Critical analysis and additional information about the identity and distribution of the genus *Callumbonella* (Mollusca: Gastropoda: Trochoidea) in the East Atlantic and the Mediterranean Sea

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Abstract: The present state of the genus *Callumbonella* is discussed. At present three species in this genus are known in literature: *Callumbonella suturale* (Philippi, 1836) from the Mediterranean Sea and NW Africa, *C. gorgonarum* (P. Fischer, 1883) so far only known from the Cape Verde Islands but regarded as a synonym of *C. suturale* by CLEMAM and finally *C. namibiensis* (Rolán in Rolán et al., 2009) from Namibia. After studying about 450 specimens dredged off the coasts of the Bay of Biscay, the Alboran Sea and the West African coasts from Morocco to Namibia, the authors want to show the morphological variability of only one species, namely *C. suturale*. The conclusion is that *C. gorgonarum* is merely a form and that *C. namibiensis* becomes a junior synonym of *C. suturale*.

Abbreviations:
CFN: Private collection of Frank Nolf
CJV: Private collection of Johan Verstraeten
D.: Diameter
dr.: dredging
H.: Height
MNHN: Muséum national d'Histoire naturelle (Paris, France)
ms.: manuscript
RBINS: Royal Belgian Institute of Natural Sciences (Brussels, Belgium)
sp.: specimen(s)
st.: station

Introduction: Philippi (1836) described the species *Trochus suturalis* from a fossil shell, collected in Sciaca, Sicily, Italy. Locard (1898) included it in the genus *Zizyphinus* and commented that the Recent species is a little different from the fossil species described by Philippi. Later on, Thiele (1924) designated the genus *Callumbonella* as a replacement name for the genus name *Umbotrochus* Thiele, 1914 (non Perner in Barrande, 1903 ex Monterosato MS), which includes *Gibbula gorgonarum* P. Fischer, 1882 as the only species. The latter is considered as a synonym of *Callumbonella suturale* in the CLEMAM-url-pages. The real position of the genus *Callumbonella* is not clear yet. Vaught (1989) placed it in the subfamily Umboniinae H. Adams & A. Adams, 1854. Later on CLEMAM used the name Margaritinae Thiele, 1924, corrected by Bouchet & Rocroi (2005) as Margaritini Thiele, 1924 [= Margaritinae Stoliczka, 1868 (inv.)], but at present (December 2013) CLEMAM does not assign it to any subfamily. Up to now two or three species – depending on the references - are known in this genus: *C. suturale* (Philippi, 1836) from Morocco (NW Africa) up to South Ireland in the East Atlantic, and eastwards into the Mediterranean Sea to the Sicily Channel, and *C. namibiensis* Rolán in Rolán et al. (2009) from Namibia. *C. gorgonarum* (P. Fischer, 1883), until now only known from the Cape Verde Islands, is regarded as a species by Rolán et al. (2009), but rejected by CLEMAM (2013).

Material examined: All studied specimens came from the private collections of the authors, the Dautzenberg collection (RBINS) and the collections of MNHN, as indicated below.
The purpose of the present study was to determine how many species really belong to the genus *Callumbonella* by comparing amongst others the morphological characteristics of hundreds of representatives from the Celtic Sea to the south of Namibia in the E Atlantic and the western Mediterranean Sea.

Celtic Sea - Bay of Biscay, W France - North Spain: 1 crabbed sp., MNHN, labelled '*coll. Locard*' and '*Zizyphinus – Golfe de Gascogne*' (= doubtful origin - probably '*G. gorgonarum*' from the Cape Verde Islands); 1 sp., MNHN, 48°38'N 09°53'W, '*Thalassa*' expedition (1973), st. 2457, dredged at -800m; 1 sp., MNHN, 48°14'N 09°08'W, '*Thalassa*' expedition (1973), st. 2416, dredged at -480m; 19 sp., MNHN, '*Jean Charcot Muséum 1968*' expedition, 47°40'N 08°05'W, dredged at a depth of 800-920m, st. 18; 8 sp., MNHN, '*Jean Charcot Muséum 1968*' expedition,

47°45'N 07°55'W, dredged at a depth of 900-1120m, st. 16; 1 sp., MNHN, 44°35'N 02°07'W, '*Lagardère: 1963-1972*', st. G57, dredged at a depth of 400-420m; 3 sp., MNHN, 43°51'N 02°10'W, '*Thalassa*' expedition (1970), st. W346, dredged at a depth of 460-520m; 12 sp., MNHN, 43°51'N 6°12'W, '*Thalassa*' expedition (1970), st. W416, dredged at a depth of 392-850m; 32 sp., MNHN, 43°50'N 06°10'W, '*Thalassa*' expedition (1970), st. W414, dredged at a depth of 520-620m; 1 sp., MNHN, 43°50'N 06°09'W, '*Thalassa*' expedition (1970), st. W41, dredged at a depth of 500-540m; 3 sp., MNHN, 43°42'N 03°43'W, '*Sarsia*' expedition (1976), st. 7615A, dredged at a depth of 330-340m; 2 sp., MNHN, 43°41'N 03°49'W, '*Thalassa*' expedition (1970), st. W371, dredged at a depth of 320-1050m; 1 sp., MNHN, 43°39'N 01°56'W, '*Thalassa*' expedition (1970), st. W353, dredged at a depth of 210-380m; 2 sp., MNHN, 43°35'N 03°33'W, '*Thalassa*' expedition (1970), st. W373, dredged at a depth of 370-580m; 1 sp., MNHN, labelled '*Zizyphinus folini*' 'coll. Locard', '*Travailleur & Talisman*' expedition (1881).

Portugal: 2 sp., MNHN, 41°31'N 09°16'W, '*Thalassa*' expedition (1972), st. Y378, dredged at -1000m; 1 sp., MNHN, 41°29'N 09°16'W, '*Thalassa*' expedition (1972), st. Y380, dredged at -780m, 1 sp., MNHN, 41°20'N 09°12'W, '*Thalassa*' expedition (1972), st. Y392, dredged at -550m; 1 sp., MNHN, 41°19'N 09°14'W, '*Thalassa*' expedition (1972), st. Y394, dredged at -410m; 1 sp., MNHN, 41°19'N 09°14'W, '*Thalassa*' expedition (1972), st. Y395, dredged at -810m; 6 sp., MNHN, 36°41'N 07°19'W, '*Balgim*' expedition (N.O. "*Cryos*"), st. CP25, dredged at a depth of 543-544m, 31 May 1984.

Morocco – Alboran Sea: 2 sp., CFN. Melilla, Cabo Tres Forcas, Spain; 1 sp., MNHN, Melilla, 1972; 16 sp., Melilla, Spain, ex coll. Rutllant; 1 sp., MNHN, Melilla, Spain, ex coll. Staadt; 3 sp., MNHN, 36°50'N 09°15'W, '*Balgim*' expedition (N.O. "*Cryos*"), st. CP135, dredged at a depth of 678-684m, 28 May 1984; 4 sp., MNHN, 36°02'N 2°45'W, '*Calypso*' expedition, st. 1306, dredged at a depth of 520-530m; 3 sp., MNHN, 35°50'N 3°19'W, '*Calypso*' expedition, st. 1289, dredged at -500m; 9 sp., MNHN, 35°57'N 03°08'W, '*Balgim*' expedition (N.O. "*Cryos*"), st. CP145, dredged at a depth of 360-386m, 16 June 1984; 8 sp., MNHN, 35°26'N 04°14' W, '*Balgim*' expedition (N.O. "*Cryos*"), st. CP135, dredged at a depth of 390-400m, 15 June 1984; 2 sp., CFN, trawled off Lampedusa, Italy at -400m, 1992; 7 sp., CJV, Alboran Sea, dredged at -160m.

Morocco – E Atlantic: 3 sp., MNHN, Cap Spartel, off Tanger, '*Talisman*' expedition (1883), dr.8, dredged at -550m, 10 June 1883; 1 sp., MNHN, 34°20'N 07°18'W, '*Balgim*' expedition (N.O. "*Cryos*"), st. CP89, dredged at a depth of 719-724m, 7 June 1984; 2 sp., MNHN, 33°45'N 08°32'W, '*Balgim*' expedition (N.O. "*Cryos*"), st. CP84, dredged at a depth of 345m, 6 June 1984; 3 sp., '*Travailleur*' expedition (1882), dr.32, dredged at -440m, 25 July 1882.

Canary Islands: 1 sp., CFN, trawled by fishermen.

Cape Verde Islands: 1 sp., MNHN, **lectotype**, São Antônio, Fogo, 16°52'N 25°10'W, '*Talisman*' expedition, dredged at a depth of 400-580m, 29 July 1883; 102 sp., MNHN, 16°52'N 25°10'W, São Antônio, '*Talisman*' expedition, dr. 111, dredged at a depth of 400-580m, 29 July 1883; 41 sp., MNHN, São Antônio, Fogo, '*Talisman*' expedition, dr.111, dredged at -590m, 29 July 1883; 1 sp., MNHN, '*S.A.S. Le Prince de Monaco*' expedition, dredged by the '*Princesse Alice*' (1901) at -628 m; 5 sp., RBINS + 5 sp., MNHN, Maio, '*S.A.S. Le Prince de Monaco*' expedition, st. 1190, dredged by the '*Princesse Alice*' (1901) at -628m, 14 August 1901.

Western Sahara: 14 sp., MNHN, 22°31'N 17°21W, '*Discovery*' expedition, st. 8003, dredged at a depth of 725-744m; 1 sp., MNHN, '*Talisman*' expedition (1883), dr.86, dredged at a depth of 820m, 12 July 1883.

Mauritania: 2 sp., MNHN, Cap Blanc, '*Travailleur*' and '*Talisman*' expedition (1883), dr.96-97, dredged at a depth of 2324-2330m, 15 July 1883; 6 sp., MNHN, Cansado, Cap Blanc, 23°40'N 17°04'W, '*Discovery*' expedition, st. 10124, dredged at a depth of 660-665m; 7 sp., MNHN, 23°40'N 17°04'W, '*Discovery*' expedition, st. 8014, dredged at a depth of 550-595m; 11 sp., MNHN, 21°15'N 17°41'W, '*Meteor*' expedition, st. 60-57, dredged at a depth of 520-590m; 2 sp., MNHN, Cap Blanc, 20°30'N 17°W, '*Talisman*' expedition, dr.96-97, dredged at a depth of -250m, 15 July 1883; 4 sp., MNHN, 18°41'S 11°24'E, '*Walda*' expedition (N.O."*Jean Charcot*"), st. CM03, dredged at -480m, 1968; 45 sp., MNHN, 18°30'N 16°43'W, '*Meteor*' expedition, st. 60-60, dredged at a depth of 520-590m; 8 sp., MNHN, 17°18'N 16°52'W, '*Meteor*' expedition, st. 60-69, dredged at -805m.

Senegal: 9 sp., MNHN, St. Louis, trawled at a depth of 80m, March 1987; 2 sp., MNHN, St. Louis, Senegal, dredged at a depth of 300m, 1981.

Ivory Coast: 7 sp., MNHN, 04°35'N 06°50'W, '*Guinean II*' expedition, dr.19, dredged at -400m, 6 April 1964.

Ghana: 18 sp., MNHN, 03°53'N 02°33'W, '*Pillsbury*' expedition, st. P-34, dredged at a depth of 1948-1984m.

Angola: 2 sp., CFN, trawled by fishermen off Luanda, 1989.

Namibia: 3 sp., MNHN, **paratypes**, between 18°11.12'S and 18°12.56'S, 11°24.80'E and 11°25.41'E, station 24, dredged between 500

and 541m, 10 March 2005; 10 sp., CFN, dredged by Belgian fishermen off mouth of the Cunene River, Cape Fria, Namibia at a depth of 350 m, 1974; 2 sp., CFN, between Lüderitz and Walvis Bay, 25°S 12°E, trawled by fishermen between 400 and 450 m, 2008.

Results: The following is a survey of the different species which have been described in literature. Each of them is fully documented and commented.

Genus *Callumbonella* Thiele, 1924

The genus *Callumbonella* is hitherto still not assigned to any subfamily (C. Vilvens, pers. com.) within the TROCHOIDEA. In literature three different species have been described from the East Atlantic and the Mediterranean Sea: *Callumbonella suturale* (Philippi, 1836), *C. gorgonarum* (P. Fischer, 1883) and *C. namibiensis* (Rolán in Rolán, Gonzalez-Porto & de Matos-Pita, 2009)

Callumbonella suturale (Philippi, 1836)
(textfigures, p.11)

= *Trochus suturalis* Philippi, 1836;
= *Zizyphinus folini* P. Fischer, 1882: a large form from the Mediterranean (according to Jeffreys, 1883; Dautzenberg & Fischer, 1927; Ghisotti & Mellone, 1971; Poppe & Goto, 1991; Malaquias et al., 2003);
= *Trochus tetragonostoma* Jordan, 1895 (textfigure, p.11): description made from a single immature specimen (3 by 3 mm) from a depth of 692 to 1043 m, off the Faroe Channel, 80 to 90 miles north of the Butt of Lewis, Outer Hebrides, UK. Though Jordan clearly stated this is not *Trochus suturalis*, Malaquias et al., 2003 regard Trochus tetragonsotoma as a synonym. The characteristics described by Jordan tend to indicate that this species could belong to another genus such as *Margarites* for instance.
= *Calliostoma vincentae* Kaicher, 1986 (no pagination) ex Rutllant, ms.: a detailed analysis was given by Rosenberg & Petit (2003);
= *Calliostoma vicentae* Rutllant, ms.
= *Calliostoma vincentae* Kaicher, 1986 and auct.

Description:
Original description (Philippi, 1836):
"*Tr. testa obliqua, depresso-conica, anfractibus, planatis, medio laevissimis, supra et infra serie tuberculorum parvorum coronatis, ultimo angulato, marginato, facie inferiore convexa, concentrice cingulata, umbilicata. Unicum specimen prope Sciacca inveni. Species distinctissima, 4''' fere alta, 4½''' lata; anfractus septem, planati, medio laevissimi; noduli superiores majores, acuti; margo anfractus ultimi densissime transversim striatus, sulcis obliquis eleganter granulato-nodosus. Cingula baseos circa 16, inaequalia. Apertura laesa, angulata*."
The following text agrees with this description by Philippi, which was based on a single specimen collected at Sciacca (Sicily, Italy) and it fits most of the specimens collected between South Ireland and the area from the Alboran Sea to the Sicilian Channel very well.
Shell light, not very solid, oblique. Low spire conical. Protoconch very short (1-1.5 whorl), occasionally eroded, teleoconch with 7 slightly convex whorls and a thin but well-marked suture. Sculpture delicate, consisting of thin granulose concentric cords (14-18 in the last whorl), except for the subsutural zone which has more prominent white nodules. Bottom of each whorl and the periphery of the body whorl encircled with 2 rows of very tiny nodules looking like teardrops, regularly spaced and nearly overlapping. Middle cords absent in the first whorls. Surface rather glossy. Lateral profile straight, externally iridescent, especially in the aperture. Periphery of the body whorl angulated and with prosocline growth striae. Base convex with thin irregular smooth cords (10-12), sometimes alternating with fine concentric threads. Umbilicus covered by a white callous. Aperture squared. Columella smooth. Colour creamy flesh dorsally and white from the periphery to the base. Specimens from the Sicily Channel often whitish with pink axial streaks.
The animal was described by Jeffreys (1883) as " ... *pale brownish-yellow; tentacles conical, edge on each side with a purplish-brown line; eyes black, conspicuous, placed as usual in the genus; foot thick, fringed with white conical papillae 4 on each side; no ocelli or eye-spots*."
Operculum round, yellowish brown, transparent, multispiral, with the spiral lines closer together in the central part than near the margin.
The radula was studied by Rolán et al. (2009) on one specimen from Melilla and three more from the Alboran Sea: '*It is bilaterally symmetrical, with 40 rows of teeth. Both the central and the marginal teeth fields are well developed. The cusps and the base rows are coincident. The rachidian tooth is wide, almost* ***rounded****, with an upper short sharp border, in which there are very small cusps at both sides* ***(around 8),*** *and a central part* ***scarcely prominent, but with triangular form****. The five lateral pairs of teeth are similar in size, increasing from the inner to outer ones; they are pointed with small cusps at both sides* ***(about 6)****. The marginal teeth are elongate, sharply pointed, the innermost is largest, with very small cusps on its internal border; the size of the marginal teeth decreases outwards along the row. In the lower face of the*

marginal there is a prominent ridge hardly visible in the smaller ones.'
We have deliberately chosen for a reproduction of the original description by Rolán et al. (2009) and highlighted (in bold characters) in this paper the very few differences between *C. suturale* and *C. namibiensis* described by the author with the aim to clarify the discussion (compare with the text on p. 6 in this paper).

Distribution: The species was originally described from fossil material collected in Sciacca, Sicily, Italy and it is also known from the Early Pliocene in the western Mediterranean (Estepona) and the central Mediterranean (Italy), the Pliocene and the Pleistocene (Italy) and the Quaternary of Calabria and Sicily.
There are many records of the recent species in literature:

- The first notice and description of live specimens was given by Jeffreys (1873; 1883). This author mentions finds from 174 to 1025 m in the Bay of Biscay and the Gulf of Marseille ("*Travailleur*" expedition) and between 455 and 1595 m from the "*Porcupine*" expedition in the Bay of Vigo in 1869 and 1870. Other localities included were the southern Irish and British Coasts but also Vigo, Spain and Sagres, SW Portugal on the Iberian Peninsula, the western Mediterranean coast off North Africa, the Gulf of Tunis, Algeria and Morocco.
- Locard (1898) added new locations to the geographical distribution of this species, after studying the samples from the ''*Travailleur*'' and ''*Talisman*'' expeditions: South Ireland at 1026 m; the Bay of Biscay at 160-510 m; Portugal between 549 and 986 m; South Spain at 379 m; west of Corsica at 280 m; north of Oran, Algeria at 980 m; West Morocco between 440 and 1435 m; Western Sahara at 2330 m.
- Dautzenberg (1891; 1927) and Dautzenberg & Fischer (1897) mentioned the Bay of Biscay, the NW coast of Spain, west of Portugal, west of Morocco, at depths between 160 and 749 m in fine sand, silt and clay bottoms, after working on the samples collected during the Atlantic Ocean expeditions carried out by Prince Albert I from Monaco.
- Ghisotti & Mellone (1971) referred to it as a mainly deep-water East Atlantic species with a presence in the west Mediterranean waters up to the Sicily Channel.
- Nordsieck & Talavera (1979) reported the species from Gran Canaria, Canary Islands.
- Poppe & Goto (1991) supposed that specimens from Mellila could have been fished off Larache, on the Atlantic coast of NW Morocco making the real presence of this species in the Alboran Sea doubtful. Yet, specimens from SE Spain were obtained later on (CFN & CJV).
- Martinez et al. (1993) reported the collecting of two specimens at a depth between 664 and 724 m off the Cantabrian Sea, North of Spain (''CAP-89'' scientific expedition).
- Templado et al. (1993) mentioned a few finds off the Mediterranean coast of Spain and also in the Atlantic waters of the Gulf of Huelva (''*Fauna I*'' scientific expedition) at about 500 m depth in a muddy bottom.
- Recently, the geographic distribution of *Callumbonella suturale* (Philippi, 1836) was exhaustively documented for the European and North African coasts by M. Malaquias, J. Borges & T. Borges (2003). This study reports localities off the coasts of West Africa as for instance Morocco, Western Sahara, the Canary Islands and the Cape Verde Archipelago. The latter locality refers to a trochid species described under the name *Gibbula gorgonarum* by P. Fischer (1883) which M. Malaquias et al. (2003) consider to be a synonym of *Callumbonella suturale* (Philippi, 1836). These authors added two other specimens from South Portugal to the list of localities. The sample was collected as a result of the European project DISCALG - a study of bycatches from crustacean trawlers on the Algarve coast - initiated by the University of the Algarve (Portugal) on a muddy bottom at a depth between 450 and 625 m in 1999 and another one trawled by a crustacean trawler on the Algarve coast in 2002.
- Rolán et al. (2009) report finds from the Alboran Sea, Algeria and Morocco.
- The present paper mentions samples from the Celtic Sea, the Bay of Biscay, the Iberian Peninsula, the western Mediterranean Sea, and the West African coasts of Morocco, Western Sahara, Mauritania, Senegal, the Cape Verde Islands (= '*C. gorgonarum*'), Ivory Coast, Ghana, Angola and Namibia (= '*C. namibiensis*').

We state that only one species, *C. suturale*, lives from the British Isles in the north (below 48°N), southwards in the Bay of Biscay, the East Atlantic coasts of the Iberian Peninsula, South Portugal, Gibraltar, the Alboran Sea, eastwards into the Mediterranean Sea to the Channel of Sicily. In the East Atlantic waters of West Africa it is found from Tanger (Morocco) to Lüderitz (Namibia) in the south. Ecologically, the species has a deep-water habitat, ranging between 160 and 2324 m, and it lives in mud, fine sand and silty clay bottoms.

***Callumbonella gorgonarum* (P. Fischer, 1884)**
(Pl. XI, Figs 61-67; Pl. XII, Figs 68-73; Pl. XIII, Figs 74-78; Pl. XIV, Figs 79-83)

= *Gibbula gorgonarum* P. Fischer, 1884 "1883"

Description:
Original description (P. Fischer, 1883):
"*Testa imperforata, conica, parum elevata, crassiuscula, supra pallide lutescente vel cinerea, lineis fuscis radiantibus, subflexuosis, irregelaribus ornata, infra alba; anfractus 7-8 planulati, sutura canaliculata discreti, liris angustis paucis, in medio anfractus obsoletis aut evanidis ornata; lira infrasuturali majore, crenulata; anfractus ultimus acute carinatus, infra liris densis, concentricis munita; apertura rhomboidalis, labro acuto; callo basali lato, subcirculari, umbilicum tegente. – Diam. maj. 14, diam. min 12, altit. 10 mill.*
Hab. Iles du Cap Vert, 410-596 mètres. Très commun."
Locard (1898) provides us with an extensive description as follows:
'*Coquille de taille assez petite, d'un galbe turbiné-conique notablement plus large que haut, imperforé. Spire peu haute, composée de 7 à 8 tours, les premiers convexes, les derniers aplatis, un peu étagés, à croissance plus rapide en diamètre qu'en hauteur; dernier tour avec même profil recto-oblique, caréné à la base, un peu bombé en dessous. Suture canaliculée, profonde et peu large. Sommet acuminé, petit, à peine mamelonné. Ombilic entièrement recouvert. Ouverture petite, à contour subrectangulaire, à peu près aussi large que haute, anguleuse dans le haut, dans le bas et au bord externe, très faiblement échancrée par l'avant-dernier tour, inscrite dans un plan extrèmement oblique. Péristome simple à bords faiblement convergents; bord externe tranchant mais un peu épaissi à l'intérieur, s'insérant immédiatement en dessous de la carène basale, à profil latéral recto-déclive dans le haut, puis légèrement arrondi dans le bas, avec une angulosité infra-médiane bien accusée, aplati et assez court en dessous; bord columellaire très écourté, épaissi, arqué, formant une angulosité prononcée avec la base du bord externe; callum reliant les deux bords bien sensible, développé surtout dans la region ombilicale. Test solide épaissi, orné de cordons décurrents peu accusés, au nombre de 8 à 10 sur le dernier tour, inégaux, inégalement répartis, un peu aplatis, le cordon supérieur plus fort et orné de plis granuleux nombreux, obliques, rapprochés, peu saillant; en dessous 8 à 10 cordons de même nature, mais plus réguliers, plus espacés; stries d'accroissement ondulées-flexueuses, très peu sensibles, même dans les espaces intercostaux. Coloration d'un jaunacé clair un peu carnéolé, avec des flammes ou linéoles en zigzag, allant du haut en bas des tours, étroites, d'un brun roux carminé, le dessous du dernier tour d'un blanc mouchete de gris, avec l'intérieur et le callum d'un blanc nacré irisé. Opercule corné, très profondément enfoncé dans l'ouverture*.'
Locard remarked that most characteristics in many samples from the Cape Verde Islands were very constant when it concerned shape, colour pattern and size. Most of the studied specimens had a monochrome base instead of being maculated, but some individuals were ornamented with continuing or interrupted radiating flammules.
The animal has not been described in literature and no samples of preserved specimens are available for study at present.

Distribution:
G. gorgonarum is only known from deep water (628-660 m) off the Cape Verde Islands. About 150 specimens were dredged by the '*Travailleur*' & '*Talisman*' expeditions (1881) and some more specimens (about 40) were dredged during the scientific expedition carried out by Prince Albert I from Monaco at a depth of 660 m off Maio, Cape Verde Islands, where it was considered to be very common by Dautzenberg & Fischer (1907). Up to now, it has appeared as if this species was endemic, but similar specimens were collected from Luanda (Angola) in 1989 (2 juvenile specimens in CFN; 1 shell in CJV). The shells were crabbed and parts of them were deteriorated. R. Ardovini and T. Cossignani (2004), as well as E. Rolán (2005) consider such shells as a separate species. While the former authors regard them as a *Callumbonella* species, Rolán (2005) states that their profile is closer to a *Calliostoma* (rather than a *Gibbula*) but this was due to overlooking the type material.
E. Rolán et al. (2009) do not agree with the opinion that *C. gorgonarum* is merely a form of *G. suturale* supported by the following arguments:
- *C. gorgonarum* is a smaller shell reaching a maximum diameter of 14 mm, while *C. suturale* can reach 19 mm. Indeed most of the shells from Cape Verde are rather small, but two specimens in the RBINS measured more than 15 mm.
- The shell of *G. gorgonarum* is more depressed: some of the shells studied by Rolán et al. (2009) were small or not fully adult and juveniles in TROCHOIDEA are mostly depressed and have a relatively larger aperture.
- '*the axial red lines are constantly present in all the shells of G. gorgonarum whereas no shell of* C. suturalis *with this colour pattern was found.*' (Rolán et al., 2009). We possess *C. suturale*

from Sicilian waters with salmon-red flammules (Pl. IV, Figs 19-24) and a few specimens from Ghana (Pl. XVII, Fig. 95) and Angola with red lines (Pl. XIX, Figs 106-110), but none of them completely match the pattern of those from the Cape Verde Islands.

- Rolán et al. (2009) described the radula of *C. callumbonella* on the basis of scarce rests in bad conditions from a dry animal. The radula has '*the central tooth irregularly denticulated on the upper border, lateral **4**, with only two external cusps*'. The authors remark that '*the **5th*** (sic) *lateral tooth has only two large external cusps*' when discussing the differences with *C. suturale* further on. Apart from this error, it is clear from the figures that the radula had been damaged in such a way that some of the lateral teeth had disappeared. The photographs of the radula are really not convincing for the statement that *C. suturale* and *C. gorgonarum* are two different species.

Conclusion:

Without question *G. gorgonarum* is not a rare species in the type locality where the shells have a rather constant appearance in very deep waters, neither accessible nor prolific for the local fishery. Fortunately, the samples from the expeditions in the 19th century were consigned to the MNHN and RBINS but scientists and amateur conchologists were no more acquainted with new material from the Cape Verde Islands later on. It is nearly comprehensive that a conservative opinion was preferred resulting in retaining this special form as a distinct species. However, during the previous decade many investigators (e.g. CLEMAM) changed their opinion and now believe that *C. gorgonarum* is merely a form of *C. suturale*. Originally we thought this could be a subspecies, but since similar shells with small size and red flammules on the last whorl have also been obtained from Angola we have to conclude that it only concerns one species. Moreover, larger shells from the Cape Verde Islands have a grey-yellow colour with only traces of red lines. This may be only a typical characteristic for small and juvenile shells. The kind of colour and size cannot be used as definitive criteria to decide if we have to treat different shells as one or two species. These arguments let us to conclude that the Cape Verde populations do not belong to a subspecies, but are only a form of *C. suturale*.

Callumbonella namibiensis Rolán in Rolán, Gonzalez-Porto & de Matos-Pita, 2009

Original description by Rolán:

'*Shell very solid, with trochoid form, the profile is stepped due to the subsutural area of each whorl being more elevated than the suture. The protoconch could not be studied because it was always eroded in all the material examined. The teleoconch has about 4-5 whorls. The spiral sculpture is formed by 10-14 cords which have elongated nodules; the subsutural area is strong, more elevate and the nodules are larger. The periphery of the last whorl is rounded and with numerous spiral threads. From here to the base, there are about 10-12 spiral main non-nodulous cords with smaller ones between them. A umbilical callus closes the area. Aperture subcircular. Colour pink-violaceous dorsally, the periphery white and the base whitish. The aperture is iridescent. Dimensions: the holotype is 19.2 mm in diameter; most of the paratypes are of similar size or smaller, although one does reach 21 mm.*

Animal, examined in five preserved specimens, is whitish, cephalic tentacles narrow and elongate. Epipodium well developed with large neck lobes and simple margins anteriorly, and a little irregular in the middle and posteriorly. Cephalic lappets small but evident, sometimes with a large lobe and another small one, sometimes with only an irregular border. There are three well developed epipodial tentacles at each side, the first pair larger. The snout is large and papillated at the tip, dorsally with numerous transverse small folds. The foot is rounded anteriorly and tapering to a point posteriorly; in the opercular area there are small separate brown lines near the foot border. Eyes black, very large, on independent peduncles.

Operculum rounded, dark brown, multispiral, slightly transparent and, near the external border, the spiral lines are close.'

The following is a textual reproduction of the description of the radula by Rolán (2009):

'*Radula (from Namibian specimens) bilaterally symmetrical. **About** 40 rows of teeth. Both the central and marginal tooth fields are well developed. The cusp and the base rows are coincident. The rachidian tooth is wide, almost **rectangular**, with a short upper sharp border, in which there are very small cusps on both sides **and an irregular depressed** central part. The five lateral pairs of teeth are similar in size, increasing from the inner to the outer ones; they are pointed with very small cusps **(from 6 to 9)** at both sides. The marginal teeth are elongated, sharply pointed, the innermost is largest and the size decreases outwards along the row, having small cusps on the inner border. In the lower face of the marginals there is a prominent ridge hardly visible in the smaller ones.*

The radula of the populations from Mauritania and Guinea-Conakry supposed conspecific, are rather similar, with the border of the rachidian tooth very irregular.'

Type locality (from Rolán, 2009): off Namibia, between 18°11.12' S and 18°12.56' S, 11°24.80' E and 11°25.41' E, between 500 and 541 m.
Geographic distribution (from Rolán, 2009): Namibia, and possibly Mauritania and Guinea-Conakry.
Measurements: 12-21 mm.
Habitat: In very homogeneous mud and sandy sedimentary soft bottom. The accompanying fauna in Namibia was composed by hormatids, decapods and polychaetes and sometimes demosponges. No Echinodermata were present. (Rolán et al., 2009)

Discussion:
It is surprising that neither E. Rolán & P. Ryall (1999), nor local collectors' shell-lists mention the species in Angolan waters. Belgian fishermen (1963-1974) already caught this species off Ambriz, North Angola and even from Cape Fria, Namibia, SW Africa. During the previous decade more specimens turned up from a depth of 400-450 m, between Walvis Bay and Lüderitz, Namibia (25° S 12° E).
Finally, E. Rolán (2009) described this form as a distinct species on the basis of samples collected at a depth between 500 and 541 m off Namibia (between 18°11.12' S and 18°12.56' S, 11°24.80' E and 11° 25.41' E) during the ''*Namibia 0502*'' expeditions carried out by the Instituto Español de Oceanografia on board of the R/N ''Vizconde de Eza'' on 10 March 2005. The collecting method was a net of the Lofoten type.
As the description of the radula of *C. namibiensisis* by Rolán (2009) is in fact a nearly textual copy of that of *C. suturale* it is clear that both examined radulae are very similar except for some very minor negligible differences. We stress that the animals concerned lived at a distance of about 6,000 km from each other. Moreover, there are also very few differences compared with the radula of *G. gorgonarum*. Even Rolán et al. (2009) had some problems to identify specimens from Mauritania, Senegal and Guinea-Conakry provisionally assigning them to *C. namibiensis*. Though these populations live closer to the geographical area inhabited by *C. suturale* they are morphological closer to those from Namibia. Originally, we also thought that *C. namibiensis* was a distinct species. In Table I we summarize the differences between extreme forms of *C. suturale* living at the borders of the geographical area. At first sight it may be tempting to designate all large specimens with convex depressed whorls and larger granules in the spiral cords - typical of the southern hemisphere - to *C. namibiensis*. Shells from the NE Atlantic, Alboran Sea and NW Africa, which are more fragile and light, more trochoid, elevated, pointed, and provided with finer granulations on the smooth whorls could be called *C. suturale*.
Unfortunately, specimens from Ghana, Ivory Coast and Mauritania can never be assigned to any of these extreme forms. Even shells from the same locality show a mix of these characteristics. Pl. XXIV, Figs 131-142 and Pl. XXV, Figs 143-154 show a survey of more than twenty morphologically different forms of *C. suturale* from South Ireland to Namibia.

Definitive conclusion: *Callumbonella suturale* finally proves to be a very controversial species. During the previous two centuries little material was available for study, though hundreds of specimens were waiting for investigation in museum collections. Scientists were probably already discouraged by the high variability of this species.
The first problem to be resolved was the choice of the type. Philippi (1836) described a fossil specimen as type for *C. suturale*. However, this shell does not completely match recent material, certainly due to the short description and the poor quality of the figure. This feature was already remarked by Locard (1898) and Rolán et al. (2009). Landau et al. (2003) described and figured shells (figs 56-59) from the Pliocene of Estepona which possess more granular cords and a more angled outline. Rolán et al. (2009) proposed to use the name *Callumbonella folini* (P. Fischer, 1883) if ever the fossil and recent species should prove morphological different. The lectotype of *C. folini* '*undoubtedly*' (sic) matches - as designated by these authors - the species as known from the Mediterranean and North Africa. However, our study resulted in a totally different conclusion. *C. suturale* is in fact so variable over its whole geographic distributional area that any type would be appropriate. Even at the same locality, at the same depth and in the same habitat specimens can be very different. For this reason and for the case of giving priority to stability in nomenclature we still prefer to use the name *C. suturale* henceforth. Due to the good condition of the samples of the MNHN we were able to discover a very special characteristic of the genus *Callumbonella*, never mentioned in literature. Especially the shells from Mauritania, Senegal, Ivory Coast, Ghana and even Namibia were still partially covered with a very thin yellow coating (Pl. VI, Figs 31-36; Pl. VIII, Figs 43-48; Pl. XX, Figs 111-115; Pl. XXI, Figs 116-117). Shells from these localities are provided with more granulous spiral cords, so this periostracum can easily be retained. European representatives are smoother and the olive-yellow cover is easily lost. Even this special feature was not sufficient enough to make a difference between several forms.

Finally, we may provisionally conclude that only one species of *Callumbonella* is present in European and West African waters instead of two or three. The name *C. namibiensis* should merely be regarded as a junior synonym, as well as *G. gorgonarum*, already assumed a synonym by CLELAM. Otherwise it would be advised to future authors to create several different species using very doubtful identification characteristics. As the study of the radula as an identification tool failed, only DNA analysis should solve the '*Callumbonella*' problem.

	Callumbonella suturale **(NE Atlantic and Mediterranean Sea)**	**'*Callumbonella namibiensis*' (Angola and Namibia)**
shell	fragile, light	solid, mostly eroded
lateral outline	almost straight	slightly stepped
spiral sculpture	first whorls nearly smooth; 10-12 spiral nodulose cords on body whorl	6 strong fine spiral cords with small nodules on body whorl
periphery of the last whorl	angled, encircled by 2 rows of very tiny nodules	angled by a wide cord
number of whorls	7	5-6
spiral sculpture from the periphery towards the base	about 10-12 fine cords	10-12 spiral main non-nodulous strong cords, alternating with narrower threads
external colour	light salmon-pink or pink streaks on a whitish background	reddish pink, nearly violaceous, with an off white periphery and base, sometimes with red lines
operculum	yellowish brown; wider concentric spaces between the spiral whorls near the external border	dark brown; narrow concentric spaces between the spiral whorls near the external border
size	10-19 mm	13-22 mm

Table I: Comparison of the main characteristics between extreme forms of *Callumbonella suturale* and *C. namibiensis*

Acknowledgements: We thank Thierry Backeljau (RBINS) for kindly making samples of *Callumbonella gorgonarum* available from the Dautzenberg collection. We are very grateful to Virginie Héros and Philippe Bouchet (both of the MNHN) for the loan of many samples of *Callumbonella*. David Monsecour was a faithful corrector of the English text.

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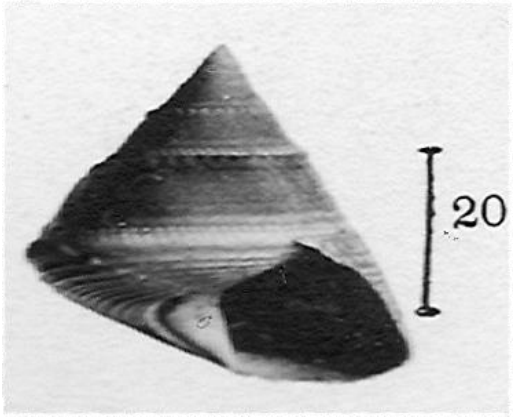
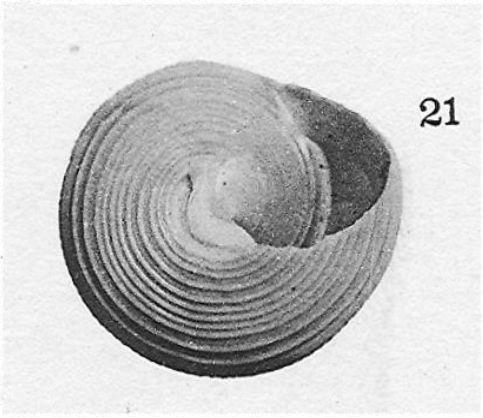
Geographic distribution of *Callumbonella suturale* ● and *C. suturale var. gorgonarum* ■

Callumbonella suturale (Philippi, 1836)





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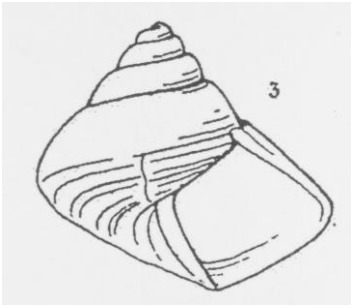
Trochus suturalis

From: Philippi, R.A., 1836. Enumeratio Molluscorum Siciliae cum Viventium tum in Tellure Tertiaria Fossilium quae in Itinere suo Observavit. *Berolini*, vol. I, Fig. 23



Trochus* (*Margarita*) *tetragonostoma

From: Jordan, H.K., 1895. On some new species of British Mollusca, from the "Triton" Expedition, with a list of other species new to the Faroe Channel *Proceedings of the Malacological Society of London*, **1**(6): 264-269.

Callumbonella gorgonarum (P. Fischer, 1883)

From: Dautzenberg, Ph. & Fischer, P. 1906. *Résultats des Campagnes Scientifiques accomplies sur son Yacht par Albert Ier Prince Souverain de Monaco. Mollusques provenant des dragages effectués à l'Ouest de l'Afrique pendant les Campagnes Scientifiques de S.A.S. le Prince de Monaco*. Imprimerie de Monaco. Fascicule XXXII, Pl. II

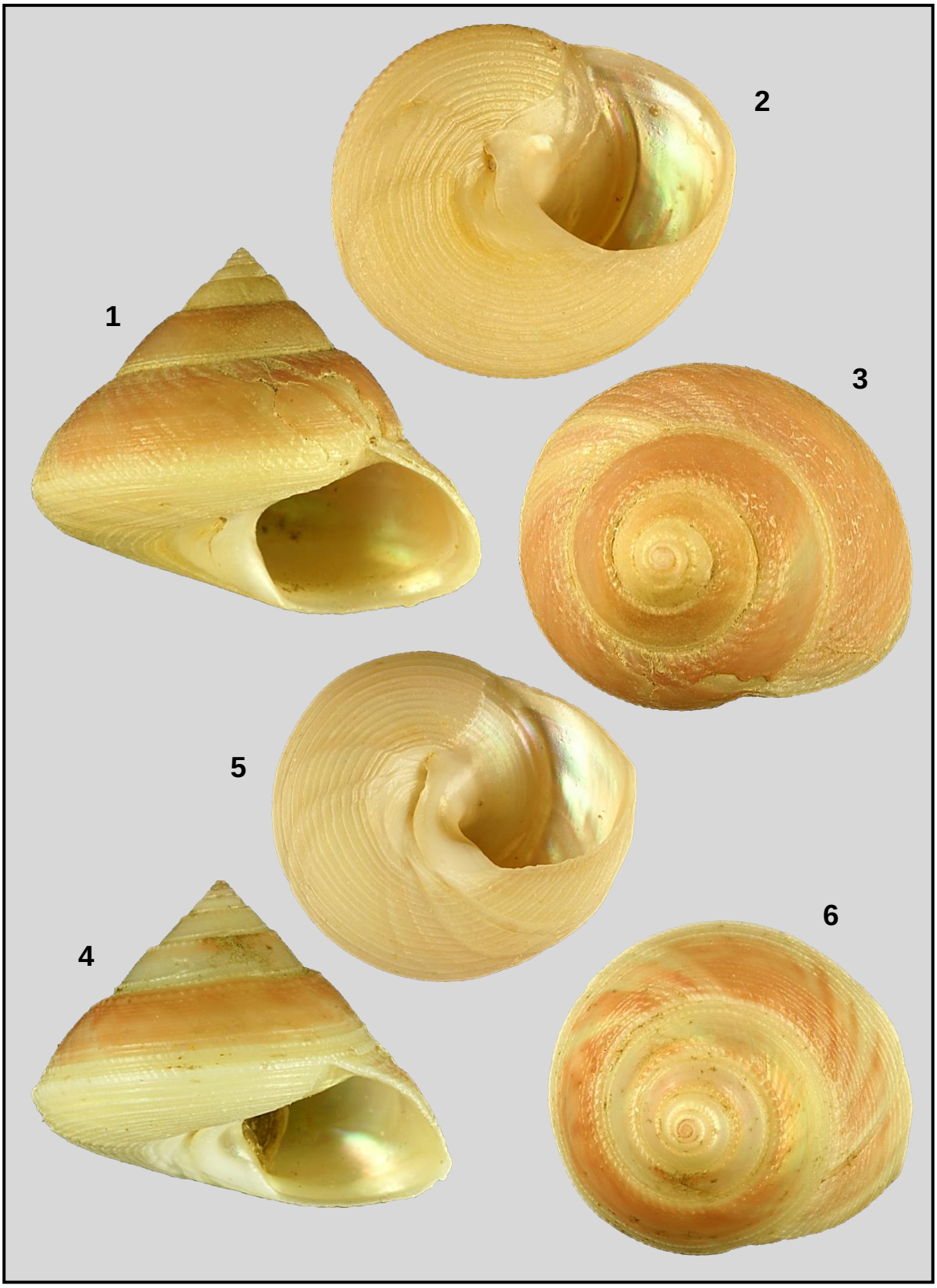


Plate I. Figs 1-6: *Callumbonella suturale* (Philippi, 1836). MNHN; 1-3: W France. 48°19' N 09°08' W. '*Thalassa*' expedition. St. Z416. Dredged at a depth of 480 m. 1973. H. 15.32 mm D. 18.43 mm; 4-6: Bay of Biscay, W France. 43°50' N 06°10' W. '*Thalassa*' expedition. St. W414. Dredged at a depth of 570 m. 1970. H. 13.12 mm D. 16.52 mm.

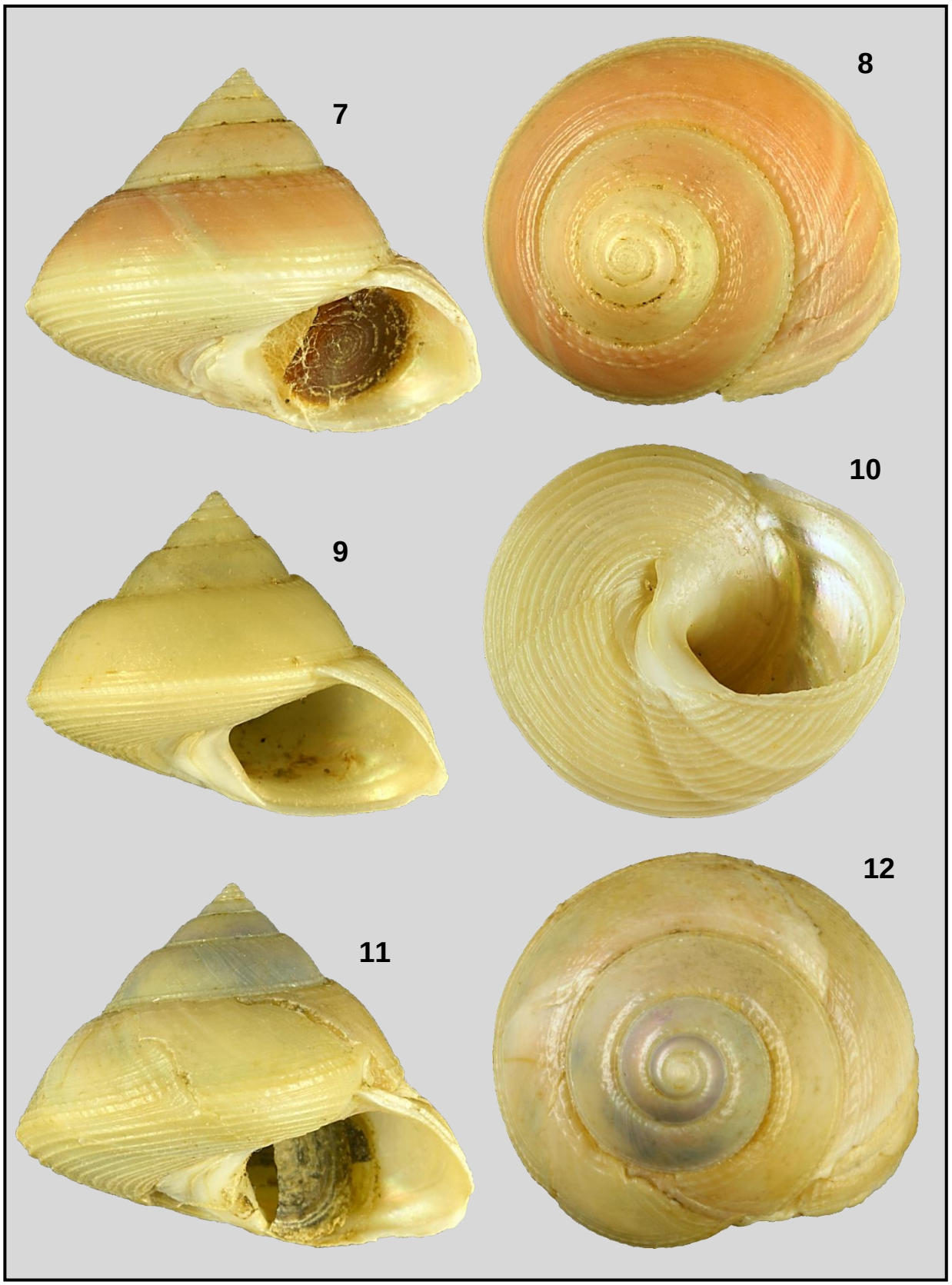


Plate II. Figs 7-12: *Callumbonella suturale* (Philippi, 1836). MNHN; Bay of Biscay, W France. 47°45' N 07°55' W. '*J. Charcot'* expedition. St. 18. Dredged at a depth of 860 m. 1968; 7-8: H. 14.07 mm D. 17.27 mm; 9-10: H. 13.61 mm D. 17.20 mm; 11-12: H. 15.11 mm D. 18.56 mm.

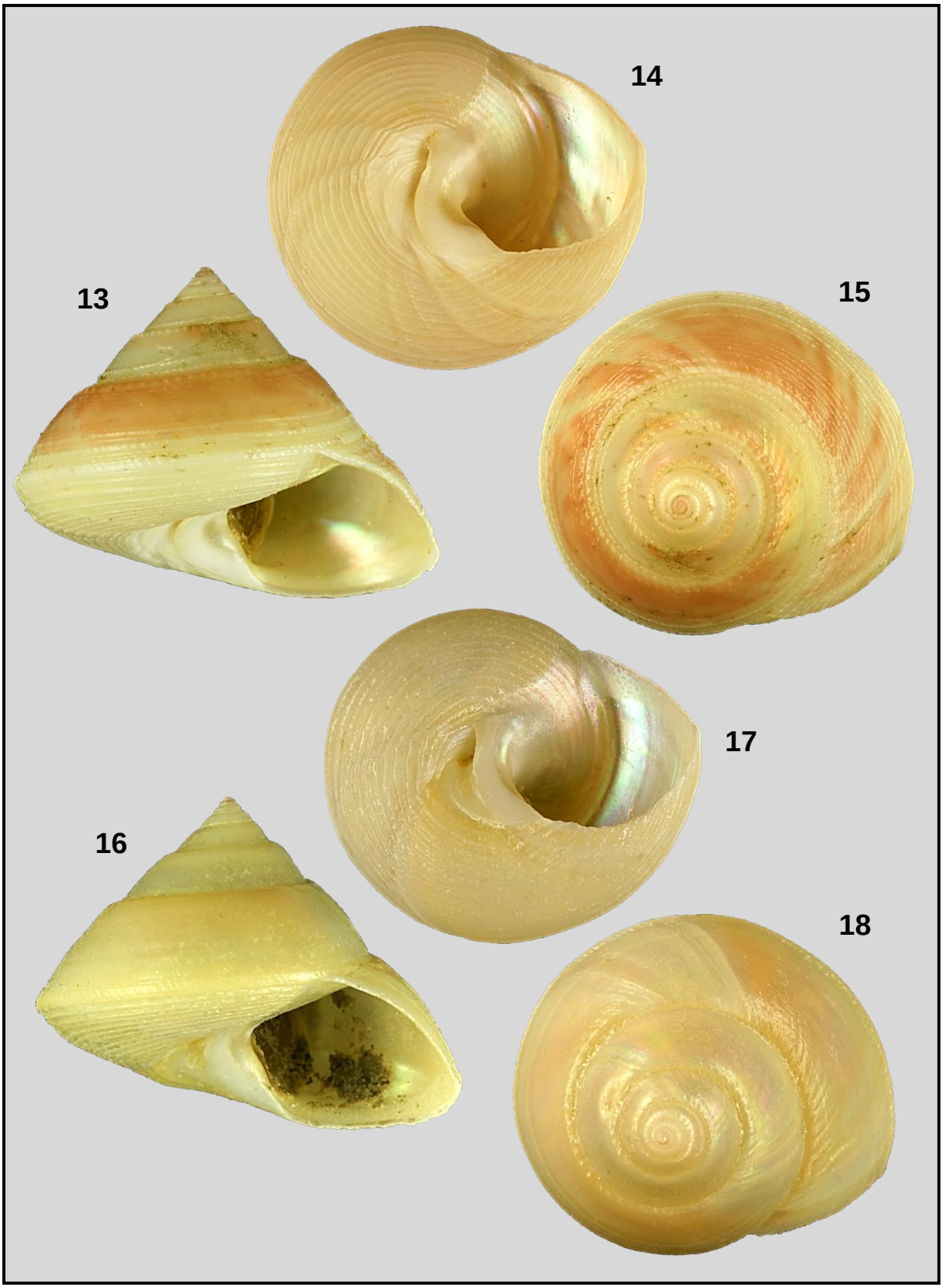


Plate III. Figs 13-18: *Callumbonella suturale* (Philippi, 1836). MNHN; 13-15: South Bay of Biscay, N Spain. 43°50' N 06°10' W. '*Thalassa*'' expedition. St. W414. Dredged at a depth of 570 m. 1970. H. 13.12 mm D. 16.52 mm; 16-18: N Portugal. 41°31' N 09°16' W. '*Thalassa*'' expedition. St. Y378. Dredged at a depth of 1000 m. 1972. H. 12.08 mm D. 14.87 mm.

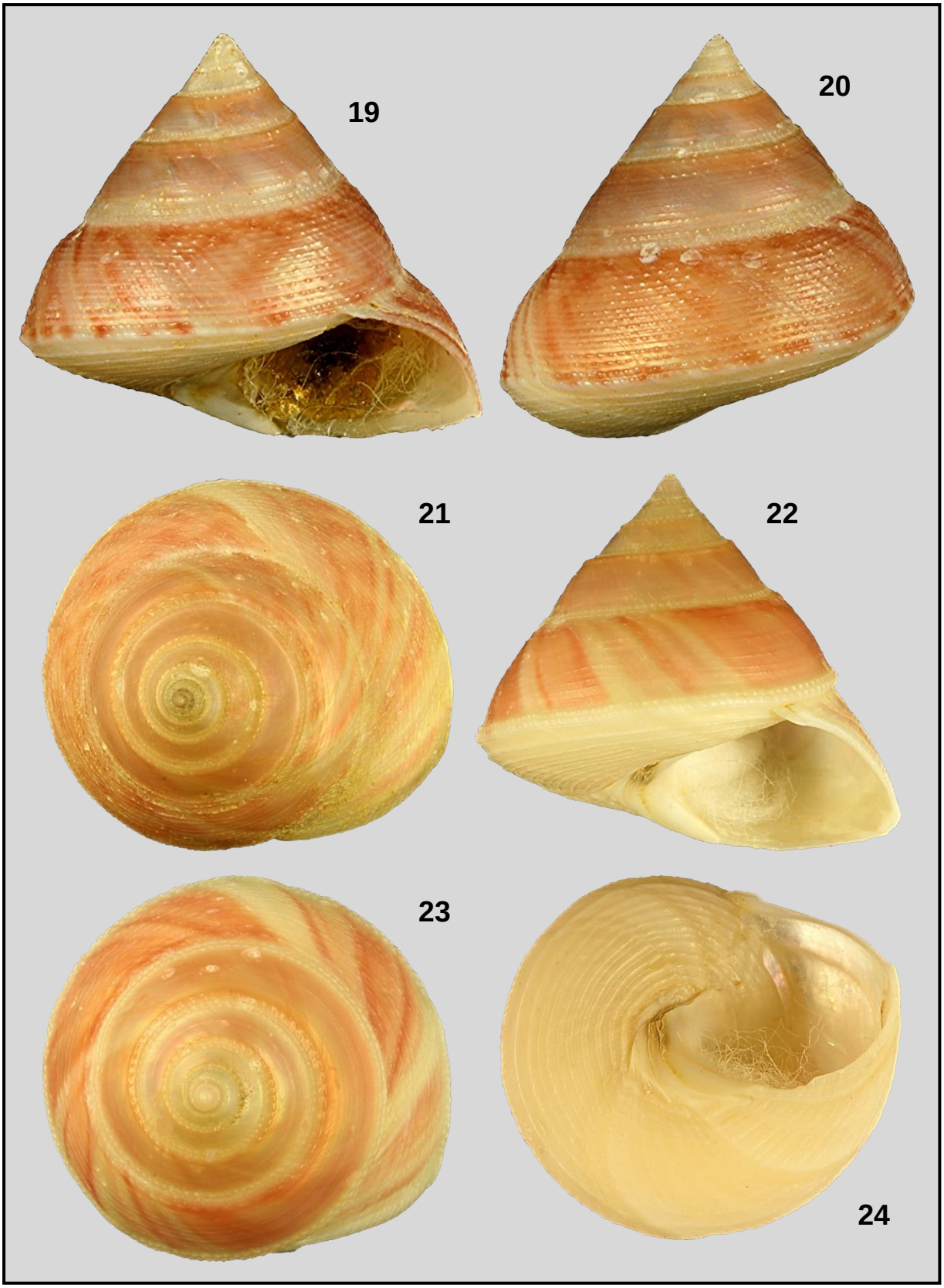


Plate IV. Figs 19-24: *Callumbonella suturale* (Philippi, 1836). Off Lampedusa, Italy. Trawled by shrimper at a depth of 375 m. 1985. CFN; 19-20: H. 15.25 mm D. 16.57 mm; 21: H. 16.10 mm D. 17.02 mm; 22-24: H. 15.22 mm D. 16.84 mm.

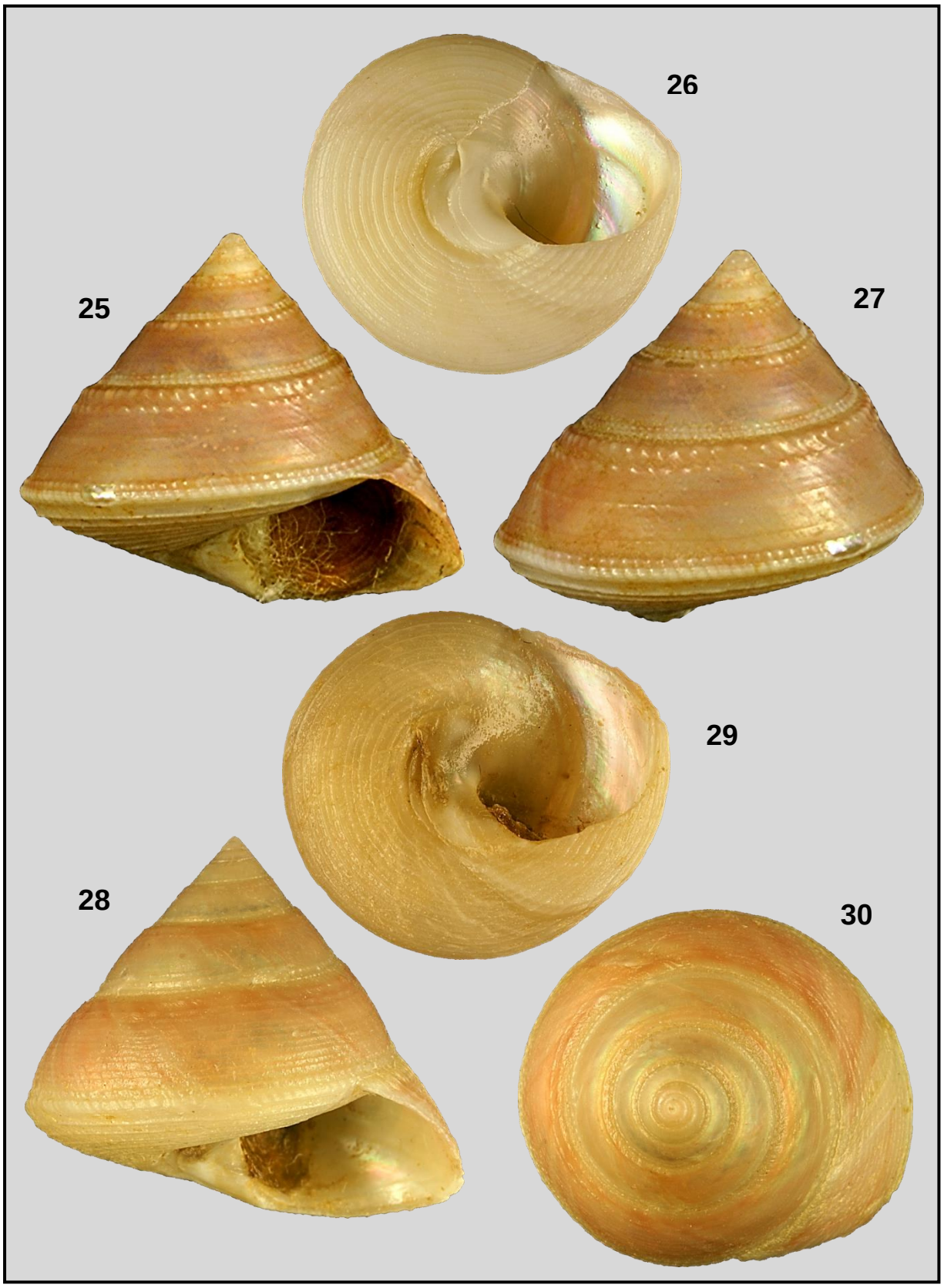


Plate V. Figs 25-30: *Callumbonella suturale* (Philippi, 1836); 25-27: Alboran Sea, Spain. Dredged at a depth of 160 m. CJV. H. 11.86 mm D. 13.72 mm; 28-30: Cabo de Tres Forcas, Melilla, Spanish Morocco. 1968. CFN. H. 16.93 mm D. 18.69 mm.

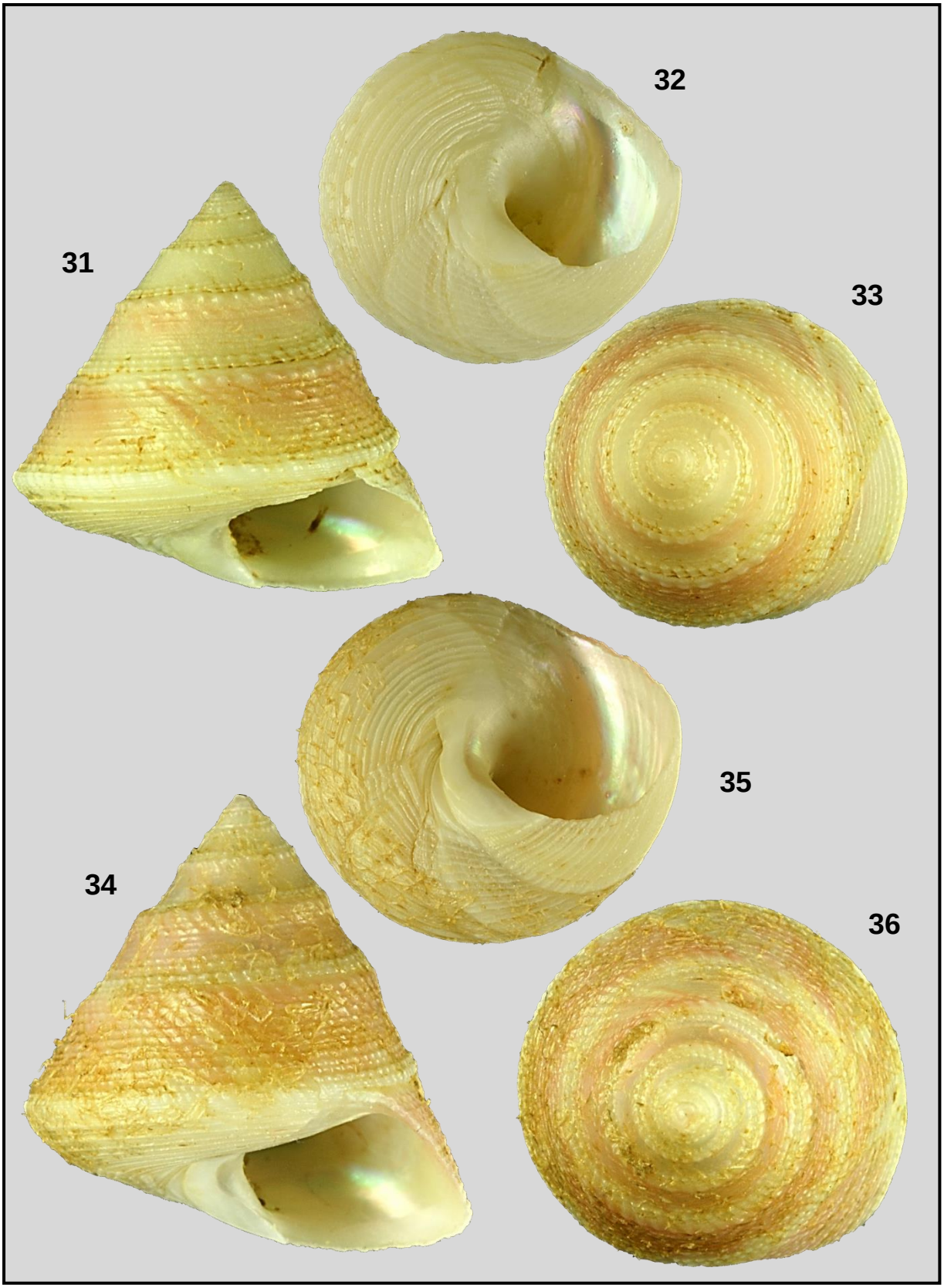


Plate VI. Figs 31-36: *Callumbonella suturale* (Philippi, 1836). MNHN. Cap Spartel, Tanger, Morocco. '*Talisman*' expedition, dr. 8. Dredged at a depth of 550 m. 10 June 1883; 31-33: H. 13.03 mm D. 13.07 mm; 34-36: H. 14.61 mm D. 13.97 mm.

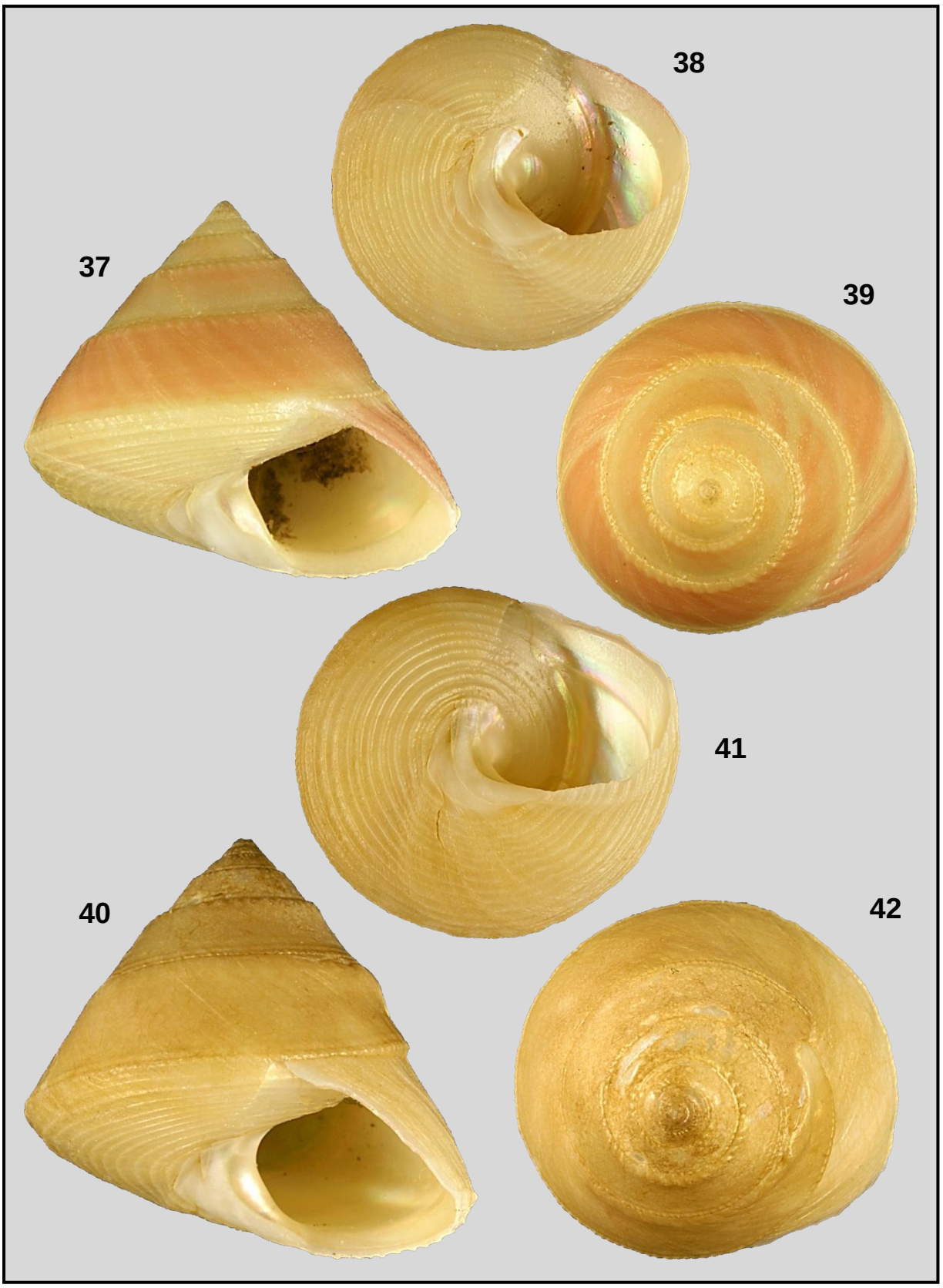


Plate VII. Figs 37-42: *Callumbonella suturale* (Philippi, 1836). MNHN. Western Sahara. 23°40' N 17°04' W. '*Discovery*' expedition. St. 10124. Dredged at a depth of 663 m; 37-39: H. 12.96 mm D. 14.91 mm; 40-42: H. 14.87 mm D. 16.32 mm.

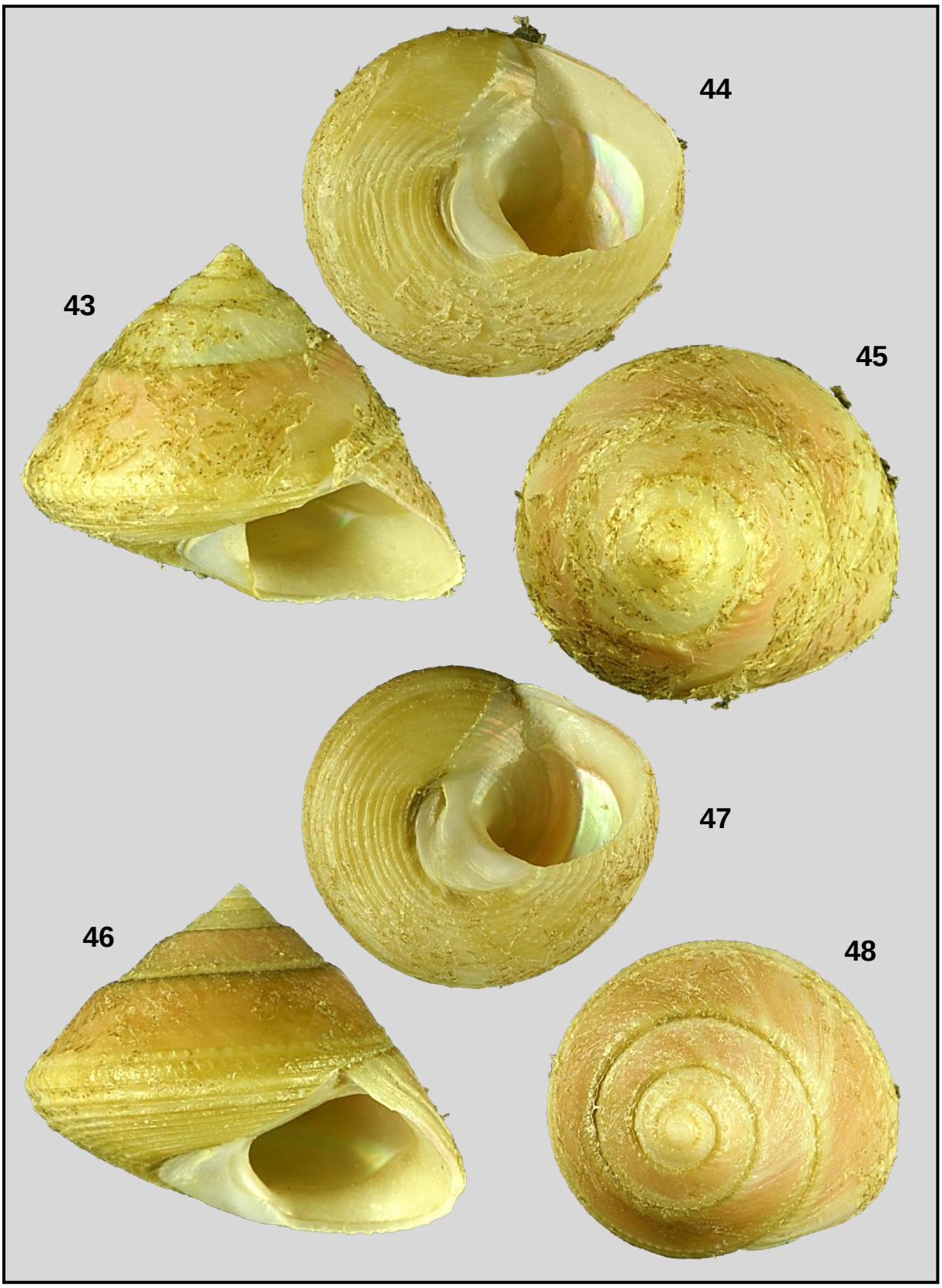


Plate VIII. Figs 43-48: *Callumbonella suturale* (Philippi, 1836). MNHN. Cansado, Cap Blanc, Mauritania. 20°44' N 17°46' W. '*Discovery*' expedition. St. 804. Dredged at a depth of 550 m; 43-45: H. 12.73 mm D. 14.09 mm; 46-48: H. 11.86 mm D. 14.58 mm.

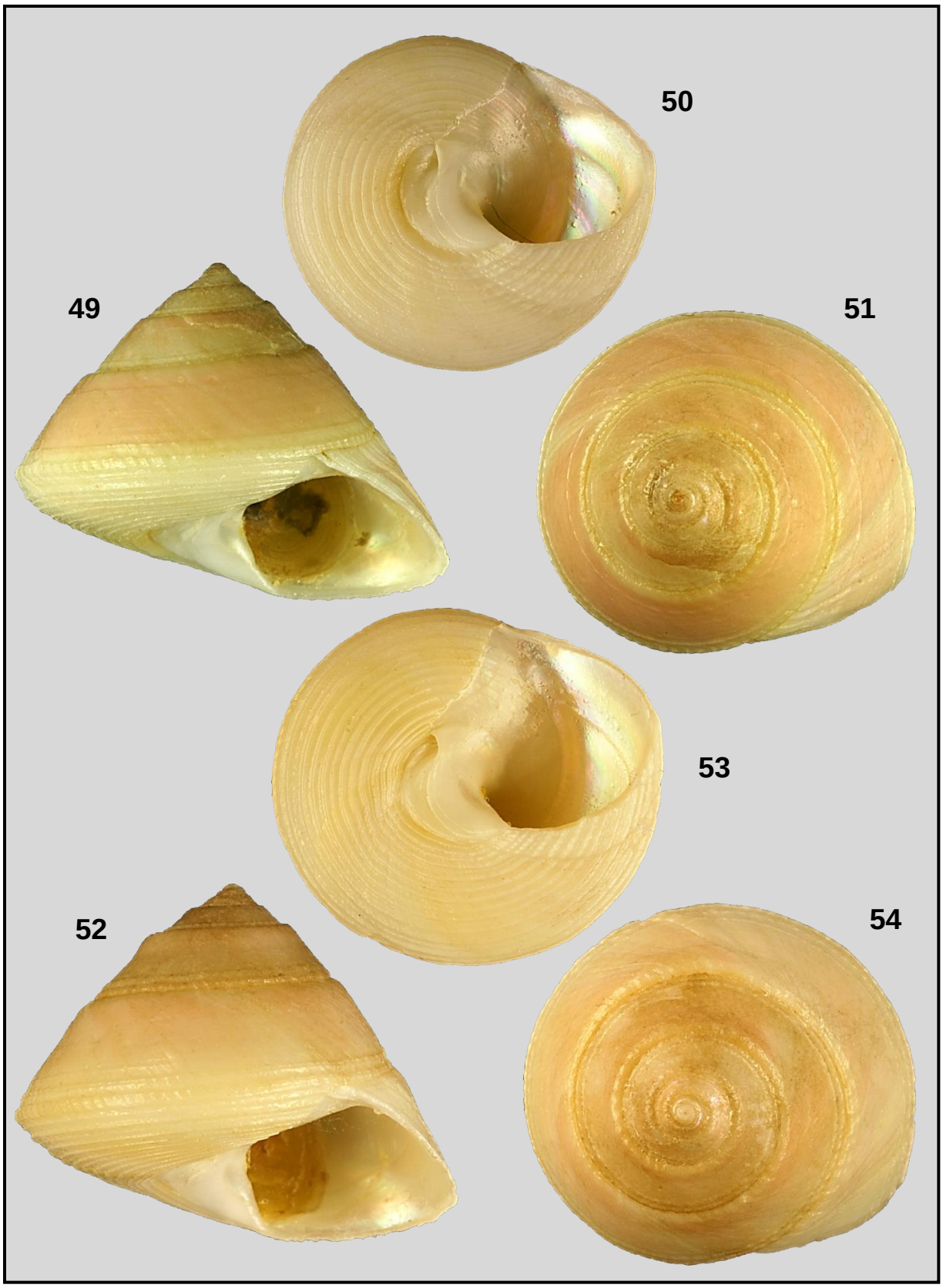


Plate IX. Figs 49-54: *Callumbonella suturale* (Philippi, 1836). MNHN. Cap Blanc, Mauritania. 20°30' N 17° W. '*Talisman*' expedition, dr. 96-97. Dredged at a depth of 250 m. 15 July 1883; 49-51: H. 13.52 mm D. 16.73 mm; 52-54: H. 14.03 mm D. 17.44 mm.

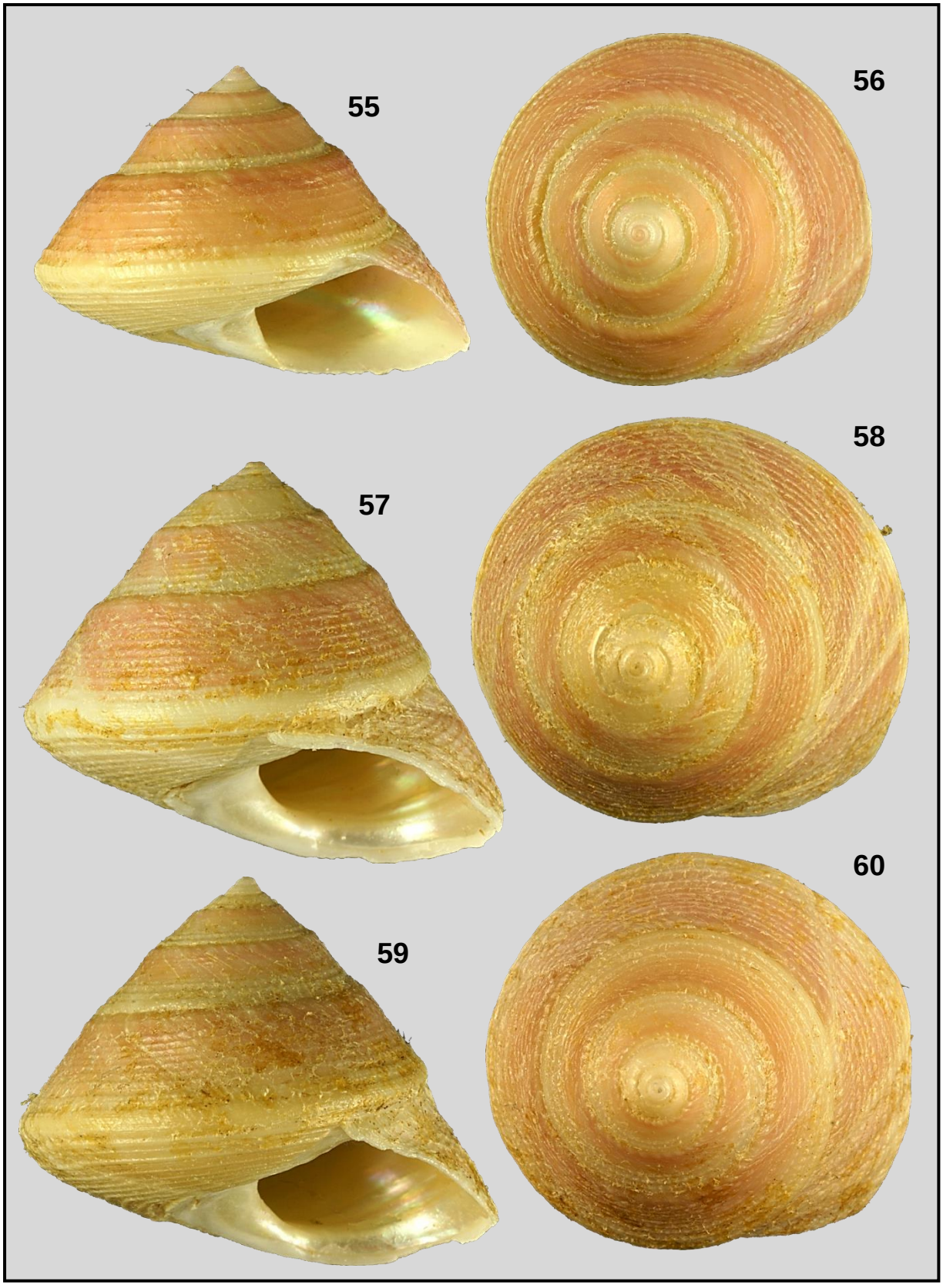


Plate X. Figs 55-60: *Callumbonella suturale* (Philippi, 1836). MNHN. Off Nouakchott, Mauritania. 18°30' N 16°43' W. '*Meteor*' expedition, St. 60-60. Dredged at a depth of 555 m; 55-56: H. 14.41 mm D. 19.21 mm; 57-58: H. 17.19 mm D. 19.69 mm; 59-60: 16.77 mm D. 19.79 mm.

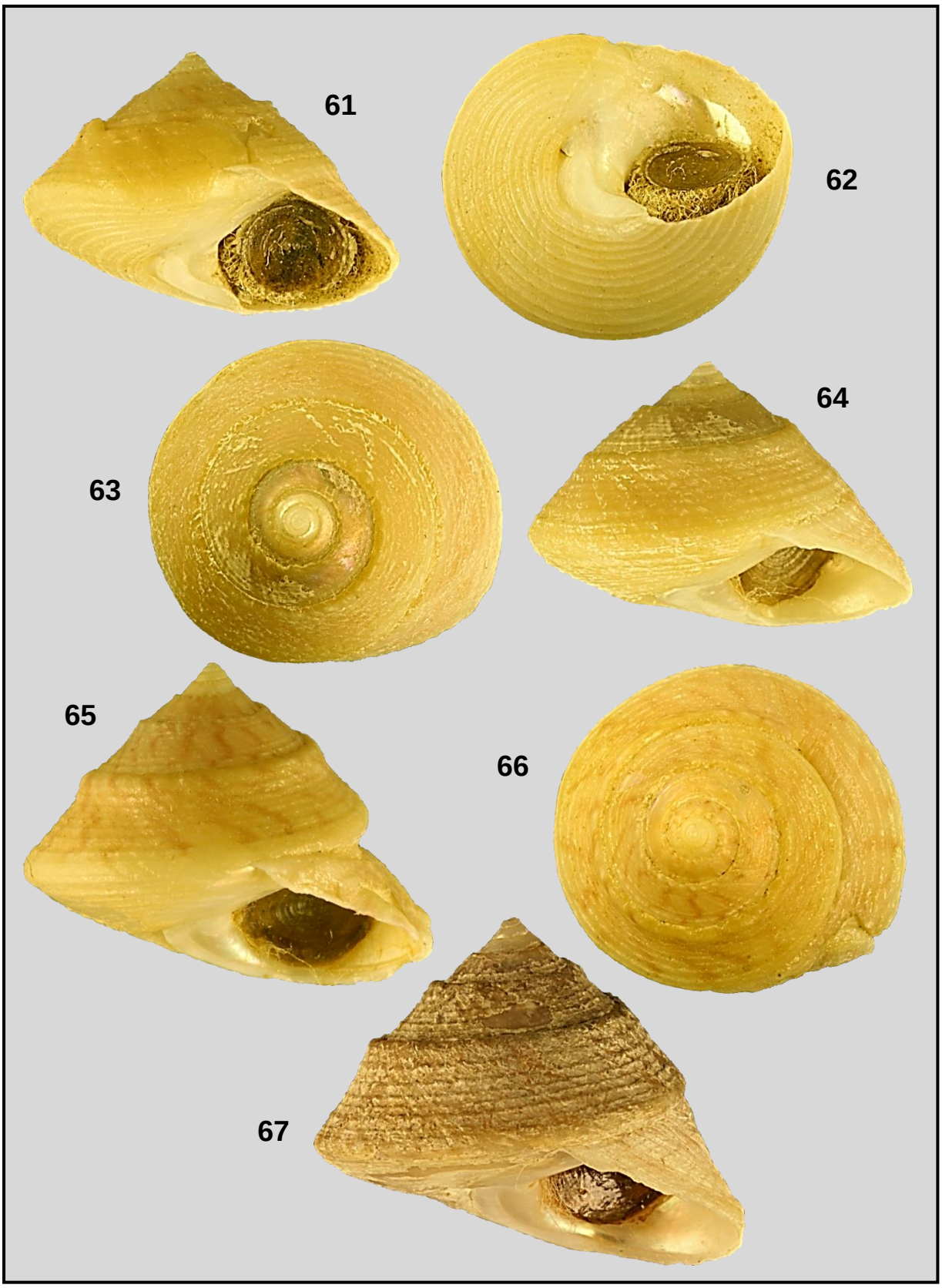


Plate XI. Figs 61-67: *Callumbonella suturale* var. *gorgonarum* (P. Fischer, 1884). RBINS. Maio, Cape Verde Islands. '*Prince de Monaco*' expedition. '*Princesse Alice*'. St. 1190. Dredged at a depth of 628 m. 14 August 1901; 61-62: H. 9.36 mm D. 13.47 mm; 63-64: H. 9.97 mm D. 13.76 mm; 65-66: H. 11.92 mm D. 14.39 m; 67: H. 12.79 mm D. 14.75 mm.

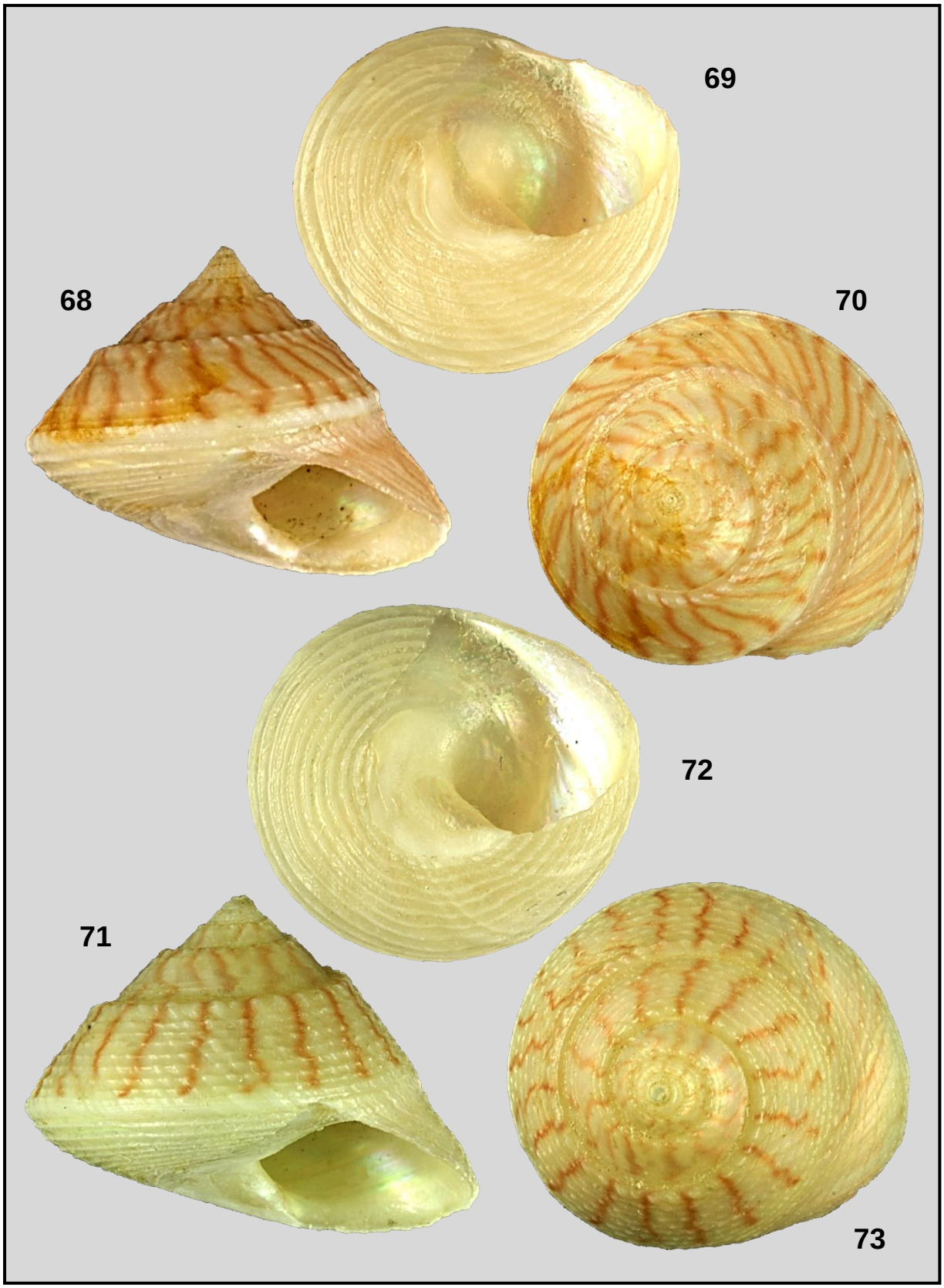


Plate XII. Figs 68-73: *Callumbonella suturale* var. *gorgonarum* (P. Fischer, 1884). MNHN. Fogo, São Antônio, Cape Verde Islands. 16°52' N 25°10' W. '*Talisman*' expedition., dr. 111. Dredged at a depth of 400-580 m. 29 July 1883; 68-70: H. 8.84 mm D. 11.51 mm; 71-73: H. 10.06 mm D. 13.21 mm.

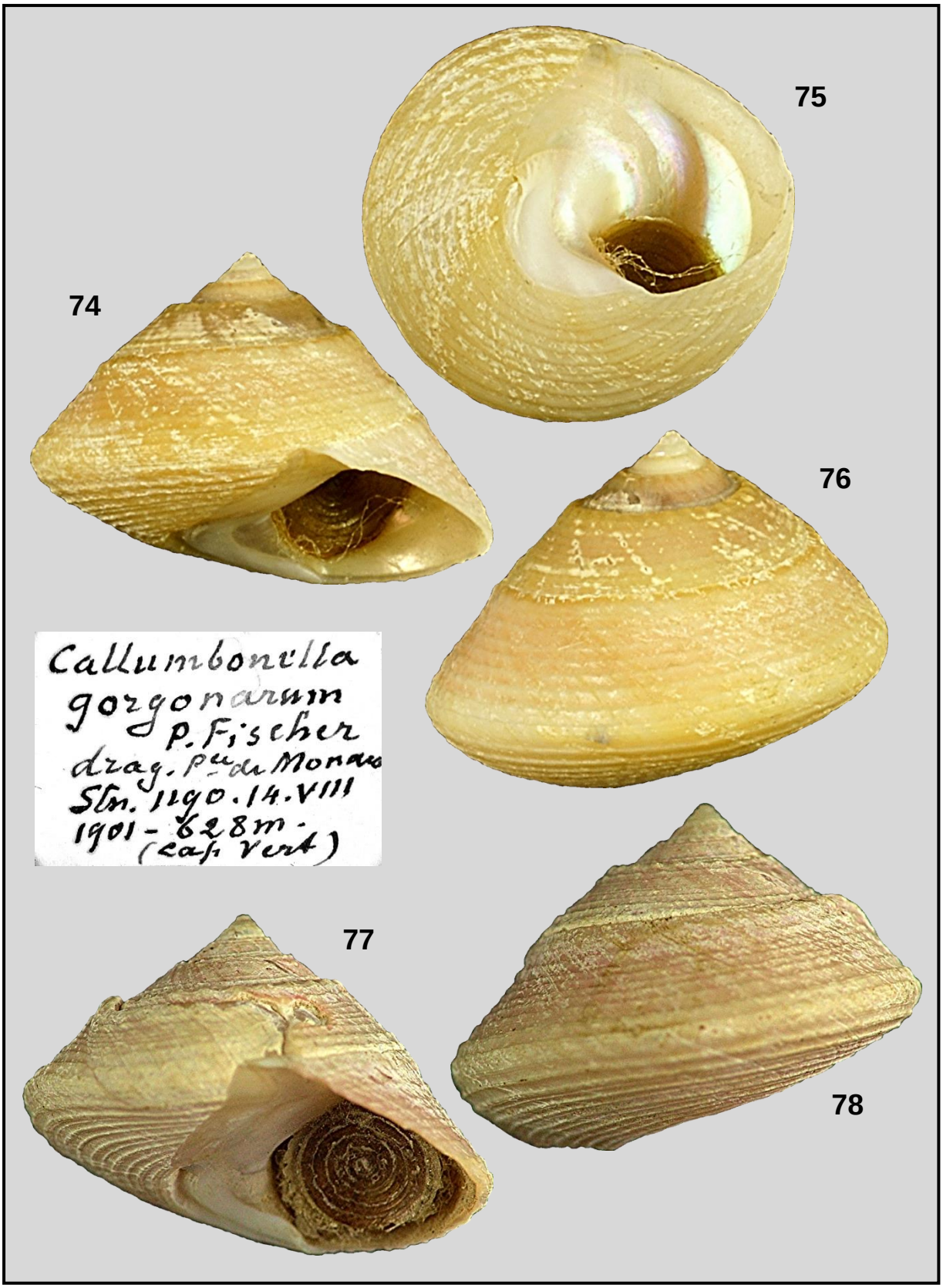


Plate XIII. Figs 74-78: *Callumbonella suturale* var. *gorgonarum* (P. Fischer, 1884). RBINS. Maio, Cape Verde Islands. '*Prince de Monaco*' expedition. '*Princesse Alice*'. St. 1190. Dredged at a depth of 628 m. 14 August 1901; 74-76: H. 10.12 mm D. 13.60 mm; 77-78: H. 9.53 mm D. 13.47 mm.

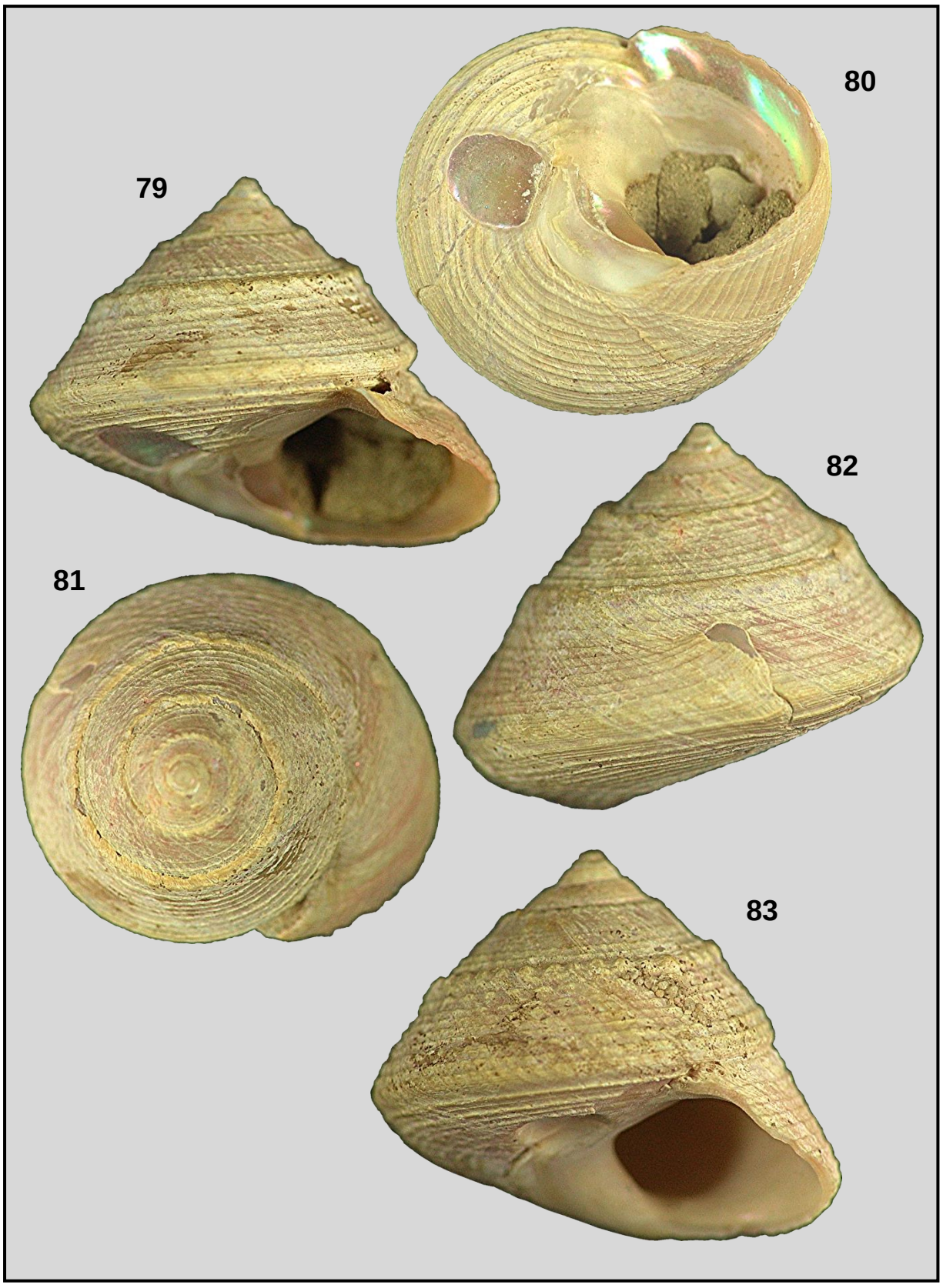


Plate XIV. Figs 79-83: *Callumbonella suturale* var. *gorgonarum* (P. Fischer, 1884). RBINS. Maio, Cape Verde Islands. '*Prince de Monaco*'-expedition. '*Princesse Alice*'. St. 1190. Dredged at a depth of 628 m. 14 August 1901; 79-82: H. 11.83 mm D. 15.09 mm; 83: H. 11.54 mm D. 13.92 mm.

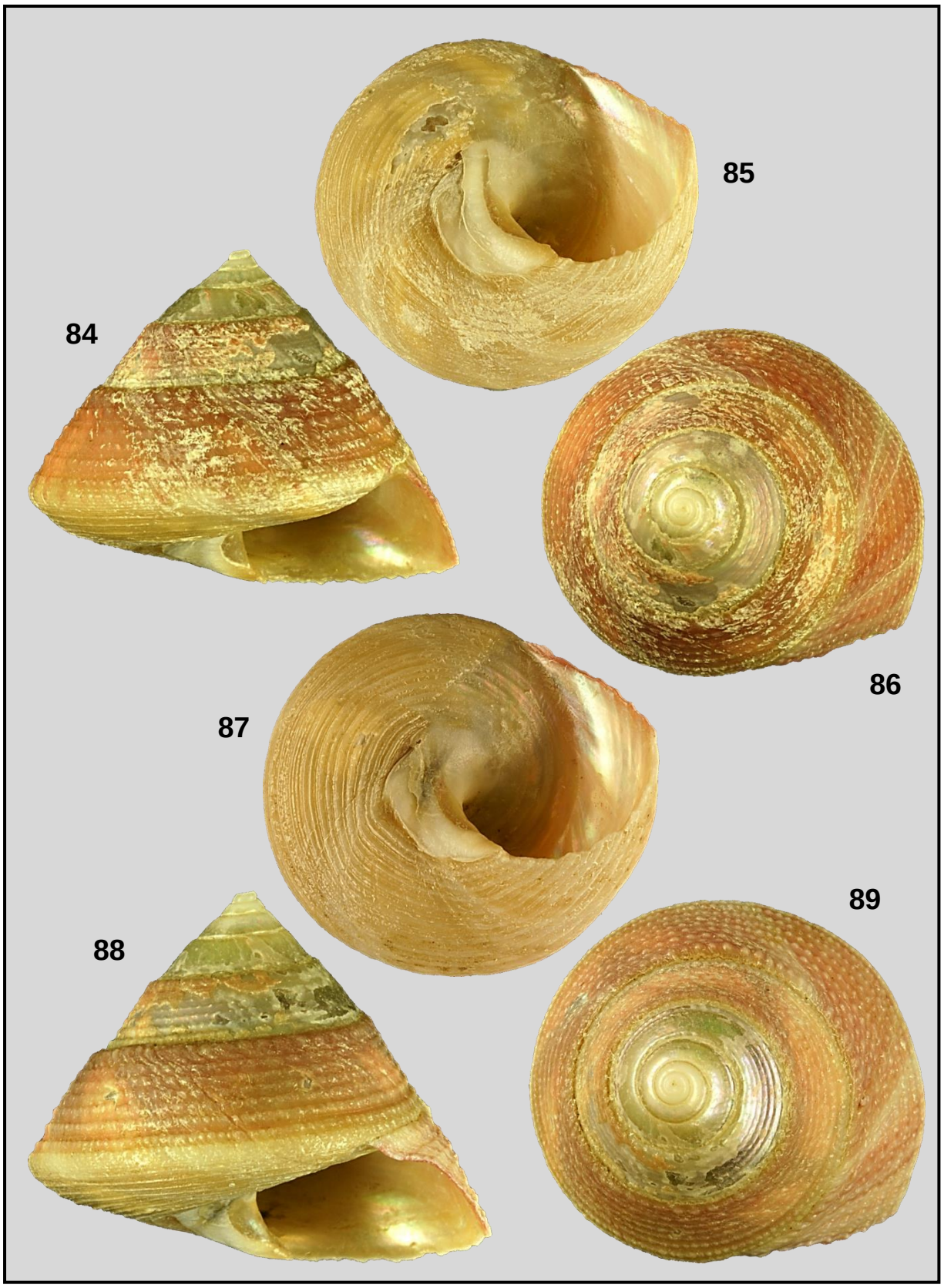


Plate XV. Figs 84-89: *Callumbonella suturale* (Philippi, 1836). CFN. St. Louis, Senegal. Trawled at a depth of 300 m. March 1987; 84-86: H. 15.26 mm D. 18.82 mm; 87-89: H. 16.18 mm D. 19.36 mm.

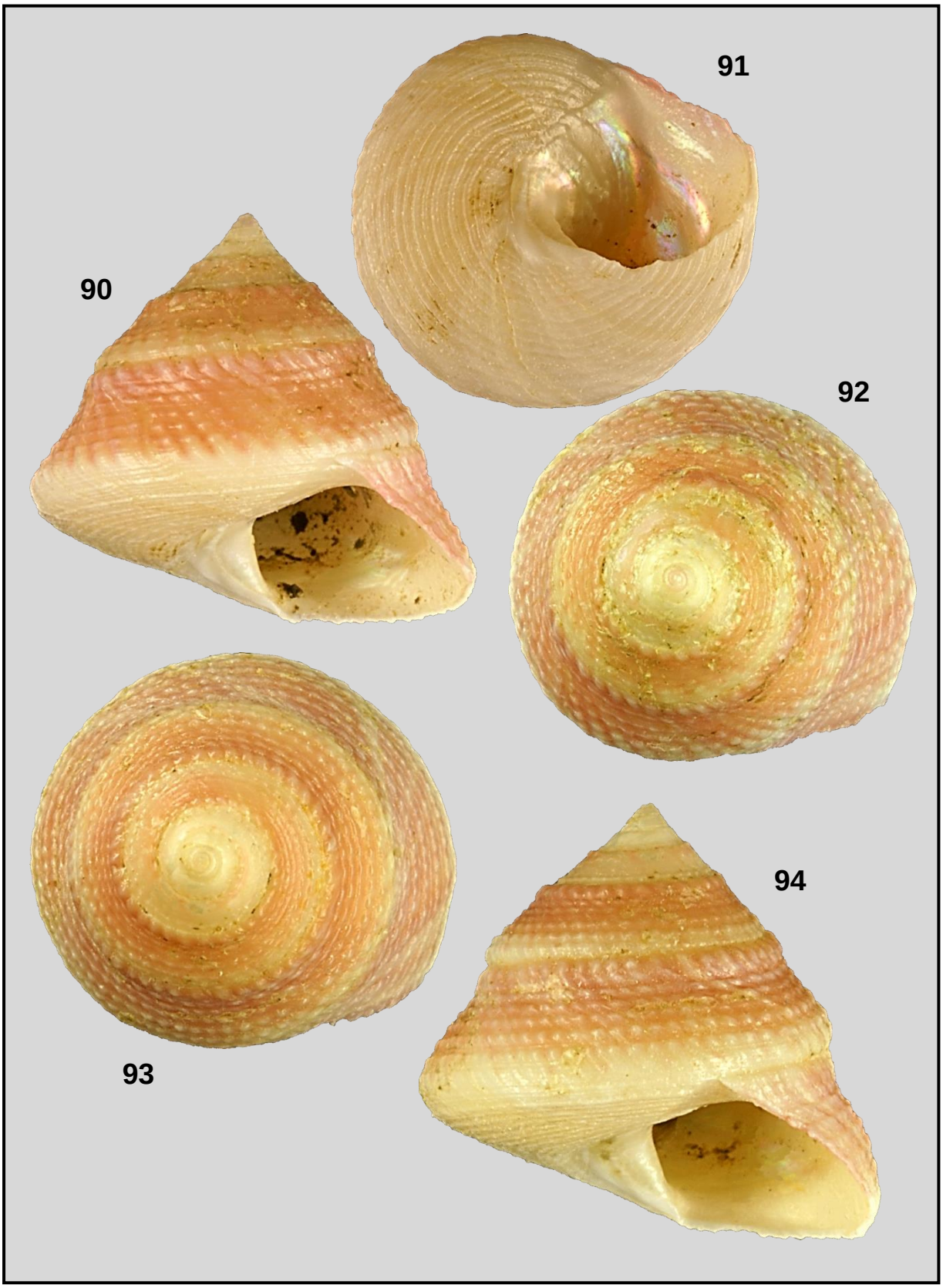


Plate XVI. Figs 90-94: *Callumbonella suturale* (Philippi, 1836). MNHN. Ivory Coast. 04°35' N 6°50' W. '*Guinean II Rufale*' expedition, dr. 19. Dredged at a depth of 400 m. 6 April 1964; 90-92: H. 11.21 mm D. 12.47 mm; 93-94: H. 12.43 mm D. 13.17 mm.

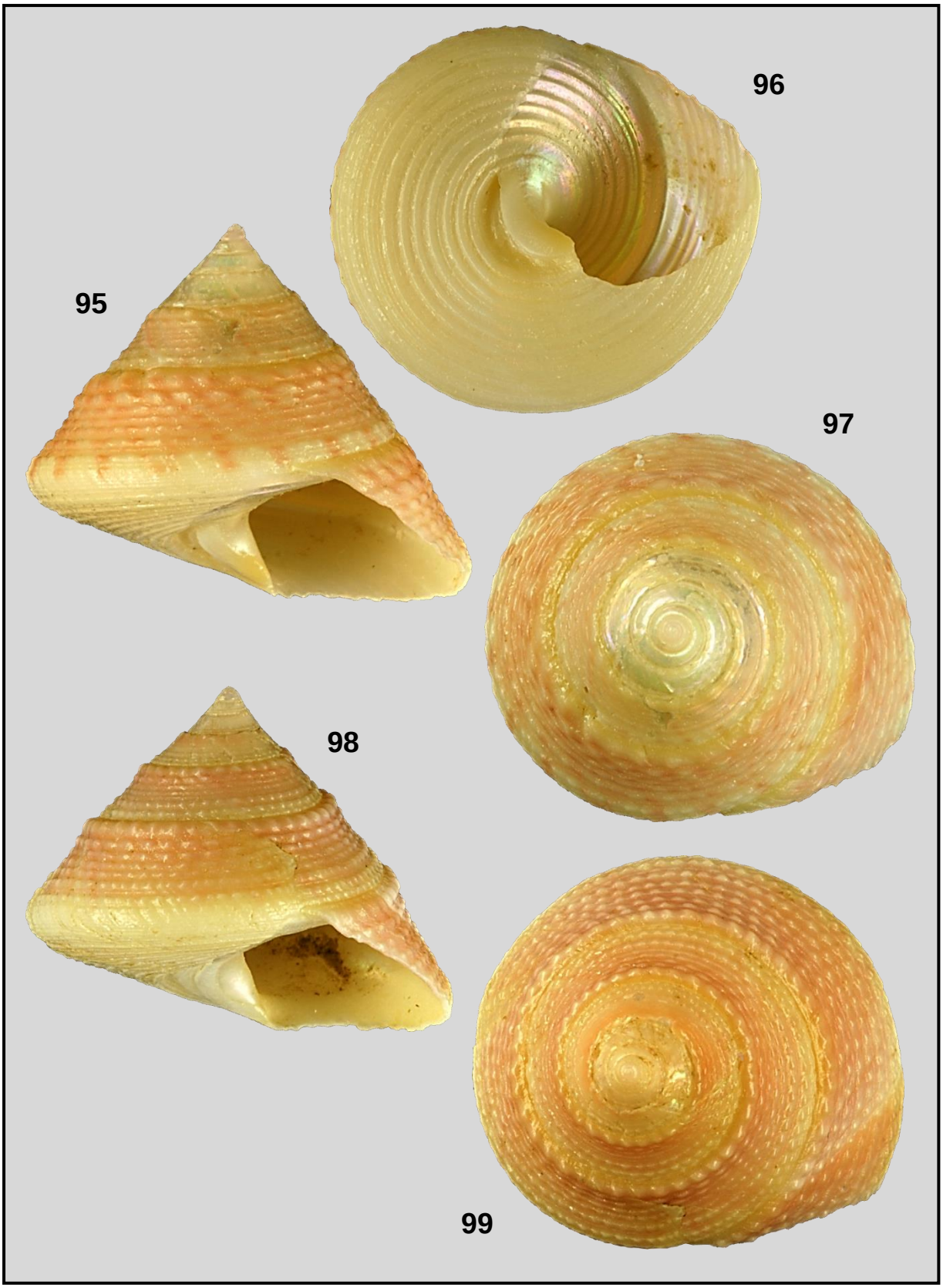


Plate XVII. Figs 95-99: *Callumbonella suturale* (Philippi, 1836). MNHN. Ghana. 03°53' N 02°33' W. '*Pillsbury*'-expedition. St. P-34. Dredged at a depth of 1966 m. 1964; 95-97: H. 12.94 mm D. 14.56 mm; 98-99: H. 12.44 mm D. 15.06 mm.

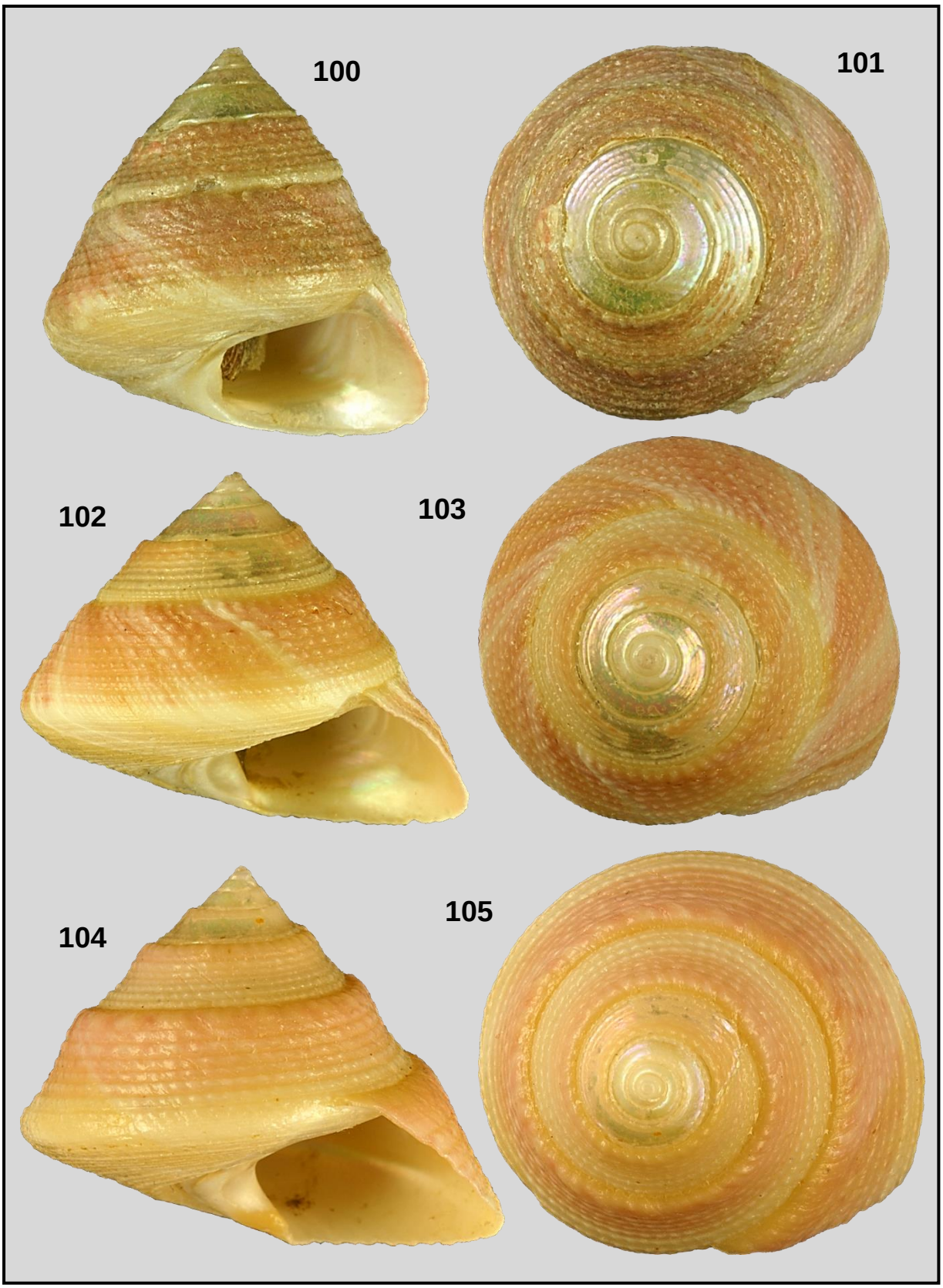


Plate XVIII. Figs 100-105: *Callumbonella suturale* (Philippi, 1836). MNHN. Ghana. 03°53' N 02°33' W. '*Pillsbury*'-expedition. St. P-34. Dredged at a depth of 1966 m. 1964; 100-101: H. 15.50 mm D. 15.32 mm; 102-103: H. 15.80 mm D. 19.07 mm; 104-105: H. 16.40 mm D. 19.55 mm.

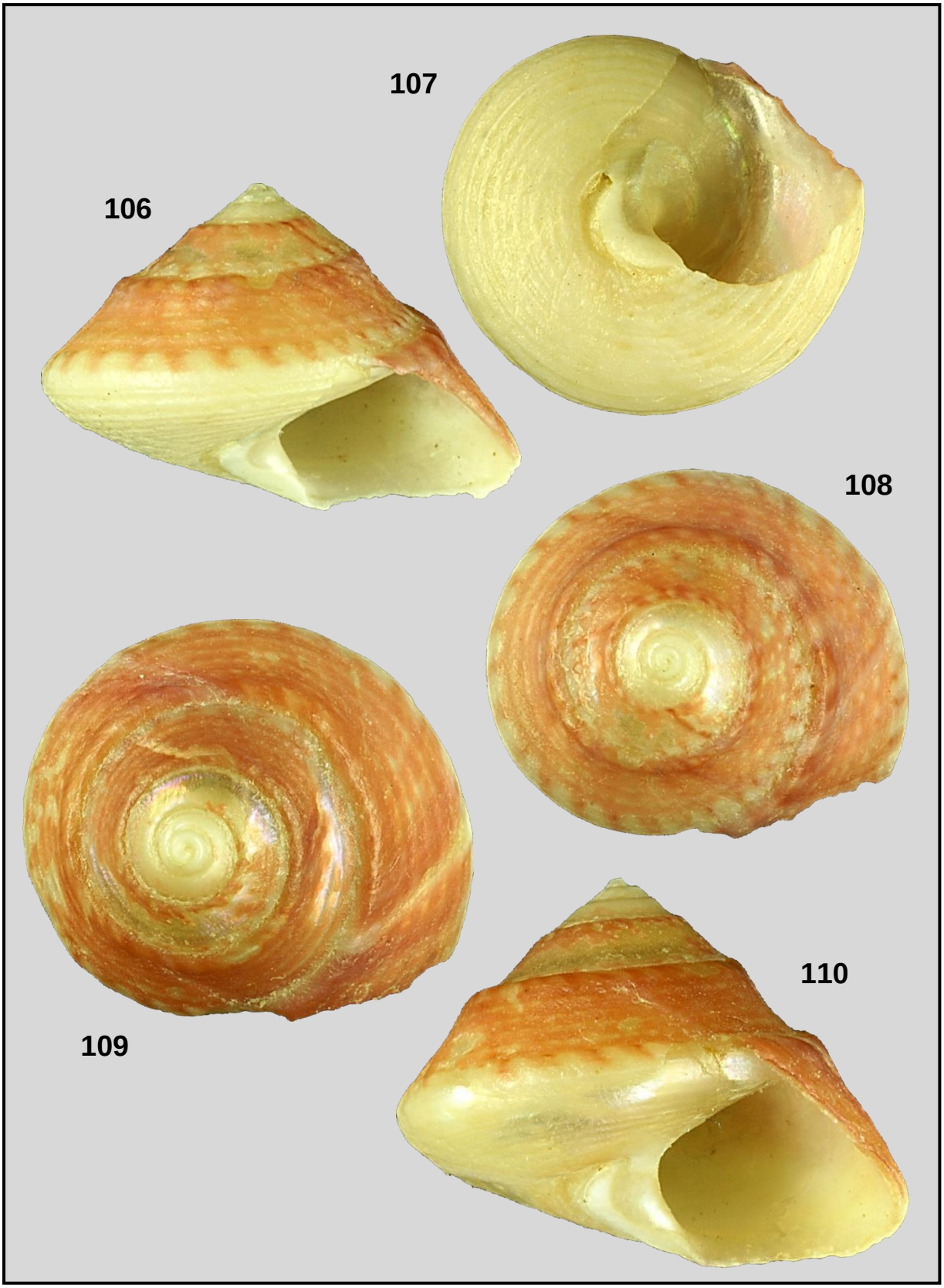


Plate XIX. Figs 106-110: *Callumbonella suturale* (Philippi, 1836). CFN. Off Luanda, Angola. Trawled by fishermen. 1989; 106-108: H. 9.05 mm D. 12.74 mm; 109-110: H. 10.76 mm D. 14.27 mm.

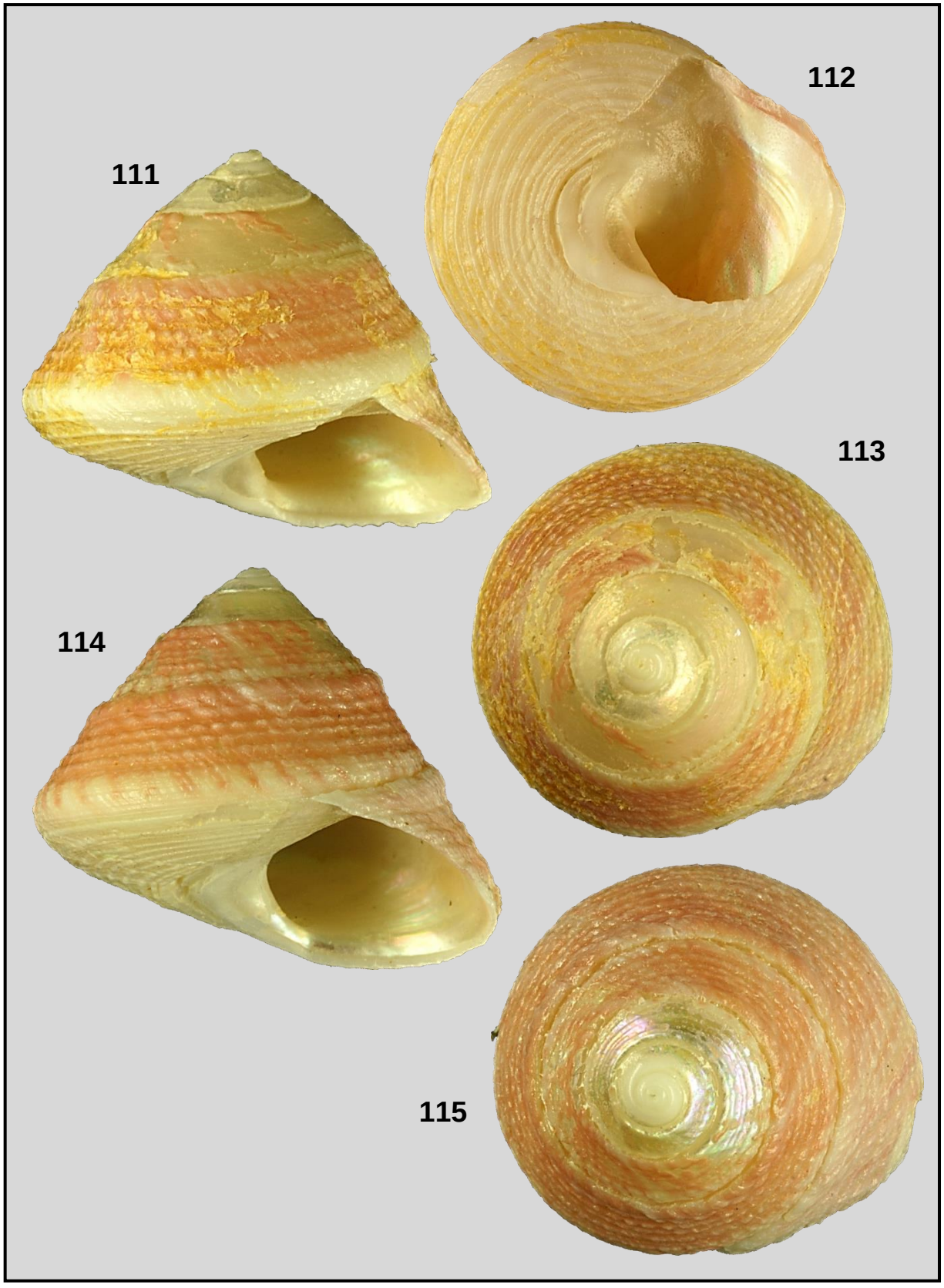


Plate XX. Figs 111-115: *Callumbonella suturale* (Philippi, 1836). MNHN. Cape Fria, off mouth of the Cunene river. '*Walda*' expedition. N.O. "*Jean Charcot*". St. CM03. Dredged at a depth of 480 m. 1968; 111-113: H. 14.24 mm D. 16.99 mm; 114-115: H. 14.56 mm D. 17.25 mm.

Plate XXI. Figs 116-119: *Callumbonella suturale* (Philippi, 1836); 116-117: MNHN. Cape Fria, off mouth of the Cunene river. '*Walda*' expedition. N.O. "*Jean Charcot*". St. CM03. Dredged at a depth of 480 m. 1968; 116: H. 14.81 mm D. 17.11 mm; 117: H. 14.45 mm D. 18.27 mm; 118-119: CFN. Cape Fria, off mouth of the Cunene river. Trawled by Belgian fishermen at -350 m. 1974; 118: H. 18.10 mm D. 17.15 mm; 119: H. 18.10 mm D. 22.23 mm.

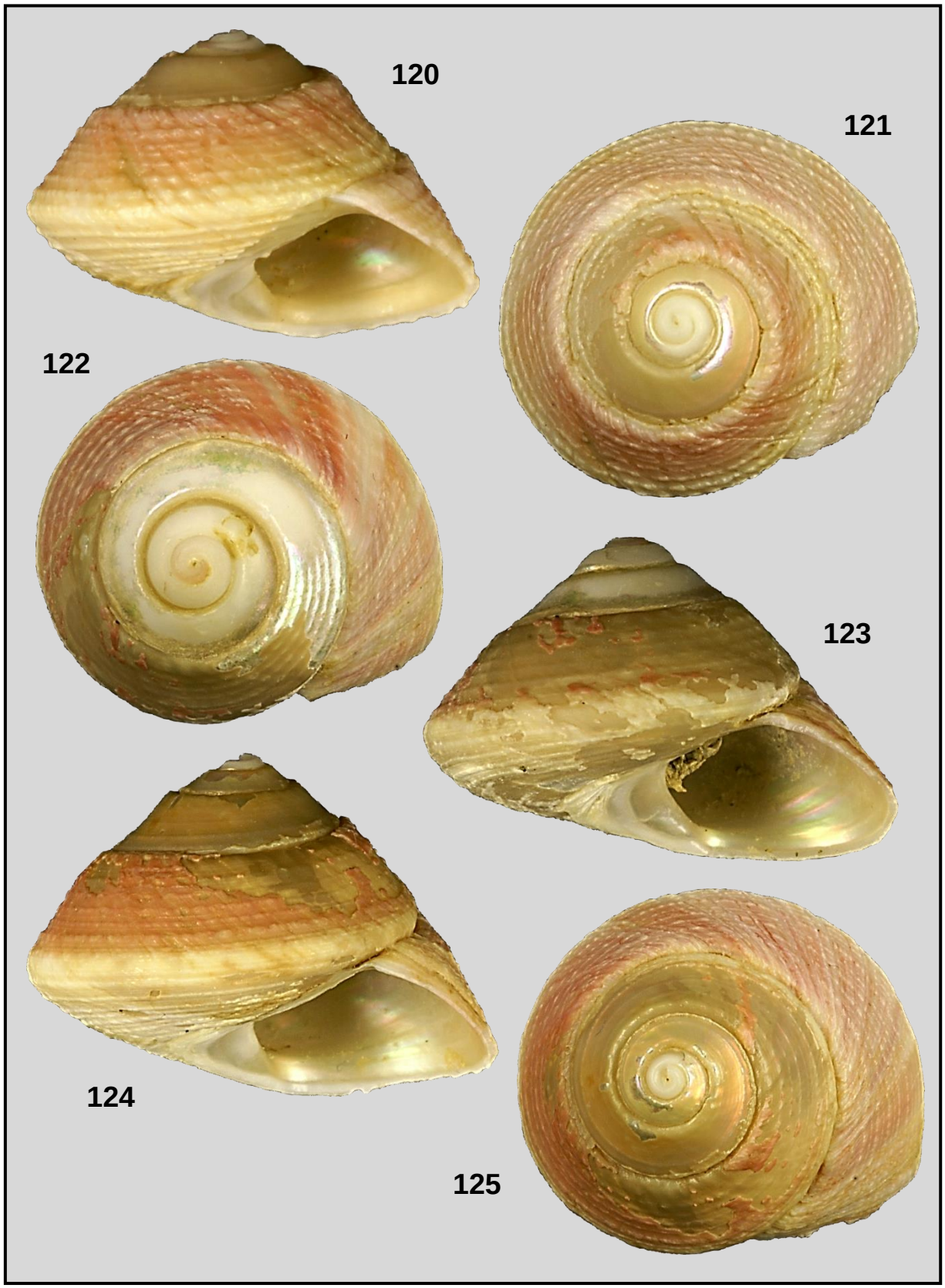


Plate XXII. Figs 120-125: *Callumbonella suturale* (Philippi, 1836) MNHN. Paratypes. Off Namibia. Between 18°11.12' S and 18°12.56' S, 11°24.80' E and 11°25.41' E. Dredged at a depth of 500-541 m. 10 March 2005; 120-121: H. 10.40 mm D. 13.93 mm; 122-123: H. 11.62 mm D. 16.28 mm; 124-125: H. 12.93 mm D. 17.09 mm.

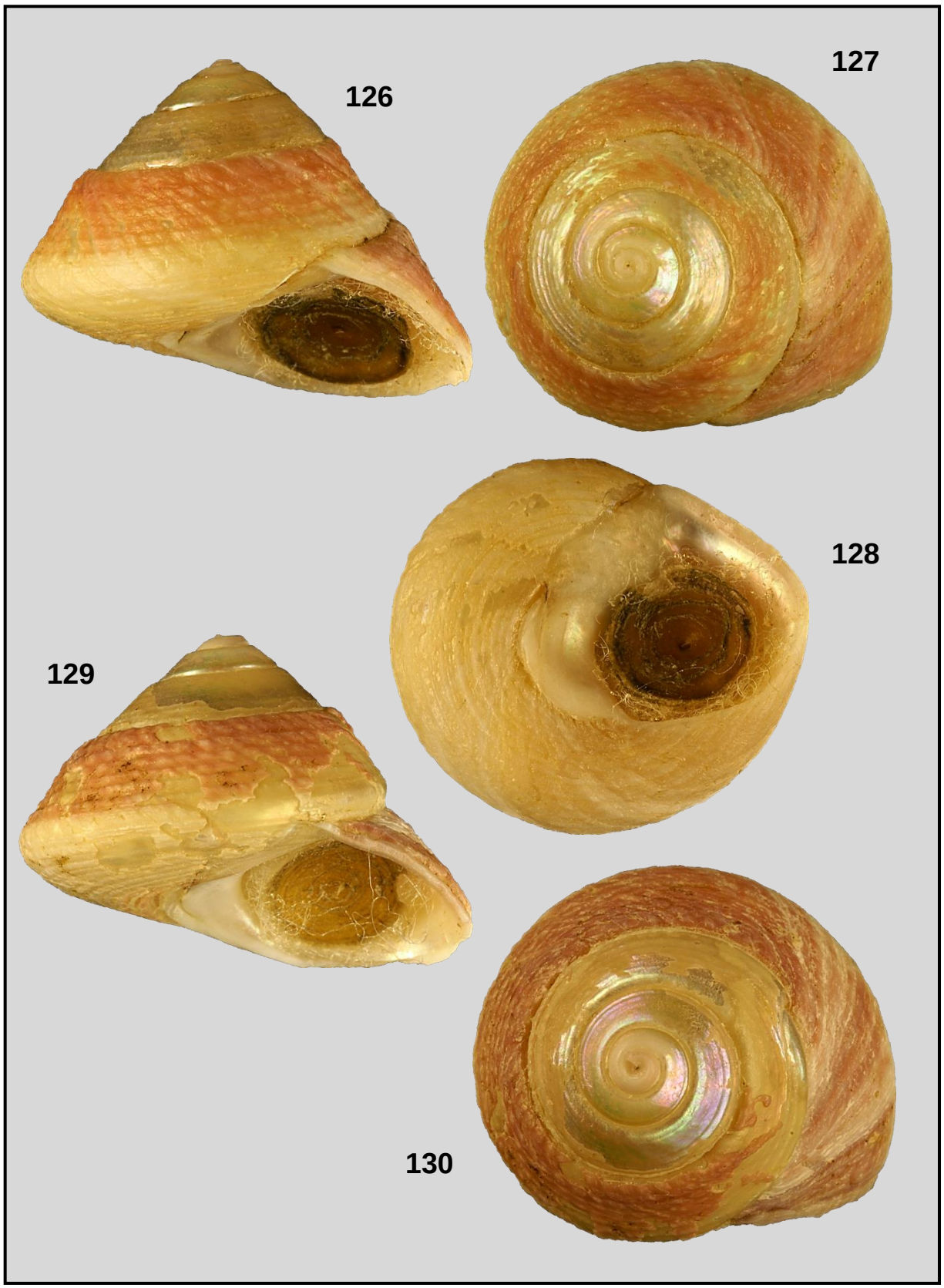


Plate XXIII. Figs 126-130: *Callumbonella suturale* (Philippi, 1836). CFN. Lüderitz, Walvis Bay, Namibia. 25° S 12° E. Dredged by fishermen at a depth of 425 m. 2008; 126-128: H. 14.85 mm D. 19.63 mm; 129-130: H. 14.92 mm D. 20.34 mm.

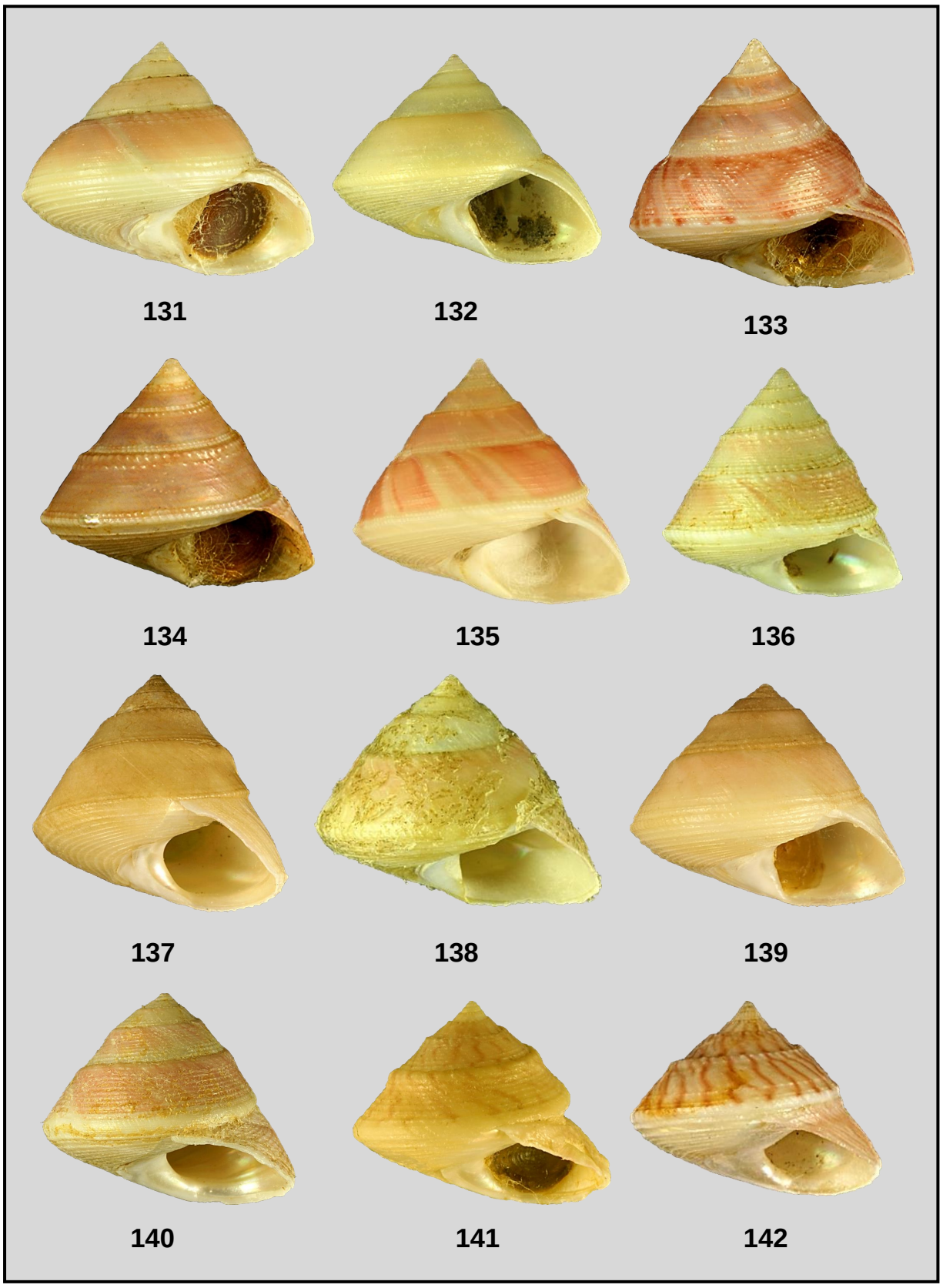


Plate XXIV. Figs 131-142: *Callumbonella suturale* (Philippi, 1836); 131: Bay of Biscay; 132: N Portugal; 133-134: Sicily, Italy; 135: Alboran Sea, Spain; 136: Tanger, Morocco; 137: W Sahara; 138-140: Mauritania; 141-142: Cape Verde Islands.

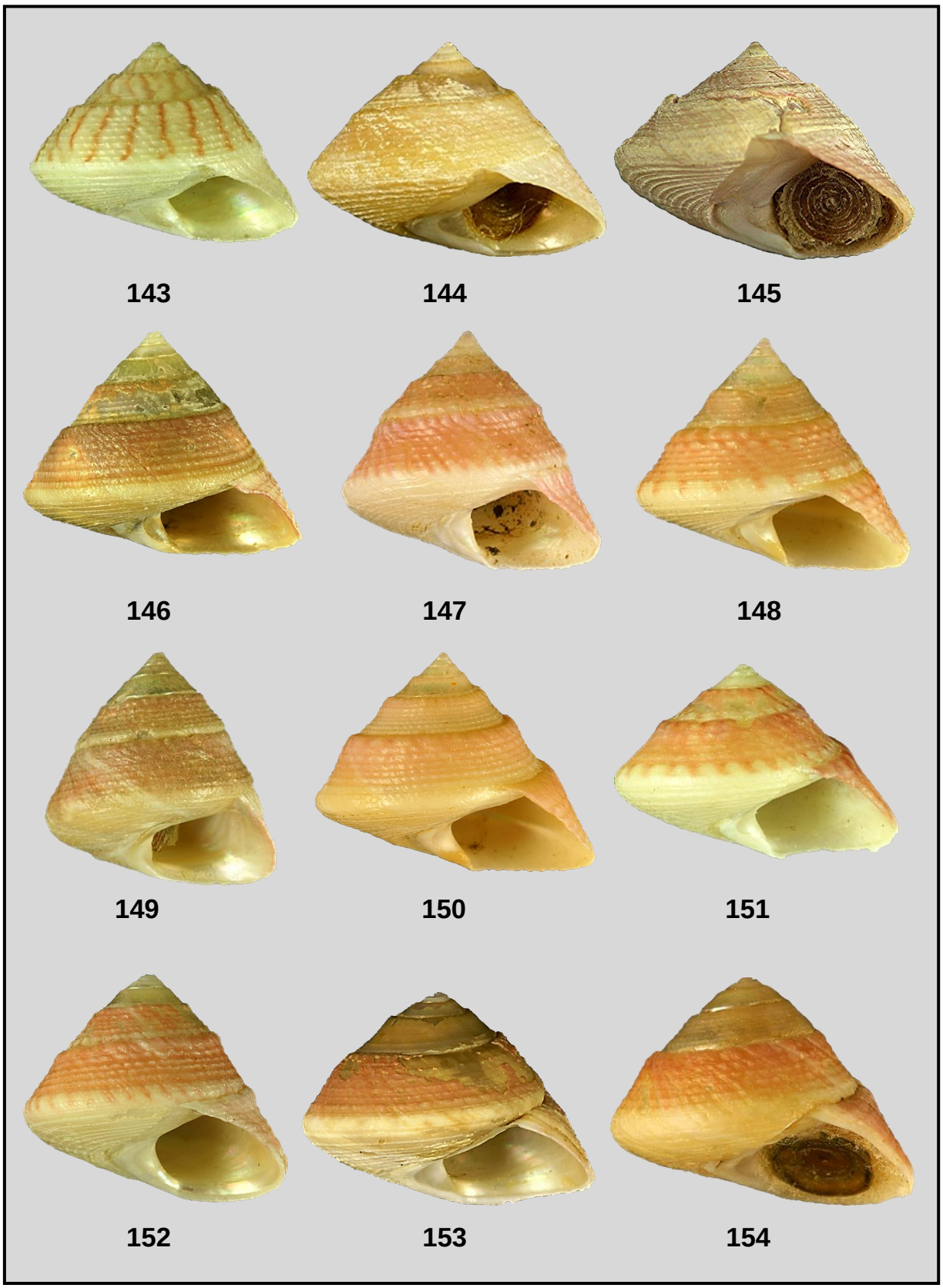


Plate XXV. Figs 143-154: *Callumbonella suturale* (Philippi, 1836); 143-145: Cape Verde Islands; 146: Senegal; 147: Ivory Coast; 148-150: Ghana; 151: Angola; 152-154: Namibia.