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www.neptunea.org

The Square House
Prinses Stefanieplein 43
8400 Oostende

Secretary: Frank Nolf
Prinses Stefanieplein 43 bus 00.01
B-8400 Oostende
Belgium
e-mail <frank.nolf@pandora.be>

Webmaster: Delphine Clement
Paasbloemlaan 8
8400 Oostende
e-mail <delphine.clement@hotmail.com>

Contact the **secretary** for subscription, delivery and payment (€ 13,0/issue + postage).

Content:

Description of a new *Apertifusus* (Mollusca: Gastropoda: Fasciolaridae), followed by an in-depth look to other species of the family Fasciolaridae in Gabonese, Angolan and Namibian waters, by Frank Nolf 1-22
A commented list of the white, mainly deep-water calliostomatids (Mollusca: Gastropoda) in the East Atlantic waters, by Frank Nolf & Steve Hubrecht. 23-40

Covers:

- Front cover: from left to right: *Apertifusus caparti* (Adam & Knudsen, 1955), *Apertifusus hubrechtii* sp. nov., *Apertifusus meyeri* (Dunker, 1869).

- Back cover: Pl. II, In: Locard, A., 1897-1898. *Expéditions scientifiques du Travailleur et du Talisman pendant les années 1880, 1881, 1882 et 1883. Mollusques testacés*. Paris, Masson, vol. 2 [1898].

Layout: Frank Nolf

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Responsible editor: Frank Nolf, Prinses Stefanieplein 43 bus 00.01 - 8400 Oostende, Belgium
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Description of a new *Apertifusus* (Mollusca: Gastropoda: Fasciolaridae), followed by an in-depth look to other species of the family Fasciolaridae in Gabonese, Angolan and Namibian waters

Frank Nolf

Prinses Stefanieplein, 43 bus 00.01
B-8400 Oostende, Belgium
frank.nolf@pandora.be

Keywords: Mollusca, Gastropoda, FASCIOLARIIDAE, *Apertifusus*, new species, Angola, E Atlantic.

Abstract: A new *Apertifusus* from Angola is described and compared with its congeners from the same waters. A survey of Angolan and Gabonese species of the family FASCIOLARIIDAE makes it clear that there is very little difference between *Viridifusus albinus* (A. Adams, 1856) and large specimens of *V. mollis* (G.B. Sowerby III, 1913). Another comparison reveals that *Apertifusus maritzaallaryae* (Cossignani & Allary, 2019) is a junior synonym of *A. caparti* (Adam & Knudsen, 1955).

Abbreviations:

ANSP: The Academy of Natural Sciences of Philadelphia, Pennsylvania, USA

BMNH: The Natural History Museum, London, UK (formerly: British Museum (Natural History))

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

CJV: Private collection of Johan Verstraeten (Oostende, Belgium)

CSH: Private collection of Steve Hubrecht (Koksijde, Belgium)

PEMARCO: Pêche maritime du Congo

RBINS: Royal Belgian Institute of Natural Sciences (Brussels, Belgium)

sp.: specimen

Introduction: Many specimens of *Apertifusus* were brought up by the fishermen operating for the PEMARCO-fisheries off the coasts of Congo and Angola in the years 1960-1973. The late Mrs. A. Kermarrec-Labisse (1908-1992) obtained hundreds of them from André Coenye, a Belgian navigating officer. Her famous collection is now part of the author's collection. Between Cabinda (Angola) and Walvis Bay (Namibia, SW Africa), a lot of new or uncommon species were dredged: e.g. *Acesta angolensis* Adam & Knudsen, 1955; *Adinopsis skoogi* Odhner, 1923; *Aporrhais senegalensis* Gray, 1838 and huge specimens of *Aporrhais*

elegantissima Parenzan, 1970; *Clavatula quinteni* Nolf & Verstraeten, 2006; *Clavatula xanteni* Nolf & Verstraeten, 2006; *Cymbium coenyei* Nolf, 2017; *Cymbium patulum* (Broderip, 1830); *Distorsio globosa* Nolf, 2014; *Europicardium nolfi* Swinnen, 2010; *Glycymeris rafaemesai* Nolf & Swinnen, 2013; *Nucula mariae* Nolf, 2005; *Phenacovolva patriciae* Nolf, 2008; *Pteropurpura fairiana* (Houart, 1979); *Xenophora testigera digitata* von Martens, 1878 and many newly described *Clavatula* and *Drillia* species. Among all those shells were dozens of *Apertifusus* and *Viridifusus* species, such as *A. caparti*, *V. albinus* and large specimens of *V. mollis*. The samples were interesting because of the presence of both juvenile and giant specimens, but especially by four aberrant shells similar to *Apertifusus caparti*. The juvenile and smaller specimens can be related to the recently described *Fusinus maritzaallaryae* Cossignani & Allary, 2019 (= *Apertifusus maritzaallaryae*), which is no more than a junior synonym of *A. caparti* (Adam & Knudsen, 1955). The new species will be compared with its relatives in the Angolan and Gabonese waters, rounding up with a survey of all the known Fasciolaridae species from that area.

Systematics:

Family FASCIOLARIIDAE Thiele, 1924 (1847)

Subfamily: Fusiniinae

Genus *Apertifusus* Vermeij & M.A. Snyder, 2018

Typetaxon: *Fusus meyeri* Dunker, 1869
[= *Apertifusus meyeri* (Dunker, 1869)]

Shell moderately to very elongate with moderately to very long, broadly open siphonal canal; canal tip flaring; whorls rounded in profile; spiral sculpture consisting of high angular widely separated cords, often with a strong secondary cord in interspaces, roughened by growth lines; axial sculpture consisting of low broad rounded ribs, often

obsolete on last whorl, not forming nodes or tubercles; aperture relatively large, adapically rounded; outer lip with weak, often short smooth lirae on inner side; inner lip adherent or very weakly erect, its adapical end with a weak parietal ridge (Vermeij & Snyder, 2018).

***Apertifusus hubrechtii* sp. nov.**
(Pl. I, figs 1-8; Pl. X, fig. 76)

Type material:

Holotype: Pl. I, figs 1-2.

Off Luanda, Angola. Trawled by Belgian fishermen (PEMARCO) at a depth of 40 fms. 1973. 51.41 mm. RBINS-I.G.: 34638-MT.4014.

Paratype 1: Pl. I, figs 3-4.

Off Luanda, Angola. Dredged by fishermen at a depth of 50 m. 49.59 mm. CSH.

Paratype 2: Pl. I, figs 5-6.

Quicombo, Angola. Trawled by Belgian fishermen (PEMARCO) at a depth of 100 m. 71.21 mm. CFN.

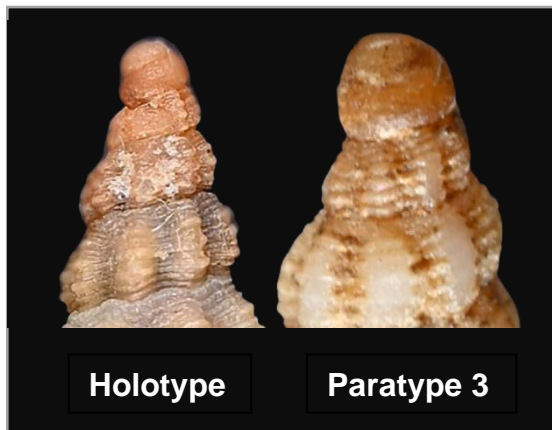
Paratype 3: Pl. I, figs 7-8.

Quicombo, Angola. Trawled by Belgian fishermen (PEMARCO) at a depth of 100 m. 105.43 mm. CFN.

Paratype 4: Farol das Lagostas, Luanda, Angola. April 1999. 39.72 mm. CJV.

Description: Shell small, moderately large, with 8-9 whorls.

Protoconch with 1^{1/2} smooth whorls.



Whorls rounded, but flattened in their upper parts. Distinct clear sutures, but not deeply incised.

Axial cords run in line from one whorl to the next, with 14-17 cords on the body whorl, distinct in the first teleoconch whorls, but becoming flattened and disappearing in a later stage. Many spiral cords run over all the whorls, consisting of primary cords separated from each other by two secondary fine spiral threads.

Siphonal canal straight, sometimes slightly sinuous at its end. Aperture ovoid, white coloured within.

Colour white, without any trace of brown coloured axial ribs or interstices.

Periostracum very thin, resistant and coloured yellowish olive. Size: from 40 to 105 mm.

The new species was already figured by Sally Diana Kaicher (1986) as *Fusinus caparti* on card 1807. Size: 102 mm. (Pl. X, fig. 76)

Type locality: Luanda, Angola. Depth: 100 m.

Distribution: between Luanda and Quicombo, Angola.

Etymology: The new species is dedicated to Steve Hubrecht, who travelled across the world for forty years and managed to build up a gigantic collection of worldwide seashells but also of land and freshwater molluscs. As a real connoisseur of shells with a great knowledge and a huge library of books and periodicals, he became an active member of our study group which resulted in the co-authorship of many papers, published in the magazine '*Neptunea*'.

Discussion: Following are the differences with the twin species *Apertifusus caparti* (Adam & Knudsen, 1955).

The new species *A. hubrechtii* has:

- * a different microsculpture: each spiral cord alternates with two thinner secondary spiral threads in contrast with *A. caparti*, which has stronger spiral cords alternating with only one secondary cord;

- * axial ribs which are much less distinct in contrast with *A. caparti* which has prominent cords separated by deeper interstices;

- * less rounded whorls, flattened in the upper part;

- * less incised sutures;

- * a straighter siphonal canal.

- * a paler and more resistant periostracum;

- * a white colour, while the juvenile stage of the shells in *A. caparti* is brown coloured, or sometimes only rusty brown on the axial or between the axial ribs.

Apertifusus meyeri (Dunker, 1869) and *Ariefusus rutilus* (Nicolay & Berthelot, 1996) are larger shells which are different by the presence of sharply rounded prominent ribs forming axially elongate nodes at the periphery of the whorls. Both are brown coloured in early stages (*A. meyeri*) or over the whole surface of the whorls (*A. rutilus*).

Conclusion: *Apertifusus hubrechtii* has enough characteristics that are different from the sibling species *Apertifusus caparti* and *A. meyeri* to consider it is a new species.

***Apertifusus caparti* (Adam & Knudsen, 1955)**

(Pl. I, figs 9-10; Pl. II, figs 11-20;
Pl. III, figs 21-28)

Material examined. Paratypes RBINS: WNW Banana, Congo. 05°50' S/ 11°32' E. 22/23-08-1948. Depth: 210 m. 2 sp. 70.3 mm, 123.8 mm; Pointe Noire, Congo-Brazzaville. 28/29-03-1949. Depth: 80 m. 2 sp. 79.1 mm, 79.9 mm; SW Moita Seca, Angola. 06°29' S/ 11°35' E. Depth: 230 m. 07-08-1948. 1 sp. 102.7 mm.

CFN: Off Luanda, Angola. Trawled by Belgian fishermen (PEMARCO). Depth: 80 m. 1970. 3 sp. 34.73 mm, 95.18 mm, 99.17 mm; Ambriz, Angola. Trawled by Belgian fishermen (PEMARCO). Depth: 70 m. 7 sp. 120.05 mm, 124.39 mm, 152.75 mm, 179.4 mm, 194.8 mm, 207.3 mm, 216.8 mm.

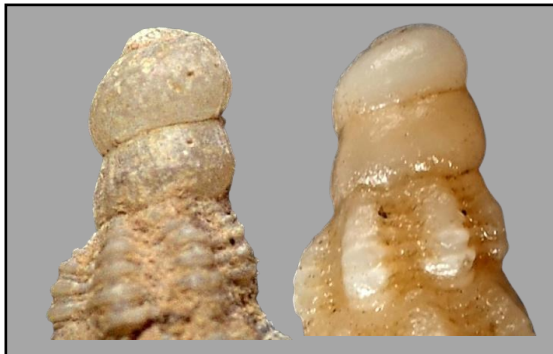
CSH: Offshore Luanda, Angola. Dredged at -80 m. 24-01-1977. 1 sp. 46.22 mm; Baia Azul, Angola. Dived at 12-15 m. 1 sp. 82.2 mm; Angola. 3 sp. 141.24 mm, 177.5 mm, 201.5 mm; Off Soyo, Angola. 2 sp. 119.90 mm, 189 mm.

CJV: Off Port Gentil, Gabon. Trawled by fishermen. 3 sp. 88 mm, 122 mm, 192 mm; Pointe Noire, Congo Brazzaville. Dredged in the harbour. 1956. 2 sp. 66 mm, 75 mm; Off Ambrizete, N Angola. Trawled at ca. 120 m depth. On hard substrate. 2 sp. 174 mm, 175 mm; Off Luanda, Angola. Trawled at a depth of 70 m. 3 sp. 78 mm, 87 mm, 91 mm.

Description:

* moderately large to very large: from 25 to 220 mm;

* protoconch: $2^{1/4}$ - $2^{1/2}$ whorls, first whorls smooth, the last one with numerous axial ribs;



* 11-12 rounded teleoconch whorls;

* axial ribs from suture to suture;

* about 18 axial regularly spaced ribs on the body whorl;

* distinct primary spiral cords alternating with thinner nearly visible secondary threads;

* white oval aperture;

* outer lip provided with pairs of teeth when the spiral cords meet the lower part of the mouth edge;

* siphonal canal straight or slightly sinuous;

* colour white, smaller specimens often tinged with red-brown between or on the axial ribs, especially in the early stages of growth;

* periostracum flaky, olive brown and wrinkled with tiny sharp scales;

* operculum: relatively thin, less oval than in *A. meyeri*.

Comments: Hadorn (1998) states that Adam & Knudsen (1955) were wrong in choosing their largest specimen as holotype, inducing in this way erroneous views and opinions by other authors when comparing *A. caparti* with *A. meyeri*. Obviously, these authors were mainly influenced by the size of both species, and they neglected to read the descriptions. It was perfectly right for Adam & Knudsen (1955) to choose for the largest specimen, which displays all the characteristics of the species, instead of the choice for a subadult specimen, which would have caused even more confusion. On the other hand, we can blame Adam & Knudsen that they have not compared their new species to the description of *A. meyeri* instead of mentioning the differences with *Fusinus perplexus* (A. Adams, 1864) (Japanese area) and '*Fusus eucosmius* Dall, 1889' [(=*Aristofusus excavatus* (G.B. Sowerby II, 1880)] (West Indies area), a procedure still used nowadays by many authors when there is a lack of sufficient material to compare.

* *A. caparti* (45-220 mm) is smaller than *A. meyeri* (175-370 mm) and has:

◦ less numerous and somewhat shorter and broader whorls;

◦ less deeply incised sutures on the upper whorls;

◦ a larger number of axial ribs and spiral cords per whorl;

◦ axial ribs always reaching from suture to suture on all whorls, except on the body whorl;

◦ alternating strong and thinner spiral cords.

Differences with *Ariefusus rutilus*: larger shell, different colouration, rounded whorls, much larger number of axial ribs and different protoconch sculpture.

Geographic distribution: from northern Gabon, Congo to middle Angola.

Habitat: mud or sandy mud, detritus and shell grit, stones at a depth of 45 to 230 m.

***Apertifusus maritzaallaryae* (Cossignani & Allary, 2019)**
(Pl. IX, fig.75)

The Italian description of this shell completely refers to ***Apertifusus caparti* (Adam & Knudsen, 1955)**:

- * based on the figures of the holotype and the three paratypes, the number of whorls is in fact 10-11 instead of 7-8 as mentioned in the original description, the same amount as in *A. caparti* (at most 12);
- * the number of axial ribs is the same in both species;
- * the size of the type material of *A. maritzaallaryae* (94-129 mm) indicates it concerns juvenile forms;
- * the only difference with *A. caparti*, mentioned by the authors, is the presence of less distinct brown coloured axial ribs, which is a typical characteristic of juvenile specimens of *A. caparti*;
- * very small specimens of the latter have very accentuated axial ribs, which become less distinct as they get bigger, a typical feature in the genus *Apertifusus* (Vermeij & Snyder, 2018), while spiral ribs become more important;
- * the type locality Cabo de São Braz is not in the southern Angola ('*sud Angola*') but south of Luanda (middle Angola).

No commentary was given to convince the readers of the differences between the two forms, except a detailed image of the suture of *A. caparti*, as a result of which we can only conclude *A. maritzaallaryae* is a **junior synonym** of *A. caparti*.

Juvenile specimens of *A. caparti* are illustrated on Pl. I, figs 9-10 & Pl. II, figs 11-14. I do not agree with Hadorn (1998) that the 'dubious' specimen of *A. caparti*, figured on Pl. II, fig. 10 by Adam & Knudsen (1955) is a juvenile specimen of *A. rutilus* (Nicolay & Berthelot, 1996). I possess a growth series of a dozen juvenile to subadult specimens, and they all have a protoconch as in *A. caparti* meaning $2^{1/4}$ first whorls and the remaining $\frac{1}{4}$ whorl sculptured with axial riblets. They all lack the axial outline of the teleoconch whorls.

Hadorn (1998) inspected the radula of the 'dubious' specimen (41.9 mm) of Adam & Knudsen, and compared it with those of *A. caparti* (200 mm). His conclusion is not convincing because specimens of a very

different size were compared. Moreover, the number of teeth and their structure is almost similar, and above all no radula of the real *Ariefusus rutilus* were examined and compared. Hadorn (1998) was evidently influenced by the comments of Nicolay & Berthelot (1996) and Bernard (1984). The latter author figured and described a specimen of a supposedly *Fusinus caparti*, which later on would be described as *Ariefusus rutilus* (Nicolay & Berthelot, 1996). Both species have a totally different outline, the sutures being very incised in *A. rutilus*. Moreover, the latter is a typical Gabonese species, of which no specimens from Angolan waters have been reported to date.

***Apertifusus meyeri* (Dunker, 1869)**
(Pl. IV, figs 29-34; Pl. V, figs 37-40;
Pl. IX, fig. 73)

Material examined. CFN: Off Libreville, Gabon. Trawled by fishermen. 3 sp. 170.0 mm, 214.4 mm, 222.5 mm; Off Abidjan, Ivory Coast. Trawled by local fishermen. 1988. 2 sp. 276 mm, 312 mm.

CSH: Off Mia-Mia, Ghana. Dredged by canoe fishermen at a depth of 40-50 m. December 2000. 2 sp. 134.17 mm, 161 mm; Cabinda, Angola. 2018. 1 sp. 209 mm; Adjua, Ghana. Dredged by fishermen at -40 m. On rock/sand bottom. 1 sp. 220 mm; Abidjan, Ivory Coast. 2006. 2 sp. 202.5 mm, 243.5 mm; Off Abidjan, Ivory Coast. Trawled by local fishermen. 1988. 1 sp. 261.5 mm.

CJV: Off Port Gentil. Gabon. 3 sp. 88 mm, 122 mm, 192 mm.

Description:

- * large, heavy shell;
- * the largest *Apertifusus* species in W African waters (175-370 mm).
- * protoconch: $1^{1/2}$ whorls, last whorl sculptured with numerous very fine indistinct axial riblets;
- * 10-12 convex whorls, separated by deep, sutures;
- * axial ribs slightly granulose, very dominant in the first teleoconch whorls, less distinct and even nearly disappearing from the 9th whorl;
- * 18-25 axial ribs (on last whorl) crossed by many parallel spiral cords;



- * siphonal canal large and elongate, straight or slightly distorted;
- * aperture narrow, elongate;
- * colour white, first teleoconch whorls brown coloured;
- * periostracum very flaky, olive-brown and wrinkled;
- * operculum relatively thick, solid, oblong and slender.

Comments: Specimens of this species have usually been overlooked or misidentified in literature, a.o. by Bernard (1984), Nicolay & Berthelot (1996) and Cherbonnier (1965) who confused it with *A. caparti*.

A. meyeri differs from *Ariefusus rutilus* by the much larger shell, the completely different protoconch and the different axial and spiral sculpture. The whorls of *A. rutilus* are angular and deeply incised to the sutures. The first teleoconch whorls of the juvenile and subadult stage of many specimens are rather similar in both species. This characteristic has never been remarked by previous authors and could eventually refer to a common ancestor. This is an argument to be considered in a revision of the genera in FASCIOLARIIDAE.

A. meyeri is larger than *A. caparti*, but the protoconch is smaller. *A. meyeri* has a larger number of whorls and the axial ribs are protruding in the middle of the first teleoconch whorls in contrast with the rounded whorls of *A. caparti*. The most important feature is the stretched and partly loosened whorls, certainly in the very large specimens.

Geographic distribution: from Sierra Leone, Ivory Coast, Ghana, through the Gulf of Guinea, Gabon and northern Angola (Hadorn, 1998). Depth: from 20 to 100 m. It is rather surprising to note that never specimens of *A. meyeri* were trawled by the PEMARCO-fishery from Cabinda to southern Angola in the years 1960-1973.

Genus ***Ariefusus* Vermeij & M.A. Snyder, 2018**

Typetaxon: *Fusinus rutilus* Nicolay & Berthelot, 1996

Shell elongate fusiform with a long straight tapering siphonal canal that is very narrowly open (less than 2 mm); axial sculpture consisting of very high, sharply rounded ribs forming axially elongate nodes at periphery; spiral sculpture consisting of fine cords not expanded into nodules; aperture small, ovate, adapically rounded; outer lip edge abapically slightly convex; inner side of outer lip with smooth lirae; inner lip adherent, its adapical end

with an obsolete parietal ridge (Vermeij & Snyder, 2018).

***Ariefusus rutilus* (Nicolay & Berthelot, 1996)**
(Pl. IV, figs 35-36)

Material examined: 1 sp. from Gabon: 1982. 141.20 mm. CFN; 1 juvenile sp. from Port Gentil, Gabon. 62.78 mm. CSH; 4 sp. from Port Gentil, Gabon. 69 mm, 73 mm, 121 mm, 142 mm. CJV.

Description:

- * protoconch mamilliform, consisting of two whorls;
- * shell fusiform, elongate;
- * teleoconch of about ten whorls;
- * first teleoconch whorls very angular, last whorls more rounded and always deeply incised to the sutures;
- * last whorl, making a sharp curve to the axis;
- * axial sculpture, clearly prevailing on the spiral one, is made of sharply rounded prominent ribs forming axially elongate nodes at periphery;
- * last whorl with 17 axial ribs;
- * spaces between ribs are slightly larger than the ribs themselves;
- * the whole surface of the teleoconch is sculptured with numerous thin spiral threads, crossing over the axial cords;
- * on the siphonal canal, the axial cords become longer and thinner, while the spiral ribs become thicker;
- * aperture ovoid;
- * siphonal canal very long, either straight or slightly sinuous;
- * operculum corneous, elongate-ovoid, dark brown with slight longitudinal striae and a basal nucleus;
- * periostracum never observed;
- * background colour creamy white, axial ribs rusty brown.



Geographic distribution: restricted to Gabon. Most specimens were collected by Korean fishing boats operating in 1979-80, at 20 km offshore the coasts of Gabon over a range of 120 km.

Conclusion: *Ariefusus rutilus* is without doubt different from the sibling species *Apertifusus caparti* and *A. meyeri*, particularly by its special

profile of axial sculpture and deeply incised sutures, and the brown coloured axial ribs.

The latter two species have rounded whorls, of which the spiral ribs are prevailing on the axial cords. This axial sculpture is strong only in the first teleoconch whorls and is gradually fading out in the last whorls. The differences between these two species are constant.

General conclusion: The genus *Apertifusus* in West Africa contains two sibling species, expanded with a third new representative species. There was really no reason for Vermeij & Hadorn (2018) to create a new genus *Ariefusus* for one recent and two extant species. It would be wiser to keep all sibling species in the same genus. Modern systematics are evolving in a way to create as much genera as species exist. I do agree that '*strongly and axially elongate nodes at shoulder angulation*' is an important characteristic, but the early whorls (from 7 to 9) of *Apertifusus meyeri* have a nearly similar outline as in *Ariefusus rutilus*. The penultimate and the last whorl of *A. meyeri* are different.

Some authors created confusion between *A. caparti* and *A. meyeri* in the past, probably by a lack of material or insufficient knowledge of the original descriptions and type material. Most of the images available on the internet, referring to *A. caparti*, are in fact specimens of *A. meyeri*, even specimen 96761 of NMR, used by WoRMS.

Recently, a new erratic conclusion was made by Cossignani & Allary (2019) by introducing '*Fusinus maritzaallaryae*' as a new species, which is no more than a small specimen of *Apertifusus caparti* (Adam & Knudsen, 1955) as such to be regarded as a junior synonym of the latter.

Genus *Viridifusus* Snyder, Vermeij & Lyons, 2012

Typetaxon: *Fusus buxeus* Reeve, 1847

The genus *Viridifusus* is characterised by a broadly fusiform shell, a relatively widely open siphonal canal (with a gap of 3 mm) with flaring tip, a very weakly erect inner lip on the main part of the last whorl but strongly erect along the siphonal canal, a slight channel and parietal ridge at the adapical end of the aperture, beaded lirae on the inner side of the outer lip (the beads are very weakly expressed in *V. albinus* and absent in *V. mollis*), a shallow suture, and a sculpture consisting of fine spiral threads and very low, numerous (11 to 22 on the last whorl) rounded ribs that extend on the last whorl to the basal constriction. The whorls

are rounded and without angulations or nodes. The beaded lirae set *Viridifusus* apart from all other Fusininae genera.

Viridifusus albinus (A. Adams, 1856)

(Pl. VII, figs 55-60; Pl. X, figs 78-79)

Type locality: Ichaboe Island, Namibia.

Material examined. CFN: off mouth of the Cunene River, border of southern Angola and Namibia. Trawled by Belgian fishermen (PEMARCO) at a depth of 80 m. 1963. 3 specimens: 97.19 mm, 108.36 mm, 117.85 mm.

Description: Shell heavy with 8 teleoconch whorls, distinctly convex, quickly increasing in diameter. Protoconch with 2^{1/2} embryonal whorls, the 1^{1/2} smooth and remaining part axially striated.

Last whorl very convex with regular, rounded axial ribs (18-20 on the last whorl), starting from a groove under the suture. These ribs are obsolete at their upper end but are most developed at the periphery.

Spiral cords are very fine (10-15 on the penultimate whorl), each primary cord separated by one thinner secondary thread.

Aperture rather large, oval, nearly circular.

Siphonal canal strong, but relatively short compared to similar species.

Colour white, greyish white or brown-yellow and especially the axial ribs are dark brown in some specimens.

Operculum elongate, oval with a longitudinal fold and a terminal nucleus.

Measurements: 95-120 mm.

Distribution: from southern Angola to southern Namibia.

Viridifusus mollis (A. Adams, 1856)

(Pl. VI, figs 45-52; Pl. VII, figs 53-54;

Pl. IX, fig. 74; Pl. X, fig 77)

Material examined. CFN: Bay of Namibe, southern Angola. On muddy sand. Dredged at a depth of 18 m. 45.36 mm; Ascension Island. 89.46 mm; Lobito, Angola. Trawled by Belgian fishermen (PEMARCO) at a depth of 80 m. 1963. 3 sp. 105.63 mm, 121.45 mm, 124.03 mm.

Description: Shell solid, outstanding heavy with 7 slightly convex whorls. Waxy appearance overall. Rather elongate with a remarkable large and swollen body whorl.

Protoconch with 2^{1/2} embryonal whorls, the 1^{1/2} smooth and remaining part axially striated. Axial cords (18-19) very distinct, but irregular, running from suture to suture in the last whorl. They become rather broad and irregular without becoming completely obsolete, but weakly pointed at periphery. Interstices between axial ribs narrow. Spiral structure weak and rather inconspicuous. Aperture oval and white. Siphonal canal strong and remarkably short. Colour mostly yellow-brown, but white specimens can occasionally also occur. The velvety periostracum is olive coloured and provided with microscopic small hairs.

Comparison with *V. albinus*: The differences noticed by Hadorn (1997), concerning the number and structure of the axial ridges, the convex character of the whorls, the size of the specimens, the shape of the aperture and its outer lip are not convincing, probably due to a lack of enough specimens from different localities. Anyway, they are not useful to separate both sibling species.

The following differences are proposed to distinguish both *Viridifusus* species from each other.

***V. mollis*:**

- * has a very heavy shell which weighs half as much as specimens of *V. albinus* of the same size, which have a slender outline;
- * has a shorter siphonal canal;
- * has on the other hand a remarkable prominent body whorl: the average ratio of last whorl/total length is 0.74 (0.73; 0.73; 0.73; 0.75; 0.77) compared to 0.70 (0.70; 0.70; 0.70) in *V. albinus*;
- * has axial ribs that are broad and irregular, from suture to suture, sharply pointed at the periphery and different from those in *V. albinus*, whose cords start from a cavity under the suture;
- * possesses spiral cords, which are weak and nearly visible in the last two whorls;
- * has a more oval aperture than *V. albinus*;
- * is definitively not so small as generally assumed and adult specimens can grow even larger than *V. albinus* specimens.

Conclusion: The original descriptions of these two species are very short and cryptic. A picture of *V. mollis* is available (Pl. IX, fig. 70), but type locality as well as type material were not mentioned. *V. albinus* on the other hand, was not figured, but well represented by three syntypes (Pl. X, fig. 73) (BMNH: holotype). Recent literature about these Angolan-Namibian FASCIOLARIIDAE is superficial and

confusing (Hadorn, 1998) or even lacking (Mallard & Robin, 2005; 2017). Probably for the first time, several specimens of both *V. albinus* and *V. mollis* were now at hand to be studied. The opportunity was taken to proceed to a detailed description of the two species and to publish enough data to establish a comparative identification table to differentiate both siblings, which are very similar species. At first glance one could even suppose they belong to only one species, but it turns out there are enough differences to separate them and to conclude they represent two species.

The following species are only briefly commented, because they have never been the subject of controversial opinions.

***Hemipolygona armata* (A. Adams, 1855)**
(Pl. VIII, figs 61-62)

Material examined. CFN: Quicombo, Angola. Trawled by Belgian fishermen (PEMARCO) at a depth of 80 m. 1973. 1 sp. 48.07 mm.

***Pseudofusus cf. rostratus* (Olivi, 1792)**
(Pl. VIII, figs 63-64)

Material: Moita Seca, northern Angola. Trawled by Belgian fishermen (PEMARCO) at a depth of 80 m. 1973. Size: 33.58 mm.

Only one specimen was available, insufficient to judge if this is really a representative of the Mediterranean species. If really so, it would mean a serious extension of its geographic range. Ardovini & Cossignani (2004) figured the southernmost record ever noticed to date, also as '*Fusinus cfr. rostratus*' on p.173 (Morocco). The shell is completely similar to the most common form of *P. rostratus*, a species with a great variability in colour and shell structure.

***Fusinus stanyi* Fraussen & Swinnen, 2006**
(Pl. V, figs 43-44)

Material examined. CFN: Moita Seca, northern Angola. Trawled by Belgian fishermen (PEMARCO) at a depth of 92 m. 1973. 1 sp. 39.18 m. Paratype 2.

Few specimens are known, because this is a very rare fasciolariid species, not comparable with any other species. A similar specimen was figured by Fraussen & Swinnen (2006), which is probably a form of *F. stanyi*, just like the specimen pictured by Ardovini & Cossignani (2004) as *Fusinus* sp. on p.173.

***Fusinus zebrinus* (Odhner, 1923)**

(Pl. V, figs 41-42)

Material examined. CFN: Praia Amelia, Benguela, southern Angola. In coarse sand between rocks. Dived at a depth of 4 m. September 1996. 1 sp. 42.30 mm.

This species can be compared with *Fusinus stanyi*. It has about the same size, but differs by the more prominent body whorl and the distinct axial and spiral cords with interrupted red-brown lines. The last whorl has a paler band at the periphery.

***Polygona filosa* (Schubert & Wagner, 1829)**

(Pl. VIII, figs 65-72)

Material examined. CFN: Luanda Bay, Angola. In sand. Dived at a depth of 4 m. 1 specimen with a size of 60.94 mm; Off Mayumba, southern Gabon. 03°30' S/ 10°20' E. Trawled by local fishermen. A sample of a dozen specimens. Size: from 45 to 58 mm.

Final conclusion:

* The genus ***Apertifusus*** is represented in the area between northern Gabon and southern Angola by three species:

- *A. caparti* (Adam & Knudsen, 1955)
- *A. meyeri* (Dunker, 1869)
- *A. hubrechtii* Nolf, 2023

Differences between these sibling species are described and figured in detail, resulting in the conclusion that *Fusinus maritzaallaryae* Cossignani & Allary, 2019 stands for small, juvenile or semi-adult specimens of *Apertifusus caparti*, and as such has to be regarded as a junior synonym of the latter.



* The genus ***Ariefusus*** is present by only one species: *A. rutilus* (Nicolay & Berthelot, 1996). However, the question is whether it was necessary to create a new genus for only one recent species and two extinct species, especially because *Apertifusus meyeri* displays the same characteristics - typical for *Ariefusus* - in the first teleoconch whorls.

* The genus ***Viridifusus*** is represented in the investigated area by two species:

- *V. albinus* (A. Adams, 1856)
- *V. mollis* (G.B. Sowerby III, 1913)

Most authors, who wrote about these species, possessed only very few specimens at hand,

especially juvenile or subadult representatives of *V. mollis* or white coloured specimens of *V. albinus*. So, they created a wrong image about these species, of which both white and yellow-brown coloured specimens exist. Moreover, adults of *V. mollis* grow larger than generally known, and they reach the same dimensions as *V. albinus*. A different view is needed to separate them and a superficial assessment following obscure original descriptions should be avoided. The comparative Table II may be a useful resource to clarify differences.

Five more fasciolariid species are enumerated, which have never created problems in identification, some of them being also present in other West African waters.

A unique specimen of possibly *Fusinus rostratus* (Olivi, 1792) was studied, but more material and deeper investigation will be needed to confirm if this was really an extension of the geographic range.

Acknowledgments: I am grateful to André Coenye (Oostende, Belgium) for providing so many interesting shells available for study, with accurate locality data. Steve Hubrecht and Johan Verstraeten, both from Belgium, offered several specimens in loan for study and photography. I thank Jan Libbrecht for the thoroughly check of the English manuscript.



Viridifusus albinus (A. Adams, 1856)
Cachama, Benguela Province, S Angola.
Dived at a depth of 32-36 m. December 2018.
53.34 mm. Juvenile stage. CJV.

	<i>Apertifusus caparti</i>	<i>Apertifusus hubrechtii</i>	<i>Apertifusus meyeri</i>	<i>Ariefusus rutilus</i>
Locality	Gabon, Congo, northern Angola	middle Angola	from Sierra Leone to southern Gabon	Gabon
Depth	45-230 m	100 m	20-100 m	35-50 m
Size	25-220 mm	40-105 mm	175-370 mm	100-200 mm
Teleoconch whorls	11-12, very rounded	8-9, rounded but flattened in upper part of whorls	10-12, first whorls very angular, later whorls partly loosened	10, all whorls very angular, axial sculpture
Sutures	not deeply incised	rather indistinct	deeply incised	very deeply incised
Spiral cords	primary cords, separated by one thinner secondary thread	each primary cord followed by two thin secondary threads	primary cords, separated by none or one thinner secondary thread	thin spiral cords, evenly spaced
Axial cords	18 regularly spaced spiral ribs on body whorl	14-17 on body whorl, disappearing in later stage	18-25; slightly granulous, dominant in first whorls, diminishing afterwards	17 sharply rounded ribs with elongate nodules at periphery on last whorl
Siphonal canal	straight or slightly sinuous	straight	large, elongate, straight or slightly distorted	very long, straight, slightly sinuous at end
Aperture	ovoid, nearly circular	ovoid	narrow, elongate	large, nearly circular
Periostracum	flaky, wrinkled	very thin, resistant	flaky, wrinkled	?
Colour	white; axial ribs or interstices in juvenile specimens sometimes brown coloured	completely white	white; first teleoconch whorls brown	creamy white with rusty brown axial ribs

Table I: Comparative table with differences between *Apertifusus* and *Ariefusus* species from Gabonese and Angolan waters



	<i>Viridifusus albinus</i>	<i>Viridifusus mollis</i>
Locality	southern Angola, Namibia	Ascension, Angola, northern Namibia
Depth	5-90 m	5-80 m
Size	90-118 mm	43-124 mm
Teleoconch whorls	8; very convex; body whorl: 70% of total length	7; body whorl swollen, it takes 75% of total length
Spiral cords	fine threads, each primary cord separated by one secondary thread	weak, nearly visible in last two whorls, evenly spaced
Axial cords	start from a cavity beneath the sutures, most developed at periphery	run from suture to suture; irregular, very distinct, sharp pointed at periphery
Siphonal canal	strong, short	very short
Aperture	nearly circular	oval
Periostracum	?	velvety, with microscopic small hairs
Colour	white or yellow-brown	white or yellow-brown
Protoconch		

Table II: Comparative table with differences between *Viridifusus albinus* and *Viridifusus mollis*

References:

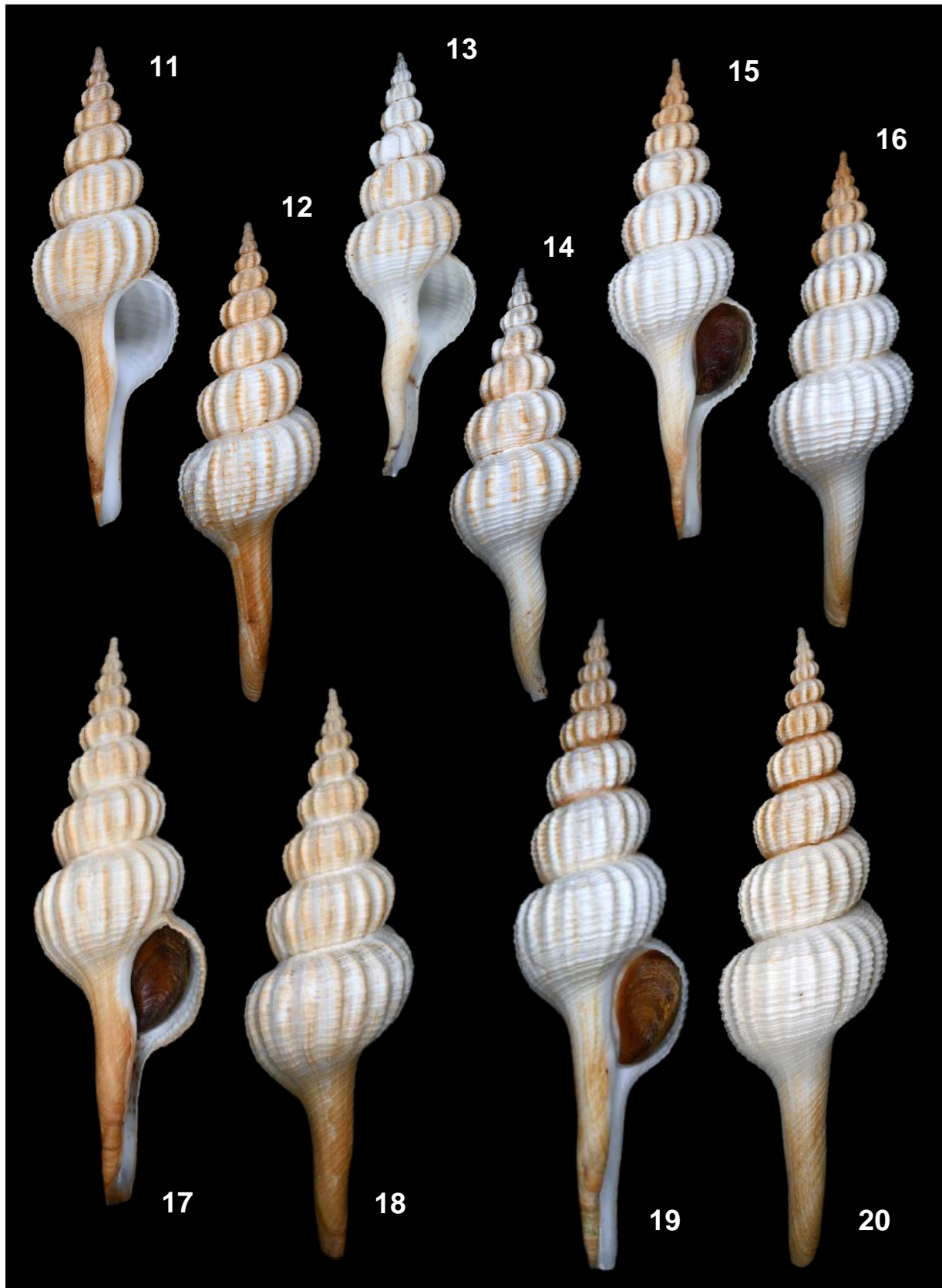
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Display of the several fasciolariid species in the Gabonese, Angolan and Namibian area



Pl. I. Figs 1-8. *Apertifusus hubrechtii* sp. nov.; 1-2: Off Luanda, Angola. Trawled by Belgian fishermen (PEMARCO) at a depth of 40 fms. 1973. 51.41 mm. Holotype. RBINS-I.G.: 34638-MT.4014; 3-4: Off Luanda, Angola. Dredged by fishermen at a depth of 50 m. 49.59 mm. Paratype 1. CSH; 5-8: Quicombo, Angola. Trawled by Belgian fishermen (PEMARCO) at a depth of 100 m. CFN; 5-6: 71.21 mm. Paratype 2; 7-8: 105.43 mm. Paratype 3; Figs 9-10: *Apertifusus caparti* (Adam & Knudsen, 1955). Ambriz, Angola. Trawled by Belgian fishermen at a depth of 80 m. 1970. CFN. Juvenile specimen. 34.73 mm.



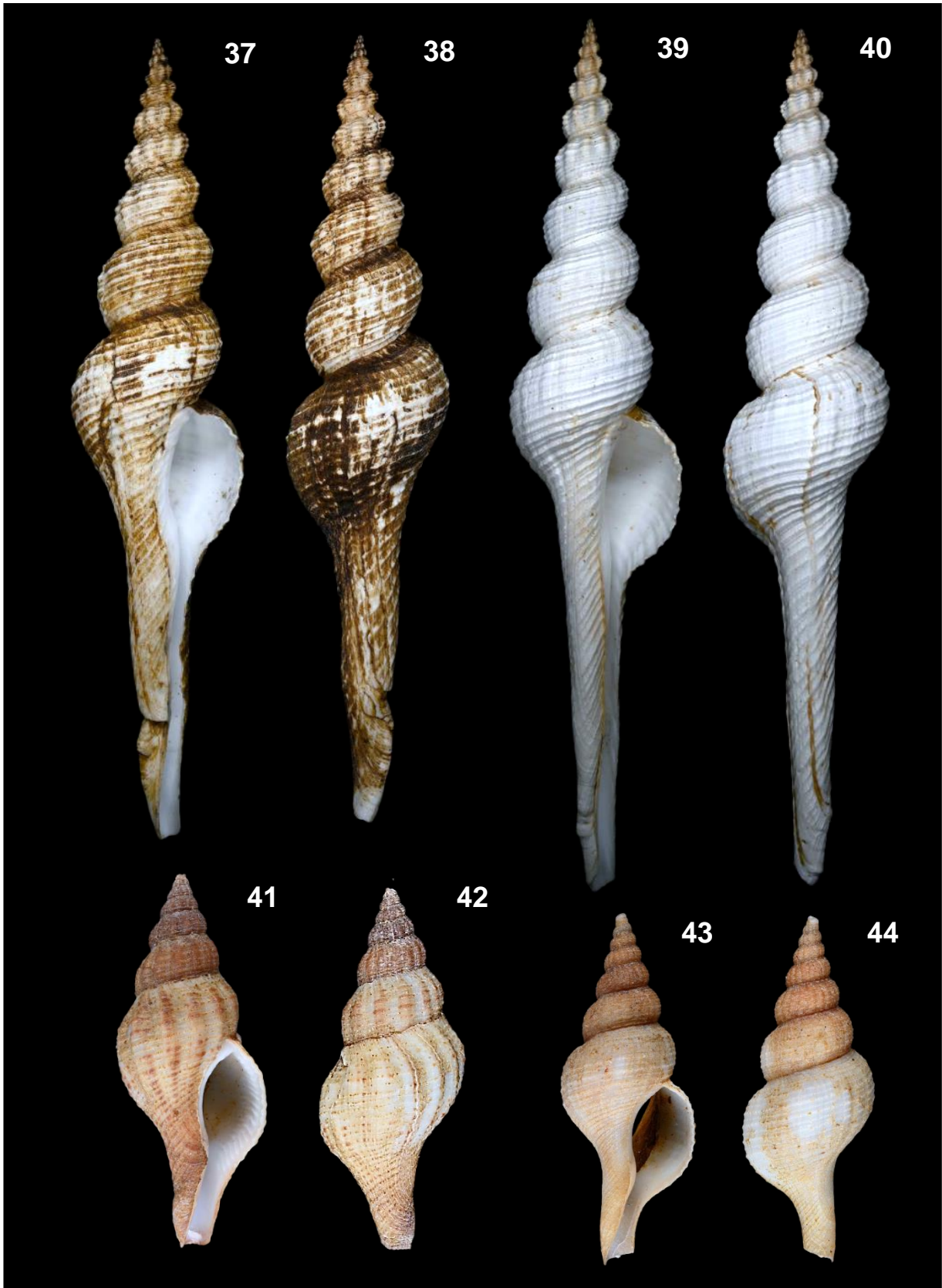
PI. II. Figs 11-20. *Apertifusus caparti* (Adam & Knudsen, 1955). CFN; 11-14: off Luanda, Angola. Trawled by Belgian fishermen (PEMARCO) at a depth of 80 m. 1970; 11-12: 99.17 mm; 13-14: 95.18 mm; 15-20: Ambriz, Angola. Trawled by Belgian fishermen (PEMARCO) at a depth of 100 m. 1970; 15-16: 120.05 mm; 17-18: 124.39 mm; 19-20: 152.75 mm.



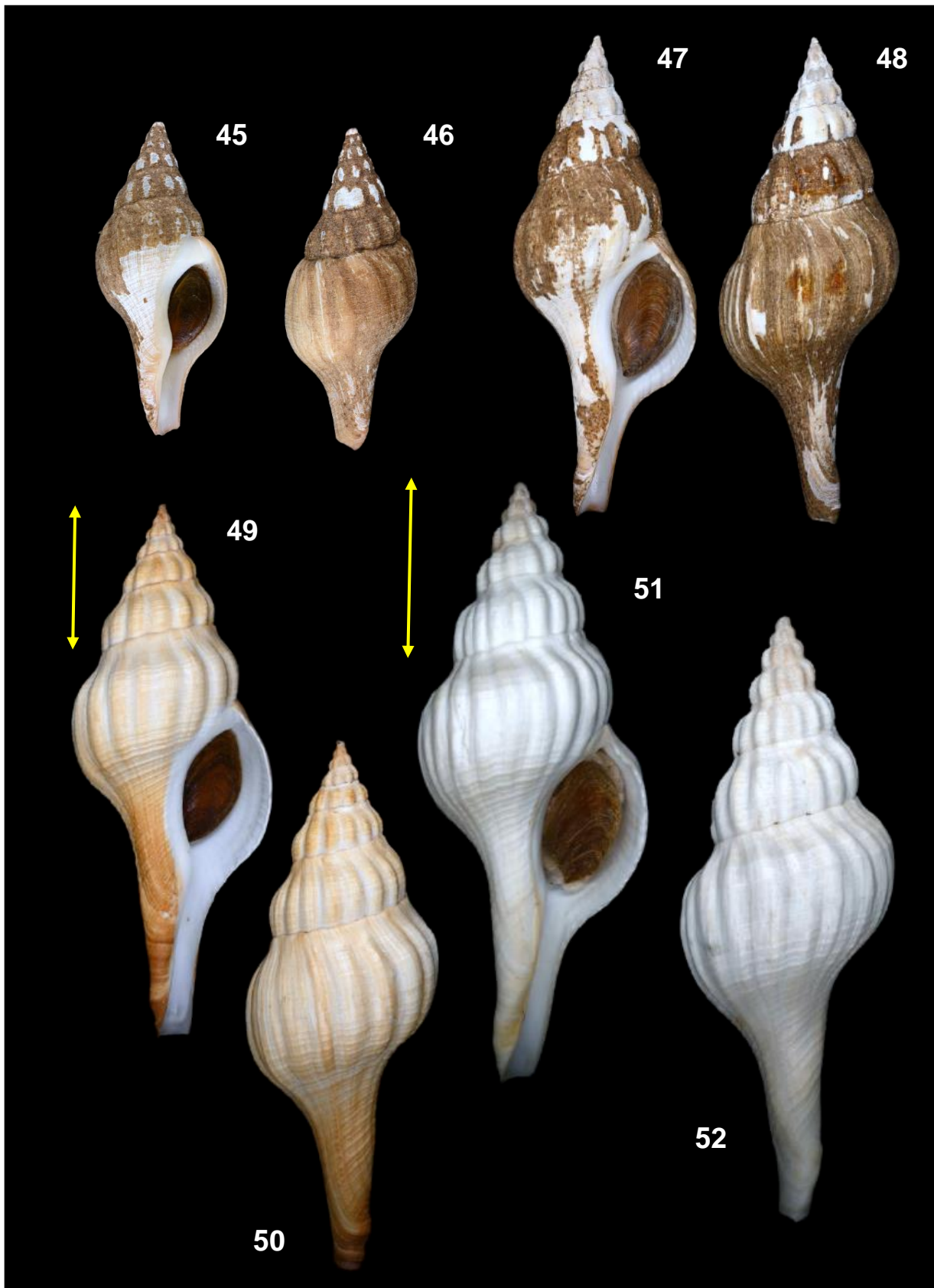
Pl. III. Figs 21-28. *Apertifusus caparti* (Adam & Knudsen, 1955). Ambriz, Angola. Trawled by Belgian fishermen (PEMARCO) at a depth of 100 m. 1970. CFN; 21-22: 194.8 mm; 23-24: 207.3 mm; 25-26: freak specimen. 179.4 mm; 27-28: 216.8 mm.



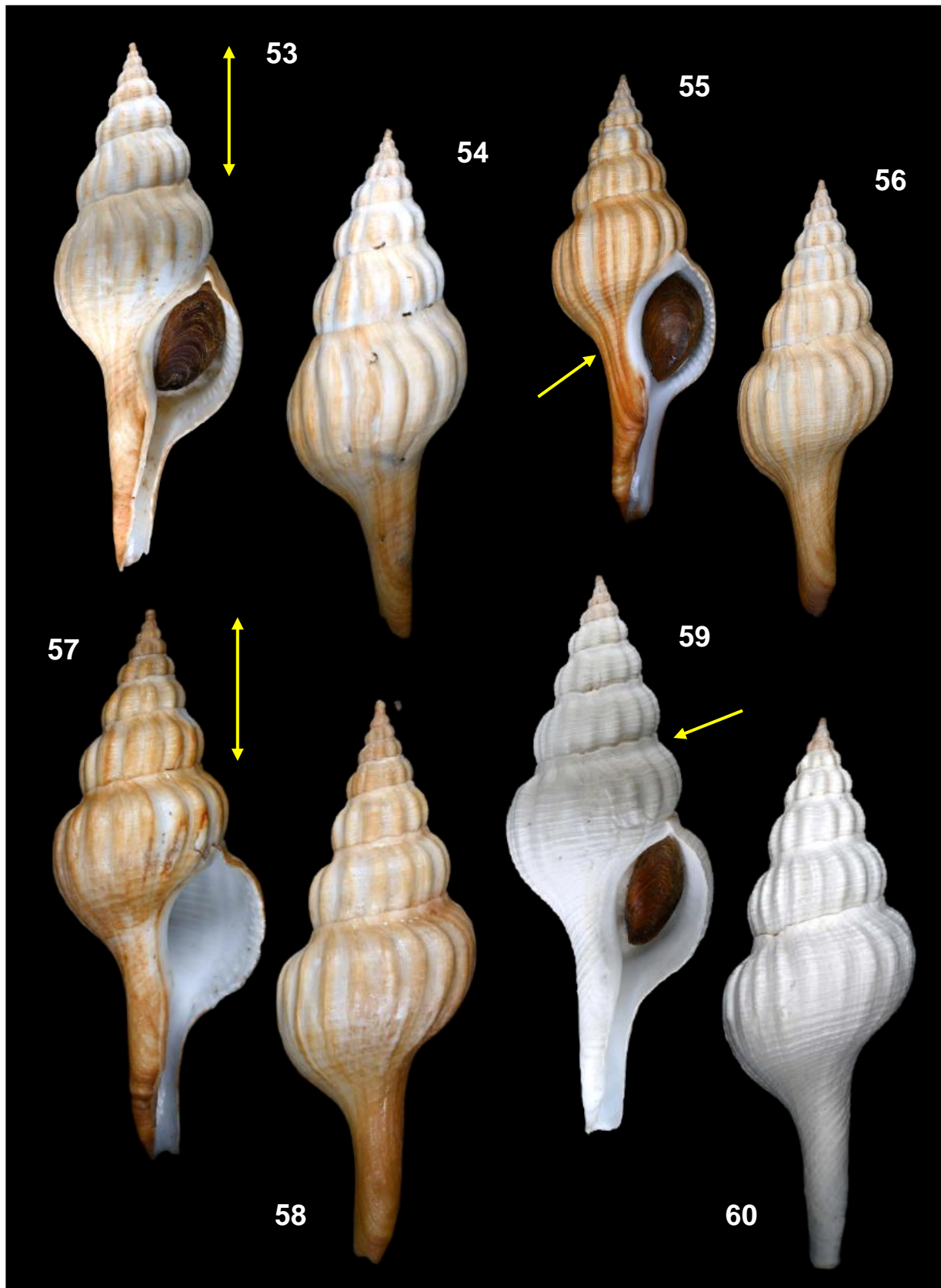
Pl. IV. Figs 29-34. *Apertifusus meyeri* (Dunker, 1869). CFN; 29-30: Off Libreville, Gabon. Trawled by fishermen at 60 km offshore. 214.4 mm; 31-34: Gabon. Trawled by fishermen; 31-32: 222.5 mm; 33-34: 170.0 mm; Figs 35-36: *Ariefusus rutilus* (Nicolay & Berthelot, 1996). Gabon. Trawled by fishermen. 1982. 141.20 mm.



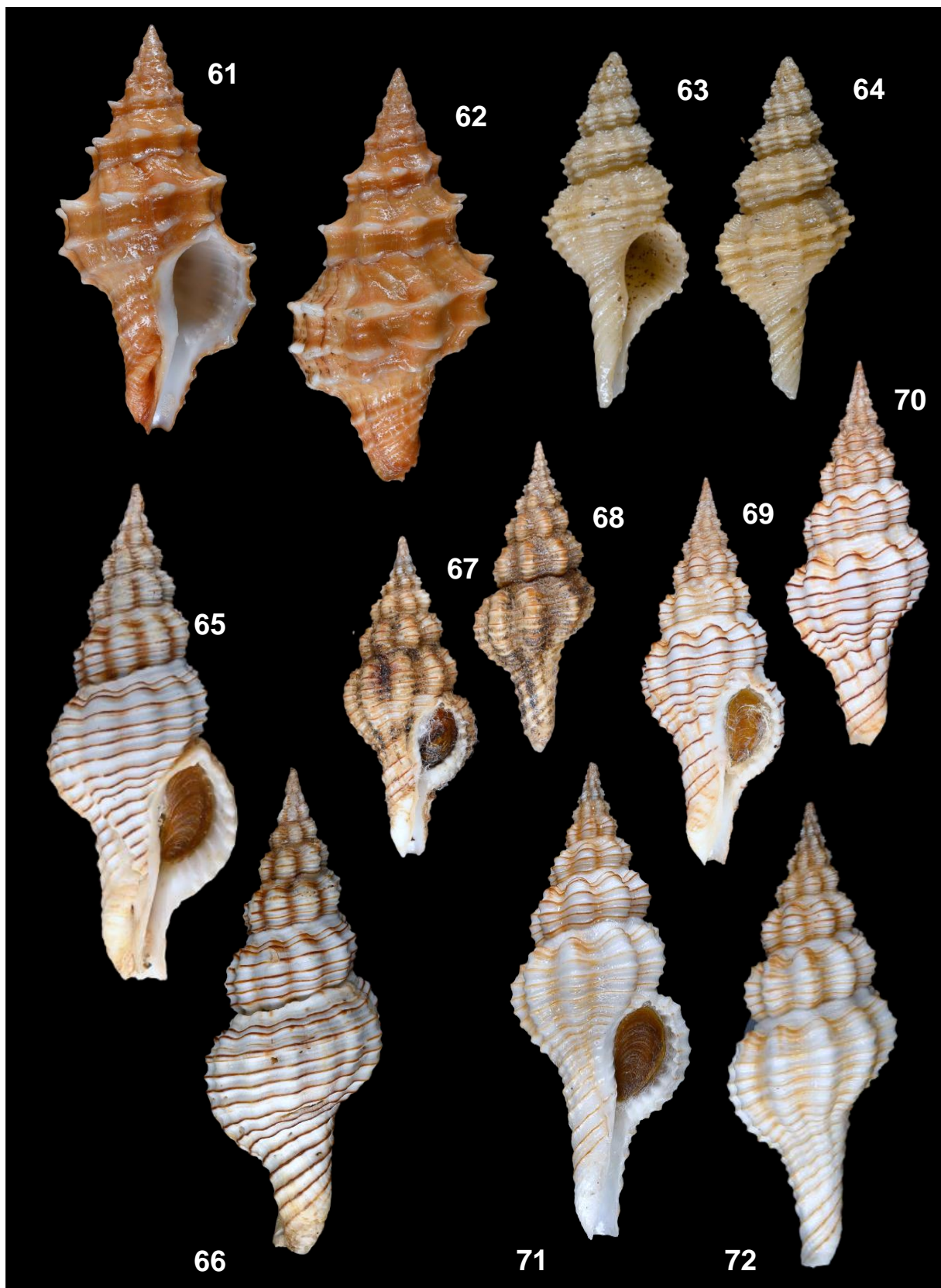
Pl. V. Figs 37-40. *Apertifusus meyeri* (Dunker, 1869). Off Abidjan, Ivory Coast. Trawled by local fishermen. 1988. CFN; 37-38: 276 mm; 39-40: 312 mm; Figs 41-42: *Fusinus zebrinus* (Odhner, 1923). Praia Amelia, Benguela, southern Angola. Between rocks in coarse sand at a depth of 4 m. September 1996. 42.30 mm. CFN; Figs 43-44: *Fusinus stanyi* Fraussen & Swinnen, 2006. Moita Seca, Angola. Trawled by Belgian fishermen (PEMARCO) at a depth of 92 m. 1973. Paratype 2. 39.18 mm.



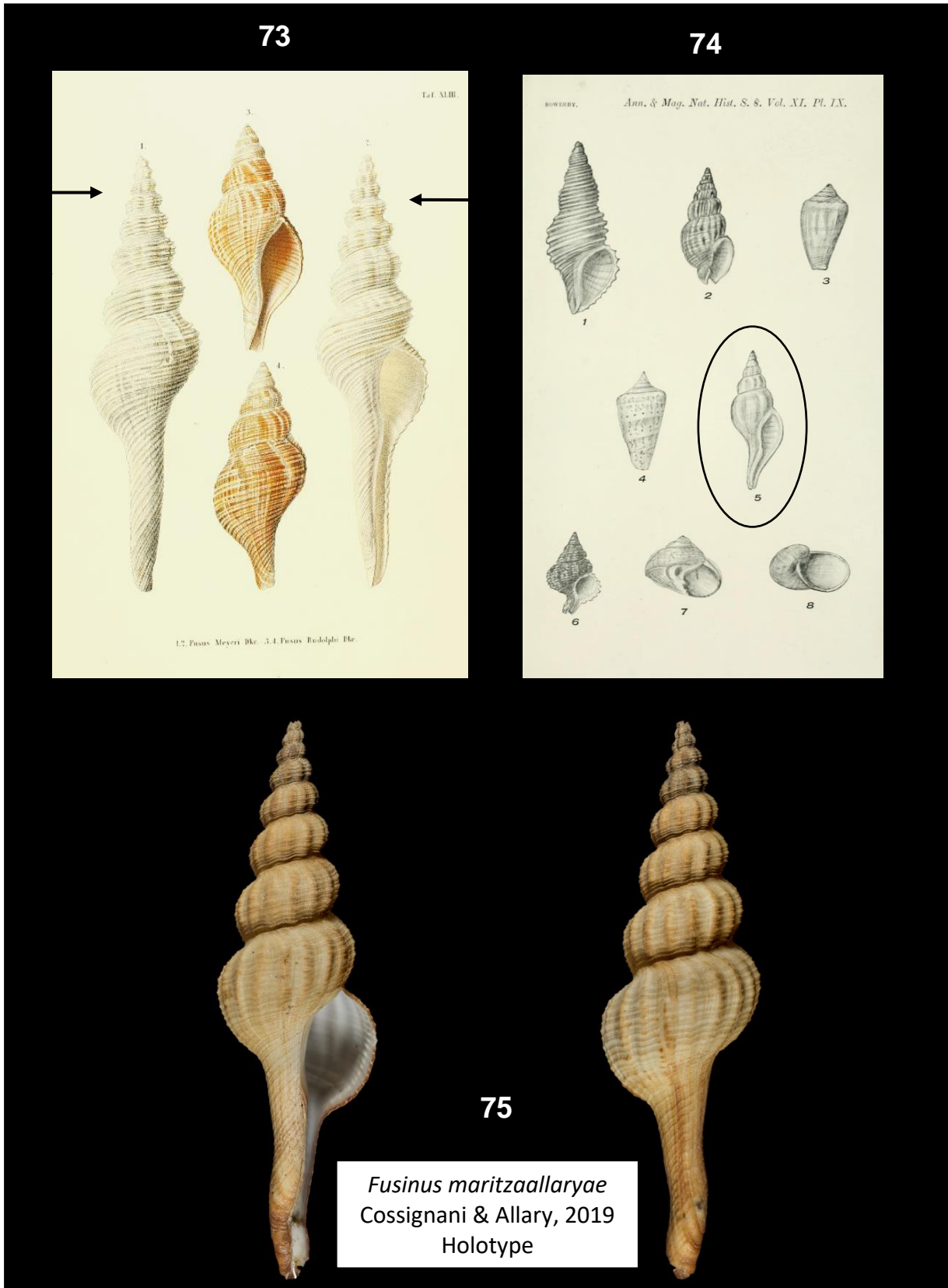
Pl. VI. Figs 45-52. *Viridifusus mollis* (G.B. Sowerby III, 1913). CFN; 45-46: Bay of Namibe, Angola. Dredged at a depth of 18 m in muddy sand. 45.36 mm; 47-48: off Ascension Island. 89.46 mm; 49-52: Lobito, Angola. Trawled by Belgian fishermen (PEMARCO) at a depth of 80 m. 1963; 49-50: 105.63 mm; 51-52: 121.45 mm.



Pl. VII. Figs 53-54. *Viridifusus mollis* (G.B. Sowerby III, 1913). Lobito, Angola. Trawled by Belgian fishermen (PEMARCO) at a depth of 80 m. 1963. 124.03 mm. CFN;
 Figs 55-60: *Viridifusus albinus* (A. Adams, 1856). Cape Fria, Namibia. Trawled by Belgian fishermen (PEMARCO) at a depth of 80 m. 1963. CFN; 55-56: 97.19 mm; 57-58: 108.36 mm; 59-60: 117.85 mm.

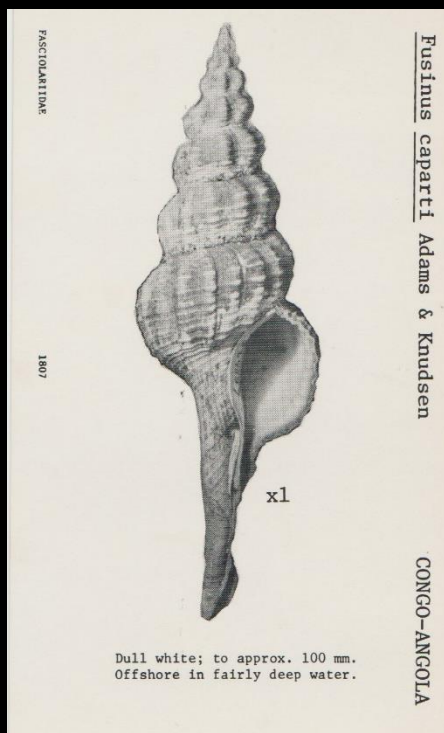


Pl. VIII. Figs 61-62. *Hemipolygona armata* (A. Adams, 1855). Quicombo, Angola. Trawled by fishermen. 1990. 48.07 mm. CFN; Figs 63-64: *Pseudofusus cf rostratus* (Olivi, 1792). Moita Seca, Angola. Trawled by Belgian fishermen (PEMARCO) at a depth of 80 m. 1963. 33.58 mm. CFN; Figs 65-72: *Polygona filosa* (Schubert & Wagner, 1829). CFN; 65-66: Luanda Bay, Angola. Dived at a depth of 4 m. 60.94 mm; 67-72: Off Mayumba, Gabon. 03°30' S/ 10°20' E. Trawled by local fishermen. 1985. CFN; 67-68: 45.02 mm; 69-70: 50.86 mm; 71-72: 58.56 mm.

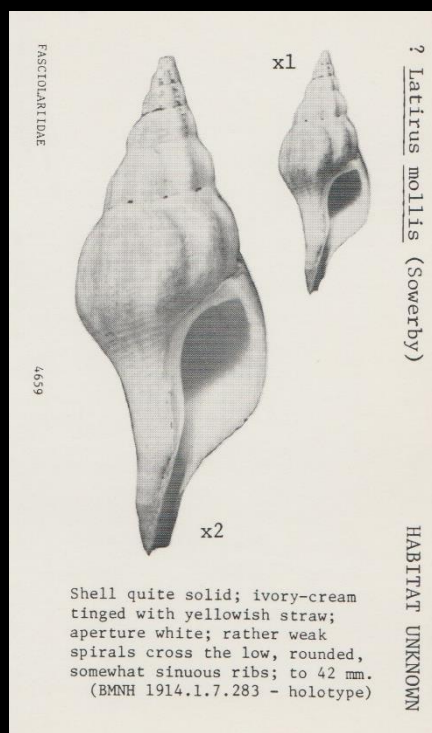


PI. IX. Fig. 73: *Fusinus meyeri*. In: Dunker, W., 1869. *Novitates Conchologicae. Mollusca Marina. Beschreibung und Abbildung neuer oder wenig gekannter Meeres-Conchylien*. Abt. II: Meeres Conchylien. Pl. XLIII, figs 1-2; Fig. 74: *Latirus mollis*. In: Sowerby, G.B. III, 1913. Descriptions of eight new marine Gastropoda mostly from Japan. *Annals and Magazine of Natural History. Series 8*, 11. Pl. 9, fig. 5; Fig. 75: holotype of *Fusinus maritzaallaryae* Cossignani & Allary, 2019 (MNHN) (junior synonym of *Apertifusus caparti* (Adam & Knudsen, 1955)).

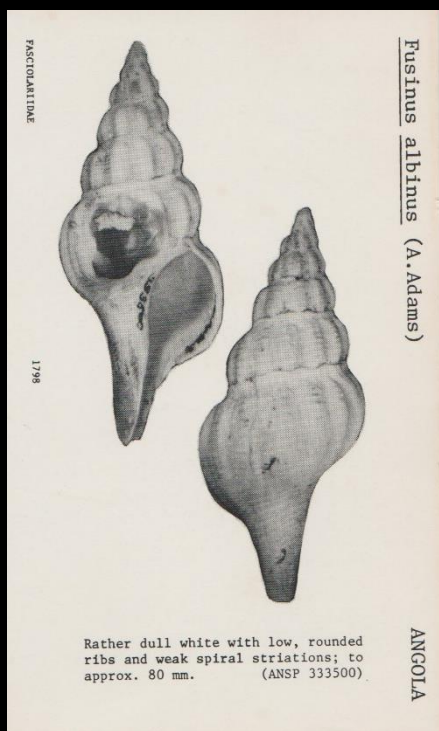
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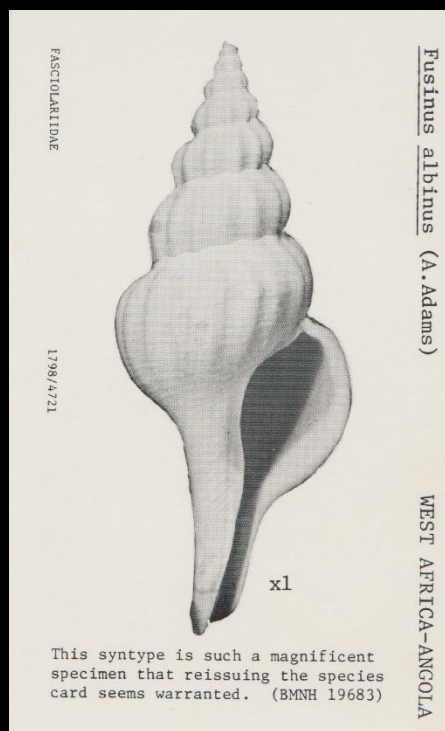
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Pl. X. Figs 76-79: Cards by S.D. Kaicher. Pack #18. FUSIOLARIIDAE. Part I. 1986. Pack #46. FUSIOLARIIDAE. Part II; 76: *Fusinus caparti* (card 1807) (= *Apertifusus hubrechtii* sp. nov.); 77: *Latirus mollis* (card 4659 - BMNH 1914.1.7.283 - holotype); 78: *Fusinus albinus* (card 1798 - ANSP 333500); 79: *Fusinus albinus* [card 1798/4721 - syntype (one from a lot 3) - BMNH 19683]

A commented list of the white, mainly deep-water calliostomatids (Mollusca: Gastropoda) in the East Atlantic waters

Frank Nolf¹ & Steve Hubrecht²

¹ Prinses Stefanieplein, 43 bus 00.01
B-8400 Oostende, Belgium
frank.nolf@pandora.be

² Strandlaan 246 bus 03.03
B-8670 Koksijde, Belgium
hubrechtsteve@gmail.com

Keywords: Mollusca, Gastropoda, CALLIOSTOMATIDAE, E Atlantic.

Abstract: After the introduction of a few new species in the family CALLIOSTOMATIDAE (Nolf & Hubrecht, 2022a & 2022b) an overview is presented of the white coloured deep-water calliostomatids in East Atlantic waters.

Abbreviations:

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

CSH: Private collection of Steve Hubrecht (Koksijde, Belgium)

D: Diameter

H: Height

MOM: Musée Océanographique de Monaco

PEMARCO: Pêche maritime du Congo

RBINS: Royal Belgian Institute of Natural Sciences (Brussels, Belgium)

Introduction: CALLIOSTOMATIDAE is a relatively small family, with an estimated 250 species of small or medium size.

Calliostomatids are found from shallow to deep-water depths and occur in all oceans, ranging from the polar to the tropic latitudes. The genus *Calliostoma* is represented by about 25 different species in Mediterranean and E Atlantic waters from Iceland to Angola. Recently, four new species were described by Nolf & Hubrecht (2022a, 2022b, 2022c). At least 16 of them are white deep-water species, most of them only known from expeditions.

In fact, all calliostomatids in the E Atlantic remain today placed in the genus *Calliostoma*, historically based on shell morphology.

There is relatively little information about deep water *Calliostoma* from the eastern Atlantic. The only major works in that field are certainly the ones of Dautzenberg (1889, 1925, 1927), Dautzenberg & H. Fischer (1896, 1897) and Locard (1897-98). It is the purpose of this paper

to list, illustrate and comment on most of the 16 different white deep-water species and 2 white forms of common rock dwellers in shallow waters.

Alphabetic listing with comments:

- *Calliostoma bullatum* (Philippi, 1844)
(Pl. I, fig. 1)

Description: Shell thin and wide, spire with slightly convex outline. Protoconch swollen with a reticulated sculpture on a smooth background. First teleoconch whorl convex with five rounded spiral ribs above the periphery. Shoulder area flattened with weaker spiral ribs. About seven slightly convex teleoconch whorls, with rather deep suture, and about six very wide shallow grooves, the last whorl with a blunt keel. Whorls covered with 6-14 spiral ribs which are finer, more numerous and evenly distributed. Additional spiral cords emerge as thin threads between two stronger ones. Spiral ribs stronger near the periphery on whorls six and seven. Fine beads frequently present on the first and second whorl below the suture in the first whorls. Body whorl slightly more convex with a blunt keel at periphery. Some specimens show slightly more convex whorls and a more regular pattern of fine spiral ribs on the whorl surface. The base is flattened with spiral cords that are strongly developed near periphery and near columella. Umbilicus closed in adult specimens. Aperture angular, columella convex, inner shell nacreous. Columella convexly curved and its callus clearly demarcates the transition to the external shell.

Colour white. Periostracum absent.

Size: H. 36 mm D. 36 mm.

(Hoffman et al, 2019).

Distribution: This is a common fossil in Early and Mid-Pleistocene formations deposited in bathyal depths.

Living specimens were found off Mauritania in deep-water coral at 450-642 m.

Comments: *C. bullatum* is larger than *C. maurolici* (Seguenza, 1876). The latter has a stronger spiral ornament, more convex whorls, a wider top angle and an open umbilicus when adult. *C. cleopatra* (Locard, 1898) from Western Sahara is smaller, with more convex whorls, stronger spiral sculpture and stronger beads on the upper spiral ribs. *C. caroli* Dautzenberg, 1927 from the Azores is smaller and it has a more angular outline with a stronger spiral structure.

- ***Calliostoma caroli* Dautzenberg, 1927**

Synonyms: *Calliostoma dautzenbergi* Finlay, 1930; *Calliostoma hedleyi* Dautzenberg, 1925 (Pl. I, fig. 2)

Type localities:

E Atlantic - 39°11' N/ 29°05'45" W – 1600 m; Off Terceira, Azores – 38°52'50" N/ 27°23'05" W – 599 m; Between Pico and S. Jorge – 38°35'30" N/ 28°05'45" W – 1250 m; W of Florès, Azores – 39°25' N/ 31°22' W – 1229 m.

Description: Shell solid, imperforated, with a weak furrow behind the columellar edge. Spire poorly elevated, composed of 7 whorls, with a very distinct shoulder in every whorl.

The three embryonal whorls are smooth and convex, the others crossed by a median hull, sloping at upper part and descending abruptly below. Last whorl angular at periphery. The surface of the last four whorls provided with weakly granulated spiral cords. Last whorl with six cords above the keel and four more separated ones below. The keel itself is composed by two juxtaposed cords with more projecting granules.

Base convex with about twenty concentric spiral cords, flattened, contiguous and not granulated. Aperture subquadrangular. Columella slightly thickened, weakly arched.

Colour white, except the embryonal whorls, which are shiny and nacreous.

Comments: *C. normani* (Dautzenberg & H. Fischer, 1897) from the Azores is very similar to *C. caroli*, but it has finer spiral ribs on inflated whorls and it lacks a blunt keel.

Distribution: E Atlantic. Azores Archipelago. Recently also discovered from Icelandic waters (Delongueville & Scaillet, 2019).

- ***Calliostoma cleopatra* (Locard, 1896)**
(Pl. II, figs 4-8)

Description: A rather large shell, solid, thick, with turbinate-conical outline, a staged profile, slightly higher than wide, not umbilicated.

Spire with 7-8 weakly convex whorls. Suture deeply canaliculated, but not very distinct.

Aperture large and slightly ovular with a simple peristome. Columellar edge rather short, thick, slightly oblique and a bit reflected to the umbilical area.

Whorls decorated with spiral cords. The penultimate whorl with 6 granulated spiral cords, which become less granulous towards the bottom of each whorl. The last whorl also with 6 spiral cords, of which the first three are very granulated, becoming smooth towards the lower part of the whorl. Base with 12-13 concentric spiral smooth cords, rather regular, with equal interstices.

Colour: yellowish white, slightly iridescent, nacreous inside the aperture.

Comments: A small shell, with slightly convex whorls bearing very noticeable nodulose cords. Much larger than *C. heugteni* Vilvens & Swinnen, 2003, with a more depressed spire, more convex whorls and smooth abapical spiral cords, basal spiral cords stronger with interstices between cords wider than the cords. This species is somewhat similar to *C. granulatum* (Born, 1778) but it is thicker with stronger spiral cords, more convex rounded whorls, and an obvious deeply canaliculated suture.

C. leptophyma Dautzenberg & H. Fischer, 1896 is similar to *C. cleopatra*, but it lacks the strong carinae on the ribs and it has a more compressed outline.

Material examined: Rockall Trough, off NW Ireland. 55°43' N/ 16°11' W. Dredged at a depth of 704 m by research ship. June 2004. CSH.

- ***Calliostoma cyrtoidea* Gofas & Hoffman, 2020**

(Pl. I, fig. 3)

Type material: Hyères Seamount. 31°32' N/ 28°60' W. Depth: 1060 m.

Description: Shell small (H. 7 mm D. 6 mm), solid, white, nacreous inside. Flattened apex, whorls convex with strong spiral sculpture, suture shallow below suprasutural channel.

Protoconch: nucleus with $\frac{3}{4}$ whorls, surface covered by regular honeycomb sculpture with

cells aligned. Transition to teleoconch clear by varix and change in sculpture.

Spire with four whorls. Body whorl with six spiral cords. The upper four cords are nodular, the cord prolonging the suture smooth and rounded with concave channel above. Eight smooth, rounded cords on convex base of body whorl, with irregular growth lines.

Umbilicus nearly closed by columellar callus. Aperture nearly circular. Lip sharp with corrugated margin reflecting external sculpture. A thick smooth callus on rounded columella. Inside nacreous. Operculum multispiral, translucent and brown. No periostracum.

Comments: This species can only be compared with *Calliostoma heugteni* Vilvens & Swinnen, 2003 and *C. freiwaldi* Gofas & Hoffman, 2020, which have flattened whorls with fine spiral cords and a peripheral keel.

Distribution: In the seamounts area of the E Atlantic: 29.6° - 34.5° N/ 27.5° N - 30.5° W.

- ***Calliostoma fernandesii* Rolán & Monteiro, 2006**

(Pl. IV, figs 18-20)

Description: A conic, solid shell, pearly-white with an iridescent shine, spire relatively high, straight profile, not umbilicated, higher iridescent into the interior. Protoconch white, with less than one whorl. Teleoconch with 8 flat whorls and a rather distinct suture. The first whorl has two nodulose cords, the second whorl has two such cords in the beginning, three at the end. The third whorl has five cords, the uppermost ones nodulose, the others smooth. In the following whorls the cords diminish, only the first one being nodulose until it almost disappears like the others, which are extremely flat and almost invisible, especially in the upper portion of the whorls. On the last whorl the cords are quite subdued but about 22 may be counted until the periphery, crossed by strongly prosocline growth lines. The last whorl forms a very marked angle in the periphery. The base also shows very subdued, almost invisible cords.

The umbilicus is covered by a small callus. The aperture is subcircular, the peristome is thin, but there is a strong callus inside the aperture (only in adult shells). The columella is fairly straight and prosocline.

The operculum is yellow, multispiral, slightly transparent and uniformly concave externally. Soft parts are whitish.

Size: from 22 to 32 mm.

Type locality: Cape Verde Archipelago.

(Rolán & Monteiro, 2006).

Material examined: East of Boavista, Cape Verde Islands. From lobster trap at a depth of 150 m. H. 28.20 mm L. 25.44 mm. CSH.

Distribution: restricted to the type locality.

- ***Calliostoma freiwaldi* Gofas & Hoffman, 2020**

(Pl. IV, figs 21-23)

Type locality: Irving Seamount. 31°98' N/ 27°93' W. Depth: 435-460 m.

Description: Shell small (H. 11 mm D. 11 mm), solid, glossy white, nacreous inside. Whorls moderately convex with strong spiral sculpture. Protoconch with $\frac{3}{4}$ whorls, surface covered by regular honeycomb sculpture with cells spirally aligned. Spire slightly concave with 6 moderately convex whorls, body whorl more convex than other whorls, rounded periphery. Last whorl with 8 spiral cords, more strongly beaded near periphery and near the umbilicus. Open deep umbilicus with strong keel at margin, spiralling inside. No periostracum.

Aperture widely curved on labial side, columella flexuous, slightly concave at intersection with penultimate whorl. Lip sharp with corrugated margin reflecting external sculpture, denticulate at base. A thin smooth callus covers the rounded columella and parietal area. Inside nacreous, with external sculpture showing through.

Operculum spiral, translucent, light brown.

Comments: *Calliostoma heugteni* Vilvens & Swinnen, 2003 is a similar species, which differs in having a higher spire with a straight profile, a concave columella, a finer sculpture and a very narrow umbilicus.

C. maurolici (Seguenza, 1876) is quite similar but differs in having a more depressed outline and its beaded sculpture is limited to the upper spiral cords.

C. leptophyma Dautzenberg & H. Fischer, 1896 has predominantly smooth spiral cords and a closed umbilicus.

Distribution: Upper bathyal range at crests and slopes of the South Azorean Seamount Chain, 30°-34.5° N/ 27.5°-30.6° W between 310 and 750 m.

- *Calliostoma granulatum* var. *lactea*
(Jeffreys, 1865)
(Pl. III, figs 9-17)

Type locality: Exmouth, England, UK. Types could not be found (Warén, 1980).

Description: Shell exceedingly dilated and rounded at the base, moderately solid. Spire moderately raised, and tapering somewhat abruptly to a fine point, with 10 whorls, rather straight. Last whorl convex and dilated, with 6-8 concentric ridges and about as many smaller secondary threads. The uppermost cords are provided with beads, less visible beneath.

Suture defined by a shallow furrow between the uppermost ridge of each whorl and the lowest ridge of the preceding one. Aperture obliquely truncated, expanding below. Outer lip thin. Inner lip white and reflected on the pillar, which is extremely thick and somewhat curved. Interior highly nacreous. Operculum rather concave.

Material examined: South of La Rochelle, W France, Bay of Biscay. Trawled by Belgian fishermen at a depth of 120 m. June 2008. 4 sp. H. 26.18 mm D. 27.50 mm, H. 26.12 mm D. 26.08 mm, H. 18.68 mm D. 17.85 mm, H. 28.19 mm D. 25.78 mm. CFN; St. George's Channel, Irish Sea, UK. Trawled by Belgian fishermen. 1975. 2 sp. H. 32.42 mm D. 33.30 mm, H. 33.15 mm D. 35.46 mm.

Distribution: The nominate species is found from the Shetlands southwards along the western coast of the British Isles, the English Channel and into the Mediterranean Sea. Also off Madeira, the Canary Islands, Morocco, Mauritania and sporadically southwards to Angola. White specimens only known from the NE Atlantic.

Comments: This variety of *C. granulatum* closely resembles *C. hirondellei* Dautzenberg & H. Fischer, 1896. The latter has only 1-2 granulated cords on the body whorl with a straight outline, instead of the numerous granulated cords on the convex last whorl in *C. granulatum*.

- *Calliostoma grimaldii* Dautzenberg & H. Fischer, 1896
(Pl. IV, figs 24-26)

Type locality: Azores. Depth: 1557 m.

Description: Shell solid, imperforated. Spire conical, composed of 7 slightly convex whorls. First two embryonal whorls are smooth,

following by two whorls, which are decorated with three granulated subequal spiral cords; above the suture there is a sharp ridge and beneath it a strongly tuberculated cord. Between the primary cords a few secondary threads may be present that are slightly granulous. A protruding ridge is present in the middle of the last whorl.

Aperture rounded, nacreous at the interior. Columella very thick. Colour: white.
Size: H. 20 mm D. 18 mm.

Distribution: NE Atlantic Ocean from the Reykjanes Ridge to off Cape Mogador. Azores archipelago. 31.7° - 59° N/ 10.7° N - 31.1° W.

Comments: Differences with *Calliostoma triporcatum* (Locard, 1898): much smaller, the lower part of the shell is less developed and more flattened, two keels instead of three. Locard in some of his works considered *C. grimaldii* as a variety of *C. triporcatum*.

- *Calliostoma heugteni* Vilvens & Swinnen, 2003
(Pl. IV, figs 27-29)

Type locality: Eastern Atlantic. 29°35' N/ 24°22' W.

Description: Shell very small for the genus, conoidal in shape, with well-marked spiral nodulose cords. Spire high, almost conical, about 15% higher than wide, with a narrow, deep, partly covered umbilicus.

Protoconch covered by a reticulate network of fine ridges. Apical fold more or less straight, terminal varix visible and slightly thickened. Teleoconch of 6 whorls, bearing spiral cords. Suture visible, not canaliculated.

Aperture subcircular, with weak lirae within. Outer lip rather thin at rim, rounded. Inner lip with no angle at meeting point with outer lip. Columella more or less straight, slightly oblique, smooth. A callus almost completely or partly closes the umbilicus. Base weakly convex, with 10-12 smooth spiral cords. Distance between cords narrower compared to cords.

Comments: It is slightly similar to *C. granulatum*, which is much larger with more numerous spiral cords, an angular periphery and without an umbilicus. *C. heugteni* is much smaller than *C. lithocolletum* Dautzenberg, 1925, which has flat whorls and smooth spiral cords.

Distribution: off Azores Archipelago, E Atlantic in the area: 30° - 34° N/ 28.3° - 30.3° W.

- *Calliostoma hirondellei* Dautzenberg & H. Fischer, 1896

(Pl. V, figs 30-36)

Type locality: Off Terceira Island, Azores.
Depth: 450-700 m.

Description: Shell solid, thick, imperforated, a bit shiny. Spire conical, composed of 8 whorls, the first being straight, the following slightly concave, separated by a shallow suture. The first embryonal whorls are shiny, the others are decorated with 6 equal spiral cords, of which the first two are slightly granulated. The last whorl is slightly inflated. The base is convex and provided with 11-13 concentric well-defined spiral cords, weaker than the others and closer. Aperture subquadrangular, nacreous inside. Columella thick and oblique.
Colour: white.
Size: H. 32 mm D. 27 mm.

Comments: *C. hirondellei* can be differentiated from *C. zizyphinum* by the more convex base and from *C. granulatum* by its straight outline, its excavated whorls and the delicate sculpture, with only 1-2 granulated cords.

Material examined: Tenerife, Canary islands. Trawled by fishermen at a depth of 250 m. July 1993. 16.8 mm. CSH; South of La Rochelle, W France, Bay of Biscay. Trawled by Belgian fishermen at a depth of 122 m. June 2008. H. 32.36 mm D. 32.08 mm. CFN.

- *Calliostoma leptophyma* Dautzenberg & H. Fischer, 1896

Synonyms: *Zizyphinus laqueatus* Locard, 1898; *Z. oppansus* Locard, 1898):

(Pl. VI, figs 37-39)

Type locality: Azores. Depth: 845 m.

Description: Shell very thick and solid, imperforated, slightly shiny. Spire conical, a little elevated, built up by 7 rather convex whorls, separated by a distinct suture. One embryonal whorl, which is smooth, the following four teleoconch whorls provided with three subgranular spiral cords, the two last whorls have four spiral cords, of which the superior cords are slightly granulate. Base of the shell with about a dozen cords, separated by narrow interstices. Aperture subquadrangular, nacreous inside. Columella thick and oblique. The umbilical area only presenting a callus.
Colour white.

Material examined: Offshore Biarritz, SW France, Bay of Biscay. 44°00' N/ 04°20' W. Dredged by research ship at a depth of 600-700 m. CSH.

Distribution: from the Hatton, Rockall and Porcupine Banks in the north, the Azorean Seamounts in the west to the continental slope off Western Sahara (Locard, 1898) in the south. Also present in the Bay of Biscay: 30 miles off the Cedeira harbour (A Coruña, Galicia) (Rolán & Suarez, 2007).

Comments: *C. leptophyma* Dautzenberg & H. Fischer, 1896 is similar to *C. cleopatra* but lacks the strong carinae on the ribs and has a more compressed outline. *C. leptophyma* is very similar to *C. hirondellei*, but has a lower spire, and the last two whorls slightly convex instead of being straight or slightly excavated.

- *Calliostoma lithocolletum* Dautzenberg, 1925

(Pl. VI, figs 40-42)

Type locality: Seine Seamount, off Madeira. 33°47' N/ 14°21' W. Trawled at a depth of 185 m. 26 July 1905. Station 2034 of Campagne Alice 2. 1 live caught specimen. H. 24 mm, D. 22 mm. Only known from the holotype in MOM.

Description: Shell shiny, solid, imperforate, trochiform, composed of ten flat whorls crossed by decurrent cords composed of regular, fine and numerous granulations. There are five of these cords on the penultimate whorl and seven on the last whorl. The granulations of the two upper rows are somewhat stronger than those of the others, which gives the whorls a slightly stepped appearance. Last whorl angular at the periphery. Base slightly convex and provided with a dozen flattened concentric cords. Aperture subquadrangular and provided at the interior and on the columellar area with a thick brilliant mother-of-pearl layer. Edge of mouth sharp. Operculum horny, thin, circular, multispiral with a central nucleus. Colour sandy, pale rose ('*coloration fauve rosé clair*'). The granulations of the two superior rows are slightly paler than the background, creating a pearly appearance. The rows on the base are scattered by small, nearly visible dots. The species looks like *Calliostoma zizyphinum*, but the shell surface is covered by numerous granulations giving the rows the arrangement of small pearls.

Comments: Dautzenberg's species clearly differs from *C. simulatum* Nolf & Hubrecht, 2022 by the following characteristics:

- 10 flat collapsed whorls instead of 9;
- the decurrent cords are all composed of regular, fine and numerous beads;
- the rather stepped outline of whorls;
- the less conical outline, caused by the more depressed whorls;
- the last whorl being angular at the periphery;
- base with 12 flattened concentric cords, instead of 9-10;
- the tiny knob at the columellar area;
- the creamy white colour of the shell.

The staged outline and the tiny knob on the columellar side are typical characteristics to differentiate this species from *C. hirondellei* Dautzenberg & H. Fischer, 1896, *C. granulatum* (Born, 1778) and *C. zizyphinum* (Linnaeus, 1758).

- ***Calliostoma maurolici* (Seguenza, 1876) [(= *C. obesulum* (Locard, 1898))]**
(Pl. VII, figs 43-48)

Type material (Early Pleistocene, near Messina, Italy) is lost. Syntypes of *Gibbula obesula* are preserved in MNHN.

Description: The protoconch is similar to that of *C. bullatum*. The sculpture is hexagonally reticulated on a smooth background. Shell small with 6 teleoconch whorls. Depressed outline. Sutures deep. Last whorl with 6 spiral cords, the two upper ones granulated. Base with about 20 concentric spiral ribs. Deep umbilicus. Nacreous interior. Colour: white. The operculum is brown, translucent, thin, chitinous and spirally developed.

Material examined: Rockall Through, W Ireland, NE Atlantic. 55.50017° N/ 15.79890° W. Dredged by RV Pelagia. H. 15.20 mm D. 18.56 mm. CSH; Rockall trough, W of Ireland, NE Atlantic. 56°05' N/ 15°08' W. Dredged at a depth of 587 m. 2006. H. 14.61 mm D. 18.57 mm. CFN; Offshore Agadir, Morocco. 31°21' N/ 10°41' W. Dredged at a depth of 680-740 m. H. 28.04 mm D. 32.54 mm. CSH; Alghero, Sardinia, Italy. Dredged at a depth of 100 m. H. 20.18 mm D. 22.33 mm. CSH.

Distribution: In deep-water corals in the NE Atlantic from the Rockall Hatton Banks off western Ireland, Porcupine Basin, Atlantis Seamount, Great Meteor, the Azores and into the Mediterranean Sea.

Comments: *C. maurolici* (Seguenza, 1876) is smaller than *C. bullatum*. It has a stronger spiral ornament, more convex whorls, a wider top angle and an open umbilicus when adult.

- ***Calliostoma milneedwardsi* (Locard, 1898)**
(Pl. VII, figs 49-51)

Type material: 'Région des Tropiques', probably W of Western Sahara. Depth: 860 m. H. 41 mm D. 36 mm.

Description: Shell large and thick, solid, turbinate-conical outline, staged whorls, slightly higher than wide, not umbilicated. Spire with 7-8 concave whorls, last whorl bordered by a carina, base weakly convex. Suture nearly distinct.

Aperture subquadrangular with a simple peristome. Columellar border thick, slightly oblique and a bit reflected to the umbilical area. Whorls decorated with spiral cords, which have a various appearance: strong or weak, rounded, protruding and subgranular. The penultimate whorl with a cord just beneath the suture, followed by three stronger cords separated by thinner threads. Last whorl with the same arrangement of spiral cords: three very fine threads, a stronger cord, 7-8 threads and finally three more cords. Base with 28 concentric spiral cords, regularly distributed over the surface. Colour: greyish white, interior of aperture nacreous.

Material examined: Nouakchott, Mauritania. Trawled at a depth of 500-600 m. March 1991. H. 27.12 mm D. 24.69 mm. CSH.

Comments: This species is similar to *C. leptophyma* Dautzenberg & H. Fischer, 1896, but it is larger with a higher shell, covered with granulated cords and a higher number of basal cords.

- ***Calliostoma normani* (Dautzenberg & H. Fischer, 1897)**
(Pl. VIII, figs 52-58)

Type locality: Off Flores, Azores. 39°18' N/ 30°40' W. Depth: 1600 m.

Description: Shell solid, large, tightly umbilicated, with 6 globose whorls. Embryonal whorls smooth, the following four whorls obtusely angular in the middle and provided by irregular spiral cords, which are contiguous and flattened at a number of 12-13 on the penultimate whorl and 35 on the last whorl. They are crossed by many fine oblique growth striae.

Base very convex. Aperture subquadrangular and nacreous inside. Columella oblique. Colour: dirty white.

Distribution: Irving Seamount. Azores Archipelago.

Comments: The species can easily be identified by its large size (H. 30 mm D. 32 mm), the slightly convex apical outline and fine regular spiral grooves on the globose whorls. *C. maurolici* is somewhat similar, but it has a slightly concave spire and a coarser and more irregular spiral sculpture. *C. caroli* Dautzenberg, 1927 is another similar species. It has a coarser spiral sculpture with fine beads on the cords and a weak keel on the upper whorl.

- ***Calliostoma occidentale* (Mighels & C.B. Adams, 1842) [(= *C. alabastrum* (Lovén, 1846) and *C. formosum* (McAndrew & Forbes, 1847)]**
(Pl. VIII, figs 59-61)

Description: Shell rather small, sub-translucent, pale horn-colour, with light brown revolving carinae, of which there are three on the upper whorls, and four spiral cords at the penultimate whorl to six on the lower one. Seven convex whorls. Sutures distinct. Spire 3/5 of the total length of the shell. Apex acute. Last whorl with a smooth space between the carinae and two or three course revolving striae around the umbilical region. Aperture moderately depressed, transversely ovate. Labrum crenulated by the carinae. Columella callous. Umbilical region indented. Size: H. 12 mm D. 10 mm.

Distribution: Northern Atlantic: Nova Scotia, Massachusetts, New Jersey, Norway (south to Bergen), Scotland, Orkneys and Shetland Islands (British Isles). Also recorded from Galicia, northern Spain (Rolán & Suarez, 2007).

Material examined: North Central Brown's Bank, Nova Scotia, E Canada. In sand and gravel. Dredged at a depth of 86 m. 1994. 2 sp. H. 14.18 mm D. 13.22 mm, H. 13.86 mm D. 13.96 mm. CFN; Angmagssalik, Greenland. Trawled by fishermen at a depth of 20 m. August 2009. 2 sp. H. 11.62 mm. D. 11.22 mm, H. 12.91 mm D. 11.13 mm. CFN; off Marwick, Shetland Islands. Trawled at -600 meters. H. 13.3 mm. CSH; 29° NNW of Cape Wrath, 59°02' N/ 05°30' W, Scotland, UK. Trawled at -99 m depth. H. 6.0 mm CSH; Rockall Through, 55.5° N/ 15.6° W. Dredged at -575m. H. 7.0 mm CSH.

- ***Calliostoma triporcatum* (Locard, 1898)**
(Pl. VIII, fig. 62)

Type material: W of Western Sahara. 20°43'60" N/ 18°07' E. Depth: 1025 m and 1445 m (MNHN).

Description: Shell rather large, thick and solid, turbinate-conical outline, staged whorls, slightly higher than wide, not umbilicated. First teleoconch whorls convex, with flattened zones separated by keels or decurrent cords. Last whorl with the same angular outline, ending with sharp ridges beneath. Suture rather distinct. Aperture relatively large and oval. Columellar edge rather short and thick, slightly curved. Whorls decorated with spiral cords, which have a various appearance: granulate, rounded, of uneven size. The two penultimate whorls with three equidistant cords, the uppermost slightly weaker than the two others and two more fine threads. Last whorl with the same arrangement of spiral cords, ending with an extra spiral cord at the periphery. Base with 17-18 regular concentric, not granulated spiral cords, more concentrated near the axis than at the periphery. Colour: yellowish white, interior of aperture whitish nacreous, very iridescent. Size: H. 27 mm D. 26 mm.

Comments: Differences with *C. milneedwardsi* (Locard, 1898): smaller, lower subequilateral profile, more excavated outline, the different arrangement of the spiral cords, which are more granulous, the aperture is larger and more rounded, the shell is not so thick and not so heavy.

- ***Calliostoma zizyphinum* var. *lyonsii* (Leach, 1850)**
(Pl. IX, figs 63-71)

Description: Shell regularly pyramidal, with a somewhat flattened or compressed base, solid and slightly glossy. Spire more or less raised, and tapering to a sharp point, with 10-12 flattened whorls. Sculpture with 6-8 concentric and imbricating ridges, besides as many smaller intermediate ones on the upper part of the last whorl, and about a dozen impressed lines or grooves on the base. The ridge which girds the base of each whorl is larger and broader than the rest, and gives the periphery an angulated appearance. The ridges on the upper whorls are granulated. The entire surface is covered with very minute and close-set, but obscure, oblique longitudinal striae. Slight suture, defined by the basal ridge of each whorl. Aperture rhomboidal. Outer lip thin. Inner lip pearly, reflected on the pillar, which is

extremely thick. Inside nacreous. Operculum slightly concave, with a small central nucleus. Colour: white, instead of the usual pale yellow or flesh colour, sometimes purple, flecked with white or reddish-brown with longitudinal streaks.

Material examined: S of the Sill, off Abbay Road, County Down, North Ireland. At low tide on submerged stones encrusted with weed. 27 September 1975. 2 sp. H. 22.24 mm D. 22.35 mm, H. 22.58 mm D. 24.27 mm. CFN; Ile Callot, Bay of Morlaix, Brittany, France. Under rock at low tide. August 1996. 1 sp. H. 21.04 mm D. 22.52 mm. CFN; Off St. George's Channel, SW England, UK. Trawled by Belgian fishermen. 1975. 3 sp. H. 33.24 mm D. 33.47 mm, H. 36.12 mm D. 36.67 mm, H. 38.50 mm D. 41.03 mm. CFN.

Distribution: From the Lofoten Islands south to the Azores Archipelago, the Canaries and Madeira. Also off Morocco.

Comments: This white form of a shallow-water *Calliostoma* species can't be compared with

any of the listed species. *Calliostoma zizyphinum* (Linnaeus, 1758) is a very variable species with much variation in the height of the cone, as well as in the number and size of the ridges and the colouration, resulting in dozens of forms and synonyms.

Conclusion: Most of the specimens treated in this listing live on deep-water coral bottoms at depths of 300-1500 m, which explains the absence of coloured shells. It may seem surprising that white forms of more shallow water species are included in this listing, but we felt it was necessary to make a comparison with some deep-water calliostomatids. For instance, we remarked a great similarity between *C. hirondellei* and *C. granulatum* var. *lactea*.

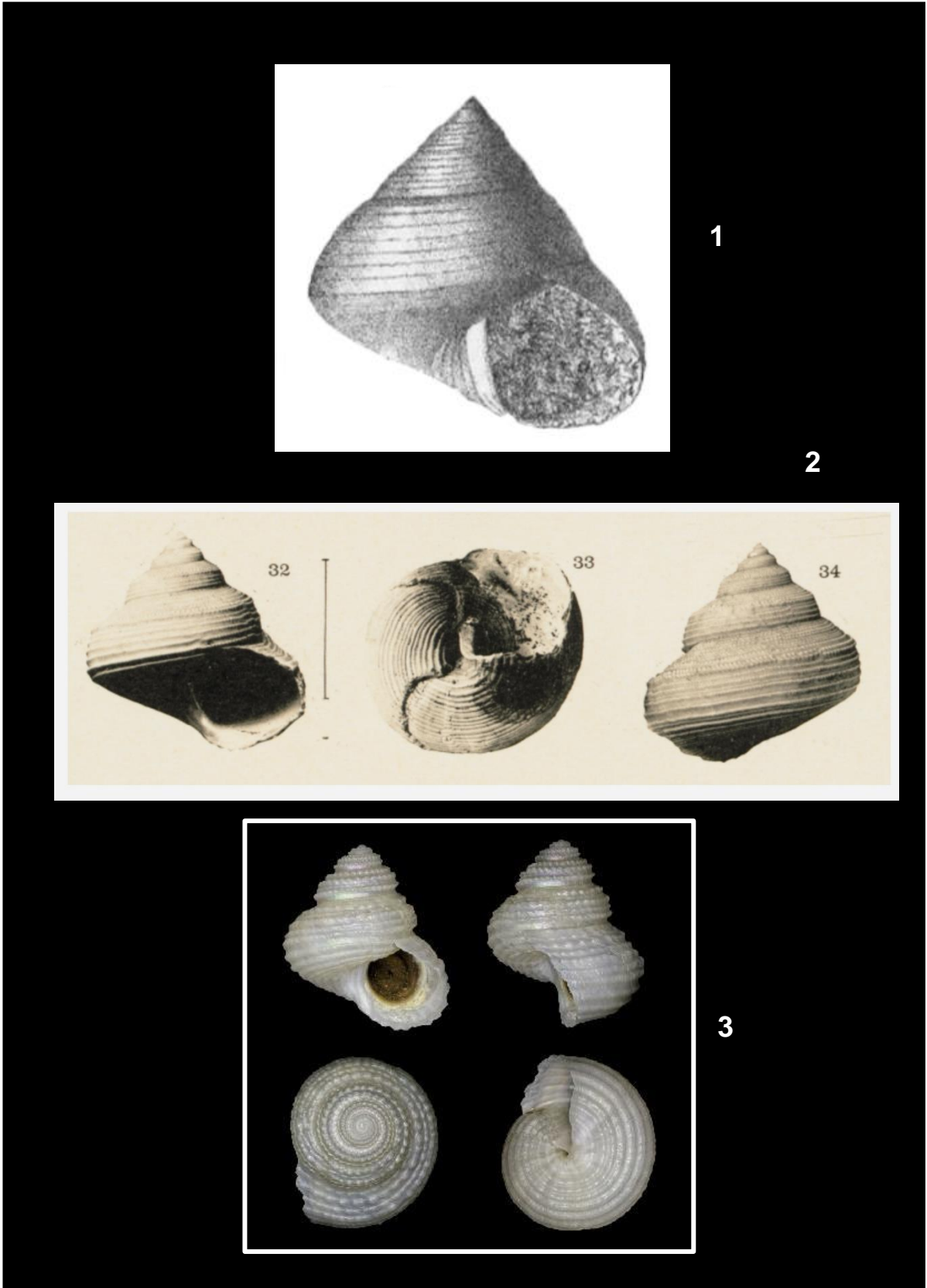
No intermediate forms between the white specimens and the coloured representatives have ever been found, neither were coloured specimens of the white deep-water species recorded, except of the shallow water dwellers *C. granulatum* and *C. zizyphinum*.

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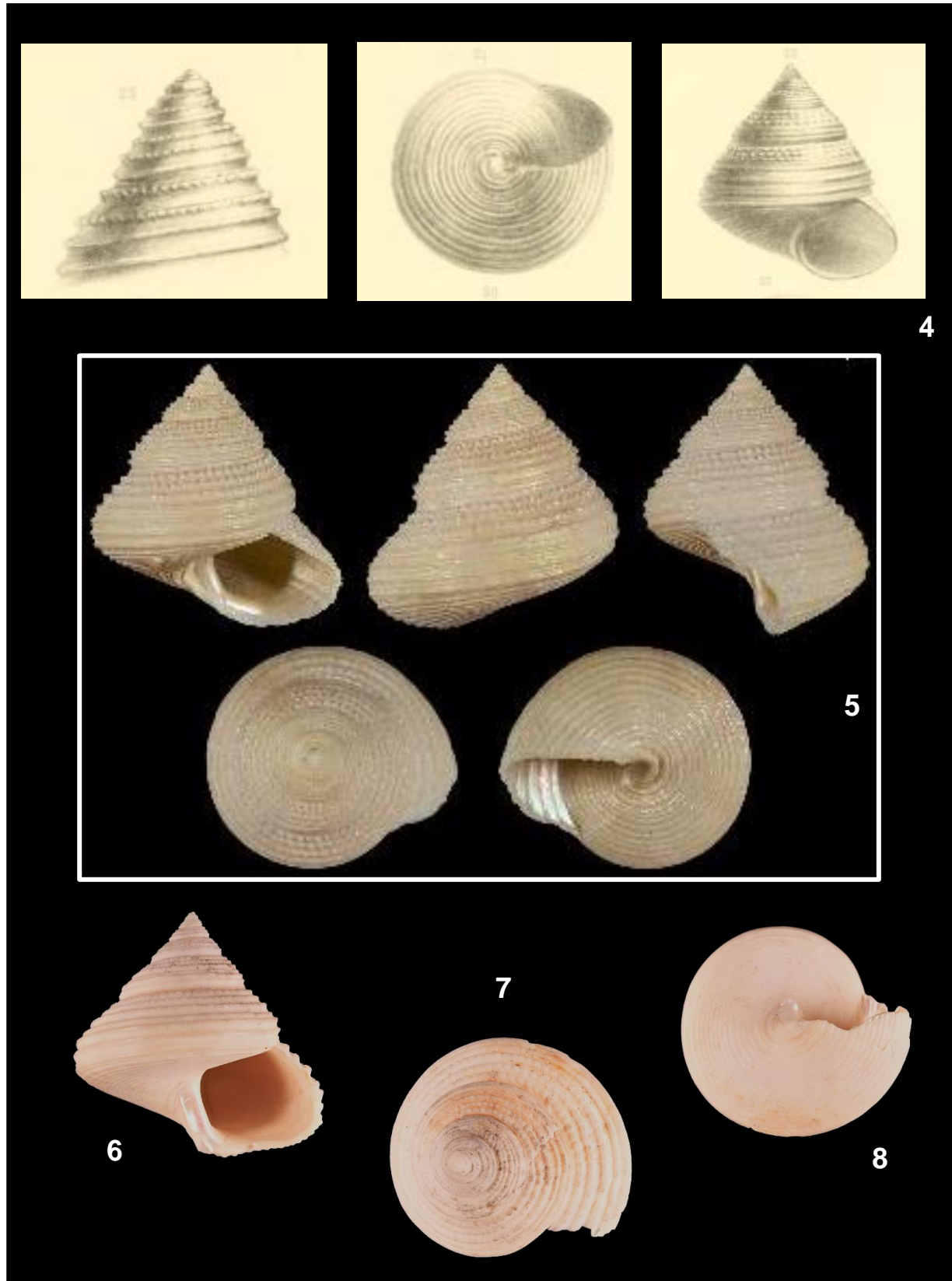
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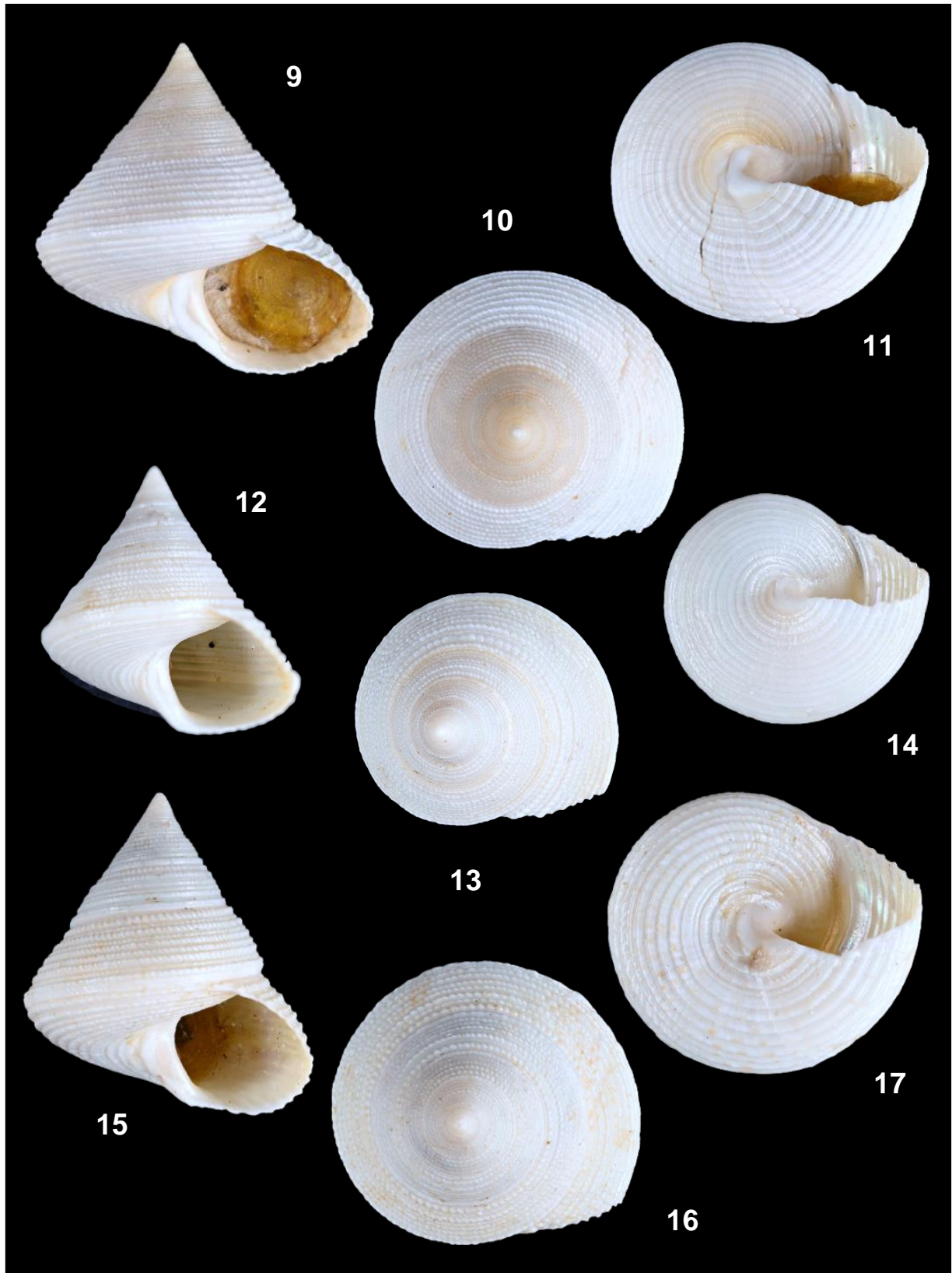
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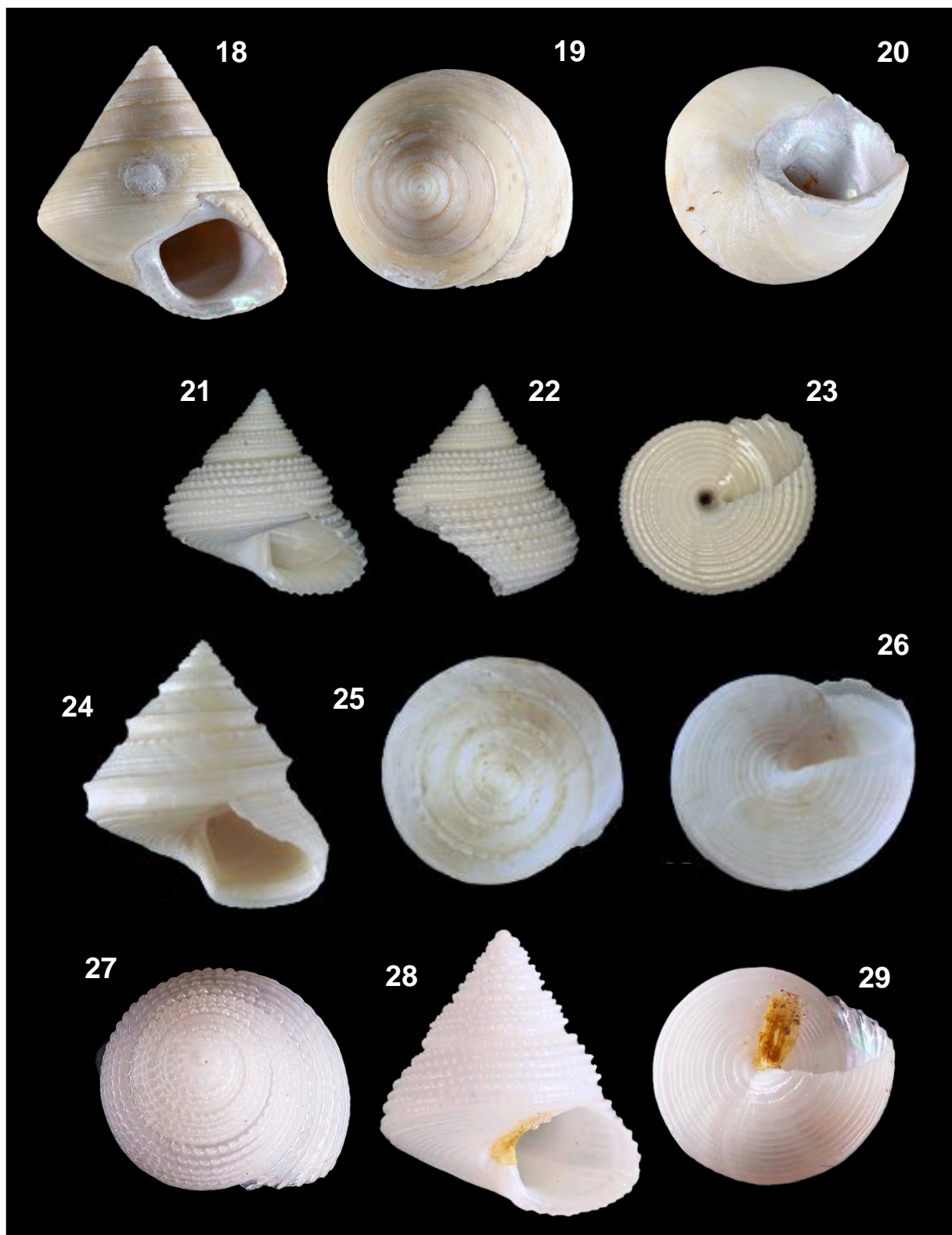
Pl. I. Fig. 1: *Trochus bullatus* Philippi, 1844, original illustration. H. 34 mm D. 34 mm; Fig. 2: *Calliostoma caroli* Dautzenberg, 1927, original figure pl. 6, figs 32-34 (D. 25 mm); Fig. 3: *Calliostoma cyrtoida* Gofas & Hoffman, 2020; original figure of holotype. Hyères Seamount, NE Atlantic. 31°19'5.9916" N/ 28°36'00" W. Depth:1060 m. H. 6.7 mm D. 6.1 mm. 18 January 1993.



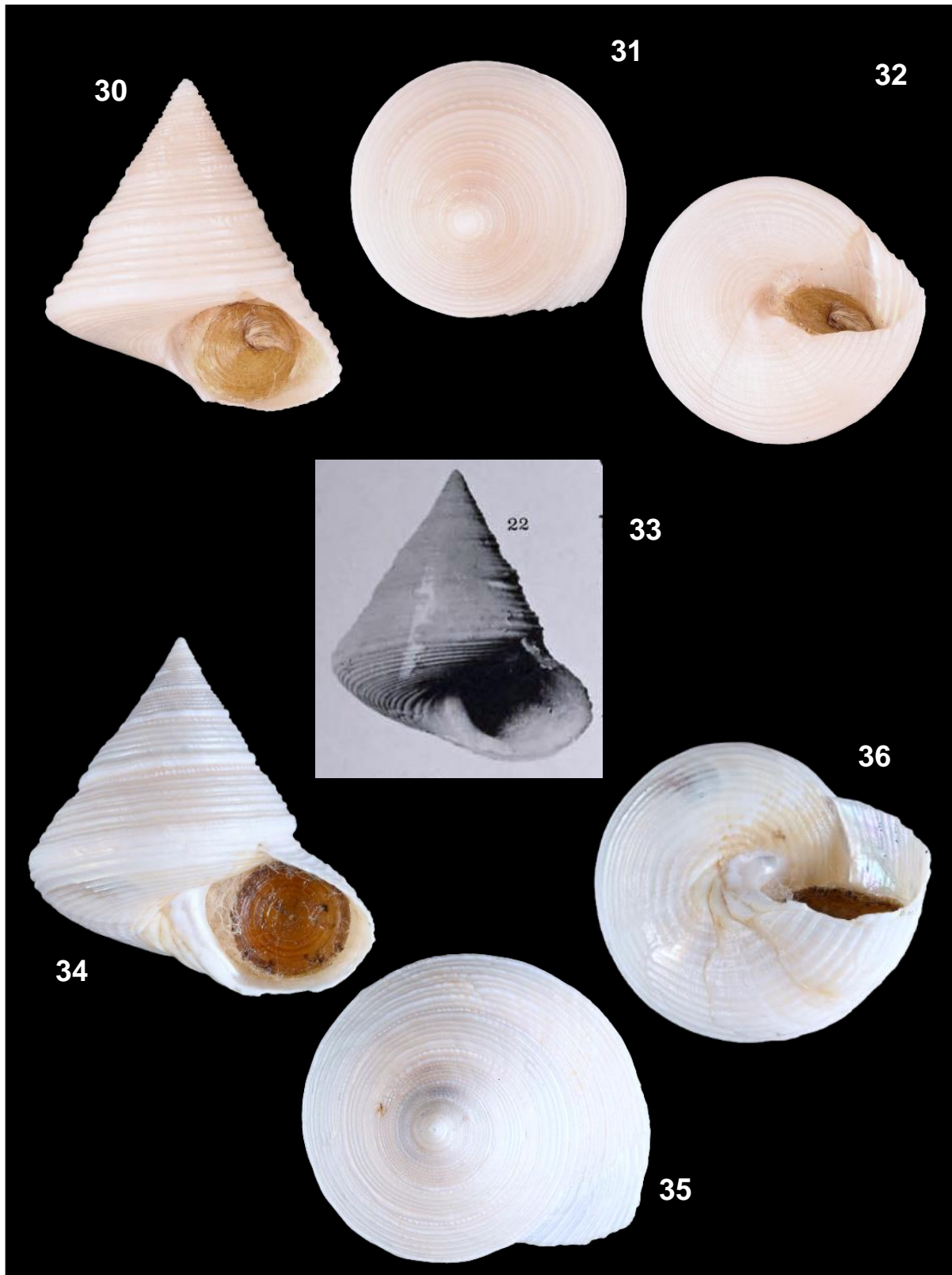
PI. II. Fig. 4-8: *Zizyphinus cleopatra* Locard, 1896; 4: Original figure, H. 27 mm D. 26 mm; 5: Off Western Sahara. 25°39'0" N/ 16°06'00" W. Depth: 1056-1056 m. 9 July 1883. 24 mm. Syntypes MNHN-IM-2000-31095.; 6-8: Rockall Trough, off NW Ireland. 55°43' N/ 16°11' W. Dredged by research vessel at a depth of 704 m. June 2004. H. 18.52 mm D. 19.07 mm. CSH.



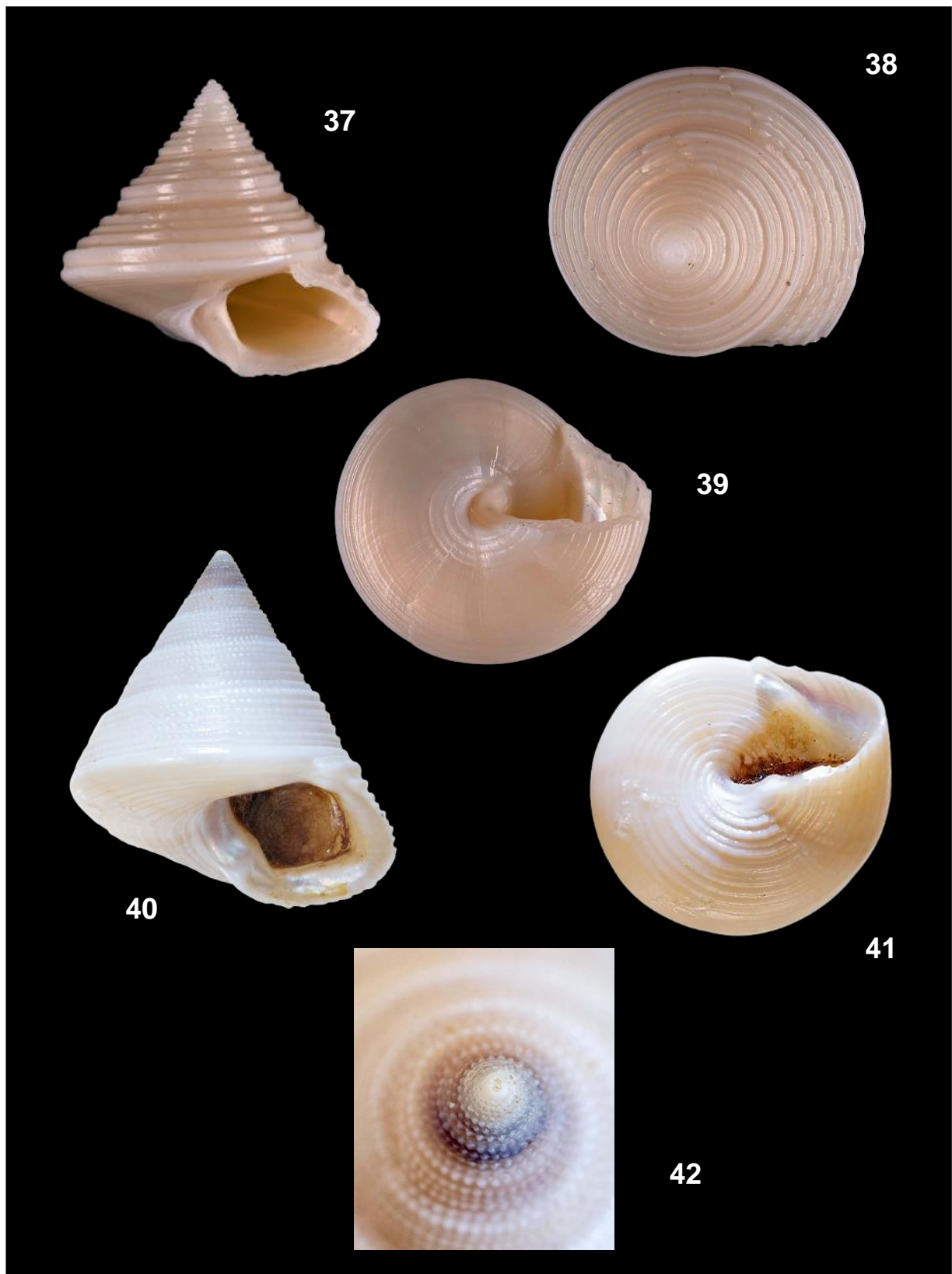
PI. III. Figs 9-17: *Calliostoma granulatum* var. *lactea* Jeffreys, 1865. CFN; 9-11: St. George's Channel, SW England, UK. Trawled by Belgian fishermen. 1975. H. 32.42 mm D. 33.30 mm; 12-14: South of La Rochelle, W France, Bay of Biscay. Trawled by Belgian fishermen at a depth of 120 m. June 2008. H. 28.19 mm D. 25.78 mm; 15-17: H. 18.68 mm D. 17.85 mm.



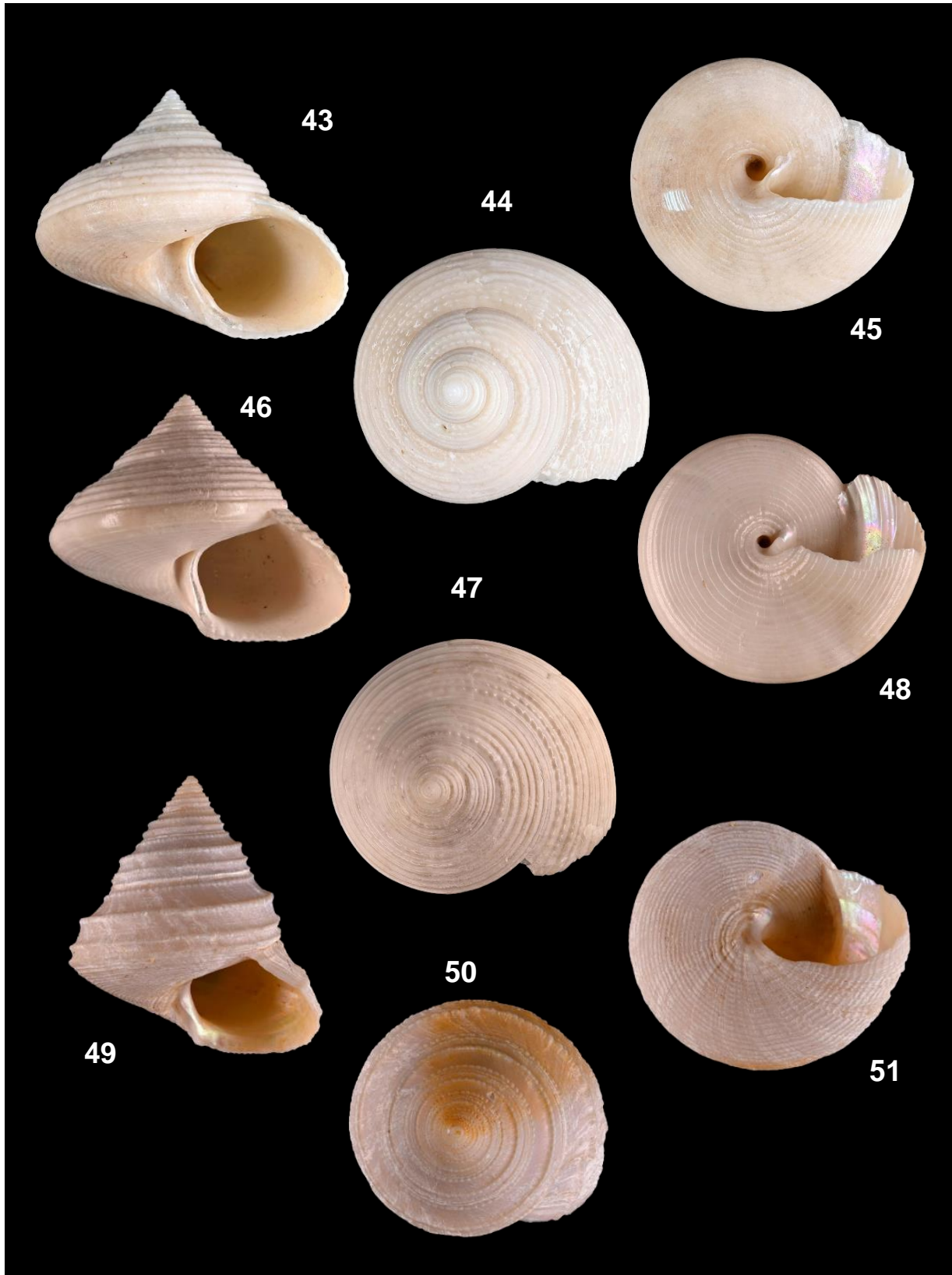
Pl. IV. Figs 18-20: *Calliostoma fernandesi* Rolán & Monteiro, 2006. E of Boavista, Cape Verde Islands. In lobster trap at a depth of 150 m. H. 28.20 mm D. 25.44 mm. CSH; Figs 21-23: *Calliostoma freiwaldi* Gofas & Hoffman, 2020. Hyères Seamount. 31.387° N/ 27.892° W. Dredged at a depth of 480 m. 16 January 1993; Figs 24-26: *Calliostoma grimaldii* Dautzenberg & H. Fischer, 1896. Irving Seamount, NE Atlantic. 32.347° N/ 28.262° W. H. 21.0 mm D. 20.0 mm (Gofas & Hoffman, 2020); Figs 27-29: *Calliostoma heugteni* Vilvens & Swinnen, 2003. 1500 km W of Canary Islands. 30°06.7' N/ 28°27.0' W. Dredged at a depth of 320 m. June 1998. H. 6.30 mm D. 5.39 mm. CSH.



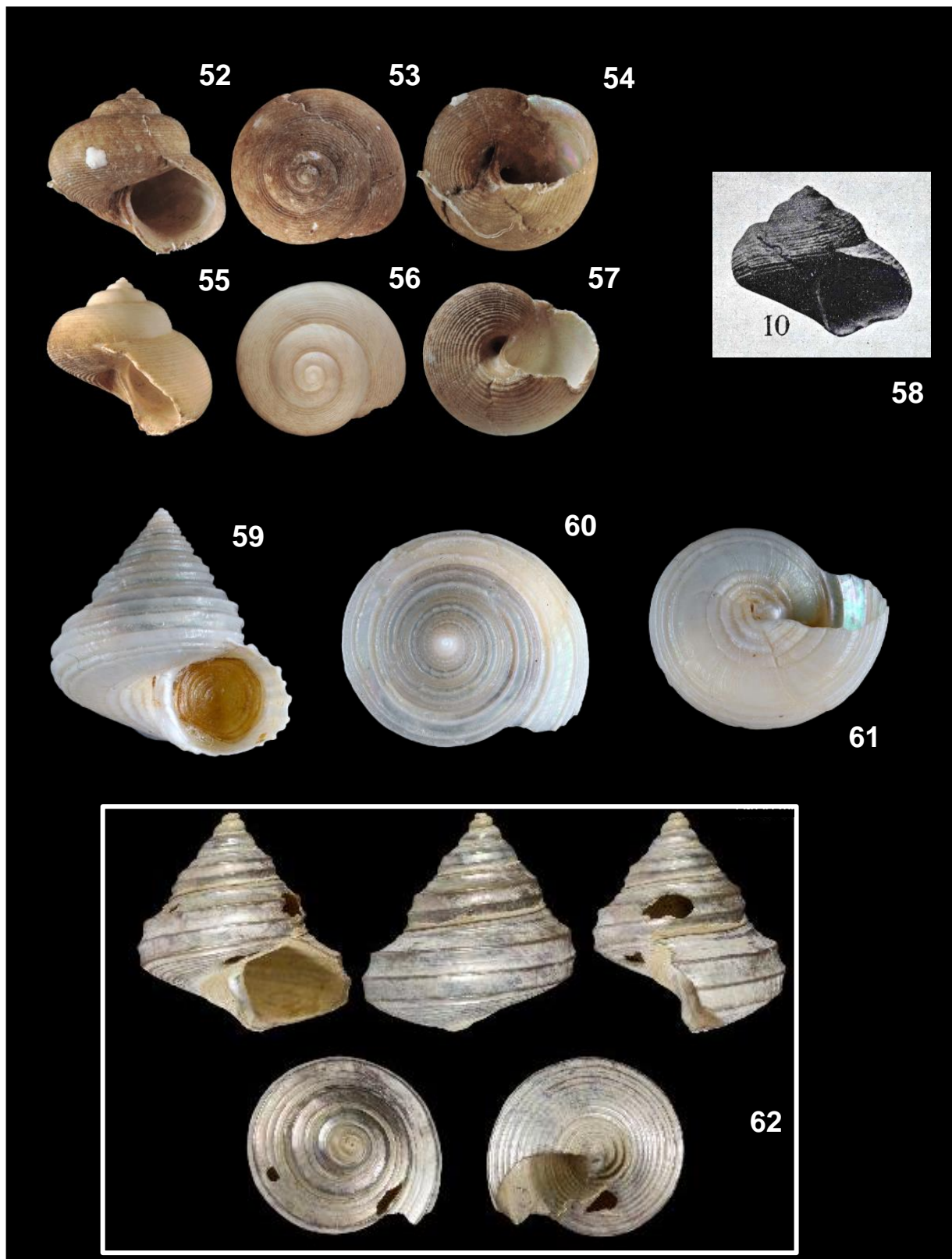
Pl. V. Figs 30-36: *Calliostoma hirondellei* Dautzenberg & H. Fischer, 1896; 30-32: Tenerife, Canary Islands. Trawled by fishermen at a depth of 250 m. July 1993. 16.8 mm. CSH; 33: holotype. H. 32 mm L. 27 mm. Pl. XXI, fig.5. In: Campagnes scientifiques de S.A. le prince Albert I^{er} de Monaco. Dragages effectuées par l'Hirondelle et par la Princesse-Alice 1888-1895. 1. Mollusques Gastropodes. *Extrait des Mémoires de la Société Zoologique de France*, by Dautzenberg, Ph. & Fischer, H., 1896; 34-36: S of La Rochelle, W France, Bay of Biscay. Trawled by Belgian fishermen at a depth of 122 m. June 2008. H. 33.22 mm D. 31.82 mm. CFN.



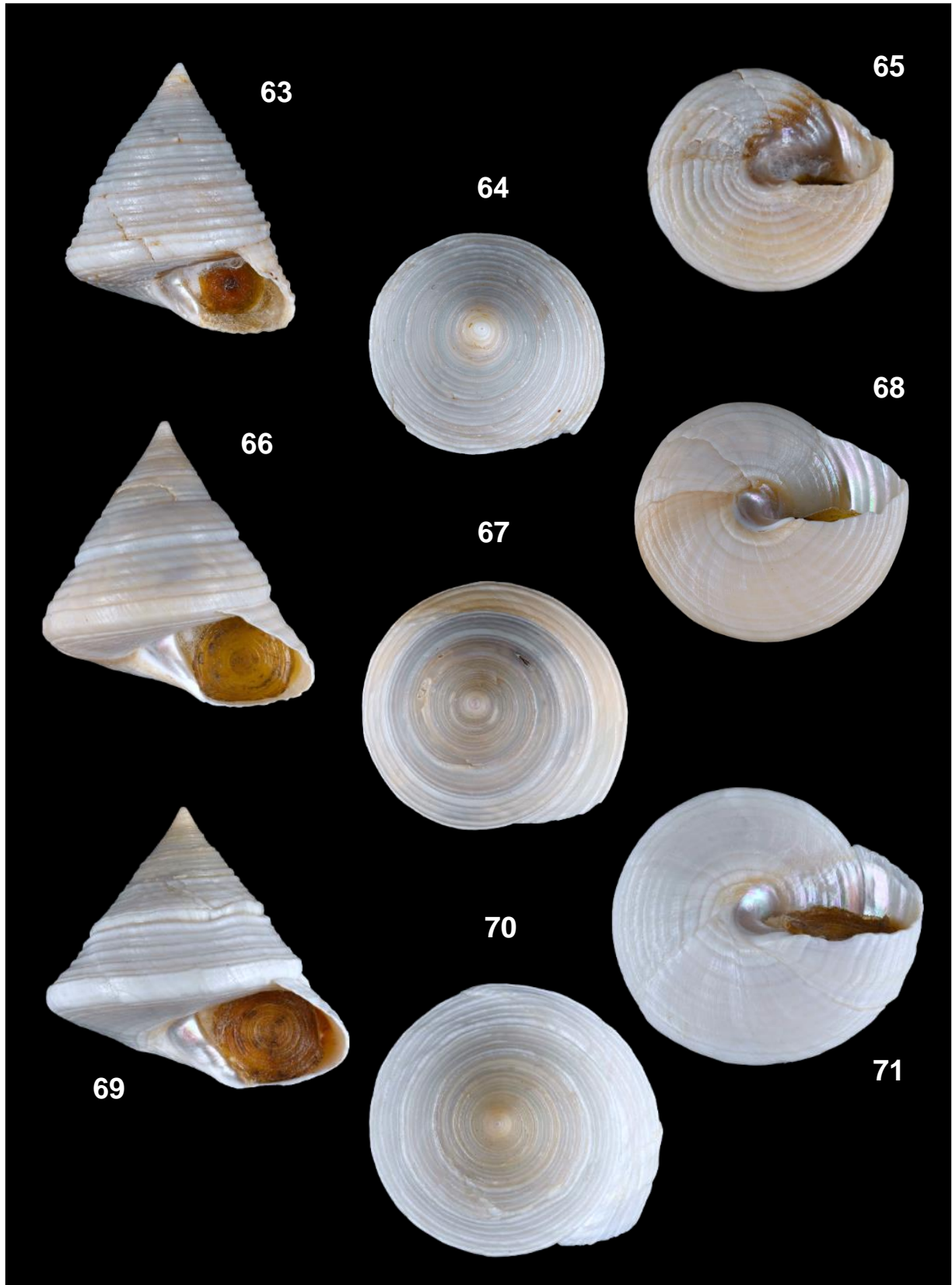
Pl. VI. Figs 37-39: *Calliostoma leptophyma* Dautzenberg & H. Fischer, 1896. Offshore Biarritz, W France, Bay of Biscay. 44°00' N/ 04°20' W. Dredged by research vessel at a depth of 600-700 m. H. 12.67 mm D. 13.84 mm. CSH; 40-42: *Calliostoma lithocolletum* Dautzenberg, 1925. Seine Seamount, off Madeira. 33°47' N/ 14°21' W. Trawled at a depth of 185 m. 26 July 1905. H. 24 mm D. 22 mm. Holotype. MOM.



PI. VII. Figs 43-48: *Calliostoma maurolici* (Seguenza, 1876); 43-45: Rockall Trough, W of Ireland, UK. 56°05' N/ 15°08' W. Dredged at a depth of 587 m. 2006. H. 14.6 mm D. 18.57 mm. CFN; 46-48: Rockall Trough, NE Atlantic, W Ireland, UK. 55.50017° N/ 15.79890° W. Collected by RV Pelagia with small boxcore. Depth: 587 m. H. 15.20 mm D. 18.56 mm. CSH; Figs 49-51: *Calliostoma milneedwardsi* (Locard, 1898). Off Nouakchott, Mauritania, NW Africa. Trawled by fishermen at a depth of 500-600 m. March 1991. H. 27.12 mm D. 24.69 mm. CSH.



Pl. VIII. Figs 52-58: *Calliostoma normani* (Dautzenberg & H. Fischer, 1897); 52-57: Off Flores, Azores Archipelago. 39°18' N/ 30°40' W. Dredged at a depth of 1600 m; 52-54: H. 30 mm. D. 32 mm; 58: Pl. III, fig. 12. In: Campagnes scientifiques de S.A. le prince de Monaco. Dragages effectuées par l'Hirondelle et par la Princesse-Alice 1888-1896. *Extrait des Mémoires de la Société Zoologique de France*, X, by Dautzenberg, Ph. & Fischer, H., 1897; Figs 59-61: *Calliostoma occidentale* (Mighels & C.B. Adams, 1842). North Central Brown's Bank, Nova Scotia, E Canada. In sand and gravel. Dredged at a depth of 86 m. 1994. H. 13.86 mm. D. 13.96 mm. CFN; Figs 62: *Calliostoma triporcatum* (Locard, 1898). Off Western Sahara. 20°43'59.988" N/ 18°07'0.0156" W. Dredged at a depth of 1445 m. 14 July 1883. H. 27 mm. D. 26 mm. Syntype. MNHN.



Pl. IX. Figs 63-71: *Calliostoma zizyhinum* var. *lyonsii* (Leach, 1850). CFN; 63-65: South of the Sill, Abbey Road, County Down, North Ireland. At low tide on submerged stones encrusted with weed. 27 September 1975. H. 22.58 mm. D. 24.27 mm; 66-71: Off St. George's Channel, SW England, UK. Trawled by Belgian fishermen. On sandy-rock bottom. 1975; 66-68: H. 36.12 mm D. 36.67 mm; 69-71: 38.50 mm D. 41.03 mm.

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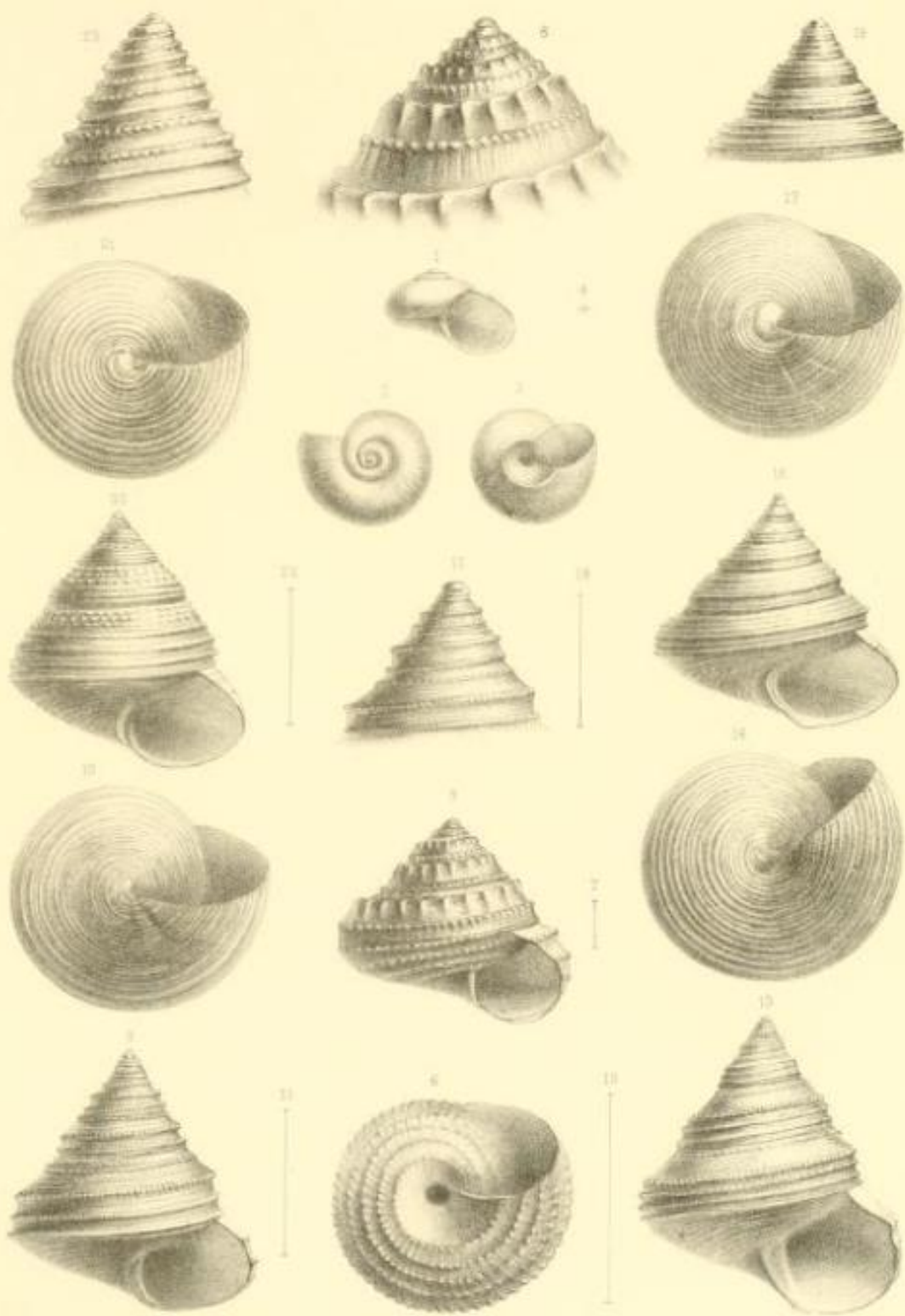
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