin; colour: olive brown; max. ¼ of body whorl covered by a bluish-greyish callus; most specimens possess oil or mud residues resulting in a back overlay	very thin, olive brown or red to dark brown; often transversed with a series of brown parallel lines	dark-olive brown and silky; ¼ of the outer surface concealed by a callus

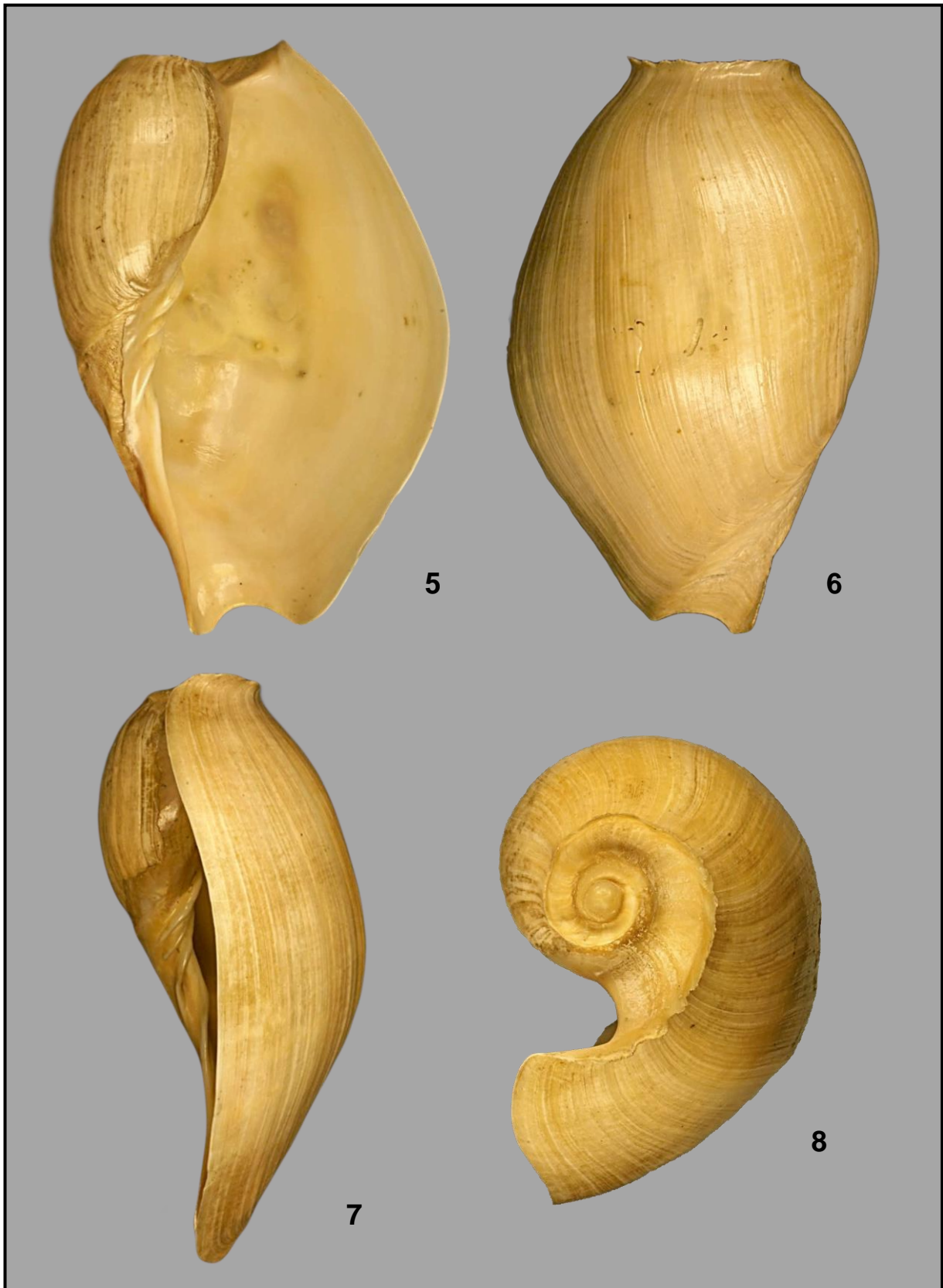
Table I : comparison of the main differences between the Angolan *Cymbium* species



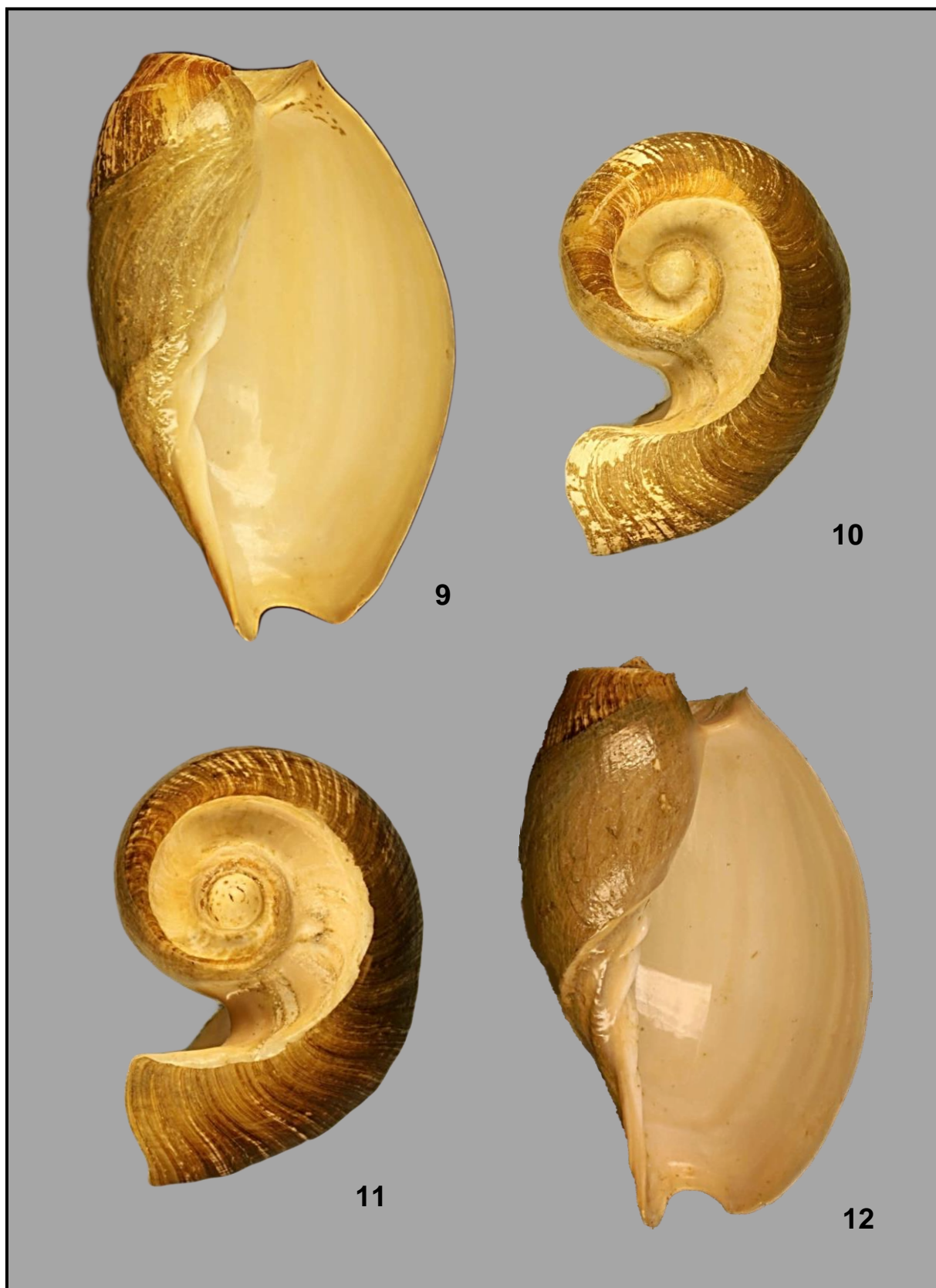
Pl. I. Broderip, W.J., 1830. A Monograph of the Genus *Cymba* [in] Broderip, W.J. and G.B. Sowerby, *Species Conchyliorum*, 1(1): figs 4-4b. *Cymbium patulum* (Broderip, 1830).



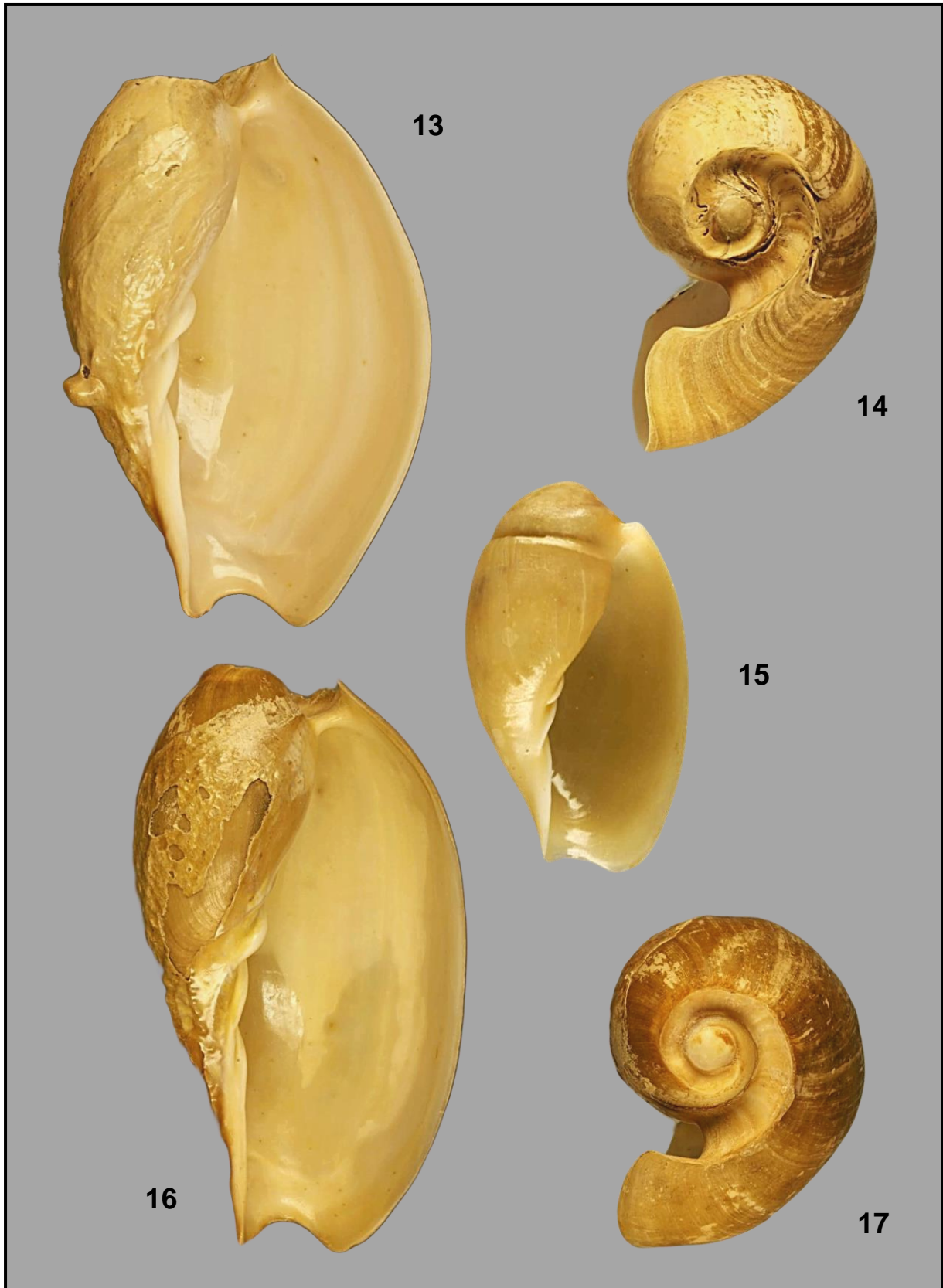
Pl. II. Figs 1-4. *Cymbium patulum* (Broderip, 1830). Ambriz, Angola. 07°51' S/ 13°08' E. Trawled by Belgian fishermen (PEMARCO) at a depth of 100 m. 1967. 168.13 mm.



PI. III. Figs 5-8. *Cymbium patulum* (Broderip, 1830). Ambriz, Angola. 07°51' S/ 13°08' E. Trawled by Belgian fishermen (PEMARCO) at a depth of 100 m. 1967. 153.76 mm.



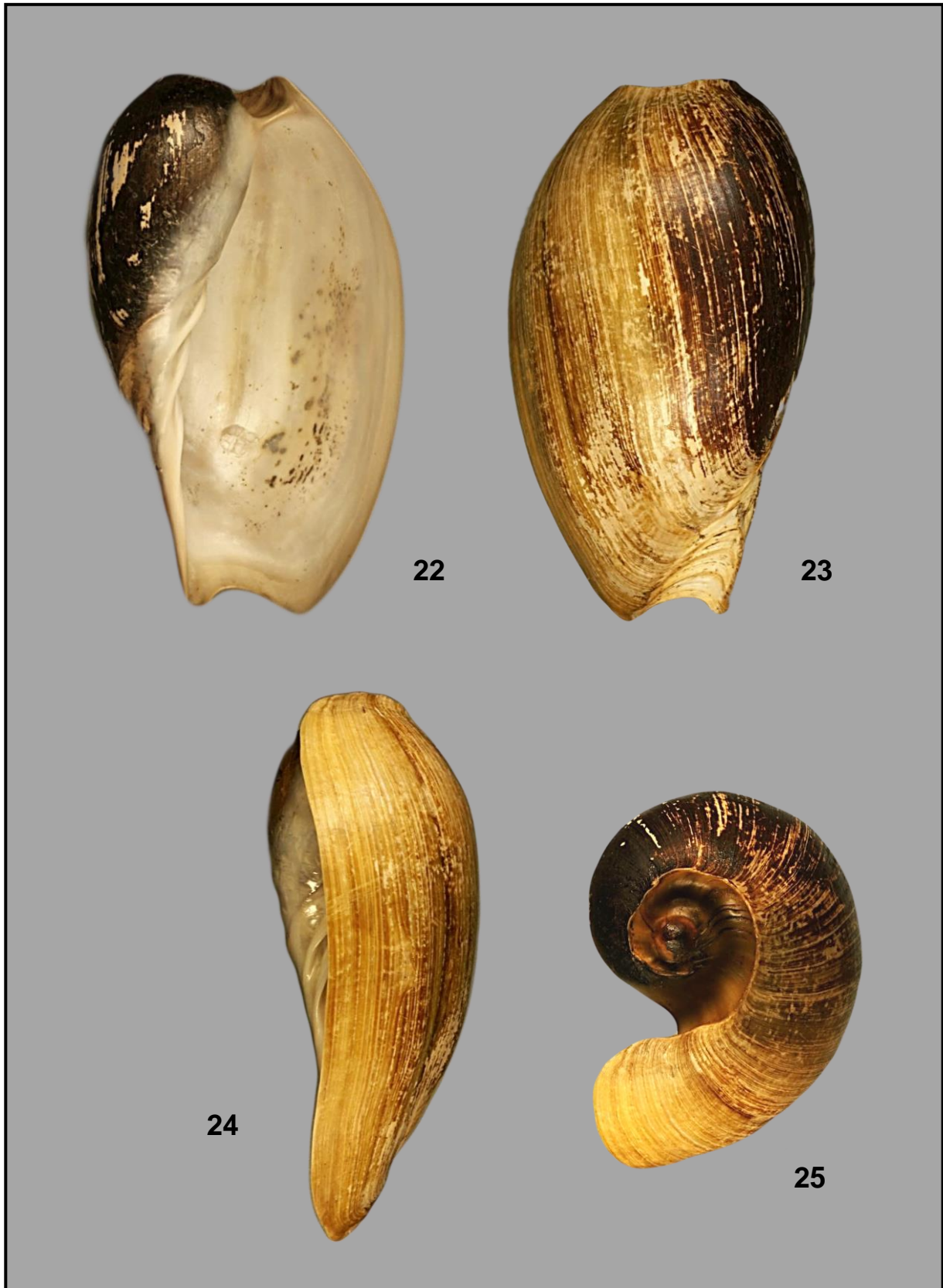
Pl. IV. Figs 9-12. *Cymbium patulum* (Broderip, 1830); 9-10: Cape Morro, Angola. 10°50' S/ 13°37' E. Trawled by Belgian fishermen (PEMARCO) at a depth of 70 m. 1972. 151.64 mm; 11-12: Ambriz, Angola. 07°51' S/ 13°08' E. Trawled by Belgian fishermen (PEMARCO) at a depth of 100 m. 1974. 144.53 mm.



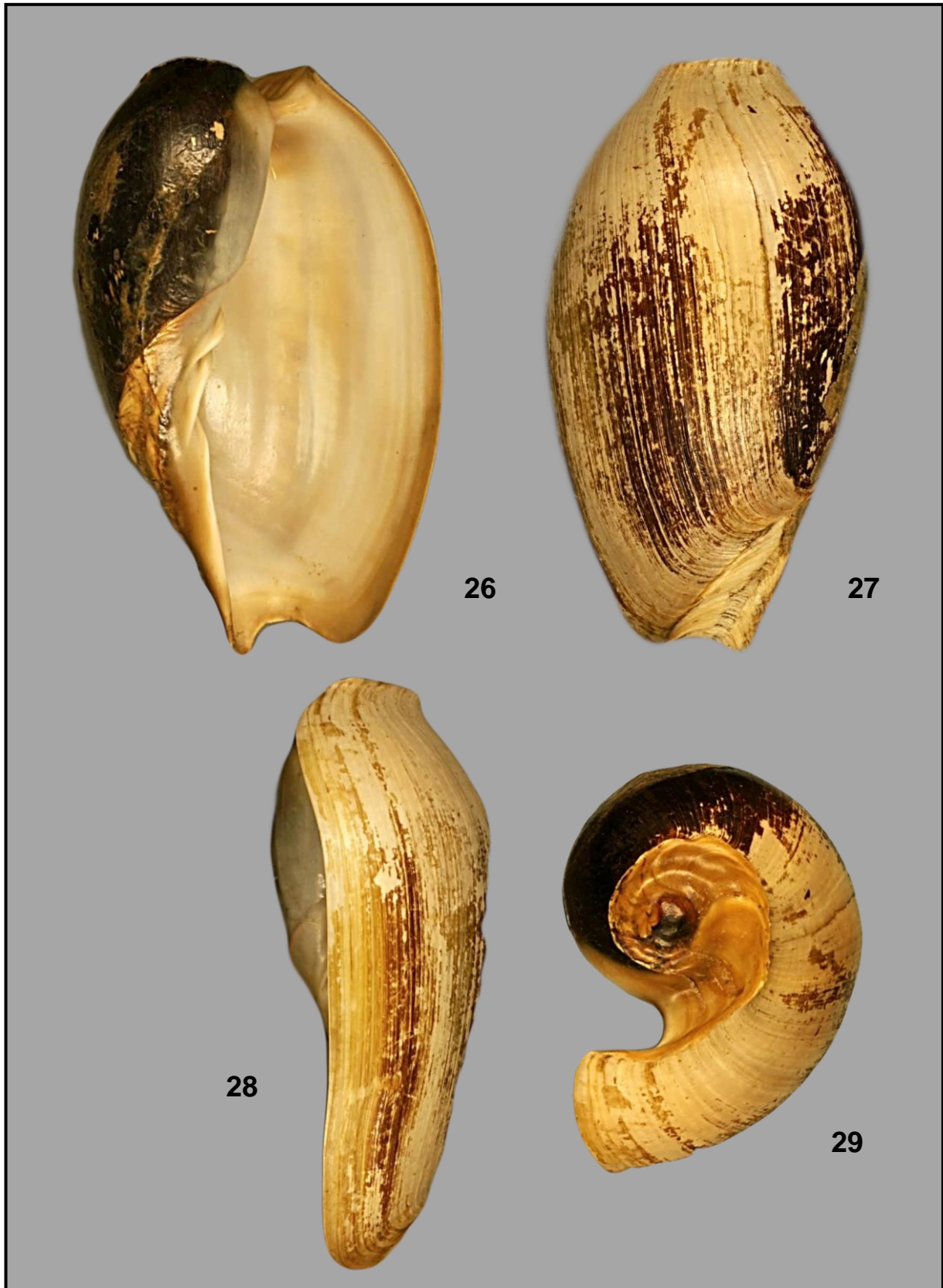
Pl. V. Figs 13-17. *Cymbium patulum* (Broderip, 1830); 13-14: Cape Morro, Angola. 10°50' S/ 13°37' E. Trawled by Belgian fishermen (PEMARCO) at a depth of 70 m. 1972. 151.64 mm; 15: Juvenile specimen. Off Cape Fria, mouth of the Cunene River, border between Angola and Namibia. 18° S/ 12 E. Trawled by Belgian fishermen. 1964. 28.72 mm; 16-17: Off mouth of the Cunene River, border between Angola and Namibia. 18° S/ 12 E. Trawled by Belgian fishermen. 1967. 138.26 mm.



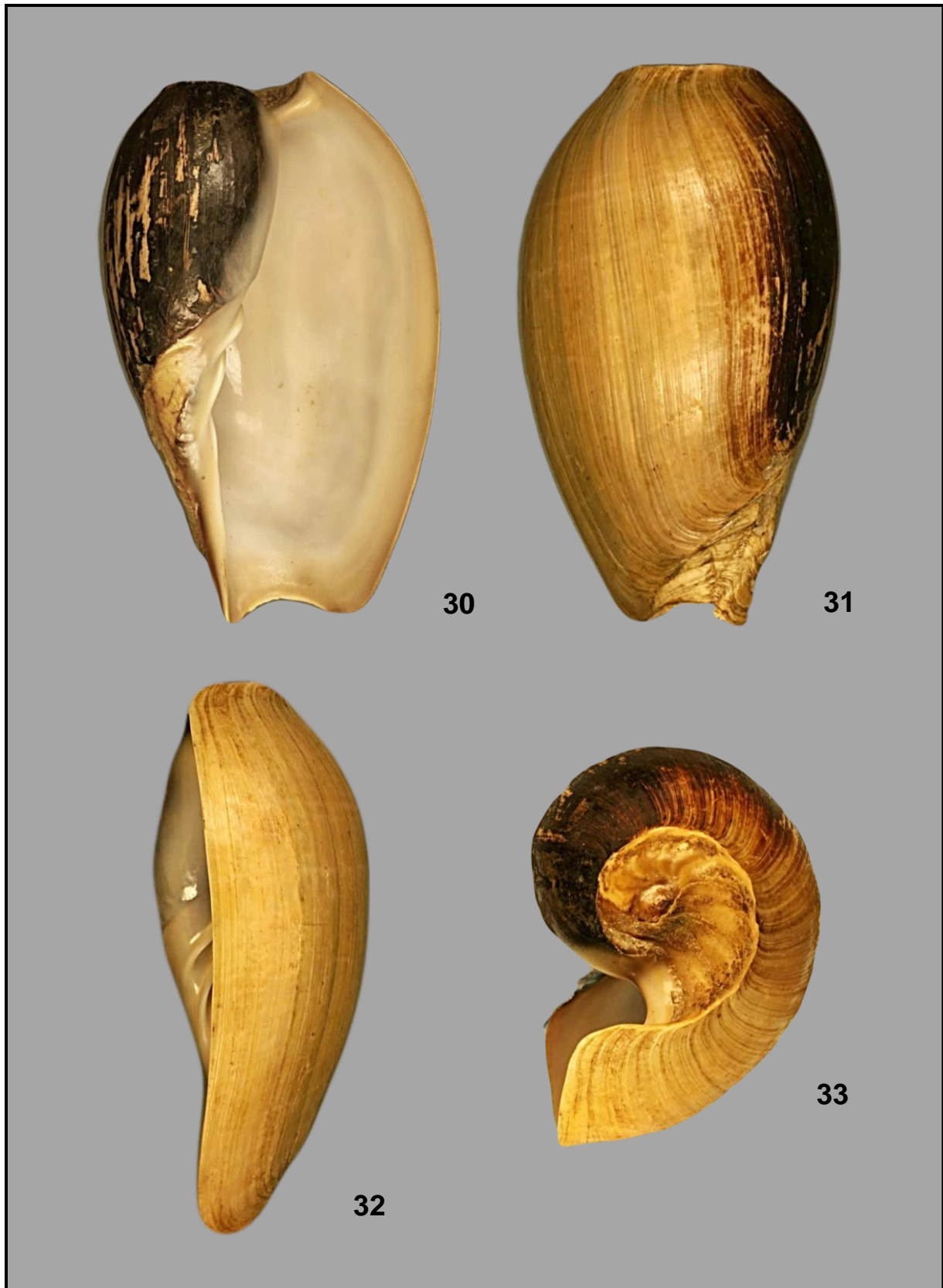
Pl. VI. Figs 18-21. *Cymbium coenyei* nov. sp. **Holotype.** Off the mouth of the Congo River, near the lighthouse between Banana and Cabinda, Democratic Republic of the Congo. 05°59' S/ 12°21' E. Trawled by Belgian fishermen (PEMARCO) on a muddy bottom at a depth of ca 20 m. 1967. RBINS (IG 33588, MT 3618). 121.23 mm.



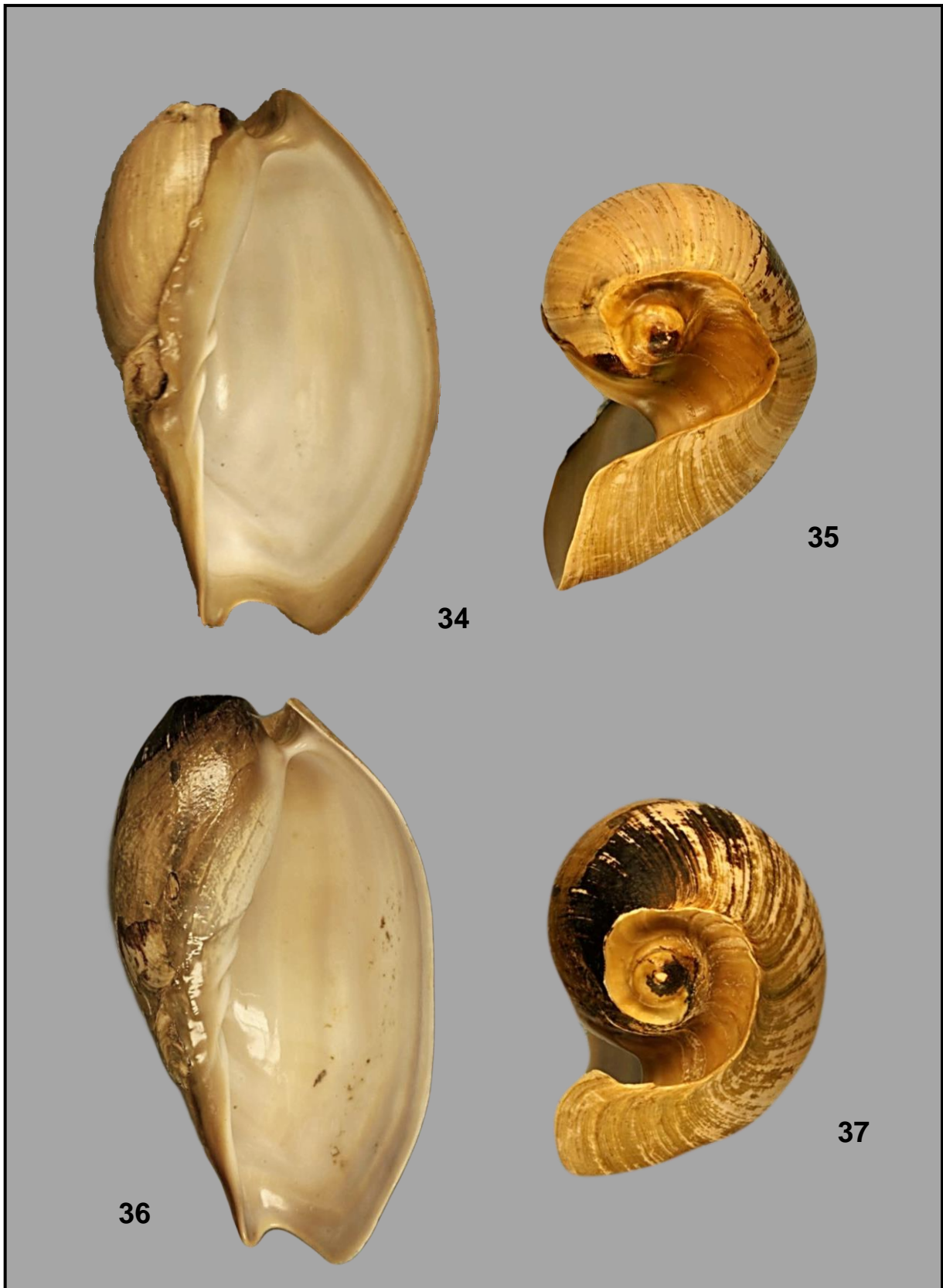
Pl. VII. Figs 22-25. *Cymbium coenyei* nov. sp. Paratype 1. Off the mouth of the Congo River, near the lighthouse between Banana and Cabinda, Democratic Republic of the Congo. 05°59' S/ 12°21' E. Trawled by Belgian fishermen (PEMARCO) on a muddy bottom at a depth of ca 20 m. 1967. 152.79 mm.



Pl. VIII. Figs 26-29. *Cymbium coenyei* nov. sp. Paratype 2. Off the mouth of the Congo River, near the lighthouse between Banana and Cabinda, Democratic Republic of the Congo. 05°59' S/ 12°21' E. Trawled by Belgian fishermen (PEMARCO) on a muddy bottom at a depth of ca 20 m. 1973. 135.29 mm.



PI. IX. Figs 30-33. *Cymbium coenyei* nov. sp. Paratype 4. Off the mouth of the Congo River, near the lighthouse between Banana and Cabinda, Democratic Republic of the Congo. 05°59' S/ 12°21' E. Trawled by Belgian fishermen (PEMARCO) on a muddy bottom at a depth of ca 20 m. 1973. 113.69 mm.



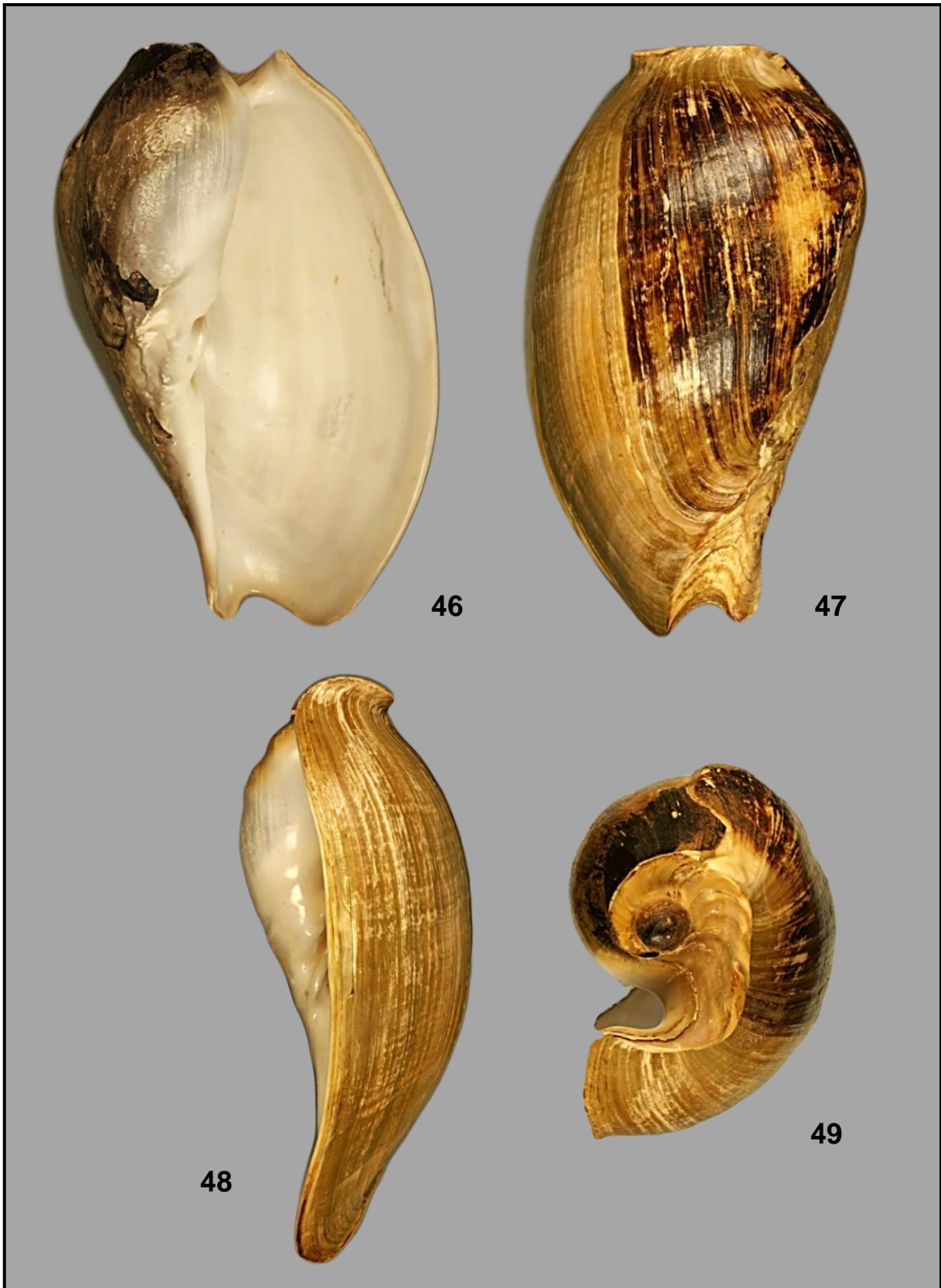
Pl. X. Figs 34-37. *Cymbium coenyei* nov. sp. Off the mouth of the Congo River, near the lighthouse between Banana and Cabinda, Democratic Republic of the Congo. 05°59' S/ 12°21' E. Trawled by Belgian fishermen (PEMARCO) on a muddy bottom at a depth of ca 20 m. 1967; 34-35: paratype 5. 138.59 mm; 36-37: paratype 6: 139.91 mm.



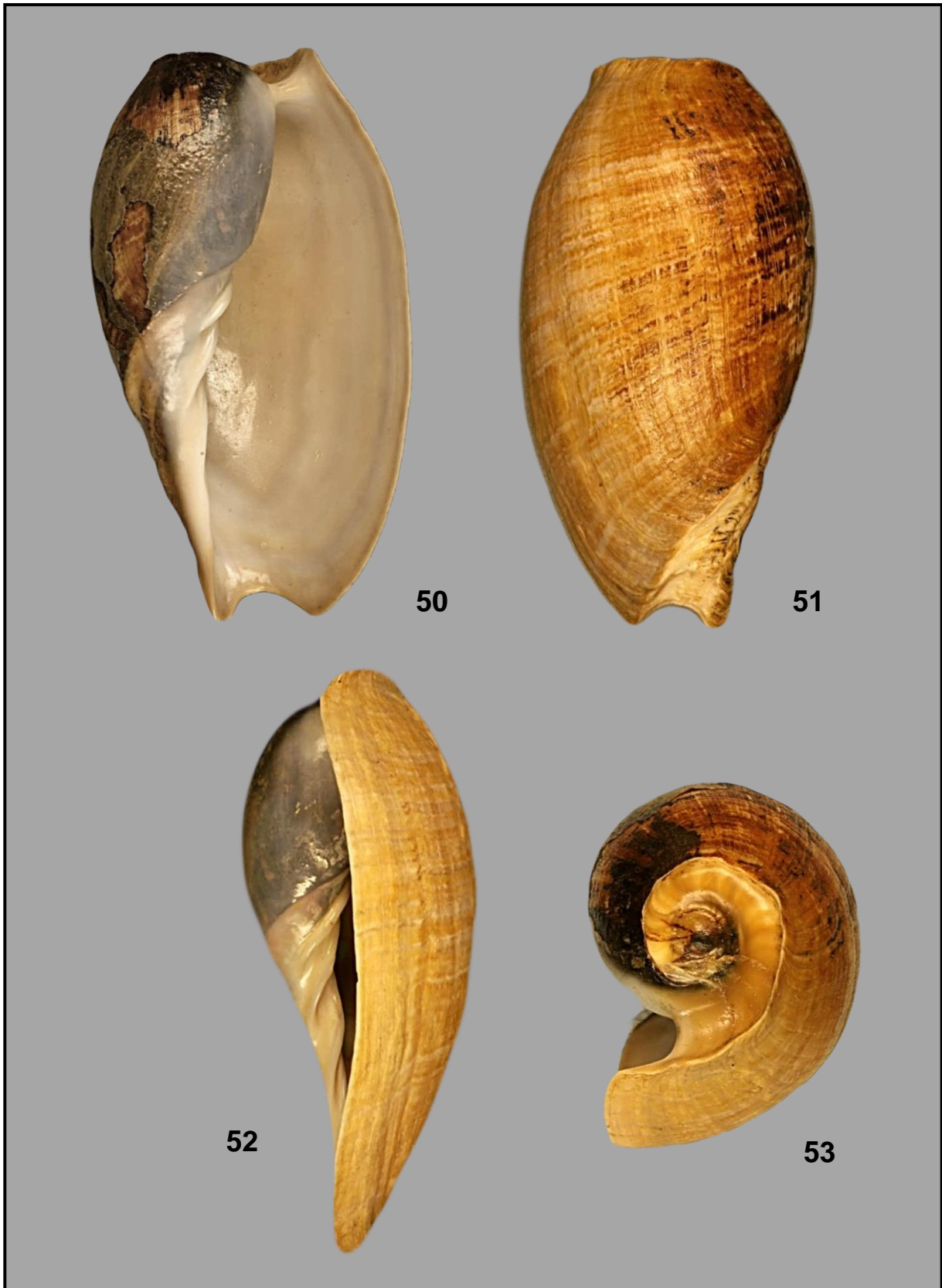
PI. XI. Figs 38-41. *Cymbium coenyei* nov. sp. Off the mouth of the Congo River, near the lighthouse between Banana and Cabinda, Democratic Republic of the Congo. 05°59' S/ 12°21' E. Trawled by Belgian fishermen (PEMARCO) on a muddy bottom at a depth of ca 20 m. 1967; 38-39: paratype 7. 138.59 mm; 40-41: paratype 8. 139.91 mm.



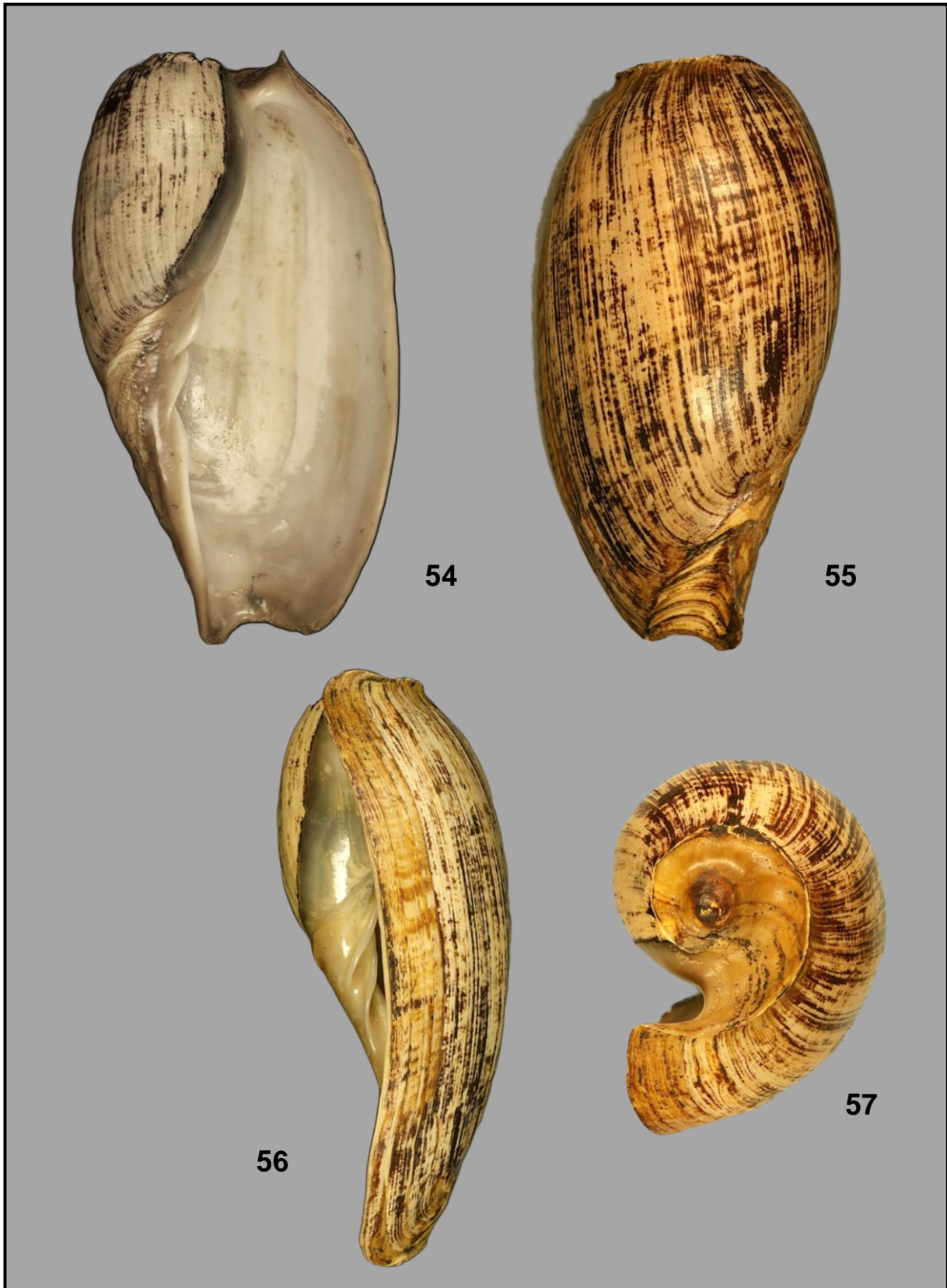
Pl. XII. Figs 42-45. *Cymbium coenyei* nov. sp. Paratype 9. Off the mouth of the Congo River, near the lighthouse between Banana and Cabinda, Democratic Republic of the Congo. 05°59' S/ 12°21' E. Trawled by Belgian fishermen (PEMARCO) on a muddy bottom at a depth of ca 20 m. 1967. 115.92 mm.



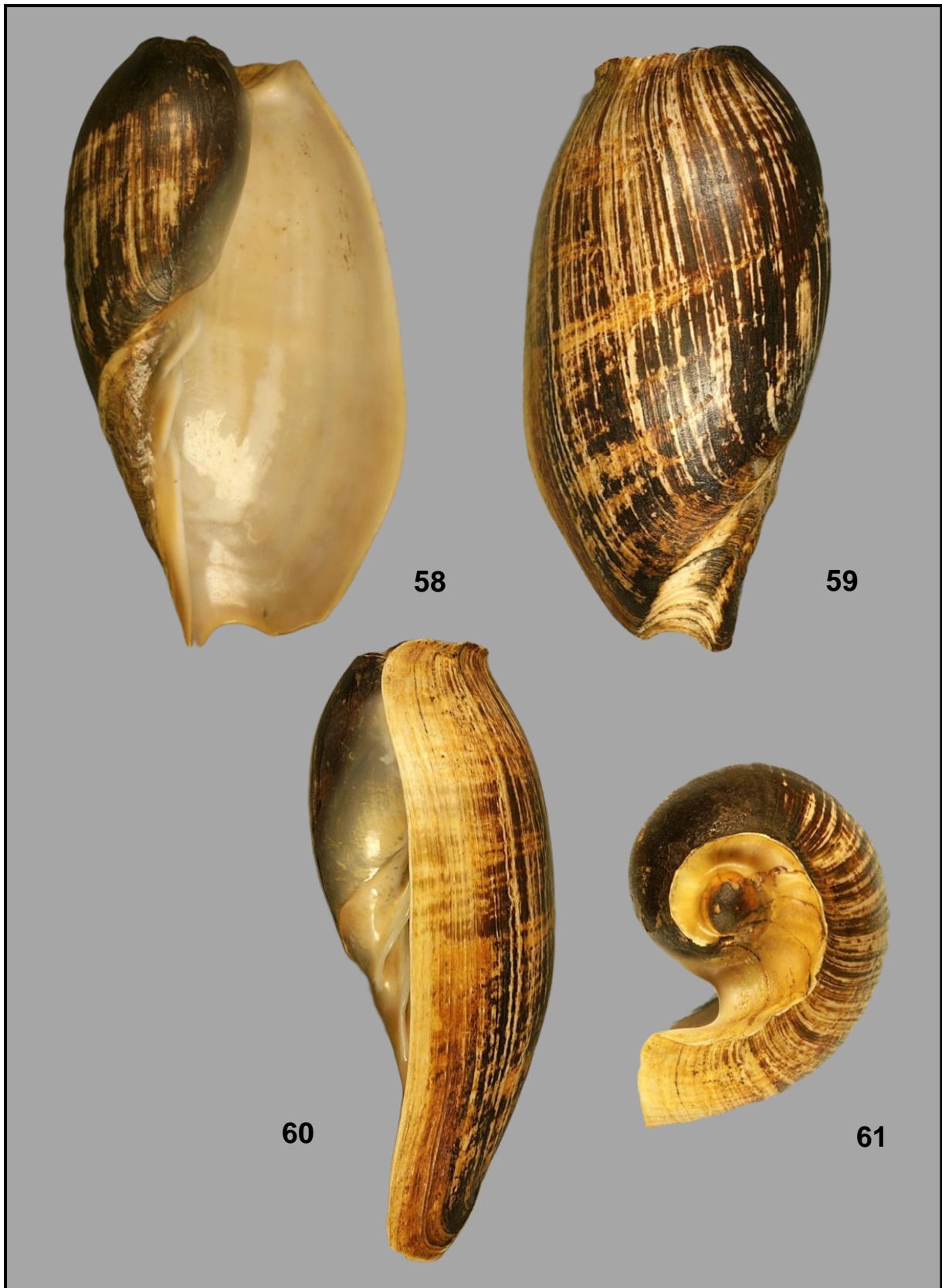
Pl. XIII. Figs 46-49. *Cymbium coenyei* nov. sp. Paratype 10. Off the mouth of the Congo River, near the lighthouse between Banana and Cabinda, Democratic Republic of the Congo. 05°59' S/ 12°21' E. Trawled by Belgian fishermen (PEMARCO) on a muddy bottom at a depth of ca 20 m. 1967. 139.76 mm.



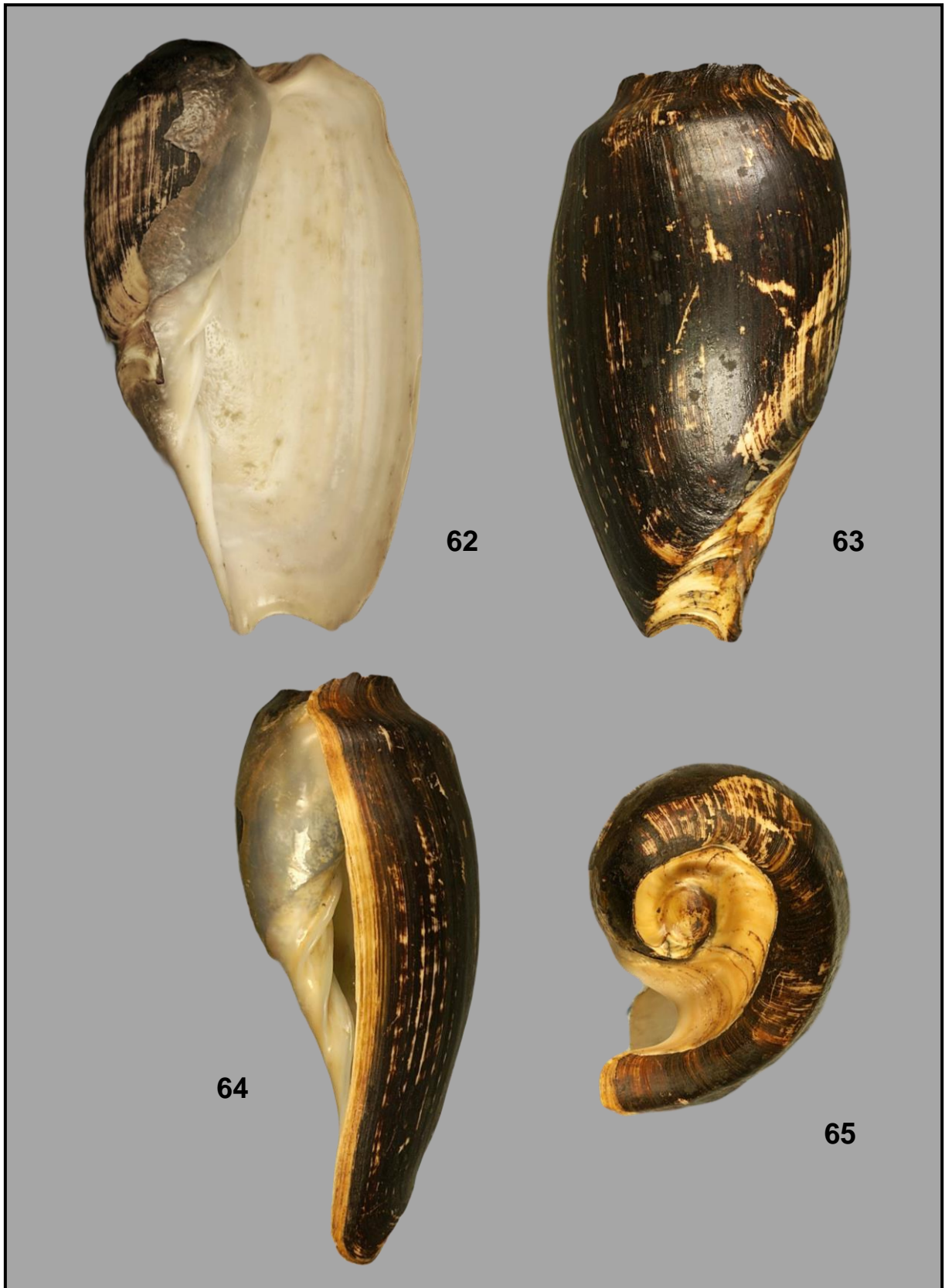
Pl. XIV. Figs 50-53. *Cymbium coenyei* nov. sp. Paratype 11. Off the mouth of the Congo River, near the lighthouse between Banana and Cabinda, Democratic Republic of the Congo. 05°59' S/ 12°21' E. Trawled by Belgian fishermen (PEMARCO) on a muddy bottom at a depth of ca 20 m. 1967. 90.39 mm. Specimen with distinctively striped dorsum.



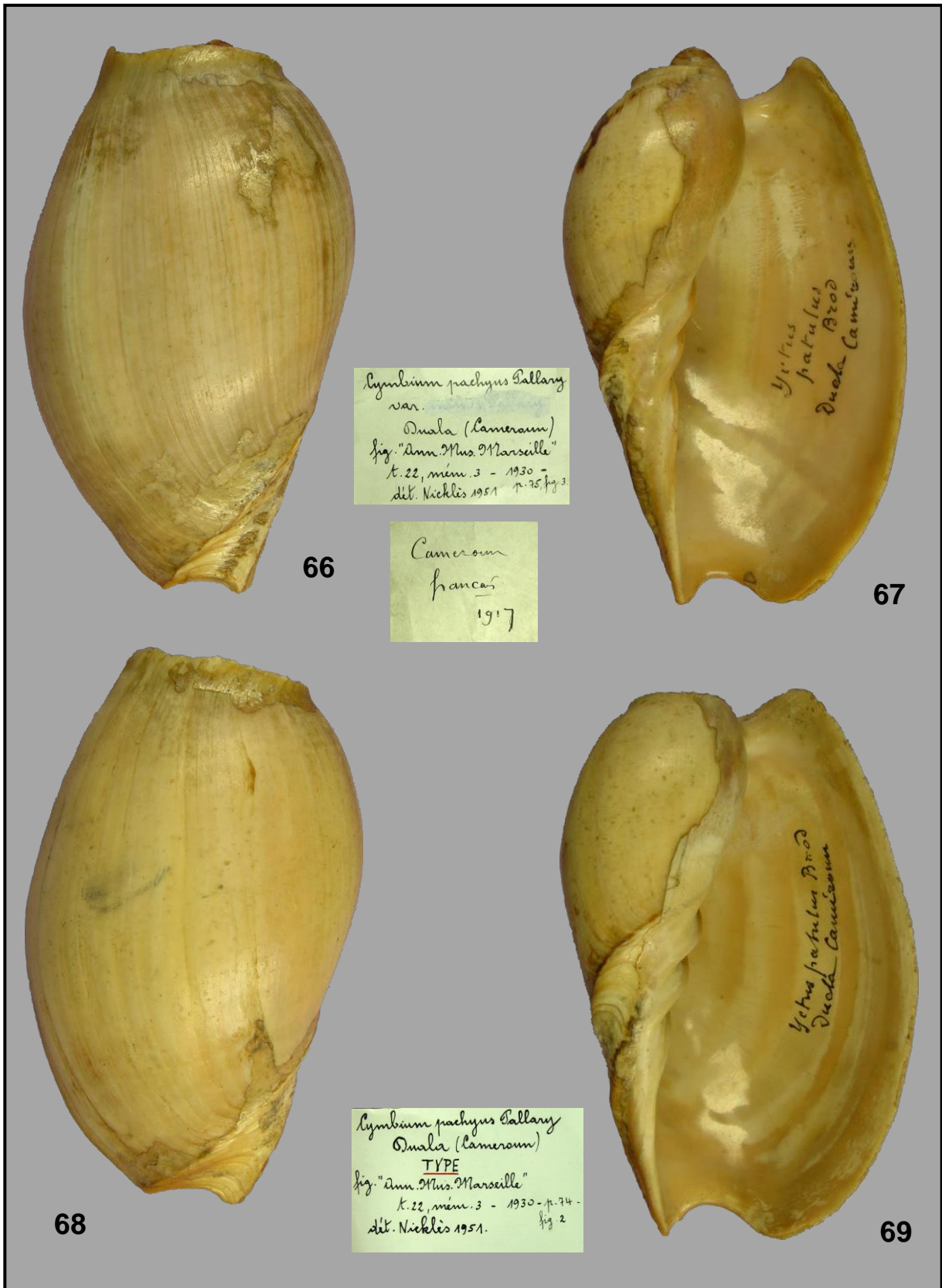
Pl. XV. Figs 54-57. *Cymbium coenyei* nov. sp. Paratype 12. Off the mouth of the Congo River, near the lighthouse between Banana and Cabinda, Democratic Republic of the Congo. 05°59' S/ 12°21' E. Trawled by Belgian fishermen (PEMARCO) on a muddy bottom at a depth of ca 20 m. 1967. 118.75 mm.



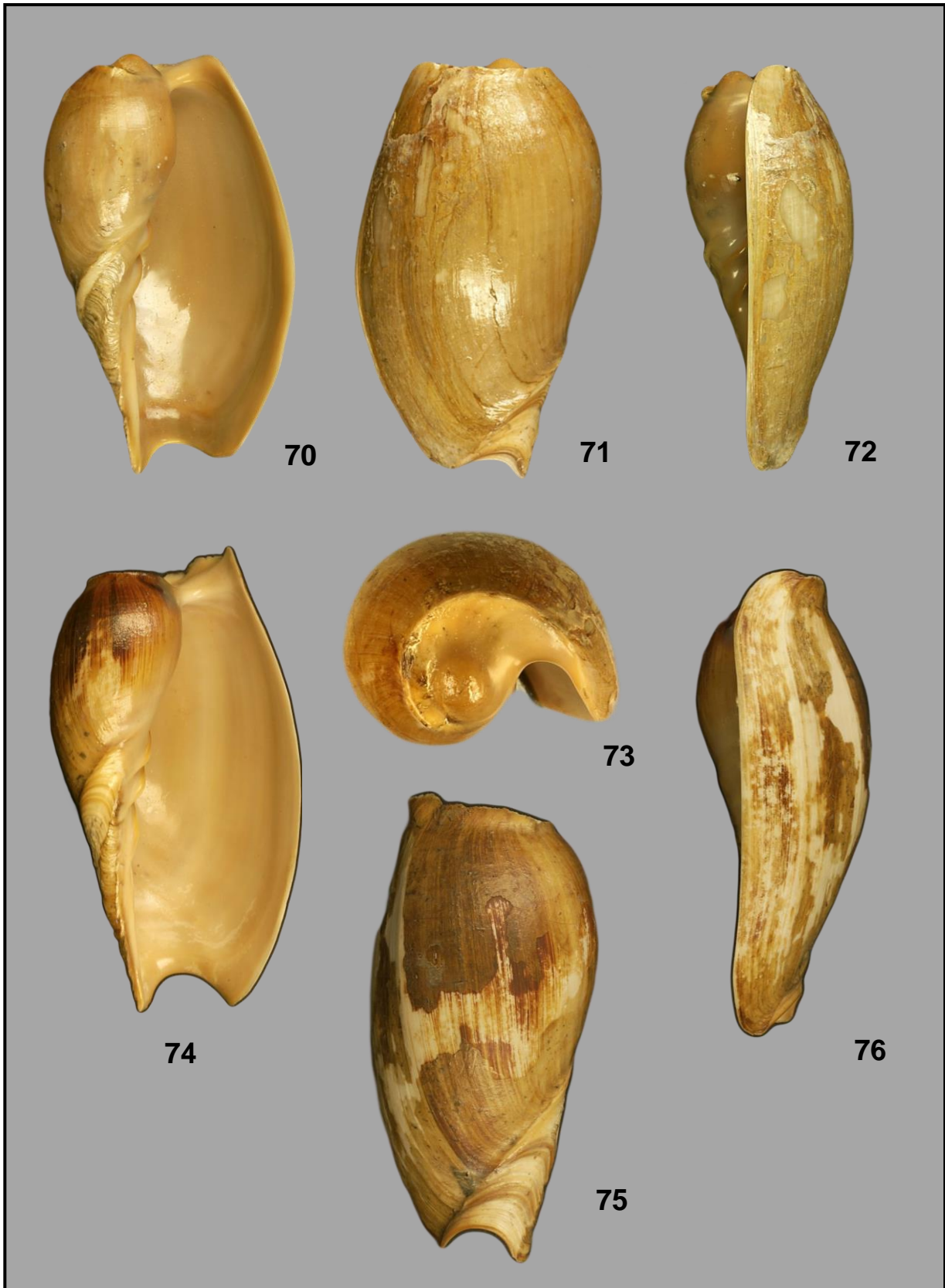
Pl. XVI. Figs 58-61. *Cymbium coenyei* nov. sp. Paratype 13. Off the mouth of the Congo River, near the lighthouse between Banana and Cabinda, Democratic Republic of the Congo. 05°59' S/ 12°21' E. Trawled by Belgian fishermen (PEMARCO) on a muddy bottom at a depth of ca 20 m. 1967. 117.35 mm.



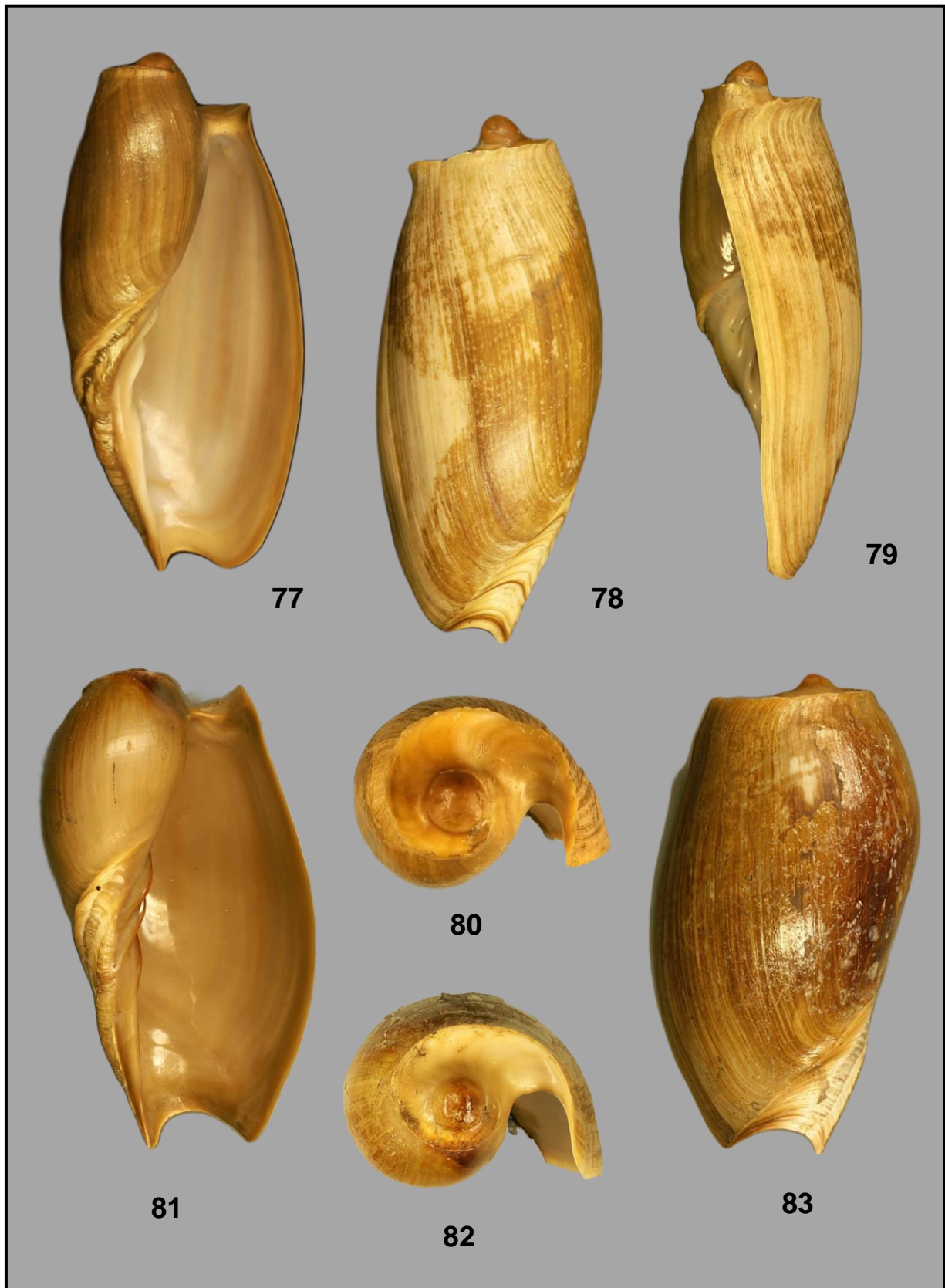
Pl. XVII. Figs 62-65. *Cymbium coenyei* nov. sp. Paratype 14. Off the mouth of the Congo River, near the lighthouse between Banana and Cabinda, Democratic Republic of the Congo. 05°59' S/ 12°21' E. Trawled by Belgian fishermen (PEMARCO) on a muddy bottom at a depth of ca 20 m. 1967. 118.92 mm.



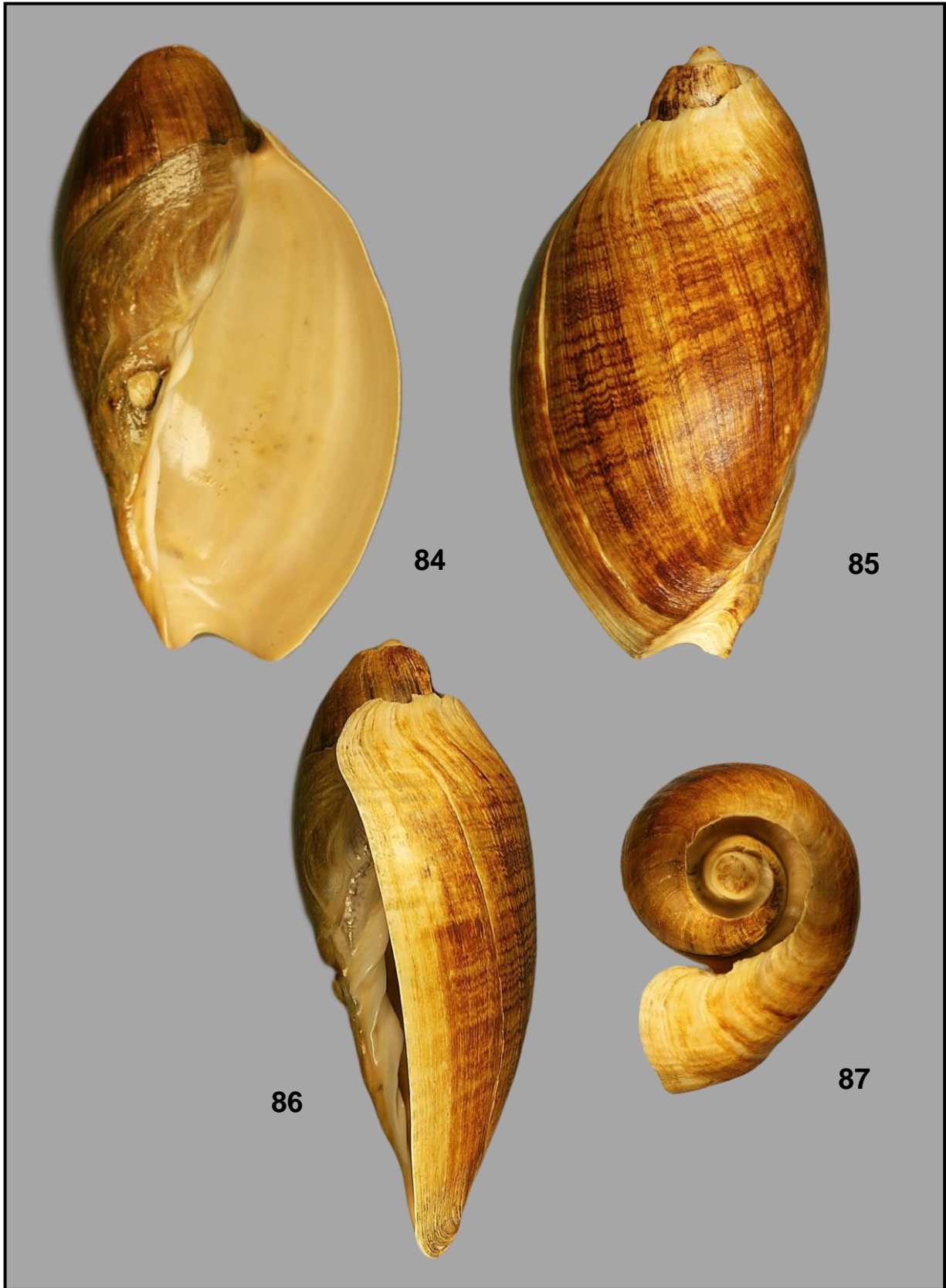
PI. XVIII. Figs 66-69. *Cymbium pachyus* (Pallary, 1930). Type material. Douala, Cameroon; 66-67: paratype; 68-69: holotype. Both designated by M. Nicklès in 1951. Dautzenberg Coll., RBINS.



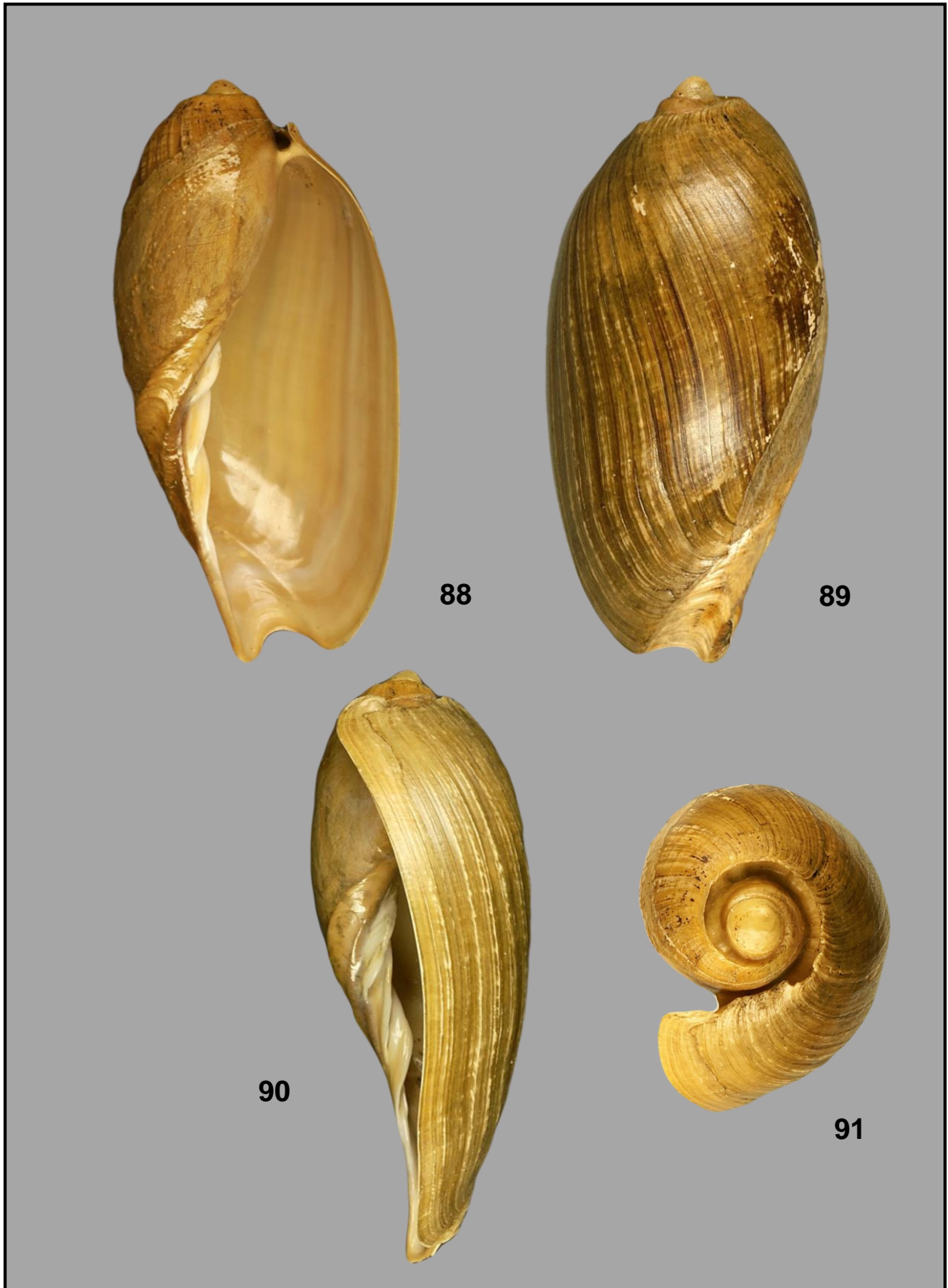
Pl. XIX. Figs 70-76. *Cymbium pachyus* (Pallary, 1930). Kribi, Cameroon. Dived. December 1975; 70-73: 84.40 mm; 74-76: 113.02 mm.



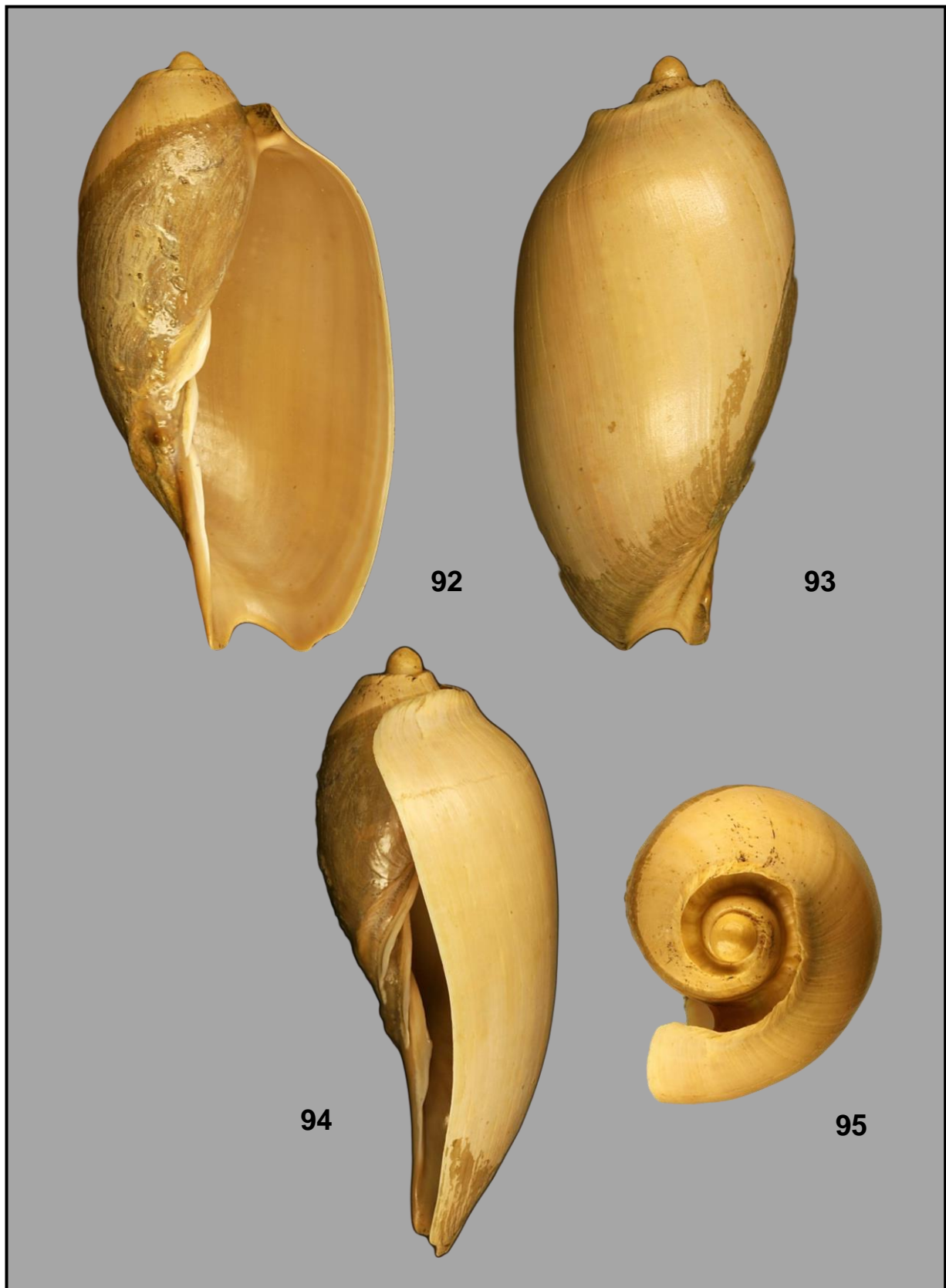
Pl. XX. Figs 77-83. *Cymbium pachyus* (Pallary, 1930). Kribi, Cameroon. Dived. December 1975; 77-80: 119.21 mm; 81-83: 113.05 mm.



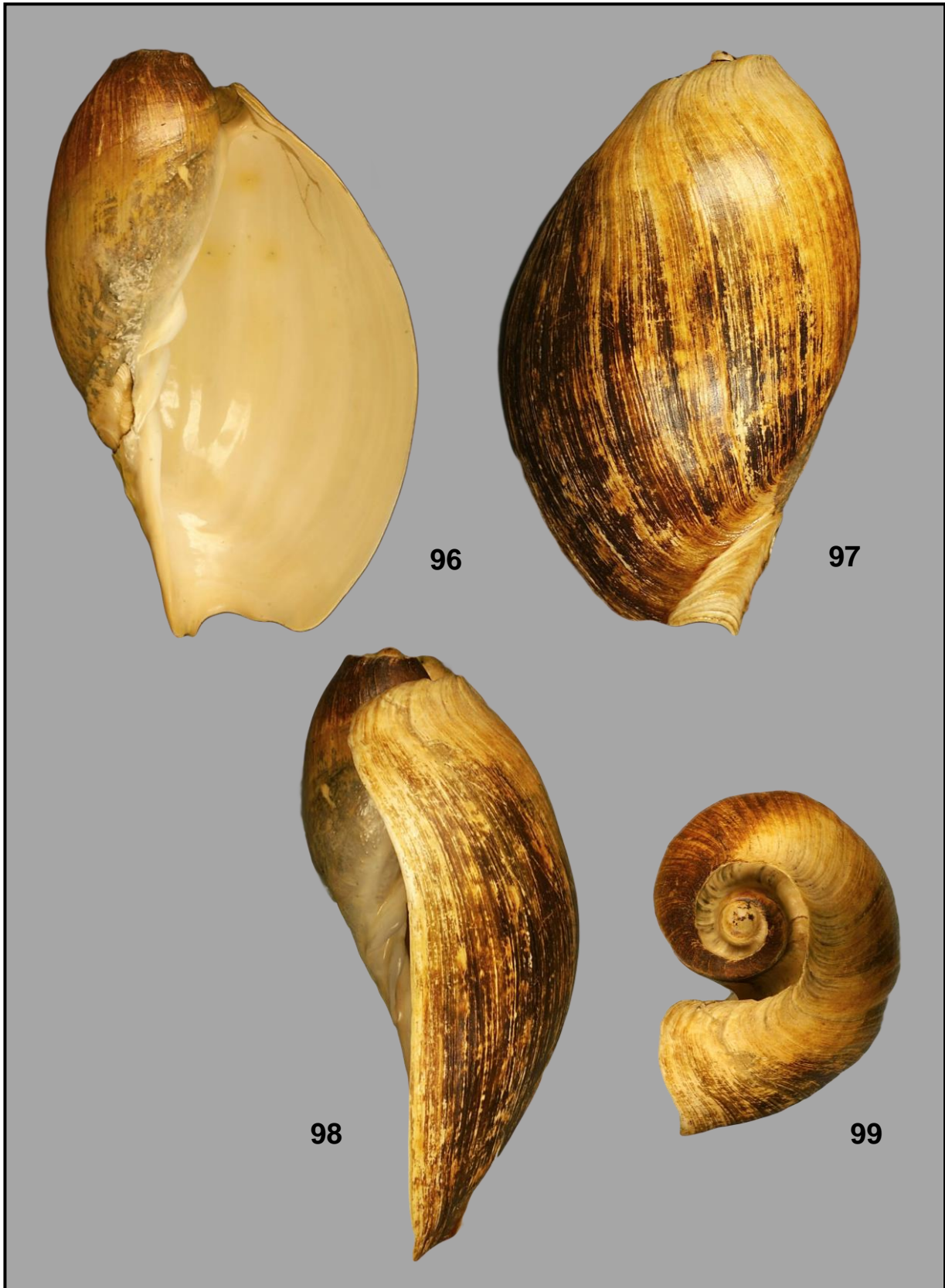
Pl. XXI. Figs 84-87. *Cymbium fragile* Fittkau & Stürmer, 1985. Off Cape Fria, mouth of the Cunene River, border between Angola and Namibia. 18° S/ 12 E. Trawled by Belgian fishermen on a muddy bottom at a depth of 183 m. 1973. 176.5 mm.



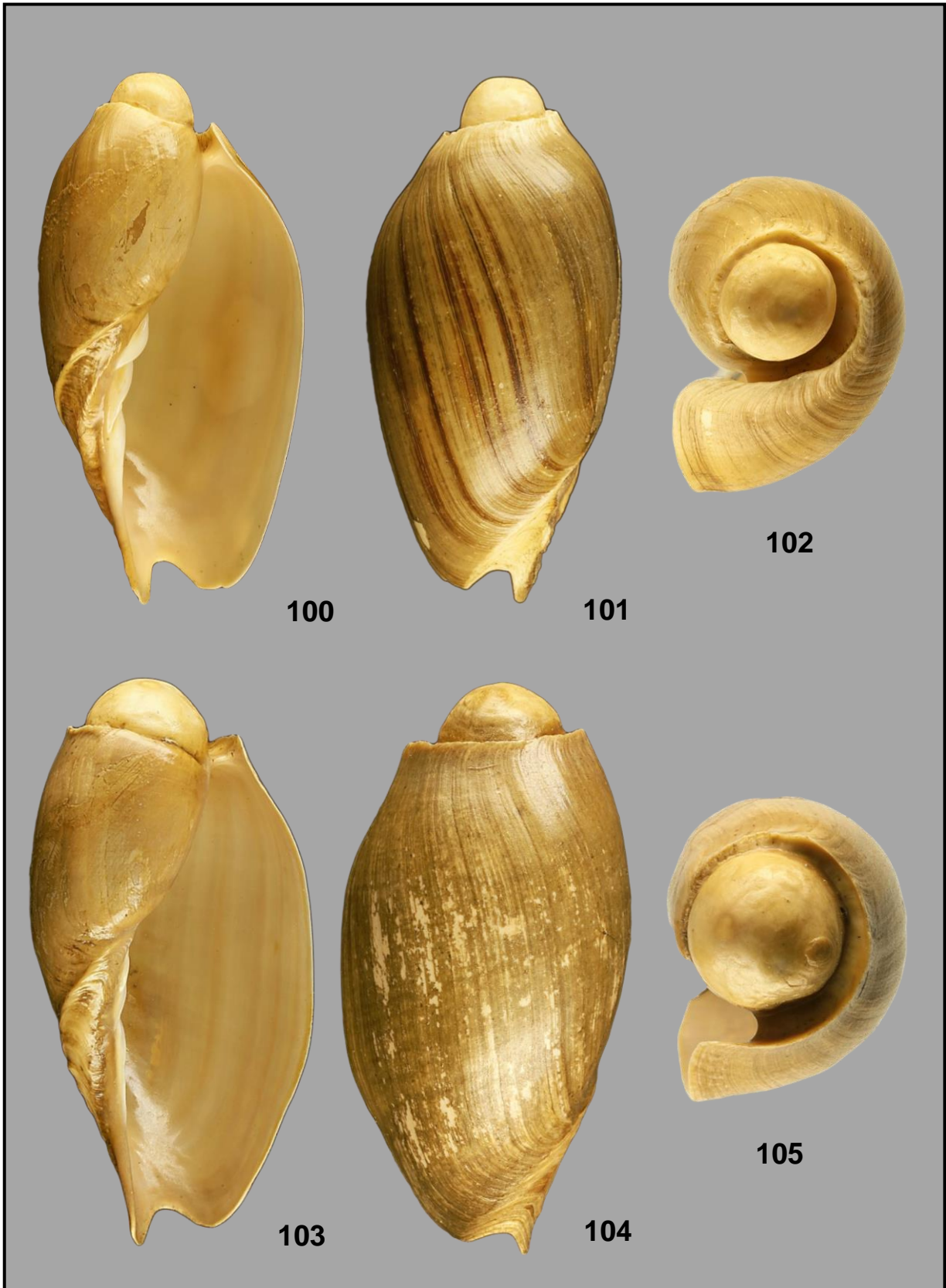
Pl. XXII. Figs 88-91. *Cymbium fragile* Fittkau & Stürmer, 1985. Off Luanda, Angola. 08°45' S/13°20' E. Trawled by Belgian fishermen (PEMARCO) 60 km offshore on a muddy bottom at a depth of 183 m. 1973. 142.13 mm.



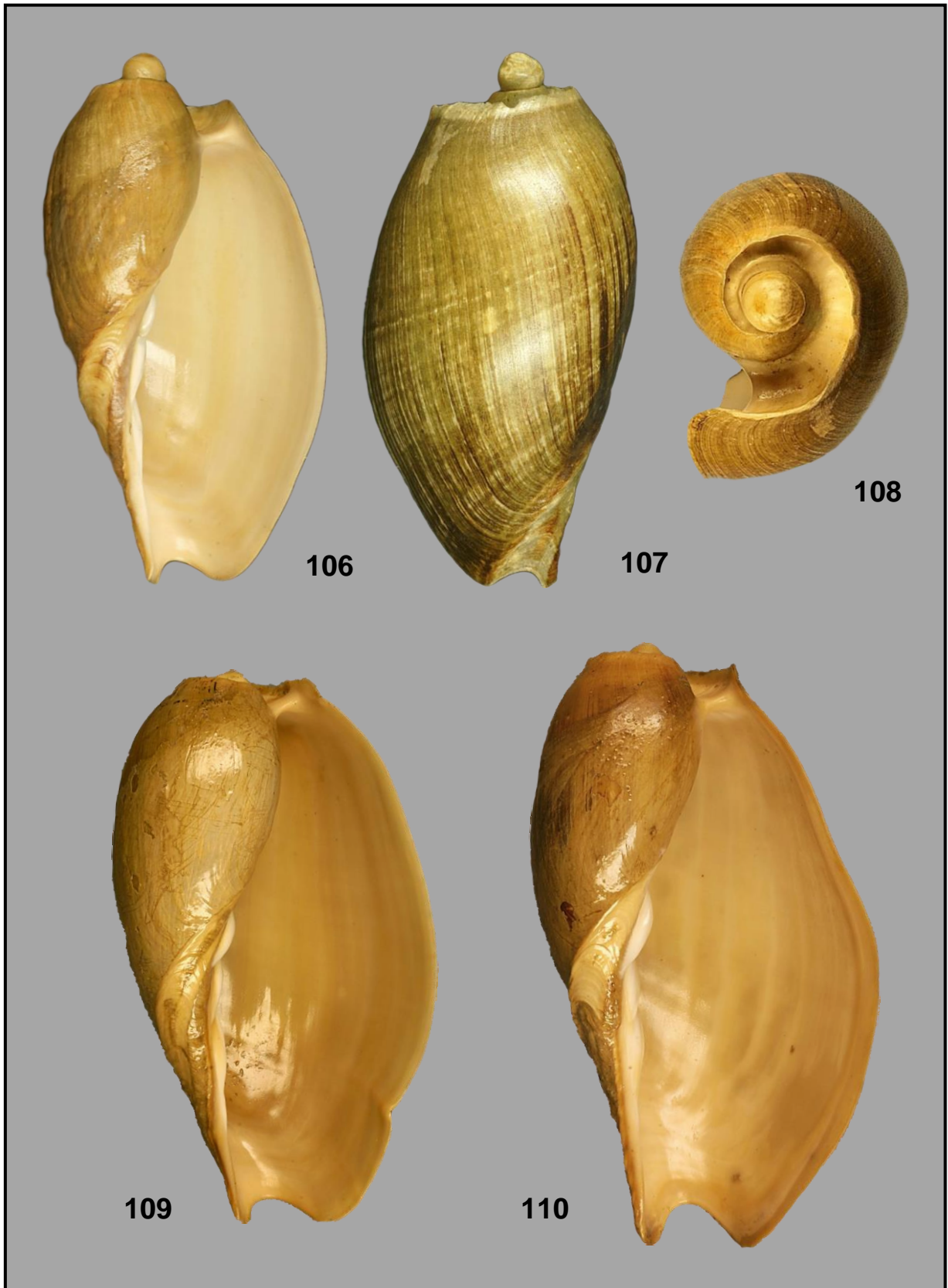
Pl. XXIII. Figs 92-95. *Cymbium fragile* Fittkau & Stürmer, 1985. Off Luanda, Angola. 08°45' S/13°20' E. Trawled by Belgian fishermen (PEMARCO) 60 km offshore on a muddy bottom at a depth of 183 m. 1973. 165.56 mm.



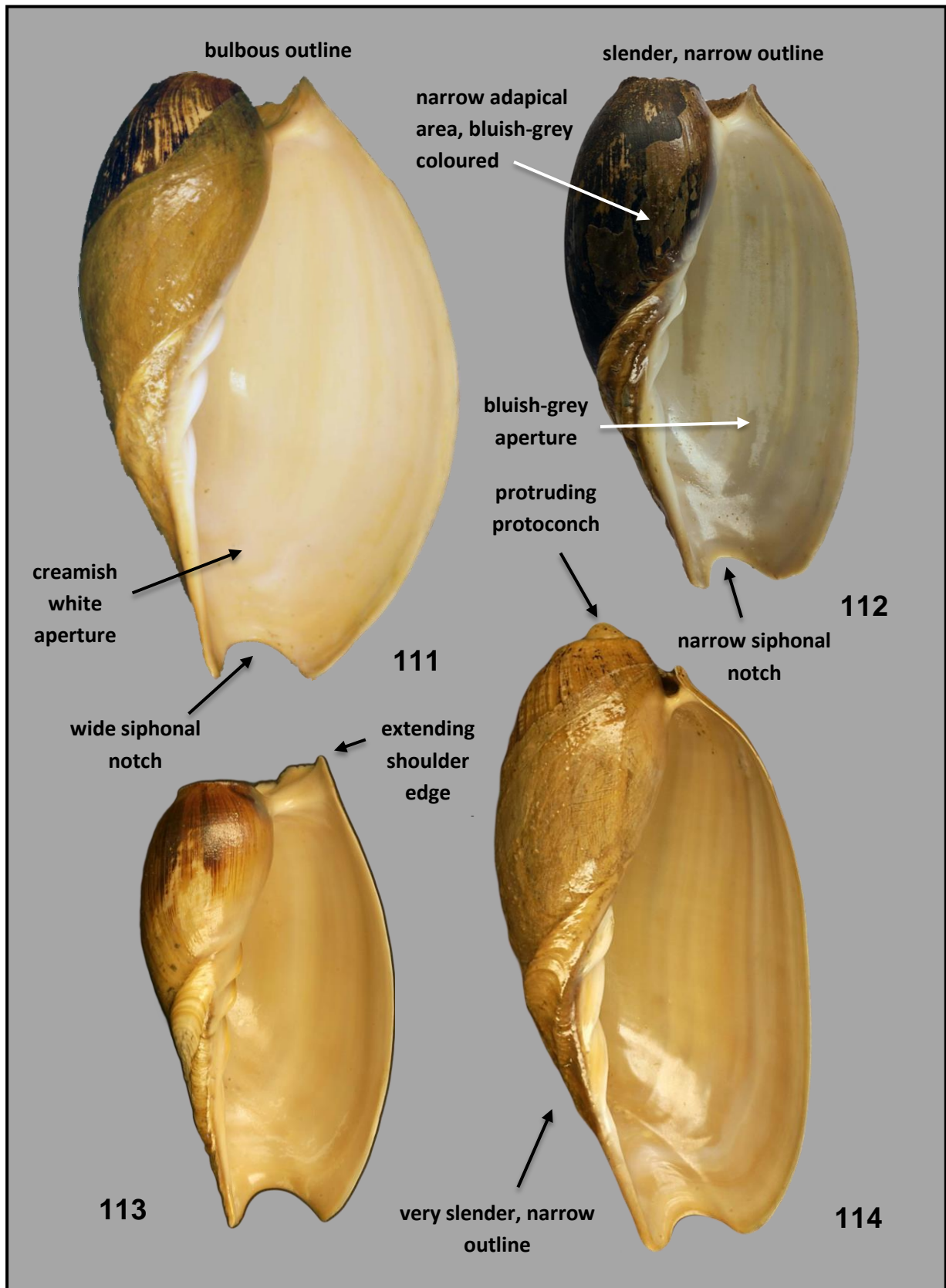
Pl. XXIV. Figs 96-99. *Cymbium fragile* Fittkau & Stürmer, 1985. Off Luanda, Angola. 08°45' S/13°20' E. Trawled by Belgian fishermen (PEMARCO) 60 km offshore on a muddy bottom at a depth of 183 m. 1973. 175.35 mm.



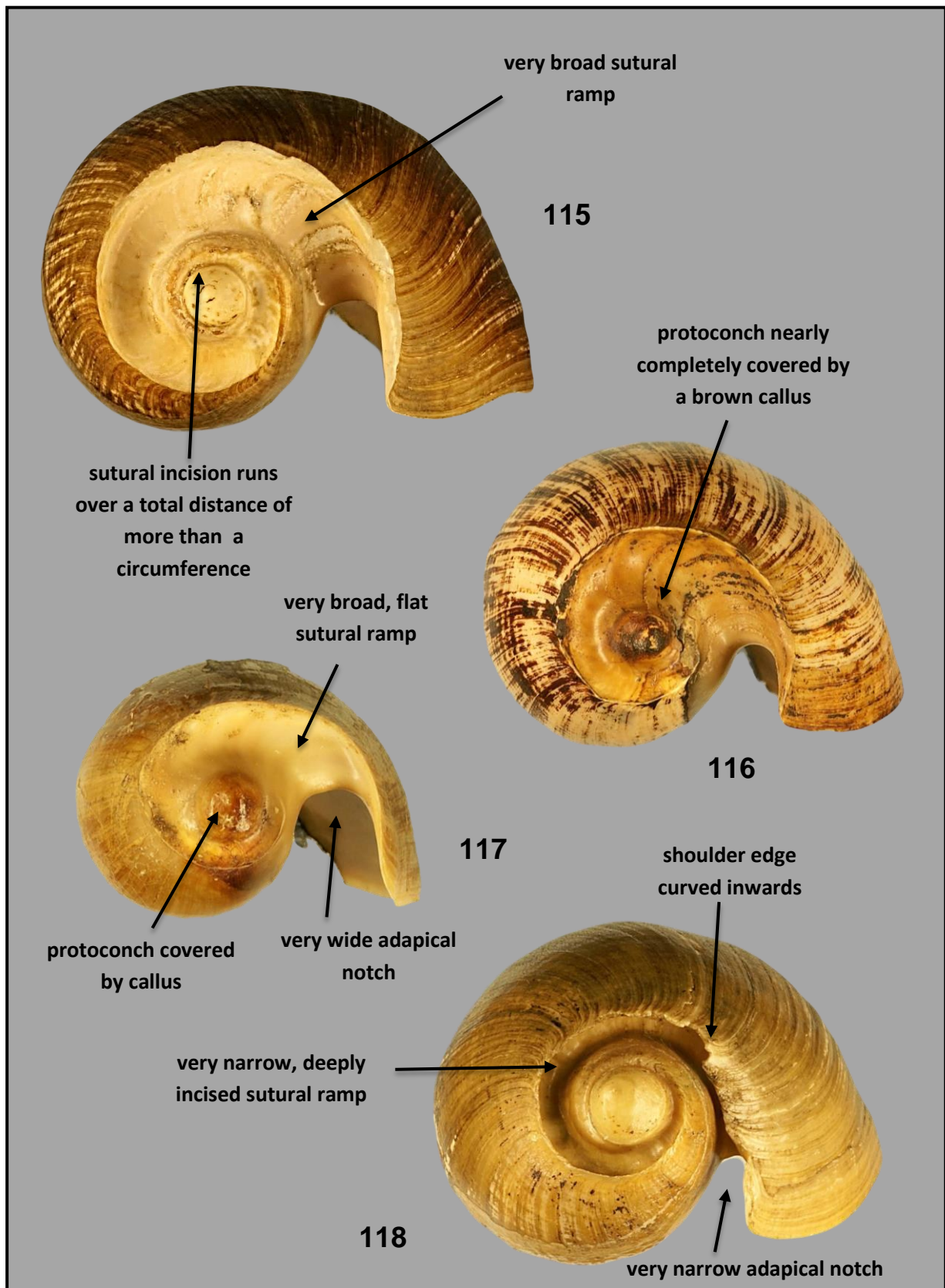
PI. XXV. Figs 100-105. *Cymbium fragile* Fittkau & Stürmer, 1985. Ambriz, Angola. Trawled by Belgian fishermen (PEMARCO) on mud at a depth of 100 m. 1973; 100-102: 99.38 mm; 103-105: 110.69 mm.



PI. XXVI. Figs 106-110. *Cymbium fragile* Fittkau & Stürmer, 1985. Ambriz, Angola. Trawled by Belgian fishermen (PEMARCO) on mud at a depth of 100 m. 1973; 106-108: 117.34 mm; 109: 118.79 mm; 110: 125.47 mm.



PI. XXVII. Figs 111-114: Comparison between the ventral side of the *Cymbium* species treated in this paper; 111: *Cymbium patulum* (Broderip, 1830); 112: *Cymbium coenyei* nov. sp.; 113: *Cymbium pachyus* (Pallary, 1930); 114: *Cymbium fragile* Fittkau & Stürmer, 1985.



PI. XXVIII. Figs 115-118: Comparison between the protoconch and the sutural ramp of the *Cymbium* species treated in this paper; 115: *Cymbium patulum* (Broderip, 1830); 116: *Cymbium coenyei* nov. sp.; 117: *Cymbium pachyus* (Pallary, 1930); 118: *Cymbium fragile* Fittkau & Stürmer, 1985.

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The following pages should be divided into sections under short headings. Whenever possible the text should be arranged as follows: **Abbreviations** (grouped in alphabetical sequence), **Introduction, Type material, Type locality, Measurements, Materials and Methods, Description, Derivation of name, Habitat, Geographic range, Results, Discussion, Conclusions, Acknowledgements** and **References**. Please, refer to a recent issue of 'Neptunea' for the lay out. All articles should be aimed at a general audience and authors should include definitions for technical terms or abbreviations.

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Alf, A. & Kreipl, K., 2004. A new *Bolma* from Madagascar (Mollusca, Gastropoda, Turbinidae). *Spixiana*, **27**(2): 183-184.

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