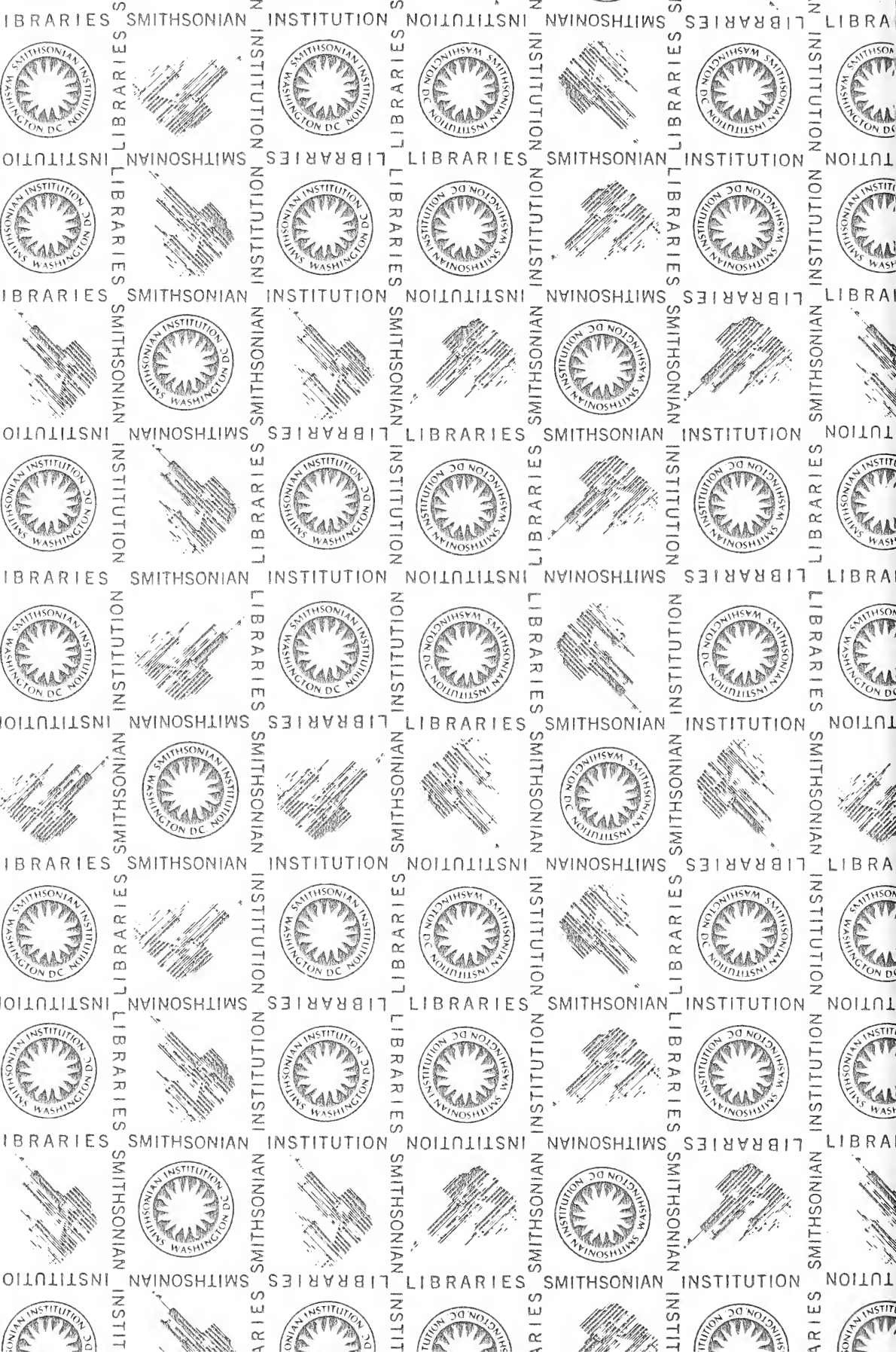
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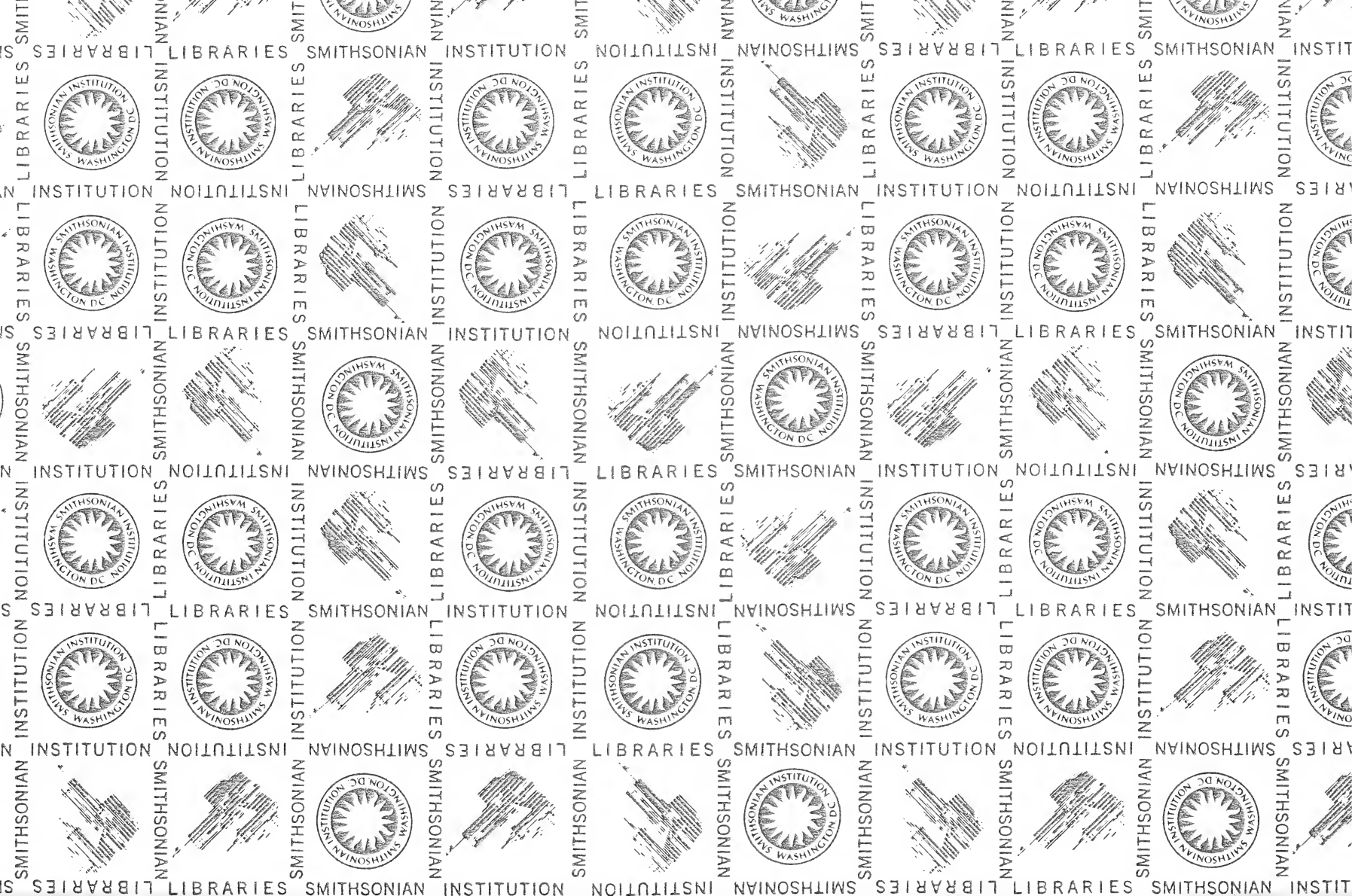
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REVISION OF THE NORTHEAST ATLANTIC BATHYAL AND ABYSSAL ACLIDIDAE, EULIMIDAE, EPITONIIDAE (MOLLUSCA, GASTROPODA)

PHILIPPE BOUCHET
Museum National d'Histoire Naturelle, Paris
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This paper constitues the third part of a monograph of the N.E. Atlantic bathyal and abyssal Gastropoda. Page and figure numbers in this volume follow numbers in the first and second volumes.

Part 1, covering the family Turridae, was published as *J. Moll. Stud.* supplement 8 (1980).

Part. 2, covering the Neogastropoda excluding Turridae, was published as *Boll. Malacol.*, supplement 1 (1985).

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CONTENTS

ABSTRACT

A revision of the deep sea ptenoglossate gastropods is presented. The area surveyed covers the Atlantic North of 33° N, East of the mid-Atlantic ridge, including the Mediterranean and the Norwegian sea. Only species normally occurring below 300 m are included. All previously published material and unpublished material from the French, British, Dutch, Italian and German deep sea programs is included. The revision includes species of the families Aclididae, Eulimidae and Epitoniidae.

The fauna contains 157 species, of which 64 are described as new. Information on hosts is given when available.

The genera *Hemiaclis* G.O. Sars and *Costaclis* Bartsch are transferred from Aclididae to Eulimidae. The following new genera are introduced: *Acrochalix, Bathycrinicola, Bulimeulima, Campylorhaphion, Crinophtheiros, Halielloides, Rectilabrum, Umbilibalcis* (Eulimidae) and *Periapta* (Epitoniidae).

RIASSUNTO

Gli autori presentano una revisione dei Gasteropodi ptenoglossi di profondità. L'area geografica esaminata si estende nell'Atlantico a nord del 33mo parallelo, a est della dorsale mediooceanica e comprende sia il Mediterraneo, sia il mare di Norvegia.

Sono citate solo le specie che normalmente si ritrovano sotto i 300 m. È stato preso in considerazione tutto il materiale raccolto nelle campagne storiche più quello recente proveniente dai programmi di studio francesi, britannici, olandesi, italiani e tedeschi relativi al benthos profondo. Questa revisione riguarda le famiglie Aclididae, Eulimidae e Epitoniidae.

Sono descritte 157 specie, di cui 64 come nuove. Ogni volta che ve ne sia stata la possibilità, sono state indicate le specie ospiti.

Sono stati proposti i seguenti nuovi generi: *Acrochalix, Bathycrinicola, Bulimeulima, Campylorhaphion, Crinophtheiros, Halielloides, Rectilabrum, Umbilibalcis* (Eulimidae) e *Periapta* (Epitoniidae).

Per *Eulima obtusa* Jeffreys, 1884 (non de Folin, 1870) è stato proposto il nuovo nome *Melanella obtusoapicata.*

In particolare, relativamente al Mediterraneo, si perviene alle conclusioni e risultati seguenti:

1. Vivono in Mediterraneo 2 Aclididae, 15 Eulimidae e 17 Epitoniidae.
2. Il nome *Aclis attenuans* designa l'*Aclis* mediterranea sinora denominata *Aclis walleri.*
3. Sono descritte quattro nuove specie di Eulimidae, conosciute solo per la soglia siculotunisina: *Halielloides fragilis, Melanella glypta, Melanella microsculpta* e *Oceanida confluens.*
4. *Sabinella bonifaciae*, parassita dei ricci Cidaridae, viene considerata specie distinta da *S. pachya.*
5. *Pelseneeria minor* Koehler & Vaney, 1908 è il nome corretto per la *Pelseneeria* mediterranea, chiamata sinora erroneamente *P. stylifera.*
6. Il nuovo genere *Crinophtheiros* ha, come specie tipo, la mediterranea *Stylina comatulicola* Graff, 1875.
7. Vengono descritte le seguenti tre nuove specie di Epitoniidae: *Papuliscala tavianii*, della soglia siculo-tunisina; *Epitonium pseudonanum*, specie circalitorale sinora erroneamente confusa con la specie batiale atlantica *E. nanum; E. dendrophylliae*, parassita dei coralli profondi.
8. La specie generalmente conosciuta come *Amaea geniculata* (Brocchi) deve essere denominata *Acrilloscala lamyi* (de Boury, 1909) che è specificamente distinta dalla specie pliocenica.
9. *Opaliopsis atlantis, Iphitus marshalli* e *Opalia abbotti* sono segnalate per la prima volta in Mediterraneo.
10. Sono state anche prese in considerazione e illustrate le piccole specie circalitorali del genere *Epitonium.*

INTRODUCTION

Material examined

The expeditions and collections on which this series is based are listed in parts 1 and 2. In the last few years, new expeditions have taken place and the gastropod material has been put at our disposal for study. Expeditions not listed in parts 1 & 2 are:

(1) Material from the ABYPLAINE expedition off SW Europe (Madeira basin), abyssal, under the direction of Dr C. Monniot. Material sorted by CENTOB. Now in MNHN.

(2) Material from the BIOMEDE 1 and BIOMEDE 2 expeditions in the deep parts of the W Mediterranean, under the direction of Dr D. Bellan. Material sorted by Dr. Arnaud and CENTOB. Now in MNHN.

(3) Material from the CANCAP series of cruises in the area around the Azores, Madeira and the Canaries under the direction of Dr van der Land. Material made available through Dr Gittenberger. Now in RMNH.

(4) Material from surveys of the German Fisheries research vessel WALTER HERWIG in the abyssal area west of Bay of Biscay. Material made available through Dr R. von Cosel. Now in the collections of the Zoologisches Institut und Museum, Hamburg University.

(5) Material from several expeditions aboard R.V. DISCOVERY off NW Africa and in the Porcupine Seabight, bathyal and abyssal. Material made available through Drs A. Rice and M. Thurston. Now in BMNH.

(6) Material obtained during geological cruises of Istituto di Geologia marina (CNR), Bologna aboard R.V. BANNOCK. Material made available through Dr M. Taviani. Now in the collections of Museo di Zoologia, Bologna University.

(7) Material from the Celtic Sea continental slope collected by Dr v. Cosel during cruises of R.V. THALASSA under the direction of Dr L. Cabioch and IFREMER.

(8) Although originating from areas outside the area covered by this series, the material from DEMERABY expedition off NE Brasil (abyssal) was examined. Collected under the direction of Drs M. Sibuet and C. Monniot. Sorted by CENTOB. Now in MNHN.

(9) Material from the Gayhead-Bermuda transect (ATLANTIS II and CHAIN cruises), communicated by Dr M. Rex. Now in MCZ.

(10) As was the case in part 2, we also examined material from many private collections of Mediterranean molluscs, mostly in Italy. These collections are cited where appropriate under the species descriptions.

(11) Material from the BALGIM expedition in the bathyal zone of the Alboran sea and Ibero-Moroccan gulf. Material not fully sorted by CENTOB, some samples included in this report (see part 4).

Family ACLIDIDAE

A world-wide revision of the family Aclididae is presently being carried out by A. Warén. Preliminary results of this work indicate that of the numerous genera formerly included in the family, only *Aclis* will remain in Aclididae. Of these genera only *Cima* Chaster, 1898, *Bouryscala* Cossmann, 1902 and *Aclis* Lovén, 1846 occur in the NE Atlantic bathyal and abyssal area. *Aclis* is treated here and the two other genera will be treated later, probably in connection with the Pyramidellidae to which they seem to have some affinity.

Genus *ACLIS* Lovén, 1846

Type species: Alvania supranitida S.V. Wood, 1842 (= *A. minor* (Brown, 1827)), by monotypy.

Synonyms: Cyclonoidea Laseron, 1956:453. Type species: *C. carina* Laseron, 1956.
Menippe Jeffreys, 1867:106 (not de Haan, 1833). Type species: *Chemnitzia gulsonae* Clark, 1850, by monotypy.
Pherusa Jeffreys, 1869:210 (not Oken, 1807). New name for *Menippe* Jeffreys, 1867.
Pherusina Norman, 1888:18. New name for *Pherusa* Jeffreys, 1869.
Marteliella Dautzenberg & Durouchoux, 1914:34. New name for *Pherusa* Jeffreys, 1869.
Eusetia Cotton, 1944:306. Type species: *Rissopsis expansa* Powell, 1930.
Schwengelia Bartsch, 1947. Type species: *Aclis hendersoni* Dall, 1927.

Remarks: The name *Cyclonoidea* Laseron was based on a typical species of *Aclis* with strong spiral keels, flaring outer lip and transparent shell. *Eusetia, Pherusa* and *Schwengelia* were based on species with more or less smooth, convex whorls, but a characteristic aperture. *Pherusina* can perhaps be kept as a subgenus for such species, but none of these occur in the area treated here.

Not very much is known about the species of *Aclis,* and no material has been available for anatomical investigations. Fretter & Graham (1982) repeat the description given by Lovén (1846). G.O. Sars (1878) figured the ptenoglossate radula. Our own observations on dried specimens and on one living, crawling specimen agree with previous descriptions, and it can be added that there is a large pedal fold on each side of the foot in *A. minor* (= *supranitida*), covering the base of the shell when the animal is crawling. There appears to be no penis in the male. For this reason we keep Aclididae as a separate family, but it is uncertain if its affinities are closer to Eulimidae or to Epitoniidae.

The genus *Aclis* can be recognized by the tall, *Turritella* resembling shell, usually sculptured by one or several strong spiral keels, a smooth protoconch, and especially the aperture with a distinctly reflected inner lip, with a narrow umbilical chink, an opisthocline outer lip and the lower part of the aperture being drawn out towards the center of the shell and distinctly flattened. The shell of living specimens or fresh shells are vitreous and the digestive gland usually dark greenish.

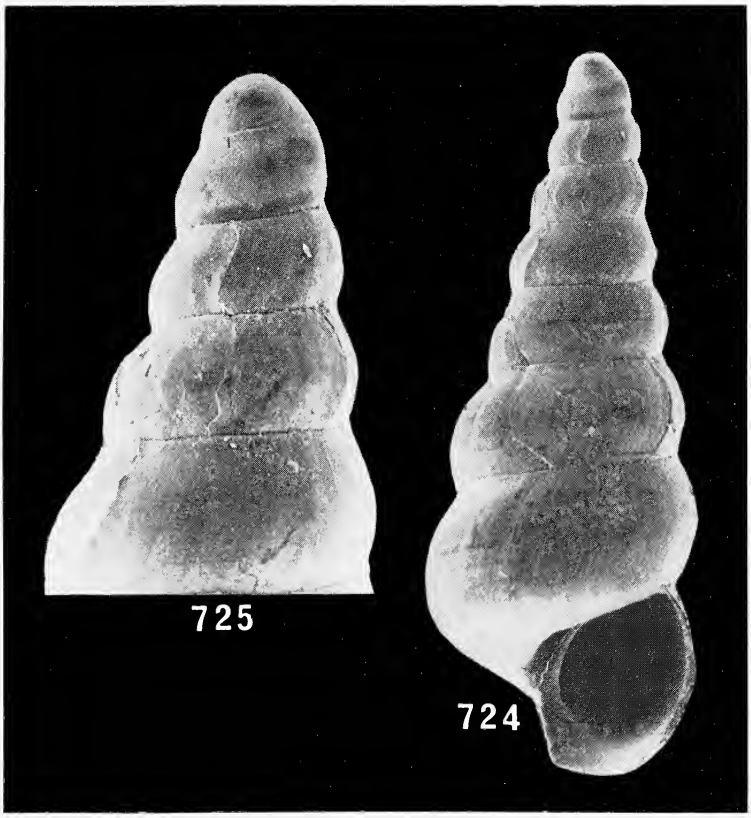
The three NE Atlantic deep water species can be separated as follows:

A. Diameter of first whorl more than 300 μm	*A. sarsi* (p. 304)
A. Diameter of first whorl below 200 μm	B
B. Diameter of body whorl 0.7 mm at height of 2 mm, spire approximately straight conical in large specimens	*A. walleri* (p. 304)
B. Diameter of body whorl 0.9 mm at height of 2 mm, spire approximately concave in large specimens	*A. attenuans* (p. 306)

The shells of the species of *Aclis* are very variable. Within the species treated here there exists a smaller, more slender form and a larger broader form, probably corresponding to males and females respectively (cf figs 728 and 729 or 730 and 731). Also the sculpture is variable and can hardly be used to distinguish these species.

The species discussed here resemble the subgenus *Pherusina* in having almost smooth whorls, but the species of *Pherusina* have a slenderly ovate shape of the shell, not conical.

A single shell from the Canaries most probably represents a new species, but it is old and worn and we prefer to leave it undescribed (figs 724-725). It has the same kind of apical whorls as *A. sarsi* but the shape is similar to *A. attenuans*.



Figs 724-725 *Aclis* n.sp., CANCAP 2.157, 27° 05 N, 17° 59 W, 650 m, height 2.69 mm.

Aclis sarsi (Dautzenberg & Fischer, 1912) Figs 728-729, 733-735

Aclis walleri var. *carinata* Norman, 1879:53 (not *A. carinata* E.A. Smith, 1871).
Aclis walleri, G.O. Sars 1878:196, pl. 11, fig. 18 (not Jeffreys, 1867).
Aclis walleri, Jeffreys 1884:343 (not Jeffreys, 1867).
Aclis walleri var. *sarsi* Dautzenberg & Fischer, 1912: 250, pl. 10, figs 31-32.

Type material: In MOM.

Type locality: MONACO st 1052, 65° 41 N, 09° 30 E, 440 m, Sklinna Banken, off Norway.

Material examined: Bergen Area, Korsfjorden and off the fjord, W Norway, 150-600 m, 150 shs and spms, coll AW; VÖRINGEN st 173b, 69° N, 14° E, 540 m, 37 shs; st 195, 70° 55 N, 18° 38 E, 196 m, 13 spms; st 255, 68° 12 N, 15° 40 E, 624 m, 2 shs; Lödingen, Lofoten, N Norway, 110-280 m, 7 spms, Tromsö Museum; INGOLF st 81, 61° 44 N, 27° 00 W, 913 m, 1 sh; st 85, 63° 21 N, 25° 21 W, 320 m, 2 shs; st 90, 64° 45 N, 29° 06 W, 1070 m, 3 shs; THOR 1904 st 78, 61° 07 N, 09° 30 W, 835 m, 6 spms; 1903 st 166, 62° 57 N, 19° 58 W, 957 m, 4 shs; st 167, 63° 05 N, 20° 07 W, 557 m, 1 spm; CHALLENGER II st 15, 56° 44 N, 09° 28 W, 1632 m, 1 spm; TRAVAILLEUR 1882 st 40, 33° 09 N, 09 ° 38 W, 1900 m, 1 spm; THALASSA st Z428, 48° 27 N, 10° 50 W, 850 m, 1 sh; Z459, 48° 37 N, 09° 53 W, 1180 m, 1 spm.

Distribution: From SW of Iceland and N Norway, on the deep continental shelf and upper slope, S to off the Atlantic coast of Morocco, 100-1900 m.

Remarks: Warén (1980) points out that the present species always has been confused with *A. walleri,* but *walleri* can easily be separed by having a more slender apex, a larval shell of three whorls, not one as in *A. sarsi* and by having small black eyes, as mentioned by Jeffreys in the original description, while *A. sarsi* has no eyes.

Aclis walleri Jeffreys, 1867 Figs 726-727, 736

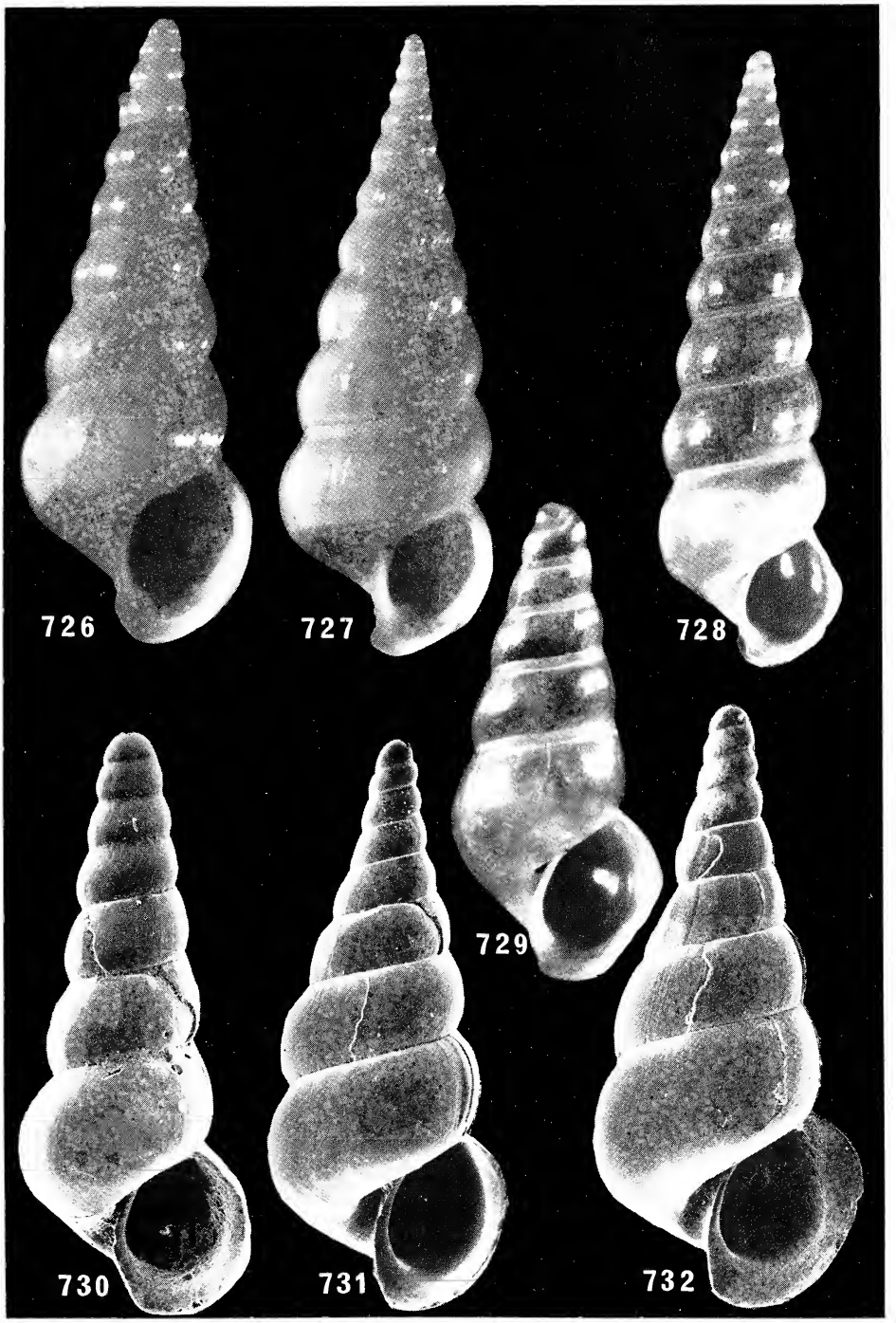
Aclis walleri Jeffreys, 1867:105; 1869:pl. 72, fig. 4. (1861:299, *nom. nud.*).
Aclis exigua G.O. Sars, 1878:196, pl. 22, fig. 8.
Aclis walleri var. *minor* Jeffreys, 1884b:343 (not *Aclis minor* (Brown, 1827)).

Type material: Lectotype (Warén 1980) USNM 182214.

Type locality: 40-45 miles E of Whalsey Skerries, Shetland, 140 m.

Material examined: 20 shells and specimens, Korsfjorden, W Norway, coll AW; The Skagerrack, Sweden, 300-600m, SMNH; N of Skagen, Skagerrack, 200 - 660 m, 6 samples, 7 spms, ZMC; TRAVAILLEUR 1880 dr 10, 43° 40 N, 02° 15 W, 946 m, 1 sh; THALASSA X334, 44° 10 N, 04° 52 W, 1900 m, 1 spm; X336, 44° 11 N, 05° 11 W, 1950 m, 3 shs; Z397, 47° 34 N, 07° 13 W, 511 m, 2 shs; Z417, 48° 12 N, 09° 10 W, 865 m, 1 sh; Z427, 48° 27 N, 09° 48 W, 330 m, 1 spm; Z457, 48° 38 N, 09° 53 W, 800 m, 1 spm; Z458, 48° 42 N, 09° 53 W, 350 m, 5

Figs 726-732. Genus *Aclis*. 726-727, *A. walleri*, BIOGAS DS 86, 2.74 mm and 4.73 mm respectively. 728-729, *A. sarsi*, W of Korsfjorden, W. Norway, 280 m, 6.23 and 2.0 mm. 730-732, *A. attenuans*, 730 and 731 from off Roseto, Italy, 1.5 and 2.2 mm. 732 from off Calvi, Corsica, 2.2 mm.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spms; NORATLANTE E16, 47° 32 N, 08° 31 W, 1970 m, 1 spm; SARSIA 7615A, 43° 42 N, 03° 34 W, 290 m, 1 sh; INCAL DS03, 57° 25 N, 11° 04 W, 610 m, 1 sh; CHALLENGER II st 11, 56° 47 N, 10° 08 W, 1964 m, 1 spm; BIOGAS CP07, 44° 10 N, 04° 16 W, 2170 m, 1 sh; CP23, 44° 05 N, 04° 21 W, 1980 m, 1 spm; CP25, 44° 05 N, 04° 17 W, 1894 m, 1 spm; CP37, 47° 34 N, 2175 m, 1 spm; DS32, 47° 32 N, 08° 05 W, 2138 m, 1 sh; DS52, 44° 06 N, 04° 22 W, 2006 m, 4 spms; DS62, 47° 33 N, 08° 40 W, 2175 m, 5 spms; DS 63, 47° 33 N, 08° 35 W, 2126 m, 3 spms; DS86, 44° 05 N, 04° 19 W, 1950 m, 4 spms; DS87, 44° 05 N, 04° 19 W, 1913 m, 2 spms; Off Nicotera, Golfo di Gioia, S Italy, 180 m, 1 old worn shell, coll. Crovato.

Distribution: From Lofoten, N Norway (G.O. Sars 1878), along the European coast to N Spain, on the continental shelf and slope.

Remarks: Aclis walleri has often been recorded from the Mediterranean, but most such records that we have examined are referrable to *A. attenuans*. It has also been recorded from the American East Coast (Bartsch 1947, Verrill 1882). The species is not known from the area between the European and American continents, but N American specimens resemble European ones very closely and if that gap in the distribution disappears we will not hesitate to consider the American and the European forms synomyms. Then a few more names will have to be included in the synonymy of *A. walleri* viz.: *Aclis tenuis* Verrill, 1882 = *fernandinae* Dall, 1927 = *tanneri* Bartsch, 1947 = *verrilli* Bartsch, 1911 (types and other material of these species in USNM has been examined).

The larval shell consists of three whorls and it can be concluded that the development is planktotrophic.

In the Mediterranean material examined by us, only a single shell proved to be *A. walleri*. Since it may be of Pleistocene origin, it is hardly enough to extend the Recent distribution to the Mediterranean.

Aclis attenuans Jeffreys, 1883 Figs 730-732

Aclis attenuans Jeffreys, 1883:396, pl. 16, fig. 3.
Eulima acutalis Jeffreys, 1883:397, pl. 16, fig. 5.
Aclis walleri of Mediterranean authors, not Jeffreys, 1867.

Type material: A. attenuans, 8 syntypes USNM 252195, 252196; *E. acutalis,* 6 syntypes USNM 133154, 133155.

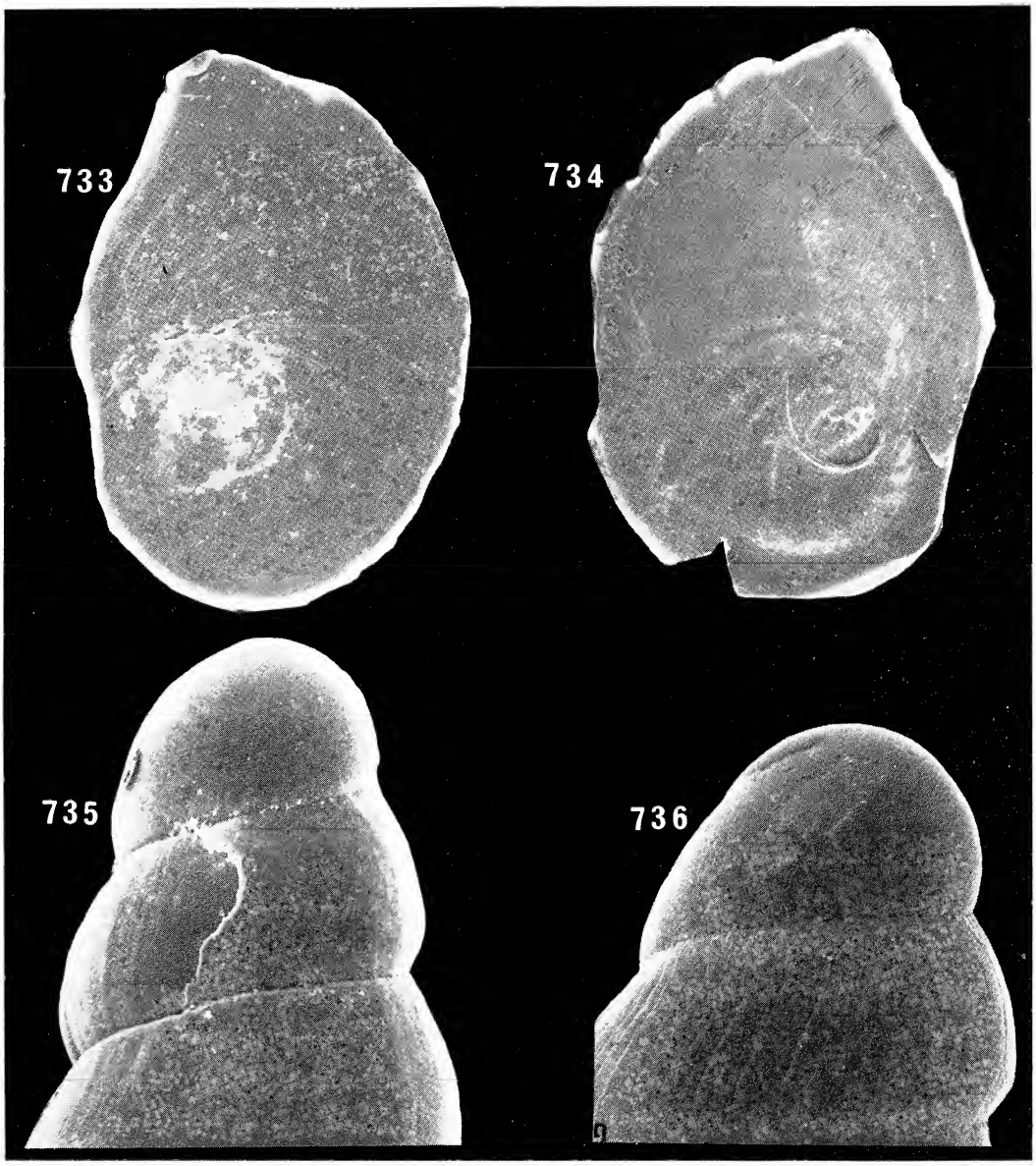
Type locality: A. attenuans and *E. acutalis*, Off Crete, 70-120 fathoms.

Material examined: The type material and: 35 miles off Roseto (Adriatic), 6 shs; off Sicily, 100 m, 4 shs; off Calvi, Corsica, 150 m, 1spm, 15 shs (all coll. AW); about 25 shs from the Tyrrhenian and Ligurian Seas from private collections, 100-250 m.

Distribution: The central parts of the Mediterranean, on the continental shelf.

Remarks: There is a constant difference in shape between the Atlantic *A. walleri* and *A. attenuans*, the latter having a proportionally broader shell with perfectly smooth whorls without a trace of axial ribs and never reaching half the size of the Atlantic form. No material is known from the Alboran Sea and SW Iberian Peninsula, where a transition may take place so we have decided to treat them as separate species. This decision is supported by the fact that we have found *A. attenuans* to reach back to early Pleistocene, in several Italian deep water deposits, with no noticeable change in shell morphology.

Aclis attenuans is not a deep sea species, but has been included here because it so often is confused with *A. walleri*.



Figs 733-736. Details of *Aclis*. 733-735, *A. sarsi*, operculum, 1.06 and 1.2 mm; apex, diameter of initial whorl 0.23 mm (all from Korsfjorden, Norway). 736, *A. wa!leri*, apex diameter of initial whorl 0.15 mm (THALASSA Z458).

Family EULIMIDAE

The Eulimidae is one of the largest families in deep water, judging from the high number of species and small number of specimens in our material, perhaps even richer than the Turridae. The species are almost always parasitic on echinoderms. (A few exceptions may exist but are uncertain.) For a review of the biology and systematics of the family see Warén 1984a.

Although most of the species (possibly with the exception of *Hemiaclis* and *Costaclis* which may be free-living predators, see p. 450, 453) are parasitic, few of the species treated here are known from the host. This is due to the fact that only a limited number are permanently associated with the host. Most species parasitize the host for a limited time and then leave it afterwards to hide somewhere in or on the bottom. Also the rough treatment of the hosts in the dredge, during the sieving of the bottom material and during the sorting contributes by tearing off the proboscis by which most eulimids are attached to the host. Finally many echinoderm workers seem rarely to notice the eulimids, because they are seldomly mentioned in the echinoderm literature.

From the area discussed here, eulimid parasites have been found on the following echinoderm groups:

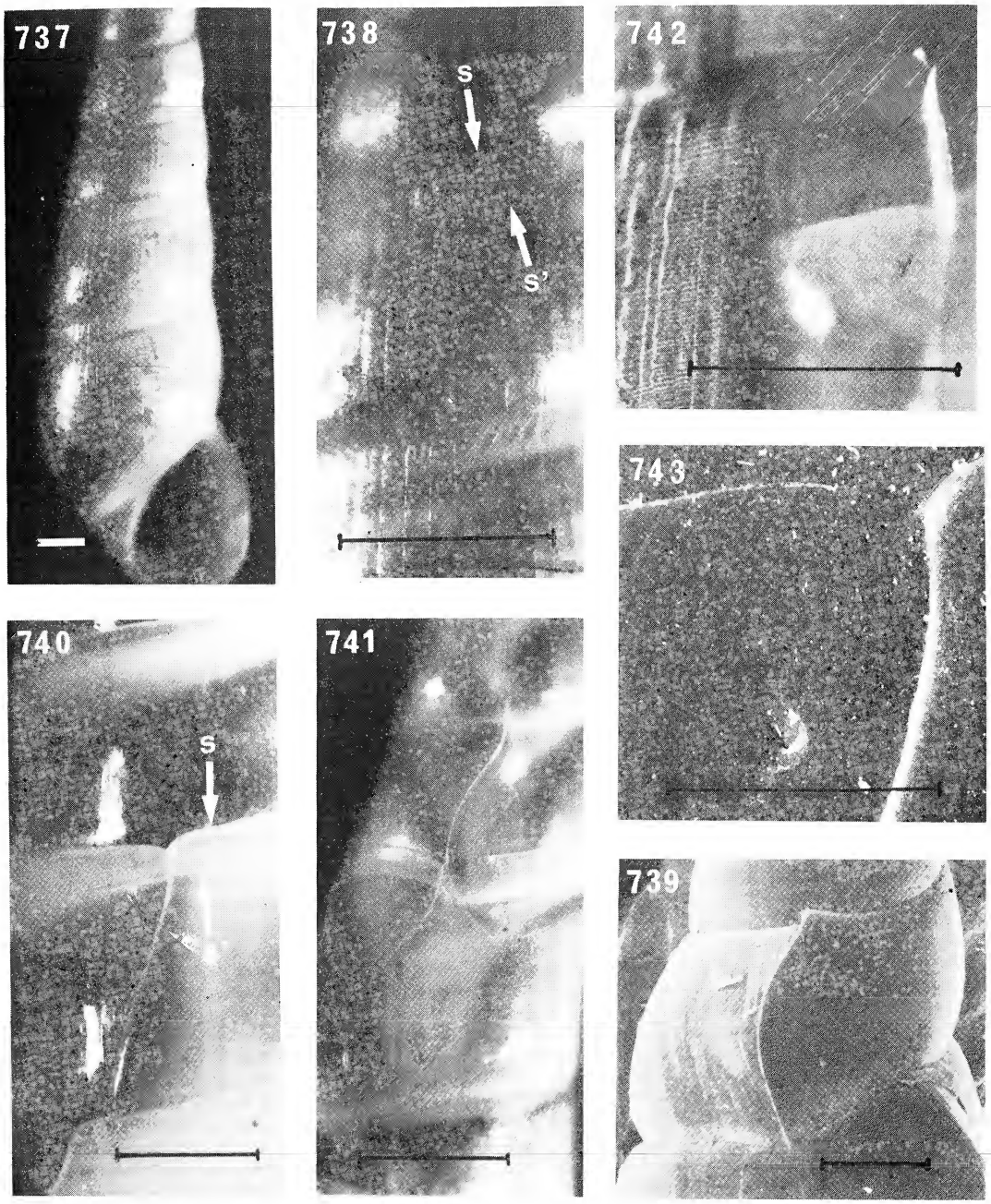
Asteroids: Nothing.
Ophiuroids: *Eulima bilineata, Ophieulima minima, Ophiolamia armigeri.*
Holothurians: *Melanella frielei, Melanella myriotrochi, Pisolamia brychia, Megadenus oneirophantae, Molpadicola* sp., *Entocolax* sp., *Enteroxenos oestergreni.*
Echinoids: *Sabinella bonifaciae, Eulitoma insignis, Pelseneeria stylifera, P. profunda, P. media, P. minor, P. striata.*
Crinoids: *Bathycrinicola talaena, Crinolamia dahli.*

Systematics

The arrangement of the genera does not reflect any proposed relationship; the eulimids are still too poorly known to allow that. We have simply arranged them according to host group as far as known. For example, the genera *Eulima, Sticteulima, Fuscapex, Ophieulima* and *Ophiolamia* all parasitize ophiuroids. Together with these we have included *Batheulima, Haliella, Haliella-loides* and *Rectilabrum* the hosts of which are unknown, but the shells of which show a resemblance to the ophiuroid parasitizing eulimids. The same is the case with most of the other species. They are included in a genus because they resemble the type species in shell morphology. In some cases the genera have become quite diverse assemblages, in others they remain fairly uniform groups. We have noted it when a species differs from the appearance normal for a genus.

We have introduced eight new genera. From the shell morphology only, we could certainly have introduced ten additional genera, but when one becomes more familiar with the biology of eulimids and starts to realize how much the shell morphology is influenced by the way of life, one becomes more reluctant to base new genera on shell characters only. We have, therefore, avoided making new genera unless our experience of other eulimid faunas indicates that there is a reason for it.

As a consequence of this view we have at the end of this revision brought together a number of species of unknown affinity that we describe as *«Eulima»* spp. These species could not have been introduced into any of the genera used here without additional knowledge of soft parts or hosts.



Figs 737-743. Shell morphology in Eulimidae. 737-738, *Melanella costellata*, holotype. Strongly ribbed sculpture. 739, *Sabinella bonifaciae*, Palermo, Italy. Irregular and bulging incremental scars as a consequence of strongly expanded outer lip. 740, *Melanella turrita*, holotype. Normal incremental scar. 741, *Curveulima macrophthalmica*, W Norway. Species with flexuous suture, making distinct «dips» at the suture. 742-743, *Melanella lubrica*, W Norway light microscopical and SEM photograph of same area of same specimen. s: suture, s': false suture. Scale lines: 739-741: 0.25 mm, 737-738, 742-743: 0.5 mm.

Identification of species

Although the identification and limitation of genera is unusually difficult in the Eulimidae, the recognition of species is usually easier, at least after some practice. It is true that the species often are extremely featureless and similar to each other, but they are also quite constant in shell morphology with very little individual variation.

Many of the important characteristics for separation of species have not been used in earlier literature, because some are difficult to observe or have not been recognized previously. In this section we will discuss some shell features important for identification of eulimid species.

Localization on eulimid shells. All descriptions of the shells are done assuming the shell to be in the position as in fig. 756, unless it is stated to be a side view, which corresponds to figure 755. This means that «right side» is the apertural side, «upwards» corresponds to towards the apex, «backwards» towards the side that is not shown in fig. 756 and «downwards» means towards the base.

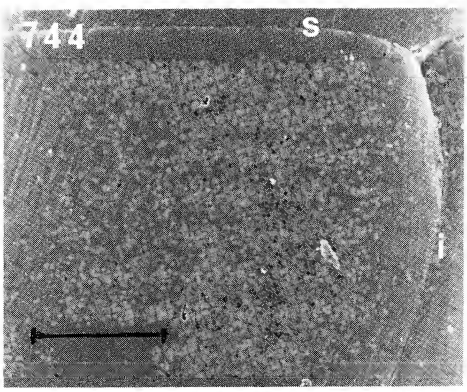
Incremental scars. Eulimids have a periodical growth, i.e. the growth takes place during a short time during which a section of the shell, often 0.3-1.5 whorls, are formed. After this comes a time when this section is thickened and then a usually much longer time with no growth. This is obvious from the number of specimens of the different stages that are found in any population. During the time with no growth, the outer lip is thickened and when it starts growing again this old outer lip is easily visible (figs 739-743). Some species never or rarely form incremental scars e.g. the species of *Pelseneeria.* In some species the scars occur irregularly, in others at very constant intervals. Three different types of scars can be distinguished. 1. The normal type (fig. 740) with no deviation of the «false suture» (see below). 2. «*Vitreolina* type» (fig. 741). Here the false suture makes a distinct curve downwards or a «dip» just before the scar and curves again after the scar. 3. «*Sabinella* type» (fig. 739). This type occurs in species with an expanded outer lip, which causes the scar to bulge outwards, e.g. *Sabinella* and *Oceanida.*

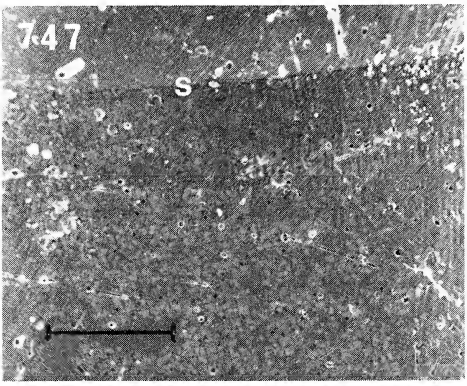
Size. As a consequence of the periodical growth, the size-frequency distribution of most eulimids will be characterized by a staccato-pattern, with several specimens of a small size range, then an interval, then the next size or age group. The maximum size of a species is usually very well defined, both in length and number of whorls and a considerable proportion of a population seems to reach this size. It is extremely rare to find specimens that considerably exceed the normal maximum size and if such specimens are found it is more likely that a second species is involved.

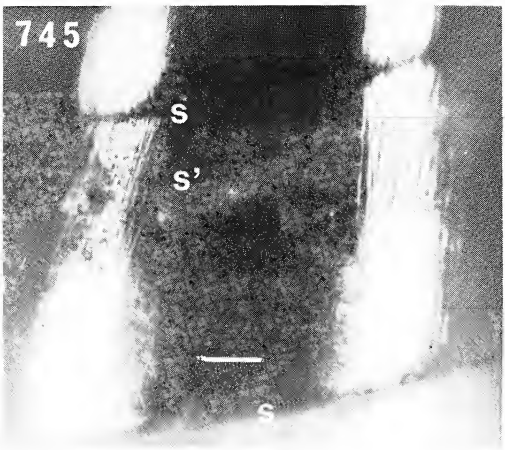
Polymorphism. In almost all Eulimidae there is a distinct difference between juveniles and specimens approaching adulthood. Young specimens have a distinctly angulated body-whorl and often a more fragile shell. In a large proportion of the species, there is also a second difference within a species, namely between males and females. This difference seems to exist in all species that are not simultaneous or consecutive hermaphrodites. Specimens that will become males are more slender, have flatter whorls and attain a smaller size, usually 2/3 of the size of the females. This makes it very important to examine the larval shells, in which we have seen no evidence of sexual dimorphism.

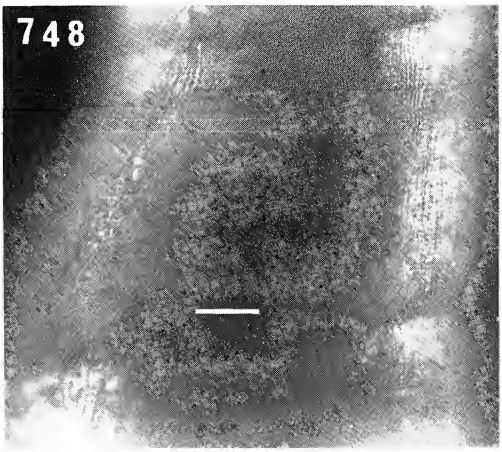
Shell shape. Eulimids are generally considered to be tall slender shells, but actually a considerable number of species differ drastically. No limpet-shaped species are known from the Atlantic area, but numerous more or less globular species are known. The globular shape does not seem to be an indication of relationship, because species with totally different anatomy such as *Pelseneeria* and *Ophiolamia* may have this shell shape. Instead there is a correlation between this shape and living closely associated with the host.

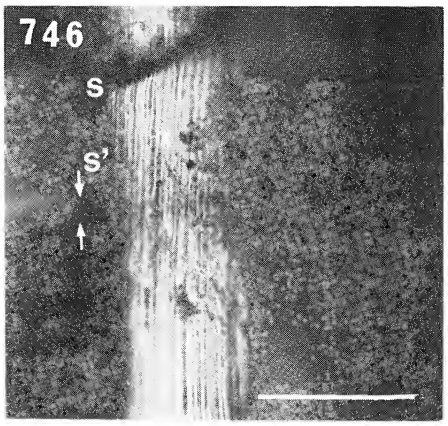
Most eulimids are, however, tall slender species, some of which are distinctly curved. The curvature was earlier (e.g. Bartsch 1917) used as a character for dividing the species into genera. We have, however, seen many cases of straight and curved species that are evidently

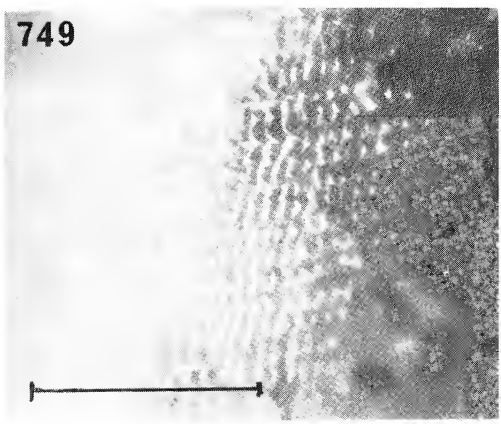












Figs 744-749. Sculpture in Eulimidae. 744-746, *Melanella orphanensis*, Trondheimsfjord, Norway. 744, SEM photograph, showing incremental lines. 745-746, the same specimen seen with light microscopy. 747-749, *Melanella reticulata*, holotype, corresponding views. s: suture, s': false suture, i: incremental scar. Scale line: 0.1 mm.

closely related. There is a strong correlation between having a curved shell and having the incremental scars regularly arranged along one side of the shell (figs 1032-1035).

In some species with numerous whorls the scars may form a line running up the spire and at the same time twisting so that the line which started on the right side of the body whorl ends with a scar to the larval shell on the left side of the shell. In such species the shell is often not regularly curved, but irregularly twisted in directions corresponding to the scars, so that the scars are at the inside of the curve all the time. We find it therefore more likely that the curvature simply is a growth phenomenon, caused by distortion of the growth by the thickened outer lip and do not assign it any importance for higher classification. This conclusion was also reached by Wrigley (1944). It is however important for distinction of species. Occasionally one finds specimens of such curved species that are curved in the «wrong» direction, but that is simply caused by their death while in the process of growth and having formed only half a whorl instead of a complete turn.

Sculpture. Although most eulimids are considered to be smooth, there exists much sculpture in the group. Only very few species have any obvious, easily visible sculpture of distinct ribs, but such a sculpture is present in some species of *Melanella* (see figs 737-738). Incremental scars also form a kind of sculpture; this has been discussed above. Microsculpture exists in several forms and the term is here used for sculpture difficult to detect even at x 50 magnification with a stereo microscope. One can distinguish between two different kinds: 1. Real sculpture visible at SEM examination. 2. False sculpture, evidently consisting of refraction phenomena caused by the superficial layers of the shell. To examine this sculpture it is necessary that the light is reflected at some part of the shell (figs 742, 745-746, 748-749). A pattern can be seen at the point of reflection. The sculpture may consist of spiral or axial line or a combination of these, but an SEM examination will show a different pattern or no pattern at all. This sculpture is often best visible in shells that have been dead for a short time before they were found.

Growth lines are present in many species throughout the family. These are irregular, axial lines, often not reaching from one suture to the other and appearing at irregular intervals, often close-set. These should not be confused with the axial lines that occur in many eulimid species, especially those with a coloured shell (figs 750-752). These axial lines are usually very sharp and well defined and reach from suture to suture. They are straight or slightly curved and run somewhat obliquely. Sometimes they are strong enough to resemble weak incremental scars, but they do not interrupt the suture as the scars do (fig. 752).

Suture. The suture of a gastropod is the line where a preceeding whorl disappears under a later one. In species with a transparent shell there is usually a second line, running parallel to the suture, some distance below. This line is simply a transparency phenomenon, marking the internal contact between the whorls and the area between the suture and this line is the zone where the whorls are connected.

Bartsch (1917) called this line «false suture», a term adopted in this paper. The real and false suture are shown on fig. 740. From figs 744 and 745 it is obvious that the false suture is a transparency phenomenon.

Convexity of the whorls. The convexity of the whorls is a very important character for distinction of the species, but it is also very difficult to describe, measure and depict. Drawings do not show this character well, but in some cases we give additional photographs which show the convexity more precisely. The convexity of the whorl may also change at the subsutural zone (figs 892, 893, 895).

Aperture. The aperture is one of the most informative parts of the eulimid shell and often seems to be good for generic classification. The aperture actually is the opening only, but in malacological literature also the parts delimiting this area are included. The delimiting elements are: outer lip, and inner lip.

The inner lip consists of columella and parietal callus (of which the latter sometimes is lacking and then replaced by the parietal wall). The outer lip should be examined both from the front and the side. Seen from the front it may be curved or straight (i.e. the lateral part forming a flat surface with the preceeding whorl) and the lower part (i.e. the part between the side and the columella) may be protruding or retracted. Seen from the side, the outer lip may be opisthocline (connection at the suture behind the lowermost part), prosocline (connection in front of lowermost part) or orthocline (in the same plane) (see figs 760, 782, 824). Some species have a very straight outer lip (e.g. *Rectilabrum* fig. 824), in some there is a notch below the suture (e.g. *Auriculigerina* fig. 1046), in some the outer lip is evenly curved from suture to base (fig. 1062). In some species the most projecting part of the outer lip is situated below the midpoint (fig. 822) in others it is above (fig. 820). These features are important for distinction of the species.

An umbilicus is present in very few eulimids, only *Niso* and *Umbilibalcis* have a well developed one, but an indistinct umbilical chink or crevice may occur in some groups. Often this is simply a sign of the specimen not being adult, especially if the inner lip is thin.

Colour. Most eulimids are colourless, but especially the genera that still have a radula are often coloured with yellowish or brownish patterns. These colours often fade in dead specimens, but this may take a long time; even in fossil specimens these patterns may be present. Experience of tropical species of *Hemiliostraca, Sticteulima* and *Eulima* has shown that such patterns often are highly specific and constant within a species, but there are also cases where we have observed what we believe to be «albinistic» specimens. Often the larval shell is coloured and the teleoconch colourless.

The colourless eulimids are usually more or less transparent, but this disappears with time after death, presumably due to some transformation of the crystalline structure.

Larval shell. This term is used for the protoconch I (or «embryonic shell», present on a larva when it hatches) plus protoconch II (the veliger shell, formed during the planktotrophic life, if there is such a stage). These two parts of the shell are usually easy to distinguish on gastropod larval shells, but the Eulimidae are an exception.

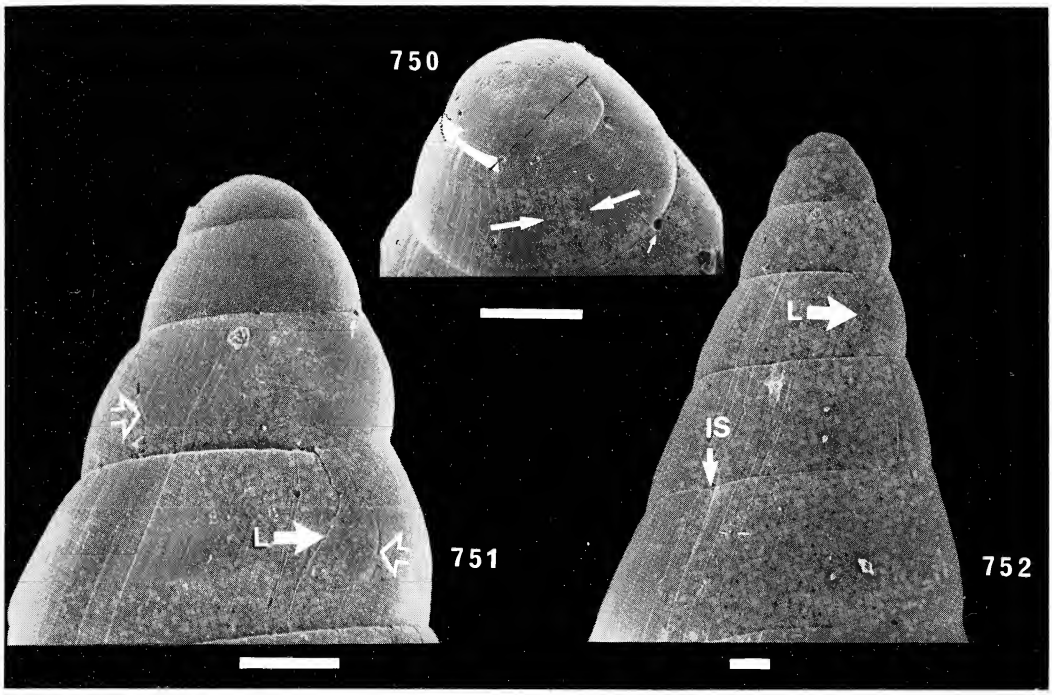
In *Niso* and a few additional species the larval shell has a sculpture of flexuous, thin axial lines (figs 750-751), which are absent on the initial whorl. This change in sculpture, not noticeable in smooth species, may represent the change from life in an egg capsule to planktonic life but this remains to be demonstrated. Often it is quite difficult to distinguish between larval shell and teleoconch, but usually there is a more or less distinct scar, coinciding with a change in convexity of the whorls, a change in colour (especially distinct at the subsutural zone), a sharp change in corrosion, a change in the direction of the axis of the whorls, or as in *Niso* and *Batheulima fuscoapicata*, a change in sculpture.

The number of whorls of the larval shell is difficult to estimate (in all gastropods); it depends on how the initial whorl is counted. Attempts have been made (see e.g. Warén 1974, Verduin 1977) to define the number of whorls, but even extremely small damage or irregularity of the suture distort the values considerably (± 0.1 - 0.2 whorls). Also the shape of the initial whorl may increase the difficulty. It is rather easy from the SEM photography (figs 750-751) to say that *Niso tricolor* has a larval shell of 2.8 whorls with an accuracy of ± 0.05 whorls. It is much more difficult in species where the initial whorl is upturned or tilted as in *Eulima devistoma* (fig. 794). For this reason we have always distinguished between number of larval and teleoconch whorls. The latter is usually, at least when the larval shell can be demarcated, very easy to estimate with a good precision.

The height of the larval shell is measured parallel to the axis, from the tip to the intersection of the larval scar and the teleoconch suture. This is not the actual size of the larval shell, which may be 10-20% higher, but it gives a well defined approximation that may be used for comparison. In some species, however, the larval shell may vary in the way it connects to the teleoconch (figs 992-993), but this has been observed only in *Pelseneeria* among the genera discussed here (*Stilifer* is another good example of this).

Soft parts. The soft parts of only a few species have been examined. There are two reasons for this: First, very little alcohol preserved material has been available and when only a few specimens are known we prefer to save the shell for documentation of the species. The second reason is that the huge amount of work needed would not have resulted in a correspondingly improved classification, because there exists very little material for comparison.

Presence or absence of eyes and their size is a good and usually easily observable character that can also be seen through the shell in dried specimens. This may be facilitated by immersion in benzene, which makes the shell more transparent.



Figs 750-752 *Niso tricolor*, USNM 432980a, Florida, U.S.A. Sculptural details. 750, apex, apical view. The two arrows indicate where we assume the transition from protoconch I to protoconch II to take place. The large arrow indicates how the number of whorls is counted, from an imagined baseline. The protoconch I in this case consists of 0.8 whorls. The small arrow indicates a corrosion hole, to facilitate comparison with fig. 751, which shows the veliger shell and some postlarval growth. «L» indicates the scar separating larval shell from teleoconch. Compare the convexity of this whorl on each side of the spire. The larval shell consists of two whorls of veliger shell plus 0.8 whorls of protoconch I. Open arrows indicate repaired damage. 752, spire with incremental scar, also with axial lines, that should be compared with the axial sculture of the larval shell, the lines of which are more crowded and flexuous. Scale line 0.1 mm.

Determination key

This is not a key to genera, but rather to groups of similar species, sometimes genera, sometimes single species. Only species with a shell are included. Shell-less species can usually be determined from the host and a comparison with the description. If such species are found in other hosts, a careful comparison with types or other critically determined specimens has to be undertaken.
The following shell-less species are known from the area:

Host	Parasite
Molpadia blakei	*Molpadicola* sp.
Myriotrochus vitreus	*Entocolax sp.*
Parastichopus tremulus	*Enteroxenos oestergreni*

For the shell-bearing species it is very important to have material for comparison consisting of critically determined specimens compared with type-material, and comparisons with type material should be done before describing new species or when there exists any uncertainty when determinations of importance are made, e.g. reports of new hosts or extension of distribution or anatomical studies.

1. Shell inflated and globular	2
1. Shell conical or slender	5
2. Apex brown	*Pelseneeria* (p. 417)
2. Apex colourless	3
3. Spire high and distinctly concave	*Pisolamia* (p. 386)
3. Spire low and of convex shape	4
4. Larval and first postlarval whorl broader than high	*Ophiolamia* (p. 348)
4. Larval and first postlarval whorl higher than broad	*Megadenus* (p. 387)
5. Apex brownish or yellowish	6
5. Apex colourless	16
6. Umbilicus present, wide	*Niso* (p. 447)
6. No umbilicus, or only a narrow crevice	7
7. Outer lip strongly prosocline, straight	«*Mucronalia*» (p. 446)
7. Outer lip not strongly prosocline, more or less curved	8
8. Teleoconch yellowish or with colour pattern	9
8. Teleoconch colourless	13
9. Teleoconch with colour pattern	10
9. Teleoconch of a uniform brownish or yellowish colour	12
10. Shell more than 2.9 times as high as broad	*Eulima* (p. 318)
10. Shell less than 2.9 times as high as broad	11
11. Aperture regularly ovate	*Sticteulima* (p. 322)
11. Aperture distorted-looking	«*Eulima*» (p. 461)
12. Shell short and broad, cylindrically ovate	*Fusceulima* (p. 412)
12. Shell conical, slender	*Eulitoma* (p. 429)

13. Large species ca 25 mm	*Eulitoma insignis* (p. 429)
13. Medium size species 2-10 mm	14
14. Larval shell smooth and shell at least 3 times as high as broad	*Eulima* (p. 318)
14. Larval shell with axial sculpture or shell shorter than 3 times the breadth	15
15. Whorls distinctly convex	*Batheulima* (p. 334)
15. Whorls slightly convex or flat	*Fuscapex* (p. 324)
16. Distinct umbilicus	*Umbilibalcis* (p. 444)
16. No umbilicus	17
17. Distinct incremental scars present	21
17. No distinct incremental scars	18
18. Large species, more than 10 mm high, with axial ribs	*Costaclis* (p. 450)
18. Small species, smooth or with axial microsculpture	19
19. Apex evenly rounded with a small initial whorl	*Parastilbe* (p. 452)
19. Apex starting abruptly with a large initial whorl	20
20. Outer lip (in side view) strongly protruding	*Crinolamia* (p. 394)
20. Outer lip evenly curved, sharp axial microsculpture present	*Hemiaclis* (p. 453)
21. Old outer lips projecting outside the shell	*Auriculigerina* (p. 440)
21. Old outer lips not projecting	22
22. Outer lip strongly prosocline and straight	*Rectilabrum* (p. 345)
22. Outer lip not strongly prosocline and straight	23
23. Larval shell with more than 2 whorls	24
23. Larval shell with less than 2 whorls	34
24. Incremental scars of *Vitreolina* type (fig. 741)	25
24. Incremental scars not of *Vitreolina* type	28
25. Shell straight and regularly coiled	*«Eulima» chionea* (p. 468) and *anonyma* (p. 466)
25. Shell with curved or twisted spire	26
26. Larval shell cylindrical with same apical angle as teleoconch	*Campylorhaphion* (p. 437)
26. Larval shell with larger apical angle than teleoconch	27
27. Incremental scars forming a line	*Vitreolina knudseni* (p. 434) and *Curveulima eschara* (p. 402)
27. Incremental scars scattered over the spire	*Curveulima* (p. 399)
28. Shell regularly curved	*Acrochalix* (p. 436)
28. Shell straight or irregularly twisted	29

29. Diameter of shell less than 30% of height	30
29. Diameter of shell more than 30% of height	31
30. Larval whorls convex	*Crinophtheiros* (p. 397)
30. Larval whorls perfectly flat	*Melanella frielei* (p. 361)
31. Outer lip ortho- or prosocline	32
31. Outer lip opisthocline	33
32. Spire twisted, incremental scars strong	*Sabinella* (p. 425)
32. Spire straight, incremental scars weak	*Ophieulima* (p. 347)
33. Outer lip distinctly flattened (front view)	*«Eulima» confusa* (p. 461)
33. Outer lip evenly arched (front view)	*Bathycrinicola* (p. 406)
34. Height of aperture more than 35% of shell height	35
34. Height of aperture less than 35% of shell height	39
35. Line columella - parietal wall almost straight	36
35. Line columella - parietal wall distinctly curved or angulated	37
36. Diameter of shell 32% of height	*Haliella canarica* (p. 340)
36. Diameter of shell 39% of height	*Fusceulima thalassae* (p. 414)
37. Shell inflated	*Bulimeulima* (p. 459)
37. Shell conical	38
38. Incremental scars weak	*Bathycrinicola* (p. 406)
38. Incremental scars very strong	*Oceanida* (p. 442)
39. Outer lip very strongly projecting, almost like a claw, small, cylindrical species	*Fusceulima projectilabrum* (p. 414) and *ingolfiana* (p. 415)
39. Outer lip not extremely projecting	40
40. Aperture at least 2.5 times as high as broad	*Haliella stenostoma* (p. 339)
40. Aperture less than 2.4 times as high as broad	41
41. Larval shell conspicuously tilted (fig. 794)	*«Eulima» devistoma* (p. 464) and *strongylostoma* (p. 466)
41. Larval shell not tilted (fig. 913)	42
42. Fairly high aperture (at least 33% of total height) combined with strongly convex whorls	*Halielloides* (p. 342)
42. Aperture usually shorter than 30% of total height, if higher, the whorls are almost flat	*Melanella* (p. 352)

NOT RECOGNIZABLE TAXA

Eulima undulosa de Folin, 1893. This species was described from Fosse de Cap Breton. It was compared with *Eulima parfaiti* de Folin, but differs by being irregularly curved. It was said to be 3.2 mm high, but the description is not detailed enough to allow identification and the types are lost.

Genus *EULIMA* Risso, 1826

Type species: Awaiting a decision by the ICZN; here *E. glabra* (Da Costa, 1778) (= *E. subulata* (Donovan, 1803)) is considered the type species.

Remarks: The case of the type species of *Eulima* was presented to ICZN in 1979, but no action has been taken. It is, however, a good assumption to consider *E. glabra* the type species. This will cause less nomenclatorial confusion than any other solution.

The species of *Eulima* for which the hosts are known (*E. glabra* and *E. bilineata*) parasitize ophiuroids, but leave the host at any disturbance. The anatomy and host choice was described in some detail by Warén (1984b).

The species of *Eulima* are characterized by a tall, slender shell, slightly convex or flat whorls, a straight or slightly sinuous outer lip; usually the teleoconch and still more often the protoconch have some brownish colour markings, more distinct at or close to the suture. The buccal mass of the two species mentioned above is equipped with a ptenoglossate radula, jaws, and a pair of salivary glands.

The soft parts of the new species described here are not known, as is also the case with *E. dysnoeta*; they are included in *Eulima* on the basis of shell characters only.

The species here referred to *Eulima* may be distinguished as follows:

A. Shell completely colourless	*E. incolor*	(p. 319)
A. Shell with some colour pattern, at least on larval shell	B	
B. Aperture at least twice as high as broad	C	
B. Aperture 1.6 times as high as broad	*E. dysnoeta*	(p. 312)
C. At a height of 6 mm the aperure constitutes 0.33 of the height	*E. bilineata*	(p. 320)
C. At the same height the aperture constitutes 0.27 of the height	*E. grimaldii*	(p. 322)

Eulima dysnoeta Dautzenberg & Fischer, 1896 Figs 757-758, 792

Eulima dysnoeta Dautzenberg & Fischer, 1896:460, pl. 19, fig. 21.
Eulima dysnoeta, Dautzenberg 1927:163, pl. 5, fig. 2.

Type material: Lectotype, here selected, the figured specimen, in MOM (apex broken but still kept), one paralectotype in IRSN.

Type locality: MONACO st 553, 37° 43 N, 27° 26 W, 1385 m.

Material examined: The type material.

Distribution: Only known from the type locality in the Azores.

Remarks: It can be added to the original description that the larval shell consists of about 3.0 rather convex whorls, marked with a conspicuous brown band, just below the suture. The parietal callus is distinct. There is some indication of a yellowish band just below the suture, also on the teleoconch, although this is not mentioned in the original description.

Nothing is known about the biology or the soft parts.

Eulima dysnoeta resembles the species of *Melanella* in the shape of the shell, especially the shape of the aperture, but no species of *Melanella* has a coloured larval shell (or any other colour pattern).

Eulima incolor n.sp. Figs 753, 761-762

Type material: Holotype in MNHN.

Type locality: BIOGAS st DS52, 44° 06 N, 04° 22 W, 2006 m.

Material examined: The holotype.

Distribution: Only known from the holotype, from off N Spain, 2006 m.

Description: Shell tall, slender, transparent, colourless with flat whorls, pointed apex and a fairly large aperture. The larval shell consists of 2.0 convex, colourless whorls and is rather cylindrical. The teleoconch consists of 9.3 almost perfectly flat whorls. The suture is almost invisible, the false suture much more distinct and the subsutural zone occupies about 1/5 of the height of the whorls. The surface is rather rough, but there is no distinct sculpture except some incremental lines. No incremental scars except the one defining the larval shell. Aperture pear shaped, lower part excavated and retracted backwards. Columella solid, forming an indistinct angle with the distinct parietal callus. Outer lip slightly retracted at the suture, unusually straight.

Dimensions: Height of the shell 6.64 mm, diameter 1.64 mm, height of the aperture 1.66 mm, breadth 0.80 mm.
Soft parts: Eyes small, tentacles short, operculum (fig. 753) slender with unusually large attachment area, bordered by a fold as in *Parvioris* but situated on the opposite side of the area compared with that genus. Foot and head normal.

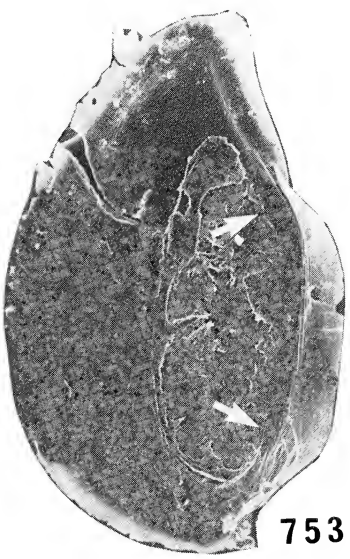


Figure 753. *Eulima incolor*, holotype, operculum. diameter 1.28 mm. White arrows indicate fold.

Remarks: Eulima incolor resembles the species of *Eulima* in the shape of the shell and the columella, although the aperture is unusually short for the genus. The odd attachement fold of the operculum is quite different from the simple operculum of the other species of *Eulima* we have examined. We have, however, included *incolor* in *Eulima* because it differs still more from any other genus and we have not wanted to make a new genus for it.

It differs from other species of *Eulima* by the total absence of colour and incremental scars. This character and the straight outer lip make it easy to separate it from all species of *Melanella.*

Eulima bilineata Alder, 1848 Figs 754-756, 797

Eulima bilineata Alder, 1848:141 (not Adams & Reeve, 1850 = *Leiostraca bivittata* (H. & A. Adams, 1853).
Eulima bilineata, Forbes & Hanley 1853:237.
Eulima trifasciata, Winckworth 1932:225 (not *Turbo trifasciatus* J. Adams, 1800).
Eulima bilineata, Warén 1984b:275.

Type material: Not found.

Type locality: Cullercoats, Northumberland.

Material examined: About 1500 specimens from all parts of the distributional area.

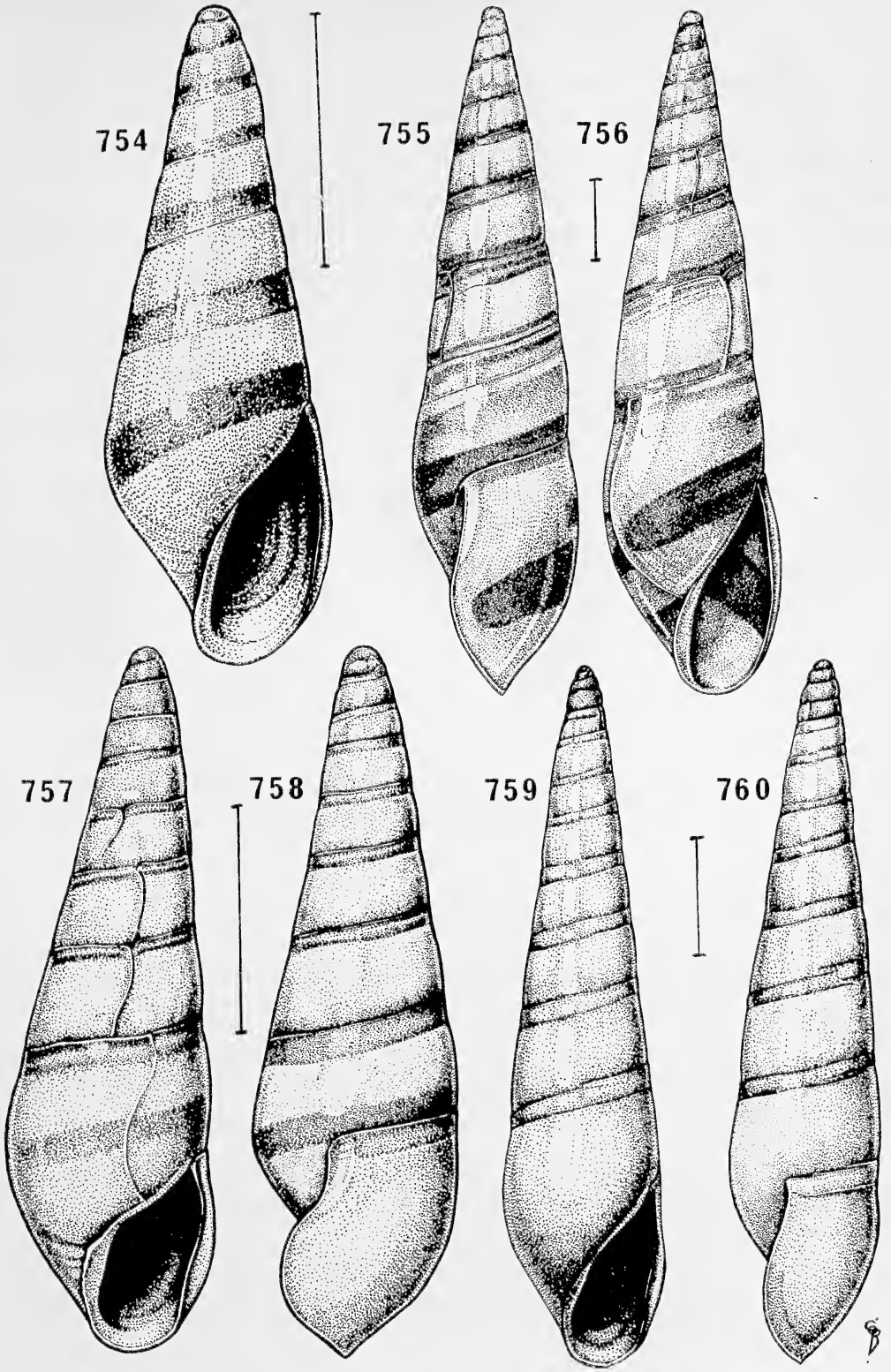
Distribution: From N Norway, Iceland and the Faroes, along the European coasts and throughout the Mediterranean, 50-900 m, parasitic on the ophiuroids *Ophiothrix fragilis, Ophiopholis aculeata* and *Ophiactis balli*, possibly also on some other ophiuroids (Warén, 1984b).

Remarks: Alder (1848) introduced the name as a replacement name for *Eulima lineata* Sowerby, 1834. At the same time, however, he gave the distinguishing features from *Eulima glabra* (Da Costa) of which *E. lineata* is a synonym, judging from the size (0.7 inches) that Sowerby gave for his specimen. It is therefore evident that Alder had misidentified Sowerby's species, and we have here followed Forbes & Hanley (1853) in their use of the name *bilineata*, as have all other authors except Winckworth (1932) who identified *E. bilineata* with *Turbo trifasciatus* J. Adams, 1800. Judging from Adams' figures, this is not correct. It is true that the shape indicated by Adams is much more slender than that of *Cingula cingillus* (Montagu), the species with which other authors have identified *T. trifasciatus*, but all the figures of John Adams are exaggerated in this way.

In European waters, only *Eulima glabra* (Da Costa) is likely to be confused with *E. bilineata*, however *E. glabra* has perfectly flat whorls and a very straight outer lip.

Eulima bilineata has been recorded from E North America by several authors (Abbott 1974, Dall 1889 and others), but examination of all eulimid material in the major N American museums failed to reveal a single specimen from this area.

Figs 754-760. Genus *Eulima*. 754-756, *E. bilineata*, Bergen area. 757-758, *E. dysnoeta*, holotype.759-760, *E. grimaldii*, holotype. Scale line: 1 mm.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Eulima grimaldii n. sp. Figs 759-760, 793

Type material: Holotype and one paratype in MNHN.

Type locality: MONACO st 1349, 38° 36 N, 28° 06 W, 1250 m.

Material examined: The type and MONACO st 553, 37° 43 N, 25° 05 W, 1385 m, 2 shs.

Distribution: Only known from the material examined, from the Azores.

Description: Shell tall, slender, conical, fairly solid, now colourless and opaque, originally probably transparent and perhaps with some colour pattern. Larval shell brownish with a more darkly coloured zone just below the suture; consisting of 3.3 convex whorls, now corroded. The holotype has 7.5 postlarval whorls with several irregularly scattered incremental scars. No sculpture except a few very indistinct incremental lines. Suture almost invisible, false suture more distinct. The convexity of the whorls is obvious, about the same as in *E. bilineata*. The aperture is tall and slender with a straight but distinctly inclined columella. The parietal callus is very indistinct. Outer lip more sigmoid than in *E. bilineata*, also more opisthocline.
Dimensions: Height of the shell 6.05 mm, diameter 1.37 mm, height of the aperture 1.56 mm, breadth 0.70 mm.

Remarks: The shape of the shell of *E. grimaldii* is very similar to *Melanella monterosatoi* (De Boury) (= *Polygireulima monterosatoi*), but that species has a perfectly colourless and smaller larval shell (fig. 921).

No soft parts or biology are known for this species, but the specimens are in good condition.

Genus *STICTEULIMA* Laseron, 1955

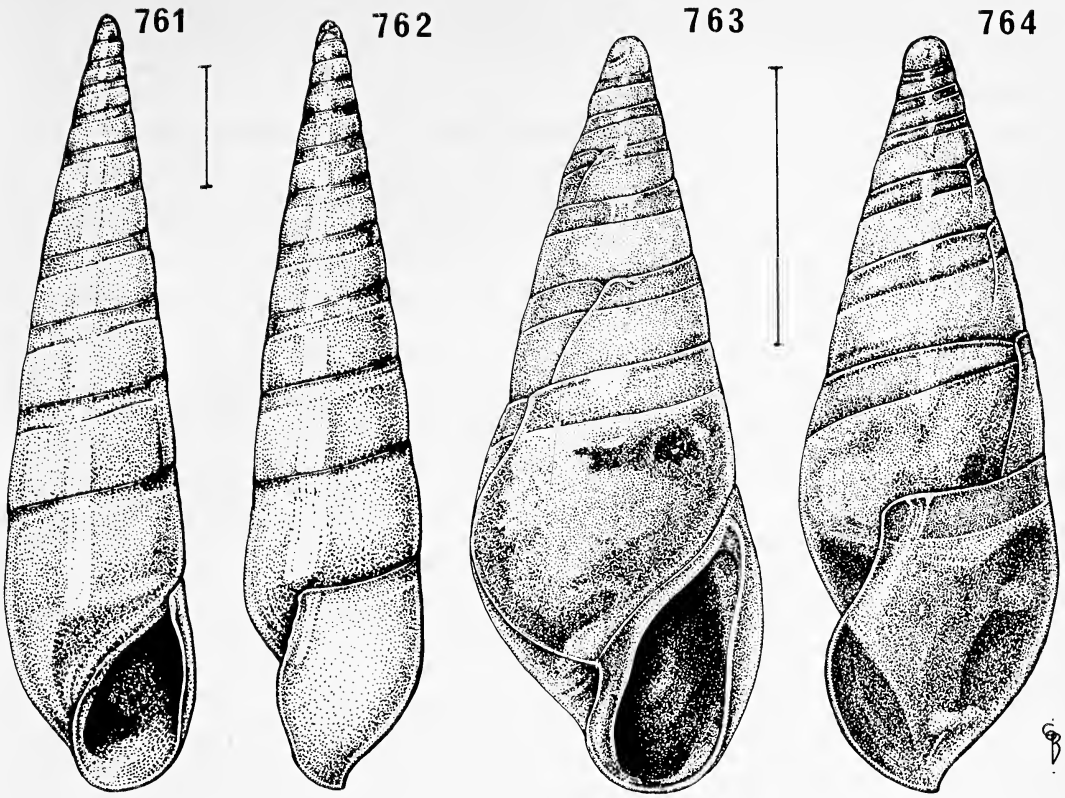
Type species: Sticteulima cameroni Laseron, 1955, by original designation.

Remarks: The type species is an Australian shallow water species; its host is not known, but several closely related species are known to parasitize ophiuroids (Warén in prep.). We have seen several species from intermediate depths, 100-1000 m, from tropical dredgings, but the genus is most common in more shallow water and occurs also intertidally.

There is one Mediterranean species known of this genus, *Sticteulima jeffreysiana* (Brusina) and one additional species is known from Madeira, *S. badia* (Watson). The new species described here may ultimately prove to belong to more shallow water, but we have not seen it in such material and in order to describe the deep water fauna as completely as possible, we include *S. lata* here.

Sticteulima badia differs from this new species by being dark brown instead of transparent with irregular brownish areas; *S. jeffreysiana* is a little smaller, usually 2.0 mm long, has a distinct, dark brown instead of colourless subsutural zone on the larval shell and is proportionally higher, 2.7-2.8 times the diameter instead of 2.5-2.6 as in *S. lata.*

The species of *Sticteulima* resemble rather much the species of *Fuscapex* but are easily distinguished by the much larger size of the larval shell in *Fuscapex* and also by the postlarval shell of *Fuscapex* being colourless.



Figs 761-764. Genera *Eulima* and *Sticteulima*. 761-762, *E. incolor*, holotype. 763-764, *S. lata*, holotype. Scale line: 1 mm.

Sticteulima lata n.sp. Figs 763-764, 795

Type material: Holotype and one paratype in RMNH no 55723.

Type locality: CANCAP st 3.102, 30° 07 N, 15° 53 W, 600 m.

Material examined: The type material.

Distribution: Only known from the type material, from the Canaries, 600 m.

Description: Shell conical, pointed, solid, colourless, transparent with light brown areas irregularly distributed over the central parts of the whorls. Larval shell of 2.5 distinctly convex, brownish whorls of a height of 390 μm. The holotype has 4.3 postlarval, almost flat, perfectly smooth whorls. Suture almost invisible. Subsutural zone broad, occupying 3/8 of the height of the whorls. Incremental scars conspicuous, about 2/3 of a whorl apart, all the way up to the larval shell. Aperture somewhat rectangular, rounded below, pointed in its upper part. Outer

lip slightly prosocline, slightly sinuated just at the suture, most projecting at 3/10 of its height. Inner lip reflected on the solid columella and continuous with the parietal callus.
Dimensions: Height of the shell 2.57 mm, diameter 0.98 mm, height of the aperture 0.98 mm, breadth 0.38 mm.

Remarks: Sticteulima lata resembles *S. jeffreysiana* closely but can be separated by the characters mentioned in the introduction to the genus. There seems not to be any doubt that they are different, because there was also one specimen of *S. jeffreysiana* present in the material from the type locality, probably washed out from more shallow water. This could also be taken as an indication that *S. lata* belongs to the shallow water fauna; only further work can solve this question.

Genus *FUSCAPEX* Warén, 1981

Type species: F. ophioacanthicola Warén, 1981, by original designation.

Remarks: The type species was found on *Ophioacantha* sp., in 1200 m, at the Kermadec Islands, S Pacific. No hosts are known for the European species of *Fuscapex*, but one would expect them also to live as parasites on ophiuroids.

The soft parts of *F. talismani* and *F. cabiochi* have been examined by dissection and serial sectioning and some results of this are given below to better define the genus.

The animal has a well developed foot, with a slender operculum. No epipodial appendages were noticed. Posterior and anterior pedal glands present, the latter barely reaching into the cephalopedal haemocoel in *F. talismani* while in *F. cabiochi* it occupies a considerable part of the cavity. Head with a large, claviform penis; no snout; flattened tentacles of which the inner sides meet to form a «V». Large black eyes situated centrally and subcutaneously in the tentacle bases, present in all species of the genus of which live taken material has been seen. They are also visible through the shell in dried specimens. Proboscis sheath: anterior part muscular, posterior part more glandular and strongly coiled. Buccal mass with ptenoglossate radula, teeth 3-4 μm long, buccal ganglia, but no jaws. Salivary glands situated along anterior part of oesophagus in front of nerve ring. Posterior oesophagus opening to ventral part of the large stomach, close to the exit of the intestine. Here is also the opening to the digestive gland. Stomach also opens to a large «caecum» which runs upward, towards the spire in the extreme right part of 2 whorls (as described in *Eulima* (Warén 1984b)). Stomach and especially «caecum» of some specimens full of small ovate bodies, possibly lymphocytes of host. No mature females sectioned, but pallial oviduct open at least late in its development. 6 specimens of *F. talismani* were found to be of sex as follows: 3.2 mm, solid outer lip, - male; 3.2 mm, solid outer lip - male; 3.2 mm thin outer lip - female, hardly any oviduct developed; 3.65 mm, solid outer lip - male; 4.4 mm, solid outer lip - female, oviduct partly developed; 4.6 mm, solid outer lip - female, oviduct partly developed. No vestigial penis or other sign of sex change in females. Therefore it is concluded that the sexes are separate and the males are 0.6 times the size of females (maximum size of female *talismani* 5.4 mm).

All the species of *Fuscapex* have a large, blunt, rounded, brown larval shell, 400-500 μm high, usually without sculpture, a teleoconch of a distinctly convex shape, a large ovate aperture with an evenly arched columella and a distinct parietal callus.

The differences between the species are small and determination difficult. It is only thanks to the good material taken by THALASSA (series Z) that it has been possible to see that the minor differences used for separation below really are consistant when the species occur sympatrically.

The shell of the species of *Fuscapex* resembles that of *Batheulima* in the shape of the larval shell and the thin, transparent shell of the teleoconch, but we have seen axial sculpture on the larval shell only in *F. microcostellata* (fig. 791).

The species of *Fuscapex* can be determined by this key, but it is almost necessary to have material of several species available, to understand the small differences.

A. Outer lip straight for some distance, i.e. running parallel to the axis of the shell, in apertural view	B
A. Outer lip evenly arched (apertural view)	C
B. Shell fairly solid, lower whorls almost flat	*F. microcostellata* (p. 331)
B. Shell thin and fragile, lower whorls distinctly convex	*F. talismani* (p. 326)
C. Columella perpendicular, outer lip orthocline	D
C. Columella distinctly curved to the left, outer lip slightly opisthocline	*F. cabiochi* (p. 328)
D. Maximum size about 3.5 mm	*F. baptocephala* (p. 328)
D. Maximum size about 6.5 mm	*F. major* (p. 325)

Fuscapex major n.sp. Figs 765-768, 785

Type material: Holotype and 1 additional paratype from the type locality in MNHN.

Type locality: MONACO st 1349, 38° 36 N, 28° 06 W, 1250 m.

Material examined: The types and PORCUPINE 1870 st 17-17a, 39° 39 N, 09° 39 W, 1100-2005 m, 2 shs; DISCOVERY st 7984, 25° 26 N, 16° 10 W, 850 m, 2 spms (juv.).

Distribution: Only known from the material examined, the Azores, off Portugal and West Africa, in 800-2000 m.

Description: Shell tall, conically ovate, rather solid, colourless, with an obtuse, brownish larval shell. Protoconch consisting of a little more than 2 whorls, perfectly smooth, distinctly convex, about 460 μm high. The holotype has 6.5 postlarval whorls, sculptured by numerous, indistinct growth lines and separated by a distinct suture. Subsutural zone constitutes about 1/7 of the height of the whorls. There are about 8 not very strong incremental scars, with intervals of about 0.8 whorls. Aperture rather broad, with an evenly rounded outer lip and columella. Inner lip reflected over the columella. Parietal callus thin, distinct. Outer lip orthocline, meeting the suture at a right angle.

Dimensions: Height of the holotype 6.47 mm, diameter 2.38 mm, height of the aperture 2.52 mm, breadth 1.0 mm.

Remarks: Fuscapex major looks like a large edition of *F. baptocephala*, but can be distinguished by its larger size (*F. baptocephala* never exceeds 3.5 mm) and by its proportionally higher aperture in young specimens. It also shows some resemblance to *«Eulima» leptozona*, but that species has a coloured shell and the columella and the parietal wall form a distinct angle, not an even arch as in *F. major*.

There is some possibility that we have two species included under *F. major*. The specimens from the PORCUPINE expedition have a shorter aperture and flatter whorls (figs 767-768), but we have not wanted to describe a new species on these specimens, because of their poor condition.

Fuscapex talismani n.sp. Figs 769-772, 786

Type material: Holotype and 6 paratypes in MNHN; 1 paratype (TALISMAN) BMNH 1970040.

Type locality: THALASSA st Z445, 48° 52 N, 11° 07 W, 1200 m.

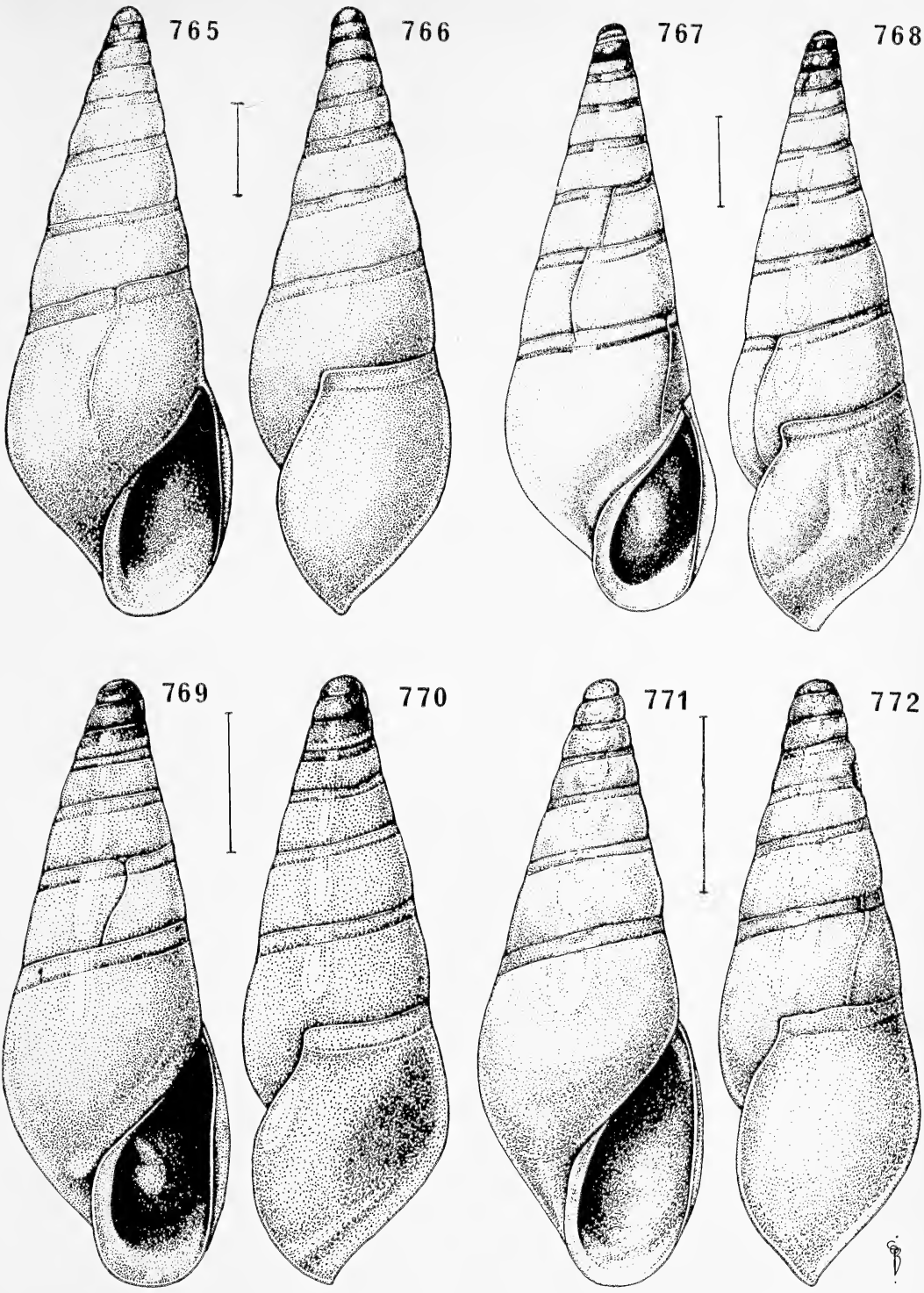
Material examined: The holotype and 6 additional spms from the type locality; THALASSA st Z422, 48° 21 N, 09° 40 W, 1175 m, 1 sh; Z436, 48° 40 N, 09° 56 W, 1210 m, 1 spm; Z435, 48° 40 N, 09° 53 W, 1050 m, 19 spms; Z447, 48° 47 N, 11° 12 W, 1490 m, 4 spms; TALISMAN st 139, 38° 38 N, 28° 21 W, 1257 m, 2 spms; PORCUPINE st 17a, 39° 39N, 09° 39W, 1355 m, 1 sh.

Distribution: Only known from the material examined, from the Azores and the Bay of Biscay, in 1000-1500 m.

Description: Shell conical, whitish semitransparent, rather short and broad, with a blunt, yellowish larval shell. The larval shell consists of 2.3 convex, brownish yellow shorls, without any sculpture. The holotype has 6 postlarval whorls, sculptured by numerous indistinct growth lines and 10 incremental scars, forming two series, half a whorl apart, but this is less evident in some specimens. The suture is shallow but distinct, at least more distinct than the false suture. The aperture is high and slender, rather deeply excavated in its lower part and reaching rather far up along the right side of the shell. The inner lip is reflected rather far over to the left, but there is no umbilical chink or fissure. Parietal callus thin but distinct. Outer lip orthocline, most projecting at or just below the middle of its height and forming an obtuse angle with the suture.
Dimensions: Height of the holotype 5.00 mm, diameter 1.68 mm, height of the aperture 1.92 mm, breadth 0.80 mm.

Remarks: Fuscapex talismani resembles rather much *F. microcostellata* in general shape, but the latter species has the attachment of the outer lip to the body whorl more retracted and thus a more opisthocline aperture. Furthermore, the most projecting part of the outer lip is situated well above the middle of the height of the lip in *F. microcostellata.*

Figs 765-772. Genus *Fuscapex*. 765-766, *F. major*, holotype. 767-768, *F. major*, PORCUPINE st 17a. 769-772, *F. talismani*, TALISMAN st 139 and PORCUPINE st 17a. Scale line: 1 mm.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Fuscapex baptocephala (Dautzenberg & Fischer, 1896) Figs 777-780, 788

Eulima baptocephala Dautzenberg & Fischer, 1896:461, pl. 19, fig. 20.
Eulima baptocephala, Dautzenberg 1927:165, pl. 5, fig. 7.

Type material: Lectotype, here selected, the figured specimen, in MOM; one paralectotype in IRSN.

Type locality: MONACO st 211, 39° 18 N, 31° 12 W, 1372 m.

Material examined: The type material and MONACO st 1349, 38° 36 N, 28° 06 W, 1250 m, 12 spms; TALISMAN st 139, 38° 38 N, 28° 21 W, 1250 m, 2 spms; PORCUPINE st 17a, 39° 39 N, 09° 39 W, 1355 m, 7 spms; THALASSA st Z435, 48° 40 N, 09° 53 W, 1050 m, 1 sh; Z438, 48° 34 N, 10° 25 W, 1400 m, 2 spms; Z446, 48° 47 N, 11° 08 W, 1470 m, 5 spms; Z447, 48° 47 N, 11° 13 W, 1490 m, 19 spms; Z459, 48° 37 N, 09° 53 W, 1180 m, 3 shs; CANCAP st 4.055, 28° 45 N, 13° 20 W, 1360 m, 1 spm.

Distribution: Only known from the material examined, from the Azores and off SW Europe and N Africa in 1000-1500 m.

Remarks: Fuscapex baptocephala resembles closely *F. major*, in the shape of the shell but at a size of 3.2 mm, the normal size for *baptocephala*, the height of the shell of *F. major* is only 2.3 times the height of the aperture, while the same proportion for *baptocephala* is about 2.6 or more. Young specimens of *F. major* also have a very thin, fragile outer lip and the lower left corner of the aperture is distinctly angulated as is normal in young specimens of most eulimids. It also resembles *F. cabiochi* closely, but *F. cabiochi* has a brown protoconch, while that of *baptocephala* is light brownish yellow. Furthermore, the height of the aperture of *F. baptocephala* is less than 2.1 times the breadth while that of *F. cabiochi* is greater than this value.

There is some possibility that two species are involved in the material of *F. baptocephala* listed above. Specimens from the Azores are somewhat more slender (figs 777-778), have a shorter aperture, and may prove to be specifically distinct from the specimens from the European and North African coast. We have, however, considered our material from the Azores too small to exclude the possibility that these specimens are just unusually slender.

Fuscapex cabiochi n.sp. Figs 773-776, 787

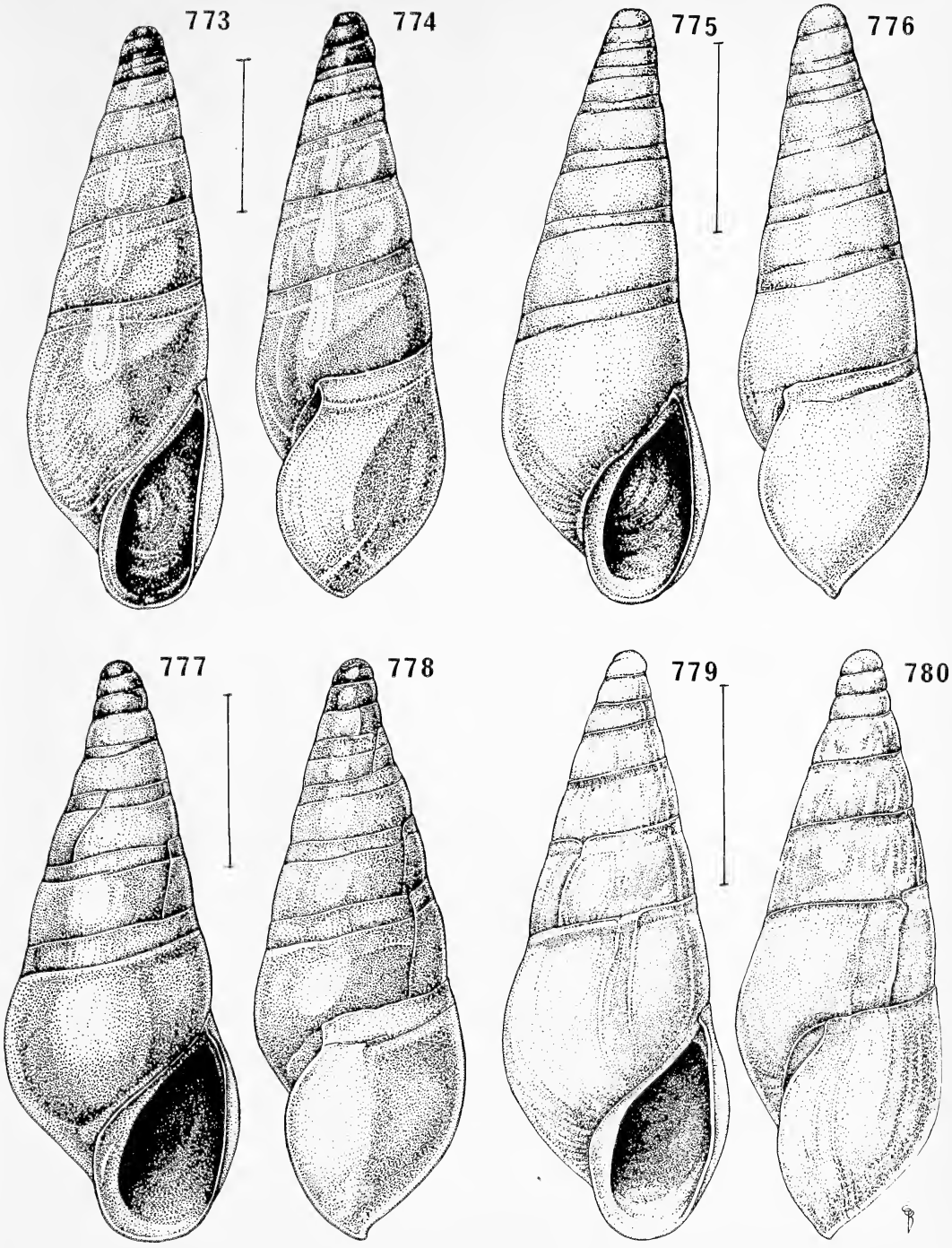
Type material: Holotype in MNHN.

Type locality: THALASSA st Z447, 48° 47 N, 11° 13 W, 1490 m.

Material examined: The type sample with 60 spms; THALASSA Z434, 48° 41 N, 09° 54 W, 720 m, 1 spm; Z435, 48° 40 N, 09° 53 W, 1050 m, 4 spms; Z438, 48° 34 N, 10° 25 W, 1400 m, 2 spms; Z449, 48° 41 N, 10° 34 W, 730 m, 1 spm; Z446, 48° 47 N, 11° 08 W, 1470 m, 1 spm.

Distribution: Only known from the material examined from the NW parts of the Bay of Biscay.

Figs 773-780. Genus *Fuscapex*. 773-776, *F. cabiochi*, THALASSA Z447. 777-780, *F. baptocephala*, MONACO st 1349, the two latter specimens from PORCUPINE 1870 st 17a. Scale line: 1 mm.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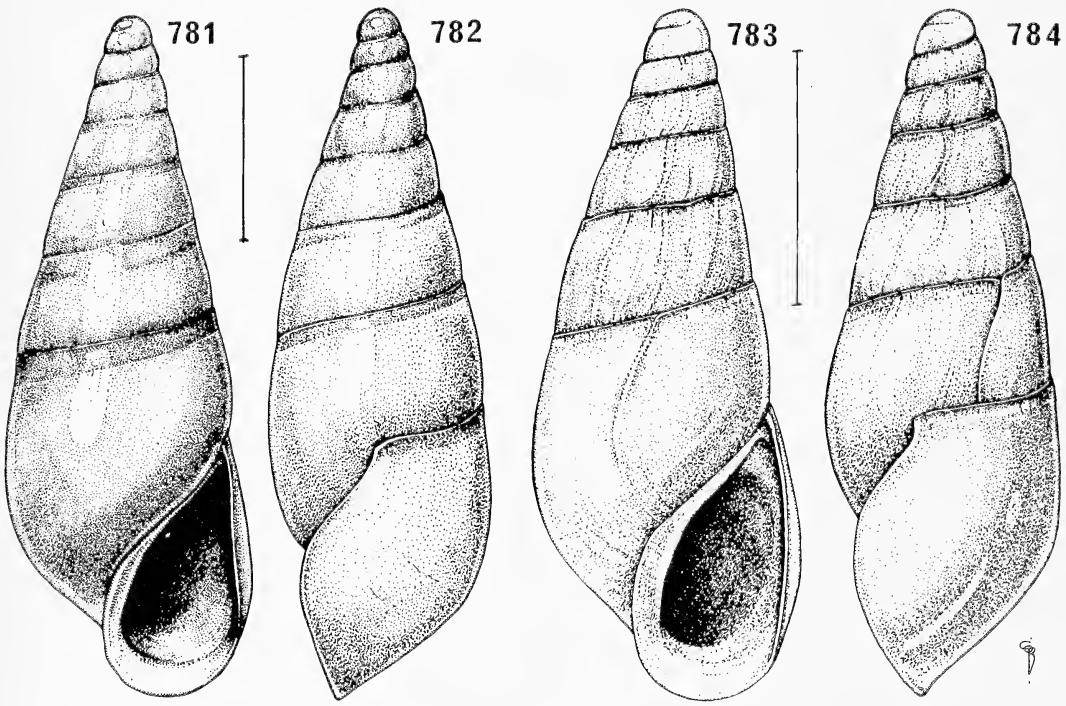
Description: Shell conical, thin, transparent, colourless except the dark brown larval shell. The larval shell consists of 2.7 perfectly smooth, slightly convex whorls with a darker subsutural zone. Its height is 400 μm. The holotype has 5.3 postlarval whorls, perfectly smooth, except 5-6 incremental scars at irregular intervals. The suture is very shallow and indistinct, less conspicuous than the false suture that demarcates a subsutural zone occupying about 1/5 of the height of the whorls. The aperture is rather high, with the outer lip and the columella running parallel for a short distance (seen from the front). The outer lip is slightly opisthocline with the most projecting part situated just below the middle of the height. The inner lip is distinctly reflected and there is a shallow umbilical furrow behind it. Parietal callus very thin but distinct.
Dimensions: Height of the holotype 3.72 mm, diameter 1.32 mm, height of the aperture 1.40 mm, breadth 0.59 mm.

Remarks: Fuscapex cabiochi differs from *F. baptocephala* by having a darker larval shell, less solid teleoconch and by having the lower corner of the aperture distinctly drawn out to the left.



Figs 781-784. *Fuscapex microcostellata*, PORCUPINE 1870, st 17-17a. The left specimen is the holotype. Scale lines: 1 mm.

Fuscapex microcostellata n.sp. Figs 781-784, 791

Type material: Holotype USNM 842105; paratype from the type locality BMNH 1970051.

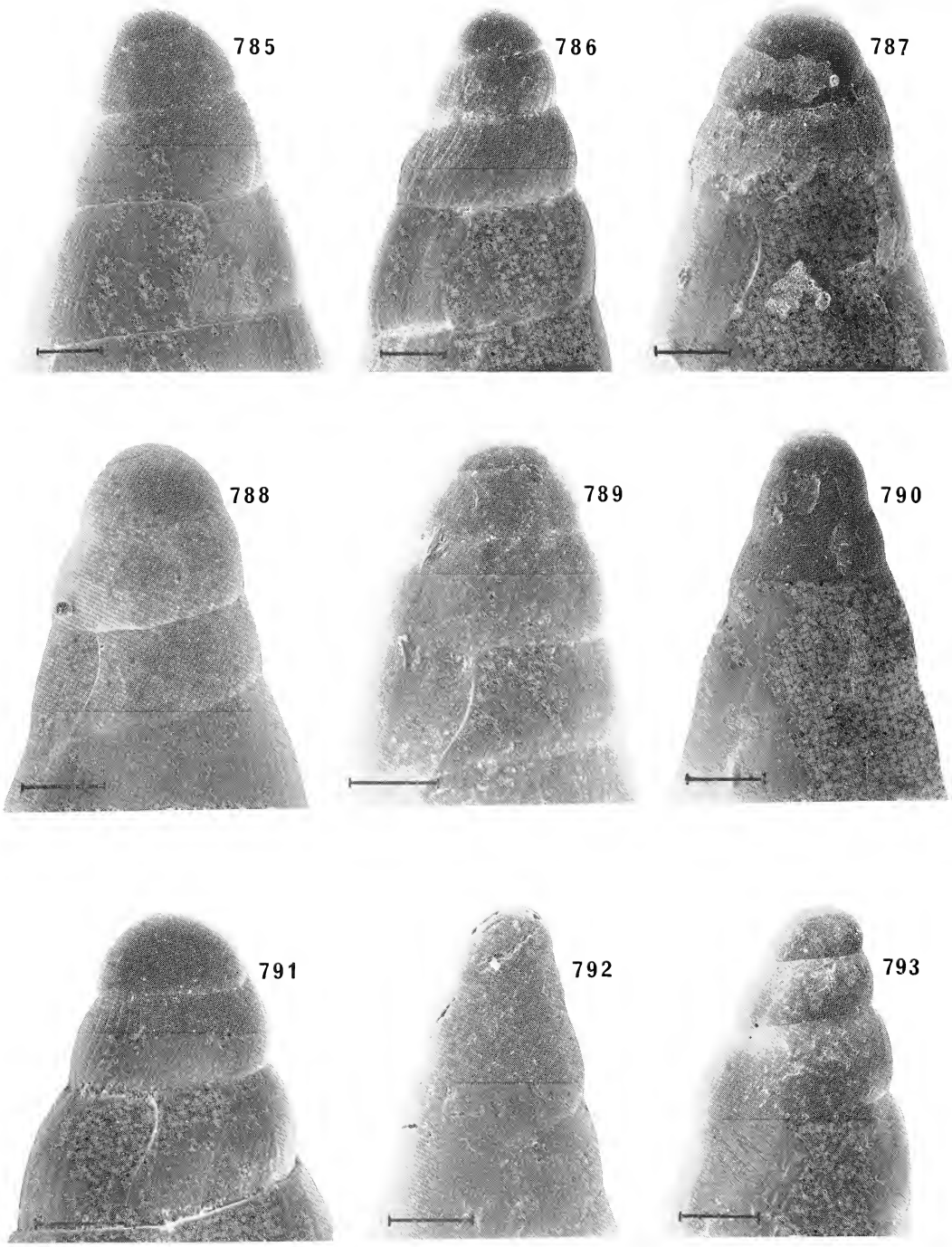
Type locality: PORCUPINE 1870 st 17a, 39° 39 N, 09° 39 W, 1355 m.

Material examined: The types and MONACO st 698, 39° 11 N, 30° 45 W, 1846 m, 1 spm; st 719, 39° 11 N, 29° 06 W, 1600 m, 6 shs; st 703, 39° 21 N, 31° 06 W, 1360 m, 1 sh; st 1349, 38° 36 N, 28° 06 W, 1250 m, 3 shs.

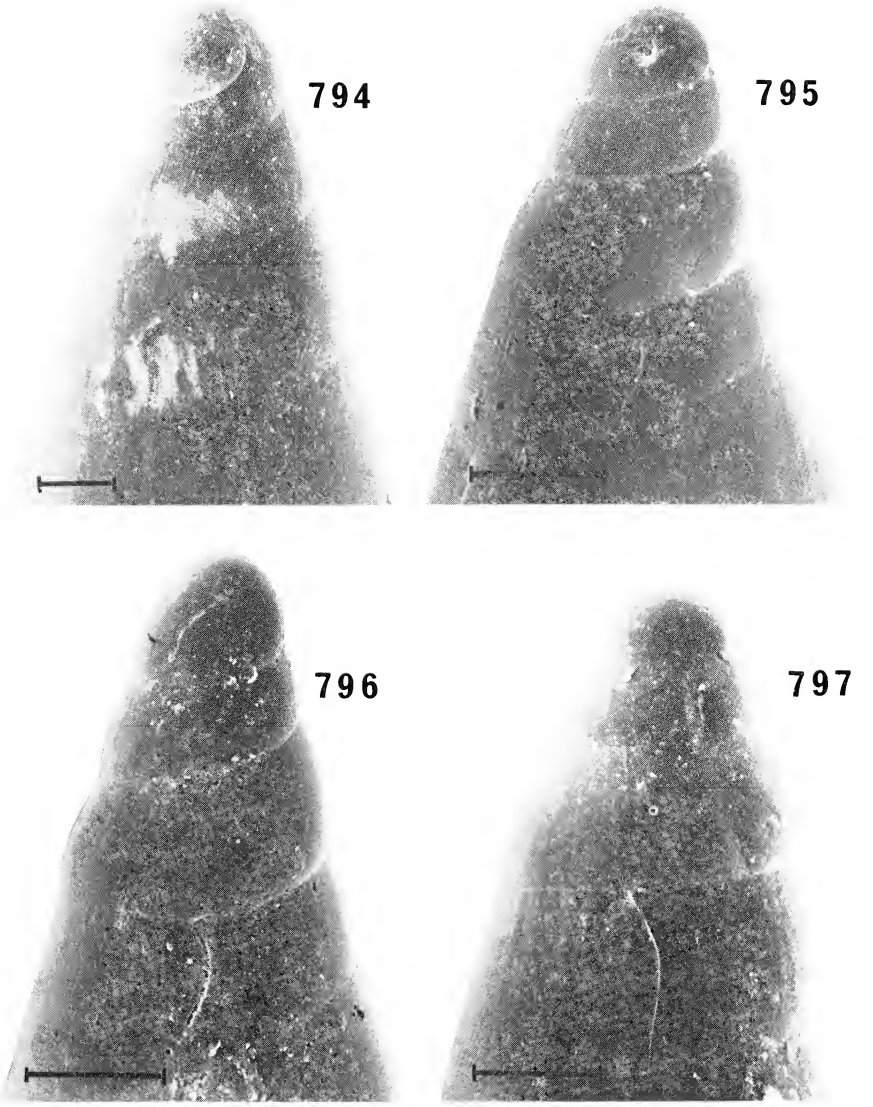
Distribution: Only known from the material examined, from the Azores and off Portugal, in 1250-1846 m.

Description: Shell short, rather broad, conically ovate, with a blunt apex. Larval shell not very well preserved, but brownish and the diameter is 240 μm, 200 μm from the tip. The shell consists of 7-8 whorls, including the larval shell. The apical whorls are distinctly convex, later whorls less so and the last three whorls almost perfectly flat. The whorls are sculptured by some sharp very thin axial lines and indistinct incremental lines. Suture indistinct. Incremental scars irregularly dispersed, indistinct. Aperture big, pear-shaped. Inner lip forming a thick deposit on the columella. Parietal callus distinct, but thin. Outer lip strongly opisthocline, meeting the suture at a blunt angle, and with its most protruding part situated at the midpoint of its height.
Dimensions: Height of the holotype 2.76 mm, diameter 1.04 mm, height of the aperture 1.34 mm, breadth 0.48 mm.

Remarks: Fuscapex microcostellata resembles rather much *F. talismani* but that species has more convex whorls, a less opisthocline outer lip and a considerably larger maximum size.



Figs 785-793. Apices of Eulimidae. 785, *Fuscapex major*, DISCOVERY st 7984. 786, *F. talismani*, THALASSA Z447. 787, *F. cabiochi*, THALASSA Z447. 788, *F. baptocephala*, THALASSA Z447. 789, *Batheulima fuscoapicata*, MONACO st 719. 790, *Rectilabrum lanceolatum*, INCAL DS03. 791, *Fuscapex microcostellata*, MONACO st 1342. 792, *Eulima dysnoeta*, holotype. 793, *E. grimaldii*, MONACO st 553. Scale line: 0.1 mm.



Figs 794-797. Apices of Eulimidae. 794, «*Eulima*» *devistoma*. 795, *Sticteulima lata*, paratype. 796, *S. jeffreysiana*, Adventure Bank. 797, *Eulima bilineata*, INCAL DS 03.

Genus *BATHEULIMA* Nordsieck, 1968

Type species: Eulima fuscoapicata Jeffreys, 1884, by original designation.

Remarks: Nordsieck introduced *Batheulima* as a subgenus of *Eulima*, for species with a brown larval shell, evidently unaware that *Eulima* also has a brownish larval shell. Nevertheless the generic name can be used because *E. fuscoapicata* was designated as type species, and there is a large number of deep water species that in several features resemble *B. fuscoapicata.* They have a vitreous fragile, shell with convex whorls, sculptured by fine, slightly sigmoid, oblique growth lines, a brown larval shell with sharp, very fine oblique axial riblets, a strongly projecting outer lip, and a somewhat irregular and squarish aperture.

No soft parts have been available for examination and no hosts are known.

The species included in *Batheulima* are easily separated from one another by their shape. *B. fuscoapicata* is about 3 times as high as broad, *B. abbreviata* and *B. thurstoni* are shorter than 2.75 times the diameter. Also the larval shells look quite different, *B. abbreviata* having a very blunt one, resembling those of *Fuscapex* (see figs 785-788) and *B. fuscoapicata* and *B. thurstoni* having larval shells that are more pointed and with about one whorl more (fig. 789). *Batheulima fuscoapicata* differs from *thurstoni* by having a more protruding outer lip and about one postlarval whorl more at the same size.

Batheulima abbreviata (Jeffreys, 1884) Figs 802-803

Eulima abbreviata Jeffreys, 1884: 370, pl. 28, fig. 7.

Type material: Two syntypes in BMNH.

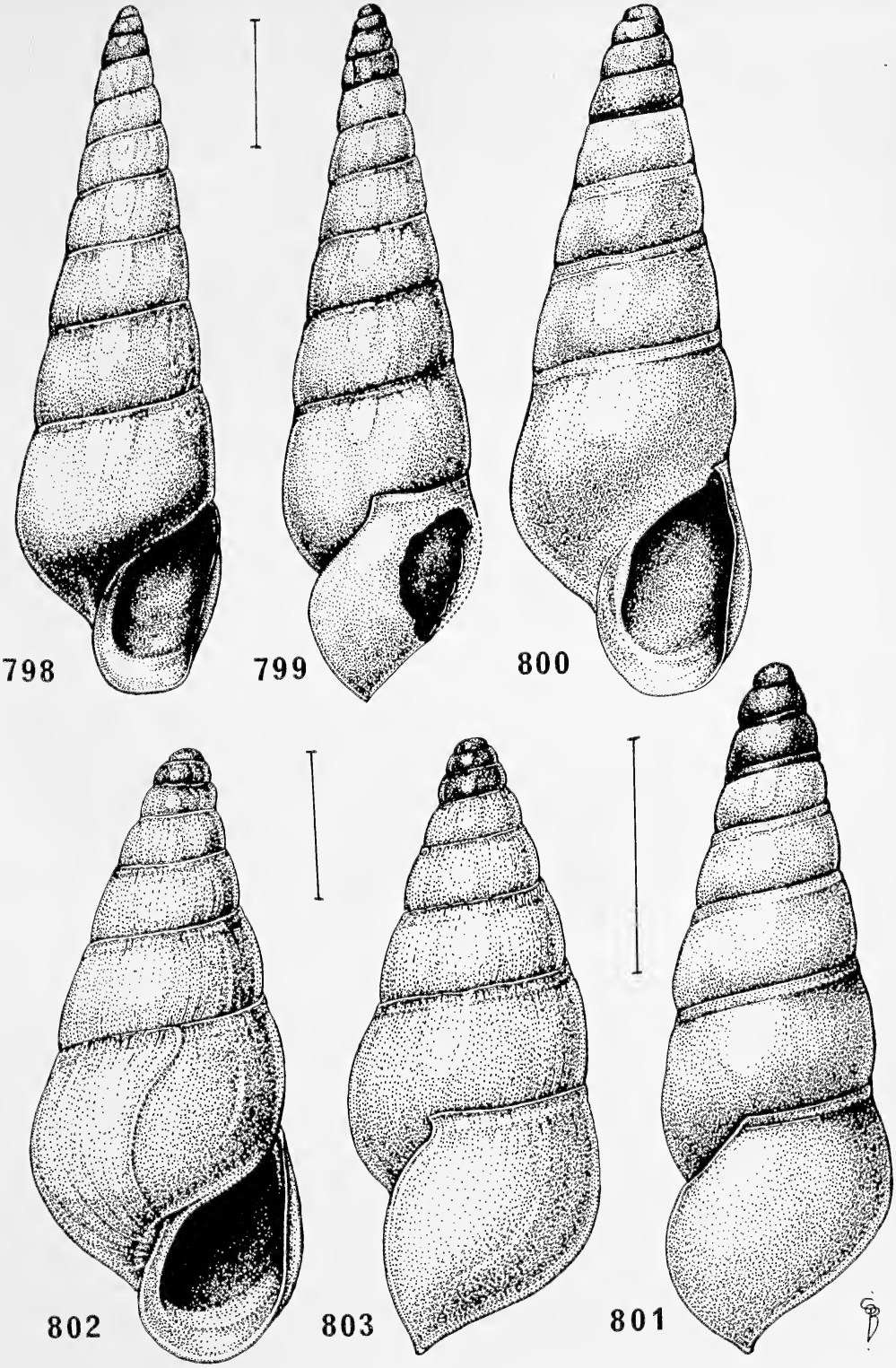
Type locality: PORCUPINE 1870 st 17a, 39° 39 N, 09° 39 W, 1355 m.

Material examined: The types and PORCUPINE 1870, st 17, 39° 42 N, 09° 43 W, 1100-2005m, 2 shs.

Distribution: Only known from the material examined, from off Portugal.

Remarks: The brown larval shell and broad, ovate shape make it easy to recognize *B. abbreviata.* The larval shell consits of 2.5 whorls and its height is 440 μm. The species of *Fuscapex* have a proportionally more slender shell and a more narrow aperture with a solid parietal callus.

Figs 798-803. Genus *Batheulima.* 798-801, *B. fuscoapicata*, PORCUPINE 1870, st 17-17a. 802-803, *B. abbreviata*, PORCUPINE 1870, st 17, coll. Sykes. Scale line: 1 mm.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Batheulima fuscoapicata (Jeffreys, 1884) Figs 789, 798-801

Eulima fuscoapicata Jeffreys, 1884:369, pl. 28, fig. 5.
Eulima fuscoapicata, Dautzenberg 1889:58, pl. 4, figs 4a-c.
Eulima apicofusca Locard, 1897:424 (unjustified emendation).

Type material: 3 Syntypes in BMNH.

Type locality: PORCUPINE 1870 st 17a, 39° 39 N, 09° 39 W, 1355 m, designated by Warén (1980).

Material examined: MONACO st 112, 38° 35 N, 28° 06 W, 1287 m, 2 spms; st 203, 39° 27 N, 30° 55 W, 1557 m, 4 spms; st 233, 38° 33 N, 28° 09 W, 1300 m, 1 sh; st 683, 38° 20 N, 28° 05 W, 1550 m, 1 sh; st 698, 39° 11 N, 30° 45 W, 1846 m, 6 spms; st 719, 39° 11 N, 29° 06 W, 1600 m, 10 spms; st 1349, 38° 36 N, 28° 06 W, 1250 m, 7 shs; PORCUPINE 1870 stns 16,17, 17a, 39° 39-55 N, 09° 39-56 W, 1100-2005 m, 37 spms; TRAVAILLEUR, off Cape Finisterre (SW bay of Biscay), no depth, 1 spm; USFC st 2415, 30°44 N, 79°26 W, 800 m, 1 sh; BIOGAS st CP 37, 47°34 N, 08°39 W, 2175 m, 1 sh.

Distribution: Only known from the material examined, from the Bay of Biscay, off Portugal, the Azores, and off SE US, 800 - 2175 m.

Remarks: B. fuscoapicata attains a height of 7.3 mm, but most specimens we have examined are 3-4 mm high. The slender shape, large brown larval shell with thin axial ribs (fig. 789) and squarish aperture with a flaring outer lip make it easy to identify. The larval shell, general shape and slightly convex whorls resemble *Eulima grimaldii* but *E. grimaldii* has a more slender aperture with an evenly arched, never flaring, outer lip.

Batheulima thurstoni n.sp. Figs 804-805

Type material: Holotype BMNH 1984167.

Type locality: DISCOVERY st 9541 (1), 20° 07 N, 21° 25 W, 3850 m.

Material examined: The holotype and WALVIS st DS06, 33° 24 S, 02° 33 E, 4585 m, 2 spms; DS07, 27° 00 S, 01° 07 E, 5157 m, 1 spm.

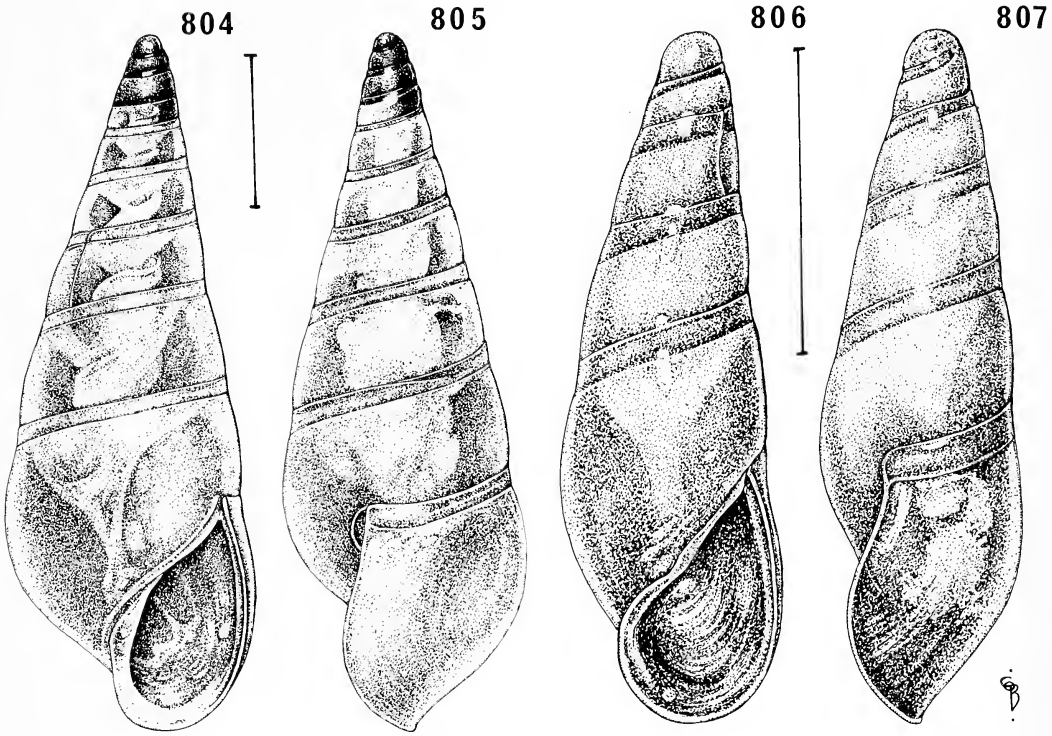
Distribution: Only known from the material examined, from W of Africa, in 3850-5157 m.

Description: Shell slightly rounded, conical, perfectly transparent, colourless except the larval shell which is dark brown. The larval shell consists of 2.5 distinctly convex whorls sculptured by slightly sigmoid, sharp axial lines. It is quite blunt and dark brown. The holotype has 6.0 teleoconch whorls, without a trace of sculpture, except the incremental scars, which are irregularly disposed, 1.0-1.25 whorls apart. Suture shallow and indistinct, dominated by the false suture. Outline of spire slightly concave. Aperture rather high and regularly rounded. Inner lip with a narrow umbilical fissure. Parietal callus thin but distinct. Outer lip slightly expanded, retracted at the suture, not very strongly protruding.

Dimensions: Height of the shell 4.36 mm, diameter 1.60 mm, height of the aperture 1.40 mm, breadth 0.84 mm.

Remarks: Batheulima thurstoni is only known from rather far to the south of the area discussed in this paper, but as it seems to be a decidedly abyssal species it is likely that it will occur also further to the north.

The dark brown, blunt larval shell with distinct axial sculpture make this species recognizable. The larval shell is more blunt than in *B. fuscoapicata*, but less blunt than that of *B. abbreviata.*



Figs 804-807. Genera *Batheulima* and *Haliella.* 804-805, *Batheulima thurstoni*, holotype. 806-807, *Haliella canarica*, holotype. Scale line: 1 mm.

Genus *HALIELLA* Monterosato, 1878

Type species: Eulima stenostoma Jeffreys, 1858, by monotypy.

Remarks: The genus *Haliella* is characterized by the tall, cylindrical, blunt shell with convex whorls and a very high aperture with a strongly twisted columella.

The genus contains a few species from deep water, closely resembling each other in shell morphology.

The anatomy has been investigated in *H. stenostoma* by Warén (1984a); the results below are based on better preserved material and discrepancies with the earlier description are due to this.

The animal has a short, broad foot, a slender operculum, no pedal appendages, cylindrical, slender tentacles but no eyes, no snout, no pallial tentacles. Gill and osphradium normal for the family. The alimentary canal consists of a muscular proboscis sheath, reaching half a whorl backwards in preserved specimens. Here a pair of retractor muscles attach and it splits into two branches. One of these two branches ends blindly after another quarter of a whorl. The other branch continues, in numerous tight coils, backwards for half a whorl, where there are two buccal ganglia. The oesophagus makes the normal loop through the nerve ring and continues to the stomach, which hardly can be distinguished from the digestive gland(s?). There is also a large «caecum» running backwards for a whorl or two in the extreme right corner of the whorls. About two thirds of the cephalopedal haemocoel is filled out by the anterior pedal gland. All specimens have a penis, only specimens larger than 5-7 mm have a pallial oviduct and serial sections show that specimens smaller than this size produce only spermatozoa in the gonad; at 5-7 mm they start to produce eggs and at a larger size they produce only eggs. Nevertheless it seems as if they are able to function as simultaneous hermaphrodites when full grown, because sperm from their earlier male phase is stored in the old seminal vesiculum, which now also functions as an ovarian duct and opens on a large papilla in the early pallial oviduct. Further down the pallial oviduct there is also a receptaculum seminis. The pallial oviduct is open throughout its course in the pallial cavity.

We assume that the specimens store previously produced sperm in the duct now functioning as the ovarian duct, because when bursae copulatrices occur in eulimids they consist of side pouches from the pallial oviduct and also because no change in structure of the walls of the seminal vesicle takes place when it starts to function also as ovarian duct. This simultaneous hermaphroditism can, of course, only continue as long as there is sperm left, because we have seen no sign of sperm production in these adult females.

In addition to the type species, *H. stenostoma* we describe a new species and report one or two other species known only from fragmentary specimens, in too poor a condition to be described. They differ considerably in shape from *H. stenostoma*, but the apex (when known) and the apertures are quite similar and they do not fit better in any other genus. They can be distinguished according to the key below:

A. Aperture 2.5-3.0 times as high as broad	*H. stenostoma* (p. 339)
A. Aperture 1.8-2.1 times as high as broad	B
B. Aperture broadest close to the lower edge	*H. canarica* (p. 340)
B. Aperture broadest in the middle	*Haliella* sp. (p. 341)

Haliella stenostoma (Jeffreys, 1858) Figs 808-811

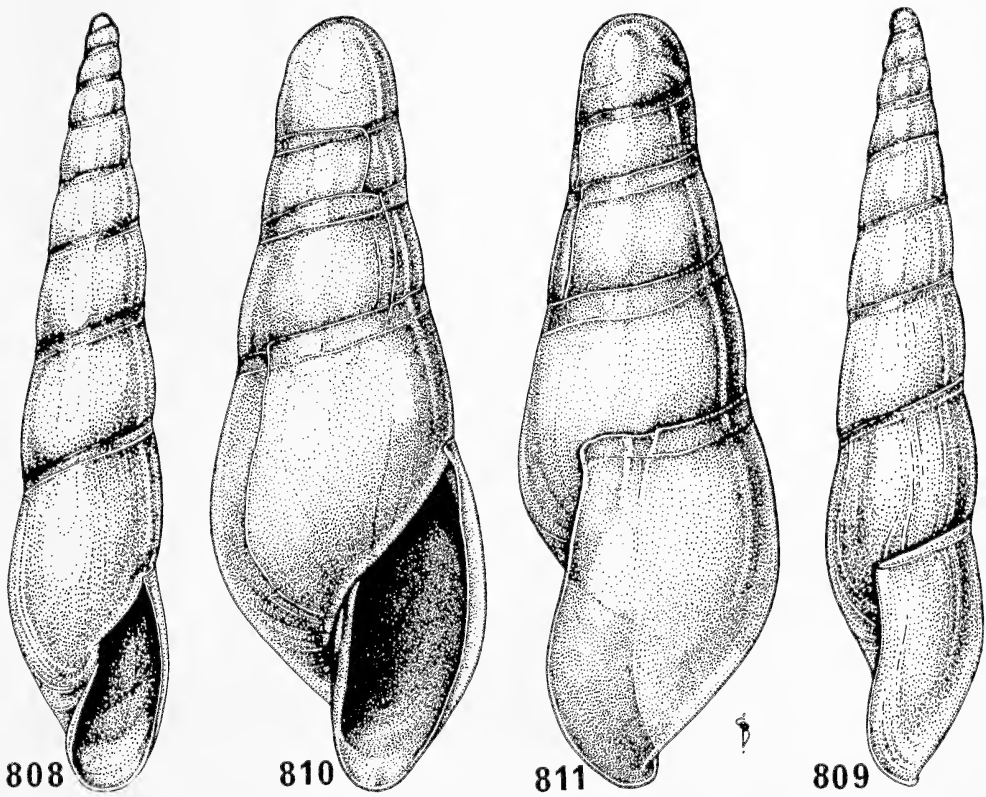
Eulima stenostoma Jeffreys, 1858:128, pl. 5, figs 7a-b.
Eulima geographica De Folin, 1887:204, pl. 3 figs. 9-10.

Type material: E. stenostoma, Holotype USNM 202094; *E. geographica*, one syntype in BMNH 1978 157.

Type localities: E. stenostoma, off Shetland, 90 fathoms; *E. geographica*, probably from the TALISMAN 1883, off Morocco, but the position and depth given by de Folin do not fit the station lists.

Material examined: The type material and about 220 samples with 800 spms from all parts of the distributional area.

Distribution: From Greenland and N Norway, in the fjords and the upper part of the continental slope, southwards along the European coasts, also the Mediterranean, south to the Canaries, also off E Canada and NE US, to off Cape Hatteras. The depth range is 50 (N Norway) to about 2500 m.



Figs 808-811. *Haliella stenostoma*, the Skagerrack, W. Sweden, 400m, 10.3 and 2.85 mm.

Remarks: Haliella stenostoma is the only eulimid where records in the literature can be trusted and it is perhaps the most easily identified of the shelled eulimids. The slender, cylindrical shape, very high aperture, the blunt apex and the thin, perfectly transparent shell contribute to this. It can be confused with *Halielloides ingolfiana* which also has a very blunt apex and cylindrical shape, but the latter has a lower aperture with an evenly curved columella.

The host of *H. stenostoma* is not known. One egg capsule was found in June 1974, in Kosterfjorden at the Swedish West Coast, 100 m. It is a simple, rounded sac with some sand grains attached to the smooth surface and it contained two young, 700 μm high. This is the same size as the smallest benthic stages we have observed and indicates non-planktotrophic larval development.

Haliella stenostoma reaches a maximum size of 12.5 mm in N Norway.

Haliella canarica n.sp. Figs 806-807

Type material: Holotype RMNH no. 55720.

Type locality: CANCAP st 4.060, 29° 48 N, 13° 45 W, 590 m.

Material examined: The holotype.

Distribution: Only known from the holotype, from the Canaries in 590 m.

Description: Shell small, conical, glossy, transparent, with a blunt apex and unusually broad, rounded base. The larval shell consists of slightly more than 1.0 very high whorl, and its height is 370 μm. The holotype has 3.5 postlarval slightly convex, very glossy whorls, connected by an almost invisible, very shallow suture. Subsutural zone distinct, occupying about 1/3 of the height of the whorls. No sculpture except 4 incremental scars, 1.2-0.8 whorls apart. Aperture rather high, very distinctly pear-shaped with columella and parietal wall forming a straight line. Outer lip orthocline, shallowly and broadly sinuated below the suture. Parietal callus and inner lip thin.

Dimensions: Height of the shell 2.24 mm, diameter 1.40 mm, height of the aperture 0.80 mm, breadth 0.40 mm.

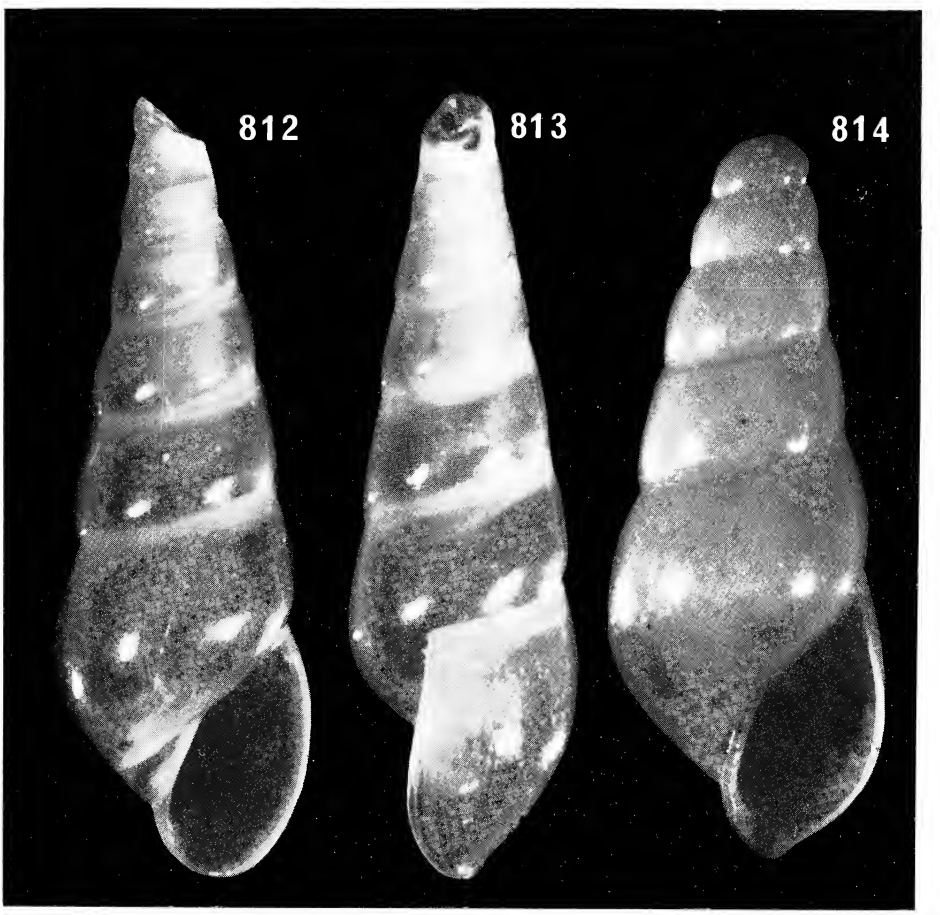
Remarks: The holotype is an empty, but perfectly preserved shell, and its characters are unique, so we are not hesitant to describe this species from a single empty shell. The outer lip is solid, so it can be concluded that the maximum size is probably not more than twice the size of the holotype.

The pear-shaped aperture, small size, twisted columella and blunt apex make this species easily recognizable.

Haliella sp.

In the Norman collection, in BMNH, we found a broken *Haliella* labelled 2200 m. This shell probably originates from the Travailleur or Talisman expeditions, but as there are two stations of this depth we can not give a locality. It differs from *Haliella stenostoma* by having a smaller larval shell, 270 μm across, 100 μm from the point, instead of 310 μm and the larval shell is brownish. The condition of the shell is too poor to allow more comparisons.

Another fragmentary specimen (Figs 812-813), possibly belonging to the same species, was taken by CHALLENGER II, st 14, 56° 45 N, 09° 46 W, 1770 m. It is a single live taken specimen, but most of the spire is missing. It differs from *H. stenostoma* by its larger apical angle, shorter aperture and slightly flatter whorls. The columella, however, is identical, although proportionally shorter.



Figs 812-814. Genera *Haliella* and *Halielloides*. 812-813, *Haliella* sp.n., CHALLENGER II, 5.56 mm. 814, *Halielloides* sp.n., TALISMAN st 42, 2.40 mm.

Genus *HALIELLOIDES* n. gen.

Type species: H. ingolfiana n.sp.

Diagnosis: Eulimids with a short, cylindrical shell, convex whorls, a strongly arched but only weakly opisthocline outer lip, an ovate aperture and reflected inner lip with a distinct umbilical fissure.

Remarks: This new genus is erected for a large group of deep water eulimids. So far only a single species is known from European waters, but several species have been described from the W Atlantic and we have examined several species from tropical deep water that should be referred to this genus.

No soft parts have been available for examination, although some of the specimens of *H. ingolfiana* were taken alive.

Some species of *Melanella* resemble *H. ingolfiana* in having a cylindrical shell and convex whorls, but they have a much shorter aperture. Among the European *Melanella* species the height of the aperture is less than 2.1 times the breadth, while the same value for *Halielloides ingolfiana* is 2.2.

Halielloides fragilis differs from the type species in having a shorter aperture, but the shape of the spire, cylindrical with distinctly convex whorls, is quite similar, and we have found no better place for this species.

Halielloides ingolfiana n.sp. Figs 815-818

Type material: Holotype and five paratypes from the type locality in ZMC.

Type locality: INGOLF st 90, 64° 45 N, 29° 06 W, 1070 m.

Material examined: The type material and: off Hammerfest, N Norway, 1 spm, ZMB; Trondheimsfjorden, W Norway, G.O. Sars leg, 6 spms, ZMO; off N Norway, 130-200 m, 2 shs, coll. AW; INGOLF st 78, 60° 37 N, 27° 52 W, 1505 m, 1 sh; st 98, 65° 38 N, 26° 27 W, 260 m, 1 sh; PORCUPINE 1870, st 16, 17, 17a, 39° N, 09° W, 1100-2005 m, 2 shs.

Distribution: From Norway and the Reykjanes Ridge to Portugal, in 150-1500 m.

Description: Shell blunt, cylindrical, colourless and transparent. The larval shell consists of 1.2 whorls, its diameter is about 530 μm and its height 590 μm. These whorls are slightly more convex than those of the teleoconch and demarcated from the teleoconch by a distinct scar. The holotype has 3.7 postlarval whorls, but the largest specimen examined (Trondheimsfjord) has 4.5 teleoconch whorls at a height of 4.2 mm. The whorls are unusually rounded, sculptured by indistinct growth lines running parallel to the outer lip and by distinct incremental scars about 3/4 of a whorl apart. The suture is deep and distinct and there is a narrow subsutural zone occupying about 1/10 of the height of the whorls. The aperture is high and rounded and somewhat drawn out, downwards and to the left. The columella is rounded with a reflected inner lip and a distinct umbilical furrow behind it. Parietal callus distinct, but not thick. Outer lip slightly opisthocline although strongly projecting at 2/5 of its height.

Dimensions: Height of the holotype 2.92 mm, diameter 1.04 mm, height of the aperture 1.10 mm, breadth 0.47 mm.

Remarks: Halielloides nitida (Verrill, 1884) (= *Eulimella nitida* Verrill, 1884 = *Eulima verrilliana* Bush, 1909) is very similar to the species described here, but seems to differ by having a more oblique aperture, weaker incremental scars and by reaching a larger size. We have figured a shell for comparison (fig. 819-820). It is not impossible that these two species finally will turn out to be synonyms, but from our experience of variation in other eulimids, known from richer material, it seems more likely that they actually constitute two distinct species.

Halielloides ingolfiana resembles slightly young specimens of *Haliella stenostoma*, but they have a proportionally higher aperture and the shape is less cylindrical in *H. stenostoma*. The species of *Fusceulima* have a somewhat similar cylindrical shell, but the height of their aperture never exceeds 2.0 times the breadth, while this relation in *H. ingolfiana* is 2.2.

Hallielloides fragilis n.sp. Figs 821-822

Type material: Holotype USNM 133140.

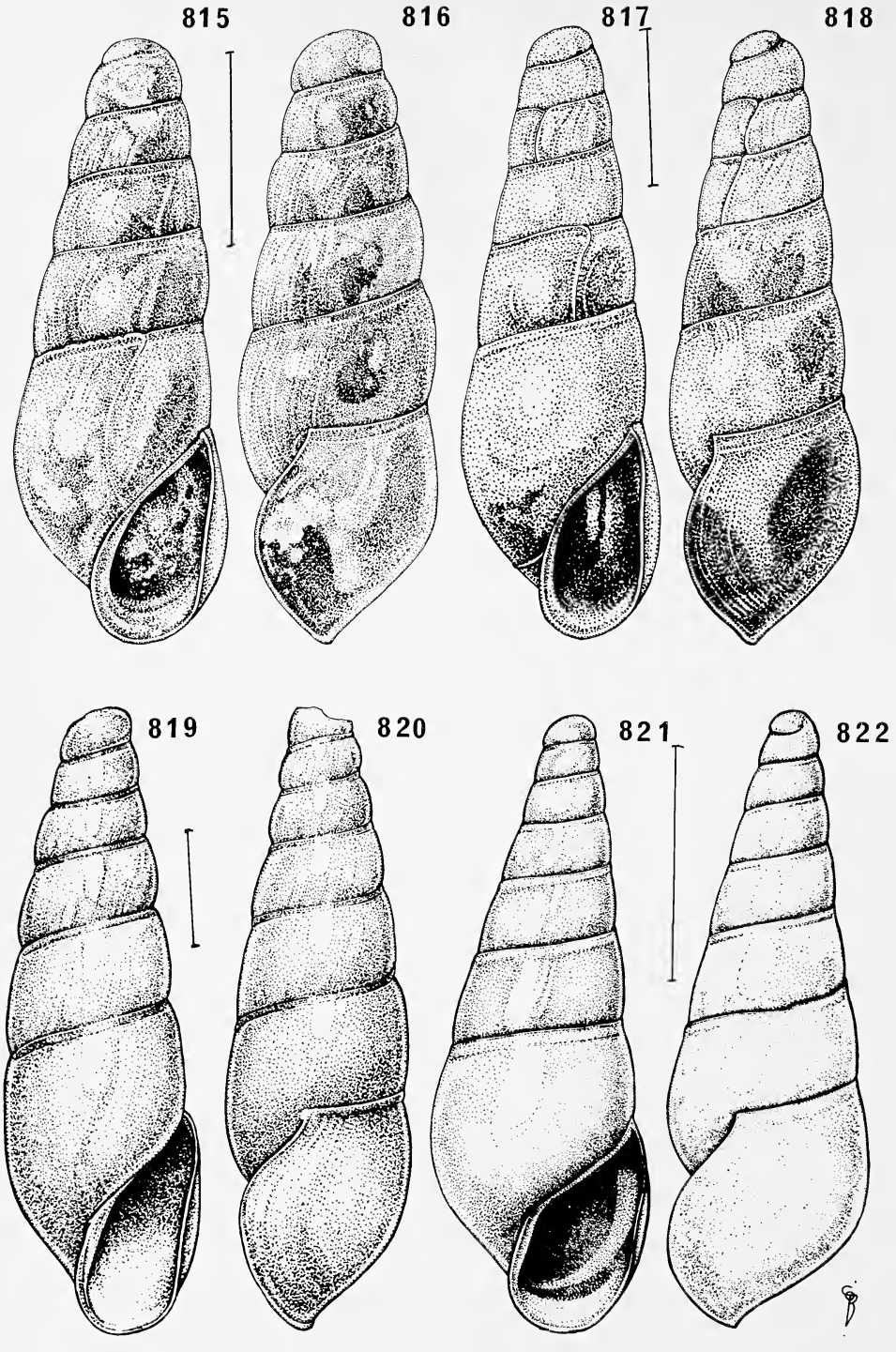
Type locality: PORCUPINE 1870 Adventure Bank, 55-167 m.

Material examined: The holotype and PORCUPINE 1870 st 6 or 24, 48° 26 N, 09° 44 W, 651 m or 37° 19 N, 09° 33 W, 531 m, 1 sh.

Distribution: Only known from the material examined, from the Mediterranean and the Atlantic, but the Atlantic locality is not very precise.

Description: Shell cylindrical, blunt, colourless, fragile with a somewhat rhomboid aperture. The larval shell consists of a little more than 2 cylindrical and blunt whorls of a height of 470 μm. The holotype has 4.7 postlarval whorls, slightly convex and without any sculpture. Incremental scars very indistinct, irregularly appearing 0.7-1.0 whorls apart. Suture very shallow and indistinct. Aperture slightly rhombic, evenly rounded in its lower part, also slightly excavated here. Columella solid, almost perpendicular, forming a distinct angle with the parietal wall. Only traces of parietal callus. Outer lip retracted at the suture, evenly arched with the most protruding part situated below its midpoint.
Dimensions: Height of the shell 2.72 mm, diameter 1.00 mm, height of the aperture 0.92 mm, breadth 0.50 mm.

Remarks: Halielloides fragilis resembles slightly *H. ingolfiana* in the shape of the shell and the aperture, but the diameter of the first whorl in *ingolfiana* is about 0.4 mm while it is 0.2 mm in *fragilis*. *Halielloides fragilis* also has flatter whorls, a less curved columella and no incremental lines. There is also some resemblance to *«Eulima» leptozona*, but *H. fragilis* has slightly lower aperture, more cylindrical shape and has no trace of colour pattern.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822

Hallielloides sp.

A single slightly broken shell from TALISMAN st 42, 30° 08 N, 14° 02 W, 2200 m, can not be referred to any eulimid species known to us. It is clearly referable to *Halielloides* from the shape, the blunt apex, presence of umbilical chink and the shape of the aperture. It gives an impression of being a young specimen, so we will not describe it, but figure it (fig. 814). It differs from *H. ingolfiana* in having a smaller larval shell (height 480 μm), less cylindrical shape and less convex whorls.

Genus *RECTILABRUM* n.gen.

Type species: R. lanceolatum n.sp.

Diagnosis: Eulimids resembling *Eulima* but with a colourless shell, shorter aperture; no radula, no eyes.

Remarks: Three specimens of the type species have been sectioned, but their preservation was not good and little information could be obtained. All specimens were males with a well developed penis, but in the two larger specimens (4-5 mm high shell) also some early stages of eggs were noticed in the gonad and a pallial oviduct had started to develop. The species is thus a protandrous (possibly also simultaneous) hermaphrodite. The foot is well developed. Head with tentacles, no eyes, no snout. Penis flattened, with the tip folded down along the left side (in relaxed, backwards folded position). Anterior part of proboscis sheath very muscular; posterior part much longer and thin-walled. No radula (verified by dissection). Buccal mass, salivary glands and buccal ganglia not identified, but tissues with structure resembling salivary glands were found; these may, however, belong to the proboscis sheath (as in *Haliella*). Anterior pedal gland reaching back into cephalopedal haemocoel, not very large, occupying only half the length of the cavity.

We have hesitated rather much before describing this new genus, but the single species included here does not fit any described genus. The shape of the shell is quite similar to several species of *Hypermastus* (Pilsbry), but the larval shells are totally different (figs 790 and 925), although both groups have planktotrophic development. In conchological features the genus *Rectilabrum* resembles *Eulima* more than any other genus, but the totally different alimentary canal prohibits a position in that genus.

In addition to the single species described here, we have seen several undescribed tropical deep water species that judging from the shell are candidates for a position in *Rectilabrum.*

The very straight outer lip (seen from the side) makes it easy to distinguish *R. lanceolatum* from all East Atlantic eulimids known to us.

Figs 815-822. Genus *Halielloides*. 815-816, *H. ingolfiana*, holotype. 817-818, *H. ingolfiana*, Trondheimsfjord, Norway. 819-820, *H. nitida*, off Chesapeake Bay, Virginia, USA, 2700 m. 821-822, *H. fragilis*, holotype. Scale line: 1 mm.

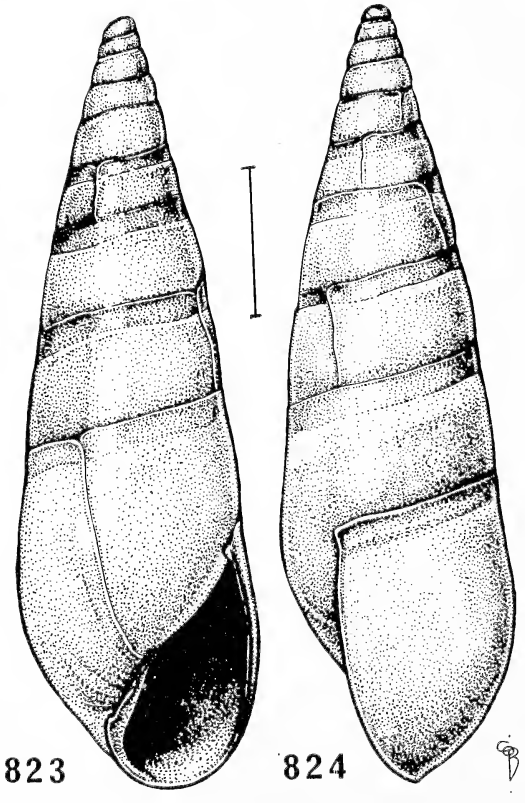
Rectilabrum lanceolatum n. sp. Figs 790, 823-824

Type material: Holotype in MNHN.

Type locality: BIOGAS st DS 57, 47° 31 N, 09° 07 W, 2906 m.

Material examined: BIOGAS st DS 50, 44° 09 N, 04° 16 W, 2124 m, 1 sh; DS 55, 47° 35 N, 09° 41 W, 4125 m, 1 spm; DS 60, 47° 27 N, 09° 07 W, 2742 m, 1 spm; DS 66, 47° 28 N, 09° 00 W, 3480 m, 1 sh; DS 75, 47° 28 N, 09° 08 W, 3250 m, 1 sh; DS 78, 46° 31 N, 10° 24 W, 4706 m, 1 spm; DS 82, 44° 25 N, 04° 53 W, 4462m, 1 spm; KG 208, 47°35N, 09°40W, 4130m, 1 spm; INCAL DS 01, 57°59 N, 10°40W, 2091m, 1 spm; DS 02, 57°59N, 10°49W, 2081m, 4 spms; ØS 03, 46°03N, 10°19W, 4798m, 2 spms; ØS 04, 46°04N, 10°12W, 4800m, 1 spm; WS 09, 47°28N, 09°40W, 4327m, 1 sh; CHALLENGER II st 2, 55° 04 N, 12° 33 W, 2857m, 1 sh; st 4, 56° 52 N, 10° 01 W, 1993m, 2 spms; st 11, 56°47 N, 10°08W, 1964m, 1 spm; st 14, 56°45 N, 09°46 W, 1770m, 1 spm; st 68, 58°42 N, 09°43W, 1800m, 1 spm; DISCOVERY st 9756(4), 50°04 N, 13°55 W, 3690m, 2 spms; ATLANTIS II 24, st 125, 37°25N, 65°52 W, 4825m, 1 spm.

Distribution: Only known from the material examined, from the bathyal and abyssal parts of the North Atlantic, both E and W sides.



Figs 823-824. *Rectilabrum lanceolatum*, holotype. Scale line: 1 mm.

Description: Shell straight, conical, slender, awl-shaped and colourless. The larval shell is not distinctly set off from the teleoconch, but the diameter of the first whorls is about 200 μm and the first three whorls are distinctly more convex than later whorls (fig. 790) which indicates planktotrophic larval development. A specimen of 5.6 mm has approximately 10 whorls, which are very smooth and flat. The suture is very shallow and indistinct; the false suture much more conspicuous. There are about 7 incremental scars, 1.2-0.7 whorls apart, made more conspicuous by the more solid and opaque shell formed just before the actual scar. Aperture high and slender with a straight columella distinctly inclined to the left. Outer lip slightly thickened and very straight. Almost no parietal callus.
Dimensions: (holotype) height 5.00 mm, diameter 1.50 mm, height of the aperture 1.44 mm, breadth 0.68 mm.
Operculum colourless, thin, tall, slender, with a distinct reinforcement rib, as in *E. bilineata.*
Soft parts, see description of genus.

Remarks: Nothing is known about the host of this species. It is, however, very characteristic and easy to recognize from the straight outer lip, flat whorls and the distinctly more opaque areas just in front of the incremental scars. The adult animal has no eyes, which is most unusual in gastropods assumed to have planktotrophic larval development, but a young specimen from INCAL DS01, with only 0.8 postlarval whorls, has a pigmented body and pigment spots centrally in the bases of the tentacles.

Genus *OPHIEULIMA* Warén & Sibuet, 1981

Type species: Stilifer minima Dall, 1927, by original designation.

Remarks: The type species is parasitic on *Ophiactis abyssicola* (M. Sars), and Warén (1981) described *O. fuscoapicata* from *Ophiactis profundi* Lütken & Mortensen, from Kermadec Islands, 1200 m. The two species have been found attached dorsally on their hosts.

The species of *Ophieulima* resemble those of *Stilapex* Iredale in having an inflated shell and in the habit of parasitizing ophiuroids but the shell of *Stilapex* is still more inflated, like that of *Pelseneeria*, their larval shells consists of less than two whorls, and all species known live on the oral side of the host.

A good way to recognize at least the two described species of *Ophieulima* is the sculpture of very fine incised spiral lines, but these are present only in perfect specimens.

Ophieulima minima Dall, 1927 — Figs 827-830, 832-833

Stilifer minima Dall, 1927:73.

Type material: Holotype and 2 paratypes USNM 108039.

Type locality: USFC st 2668, off S Georgia, 30° 58 N, 79° 38 W, 538 m.

Material examined: Listed by Warén & Sibuet 1981.

Distribution: From the S part of the Bay of Biscay to S Iceland, in 2100 - 1000 m, also in the W Atlantic (only the type locality).

Remarks: The species is quite variable (cf. figures) and the male is half the size of the female, but it is easily recognizable among the known eulimids from the N Atlantic. It could be confused with *Pelseneeria*, some species of which have a spiral sculpture of microscopical lines, but in *Pelseneeria* these lines are running parallel and closer to each other (fig. 995). Other distinguishing characters are the presence of cuticular spines on the penis in *Pelseneeria* and the columella which is well developed with a reflected inner lip in *Ophieulima* while it is thin and hardly reflected in *Pelseneeria.*

The larval shell consists of 3 brownish whorls, indicating planktotrophic larval development.

Genus *OPHIOLAMIA* Warén & Carney, 1981

Type species: O. armigeri Warén & Carney, 1981, by original designation.

Remarks: The type species was described from off Virginia (W Atlantic) in 4000 m, parasitic proximally on the underside of the arms of *Ophiomusium armigerum* (Lyman) (Ophiuroidea). One or two very similar species have since been found parasitizing Indo-Pacific species of *Ophiomusium* in the same way (unpublished). These species differ from most eulimids in having a rough, chalky shell surface (fig. 834). *O. armigeri* can be expected to occur in the area treated here.

The new species described below differs in shell-structure by having a very fragile, thin, polished shell, but the shape of the shell is similar to that of *O. armigeri.* It differs also by being a simultaneous hermaphrodite (separate sexes in *O. armigeri*) and its host is not known, so it may be a little bold to include the new species here, but the only other alternative would be to erect a new genus.

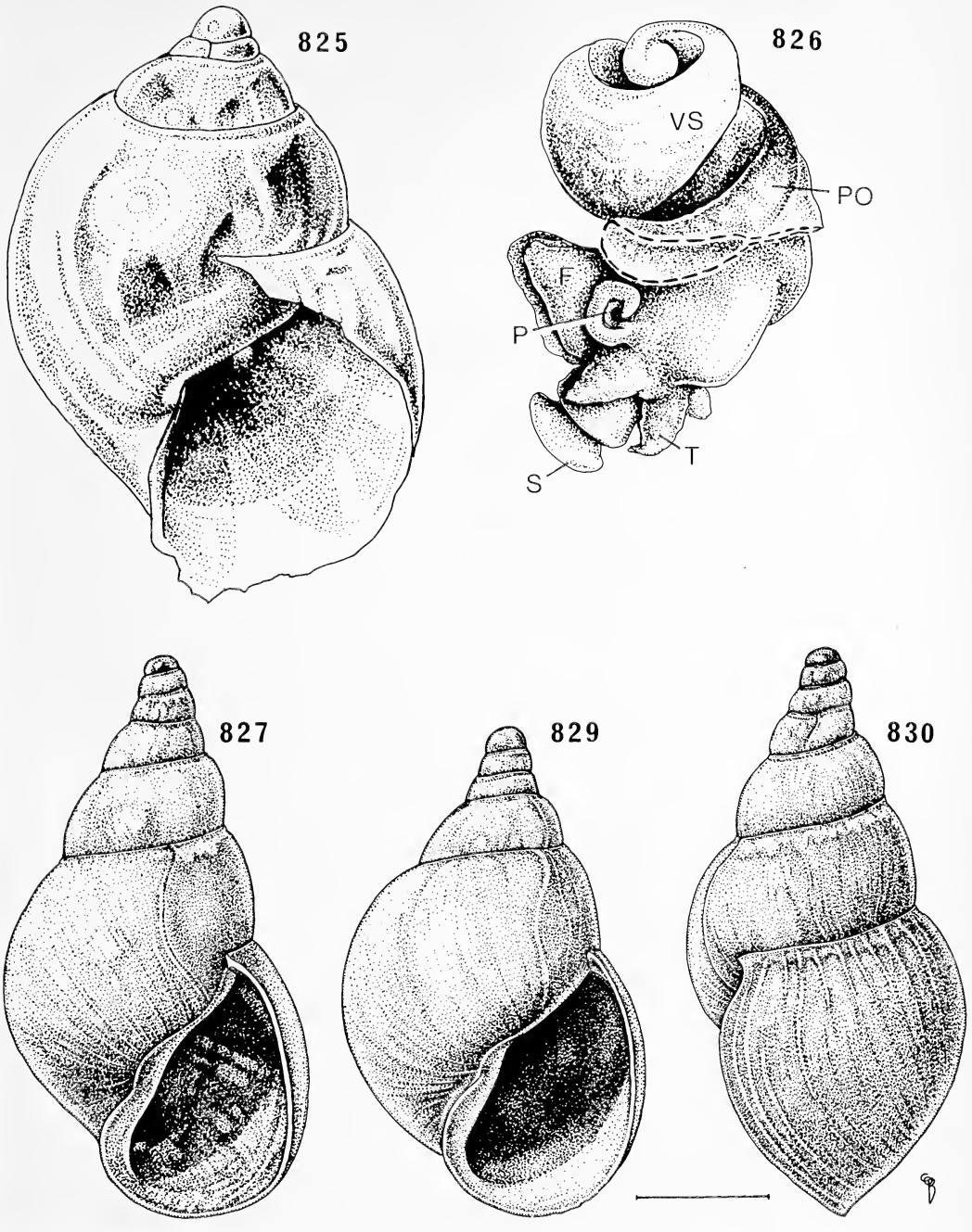
Ophiolamia (?) *fragilissima* n. sp. Figs 825-826, 831

Type material: Holotype RSM 1985012.2.

Type locality: CHALLENGER II st 6, 55° 03 N, 12° 29 W, 2900 m.

Material examined: CHALLENGER II st 10, 56° 37 N, 11° 04 W, 2540 m, 2 spms (serially sectioned); INCAL CP04, 56° 33 N, 11° 12 W, 2500 m, 1 spm (sectioned).

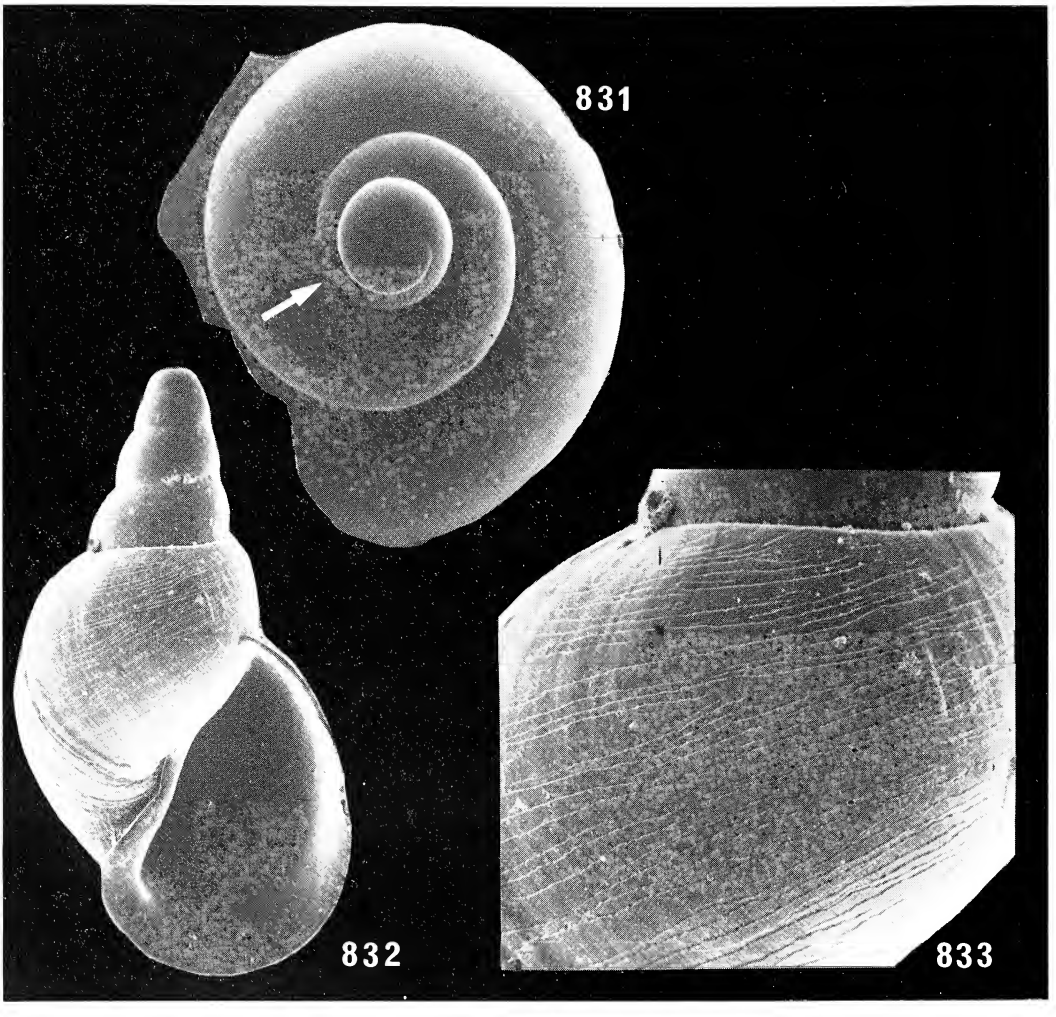
Distribution: Only known from the material examined, from W of Scotland, 2500-2900 m.



Figs 825-830. Genera *Ophiolamia* and *Ophieulima*. 825, *Ophiolamia fragilissima*, holotype, 2.3 mm. 826, *O. fragilissima*, soft parts. Mantle cut along the dashed line. F: foot, P: penis, PO: pallial oviduct, S: snout, T: tentacle, VS: visceral sac. 827-830, *Ophieulima minima*, paratypes. Scale line: 0.5 mm.

Description: Shell small, colourless, polished, ovate. The larval shell consists of 1.25 whorls, it is wart-shaped and unusually low. The holotype has 2.8 postlarval whorls of rapidly increasing diameter, but the INCAL-specimen probably had one whorl more. The subsutural zone is very narrow and inconspicuous. There is no sculpture except the distinct scar separating the larval shell from the teleoconch. The shell is extremely fragile and is cracked by the contraction of the drying soft parts. The aperture occupies slightly more than half the total height of the shell and is broad and ovate with a thin, slightly reflected inner lip on the columella, but no parietal callus.

Dimensions: Height of the shell 2.3 mm. Other measurements irrelevant because the aperture is partly crushed. The INCAL specimen may have been 3.0 mm high, but the body whorl was crushed.



Figs 831-833. Genera *Ophiolamia* and *Ophieulima*. 831, *Ophiolamia fragilissima*, INCAL CP04, diameter of larval shell 280 μm. Limit marked by a white arrow. 832-833, *Ophieulima minima*, THALASSA Z435, male, 1.41 mm. 833, body whorl of same specimen, x 145.

Figure 834. *Ophiolamia armigeri*, parasitic on *Ophiomusium armigerum*. From off Virginia, USA, 4000 m. Diameter of the host 11.2 mm.

Soft parts. The animal has a well developed foot with a thin, yellowish operculum that fills the whole aperture. There is a big cylindrical snout with a demarcated distal disc, probably used for attachement on the host, a pair of short, stout tentacles without eyes, a penis (unusually small) but no other appendages on the head-foot. All specimens also had an oviduct in addition to penis.

Remarks: Attempts were made to section three of the specimens, but the state of preservation was too poor to allow detailed study of the anatomy. It could be verified, however, that the species is a simultaneous hermaphrodite; both sperm and eggs being formed at the same time, but in different parts of the gonad.

All specimens were found free in the bottom material, as far as we know, which is unusual for species of eulimids of this shell shape and with a well developed snout. The systematic position in *Ophiolamia* is tentative, but there is no genus where the species fits well.

Among eulimids known from the Atlantic it could possibly be confused with *Pelseneeria* or *Ophieulima* but these species have a brownish larval shell (colourless in *O. fragilissima*) of at least two whorls and the shape of the shell is not so regularly ovate, but more pear- or apple-shaped. The shape of the shell is similar to *O. armigeri* as is also the shape of the larval shell, but that species has a rough surface of the shell with coarse incremental lines.

Genus *MELANELLA* Bowdich, 1822

Type species: Melanella dufresnei Bowdich, 1822, by monotypy.

Synonyms: Balcis Leach in Gray, 1847. Type species pending, application made to ICZN. *Eulimaustra* Laseron, 1955. Type species *Eulima proxima* Sowerby, 1866, by monotypy.

Remarks: Several species of *Melanella* are known to be parasites of holothurians (Warén, 1984a) both external and internal. Of the species treated here, only two have been found on hosts, *Melanella frielei* on *Mesothuria intestinalis* and *M. myriotrochi* on *Myriotrochus bathybius*. Of the species discussed here, the anatomy has been examined in *M. frielei, lucida, insculpta* and *charissa*. These species resemble each other closely, but the organization also resembles many other genera.

The head-foot is well developed, with a large operculum, a posterior pedal gland, an anterior pedal gland that invades the cephalo-pedal haemocoel, well developed propodium, and, at least in *M. frielei* the only one that has been examined alive, the animals are very mobile. Tentacles long, slender with eyes (when present) in the central part of each tentacle base. Proboscis simple, muscular, completely retractile. No snout. No radula or jaws. Buccal mass transformed to a short cylindrical muscular tube, bordered by the buccal ganglia and probably functioning as a pump. Oesophagus long, slender, very uniform from buccal ganglia to stomach. Male with large, flattened penis, often with the distal part enlarged. Female with open pallial oviduct, seminal receptacle, capsule gland and albumen gland and a small ciliated duct from the ovary to the albumen gland. Sexes separate, no indications of sex change noticed. Male about 2/3 of the size of the female.

The genus *Melanella* as it has been used here is, regarding shell morphology, a diverse group, but we have seen no possibility to split the group further. We have seen numerous species from other areas connecting the different shell types into a large, diverse pool of species, of which we know the morphology and ecology for a few species only. Certainly many of them will prove not to be related when more is known, but for a faunistic survey of an area we find it better to bring together a large number of poorly known species than to attempt to split them into groups on characters of uncertain validity.

The species of *Melanella* can be determined with this key:

A. Larval shell with more than 2.0 whorls	B
A. Larval shell with less than 2.0 whorls	C
B. Spire distinctly curved	*M. spiridioni* (p. 354)
B. Spire straight	*M. frielei* (p. 361)
C. Distinct axial ribs present (see figs 737-738)	D
C. No distinct axial ribs	G
D. Whorls distinctly convex, aperture low (20-22% of height)	*M. densicostata* (p. 367)
D. Whorls almost flat, aperture rather high (25-30% of height)	E
E. Whorls slightly convex	F
E. Whorls flat	*M. gagei* (p. 374)
F. Ribs 5-10 μm broad	*M. glypta* (p. 368)
F. Ribs on 5th teleoconch whorl 20-30 μm broad	*M. costellata* (p. 372)
F. Ribs on 5th teleoconch whorl 35-40 μm broad	*M. turbonilloides* (p. 372)

G. Inconspicuous but distinct and regular microsculpture present	H
G. No regular microsculpture	L
H. Microsculpture consists of axial lines	I
H. Microsculpture giving a more or less reticulated appearance (fig. 748)	K
I. Outer lip distinctly prosocline	*M. turrita* (p. 360)
I. Outer lip orthocline	J
J. Initial whorl distinctly pointed	*M. orphanensis* (p. 370)
J. Initial whorl evenly rounded	*M. microsculpta* (p. 378)
K. Diameter of larval shell less than 400 μm	*M. reticulata* (p. 364)
K. Diameter of larval shell 500 μm	*M. laurae* (p. 367)
L. Height of the aperture 30-35% of shell height	M
L. Height of the aperture 20-27% of shell height	O
M. Whorls distinctly convex	*M. martynjordani* (p. 360)
M. Whorls flat	N
N. Shell more slender than 1/3 of the height	*M. obtusoapicata* (p. 357)
N. Shell broader than 1/3 of the height	*M. pseudoglabra* (p. 358)
O. Larval shell strongly inflated (fig. 915)	*M. lucida* (p. 364)
O. Larval shell not strongly inflated	P
P. Whorls strongly convex (fig. 859)	*M. charissa* (p. 366)
P. Whorls slightly convex or flat (fig. 869)	Q
Q. Height of larval shell less than 400 μm	R
Q. Height of larval shell more than 400 μm	S
R. Whorls perfectly flat	*M. jeffreysi* (p. 370)
R. Whorls slightly convex	*M. similior* (p. 371)
S. Whorls perfectly flat	*M. planisutis* (p. 378)
S. Whorls convex	*M. insculpta* (p. 376)

Four species that probably belong to *Melanella* are not included in the key: *myriotrochi, doederleini, richardi* and *halorhaphe. Melanella doederleini* is perhaps a fossil species, but may be recognized by its stout, curved shape and large larval shell. *Melanella richardi* is only known from the original description, which seems to be enough to determine that it is not any of the species in the key, but which is insufficient for detailed comparison. *Melanella halorhaphe* is a rather large species, 10 mm high, is also only known from the original description and seems to be a *Melanella. Melanella myriotrochi* differs greatly by having convex whorls of rapidly increasing height and a large aperture. These species are figured in figs 839-840, 902-903 and 906-907.

Melanella spiridioni (Dautzenberg & Fischer, 1896) Figs 835-838, 923

Eulima spiridioni Dautzenberg & Fischer, 1896:464, pl. 19, fig. 25.
Eulima spiridioni, Dautzenberg 1927:167, pl. 5, fig. 3.

Type material: Lectotype, here selected, the figured specimen, in MOM; 5 paralectotypes in IRSN.

Type locality: MONACO st 703, 39° 31 N, 31° 06 W, 1360 m.

Material examined: The type material and MONACO st 203, 39° 27 N, 30° 55 W, 1557 m, 1 spm; st 213, 32° 23 N, 31° 25 W, 1384 m, 2 shs; st 233, 38° 33 N, 28° 09 W, 1300 m, 2 shs; st 553, 37° 43 N, 25° 05 W, 1385 m, 17 shs; st 578, 38° 26 N, 26°31W, 1165m, 2 shs; st 683, 38°20N, 28°05W, 1550m, 1 sh; st 703, 39°21N, 31°06W, 1360m, 1 sh; st 719, 39°11N, 30°24W, 1600m, 1 sh; st 1713, 28°04N, 16°50W, 1535m, 3 spms; off Pantelleria, 709m, 1 sh, BMNH; THALASSA st Z421, 48°23N, 09°34W, 950m, 1 sh; Z428, 48°27N, 10°50W, 850m, 1 sh; Z435, 48°40N, 09°53W, 1050m, 3 spms; PORCUPINE 1870 st 9, 48°06N, 09°18W, 981m, 1 sh (paratype of *E. glabra* Jeffreys).

Distribution: Only known from the material examined, from the Azores, the Mediterranean and the Bay of Biscay in 700 - 1600 m.

Remarks: We are very uncertain about placing *spiridioni* in *Melanella*; it resembles closely some of the small species of *Vitreobalcis*. In *Vitreobalcis*, however, the most protruding point of the outer lip is situated at or above the middle of its height while in *M. spiridioni* its position is well below this point. Another difference is that in *Vitreobalcis* the outer lip in a front view usually is quite straight for some distance below the suture; in *M. spiridioni* it is more curved. Moreover, the body-whorl of *Vitreobalcis* species is usually somewhat inflated compared to the whorls before. This, however, is not the case in *spiridioni*. Therefore we have placed *M. spiridioni* in *Melanella*, at least until more is known about it.

Melanella spiridioni resembles closely *Campylorhaphion famelicum*, but that species is more slender, has a less solid shell and the protoconch is cylindrical instead of conical as in *M. spiridioni*. Some of the shallow eulimids with curved shells may be confused with *M. spiridioni* but there is no species described that has as blunt larval shell (initial whorl diameter 140 μm) as *M. spiridioni*.

Melanella richardi (Dautzenberg & Fischer, 1896) Fig 839

Eulima richardi Dautzenberg & Fischer, 1896:463, pl. 19, fig. 18.
Eulima richardi, Dautzenberg 1927:164, pl. 5, fig. 4.

Type material: Lost? (not in MOM, MNHN, IRSN).

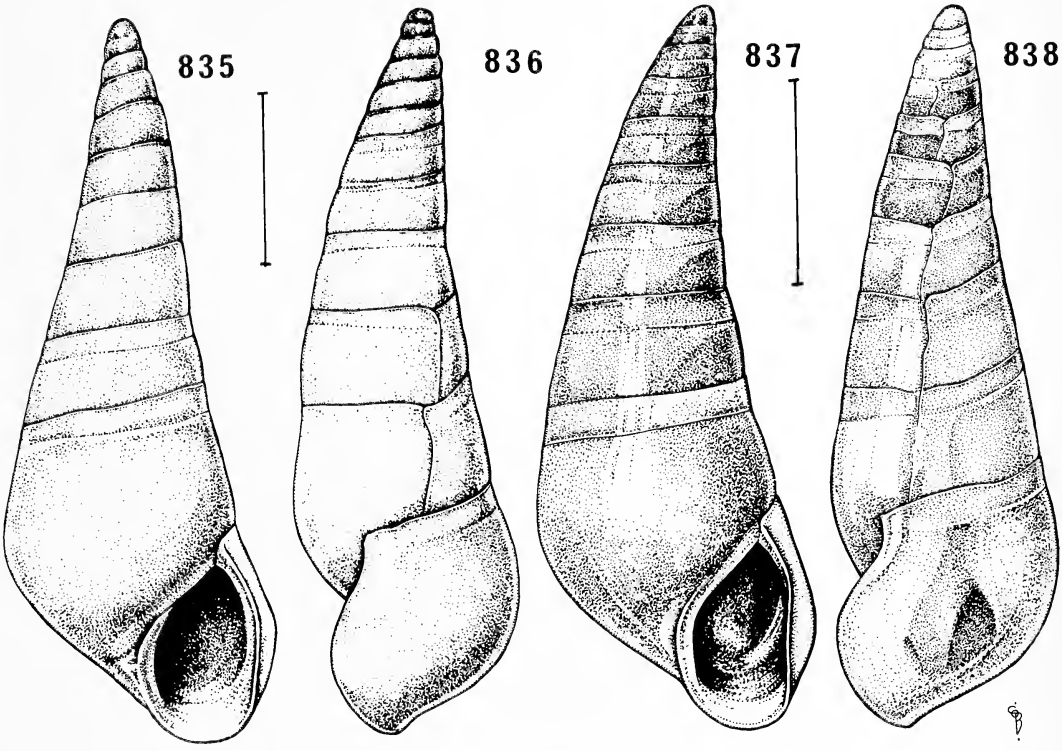
Type locality: MONACO st 553, 37° 43 N, 25° 05 W, 1385 m.

Material examined: None.

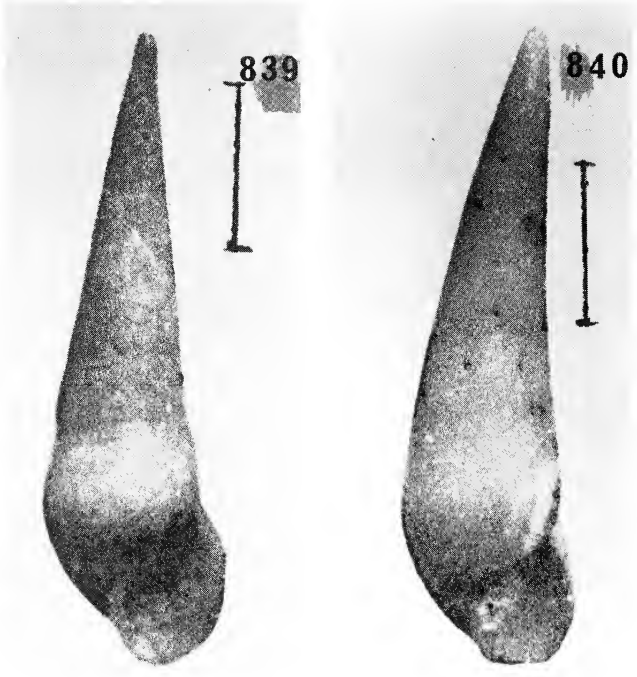
Distribution: Only known from the type locality, at the Azores.

Remarks: No type material could be found in MOM during repeated visits there and no material of this species exists in IRSN. Dautzenberg & Fischer listed st 233 in the original description, and that specimen was found in MOM, but proved to belong to an undescribed species, probably belonging to *Batheulima*, but too poor to classify with any certainty. The original description and figure was probably based on a species with outlines similar to *M. charissa* and *M. densicostata*, but with flatter whorls and no sculpture. The size was said to be 7 mm high. We can give no further information about this name, until a mollusc corresponding to the description is found.

Figure 839 is a reproduction of Dautzenberg's (1927) figure.



Figs 835-838. *Melanella spiridioni*, MONACO st 553 and PORCUPINE 1870 st 28-28a respectively. Scale line: 1 mm.



Figs 839-840. Genus *Melanella*. 839, *M. richardi*, syntype, 7 mm. 840, *M. halorhaphe*, holotype, 10 mm. From Dautzenberg 1927, plate 5, figs 4 and 5.

Melanella halorhaphe (Dautzenberg & Fischer, 1896) Fig 840

Eulima halorhaphe Dautzenberg & Fischer, 1896:462, pl. 19, fig. 26.
Eulima halorhaphe, Dautzenberg 1927:168, pl. 5, fig. 5.

Type material: not found (not in MOM, MNHN, IRSN).

Type locality: MONACO st 234, 39° 02 N, 27° 55 W, 454 m.

Material examined: None.

Distribution: Only known from the type locality in the Azores.

Remarks: We have not seen the type of this species nor a specimen to which the description can be applied. It is large and distinctly curved. From the original figure (here fig. 840) it seems to have very flat whorls, but this may also be a result of the figure having been cut out for mounting the plate (cf. figs 1 and 2 in Dautzenberg's (1927) work, the same plate, where some black background is still visible).

Melanella obtusoapicata nom. nov. Fig 843

Eulima obtusa Jeffreys, 1880:317, *nom. nud.* (Not de Folin, 1870:211)
Eulima obtusa Jeffreys, 1884:370, pl. 28, fig. 10.

Type material: Holotype BMNH 1885.11.5.2074.

Type locality: PORCUPINE 1870 st 17a, 39° 39 N, 09° 39 W, 1355 m.

Material examined: THALASSA st X343, 44° 07 N, 04° 39 W, 630 m, 2 spms; PORCUPINE 1870 st 17a, as above, 3 shs.

Distribution: Only known from the two records above, off Portugal and N Spain in 1355-630 m.

Remarks: Jeffreys' name has to be replaced because of homonymy with a species described 13 years earlier by De Folin.

Jeffreys' (1884) records from PORCUPINE 1870 st 55 and from Malta are erroneous. The specimens (in USNM) belong to *Haliella stenostoma.* The specimens from TRAVAILLEUR 1880 (Jeffreys 1880) seem to be lost, and we consider this record dubious.

Melanella obtusoapicata resembles closely *M. pseudoglabra*, but that species is proportionally broader and has a less cylindrical shape. The outer lip is more strongly projecting in *M. obtusoapicata* than in *M. pseudoglabra.* The two specimens known of *M. obtusoapicata* are about 4 mm high and at this size they resemble males of *M. frielei.* For differences, see under that species. *M. obtusoapicata* also resembles *M. martynjordani*, but that species has distinctly convex whorls and a less projecting outer lip.

The larval shell resembles that of *M. jeffreysi*, but has a third of a whorl less and is proportionally lower.

Melanella pseudoglabra (Dautzenberg & Fischer, 1912) Figs 844-845, 917

Eulima glabra Jeffreys, 1884:367, pl. 28, fig. 2, not *Eulima glabra* (Da Costa, 1778).
Eulima pseudoglabra Dautzenberg & Fischer, 1912:253.

Type material: Holotype BMNH 1885.11.5.2032.

Type locality: PORCUPINE 1870 st 17, 39° 42 N, 09° 43 W, 1110-2005 m.

Material examined: The holotype and THOR 1906, 43° 37 N, 02° 08 W, 480-1500 m, 1 sh; THALASSA Y378, 41° 31 N, 09° 16 W, 1000 m, 1 spm.

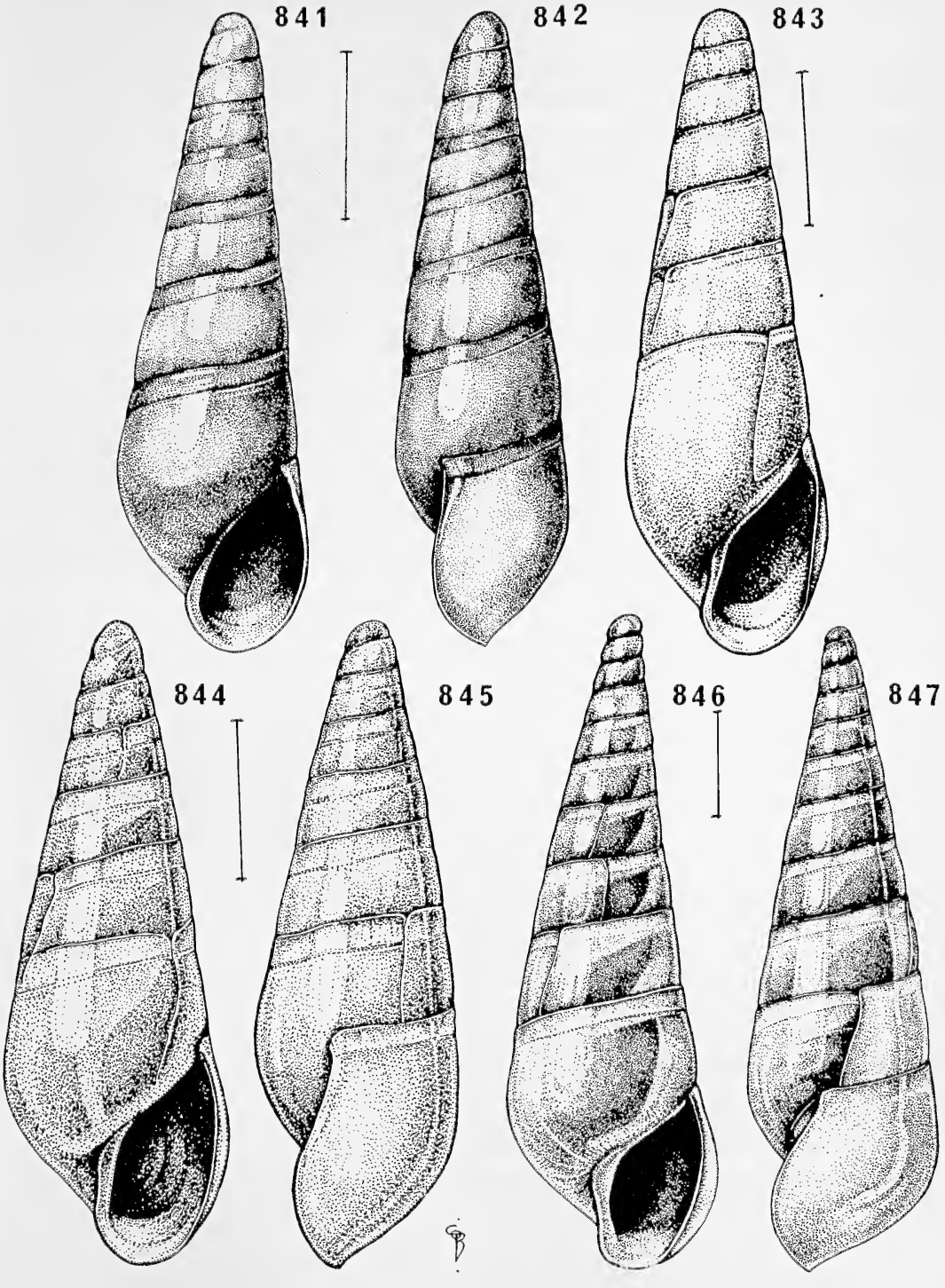
Distribution: Only known from the material examined, from off Portugal and N Spain, on the continental slope.

Remarks: Melanella pseudoglabra resembles closely *M. frielei*, but the latter has a much more pointed apex, a smoother shell and the animal of *frielei* has big, black eyes, while *M. pseudoglabra* has no eyes. It also resembles *Melanella turrita*, but *M. turrita* has a slightly curved spire, a strongly projecting outer lip and the initial whorl is strongly inflated.

The larval shell resembles that of *M. martynjordani*, but that species is more slender and cylindrical and has a more pear-shaped and broader aperture.

Jeffreys (1884) also recorded *M. pseudoglabra* from PORCUPINE 1870 st 9. We have examined the specimen and it proved to belong to *M. spiridioni.* The few details in the original description of *glabra* that fit this specimen also fit the specimen from st 17; the drawing was prepared from the specimen from st 17, and this was the specimen given to British Museum glued on a piece of black paper, while the specimen from st 9 was kept by Jeffreys in his own collection. We have therefore regarded the specimen from st 17 as holotype.

Figs 841-847. Genus *Melanella*. 841-842, *M. martynjordani*, USNM 133130. 843, *M. obtusoapicata*, holotype. 844-845, *M. pseudoglabra*, syntype. 846-847, *M. turrita*, holotype. Scale line: 1 mm.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Melanella martynjordani (Jordan, 1895) Figs 841-842, 913

Eulima martyn-jordani Jordan, 1895:266, pl. 16, fig. 5.
Eulima martyni Kobelt, 1903:183 (unjustified emendation).

Type material: Holotype in NMW.

Type locality: 80-90 miles N of Butt of Lewis, Outer Hebrides, 900 m.

Material examined: The type and: TRAVAILLEUR 1880, no loc., 1 sh, USNM 133130; PORCUPINE 1870 st 17, 39° 42 N, 09° 43 W, 1100-2005 m, 2 shs; THALASSA Z407, 47° 44 N, 08° 07 W, 1100 m, 1 spm; Z 435, 48° 40 N, 09° 53 W, 1050 m, 2 shs; Z 442, 45° 55 N, 11° 02 W, 975 m, 1 sh; LAGARDERE Gch 76, 44° 33 N, 02° 16 W, 1020 m, 1 sh.

Distribution: Only known from the material examined, off the European Atlantic coast, in about 1000 m.

Remarks: Melanella martynjordani has strongly reduced eyes, visible as small black dots about 5 μm diameter.

Melanella martynjordani resembles closely *M. orphanensis* and *M. similior*, but the outer lip of these two species is strongly projecting in its lower part and not sinuated below the suture, but connects to it at a right angle. It also resembles young specimens of *M. lucida* and *charissa*, but these two species have a strongly projecting outer lip and very convex apical whorls. *Melanella obtusoapicata* and *pseudoglabra* have flatter whorls than *M. martynjordani.*

The larval shell of *M. martynjordani* resembles that of *M. orphanensis*, but has 1/4 of a whorl less and is less pointed.

Melanella turrita n. sp. Figs 740, 846-847

Type material: Holotype in MNHN.

Type locality: Off the Norwegian coast, 63-64° N, in 200-400 m.

Material examined: The holotype.

Distribution: Only known from the type locality.

Description: Shell high, conical, slightly concave, slightly bluish transparent. The larval shell consists of 1.5 whorls, of which the first one is strongly convex and partly of larger diameter than the following one. Its height is 430 μm. The holotype has 8.5 postlarval whorls. The whorls are slightly convex and sculptured by thin, sharp, indistinct, slightly curved incremental lines which in some places on the upper whorls give the edge of the whorls, at the suture, a serrated appearance. There are 8 incremental scars with irregular intervals of 0.5-2 whorls. The

aperture is short, rounded and broad. Outer lip strongly opisthocline and joining the suture at an obtuse angle. Its most projecting part situated at the lower 1/5 of the height. Columella slightly curved and forming a strong curve over to the parietal wall, which is covered by a distinct callus.
Dimensions: Height of the shell 6.10 mm, diameter 1.90 mm, height of the aperture 1.60 mm, breadth 0.88 mm.

Remarks: Melanella turrita has no eyes. The larval shell resembles that of *M. lucida*, but *M. lucida* has a less protruding, orthocline outer lip, higher apical whorls and more convex whorls in the teleoconch. *Melanella frielei* which can be expected to occur with *M. turrita* has eyes, a straight columella and a smaller larval shell.

Melanella frielei (Jordan, 1895) Figs 848-852, 920

Eulima intermedia, G.O. Sars 1878:210, pl. 11, fig. 20 (not Cantraine, 1835).
Eulima frielei Jordan, 1895:266, pl. 16, fig. 6.
Eulima xiphidiopsis Dautzenberg & Fischer, 1896:464, pl. 19, fig. 19.
Eulima anceps Marshall, 1901:124.
Eulima anceps, Sykes 1903:348, pl. 14, fig. 8.
Eulima frielei, Sykes 1903:350, pl. 14, figs 5, 9.
Eulima xiphidiopsis, Dautzenberg 1927:164, pl. 5, fig. 6.

Type material: E. frielei, holotype in NMW; *E. xiphidiopsis*, lectotype, here selected, the specimen figured by Dautzenberg & Fischer, in MOM; one paralectotype in IRSN; *E. anceps*, 3 syntypes in NMW.

Type localities: E. frielei, 80-90 miles N of Butt of Lewis, Outer Hebrides, 900 m; *E. xiphidiopsis*, MONACO st 553, 37° 43 N, 25° 05 W, 1385 m; *E. anceps*, off Arran, Scotland, 55 m.

Material examinated: The type material and about 450 spms from N, W and SW Norway and the Skagerrack, ZMB, TM, ZMO, SMNH, coll. AW; INCAL DS03, 57°26 N, 11°04 W, 614 m, 7 spms; DS 04, 57°23 N, 11°07 W, 619 m, 1 spm; THALASSA X343, 44°07 N, 04°39 W, 630 m, 2 shs; CANCAP st 2065, 28°11 N, 13°57 W, 670 m, 1 sh; st 4063, 28°49 N, 13°42 W, 875 m, 1 sh; «Palermo», 8 spms, ZMR; Adventure Bank, 92 fms, 2 shs, coll. Sykes, BMNH; off Calvi, Corsica, 70-150 m, 4 spms, coll. AW; off W Italy, 1 sh, coll. Taviani; off Cap Sicié, S France, 1 spm, coll. Gofas; Shetland, Hebrides, Guernsey, Exmouth, Gulf of Naples, Mediterranean 72-100 m, coll. Jeffreys, USNM.

Distribution: From N Norway, along the continental shelf and upper slope, into the Mediterranean, and southwards to the Canaries, in Scandinavia in 30-700 m, southwards deeper, down to 1300 m. It is an ecto- and endoparasite on *Mesothuria intestinalis* (Ascanius).

Remarks: Melanella frielei is sometimes found attached by its proboscis on specimens of *Mesothuria intestinalis* taken by trawl. Host specimens taken by dredge, where they are more or less damaged by heavy bottom material are free from the parasites, but *E. frielei* is often found free in such dredge hauls. The snail is also often found in the body-cavity or buried in the skin of this holothurian. In laboratory experiments it readily reattaches to specimens of *Mesothuria* kept in tanks, while it proved impossible to get it to parasitize *Bathyplotes natans* (M. Sars), *Stichopus tremulus* (Gunnerus), *Cucumaria lactea* (Forbes), *C. hyndmanni* (Thompson), *Thyone fusus* (O.F. Müller) and *Psolus phantapus* (Strussenfeld).

Two specimens taken May 9th., 1974, in 150 m, at the Swedish Coast deposited two egg capsules in the jar with sea-water where they were left overnight. Each capsule contained about 150 eggs of a diameter of 100 μm. The capsule consists of an outer smooth wall and an inner wall sculptured by undulating lines. These lines radiate from an «umbilical string» by which the inner wall is attached in the outer one. The capsule is oval and on the surface of the inner capsule that is directed away from the «umbilical area» the lines run longitudinally.

The height of protoconch I is 160 μm, the height of the whole larval shell 500 μm; this and the egg size clearly indicates palnktotrophic larval development.

The animal has two big, black eyes.

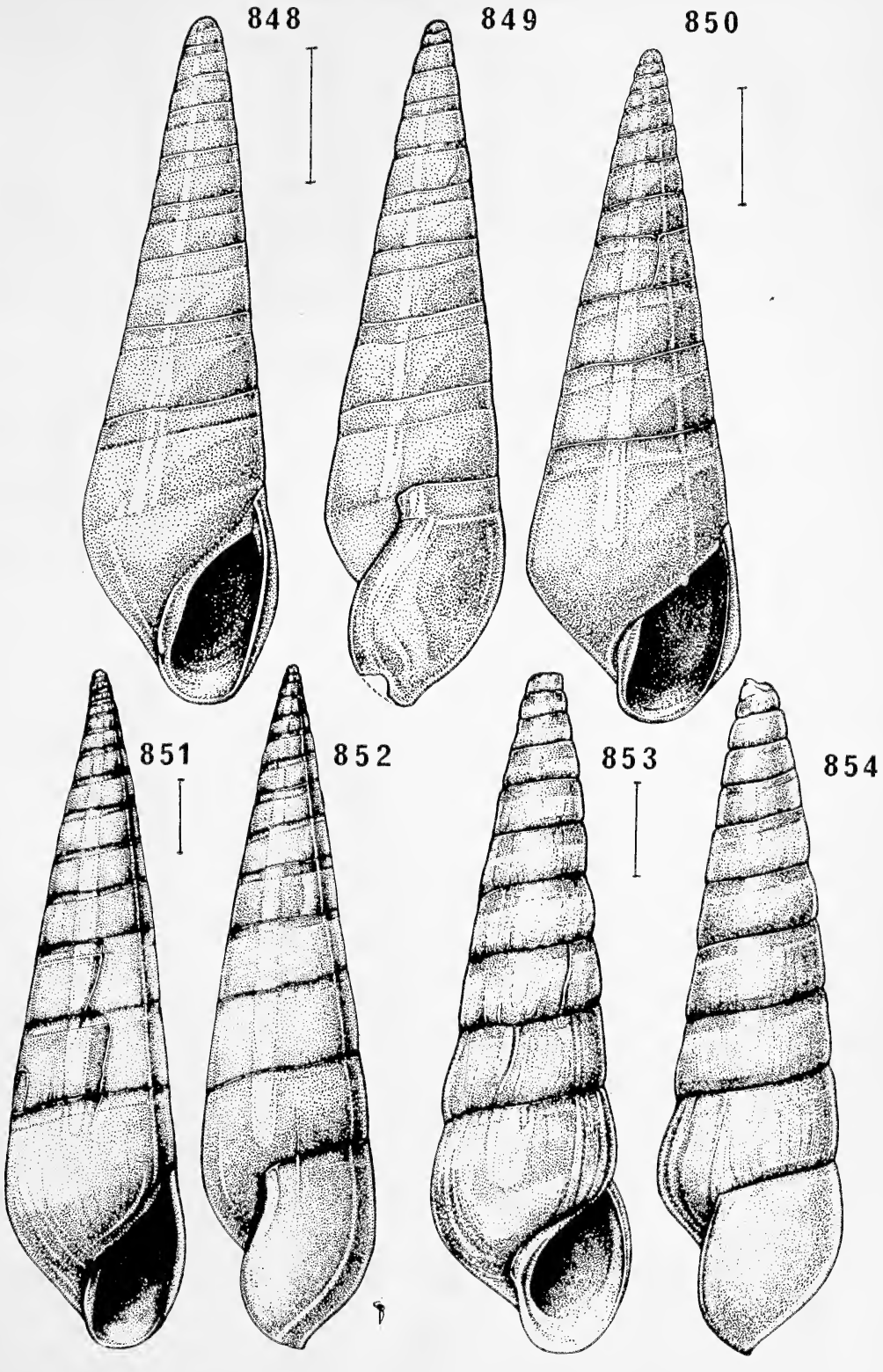
Specimens from the S part of the distributional area have a slightly higher larval shell and were described as *E. xiphidiopsis*, but the teleoconch is so similar and the differences in the larval shell so small, that we can see no reason to separate two species, at least not from our very restricted material from the south.

Among the species from shallow water, it is *Melanella lubrica* (Monterosato) (=*intermedia* auctt., not Cantraine) that is most likely to get confused with *M. frielei*, but the larval shell is more pointed (figs 920 and 922) and the outer lip of the teleoconch is not situated below the suture in *M. lubrica*. *M. lubrica* also has a distinct spiral micro-sculpture (figs 742-743) which is lacking in *M. frielei*.

Melanella obtusoapicata and *M. pseudoglabra* are also very similar, but have a broader apex. The diameter of the spire, 200 μm from the point is 250 μm in *M. frielei*, while the same measurement in *obtusoapicata* and *pseudoglabra* is 340 μm.

Melanella frielei does not change sex. Mature females are 7-10 mm high, males 4-5 mm.

Figs 848-854. Genus *Melanella*. 848-849, *M. frielei*, holotype of *M. xiphidiopsis*, presumably a male. 850, *M. frielei*, Bergen area, Norway, young female. 851-852, *M. frielei*, Bergen area, mature female. 853-854, *M. lucida*, holotype. Scale lines: 1 mm.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Melanella lucida (Verrill, 1884) Figs 853-854, 915

Eulimella lucida Verrill, 1884:192, pl. 32, fig. 3.

Type material: Holotype USNM 38218.

Type locality: USFC st 2038, 38° 31 N, 69° 08 W, 3700 m.

Material examined: The holotype and USFC st 2714, 38° 22 N, 70° 18 W, 3320 m, 1 spm; INCAL DS09, 55° 08 N, 12° 53 W, 2897 m, 1 spm; CHAIN 50 st 85, 37° 59 N, 69° 26 W, 3834 m, 1 spm; ATLANTIS II 12, st 62, 39° 26 N, 70° 33 W, 2496 m, 1 spm; CHALLENGER II st 2, 55° 04 N, 12° 33 W, 2857 m, 9 spms; st 4, 56° 52 N, 10° 01 W, 1993 m, 1 spm; st 6, 55° 03 N, 12° 29 W, 2900 m, 1 spm; st 12, 56° 49 N, 10° 15 W, 2076 m, 1 spm; st 55, 54° 40 N, 12° 16 W, 2878 m, 4 spms; st 140, 54° 40 N, 12° 40 W, 2912 m, 9 spms; st 137, 54° 34 N, 12° 19 W, 2900 m, 1 spm; st 143, 54° 41 N, 12° 14 W, 2892 m, 1 spm.

Distribution: Only known from the material examined, from the Rockall Trough and off the NE US, on the lower part of the continental slope.

Remarks: It was probably a *lapsus calami* when Verrill described this species in Pyramidellidae; it is a typical eulimid, as our sectioned material shows.

Melanella lucida resembles *M. charissa*, but the latter normally has a curved spire, more convex whorls and a more cylindrical larval shell (figs 915, 916). It also resembles *M. turrita, M. frielei, M. pseudoglabra* and *M. obtusoapicata*; for differences, see under these species.

Melanella lucida has no eyes and the development can be assumed to be direct, probably with a short dispersal stage.

Melanella reticulata n. sp. Figs 747-749, 855-858

Type material: Holotype in MNHN.

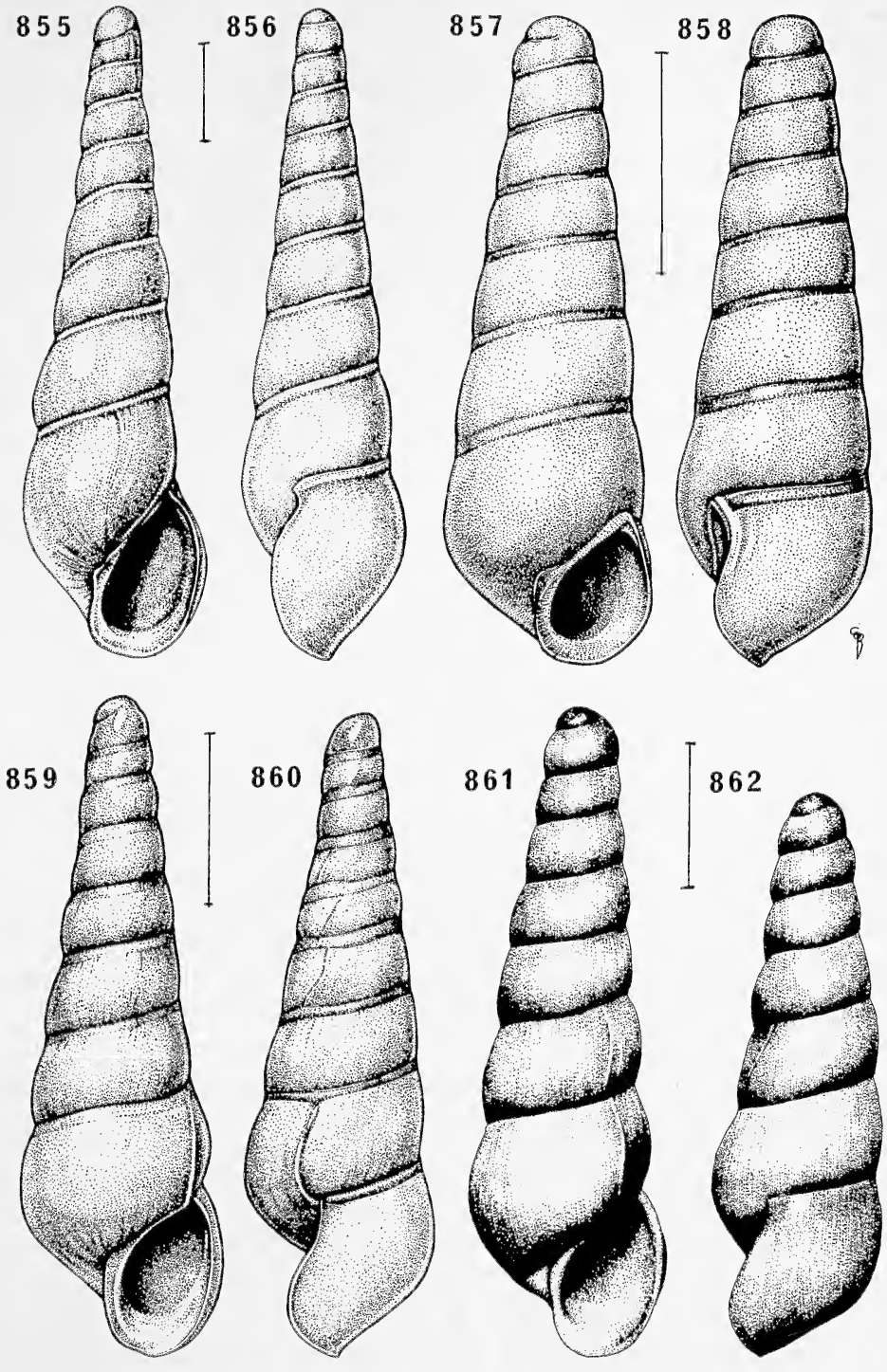
Type locality: MONACO st 233, 38° 33 N, 28° 09 W, 1300 m.

Material examined: The holotype and 2 shs from the type locality; MONACO st 553, 37° 43 N, 25° 05 W, 1385 m, 2 shs; st 719, 39° 11 N, 29° 06 W, 1600 m, 3 shs.

Distribution: Only known from the material examined from the Azores, 1300-1600 m.

Description: Shell tall, slender, fairly solid, with convex whorls and a large, rounded aperture. The larval shell consists of 1.2 whorls, measures 380 μm diameter and is 560 μm high, it is blunt and unusually cylindrical. The holotype has 7.3 postlarval whorls of slowly increasing height. The suture is emphasized by the constricted subsutural zone, but is actually quite indistinct and very shallow. The subsutural zone occupies about 1/7 of the height of the whorls. The sculpture consists of close-set microscopical axial lines and more indistinct spiral lines, giving the surface a reticulated appearance. The distance between two lines of either kind is about 5

Figs 855-862. Genus *Melanella*. 855-856, *M. reticulata*, holotype. 857-858, *M. reticulata*, young specimen, MONACO 719. 859-860, *M. charissa*, INGOLF 10. 861-862, *M. laurae*, syntypes. Scale lines: 1 mm.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μm. There are also incremental scars, 0.4-0.6 whorls apart. The outer lip is slightly prosocline and sinuated below the suture. The most protruding part is situated just below the middle of its height. The aperture is low and wide, broadly rounded in its lower part, obtusely pointed in its upper part, with the outer lip tangential or even more expanded. Columella slightly curved. Inner lip reflected over the columella and continuous with the parietal callus.
Dimensions: Height of the shell 5.05 mm, diameter 1.38 mm, height of the aperture 1.32 mm, breadth 0.82 mm.

Remarks: Young specimens differ considerably by having a very small squarish aperture (fig. 857), but identification of these is facilitated by the reticulated sculpture. The microsculpture resembles that of *Melanella alba* (Da Costa), a 20 mm high shallow water species.

The reticulated microsculpture makes *M. reticulata* easy to identify among most species of *Melanella* from deep water, but a very similar sculpture is found also in *M. laurae.* That species differs in having a larger larval shell, diameter 500 μm, and in being proportionally broader and more cylindrical.

Melanella charissa (Verrill, 1884) Figs 859-860, 863-864, 916

Eulimella charissa Verrill, 1884:193, pl. 32, fig. 4.

Type material: Holotype and 1 paratype USNM 35164.

Type locality: USFC st 2038, 38° 31 N, 69° 08 W, 3700 m.

Material examined: The types and USFC st 2714, 38° 22N, 70° 18W, 3220m, 1 spm; INGOLF st 10, 64° 24N, 28° 50W, 1484m, 1 spm; st 37, 60° 17N, 54° 05W, 3229m, 5 spms; INCAL DS 05, 56° 28N, 11° 12W, 2503m, 3 spms; DS 07, 55° 01N, 12° 32W, 2884m, 3 spms; DS 09, 55° 08N, 12° 53W, 2897m, 2 spms; CP 06, 55° 02N, 12° 41W, 2890m, 1 spm; CHALLENGER II st 2, 55° 04 N, 12° 33 W, 2857 m, 8 spms; st 4, 56° 52 N, 10° 01 W, 1993 m, 16 spms; st 6, 55° 03 N, 12° 29 W, 2900 m, 4 spms; st 10, 56° 37 N, 11° 04 W, 2900 m, 10 spms; st 14, 56° 45 N, 09° 46 W, 1770 m, 1 spm; st 55, 54° 40 N, 12° 16 W, 2878 m, 4 spms; st 111, 54° 40 N, 12° 16 W, 2886 m, 1 spm; st 135, 54° 39 N, 12° 16 W, 2900 m, 1 spm; st 140, 54° 40 N, 12° 16 W, 2912 m, 4 spms; st 16, 56° 45 N, 09° 33 W, 1637 m, 1 spm; PORCUPINE 1870 st 17, 39° 42 N, 09° 43 W, 1100-2005 m, 1 spm; CHAIN 50 st 85, 37° 59 N, 69° 26 W, 3834 m, 5 spms.

Distribution: Both sides of the North Atlantic, in 1400-3700 m, south to 38° N.

Remarks: The animal has no eyes. The anatomy is briefly described in the introduction to *Melanella. Melanella charissa* resembles several of the species of *Melanella* from the area treated here, but can be separated as follows:

M. laurae has a larger larval shell, diameter 500 μm, instead of 400 as in *charissa. M. laurae* also has more convex whorls, and a more cylindrical shape.

Melanella jeffreysi and *orphanensis* have almost perfectly flat whorls.

Melanella martynjordani has a much less protruding outer lip, and flatter whorls.

Melanella densicostata has rather much the same shape, but is easily distinguished by its strong axial ribs and smaller larval shell (300 μm diameter).

Melanella similior has a similar aperture, but the whorls of the larval shell and teleoconch are almost perfectly flat.

Melanella laurae (Friele, 1886) Figs 861-862

Eulima laurae Friele, 1886:30, pl. 11, figs 13-14.

Type material: 4 Syntypes ZMB 21638, 1 syntype ZMO D 4419.

Type locality: VÖRINGEN st 192, 69° 46 N, 16° 15 E, 1187 m.

Material examined: The type material and CHALLENGER II st 87, 61° 13 N, 03° 59 W, 1050 m, 2 shs.

Distribution: Only known from the material examined, from about 1000 m in the Norwegian Basin.

Remarks: Melanella laurae has an extremely fine sculpture of axial lines, about 5-8 μm apart, resembling that of *M. orphanensis*, but much finer, and with numerous short interruptions, giving the surface a reticulated appearance. These lines are evidently not incremental lines, because they do not run parallel to the incremental scars, but are almost straight and form an angle of 5-10° to the axis of the shell. Another unique feature is the larval shell, which is larger (diameter 500 μm) than in any other species of *Melanella. Melanella laurae* actually resembles some species of *Fusceulima* more than most *Melanella* species, but *Fusceulima* normally have a shell with flatter whorls and a higher aperture. *Melanella reticulata* has a similar, although more elongated shape, but its larval shell has a diameter of only 360 μm and its whorls are flatter.

Melanella densicostata n.sp. Figs 865-866, 908-909

Type material: Holotype in MNHN.

Type locality: BIOGAS st DS 67, 47° 31 N, 09° 31 W, 4150 m.

Material examined: The type and INCAL WS 09, 47° 28 N, 09° 34 W, 4277 m, 1 spm; DISCOVERY st 9756 (14), 50° 04 N, 13° 55 W, 3690 m, 1 spm; st 8534 (6), 13° 19 N, 20° 39 W, 4415 m, 1 spm.

Distribution: Only known from the material examined, from SW of the British Isles, abyssal.

Description: Shell tall, slender, slightly curved, distinctly axially ribbed, with a concave, slender spire and small rounded aperture. Perfectly colourless and transparent. The larval shell consists of 1 whorl and is 360 μm high with a diameter of 280 μm. It is distinctly inflated. The holotype has 10 postlarval whorls, sculptured by straight axial ribs, 20-30 μm broad, visible also at low magnification, and reaching from suture to suture. Upper whorls distinctly convex, later whorls less so. Suture deep, crenulated by the ribs. Incremental scars 0.5-1.2 whorls apart all along the teleoconch. Aperture low, rounded, slightly expanded. Outer lip orthocline, connected to the suture at right angle, not sinuated, with the most protruding part situated at the lower 1/3. Columella solid, forming an abrupt arc over to the parietal callus.
Dimensions: Height of the shell 5.19 mm, diameter 1.42 mm, height of the aperture 1.10 mm, breadth 0.66 mm.

Remarks: The animal has no eyes. The shell resembles rather closely *M. charissa* in the shape, but is more slender (diameter of larval shell 280 μm; 400 μm in *charissa*) and is easily separated by its axial ribs, which are absent in *charissa*. Three other species of *Melanella* from the area treated have similar axial sculpture: *M. costellata, M. turbonilloides* and *M. machaeropsis*. The two first mentioned of these species have a conical, not inflated larval shell. *Melanella machaeropsis* has a spire shape similar to *densicostata* but the axial ribs of *machaeropsis* actually consist of flat sections of the shell surface, demarcated by impressed lines and its larval shell consists of 2 whorls of a height of 470 μm and a diameter of 280 μm.

Melanella glypta n.sp. Figs 867-868

Type material: Holotype in Museo di Zoologia, Bologna.

Type locality: Sicilian Channel, 36° 52 N, 13° 06 E, 695-410 m.

Material examined: Only known from the holotype.

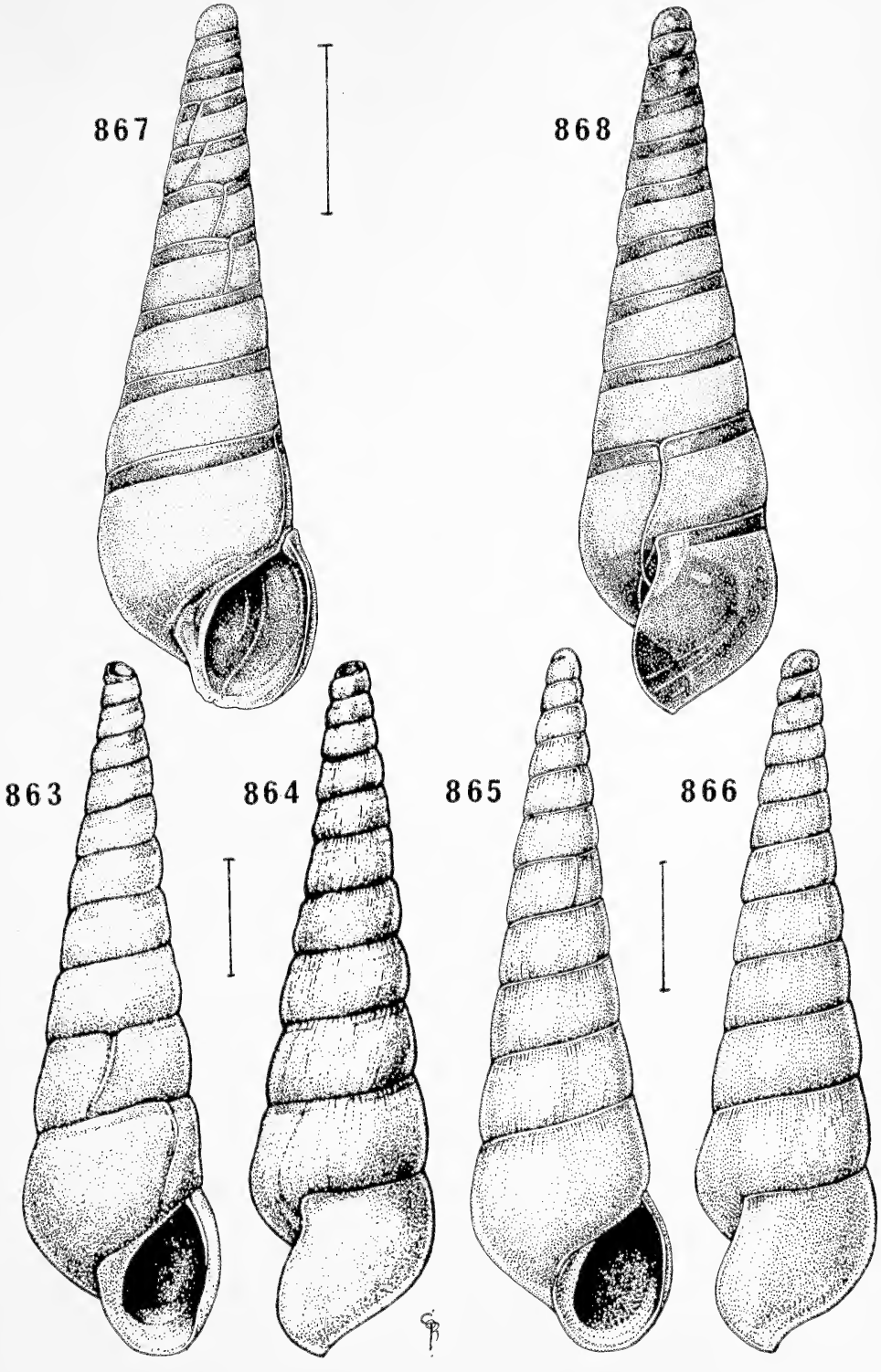
Distribution: Only known from the type locality.

Description: Shell small, slender, conical, with slightly concave spire, colourless, with fine axial sculpture and a comparatively large, rounded aperture. The larval shell consists of about 1.8 convex, perfectly smooth whorls with a rounded tip and its height is 400 μm. The holotype has 8.4 postlarval whorls of slowly increasing diameter. These are very slightly convex, but distinctly constricted towards the suture, especially in the apical teleoconch whorls. There is a rather distinct axial sculpture of sharp lines, 10-15 μm apart on the lower whorls. This sculpture is visible mainly in reflected light, but is also observable as a fine crenulation of the suture. Incremental scars strong, 0.8-1.5 whorls apart. Aperture short and wide, with conspicuously expanded columellar and parietal callus. Outer lip indistinctly sinuated at the suture, strongly protruding in its lower part, most so at the lower 1/3.
Dimensions: Height of the shell 4.10 mm, diameter 1.24 mm, height of the aperture 0.96 mm, breadth 0.58 mm.

Remarks: Melanella glypta resembles slightly *M. densicostata*, but has finer sculpture (ribs 20-30 μm apart in *densicostata*) and flatter whorls compared with *densicostata*. *Melanella costellata* has a broader, slightly convex spire and more distinctly convex whorls.

This new species is known only from the holotype, an empty shell, but is in good condition and warrants a formal description.

Figs 863-868. Genus *Melanella*. 863-864. *M. charissa*, holotype. 865-866, *M. densicostata*, holotype. 867-868, *M. glypta*, holotype. Scale lines: 1 mm.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Melanella jeffreysi (Tryon, 1886) Figs 869-871, 894, 918

Eulima solidula Jeffreys, 1880:317, *nom. nud.* (Not *E. solidula* Adams & Reeve, 1850).
Eulima subangulata Jeffreys, 1880:317, *nom. nud.* (Not *E. subangulata* Sowerby, 1834).
Eulima solida Jeffreys, 1884:368, pl. 28, fig. 4. (Not *E. solida* Sowerby, 1865).
Eulima jeffreysi Tryon, 1886:276.
Eulima platyacme Sykes, 1903:352.

Type material: Lectotype (Warén 1980) USNM 133126.

Type locality: PORCUPINE 1870 stns 9, 27, 28, off SW Europe, 560-990 m.

Material examined: The type and PORCUPINE 1870, «the Atlantic», 2 spms; st 17, 39° 42 N, 09° 43 W, 1100-2005 m, 1 sh; st 27-28, 36° 37-29 N, 07° 33-16 W, 553-586 m, 1 sh; Adventure Bank, 167 m, 1 sh; TRAVAILLEUR, «north of Spain», 1 spm; THALASSA X342, 44° 08 N, 04° 37 W, 700 m, 1 sh; Z400, 47° 33 N, 07° 19 W, 1175 m, 1 sh; Z435, 48° 40 N, 09° 53 W, 1050 m, 1 sh; CANCAP st 4.055, 28° 45 N, 13° 20 W, 1209-1308 m, 1 sh.

Distribution: Only known from the material examined, off the Atlantic coast of Morocco, the Iberian Peninsula and the Bay of Biscay, in 560-2000 m.

Remarks: Fischer-Piette & Nicklès (1946:58) recorded *M. jeffreysi* from shallow water off Dakar, Senegal. Examination of the specimen in MNHN proved the determination to be wrong. The specimen listed above, from Adventure Bank, may be erroneously labelled, as no other specimens have appeared in Italian collections.

A characteristic feature of *M. jeffreysi* is the unusually flat whorls, which together with the large larval shell (diameter 380 μm, height 500 μm) give it a strikingly cylindrical shape.

Some details in Jeffreys' description are based on other species. He said that the surface is covered by longitudinal, close-set, extremely fine lines, but actually there are only a few scattered, indistinct, very thin axial lines. This observation may, however, have been based on a specimen from the 1869 expedition, st 23, listed in the report, that in fact belongs to *M. orphanensis*. That is probably also the case with his note that the animal has eyes; *M. orphanensis* has eyes, but the two specimens from PORCUPINE 1870 st 17 have no eyes.

Melanella jeffreysi resembles closely *M. orphanensis*, but the distinct axial microsculpture, presence of eyes and more pointed larval shell in *M. orphanensis* are good characters for distinguishing the two species.

Melanella similior is less cylindrical, has distinctly convex whorls and lacks eyes.

Melanella orphanensis Clarke, 1974 Figs 744-746, 872-873, 919

Melanella orphanensis Clarke, 1974:14, fig. 5.

Type material: Holotype NMC no 66345, not examined.

Type locality: 50° 33 N, 46° 22 W, 1749 m.

Material examined: PORCUPINE 1869 st 23, 56° 13 N, 14° 18 W, 765 m, 1 spm; INGOLF st 10, 64° 24 N, 28° 50 W, 1484 m, 3 shs; st 69, 62° 40 N, 22° 17 W, 1109 m, 1 sh; st 78, 60° 37 N, 27° 52 W, 1505 m, 2 shs; st 80, 61° 02 N, 29° 32 W, 1761 m, 2 shs; st 85, 63° 21 N, 25° 21 W,

320 m, 1 sh; st 90, 64° 45 N, 29° 06 W, 1070 m, 4 spms; st 98, 65° 38 N, 26° 27 W, 260 m, 2 shs; THOR 1904, 61° 15 N, 09° 35 W, 900 m, 3 spms; Lödingen, E of Lofoten, N Norway, 250-280 m, 1 spm, Tromsö Museum; Hoöya, Trondheimsfjord, Norway, 35-45 m, 1 spm, coll. Sneli; Trondheimsfjord, Norway, 4 samples with 12 spms, ZMO, coll. AW; CHAIN 50 st 89, 40° 02 N, 70° 41 W, 196 m, 1 spm.

Distribution: Only known from the material listed above, from Norway, SW of the Faroes and Iceland, and off Labrador to New Jersey, in deep water.

Remarks: The identification of our material with Clarke's species is not certain, it is based on photographs sent by Miss J. Topping, NMC and on Clarke's description. Because of the museum's policy not to send types on loan it has not been possible to make direct comparisons, which is regrettable. Clarke (1974) said about *M. orphanensis* that «nothing like it has been seen in museum collections in eastern North America or the literature», but there are several species described that resemble it, e.g. *M. jeffreysi* and *M. charissa*, that can be expected in the area, and therefore we wonder if there is some detail we have missed by not examining the holotype.

As Clarke pointed out this species has a distinct axial sculpture (figs 744-746), best visible when the light is reflected on the shell. In bad light or worn specimens this sculpture is not visible, and the surface looks quite smooth. There are about 15-30 of these axial lines per 100 μm, and this sculpture should not be confused with the ribs present in *M. costellata* or *M. densicostata*, which are 20-30 μm broad.

M. orphanensis can be separated from most *Melanella* species by the sculpture described above, but a similar sculpture occurs in *M. laurae* and *M. reticulata*. These two species, however, have more convex whorls and a rounder aperture.

Melanella orphanensis has eyes, which is rare in deep sea eulimids with direct development.

Melanella similior n.sp. Figs 874-875, 896

Type material: Holotype in MNHN.

Type locality: BIOGAS st DS 52, 44° 06 N, 04° 15 W, 2006 m, 1 spm.

Material examined: The holotype and PORCUPINE st 17, 39° 42 N, 09° 43 W, 1100-2005 m, 1 sh; THALASSA Z435, 48° 40 N, 09° 53 W, 1050 m, 1 sh.

Distribution: Only known from the Bay of Biscay and off Portugal in 1000-2000 m.

Description: Shell small, conical, transparent, colourless, straight, rather solid. The larval shell consists of 1.5, rather convex whorls and is quite blunt and rounded. Its height is 480 μm, the diameter about 380 μm. The holotype has 5.7 postlarval whorls, with no sculpture, except irregularly disposed incremental scars with intervals of 0.7-1.2 whorls. The outer lip is orthocline, joins the suture at a right angle and has its most protruding part situated at 0.4 of its height. The aperture is high and rounded. The inner lip is reflected over the columella, slightly curved and forms a continuous, weak arc over to the parietal callus.
Dimensions: Height of the shell 3.22 mm, diameter 1.10 mm, height of the aperture 1.04 mm, breadth 0.51 mm.

Remarks: The animal has no eyes. *Melanella similior* is quite similar to several other *Melanella* species and lacks conspicuous distinguishing features. The shape of the shell is very similar to

M. martynjordani but that species has a less protruding outer lip that is distinctly sinuated below the suture. Young specimens of *M. charissa* have a similar shape, but have more convex whorls and a slightly broader aperture. *Melanella jeffreysi* has flatter whorls, and at the size of *M. similior* the body-whorl of *M. jeffreysi* is distinctly angulated, while it is evenly rounded in *M. similior*. *Melanella obtusoapicata* and *M. pseudoglabra* differ in having a straight columella and a higher aperture.

Melanella costellata (Dautzenberg & Fischer, 1897)

Figs 737-738, 876-878, 893, 912

Eulima costellata Dautzenberg & Fischer, 1897: 165, pl. 11, fig. 7.
Eulima costellata, Dautzenberg 1927:169, pl. 5, fig. 13.

Type locality: MONACO st 719, 39° 11 N, 32° 45 W, 1600 m.

Type material: Holotype in MOM.

Material examined: The holotype.

Distribution: Only known from the holotype from the Azores, in 1600 m.

Remarks: Melanella costellata is easy to recognize by the axial sculpture of distinct ribs (figs. 737-738). Such ribs occur also in *M. turbonilloides* and *M. densicostata*, but the last mentioned species has a much more slender, distinctly concave spire and a short broad aperture. *M. turbonilloides* has a slightly larger larval shell (360 μm high and 260 μm broad compared with 310 μm and 210 μm), it has a straight spire and more convex whorls.

Melanella turbonilloides n. sp. Figs 879-880, 897, 911

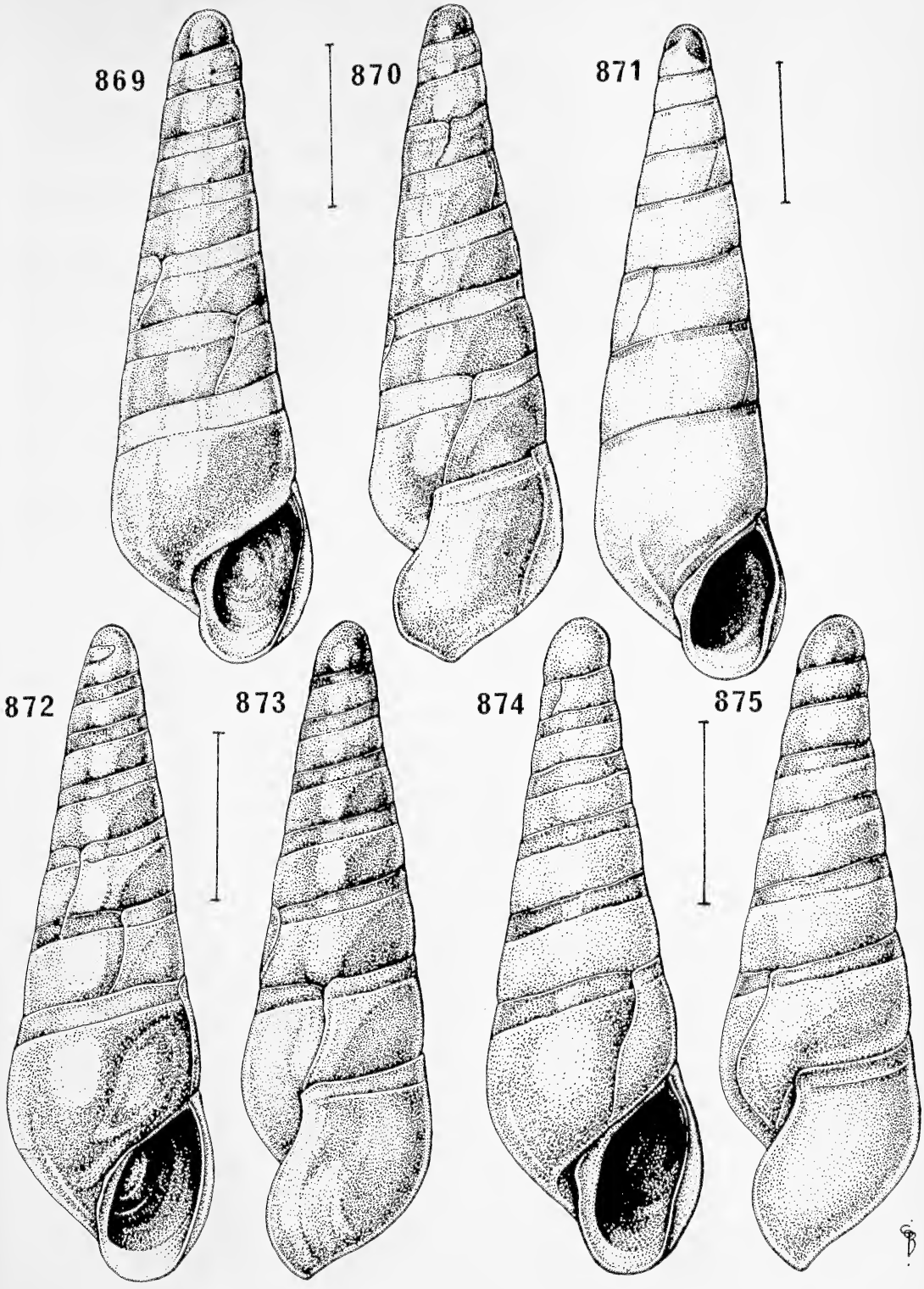
Type material: Holotype in MNHN.

Type locality: INCAL st WS 09, 47° 28 N, 09° 34 W, 4277 m.

Material examined: The type and INCAL DS 13, 46° 02 N, 10° 18 W, 4822 m, 1 spm; PORCUPINE 1870 st 17a, 39° 39 N, 09° 39 W, 1355 m, 1 sh.

Distribution: Only known from the material examined, from the outer part of the Bay of Biscay and off Portugal in 1000-4800 m.

Figs 869-875. Genus *Melanella*. 869-870, *M. jeffreysi*, PORCUPINE st 17. 871, *M. jeffreysi*, lectotype. 872-873, *M. orphanensis*, Trondheimsfjord, Norway. 874-875, *M. similior*, holotype. Scale lines: 1 mm.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Description: Shell small, regularly conical, with a rather blunt apex, rather large aperture, colourless and transparent. The larval shell consists of 1.2 convex whorls and is 360 μm high and the diameter is 260 μm. The holotype has 5.4 postlarval whorls sculptured by strong axial ribs, which give the deep and distinct suture a crenulated appearance. The whorls are distinctly convex and slightly constricted at the subsutural zone. The holotype has 2 incremental scars, 1.1 and 2.1 whorls from the outer lip. The outer lip is orthocline, very shallowly sinuated below the suture and strongly protruding in its lower part, most so at the lower 1/3. The aperture is slightly irregularly ovate, the columella almost straight, forming an indistinct angle with the parietal wall and callus.
Dimensions: Height of the shell 2.33 mm, diameter 0.79 mm, height of the aperture 0.68 mm, breadth 0.39 mm.

Remarks: The INCAL DS13 specimen is immature, 1.64mm high and we are not certain that the holotype is a mature specimen, but the presence of two incremental scars indicates that it at least is approaching maturity. This is supported by the fact that all similar species of *Melanella* (*M. insculpta, M. gagei, M. costellata, M. planisutis* and *M. microsculpta*) form 3-5 apical teleoconch whorls with no scars before the whorls with incremental scars.

Melanella turbonilloides resembles closely *M. costellata*, and may finally turn out to be the same species, but we prefer to keep them separate until this can be shown. They can be distinguished by the more convex whorls of *M. turbonilloides* and by the ribs, which on the bodywhorl of *M. turbonilloides* are 33-45 μm broad and in *M. costellata* 20-30 μm broad on the 5th postlarval whorl.

Except for the two species discussed here, *Melanella densicostata* is the only eulimid from the area, known to have such a distinct axial sculpture. It differs from *M. turbonilloides* by having a much blunter and by no means conical larval shell.

Melanella gagei n. sp. Figs 881-883, 898, 910

Type material: Holotype RSM 1985012.1; 2 paratypes in coll. AW.

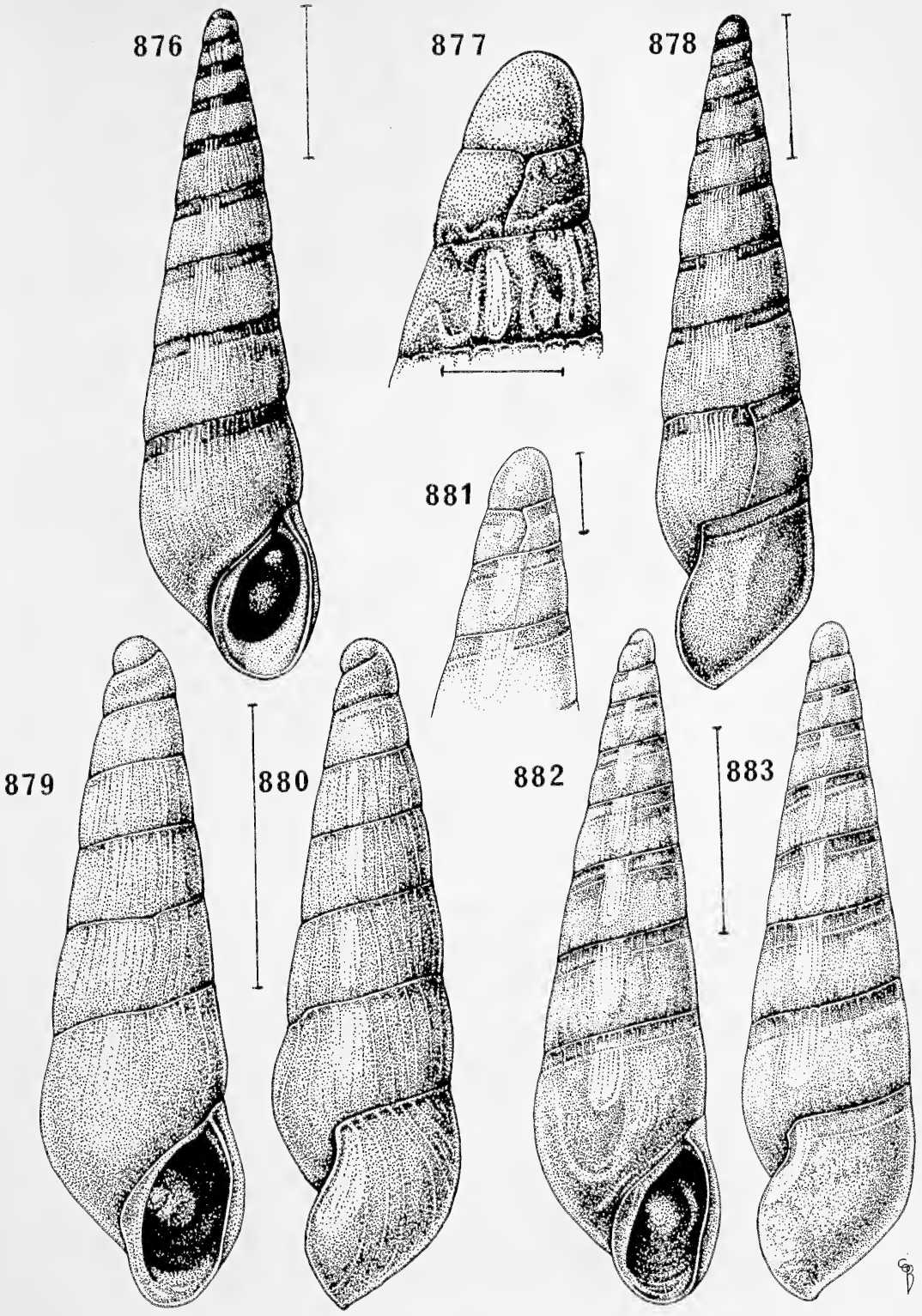
Type locality: CHALLENGER II st 14, 56° 45 N, 09° 46 W, 1770 m.

Material examined: The type material and CHALLENGER II st 10, 56° 37 N, 11° 04 W, 2540 m, 1 spm.

Distribution: Rockall Trough.

Description: Shell small, straight, conical, pointed, perfectly transparent and colourless. Larval shell 1.5 distinctly convex whorls, height 320 μm, diameter 220 μm. The holotype has 6.5 almost flat teleoconch whorls, sculptured by irregular, prosocline, straight, incremental thickenings which are more distinct over the subsutural zone and sometimes give the suture a crenulated appearance. Two specimens have no incremental scars, two specimens have 2-3 in the last 3 whorls. Aperture small, ovate. Outer lip orthocline, sinuated below the suture, most projecting part situated at the lower 1/3. Columella very slightly curved and forming an indistinct angle with the parietal wall.
Dimensions: Height of the shell 3.17 mm, diameter 0.93 mm, height of the aperture 0.91 mm, breadth 0.51 mm.

Figs 876-883. Genus *Melanella*. 876-878, *M. costellata*, holotype. 879-880, *M. turbonilloides*, holotype. 881-883, *M. gagei*, holotype. Scale lines: 1 mm except figs 877 and 881: 0.25 mm.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Remarks: The animal has no eyes. *Melanella gagei* resembles *M. planisutis* in the shape of the shell, but its height is about 3.4 times the breadth instead of 3.8 as in *planisutis*. It differs from *M. insculpta* by its perfectly conical spire. *M. microsculpta* is somewhat larger, has a broader shell and is much more solid.

Melanella insculpta n. sp. Figs 884-887, 892

Type material: Holotype in ZMC.

Type locality: INGOLF st 10, 64° 24 N, 28° 50 W, 1484 m.

Material examined: The holotype and PORCUPINE 1870 st 17, 39°42N, 09°43W, 1100-2005m, 1 sh; ATLANTIS II 12 st 73, 39°46N, 70°43W, 1300-1470m, 9 spms; CHAIN 50 st 87, 39°49N, 70°41W, 1102m, 57 spms; st 128, 39°47N, 70°45W, 1254m, 1 spm; st 207, 39°51N, 70°55W, 805-811m, 8 spms.

Distribution: Along the continental slopes of the N Atlantic, south to 39°N, in 800-2000m.

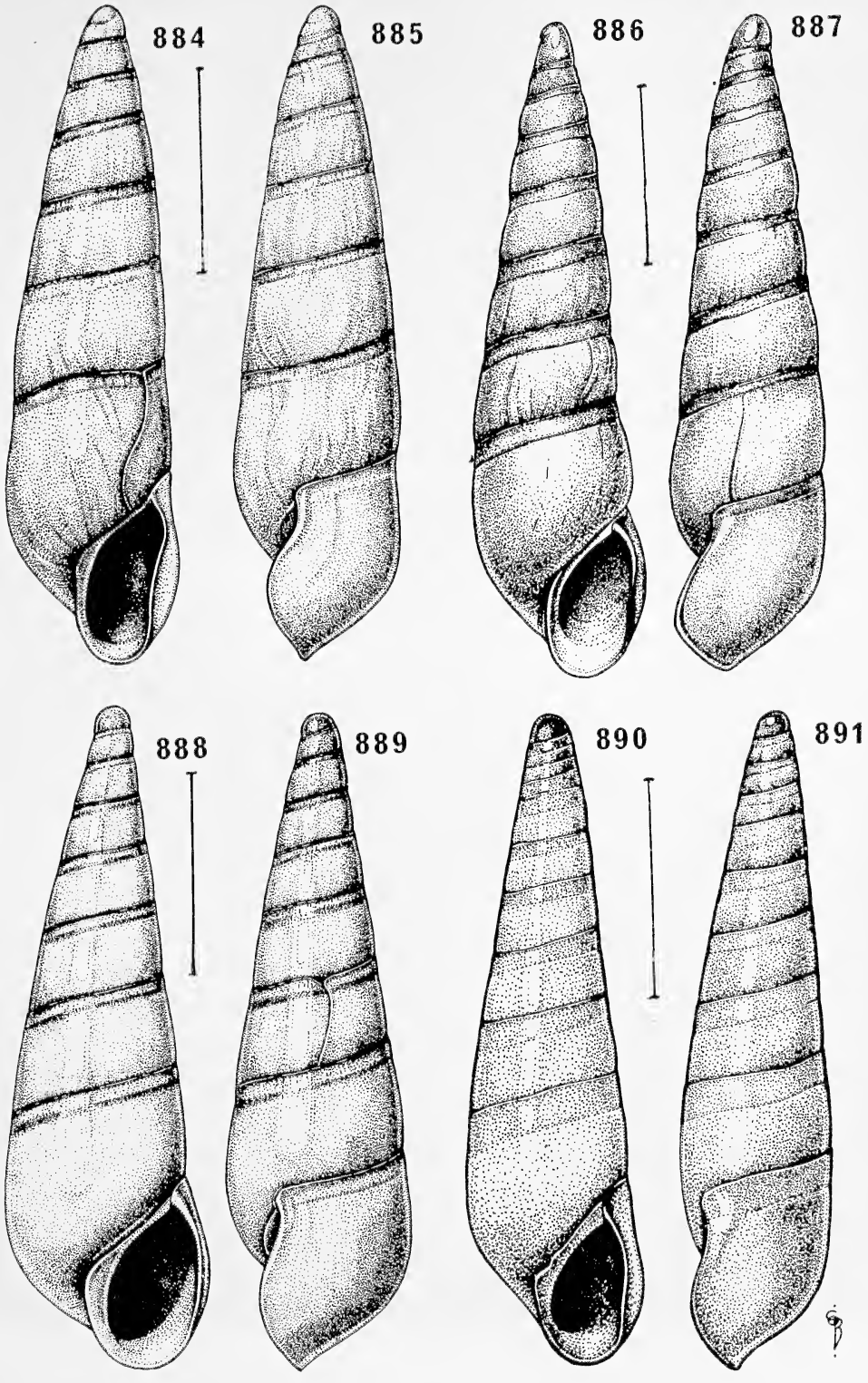
Description: Shell rather tall and cylindrical, slightly irregularly coiled, with an abruptly larger apical angle for the three first teleoconch whorls, colourless and transparent. The larval shell resembles that of *gagei* and consists of 1.5 convex whorls (fig. 910), its dimensions are: height 300 μm, diameter 220 μm. The holotype has 7 postlarval whorls which are distinctly convex and have some indistinct incremental lines and 3 incremental scars, 1.1, 2.2 and 2.7 whorls from the outer lip. The aperture is slightly oblique, downwards and towards the axis of the shell. The outer lip and the columella are parallel for some distance, giving it a slightly rectangular appearance. The outer lip is orthocline, joins the suture at a right angle or is very slightly sinuated below the suture. The most protruding part is situated at the lower 1/3. The parietal wall and the columella form an evenly curved arc, covered by the reflected inner lip.
Dimensions: Height of the shell 3.64 mm, diameter 0.91 mm, height of the aperture 0.86 mm, breadth 0.46 mm.

Remarks: The sex of 7 specimens was determined by dissection; 5 specimens 2.4-3.3 mm high were females, 2 specimens 2.2-2.3 mm were males.

The specimen from the PORCUPINE expedition (figs 884-885) has somewhat flatter whorls than the holotype (figs 886-887), but otherwise is identical, and we can see no reason for distinguishing them.

Melanella insculpta has very much the same shape as *M. costellata*, but has no trace of axial ribs. *Melanella microsculpta* is broader, has flatter whorls and a more conical shape. *Melanella gagei* does not have the apical whorls set off from the rest of the spire by a larger apical angle and it has more distinct axial microsculpture (hardly visible in *insculpta*).

Figs 884-891. Genus *Melanella*. 884-887, *M. insculpta*, PORCUPINE st 17 and holotype, respectively. 888-889, *M. microsculpta*, holotype. 890-891, *M. planisutis*, holotype. Scale lines: 1 mm.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Melanella microsculpta n. sp. Figs 888-889, 895

Type material: Holotype and 4 paratypes in BMNH, 1970044 and 1970041-43.

Type locality: PORCUPINE 1870 st 30, 36° 15 N, 06° 52 W, 702 m.

Material examined: The type material and PORCUPINE 1870, Adventure Bank, 167 m, 1 sh.

Distribution: Only known from the material examined, from off S Spain and the Mediterranean, in 167-702 m.

Description: Shell rather solid, evenly conical, with a moderate sized larval shell. Larval shell of 1.5 whorls, height 300 μm. The holotype has 7.5 postlarval whorls, sculptured by faint axial, almost straight striae and some scattered scars from earlier positions from the outer lip. Suture rather deep and conspicuous, emphasized by the slightly constricted subsutural zone. Aperture slightly prosocline, with a distinctly sinuated outer lip that has its most protruding part situated at 3/8 of its height. Columella slightly curved, with a distinct, reflected inner lip that forms an even arc over to the parietal wall.
Dimensions: Height of the shell 3.15 mm, diameter 1.19 mm, height of the aperture 1.03 mm, breadth 0.65 mm.

Remarks: Melanella microsculpta resembles *M. insculpta* but that species has a distinctly convex shape of the spire and a proportionally broader aperture.
Melanella gagei has a more slender and squarish aperture and is more slender (heigth 3.4 times the diameter of the shell, 2.7 times in *microsculpta*).

Melanella planisutis n. sp. Figs 890-891

Type material: Holotype in MNHN.

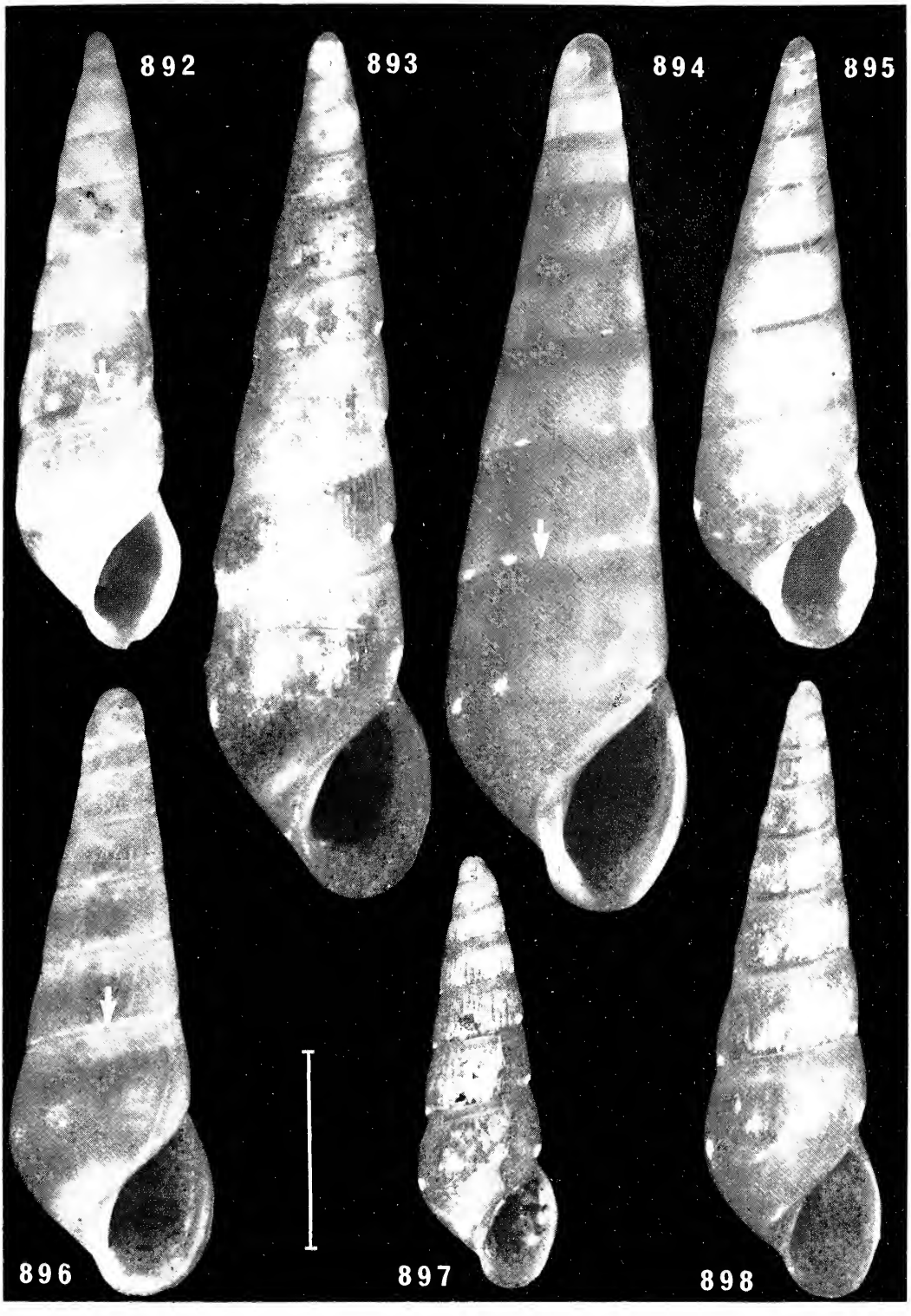
Type locality: MONACO st 719, 39° 11 N, 32° 45 W, 1600 m.

Material examined: The holotype and MONACO st 624, 38° 59 N, 28° 18 W, 2102 m, 1 sh; TALISMAN st 139, 38° 38 N, 28° 21 W, 1257 m, 1 spm; BIACORES st 120, 39° 05 N, 32° 43 W, 2100 m, 1 spm.

Distribution: Only known from the material examined from the Azores, 1600-2100 m.

Description: Shell small, rather solid, evenly conical, colourless, transparent, with a small aperture. Larval shell not very distinctly demarcated, so the number of whorls could not be counted, but the apex is evenly rounded, conical, and its diameter 200 μm from the point is 210 μm. The total number of whorls is 8.5-9. They are polished and completely smooth, very

Figs 892-898. Genus *Melanella*. 892, *M. insculpta*, holotype. 893, *M. costellata*, holotype. 894, *M. jeffreysi*, lectotype. 895, *M. microsculpta*, holotype. 896, *M. similior*, holotype. 897, *M. turbonilloides*, holotype. 898, *M. gagei*, holotype. The small arrows indicate the suture. Scale lines: 1 mm.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flat. The suture is very shallow and inconspicuous, the subsutural zone occupies 2/7 of the height of the whorls. The last three whorls each have one incremental scar, a little more than one whorl apart. The aperture is small and slender. The outer lip is sinuated below the suture, prosocline, and has the most protruding part situated at the lower 1/3. The columella with the reflected inner lip forms an even arc with the parietal callus.
Dimensions: Height of the shell 3.01 mm, diameter 0.84 mm, height of the aperture 0.71 mm, breadth 0.40 mm.

Remarks: Melanella planisutis resembles rather much *M. compactilis* (Monterosato) from more shallow water, but *M. compactilis* has a higher aperture, it is 0.30 of the height of the shell, 0.23 in *planisutis*. *M. compactilis* is also broader.

Among the deep sea species it resembles *M. gagei*, but *gagei* has more convex whorls, a more protruding outer lip and a higher aperture, 0.26 of the height of the shell.

Melanella (?) myriotrochi n.sp. Figs 906-907

Type material: Holotype in RSM.

Type locality: CHALLENGER II st ES 266, 56° 24 N, 11° 59 W, 2591 m, found in the oesophagus of *Myriotrochus bathybius* Clark.

Material examined: The holotype.

Distribution: Only known from the holotype from Rockall Trough.

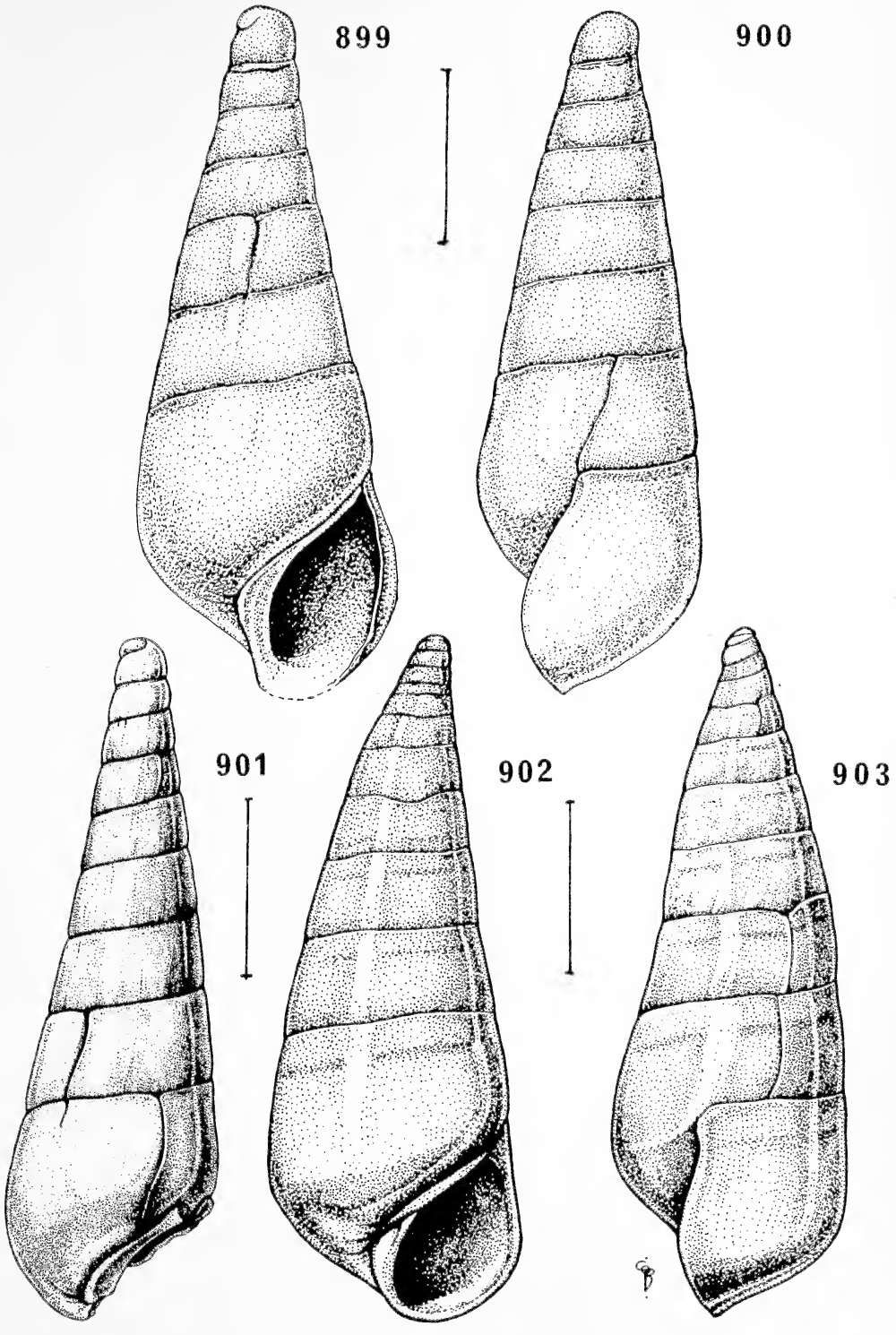
Description: Shell small, perfectly transparent, fragile, with a blunt apex and three convex whorls of rapidly increasing diameter. The larval shell consists of 1.5 whorls, with an inflated initial whorl (similar to *M. costellata*) and its height is 460 μm. The type has 2.9 teleoconch whorls, perfectly smooth except some indistinct incremental disturbances of the surface. No incremental scars. Subsutural zone narrow, 1/15 - 1/20 of the height of the whorls. Aperture damaged, but judging from the incremental disturbances, the outer lip must have been very slightly protruding in its central parts and not strongly retracted or sinuated at the suture.
Dimensions: Height of the shell 2.84 mm.

Remarks: Melanella myriotrochi was found in the oesophagus of *Myriotrochus bathybius* Clark, by Dr John Gage, who most kindly forwarded the specimen to us. We assume that it had been parasitizing the synaptid holothurian because the proboscis was still everted in the detached snail.

It is with much hesitation that we include this new species in *Melanella*; the shell differs considerably from other species included here, but it does not fit any other genus and we do not want to base a new genus on this rather damaged specimen. It may not be a fully grown specimen, but considering the small size of the host (2-4 cm), it may be adult. The larval shell is the main reason that we place *M. myriotrochi* in *Melanella*; it resembles closely that of *M. costellata* and some other species in having a distinctly inflated initial whorl.

Melanella myriotrochi resembles some species of *Oceanida* in the shape of the shell, but they do not have an inflated initial whorl and they have a much more solid shell with strong incremental scars.

Figs 899-903. Genus *Melanella*. 899-900, *M.* sp., PORCUPINE 1870 st 17. 901, *M.* sp., PORCUPINE 1870 st 27. 902-903, *M. doederleini*, lectotype. Scale lines: 1 mm.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Melanella doederleini (Brusina, 1886) Figs 902-903

Eulima stalioi, Jeffreys 1884:368, pl. 28, fig. 3, not Brusina, 1869.
Eulima döderleini Brusina, 1886:214.

Type material: Lectotype BMNH 1979229, 3 paralectotypes USNM 131144 and BMNH 1885.11.5.2027-8.

Type locality: PORCUPINE 1870 st 29-30, 36° 30-15 N, 06° 47-52 W, 413-702 m.

Material examined: The type material.

Distribution: Cf. below.

Remarks: Jeffreys' original identification with *E. stalioi* was denied by Brusina, who suggested a replacement name for the specimen figured by Jeffreys. This specimen is here selected as lectotype of *M. doederleini.* We have examined material of *E. stalioi* determined by Brusina in ZMR (sent to Monterosato) and we can verify Brusina's statement.

We have never seen any additional specimens of this very characteristic species, and the only similar species known to us is *«Eulima» altavillensis* Seguenza, 1876, from the Pliocene of Italy (figs 904-905). *«Eulima» altavillensis* differs only by having a slightly lower larval shell, and we find it likely that *M. doederleini* is based on fossil specimens of *altavillensis*, in which case *altavillensis* is the correct name.

Melanella sp. Fig. 901

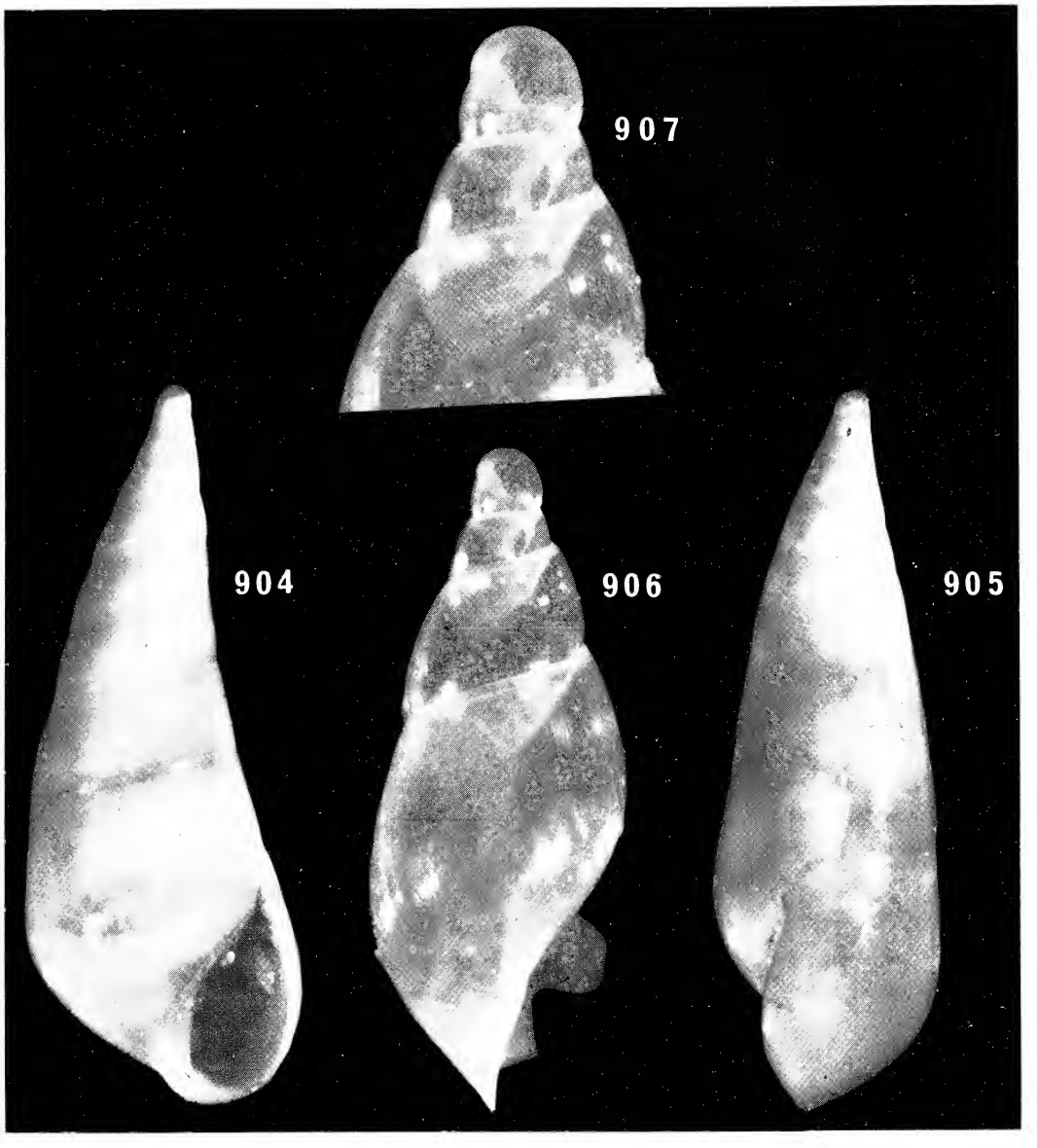
Material examined: PORCUPINE 1870 st 27, 36° 37 N, 07° 33 W, 586 m, 2 shs.

Remarks: The two shells resemble *M. jeffreysi* in shape, but the initial whorl of the larval shell is much lower, the apical angle larger and the shell more solid. The aperture is destroyed in both specimens, but they are characteristic enough to be worth noting. There is, however, some possibility that they are fossil.

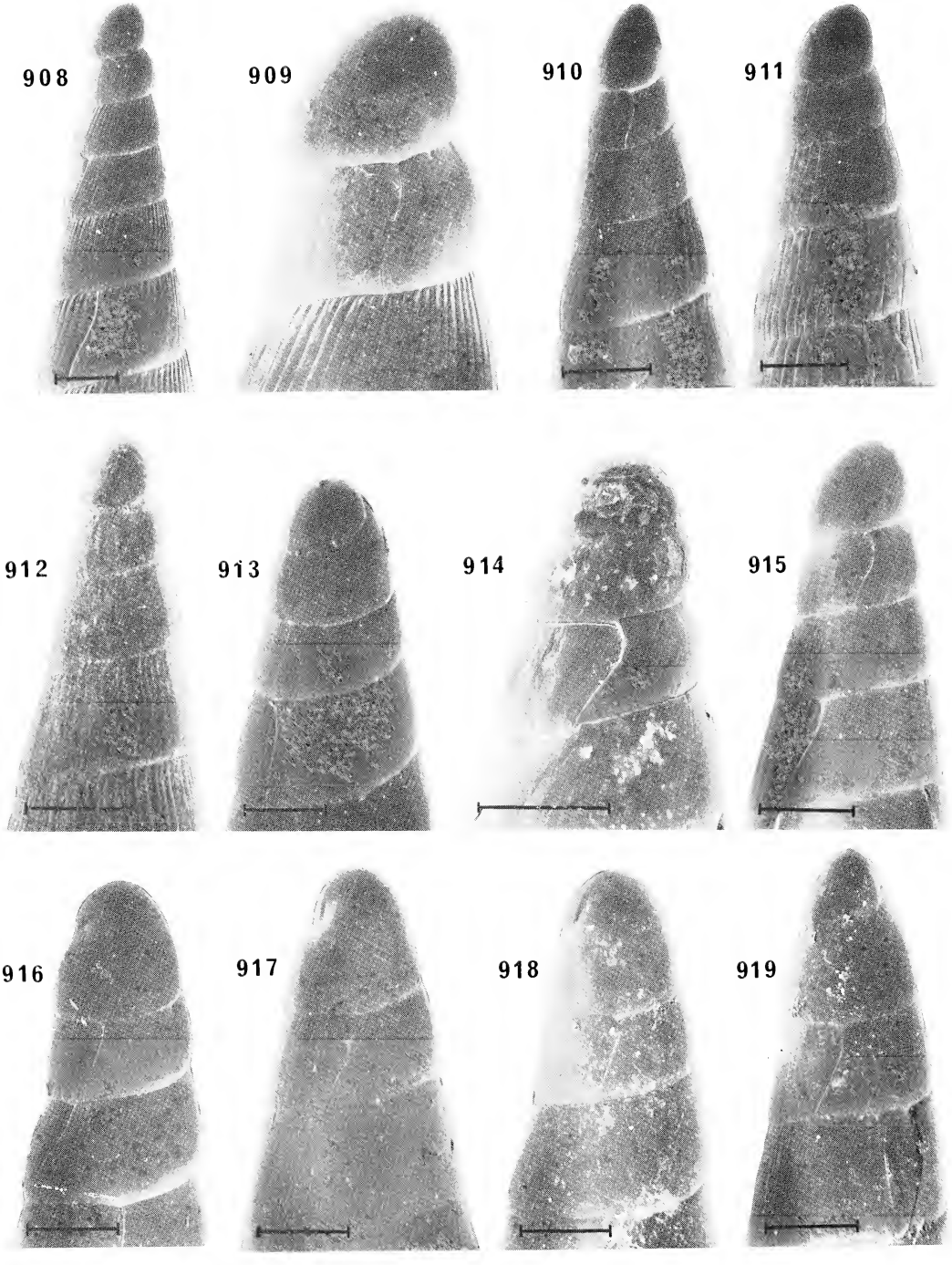
Melanella sp. Figs 899-900

Material examined: PORCUPINE 1870 st 17, 39° 42 N, 09° 43 W, 1100-2005 m, 1 sh.

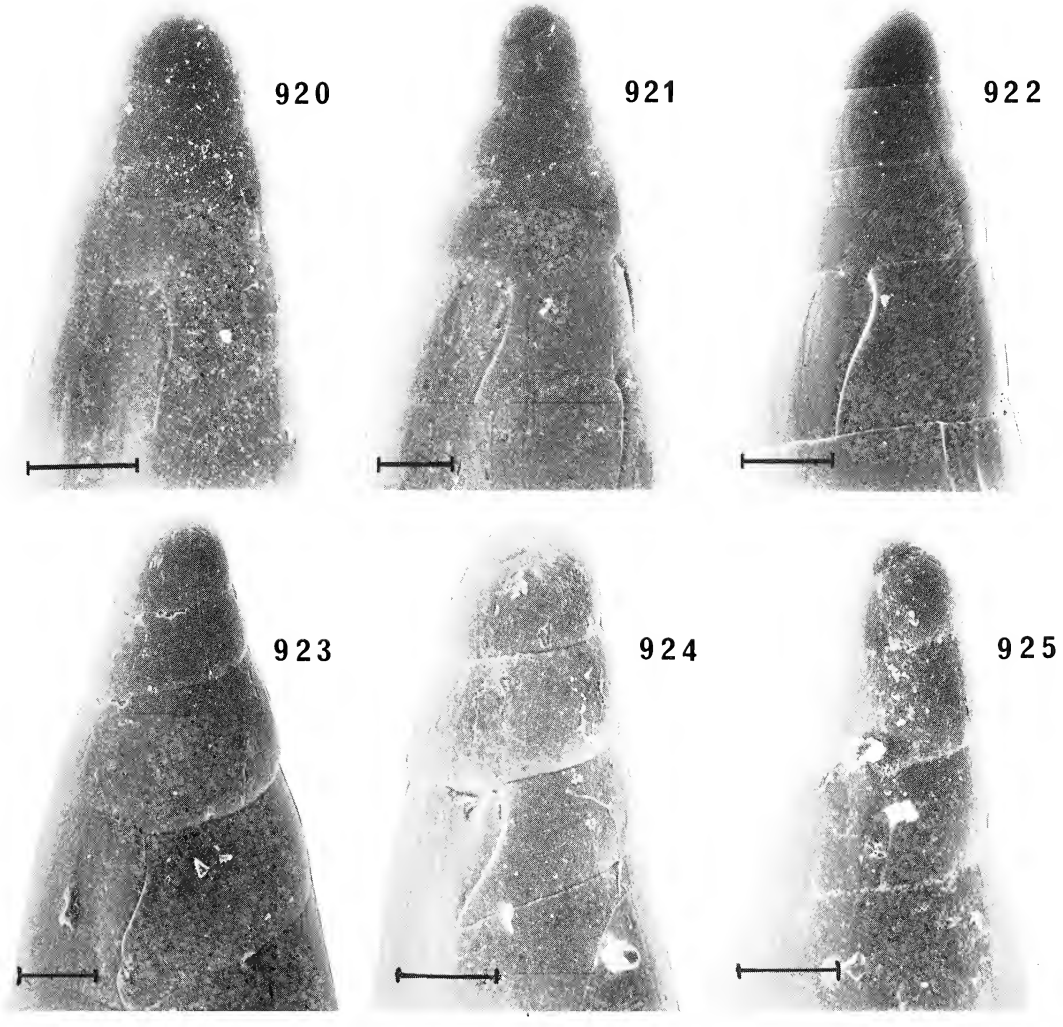
Remarks: In the material from J.T. Marshall, now in the Sykes collection in BMNH, there is a broken specimen that resembles *M. jeffreysi* in the shape of the aperture and in having very flat whorls. It differs, however, from that species by having a larger larval shell and by being broader (fig. 894). We have seen no other material of this species, and because of the poor condition, we prefer to leave it undescribed.



Figs 904-907. Genus *Melanella*. 904-905, *M. altavillensis*, syntype in coll. Monterosato, ZMR, 5.56 mm. 906-907, *M. myriotrochi*, holotype, 2.84 mm.



Figs 908-919. Apices of *Melanella*. 908-909, *M. densicostata*, DISCOVERY 9756.14. 910, *M. gagei*, CHALLENGER II st 14. 911, *M. turbonilloides*, INCAL DS13. 912, *M. costellata*, holotype. 913, *M. martynjordani*, LAGARDERE GCh 76. 914, «*Eulima*» *leptozona*, MONACO 553. 915, *M. lucida*, CHALLENGER II st 55. 916, *M. charissa*, INCAL DS5. 917, *M. pseudoglabra*, THALASSA Y378. 918, *M. jeffreysi*, CANCAP 4.055. 919, *M. orphanensis*, Trondheimsfjord, Norway. Scale lines: 200 μm.



Figs 920-925. Apices. 920, *Melanella frielei*, Koster area, W Sweden. 921, *M. monterosatoi*, Bergen area, Norway, 150-300 m. 922, *M. lubrica*, Koster area, W Sweden. 923. *M. spiridioni*, THALASSA Z435. 924, *Campylorhaphion famelicum*, THALASSA Z435. 925, *Hypermastus sauliae*, Bangau Bay, N Borneo. Scale lines: 100 μm.

Genus *PISOLAMIA* Bouchet & Lützen, 1976

Type species: Stilifer brychius Watson, 1883, by original designation.

Remarks: Only a single species is known of *Pisolamia*, and it lives attached on the ventral side of *Oneirophanta mutabilis*. The species usually occurs in pairs and it is a protandrous and simultaneous hermaphrodite, changing from male to simultaneous hermaphrodite at a size of 3-5 mm. They attach by the snout and introduce the proboscis through the ventral body wall of the holothurians, to suck fluid from the visceral blood vessels.

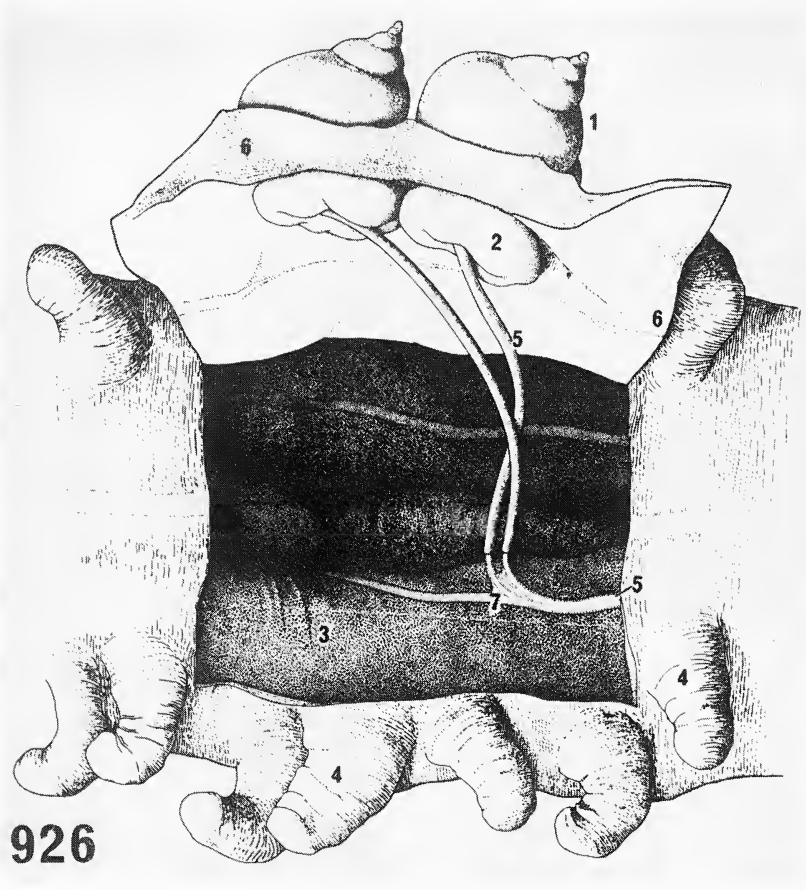


Figure 926. *Pisolamia brychia* parasitic on *Oneirophanta mutabilis* (after Bouchet & Lützen 1976). 1: snail attached on ventral side (which has been opened), 2: muscular bulge on snout, 3: intestine of host, 4: ventral tube feet, 5: proboscis, 6: cut out section of ventral body wall of host, 7: blood vessel on intestine, penetrated by proboscis.

Pisolamia brychia (Watson, 1883) Figs 926-929

Stilifer brychius Watson, 1883:130.
Stilifer brychius, Watson 1886:524, pl. 37, fig. 9.
Stilifer abyssorum Locard, 1897:416, pl. 19, figs 4-6.
Pisolamia brychius, Bouchet & Lützen 1976:1016.
Pisolamia brychius, Bouchet & Lützen 1980:59, figs 1-8.

Type material: S. brychius, holotype BMNH 1889.11.11.159; *S. abyssorum*, holotype in MNHN.

Type locality: S. brychius, CHALLENGER st 325, 36° 44 S, 46° 16 W, 4860 m; *S. abyssorum*, TALISMAN st 139, 46° 06 N, 09° 10 W, 4789 m (In both cases it can be concluded that the specimens had been found on *O. mutabilis*; cf. Theel, 1882, pl. 22, fig. 3 and Fischer, 1885:781.)

Material examined: The material listed by Bouchet & Lützen (1980) and ABYPLAINE st CP 21, 42° 58 N, 13° 59 W, 5260 m, 1 spm; CP 20, 42° 59 N, 14° 07 W, 5260 m, 2 spms; DISCOVERY st 9541 (5), 20° 17 N, 21° 30 W, 3940 m, 4 spms.

Distribution: Probably all over the abyssal parts of the Atlantic.

Remarks: The identification of *Pisolamia brychia* should not be a problem; the inflated, colourless shell with a big larval shell of 1.5 whorls and the big aperture make this species easy to recognize, even when no host information is available.

Genus *MEGADENUS* Rosén, 1910

Type species: M. holothuricola Rosén, 1910, by monotypy.

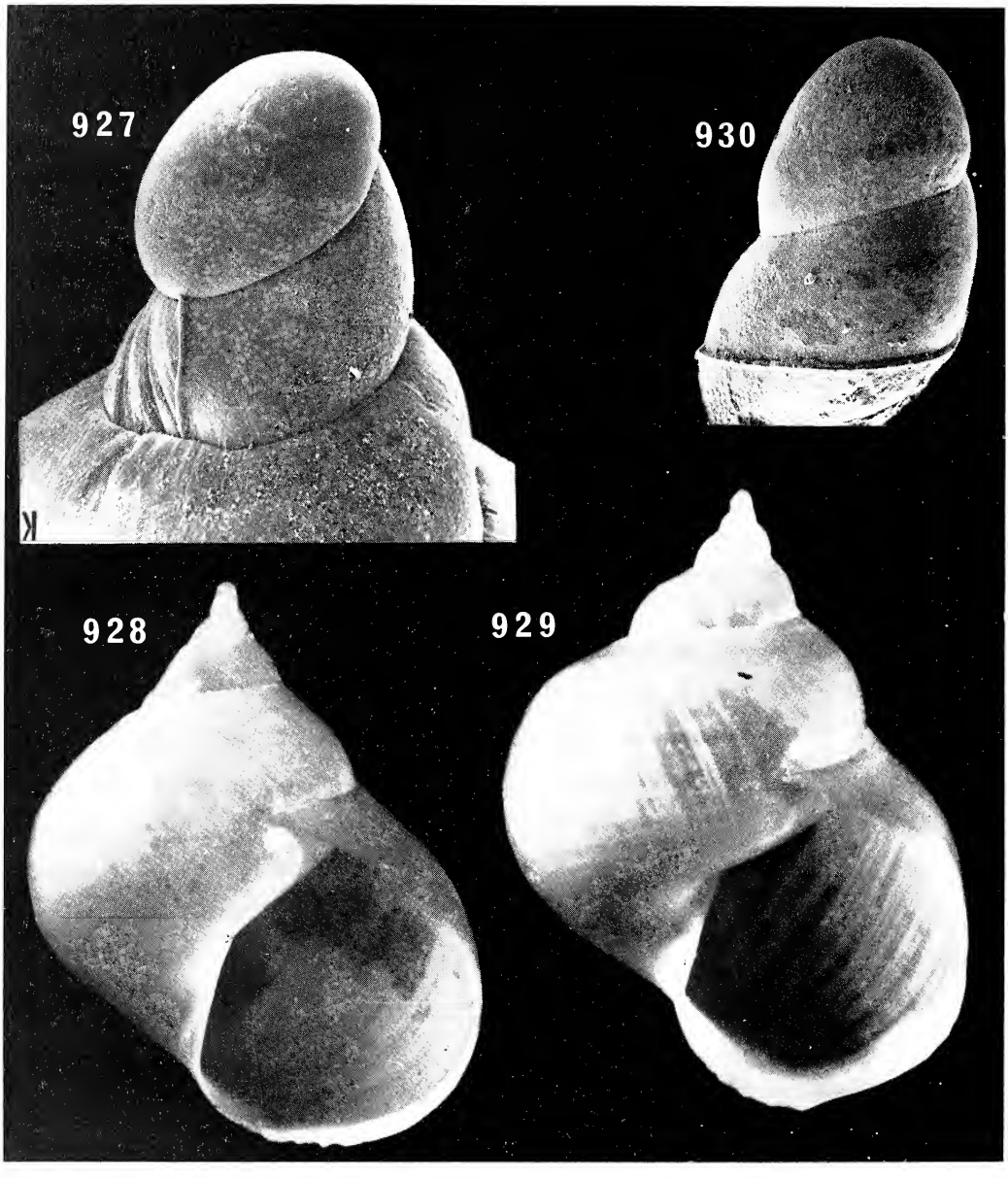
Remarks: The species of *Megadenus* live as parasites in the cloaca, water-lungs or the intestine of holothurians. The genus is most well known from tropical shallow water; the species below is the only deep water species known.

Megadenus oneirophantae Bouchet & Lützen, 1980 Figs 930-932

Megadenus oneirophantae Bouchet & Lützen, 1980:72, figs 10-11.

Type material: Holotype (female) and allotype (male) in MNHN.

Type locality: In galls in the intestine of the elasipode holothurian *Oneirophanta mutabilis* Theel, INCAL st CP 12, 46° 00 N, 10° 18 W, 4796 m.



Figs 927-930. Genera *Megadenus* and *Pisolamia*. 927-929, *Pisolamia brychia*, BIOGAS CP16, 4.8 mm and 5.3 mm respectively. 930, *Megadenus oneirophantae*, height above broken suture 0.2 mm.

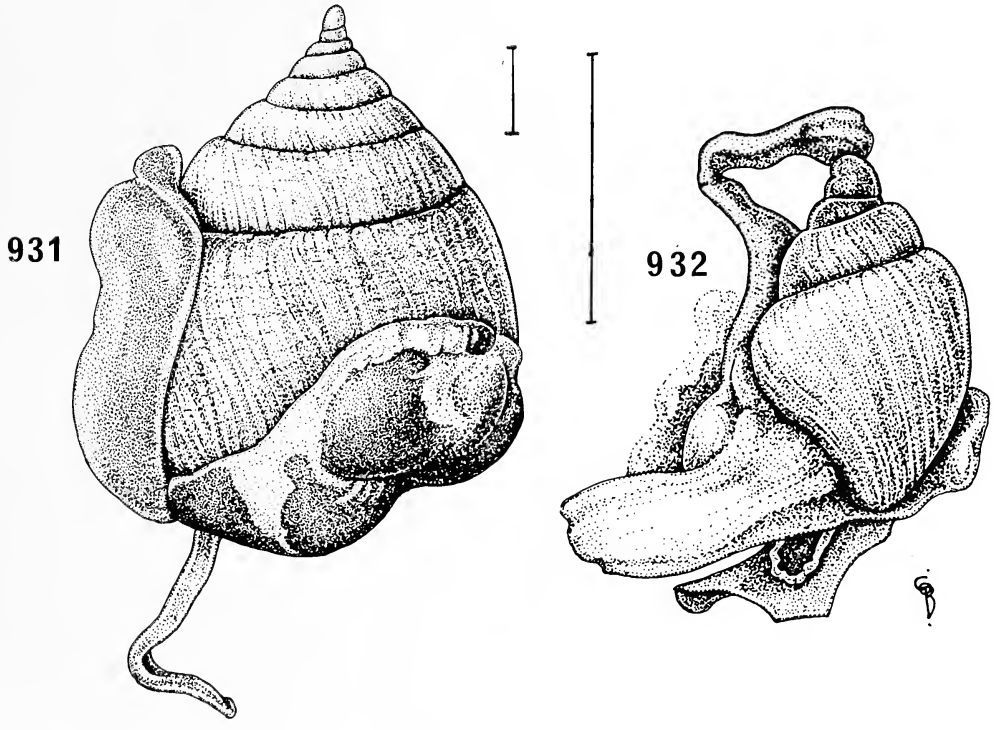
Material examined: Listed by Bouchet & Lützen, 1980.

Distribution: Only known from the material examined, from the abyssal parts of the Bay of Biscay.

Remarks: M. oneirophantae differs considerably from other species of *Megadenus* in having no large proboscis collars and in having a much more pronounced sexual dimorphism.

The probability of finding empty shells of *Megadenus* is very small, because of its life as an endoparasite. Its habit of living in small colonies in galls in the intestine of *O. mutabilis* should be enough to identify this species.

The shell of the female is very inflated, vitreous with indistinct growth lines and the base is partly covered by the foot and its folds. The male is a third of the size of the female and the shell is more slender with a deeper suture. The larval shell consists of 1.5 whorls and indicates that there is no planktotrophic larval stage.



Figs 931-932. *Megadenus oneirophantae* (from Bouchet & Lützen 1980). 931, female and 932, male. Scale lines: 2 mm.

Genus *MOLPADICOLA* Grusov, 1957

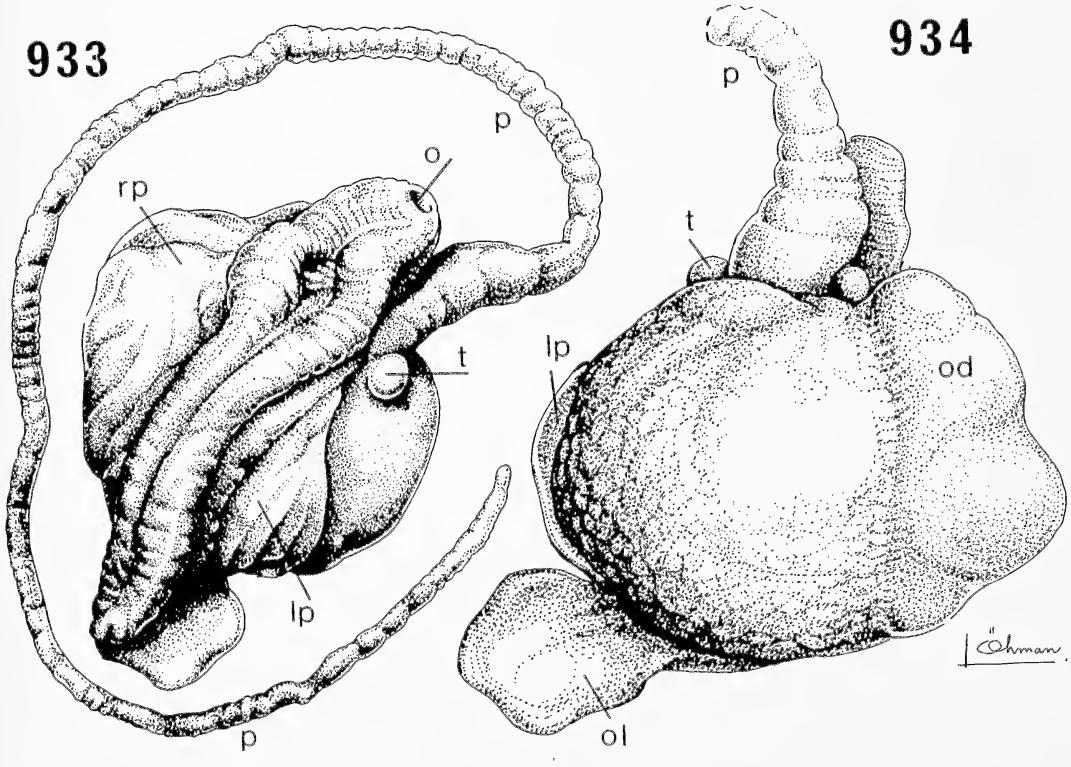
Type species: M. orientalis Grusov, 1957, by original designation.

Remarks: The type species was described from specimens of *Molpadia* sp., from a depth of 3400 m in the Sea of Okhotsk. It was said to live in the coelomic cavity.

Molpadicola sp. Figs 933-936

Material examined: INCAL st ØS 02, 48° 19 N, 15° 16 W, 4829 m, 2 spms in the respiratory tree of *Molpadia blakei* (Theel).

Remarks: The two specimens were found in an enlarged portion of the respiratory tree, rather far anteriorly, with the proboscis penetrating the wall of the tree and inserted into a blood vessel running along the intestine.



Figs 933-934. *Molpadicola* sp., INCAL ØS2. Ventral and dorsal views, lp: left pedal fold, o: opening of anterior pedal gland, od: oviduct, seen by transparency, ol: opercular lobe, p: proboscis (only proximal part drawn in fig. 934), rp: right pedal fold, t: tentacle.

The swelling also contained 12 egg capsules, simple ovate sacs, 1.5 mm long and containing 50-100 eggs of a diameter of 200 μm. One of the specimens was serially sectioned and proved to be a female. The second specimen was kept for reference (figs 933-934). Both specimens had the same kind of swelling on the right side of the body, which in the sectioned specimen proved to be the oviduct. Therefore we assume both specimens to be females. The gonad of the sectioned specimen contained only eggs, no sperm production, so therefore we must have overlooked the males when the holothurian was dissected on board R/V J. CHARCOT, and the male is still unknown.

Our anatomical observations confirm Grusov's description and we have not noticed any difference between Grusov's description and our specimens, except that the pallial oviduct seems to be more voluminous in our specimens.

This does, however, not necessarily mean that Grusov's and our specimens belong to the same species. We know that it is more or less impossible to distinguish many eulimids from poorly preserved soft parts only, and this becomes the case when considering shell-less species, unless one can find distinct morphological or biological differences. That two specimens look similar to us does not mean that they are conspecific and we prefer to leave the question open.

In the cyst where the two specimens were found, there was also a small organism (fig. 936, s) that was lost before it could be identified.

Genus *ENTOCOLAX* Voigt, 1888

Type species: E. ludwigi Voigt, 1888, by monotypy.

Remarks: The type species was described from the body-cavity of *Myriotrochus rinki* (Steenstrup), from Bering Sea. Five more species have been described from other species of Myriotrochinae (listed by Warén 1984a). Two females of a species possibly referrable to *Entocolax* were found (by AW) free in a dredge-haul from 700 m in Korsfjorden (W Norway) where also some fragments of *Myriotrochus vitreus* (M. Sars) were found, and it is possible that one of the previously described species of *Entocolax*, or an undescribed one, parasitizes this holothurian.

Genus *ENTEROXENOS* Bonnevie, 1902

Type species: E. oestergreni Bonnevie, 1902, by monotypy.

Synonym: Comenteroxenos Tikasingh, 1961. Type species *C. parastichopoli* Tikasingh, 1961, by monotypy.

Remarks: Lützen (1979) gave an excellent review of this genus, of which a few species are known to live in the body cavity of aspidochirote holthurians. They are simple, worm-shaped animals mainly consisting of an oviduct, where the reduced male is attached in the proximal part, on a so-called «receptaculum masculinum».

Enteroxenos oestergreni Bonnevie, 1902

Type locality: In the body cavity of *Parastichopus tremulus* (Gunnerus), SE and SW Norway.

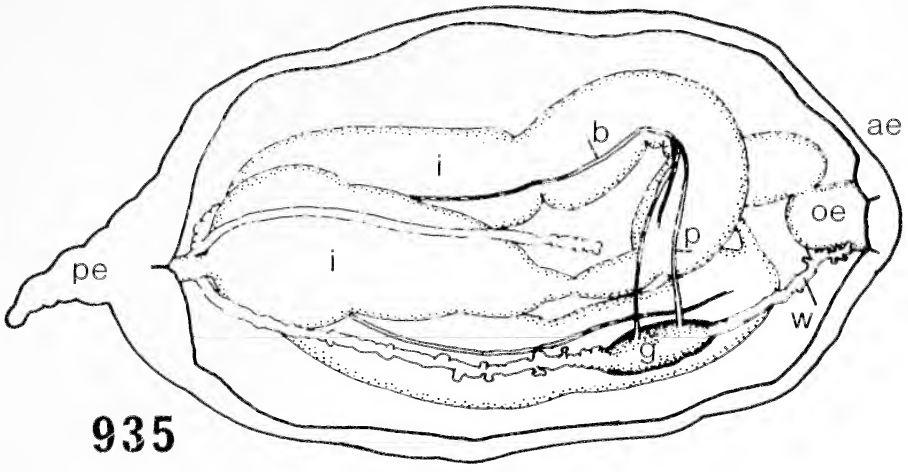
Type material: Not examined.

Material examined: Numerous specimens from the same host species, from the N part of the Swedish west coast, 50-200 m, and the Bergen area, SW Norway, 100-600 m.

Distribution: Enteroxenos oestergreni is so far known only from SW Scandinavia but there is no reason to assume that it does not occur througout the distributional area of its host, *Parastichopus tremulus,* from N Norway, to the Canaries, in 20-1900 m (Mortensen 1927).

Remarks: Enteroxenos oestergreni is usually a common parasite of *Parastichopus.* Lützen (1979) reported an infestation rate of 36.5% in a large material from the Oslo Fjord, A.W. has observed rates of about 30% in the Koster Area (Swedish west coast) and around Bergen (SW Norway). However, Lützen (pers. comm.) found no *Enteroxenos* in *Parastichopus* from the Gullmar Fjord (Swedish west coast). Examination of numerous specimens of *Bathyplotes natans* (M. Sars) and *Mesothuria intestinalis* (Ascanius) from Norway and Sweden failed to reveal any specimens in these holothurians (A.W. unpubl.).

Figs 935-936. *Molpadia blakei* parasitized by *Molpadicola* sp. 935, Schematic drawing of opened host, to show position of parasite, in the waterlung. The proboscis penetrates it and ends in a visceral blood vessel. 936, detail of fig. 935 where the gall with the snails has been opened. ae: anterior end of host, b: blood vessel of host, ec: egg capsule, g: gall on respiratory tree or waterlung, caused by snails, i: intestine, m: *Molpadicola*, oe: oesophagus of host, p: proboscis of snail, pe: posterior end of host, s: unknown organism, w: waterlung. Scale line (fig. 936): 2 mm.



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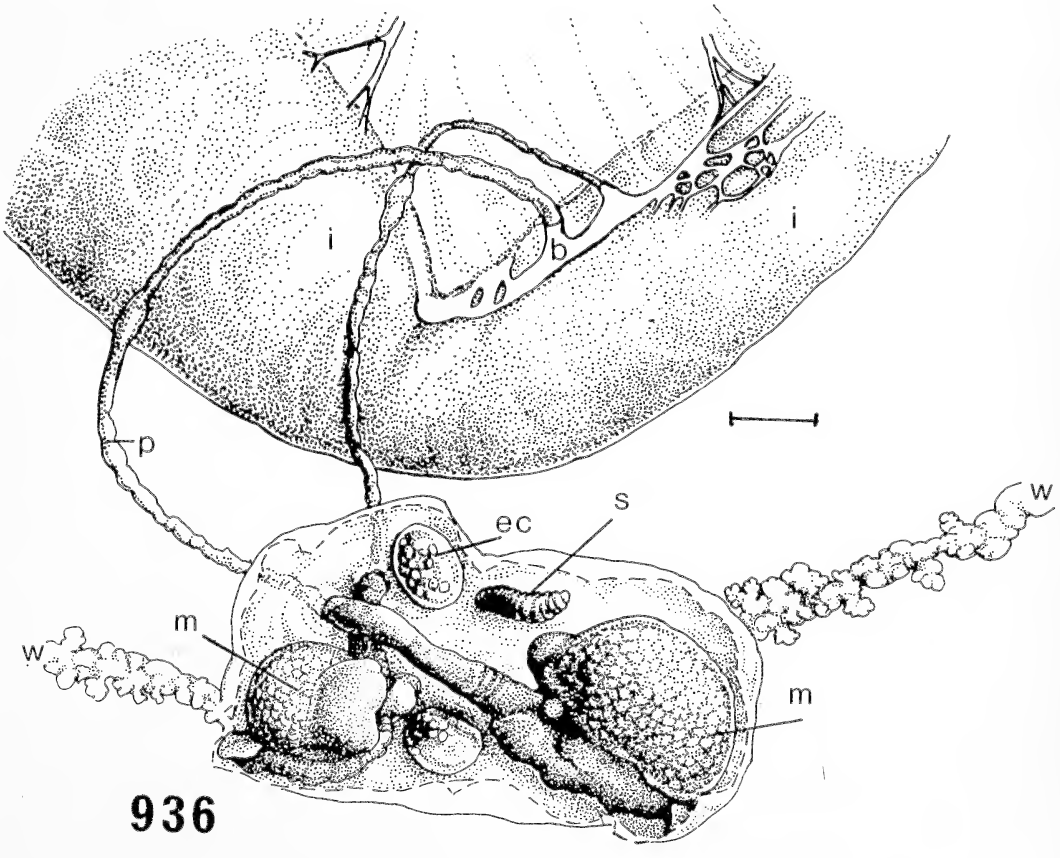

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Genus *CRINOLAMIA* Bouchet & Warén, 1979

Type species: C. dahli Bouchet & Warén, 1979, by original designation.

Remarks: Four species are presently known to belong to *Crinolamia*, and a fifth is described here. They all originate from deep water and one species, *C. ptilocrinicola* (Bartsch) is known with certainty to parasitize crinoids, the others are suspected to live on the same kind of hosts.

Crinolamia angustispira n. sp. Figs 937-938, 943

Type material: Holotype in MNHN.

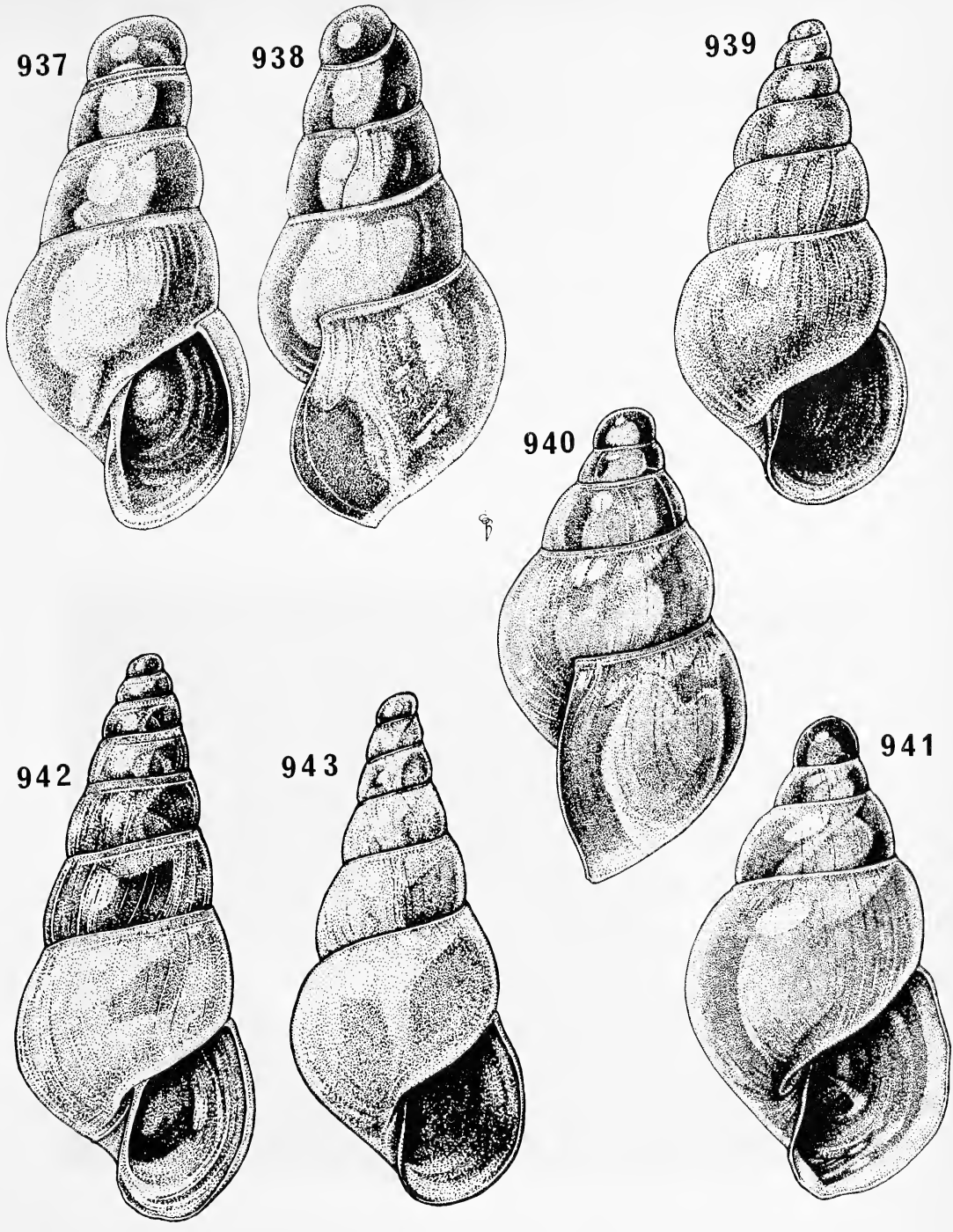
Type locality: NORATLANTE st C4, 35° 41 N, 10° 04 W, 4500 m.

Material examined: The type and INCAL DS09, 55° 08 N, 10° 53 W, 2090 m, 1 spm; CHALLENGER II st 135, 54° 39 N, 12° 16 W, 2900 m, 1 spm; st 140, 54° 40 N, 12° 16 W, 2912 m, 2 spms (serially sectioned).

Distribution: Only known from the material examined, from off W Europe, 2000 - 4500 m.

Description: Shell colourless, thin, transparent, very fragile, forming a slightly concave cone. Larval shell consisting of 1.8 whorls and 500 μm high, perfectly smooth and colourless. The holotype has 4.5 teleoconch whorls sculptured by some faint incremental wrinkles, but no incremental scars. The whorls increase their diameter faster at a larger size, which gives the spire a concave shape; they are evenly convex and have a narrow subsutural zone. The outer lip is strongly opisthocline in young specimens, and straighter in adult ones. The columella is very straight, with a slightly reflected inner lip, but no trace of an umbilical chink.
Dimensions: Height of the shell 2.5 mm, other dimensions not relevant because the aperture is partly broken.
Soft parts: (From the sectioned specimens, see above). Foot rather large, with operculum, but no pedal flaps. Head with short, blunt, cylindrical tentacles, no eyes, large penis, no snout. Hermaphrodite, large seminal vesicle and developing sperm in gonad. Female system less well developed, but nearly mature eggs present, although the open oviduct was small and inconspicuous in the specimen sectioned (height 3.2 mm). Posterior pedal gland occupies most of the foot. Anterior pedal gland reaches back into the cephalopedal haemocoel and fills 2/3 of this cavity. Proboscis sheath completely retractile. Buccal mass indistinct, no jaws, radula or radular cartilage. Stomach rudimentary.

Remarks: We have hesitated a little before describing these specimens as a new species. They resemble *C. dahli* closely, our material is small and in poor condition and the species of *Crinolamia* seem to be unusually variable for eulimids. Nevertheless our material shows the slender spire of *C. angustispira* to be a constant difference although the material originates from widely scattered localities.



Figs 937-943. Genera *Hemiaclis* and *Crinolamia*. 937-938, *Crinolamia angustispira*, CHALLENGER II st 135, 1.36 mm. 939, *C. dahli*, NORBI CP3, 3.3 mm. 940-941, *C. dahli*, NORBI CP13, 2.1 mm. 942, *Hemiaclis ventrosa*, off Korsfjorden, W Norway, 300 m, 4.4 mm. 943, *C. angustispira*, holotype, 2.5 mm.

Crinolamia dahli Bouchet & Warén, 1979 Figs 939-941, 944-945

Crinolamia dahli Bouchet & Warén, 1979:223, figs 10a-c.

Type material: Holotype and paratypes in MNHN.

Type locality: NORBI st CP 13, 76° 01 N, 01° 45 W, 3709 m.

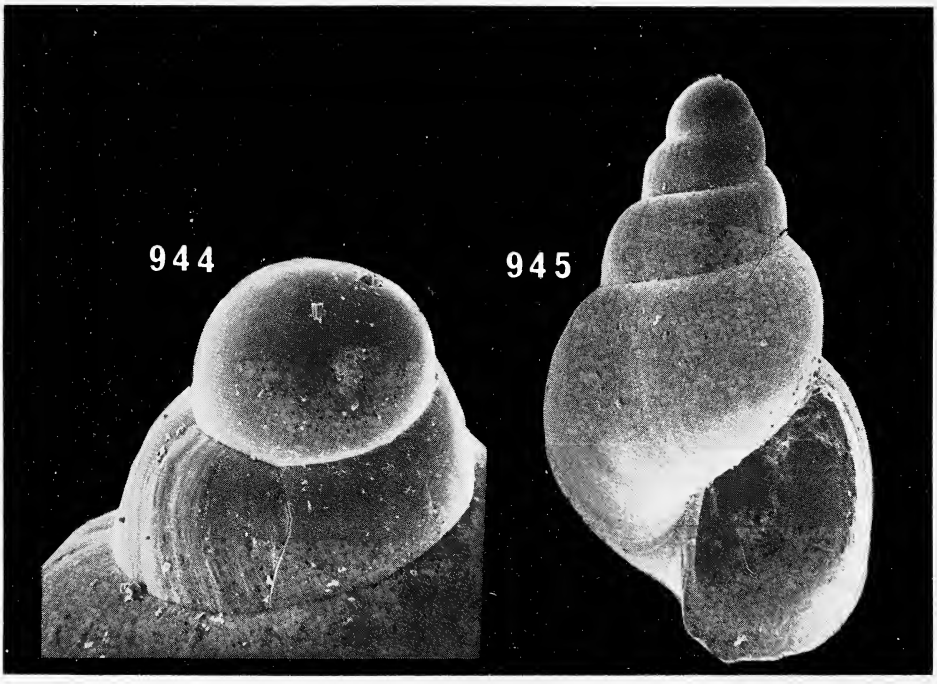
Material examined: Listed by Bouchet & Warén (1979).

Distribution: The abyssal parts of the Norwegian Sea.

Remarks: In the area between Norway and Greenland, there are no eulimids known that can be confused with *Crinolamia*, except *Hemiaclis ventrosa*, and we have figured a specimen for comparison (fig. 942). *Hemiaclis* differs by having a proportionally smaller aperture, flatter whorls, straight outer lip and by having a radula. It could also be confused with some of the rissoids or pyramidellids of the area, but they have a distinctly rounded columella.

Crinolamia angustispira differs by having a more slender spire, but is otherwise very similar.

Crinolamia dahli is suspected to be a parasite of *Bathycrinus carpenteri* (Danielssen & Koren) (Bouchet & Warén 1979:224).



Figs 944-945. *Crinolamia dahli*, Norwegian Sea, 2000-2500 m. Height of larval shell 430 μm, height of shell 1.62 mm.

Genus *CRINOPHTHEIROS* n.gen.

Type species: Stylina comatulicola Graff, 1875 (= *Eulima beryllina* Monterosato, 1878). Figs 946-947.

Diagnosis: Eulimids parasitic on crinoids. Shell straight, conical, transparent, with a small aperture. Incremental scars distinct, not regularly disposed. Aperture with very straight (front view) outer lip, evenly arched columellar-parietal wall.

Remarks: The type species was described as an ectoparasite on *Antedon mediterranea* (Lamarck) from the Gulf of Naples. A few years after the description Monterosato (1878) described *Eulima beryllina*, evidently not aware of Graff's description, but synonymized the two names a little later (1890). Figs 946-947 are prepared from a neotype (here selected) from a sample of *Stylina comatulicola* in ZMR. According to the label, this sample came from Naples, the type locality of *comatulicola*. The handwriting on the label is not that of Monterosato, but may be of a German worker; possibly the specimens were sent by Graff.

The mode of parasitism of *Crinophtheiros comatulicola* and some frequency distributions have been published by Bacci (1948) and Changeux (1956). The species introduces the proboscis in the soft tissues of the arms or the calyx and is presumed to suck body fluid. It is perfectly mobile, and shows no reductions in the soft parts, except lack of radula. It has no snout. Fretter (1955) described the parasitic way of life of *«Balcis devians»*, reported as a parasite of *Antedon bifida* (Pennant). Judging from the figure in Fretter & Graham (1962: fig 139) the record should probably be referred to *Eulima collinsi* Sykes, 1903, a species very similar to *C. comatulicola*. In the same paper Fretter also gave a detailed description of the anatomy.

Among the deep sea eulimids we have only encountered a single species resembling the two species here included in *Crinophtheiros, E. junii* De Folin, 1887, a fairly large species from the Azores.

Crinophtheiros junii (De Folin, 1887) Figs 948-949

Eulima junii De Folin, 1887:203, pl. 3, fig. 8.

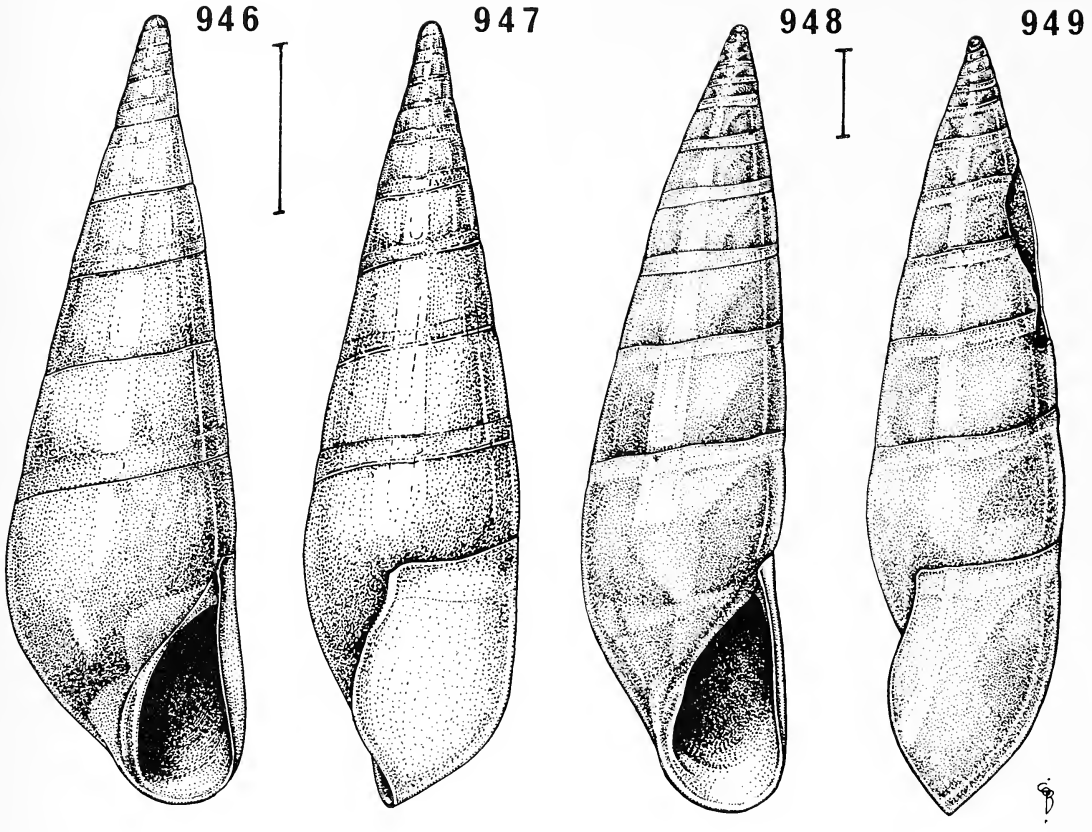
Type material: Holotype in Musée de la Mer, Biarritz.

Type locality: Between Pico and St George, the Azores, 1257 m.

Material examined: The holotype, a shell.

Distribution: Only known from the holotype.

Remarks: This species resembles in shape *C. comatulicola*, but is about twice as large, and has a larval shell of two whorls while that of *comatulicola* has more than three whorls. The aperture has very much the same shape as in *comatulicola* but its lower part gives an impression of being a little drawn out towards the side and forwards. We have not seen any deep water species that resembles it.



Figs 946-949. Genus *Crinophtheiros*. 946-947, *C. comatulicola*, lectotype, Zoological Museum of Rome. 948-949, *C. junii*, holotype. Scale lines: 1 mm.

Genus *CURVEULIMA* Laseron, 1955

Type species: C. cornuta Laseron, 1955, by original designation.

Remarks: The type species is a parasite of a comatulid crinoid in S Australia, and several other tropical species are known from crinoids. These species form a fairly uniform group in shell characters. Nothing is known about the soft parts. Of the species here included in *Curveulima, C. eschara* is the species most similar to this group. Of the other species of *Curveulima* here discussed *C. macrophthalmica* differs the most, but still there is a considerable resemblance in the shape of the aperture, especially the columella and its transition to the parietal wall. Typical for these species is the solid lower part of the body whorl, more or less forming a ridge towards the lower connection to the inner lip or columella.

The species can be distinguished by the following key:

A. Larval shell of 2.5 whorls	B
A. Larval shell of 4 whorls	C
B. Spire straight	*C. obliquistoma* (p. 402)
B. Spire curved, incremental scars in a line	*C. eschara* (p. 402)
C. Spire curved, outer lip curved in front view	*C. marshalli* (p. 400)
C. Spire irregularly twisted in different directions, outer lip unusually straight in front view	*C. macrophthalmica* (p. 399)

Curveulima macrophthalmica (Warén, 1972) Figs 950-952, 965-966

Balcis macrophthalmica Waren, 1972a:49, fig. 1.

Type material: Holotype ZMB 52201, several syntypes listed by Warén (1972a).

Type locality: Kosterfjorden, N part of the Swedish west coast, 60-100 m.

Material examined: PORCUPINE 1870 st 17, 39° 42 N, 09° 43 W, 1100-2005 m, 4 shs; THOR 1904 st 99, 61° 15 N, 09° 35 W, 900 m, 6 shs; INCAL CP04, 56° 33 N, 11° 11 W, 2483 m, 1 spm; THALASSA Z435, 48° 40 N, 09° 53 W, 1050 m, 1 spm; Z445, 48° 52 N, 11° 07 W, 1200 m, 1 sh; Lofoten, N Norway, 1 sh, USNM; Trondheimsfjorden, Norway, 18 spms, ZMO; Swedish west coast and Korsfjorden, Norway, 250 spms, coll. AW; DISCOVERY st 7984, 25° 26 N, 16° 10 W, 850 m, 1 spm.

Distribution: Only known from the material examined, from Lofoten, along the Scandinavian coasts, W of the British Isles, the Bay of Biscay, off Portugal and the Canaries, in 50-2500 m.

Remarks: The record from the Bay of Biscay and southwards are somewhat uncertain, the specimens are few and usually not in good condition. These specimens also are more slender and have flatter whorls, but we cannot justify separation of two species in the present material.

Curveulima macrophthalmica can be recognized by the twisted axis of the shell, large larval shell of more than four whorls and the high, straight aperture. There is some variation in the shape of the larval shell (figs 965-966), but all intermediates between the specimens figured can be found in the same locality and we do not suspect our northern samples to be heterogeneous.

Curveulima marshalli resembles *macrophthalmica*, but is more regularly curved, has a more slender aperture and has the incremental scars placed on the right half of the shell (apertural view), while in *macrophthalmica* the scars are irregularly disposed all over the shell. *Curveulima eschara* differs by having a larval shell of slightly more than two whorls and by having the incremental scars in a conspicuous line along the right side of the shell.

Nothing is known about the biology of *C. macrophthalmica*, but the crinoid *Harthrometra sarsi* (Düben & Koren) is usually obtained in the same dredge hauls, in Scandinavia. The animal does not look reduced or specialized in the external morphology. It has no snout, a functional foot and unusually large eyes, of about the same diameter as the distance between them. No radula is present.

Curveulima marshalli n.sp. Figs 953-955

Type material: Holotype USNM 842106 and 1 paratype USNM 842107.

Type locality: PORCUPINE 1870 st 17, 39° 42 N, 09° 43 W, 1100-2005 m.

Material examined: The type material, both empty shells.

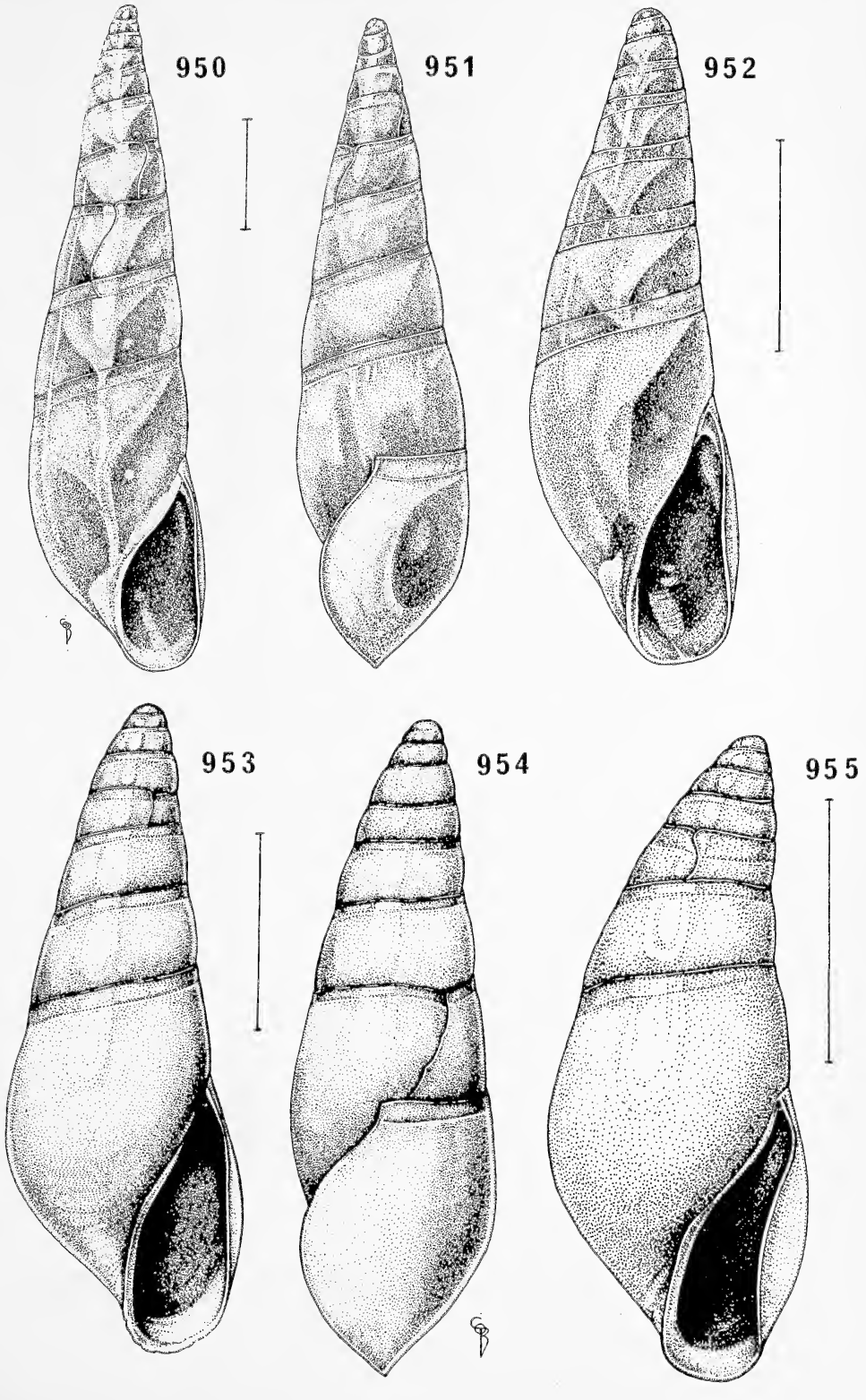
Distribution: Only known from the type material, off Portugal.

Description: Shell rather small, transparent, distinctly curved, fragile and pointed. The larval shell resembles closely that figured of *macrophthalmica* in figs 965-966 and is about 600 μm high. The holotype has 4 postlarval whorls, slightly convex and without any sculpture. Incremental scars form an irregularly twisted line, sometimes interrupted, down the spire, i.e. the scars are placed slightly more than one whorl apart. Suture shallow, making a distinct «dip» at the incremental scars. Aperture rounded at the lower part, very high and slender. The columella and the very thin parietal callus form a very slightly curved line, without a distinct separation of them. Outer lip retracted at the suture, evenly and strongly protruding, most so just below its mid point.

Dimensions: Height of the shell 4.40 mm (lower edge chipped), diameter 1.46 mm, height of the aperture 1.8 mm, breadth 0.6 mm.

Remarks: The two shells known are not in the best condition, but quite characteristic. The appearance of the shell approaches *C. eschara* and *C. obliquistoma*, but these two species have a larval shell of about two whorls and proportionally shorter aperture. Small specimens of *C. macrophthalmica* differ by having the apex curved towards the left (apertural view) and the spire twisted in different directions, not regularly curved towards the right and backwards as *marshalli*.

Figs 950-955. Genus *Curveulima*. 950-952, *C. macrophthalmica*, off Korsfjorden, W Norway. 953-955, *C. marshalli*, holotype and paratype respectively, PORCUPINE st 17. Scale lines: 1 mm.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Curveulima obliquistoma n.sp. Figs 956-960, 967

Type material: Holotype in MNHN.

Type locality: MONACO st 1349, 38° 36 N, 28° 06 W, 1250 m.

Material examined: The holotype and 3 spms from the type locality; PORCUPINE 1870 st 17, 39° 42 N, 09° 43 W, 1100-2005 m, 11 shs; BIOGAS CP23, 44° 05 N, 04° 21 W, 1980 m, 1 sh.

Distribution: Only known from the material examined, from the Azores, the Bay of Biscay and off Portugal in 1000-2000 m.

Description: Shell rather small, straight, conical, transparent, slender, with slightly convex whorls and a slender aperture. The larval shell consists of about 2.5 indistinctly mucronate whorls. The holotype has 5.9 teleoconch whorls, with 3-4 incremental scars, irregularly disposed along the spire. No microsculpture. The diameter of the spire is somewhat variable, in some specimens it is quite slender in others of more rapidly increasing diameter. Aperture obliquely pear shaped, rather small. The columella and the parietal wall form a very distinct angle. Parietal callus thin but complete. Outer lip retracted at the suture, evenly protruding in its lower part, most so well below its midpoint.
Dimensions: Height of the shell 4.12 mm, diameter 1.38 mm, height of the aperture 1.34 mm, breadth 0.60 mm.

Remarks: Nothing is known about biology or soft parts. *C. obliquistoma* resembles *C. marshalli* in appearance, but is straight and has a proportionally broader and lower aperture. The spire is almost perfectly straight although the apex can be slightly tilted in *C. obliquistoma* while in *C. marshalli* all the spire is evenly curved.

Curveulima eschara n. sp. Figs 961-962

Type material: Holotype BMNH 1984165, paratype BMNH 1984166.

Type locality: DISCOVERY st 7984, 25° 61 N, 16° 10 W, 850 m.

Material examined: The type material.

Distribution: Only known from the type locality, between the Canaries and W Africa.

Description: Shell small, pointed, conical, vitreous, slightly curved, with a narrow aperture. The larval shell consists of about 2.5 whorls and its height is 380 μm. The holotype has 5.7 teleoconch whorls, perfectly smooth and slightly convex. Five incremental scars form a slightly irregular line up the spire just behind the outer lip. Suture distinct but shallow, with a subsutural zone occupying about 1/6 of the height of the whorls. Aperture high, slender, distinctly oblique, rather deeply excavated in its lower part. Columella and parietal callus forming a slightly

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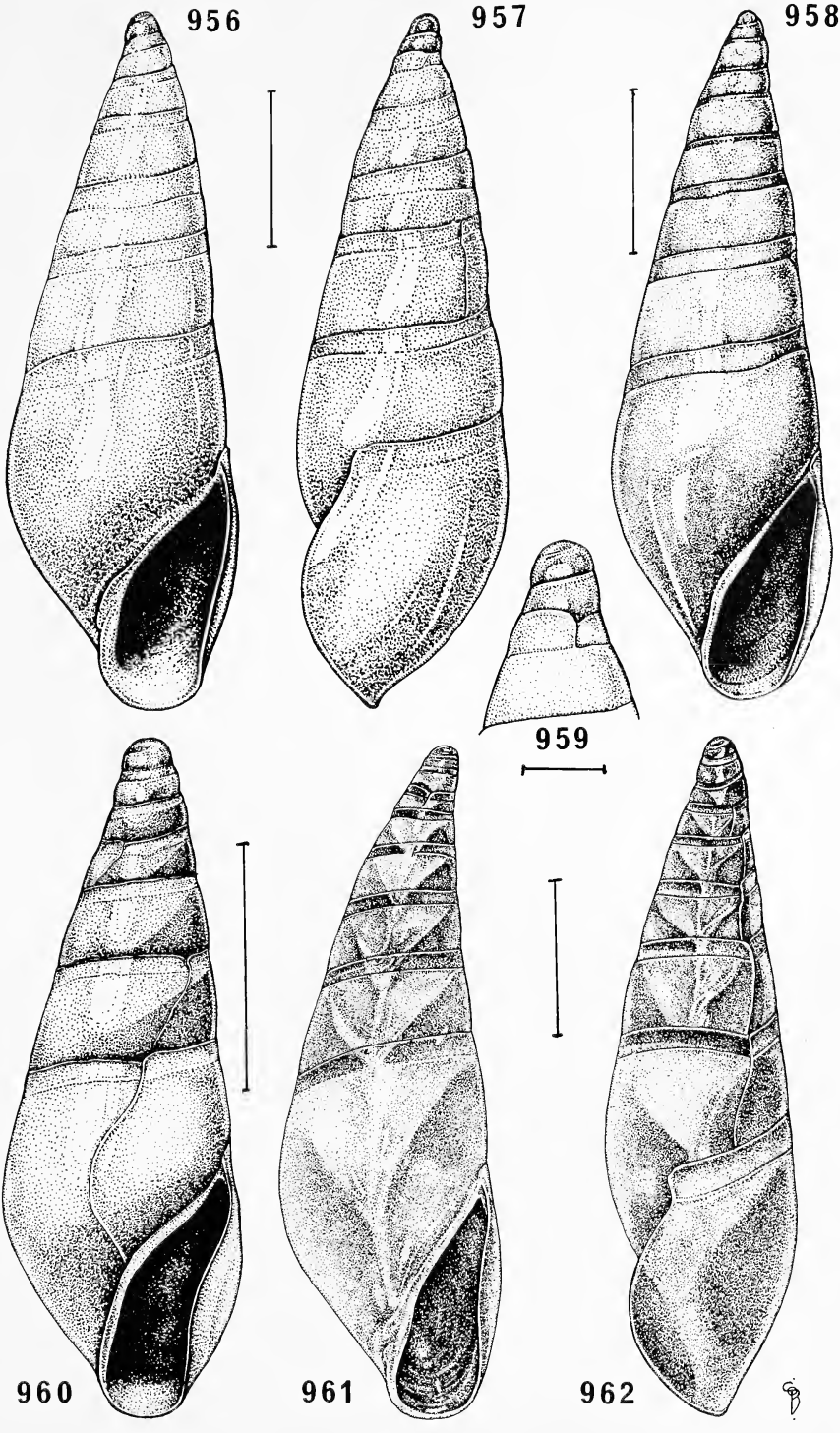
Figs 956-962. Genus *Curveulima*. 956-957, *C. obliquistoma*, holotype. 958-959, *C. obliquistoma*, MONACO 1349. 960, *C. obliquistoma*, PORCUPINE 1870 st 17. 961-962, *C. eschara*, holotype. Scale lines: 1 mm, except fig. 959: 250 μm.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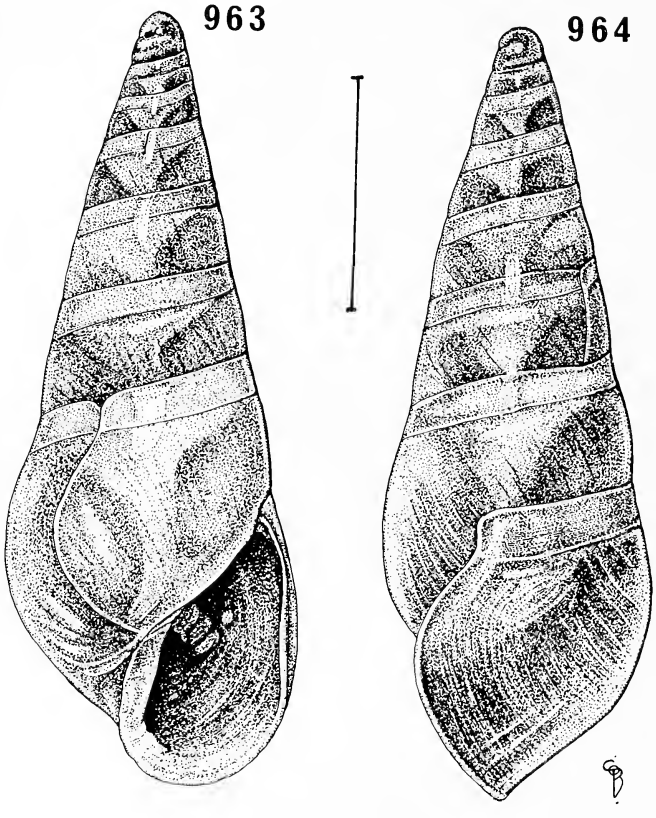
curved arc. Outer lip slightly sinuated at the suture, prosocline, strongly projecting, with the most protruding part situated at its midpoint.
Dimensions: Height of the shell 4.16 mm, diameter 1.32 mm, height of the aperture 1.36 mm, breadth 0.54 mm.

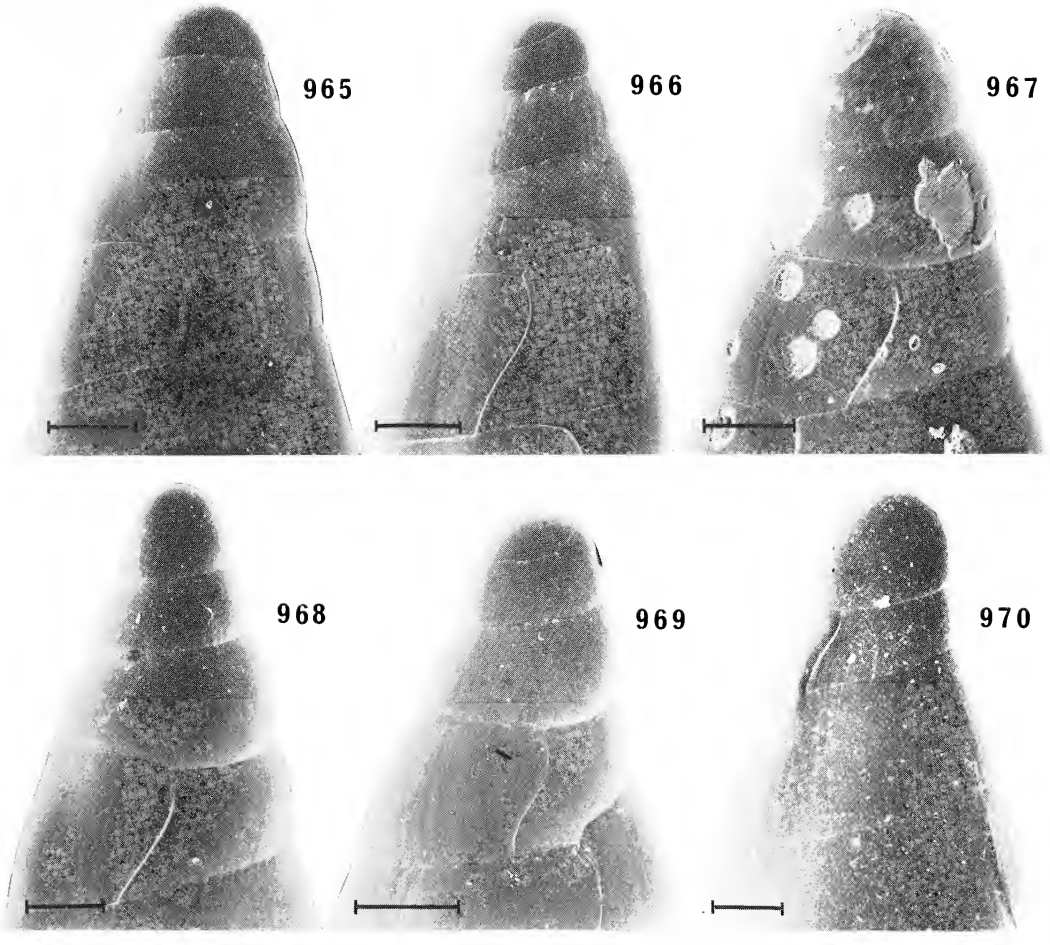
Remarks: The holotype is a perfect but empty shell, the paratype an immature specimen. Two large close-set eyes can still be seen in the dried soft parts of the paratype.

Curveulima eschara closely resembles *C. marshalli*, but has a larval shell of 2.5 instead of more than 4 whorls and a slightly shorter and broader aperture.

It also resembles *C. obliquistoma*, but is distinctly curved and has more convex whorls.



Figs 963-964. *Bathycrinicola media*, holotype. Scale line: 1 mm.



Figs 965-970. Apices of *Bathycrinicola* and *Curveulima*. 965-966, *Curveulima macrophthalmica*, Bergen area, Norway. 967, *C. obliquistoma*, BIOGAS CP23. 968, *Bathycrinicola micrapex*, THALASSA Z447. 969, *B. media*, CANCAP 2.058. 970, *B. curta*, Bergen area, Norway. Scale lines: 100 μm.

Genus *BATHYCRINICOLA* n. gen.

Type species: Eulima talaena Dautzenberg & Fischer, 1896.

Diagnosis: Eulimids parasitic on crinoids of the family Bathycrinidae. Shell broad, conical, colourless, transparent, with a large aperture and straight columella, forming a distinct angle with the parietal wall. Soft parts poorly known, but radula lacking. No snout. Operculum, tentacles, eyes, penis present, foot well developed.

Remarks: This genus is erected for a group of species which are in some cases known to parasitize crinoids, in some cases suspected to do so and in other cases resemble the aforementioned species in shell characters.

The shell shape is very similar to that of *Sabinella* spp., but the outer lip is less expanded and does not form raised varices as in *Sabinella.* Moreover *Bathycrinicola* has a straight columella, while that of *Sabinella* is more or less curved. Several species of *Sabinella* are known to be ectoparasites on cidaroid sea-urchins, where they seem to be permanently attached by the snout. At present the species of *Bathycrinicola* are known to parasitize only the family Bathycrinidae and all lack a snout.

In addition to the species included here, there are at least two records in the literature thay may be referred to *Bathycrinicola:* Wyville Thomson (1877:122-123) mentioned that specimens of *«Rhizocrinus lofotensis»* from CHALLENGER st 122C (off NE Brazil, 730 m) were infested by some specimens of *«Stylifer».* This record was repeated by Carpenter (1884:134), A.H. Clark (1921: 646-648 who referred the record to *Bythocrinus* sp?), and Lützen (1972). A.M. Clark (1977:178) reexamined the host specimens and determined them to be *Democrinus* sp. She mentioned the parasites and noticed that also a specimen of the same crinoid taken by ATLANTIS II, off NE Brazil, 1493 m, had perforations in the calyx. Dr A.M. Clark has informed us that the shell is totally dissolved, and the specimen has been dried, so we have not examined it.

A.H. Clarke (1921:649) recorded a gastropod on a specimen of *Rhizocrinus verrilli* from off Nova Scotia, 218 fathoms: «on the calyx... In bulk the parasite is actually larger than the calyx of the crinoid». We have examined the specimen, kept in the Division of Echinoderms, USNM (reg. no. E36215). The shell is dissolved, but judging from the size and shape of the dried remains, it is probably a species of *Bathycrinicola.*

Five species are here included in *Bathycrinicola*, three of which are undescribed.

Of these *B. talaena* and *B. curta* resemble each other closely and will certainly prove to be closely related when they are better known. The other three species are included in *Bathycrinicola* because of similarities in the shape of the aperture and because there is nothing contradictory in the few details known about the soft parts.

The species of *Bathycrinicola* can be separated by the following key:

A. Larval shell of 1.5 inflated whorls	B
A. Larval shell of 2 or more whorls of regularly increasing diameter	C
B. Adult size about 4 mm	*B. talaena* (p. 407)
B. Adult size 2.5-3.2 mm	*B. curta* (p. 407)
C. Larval shell of more than 3.5 whorls	*B. micrapex* (p. 408)
C. Larval shell of about 2.5 whorls, height 380 μm; teleoconch with spiral microsculpture	*B. media* (p. 412)
C. Larval shell of 3 broad and convex whorls, height 600 μm; teleoconch perfectly smooth	*B. macrapex* (p. 410)

Bathycrinicola talaena (Dautzenberg & Fischer, 1896) Figs 977-978

Eulima talaena Dautzenberg & Fischer, 1896:166, pl. 5, fig. 9.

Type material: Holotype in MOM.

Type locality: MONACO st 233, 38° 33 N, 30° 29 W, 1300 m.

Material examined: The holotype and 1 spm, BALGIM CP 68, 35°12N, 07°53W, 1998-2077m, parasitic on *Democrinus parfaiti* Perrier, 1883; THALASSA Z436, 48° 40 N, 09° 56 W, 1210 m, 1 spm; Z453, 48° 33 N, 10° 50 W, 2010 m, 1 spm.

Distribution: Only known from the material examined, from the Azores, the Bay of Biscay and the Ibero-Moroccan Gulf, in 1000-2000 m.

Remarks: The present species closely resembles *B. curta*, but differs in being larger (about 4 mm instead of 2.5 mm), by being broader and by having the lower part of the aperture less evenly rounded. Young specimens also resemble *Sabinella pachya*, but that species has a pointed larval shell of 2.5 whorls, instead of a blunt one of 1.5 whorls.

One specimen was found attached on *Democrinus parfaiti* where the proboscis was introduced between the calyx and the first arm joint. There was also a hole just beside this specimen, where probably a second specimen had been attached. The specimen was simply attached by the proboscis, which evidently is retractile because in the second, empty hole, there was no sign of a torn proboscis.

The animal has no snout, but there is a small ring fold on the proboscis 0.5 mm from the proboscis opening. The head-foot is unexpectedly small in relation to the large aperture. The head has rather short, flattened tentacles with eyes deeply buried in the bases. The distance between the eyes is about 180 μm and their diameter 40 μm. There is no snout. The foot looks normal, but was badly contracted. Operculum very thin, transparent and colourless. Penis behind right tentacle, well developed, very similar to that of *B. curta*. No well developed oviduct present. The specimen is 2.8 mm high. The last whorl is very thin and badly broken, so it is not a mature specimen.

Democrinus parfaiti was recorded from one of the THALASSA stations where *B. talaena* was obtained (Z453) by Roux (1977); the absence of this presumed host from st Z436 means very little because these crinoids are often obtained in a state that does not allow identification, sometimes not even collection.

Bathycrinicola curta (Warén, 1972) Figs 970, 979-982

Balcis curta Waren, 1972b: 1, figs 1a-b.

Type material: Holotype and 3 paratypes ZMB 53314 and 53315.

Type locality: NW of Marsteinen, off Korsfjorden, W Norway, 315-317 m.

Material examined: The types and about 20 shells and specimens from off Korsfjorden (60° N), W Norway, in 275-325 m; «Trondheimsfjorden», W Norway, 3 spms, ZMO.

Distribution: Only known from the material examined.

Remarks: The host of *Bathycrinicola curta* is not known, but *Rhizocrinus lofotensis* M. Sars, was regularly obtained in the dredge hauls off Korsfjorden, in which A. Warén obtained the material examined.

Five specimens of *B. curta*, 1.7-3.0 mm high were soaked and the gross morphology was examined. It was found to agree with the description given of *talaena*, although the head-foot of *curta* is proportionally larger. All specimens had a well developed penis and oviduct and completely retracted proboscis.

For differences from *talaena*, see under that species. *Eulima fernandinae* Dall, 1927 from off Florida, 500-900 m, is very similar to *curta* and certainly congeneric. It differs by attaining a larger size (4mm) and by being proportionally more slender. Young specimens of *Sabinella pachya* and *S. bonifaciae* also resemble *B. curta*, but differ in having a pointed, evenly conical larval shell of 2.5 whorls, instead of an inflated one of 1.5 whorls (figs 970 and 1006).

Bathycrinicola micrapex n. sp. Figs 968, 971-973

Type material: Holotype in MNHN.

Type locality: BIOGAS st DS 65, 47° 36 N, 08° 41 W, 2360 m.

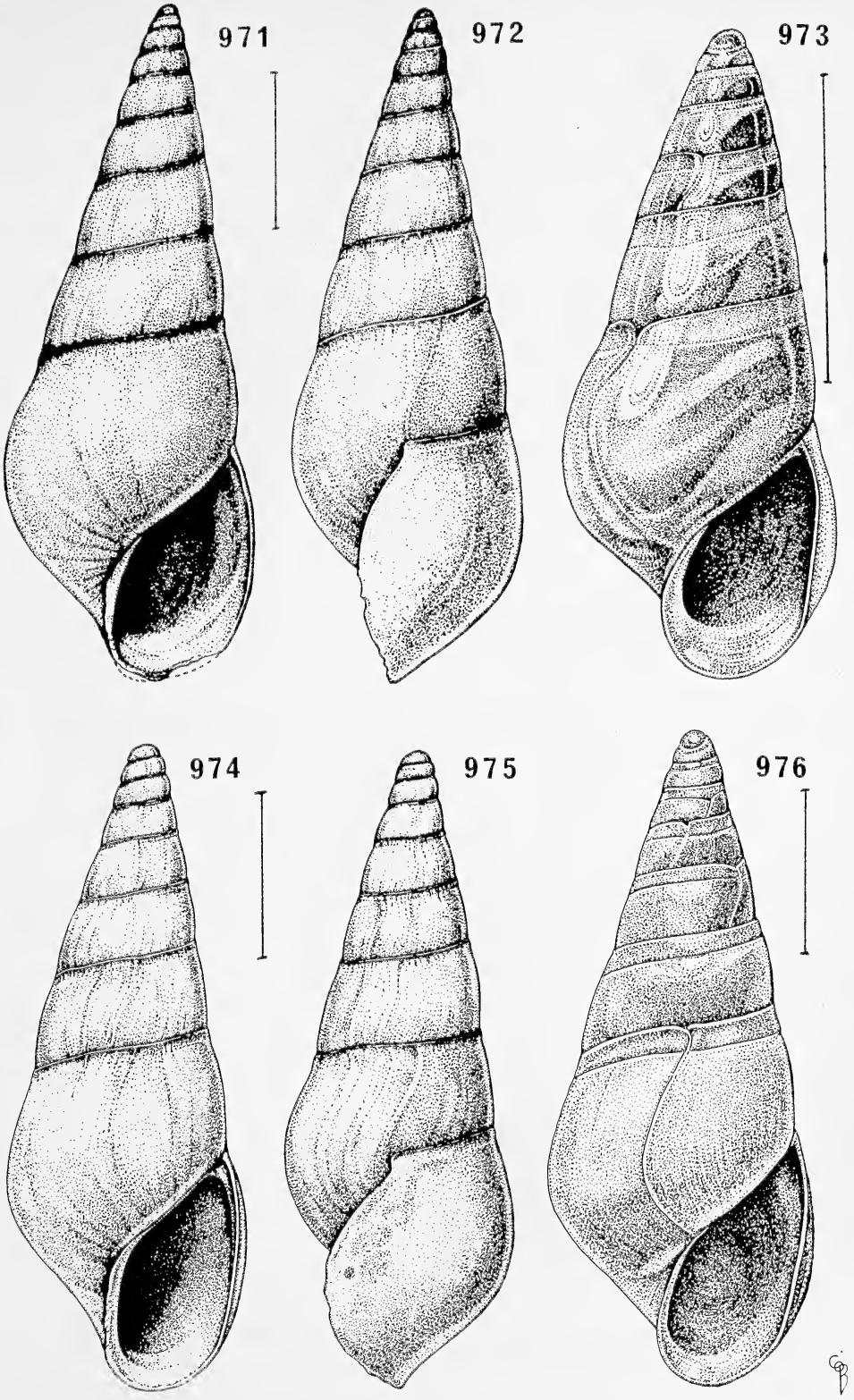
Material examined: PORCUPINE 1870 st 17a, 39° 39 N, 09° 39 W, 1355 m, 3 shs; MONACO st 1349, 38° 36 N, 28° 06 W, 1250 m, 6 shs; THALASSA Z400, 47° 33 N, 07° 19 W, 1175 m, 1 sh; Z447, 48° 47 N, 11° 13 W, 1500 m, 2 spms; BIOGAS DS61, 47° 35 N, 08° 39 W, 2250 m, 1 spm.

Distribution: Only known from the material examined, from the Bay of Biscay, off Portugal and the Azores in 1200-2400 m.

Description: Shell straight, conical, grayish transparent, pointed, with a fairly large aperture. The larval shell is unusually large but pointed, consists of 4 distinctly convex whorls and its height is 550-620 μm. The holotype has 5.0 postlarval, very slightly convex whorls, without a trace of sculpture. Incremental scars distinct, rather regularly disposed, 0.8 whorls apart along all the shell. Subsutural zone distinct, occupying about 0.15 of the height of the whorls. Aperture large, showing a tendency to rhomboid shape, with outer lip and columella, and parietal wall and lower edge running parallel with each other for some distance. Columella thin, straight. No parietal callus. Outer lip very slightly sinuated at the suture, evenly arched and protruding below, with the most projecting part situated just below the middle of its height. Dimensions: Height of the shell 4.20 mm, diameter 1.62 mm, height of the aperture 1.52 mm, breadth 0.80 mm.

Remarks: Bathycrinicola micrapex closely resembles *B. macrapex* and *B. media*, the only difference that can be concluded from the present material is the size of the larval shell and the spiral microsculpture in *B. media.*

Figs 971-976. Genus *Bathycrinicola.* 971-972, *B. micrapex*, PORCUPINE st 17a. 973, *B. micrapex*, THALASSA Z447. 974-975, *B. macrapex*, PORCUPINE st 17a. 976, *B. macrapex*, holotype. Scale lines: 1 mm.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Bathycrinicola macrapex n.sp. Figs 974-976

Type material: Holotype in MNHN.

Type locality: BIOGAS st DS 87, 44° 05 N, 04° 19 W, 1913 m.

Material examined: The holotype and PORCUPINE 1870, st 17a, 39° 39 N, 09° 39 W, 1355 m, 1 sh; MONACO st 1349, 38° 36 N, 28° 06 W, 1250 m, 2 shs.

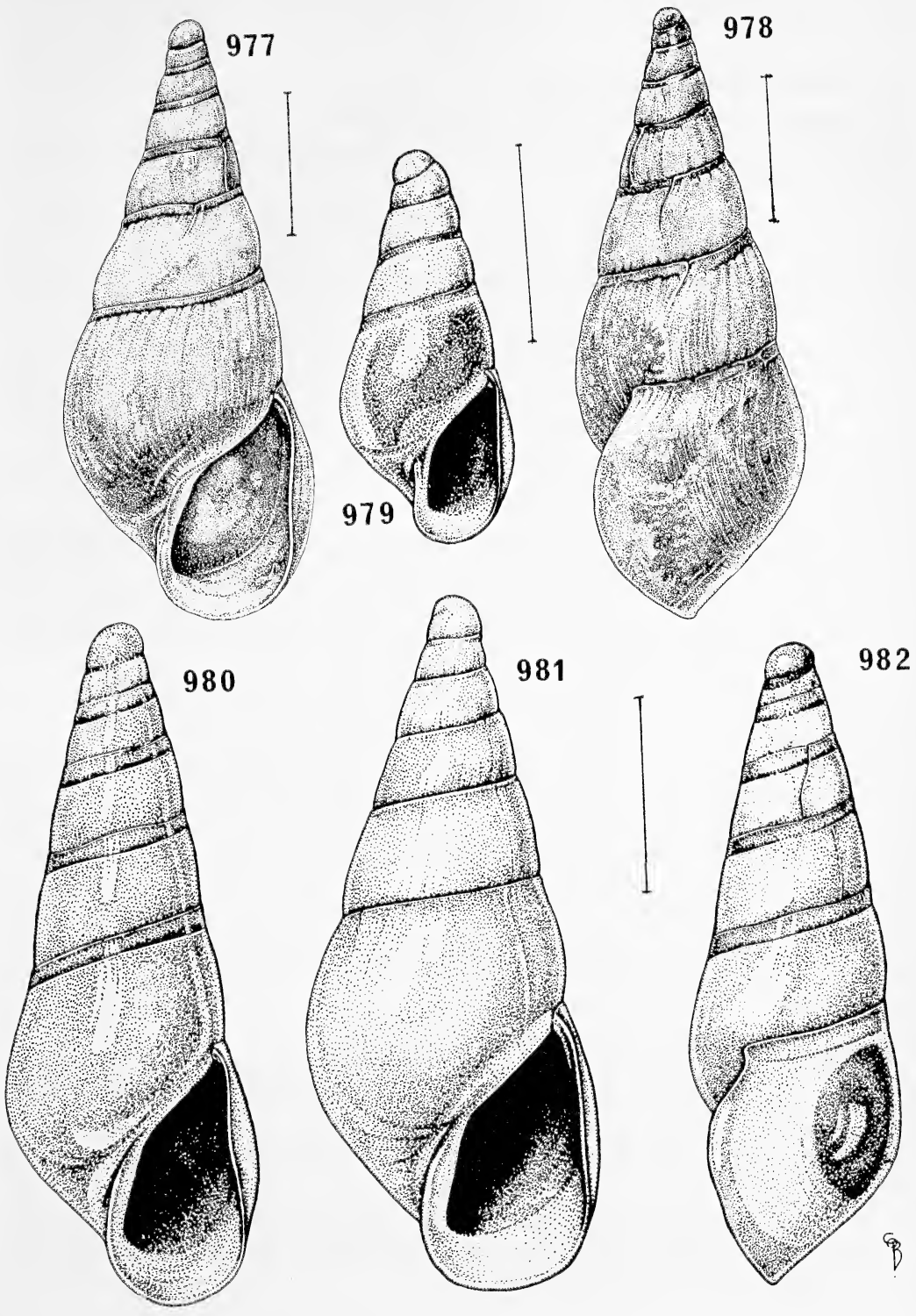
Distribution: Only known from the material examined, from off Portugal, Bay of Biscay and the Azores, 1200-1900 m.

Description: Shell straight, conical, grayish transparent, rather blunt, with a fairly large aperture. The larval shell is blunt and consists of 3.0 rather broad, evenly convex whorls, and its height is about 600 μm. The holotype has 4.5 postlarval very slightly convex whorls, without a trace of sculpture. Incremental scars distinct, rather regularly disposed, 0.5-0.8 whorls apart along the postlarval whorls. Subsutural zone distinct, occupying about 0.22 of the height of the whorls. Aperture large, showing a tendency to rhomboid shape, with outer lip and columella and parietal wall and lower edge running parallel with each other for some distance. Columella thin, very slightly curved. No parietal callus. Outer lip very slightly sinuated at the suture, evenly arched and protruding below, with the most projecting part situated just below the middle of its height.
Dimensions: Height of the shell 3.98 mm, diameter 1.68 mm, height of the aperture 1.48 mm, breadth 0.80 mm.

Remarks: Bathycrinicola macrapex has a slightly broader shape than *B. micrapex*, but it is the difference in the structure of the larval shell (fig 968) that has prompted us to distinguish between them. Some pieces of information about the soft parts were obtained from the remains in the holotype. Eyes present; no trace of penis, only a large oviduct; proboscis not retracted, no snout; foot present; operculum resembling that of *B. curta*.

All specimens we have examined appear to be immature, having a very thin outer lip, slightly angulated body whorl and somewhat angulated lower left corner of the aperture.

Figs 977-982. Genus *Bathycrinicola*. 977-978, *B. talaena*, THALASSA Z436. 979-982, *B. curta*, off Korsfjorden, Norway. Scale lines: 1 mm.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Bathycrinicola media n.sp. Figs 963-964, 969

Type material: Holotype in RMNH 55719.

Type locality: CANCAP st 2.058, 27° 58 N, 13° 15 W, 500 m.

Material examined: The holotype and 1 paratype from the type locality (the paratype figured in fig. 969 was crushed in mail).

Distribution: Only known from the type locality, between the Canaries and W Africa, 500 m.

Description: Shell straight, conical, vitreous, pointed with a rather small aperture. The larval shell consists of 2.5 somewhat convex, colourless whorls and its height is 380 μm. The holotype has 5.3 slightly convex whorls covered by an indistinct microsculpture of spiral lines about 8 μm broad, only visible by optical microscopy and where the light is reflected. Three irregularly disposed incremental scars, of which the last one is placed 0.8 whorls from the aperture. Subsutural zone distinct, occupying about 0.2 of the height of the whorls. Aperture with a slight tendency of being rhombic. Columella straight, solid. Parietal callus very indistinct, not complete. Outer lip with a very inconspicuous sinus at the suture, slightly opisthocline, evenly projecting with its most projecting part situated at the middle of its height.
Dimensions: Height of the shell 3.36 mm, diameter 1.24 mm, height of the aperture 1.12 mm breadth 0.56 mm.

Remarks: Bathycrinicola media is very similar to *B. macrapex* and *B. micrapex*, but differs from them by having a spiral microsculpture and in the structure of the larval shell (as mentioned in the key). Only two shells are known and we are not certain that they are adult, although the aperture gives an impression of this. The aperture resembles that of *«Eulima» leptozona*, but the latter has a brown apex, a brown spiral band and brown markings along the incremental scars and also flatter whorls.

Genus *FUSCEULIMA* Laseron, 1955

Type species: F. jacksonensis Laseron, 1955, by original designation.

Remarks: The type species originates from SE Australia, where several species of *Fusceulima* occur in 0-200 m. The host is not known for the type species, but Warén (1981) described *Fusceulima goodingi* from the sea urchin *Centrostephanus rodgersi* (A. Agassiz) and it can be assumed that at least some of the species here referred to *Fusceulima* will prove to have the same kind of hosts.

The species of *Fusceulima* seem to have their main distribution in temperate areas, not tropical, and numerous undescribed species have been examined from S Africa, S Australia, New Zealand and the Caribbean. To present about a dozen species have been described, but the host is known only for the species mentioned above.

The species included in *Fusceulima* usually have a small (1.5 - 4 mm high), cylindrical shell with a very obtuse apex and flat whorls. Many species have a coloured shell, yellow or brown, but some are colourless. The soft parts are not known in any species. The different species often resemble each other closely and it is important to compare the shape of the aperture and apex carefully.

We have placed four species in *Fusceulima*. Two of these resemble the type species closely and there is no doubt that they belong to this genus. *F. projectilabrum* and *convexa* differ distinctly in the shape of the aperture, but there is no genus described where they fit better and we have not wanted to describe a new genus for these puzzling species without knowing something about their anatomy or biology, so we have tentatively placed them here because of their resemblance in apical characters, and shape.

There are three additional species in more shallow water in the NE Atlantic, viz.: *Eulima fulva* Watson, *E. sordida* Watson (both from Madeira) and *Aclis lineata* Monterosato (from the Mediterranean) that belong to this genus, but they seem to be restricted to depths above 200 m.

The four deep water species of *Fusceulima* can be distinguished by the key below:

A. Aperture 1.5 times as high as broad	B
A. Aperture 2.0 times as high as broad	C
B. Whorls distinctly convex	*F. ingolfiana* (p. 415)
B. Whorls almost flat	*F. projectilabrum* (p. 414)
C. Upper part of whorls pale yellow	*F. minuta* (p. 413)
C. Shell perfectly colourless	*F. thalassae* (p. 414)

Fusceulima minuta (Jeffreys, 1884) Figs 983-984

Eulima minuta Jeffreys, 1884:370, pl. 28, fig. 9.

Type material: Lectotype (Warén 1980:29) and 1 paralectotype in BMNH, 3 paralectotypes USNM 133157.

Type locality: PORCUPINE 1870, stns 27-29, 36° 44-20 N, 08° 06-06° 47 W, 413-662 m.

Material examined: PORCUPINE 1870, Cape Sagres, SW Portugal, 85-100 m, 2 shs; Algeria, 90 m, 1 sh; Off Cadiz, 585 m, 1 sh; Adventure Bank, 165 m, 8 shs; Off St Vincent, SW Portugal, 530 m, 3 shs; Alboran Sea, 200 m, coll. Di Paco, 1 sh; Alboran Sea, 160 m, 4 shs; Off Cape Corse, 120 m, 1 sh, coll. Bogi; THALASSA st X363, 44° 06 N, 04° 54 W, 590 m, 2 shs; Ibiza, Baleares, 15-20 m, coll. Nordsieck, 1 sh; Straits of Gibraltar, 100 m, coll. Gofas, 1 sh.

Distribution: We have not been able to verify an additional record of Jeffreys (1883) from off Morocco. Thus it is known only from the continental shelves and upper slopes around the Iberian Peninsula and the Mediterranean.

Remarks: Fusceulima minuta resembles very closely *F. thalassae*, but has a somewhat smaller aperture (cf. figs 983 and 985) and the shell has a distinctly yellow colour, often visible in old shells. The drawing was prepared from an old opaque shell so the subsutural zone is not visible (fig. 983). *Fusceulima lineata* (Monterosato) can be expected to occur with *F. minuta* in intermediate depths in the Mediterranean, but can be separated by having distinctly convex whorls and a diameter of less than 150 μm 0.1 mm from the point of the shell, instead of more than 200 μm as in *F. minuta*.

Fusceulima thalassae n. sp. Figs 985-986

Type material: Holotype in MNHN, other specimens are considered paratypes.

Type locality: THALASSA st X340, 44° 07 N, 04° 30 W, 890 m.

Material examined: The type material and: THALASSA st X342, 44° 07 N, 04° 36 W, 700 m, 1 spm; st Z417, 48° 12 N, 09° 10 W, 865 m, 1 spm.

Distribution: Only known from the type material, from the upper parts of the continental slope of the Bay of Biscay.

Description: Shell forming a short obtuse cone with almost parallel but slightly convex sides, colourless, transparent, rather solid. The apex is broad and blunt, the diameter 0.1 mm from the tip being 200 - 250 μm. The larval shell is not well demarcated from the teleoconch. There are about 4.5 very slightly convex whorls, sculptured by distant, very thin and sharp axial lines about 30 μm apart. These lines are difficult to see and usually one can see only a few at a certain angle of the light. There are also one or two incremental scars. The aperture is high and ovate, with distinct parietal callus. The outer lip is shallowly sinuated below the suture, downwards it is evenly curved with the most projecting part situated at the lower third.
Dimensions: Height of the shell 1.82 mm, diameter 0.76 mm, height of the aperture 0.80 mm, breadth 0.38 mm.

Remarks: The animal has a pair of big, black eyes, diameter about 40 μm and 60 μm apart.

Fusceulima thalassae resembles closely *F. minuta* and we have hesitated before describing this new species, but the occurrence of typical specimens of *F. minuta* in the same area supports our opinion that there are two species.

The main difference from *F. minuta* is the slightly larger aperture in *F. thalassae*, constituting 0.44 of the total height instead of 0.40 as in *F. minuta*, in specimens of similar size. The difference in colour can be used for distinction only when fresh or live taken specimens are considered.

Fusceulima projectilabrum n. sp. Figs 987-989

Type material: Holotype and seven paratypes, all live taken, in MNHN.

Type locality: THALASSA st Z447, 43° 47 N, 11° 13 W, 1490 m.

Material examined: The type material.

Distribution: Only known from the type material.

Description: Shell thin, transparent, almost cylindrical, with a very obtuse apex. It consists of a little more than five slightly convex whorls, which are separated by an easily visible suture. The larval shell is very obtuse, but not distinctly separated from the postlarval whorls. The diameter is 270 μm, 100 μm from the tip. There are no traces of sculpture, except the scars from earlier positions of the outer lip which are placed about one whorl apart and not very distinct. The aperture is short and strongly expanded towards the right in its lower part, depending on the

development of the outer lip. There is a faintly developed umbilical chink. The outer lip is retracted at the suture and very strongly projecting in its lower part. The extreme part of the lip is more strongly curved than the periphery, so as to form a small hook-like projection, curving towards the center of the shell (fig. 988).
Dimensions: Height of the shell 1.81 mm, diameter 0.79 mm, height of the aperture 0.62 mm, breadth 0.33 mm.
The animal has two big black eyes, diameter about 40 μm in a dried specimen.

Remarks: The unusual development of the outer lip, a trait shared only with *F. ingolfiana* makes this species easy to recognize, but it differs conspicuously from *F. ingolfiana* by its much flatter whorls.

Fusceulima ingolfiana n. sp. Figs 990-991

Type material: Holotype in ZMC.

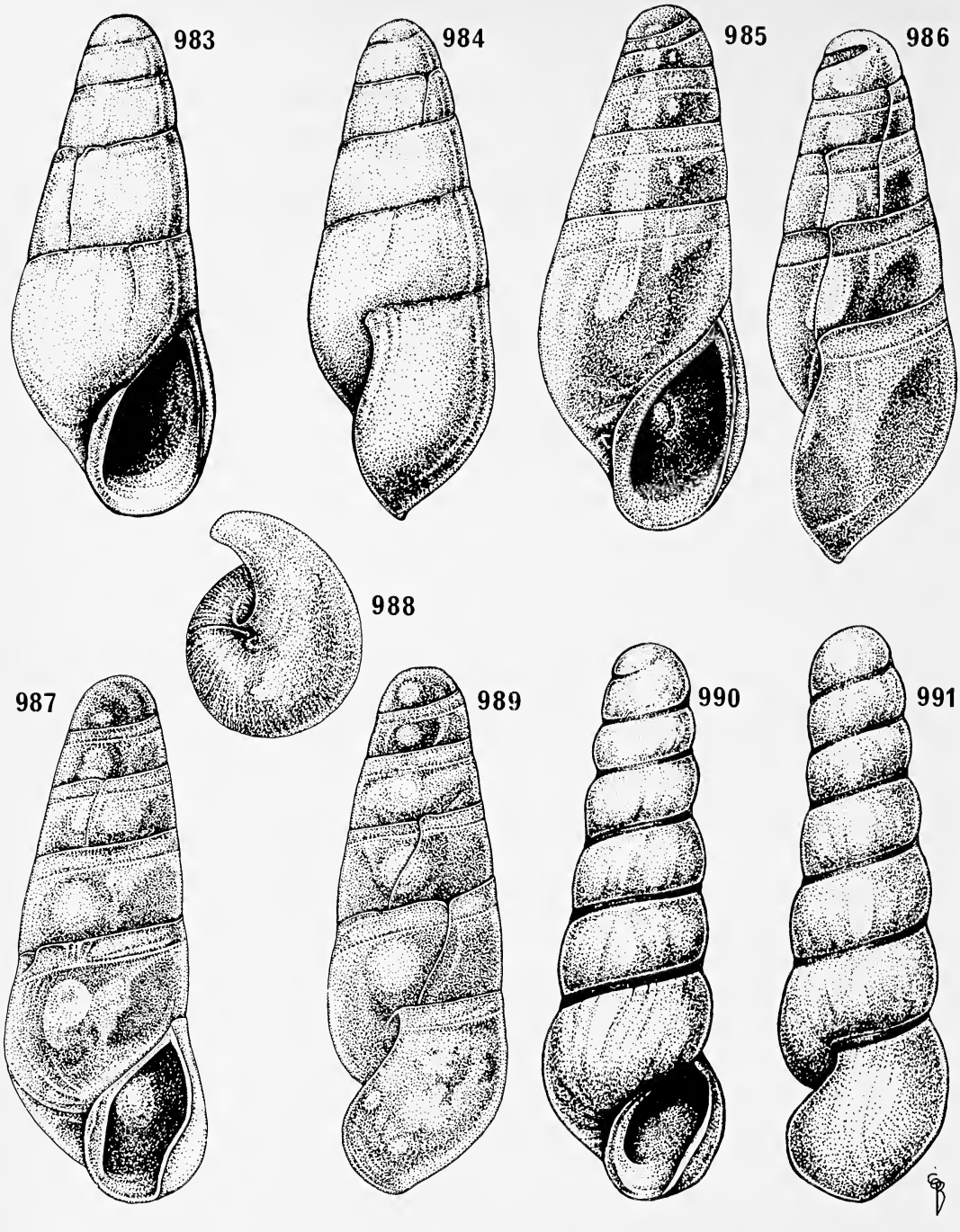
Type locality: INGOLF st 81, 61° 44 N, 27° 00 W, 913 m.

Material examined: Only known from the holotype.

Description: The shell consists of about 6.5 unusually convex whorls, forming an almost cylindrical cone with a very blunt apex. The diameter of the apex is about 250-300 μm, 0.1 mm from the tip and the larval shell is not clearly demarcated from the teleoconch. The whorls are quite convex, with a subsutural zone occupying about 1/7 of the height of the whorls. They are sculptured by some irregular and indistinct growth lines and some incremental scars, about one whorl apart. The outer lip is thickened and strongly projecting in its lower part when seen from the side, the most projecting part situated at the lower third.
Dimensions: Height 2.44 mm, diameter 0.84 mm, height of the aperture 0.67 mm, breadth 0.39 mm.

Remarks: The aperture resembles rather much that of *F. projectilabrum*, in having the extreme part curved towards the center of the shell and the two species are probably related. The appearence of the two species is however quite different because of the much more convex whorls of *E. ingolfiana*.

The description is based on a single specimen, but the species seems to be unique enough to allow this. The right side of the shell is partly damaged, probably by some predator.



Figs 983-991. Genus *Fusceulima*. 983-984, *F. minuta*, paralectotype, USNM 113157, 1.80 mm. 985-986, *F. thalassae*, holotype, 1.82 mm. 987-989, *F. projectilabrum*, holotype, 1.81 mm. 990-991, *F. ingolfiana*, holotype, 2.44 mm.

Genus *PELSENEERIA* Koehler & Vaney, 1908

Type species: Pelseneeria profunda, Koehler & Vaney, 1908, subsequent designation Winckworth (1932).

Synonyms: Turtonia Rosén, 1910, *Stylina* Fleming, 1828, *Parastilifer* Ivanov, 1954, *Rosenia* Schepman, 1914, *Venustilifer* Powell, 1938.

Remarks: The species of *Pelseneeria* live as ectoparasites on regular sea urchins, where they deposit their round eggcapsules, attached to the test. The way of feeding is known only for a couple of tropical species that are permanently attached at the gonopores by the proboscis which is introduced through the pore.

The Atlantic species are all mobile on the test. All species of *Pelseneeria* are simultaneous hermaphrodites. The larval development is planktotrophic, at least in some species, judging from comparison of veliger larvae ready to hatch in egg capsules and the larval shell of newly settled or adult specimens.

The species of *Pelseneeria* are very similar to each other and at the same time unusually variable for being eulimids, which makes determination more difficult. Careful examination of colour, shape and presence of microsculpture is important, as is also determination of the host and the position on the host.

Pelseneeria profunda has not been included in the key to the species because no material where shell characteristics could be studied has been available, but judging from the original description, it should be possible to recognize it from the size of the larval shell, about 500 μm, instead of 200-250 μm as in the other species included here.

Key to the European species of *Pelseneeria*

A. Shell covered by fine spiral lines (15/0.1 mm)	*P. striata* (p. 421)
A. No spiral sculpture	B
B. Teleoconch perfectly colourless	*P. media* (p. 419)
B. Teleoconch, especially the columella yellowish or brownish	C
C. Shell 1-3 mm high	*P. minor* (p. 420)
C. Shell 3.5 - 4.5 mm high	*P. stylifera* (p. 418)

The species of *Pelseneeria* always have a very inflated, thin, fragile, colourless or brownish-yellowish shell and a distinctly brown larval shell. Species of *Pisolamia* and *Stilapex* have a similar shape of the shell, but they have a colourless larval shell of 1 or 2 whorls, instead of 2 to 3 whorls as *Pelseneeria*. The larval shell of the species of *Pelseneeria* varies considerably in position on the teleoconch and relation to subsequent whorls. Sometimes a large part of it is concealed by the first post-larval whorl, (fig. 993), sometimes most of it is visible. This varies between specimens of the same species and can not be used for discriminating the species.

Pelseneeria stylifera (Turton, 1825) Figs 992-993, 1001-1002

Phasianella stylifera Turton, 1825:367.
Stylifer turtoni Broderip, 1832:61 (new name for *P. stylifera* Turton, 1825).
Stylifer globosus Johnston, 1841:275.

Type material: P. stylifera: Lectotype (Warén 1983) USNM 177239.

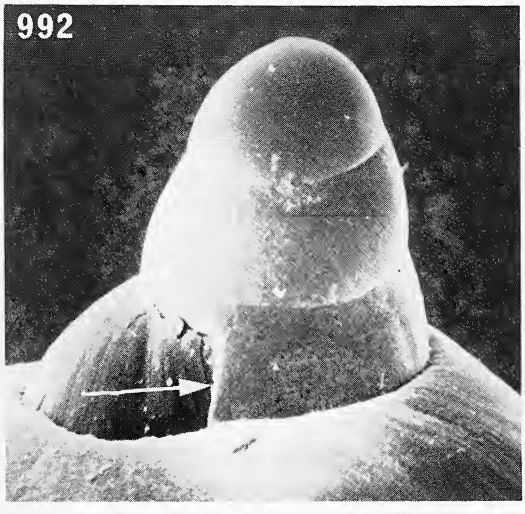
Type locality: P. stylifera: Torbay, Great Britan, on *Echinus esculentus* L.; *S. globosus*: Berwickshire, Great Britain, on *E. esculentus*.

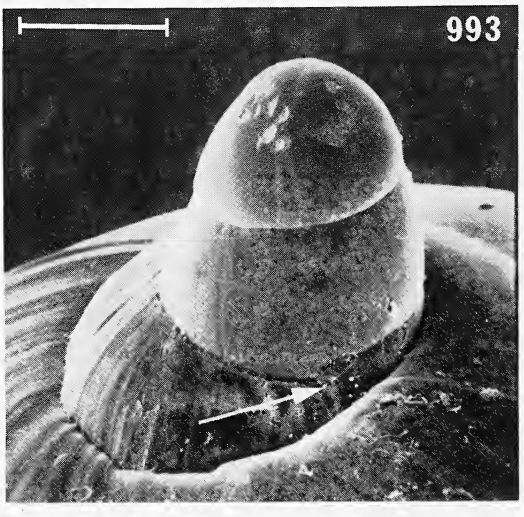
Material examined: About two hundred shells and specimens, from all parts of the distributional area.

Distribution: Along the European Atlantic coast from W Norway, to the Bay of Biscay, from the intertidal zone (Jeffreys 1867) down to 368 m (ZMB, unpublished, Storeggen, W Norway, on *Strongylocentrotus* sp.). Probably also along the East Coast of the US, in 10 - 800 m (Verrill 1882, Abbott 1975). It has been found on *Echinus esculentus, E. elegans* Düben & Koren (AW unpublished), *Psammechinus miliaris* (Gmelin) and *Strongylocentrotus* sp.

Remarks: It is very likely that *Stilifer stimpsoni* Verrill, 1882 (with the synonym *S. curtus* Verrill, 1882 =? *S. verrilli* Dall, 1927) will prove to be a synonym of *P. stylifera*, but the material available is not sufficient to show this. *Pelseneeria stimpsoni* is usually about 30% larger than *stylifera* and the shell is more distinctly brownish or yellowish, but the shape is the same and its only known host, *Strongylocentrotus (droebachiensis?)* (see Verrill 1882) is one of those frequented by *P. stylifera*. There is, however, a gap in the distribution from W Europe to N America because no species of *Pelseneeria* is known from the Faroes to Canada, where several of the host species occur. Presence of either of the two forms in this area should be a good indication of conspecificity.

Records in the literature from the Mediterranean and Madeira and from other hosts are due to confusion with other species (*P. minor* and *P. media*).





Figs 992-993. *Pelseneeria stylifera*, Scotland. Variation in insertion of larval shell. A white arrow marks the transition to the teleoconch. Scale line: 100 μm.

P. stylifera is very similar to *P. media* and *P. minor*, but the diameter of the larval shell is 230-250 μm in *P. stylifera* and 190-210 μm in *media* and *minor*, the whorls of *P. stylifera* are less regularly convex and often distinctly flattened, something we have never seen in the two smaller species.

Pelseneeria profunda Koehler & Vaney, 1908

Pelseneeria profunda Koehler & Vaney, 1908:3, figs 3, 6.
Pelseneeria profunda, Koehler & Vaney 1940:113, pl. 2, figs 28-29, 32, 34-36. (A reprinted version of the 1908 paper.).

Type material: Some completely decalcified specimens in MOM.

Type locality: Described from *Echinus affinis* Mortensen, from 38° 45 N, 26° 46 W, 1482 m and 39° 22 N, 26° 56 W, 1940 m.

Material examined: The type material.

Distribution: Only known from the type material, from the Azores.

Remarks: Koehler & Vaney (1908) remarked that their specimens, found on 11 specimens of *E. affinis* out of a total number of several hundred specimens examined, were in poor condition, with broken shells. Therefore it may be difficult to recognize this species from their description. When we examined the types in MOM, it was not possible to get any information about the shell.

Koehler & Vaney's dimension of the larval shell (500 μm) may be a good clue to the identity, but it may also be wrong, because this size is almost twice as large as any other species of *Pelseneeria* (incl. 15 tropical species).

Pelseneeria media Koehler & Vaney, 1908 Figs 999, 1003

Pelseneeria media Koehler & Vaney, 1908:4, fig. 4.
Pelseneeria media, Koehler & Vaney 1940: 113, pl. 2, fig. 30. (A reprinted version of the 1908 paper.).

Type material: Lost.

Type locality: Parasitic on *Echinus affinis*, 38° 40 N, 26° 01 W, 1805 m.

Material examined: BIACORES st 86, 39°26N, 28°02W, 1670m, 2 spms and several egg capsules on *E. affinis*; st 191, 37°56N, 24°50W, 1700m, 2 spms and several egg capsules on *E. affinis* (fig. 1003); st 217, 37°05N, 24°53W, 1735m, 2 spms and several egg capsules on *E. affinis*; MONACO st 738, 37°40N, 26°16W, 1919m, 1 spm; st 858, 38°45N, 26°36W, 1482m, 6 spms; st 1334, 39°30N, 29°02W, 1900m, 4 spms (detached specimens, no indication of host).

Distribution: Only known from the material listed above, from the Azores.

Remarks: Our material and Koehler and Vaney's drawing indicated a good deal of variation in the shape of the shell, much more than in the larger material of *P. minor* examined by us. It differs from *P. minor* by the more slowly increasing diameter of the whorls in that species, and by the total absence of colour on the columella, which in *P. minor* is dark brown.

Pelseneeria minor Koehler & Vaney, 1908 Figs 996, 998

Pelseneeria minor Koehler & Vaney, 1908:5, figs 1, 5, 7.
Pelseneeria minor, Koehler & Vaney 1940: 114, pl. 2, figs 27, 31, 33. (A reprinted version of the 1908 paper.).

Type material: Lost.

Type locality: Parasitic on *Genocidaris maculata* (Agassiz), from 33° 47 N, 14° 21 W, 185 m.

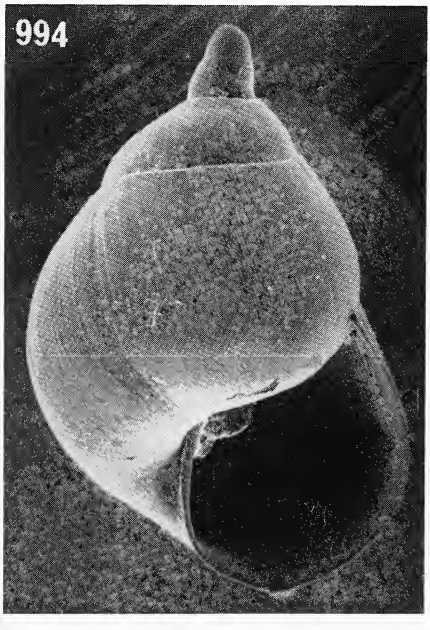
Material examined: BIACORES st 11, 38° 30 N, 27° 15 W, 90 m, 3 spms on *Genocidaris maculata* with many egg capsules; PORCUPINE 1870, Adventure bank, 160 m, 1 sh; Haifa Bay, Israel, 67 m, 1 spm detached from host, ex Al. Barash; Alboran Sea, 160 m, 1 spm, detached from host, coll. Bogi; SE Spain, intertidally, on *Psammechinus microtuberculatus* (Blainville), 1 spm, coll. J. Templado.

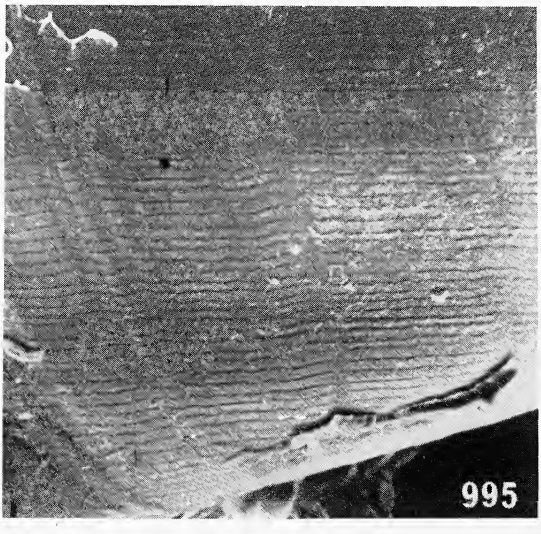
Distribution: The Azores, the Mediterranean, and Madeira, down to 185 m.

It has also been recorded from Ghana, 65 m (Mortensen 1943:362) and from Nigeria, 72 m and E of Fernando Poo, 40 m (Chesher 1966:219) from *G. maculata*, but we have not been able to verify these determinations.

Remarks: This is definitely not a deep water species, but we have included it because of earlier misidentifications (e.g. Monterosato 1878, Terreni 1980).

Pelseneeria minor closely resembles *P. media*, but *P. media* has more inflated whorls, especially the apical ones and its columella shows no trace of colour but is as colourless as other parts of the teleoconch. *Pelseneeria striata* is smaller and has a distinct but extremely fine spiral sculpture, of which no trace can be seen in *P. minor.*





Figs 994-995. *Pelseneeria striata*, BIACORES st 159. 994, Shell, height 1.5 mm. 995, Detail of sculpture, height 0.32 mm.

Pelseneeria striata n. sp. Figs 994-995, 1000, 1004-1005

Type material: Holotype in MNHN. Other specimens examined considered paratypes.

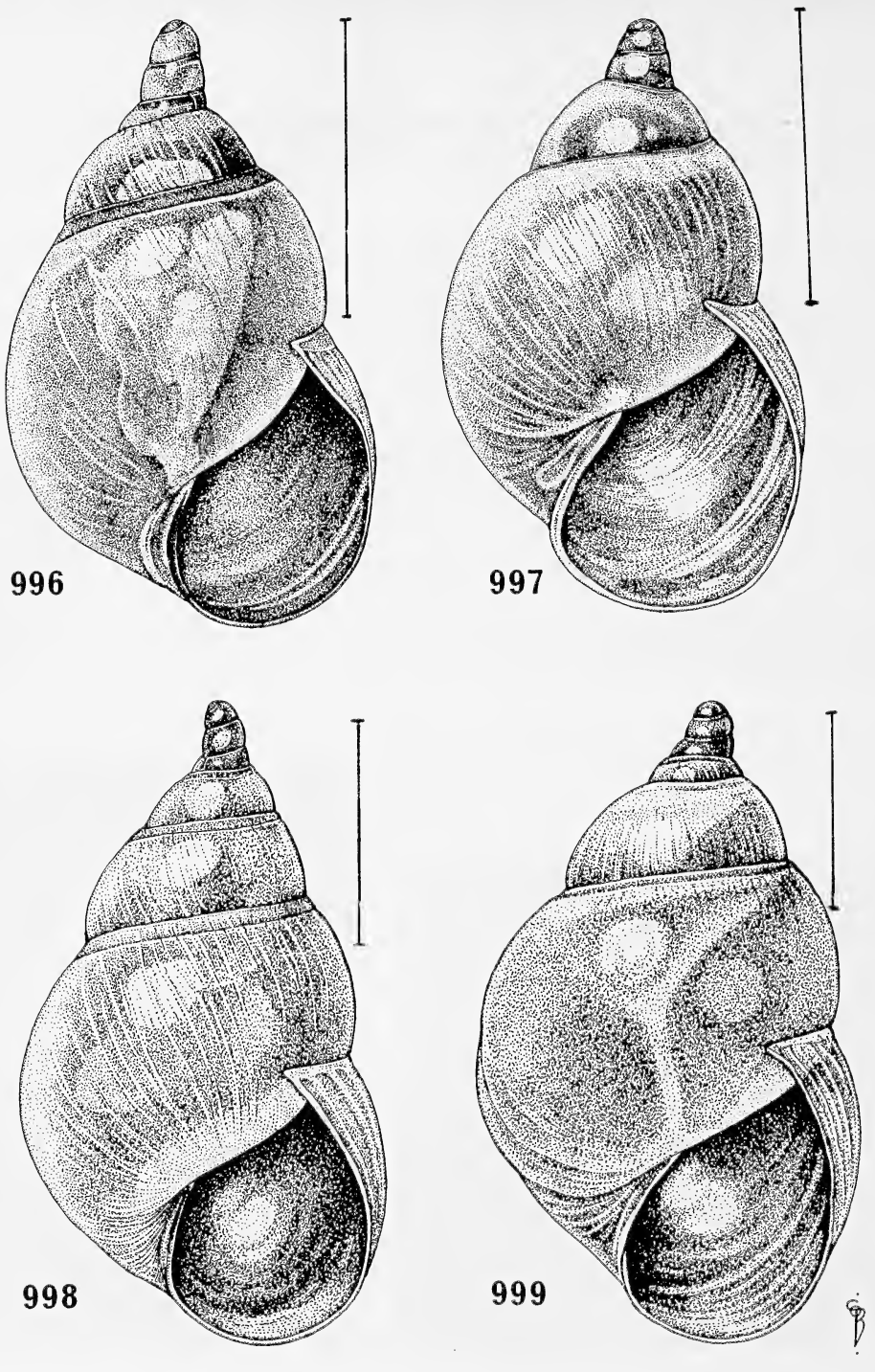
Type localitity: Parasitic on *Trigonocidaris albida* (A. Agassiz), BIACORES st 30, 38° 10 N, 28° 58 W, 275 m.

Material examined: BIACORES st 30, the holotype and 1 paratype; st 41, 1 young specimen with less than one postlarval whorl, attached at the peristome of *T. albida*, 37° 44 N, 29° 04 W, 450-475 m; st 79, 2 spms attached on the aboral side of *T. albida*, 39° 00 N, 27° 54 W, 370 m; st 159, 2 spms and several egg capsules attached aborally on *T. albida*, 37° 26 N, 25° 51 W, 565 m; st 161, 1 spm, attached aborally on *T. albida*, 37° 40 N, 29° 51 W, 590 m; st 238, 2 spms, attached aborally on *T. albida*, 37° 25 N, 25° 45 W, 500 m.

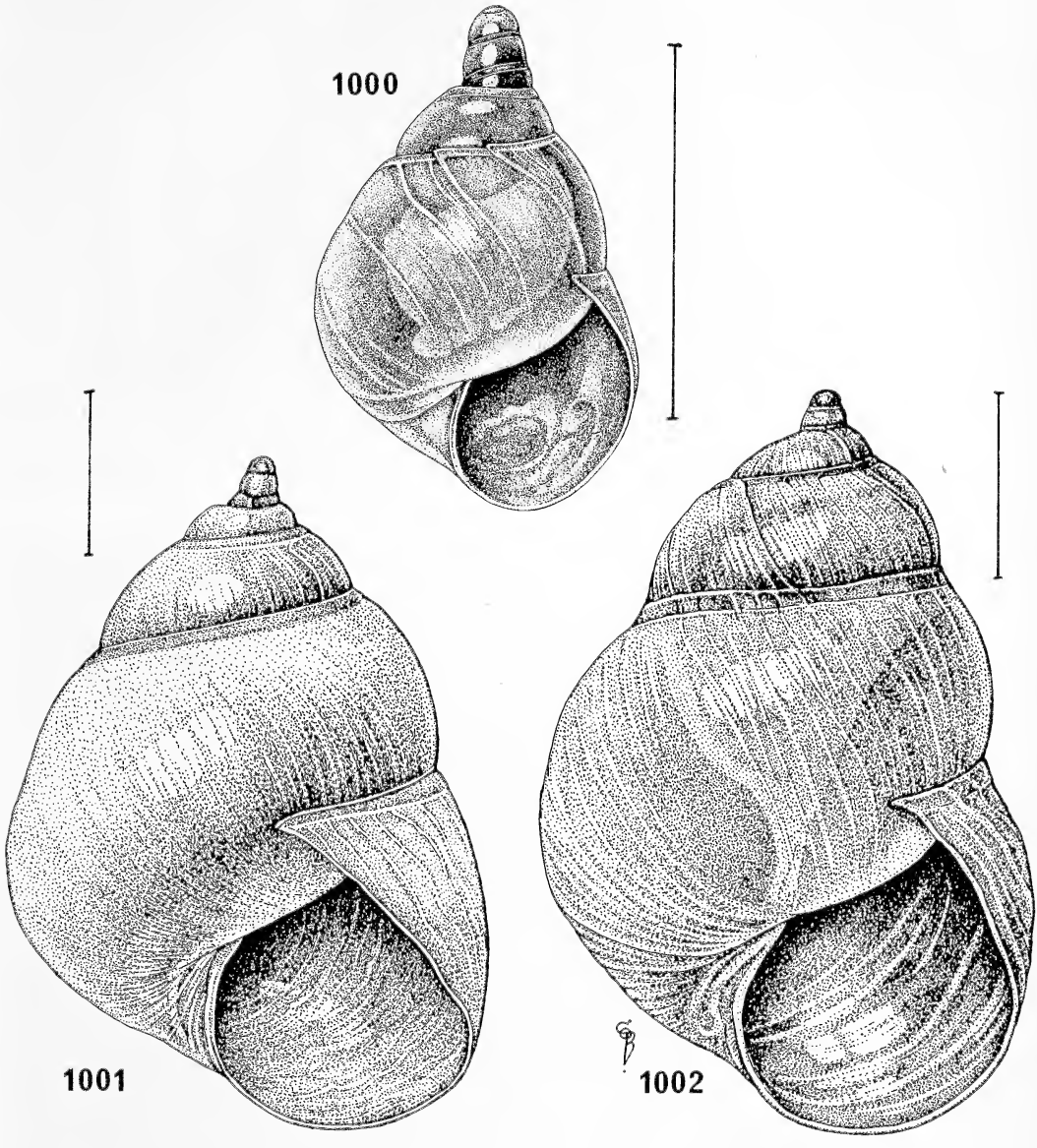
Distribution: Only known from this material from the upper part of the slopes off the Azores.

Description: Shell small, inflated, pear-shaped, perfectly transparent and glossy, colourless and fragile. The larval shell is distinctly conical, consists of 2.7 whorls and its diameter is 200 μm. The suture is much darker than the remaining part of its whorls. The holotype has 2.1 slightly convex postlarval whorls covered by a very fine sculpture of about 15 spiral lines per 0.1 mm (fig. 995). This sculpture can be seen only in favourable light under a stereomicroscope. The whorls join at an angle close to 180° so the suture is shallow and the subsutural zone well developed, occupying about 1/7 of the height of the whorls. Aperture rounded and of an indistinct yellow colour, with a curved, colourless columella. Outer lip straight, strongly prosocline. Dimensions: Height of the shell 1.34 mm, diameter 0.91 mm, height of the aperture 0.58 mm, breadth 0.52 mm.

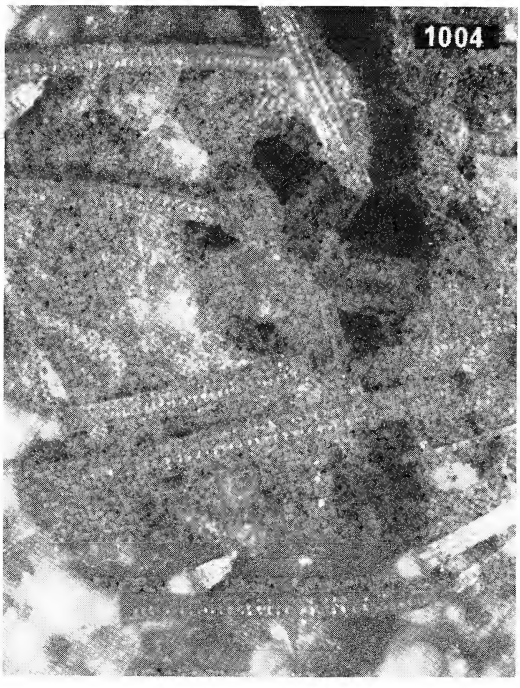
Remarks: Among the East Atlantic species of *Pelseneeria, P. striata* is easily recognized by the fine spiral sculpture. *Stilifer minuta* Dall, 1927 (fig. 997), which actually belongs to *Pelseneeria* has a similar microsculpture but can be distinguished by having more convex whorls, a more narrow subsutural zone and a straighter columella that is more turned over to the left in its lower part. The height of the aperture of *P. striata* is about 1.1 times the breadth while the same proportion of *P. minuta* is 1.4.

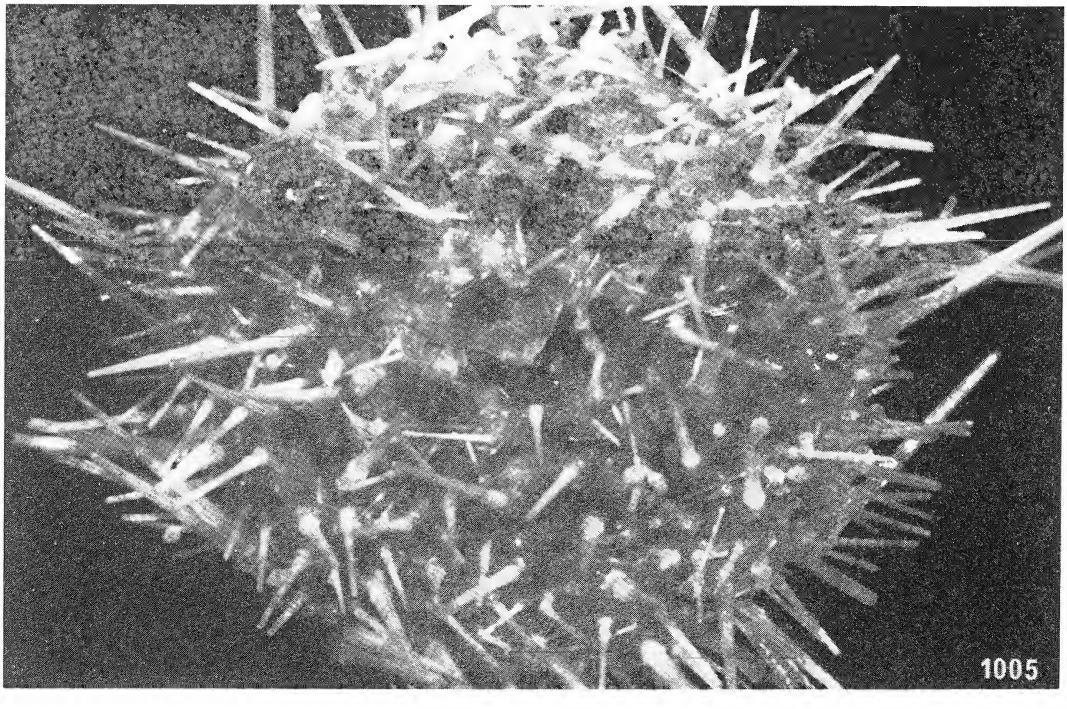


Figs 996-999. Genus *Pelseneeria*. 996, *P. minor*, BIACORES st 11. 997, *P. minuta*, syntype, USNM 108227. 998, *P. minor*, Haifa. 999, *P. media*, BIACORES st 217. Scale lines: 1 mm.



Figs 1000-1002. Genus *Pelseneeria*. 1000, *P. striata*, holotype. 1001-1002, *P. stylifera*, Aberdeenshire, Scotland. Scale lines: 1 mm.





Figs 1003-1005. Genus *Pelseneeria*: position *in situ*. 1003, *P. media* on *Echinus affinis*, BIACORES st 191. The diameter of the host is 11.6 mm and it carried 23 egg capsules. The height of the snail is 2.7 mm. 1004, *P. striata* on *Trigonocidaris albida*, BIACORES st 41. The diameter of the host is 4.6 mm and the height of the snail is 0.62 mm. This species, as other species of the genus, is normally attached on the aboral side but this young is attached close to the peristome. 1005, *P. striata*, BIACORES st 159, diameter of the host 6.2 mm. This specimen of *Trigonocidaris albida* carried 14 egg capsules.

Genus *SABINELLA* Monterosato, 1890

Type species: Eulima piriformis of Monterosato 1875:35 and later (= *E. bonifaciae* Nordsieck, 1974), not Brugnone, 1873.

Synonym: Eulimoda Laseron, 1955. Type species *Eulima munita* Hedley, 1903.

Remarks: Several species of *Sabinella* are known to be parasites on cidaroid sea-urchins (Warén 1981, 1984a), some live as ectoparasites, some make galls in the spines. Two species occur in the area treated here, but a third species has been found off the Cape Verde Islands (*Eulima troglodytes* Thiele, 1925:146, pl. 13, fig. 4) living in galls in the spines of *Eucidaris tribuloides* (Lamarck).

The species of *Sabinella* can be recognized by their habitat and by the shell, broadly conical with an indistinctly mucronate larval shell of 2.5 whorls, somewhat irregularly coiled whorls, strong incremental scars, where the whorls often make a slight change in the direction of coiling which gives the irregular appearance, and the large, expanded aperture which is somewhat drawn out in the lower left part.

The two species off Europe can be separated by the fact that *S. pachya* has a straighter spire, less rounded aperture and larger size at the same number of whorls (2.6 mm at 3.3 teleoconch whorls, 3.5 mm at 4.2 teleoconch whorls, while comparable measurements in *bonifaciae* are 2.1 mm at 4.0 whorls and 3.3 mm at 5.0 whorls).

Sabinella bonifaciae Nordsieck, 1974 — Figs 739, 1006-1012

Eulima piriformis, Monterosato 1875:35 (not Brugnone, 1873).
Sabinella piriformis, Monterosato 1890:160.
Sabinella piriformis, Monterosato 1908:116, fig.
Eulima (Sabinella) bonifaciae Nordsieck, 1974:12, fig. 13.

Type material: E. bonifaciae in coll. Giannini (Empoli).

Type locality: E. bonifaciae off Capo Comino, between Sardinia and Corsica, 200-220 m.

Material examined: 1 spm, no locality, not type, coll. Nordsieck; Palermo, Sicily, coll. Monterosato, 16 spms, ZMR; Palermo, 1 spm, BMNH; PORCUPINE, Tripoli, 75-220 m, 2 shs, BMNH; Adventure Bank, 170 m, 13 shs, BMNH; Strait of Bonifacio, between Sardinia and Corsica, 2 spms, coll. A W and coll. Di Geronimo; THALASSA Z405, 47° 43 N, 08° 08 W, 1055 m, 2 spms parasitic on *Stylocidaris affinis* (Philippi); BALGIM st CP156, 36° 20 N, 07° 53 W, 1130 m, 2 spms, parasitic on *Stylocidaris affinis*; Gulf of Saronico, SE Greece, 50 m, 3 spms, coll. Di Geronimo; off Siracusa, Sicily, 80-220 m, 1 spm, coll. Palazzi; Near Sorrento, Golfo di Napoli, Italy, 50-80 m, ca. 80 spms, coll. Crovato.

Distribution: Mediterranean W of and including the Sicilian Channel, the Ibero-Moroccan Gulf and Bay of Biscay, in 200-1100 m.

Remarks: We have examined the type material of *Eulima piriformis* in ZMR, a single, somewhat broken specimen. Its authenticity is supported by the fact that the label is characteristic for specimens originating from Brugnone and by the fact that a cut out original figure is added to the lot.

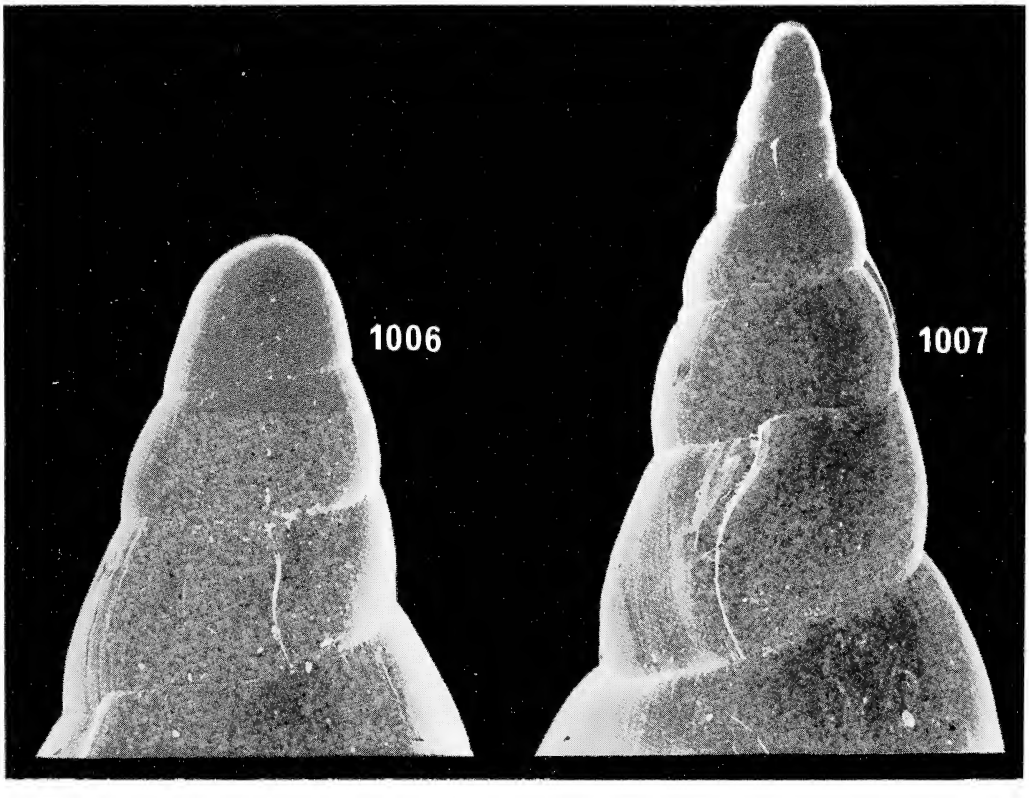
The specimen seems to be fossil and is very similar to *Vitreolina curva* (Jeffreys, 1874). There is, however, no reason to substitute the well known name of Jeffreys; the condition of the type is too poor to allow a reliable identification, and Brugnone's name can be considered a *nomen dubium*, at least until the identity can be ascertained by comparison with good material from the type stratum (Pleistocene of Ficarazzi). Monterosato was evidently aware of this fact, because on one of his labels in ZMR «Jeffreys (non Brugnone)» was cited as author of *E. piriformis*.

When Monterosato (1890 and 1908) introduced the name *Sabinella* and reviewed the genus, his concept of *S. piriformis* was based on the specimens in ZMR listed above and ICZN § 70a should be applied, and the case referred to the Commission. To wait for such a decision would delay this revision several years and we have decided to use *Sabinella* in the same sense as Monterosato, which will cause no nomenclatorial changes.

Van Aartsen (1978) synonymized *E. bonifaciae* with *piriformis*, but did not notice the discrepancies between the descriptions of Brugnone and Monterosato.

There are numerous records in the literature of *Eulima piriformis*, in papers by Jeffreys, Watson, Locard etc.; all these records have been checked in museum collections and been found to be based on other species.

Sabinella bonifaciae has on two occasions been found on the host, *Stylocidaris affinis*. The larger female is attached by the snout, on the periproct, the smaller male is not permanently attached, but is able to crawl around. The egg capsules are attached around the female; they are round, simple sacs containing several hundred eggs, diam. 100 μm, that develop to veliger larvae, 150 μm high. The height of the veliger larva when settling is 450-500 μm judging from the size of the larval shell of postlarvae, and the development thus planktotrophic. The female has a snout, the male does not;



Figs 1006-1007. *Sabinella bonifaciae*, Golfo di Napoli, *ex* coll. Crovato. 1006, larval shell, height 350 μm. 1007, apex with distinct scar, total height 1.67 mm.

tentacles flat, broad and short, with big, black eyes in the center of the base of each. Foot well developed, functional, with a large operculum (Monterosato (1908) denied the presence of operculum, but an operculum was present in his specimens although it was well concealed in the rotten remains of the animal).

There is some possibility that the specimens above, found on *Stylocidaris affinis* are not conspecific with the Mediterranean ones, which are common in areas where *Cidaris cidaris* is common (Crovato pers. comm.), but this can not be concluded with certainty from our material because none of our specimens from the Atlantic is in perfect condition.

Sabinella pachya (Dautzenberg & Fischer, 1896) Figs 1013-1014

Eulima pachya Dautzenberg & Fischer, 1896:466, pl. 19, figs 23-24.
Eulima pachya, Dautzenberg 1927:167, pl. 5, figs 10-11.

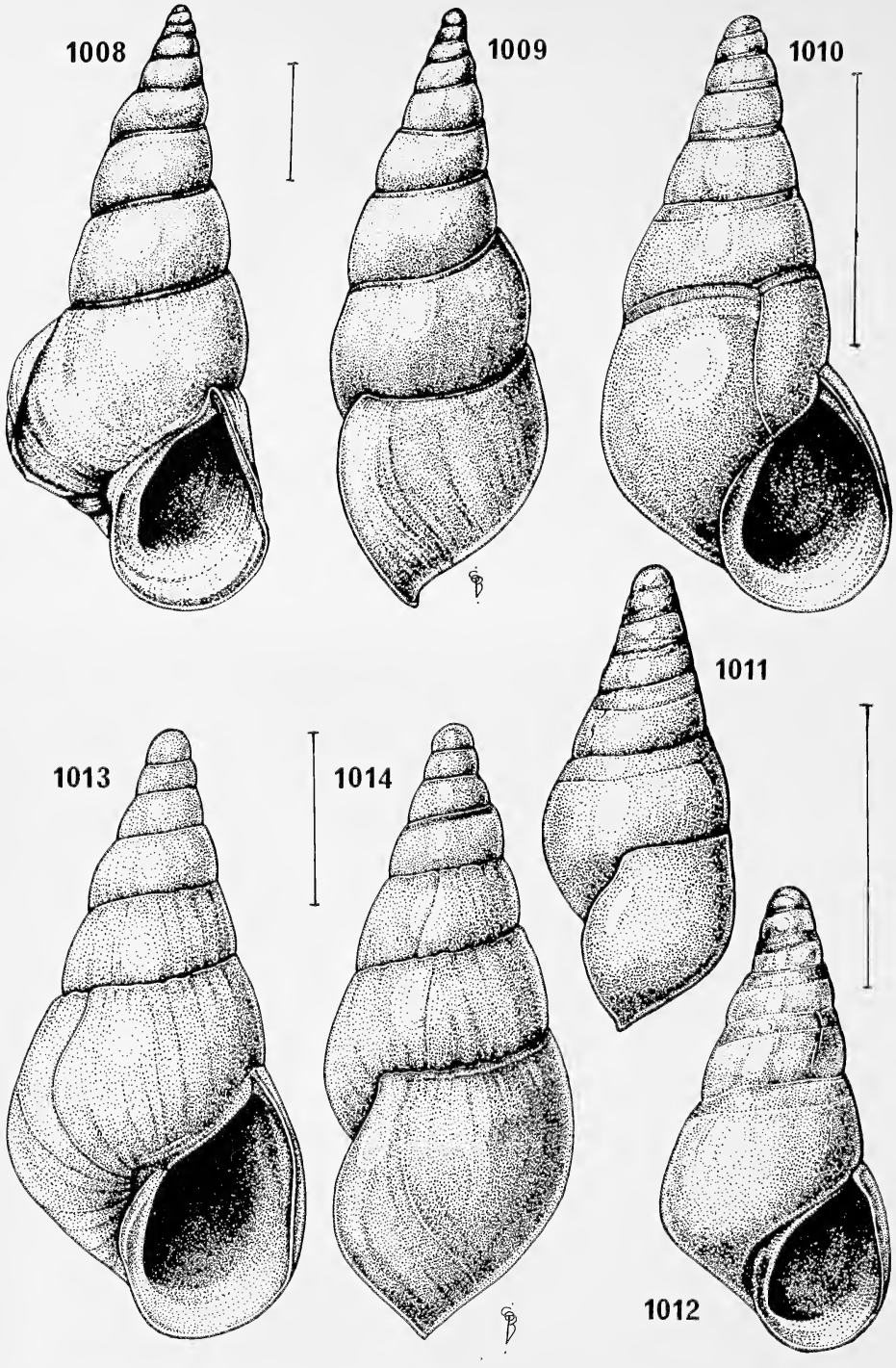
Type material: 2 syntypes in MOM.

Type locality: MONACO st 553, 37° 43 N, 25° 05 W, 1385 m.

Material examined: The type material.

Distribution: Only known from the type material, from the Azores, 1385 m.

Remarks: S. pachya has a proportionally larger aperture than *S. bonifaciae*, other differences are mentioned under the introduction to the genus. The two types both seem to be young specimens, judging from their regularly coiled and straight spire. Nothing is known about soft parts and hosts, but probably it is a parasite of some cidaroid sea-urchin.



Figs 1008-1014. Genus *Sabinella*. 1008-1012, *S. bonifaciae*, Palermo, Italy. 1013-1014, *S. pachya*, syntype, MOM. Scale lines: 1 mm.

Genus *EULITOMA* Laseron, 1955

Type species: E. nitens Laseron, 1955, by original designation.

Remarks: The type species was described from empty shells from SE Australia, and its host is not known. There are however several Japanese species which resemble *E. nitens*, of which the host is known, e.g. *Strombiformis langfordi* Dall, 1925 (figs. 1015-1016), *Curveulima nishimurai* Habe, 1958 (figs. 1017-1018) and *Balcis akauni* Habe, 1952 (figs. 1019-1020). They are all parasitic on regular sea-urchins. Habe referred them to *Curveulima* in his list of Japanese parasitic gastropods (1976) simply because they have a curved shell, something that occurs in most eulimid genera as a consequence of growth periodicity, when the species grow approximately one whorl each period.

We figure the three Japanese species above because the original descriptions are scattered and the figures are not good. Of these, *akauni* resembles *E. nitens* most closely in the shape of the aperture, but it also has some indistinct yellowish coloured stripes on the shell, just below the periphery of the body whorl and on the larval shell. Nothing is known about the anatomy of these species.

The species here included in *Eulitoma* resemble the type species in the shape of the aperture, which is distinctly rhomboid in young specimens and unusually low, and in having the lower part of the aperture unusually broad.

The inclusion of *E. insignis* here is questionable. The shape of the aperture of what is believed to be an adult specimen differs considerably, but it does not fit better in any other genus.

Key to the species:

A. Apex brownish yellowish	B
A. Apex colourless	C
B. Larval shell of at least 3 regularly rounded whorls, small species 3-4 mm high	*E. josephinae* (p. 430)
B. Larval shell of 1.5 low whorls, diameter 800 μm, large species 15-25 mm high	*E. insignis* (p. 429)
C. Shell strongly curved, height 2.5 mm	*E. obtusiuscula* (p. 431)
C. Shell indistinctly curved, height 5 mm	*E. arcus* (p. 431)

Eulitoma insignis (Dautzenberg & Fischer, 1896)

Figs 1021-1022, 1030-1031

Eulima insignis Dautzenberg & Fischer, 1896:465, pl. 19, fig. 16.
Eulima insignis, Dautzenberg 1927:162, pl. 5, fig. 1.

Type material: Lectotype, here selected, the figured specimen, in MOM.

Type locality: MONACO st 242, 38° 49 N, 27° 57 W, 861 m.

Material examined: The lectotype and MONACO st 578, 38° 26 N, 28° 51 W, 1165 m, 1 spm; ATLANTIS st 3469, 23° 12 N, 81° 22 W, 774 m, 1 spm, «external parasite on an Echinothuridae», MCZ; 37° 54 N, 29° 45 W, 1200-1500 m, 1 fragm., ZMC.

Distribution: Only known from the material examined, from the Azores and Cuba, 700-1500 m.

Remarks: The MCZ specimen was taken at ATLANTIS st 3469, on an unspecified echinothurid sea-urchin. H.L. Clark (1941) recorded a single species of echinothurid from that station viz. *Araesoma fenestratum* (Wyville-Thomson). This species occurs both in the E and W Atlantic (Mortensen 1935), and is thus probably the host.

The dried and partly decayed soft parts of the MCZ specimen were examined. The anterior part of the animal with head-foot and pallial cavity is unusually short and occupies only 1/3 of a whorl. Foot with operculum and head normally developed, tentacles with large eyes centrally in the base. Well developed pallial oviduct and penis present. Proboscis completely everted and partly torn. No snout.

None of the specimens examined appear to be mature, judging from the thin outer lip, except a broken shell from the Azores (figs 1021-1022) which with some hesitation is referred to *E. insignis*.

Eulitoma insignis is the largest of the NE Atlantic deep water species of the family; the fragment in ZMC indicates a size of 25 mm. This identification is however tentative.

No good larval shell has been available for a figure, but it is brown, consists of at least 1.5 whorls, has a diameter of 800 μm 0.1 mm from the tip and the initial whorl is unusually depressed.

The size makes identification easy, other good characteristics are: flat whorls with indistinct spiral microsculpture, irregularly appearing incremental scars about 0.8-2 whorls apart. The appearance is rather similar to *Melanella alba* (Da Costa), a shallow water species parasitic on holothurians.

Eulitoma josephinae n. sp. Figs 1027-1029

Type material: Holotype in SMNH.

Type locality: Josephine Bank, between Portugal and Madeira (approx. 36°45N, 14°10W), 200m.

Material examined: The holotype.

Distribution: Only known from the holotype. (Taken at the discovery of the bank, by the JOSEPHINE expedition).

Description: Shell small, slender, slightly curved, perfectly transparent with a blunt, yellowish larval shell. The larval shell is not well demarcated, but seems to consist of 3.5 whorls, of a height of 560 μm. It is yellowish, with a darker zone in the suture, which stops abruptly at the scar assumed to demarcate the border (fig. 1029). The holotype has 5.3 teleoconch whorls, perfectly smooth and with 3 very indistinct incremental scars. The whorls are slightly convex and connected by an almost imperceptible suture, much less distinct than the false suture. The aperture is small, deeply excavated in its lower part and has an indistinct angle between the columella and rather broad but thin parietal callus. Outer lip retracted at the suture, strongly projecting in its lower part.
Dimensions: Height of the shell 3.60 mm, diameter 1.08 mm, height of the aperture 1.0 mm, breadth 0.50 mm.

Remarks: The type and only specimen known is an empty shell. It was found in rather shallow water, but as we have not seen this species in our work on shallow water eulimids, we assume it to be an occasional shallow finding of a deep water species.

Eulitoma josephinae resembles *Eulima dysnoeta* in appearance, but that species has a more solid shell, flatter whorls, a distinctly sinuated outer lip, a distinct colour band along the whorls and a straight spire. It also resembles *Eulitoma obtusiuscula* in shape, but the latter has a colourless larval shell of 2.2 whorls, is considerably smaller and has strong incremental scars.

Eulitoma obtusiuscula n. sp. Figs 1023-1024

Type material: Holotype and 12 paratypes in MNHN.

Type locality: THALASSA st Z435, 48° 40 N, 09° 53 W, 1050 m.

Material examined: The type material and PORCUPINE 1870 st 3, 48° 31 N, 10° 03 W, 1255 m, 1 sh; THALASSA Z438, 48° 34 N, 10° 25 W, 1400 m, 1 sh.

Distribution: Only known from the material examined from the N part of the Bay of Biscay in 1000-1400 m.

Description: Shell small, curved, with a small aperture, blunt apex and distinctly convex whorls. The larval shell consists of a little more than 2, distinctly convex whorls, with a blunt apex and its height is about 360 μm. The holotype has 5.2 teleoconch whorls, distinctly convex and perfectly smooth. The suture is almost invisible, the false suture much more distinct and the subsutural zone occupies about 1/6 of the height of the whorls. The incremental scars form a line down the spire, the last one 1.15 whorls behind the outer lip, the earlier ones almost perfectly 1.0 whorls behind one another. The suture makes a conspicuous «dip» at the scars and the even curvature of the whorls becomes slightly distorted, not because of the scar, which is not very strong, but because of the outer lip being slightly flattened (tangentially). The aperture is rather deeply excavated in its lower part, unusually short and narrow. Parietal callus continuous, thin but distinct and forming an indistinct angle with the columella. Outer lip retracted at the suture, forming a strongly protruding arch with the most projecting part at the midpoint of its height.
Dimensions: Height of the shell 2.46 mm, diameter 0.88 mm, height of the aperture 0.72 mm, breadth 0.29 mm.

Remarks: The holotype and paratypes are all dried specimens, the large eyes still visible. The aperture and the curvature of the spire resembles some species of *Curveulima*, but these have an aperture that is higher in relation to the shell, especially in specimens of comparable size, i.e. young specimens.

Eulitoma arcus n. sp. Figs 1025-1026

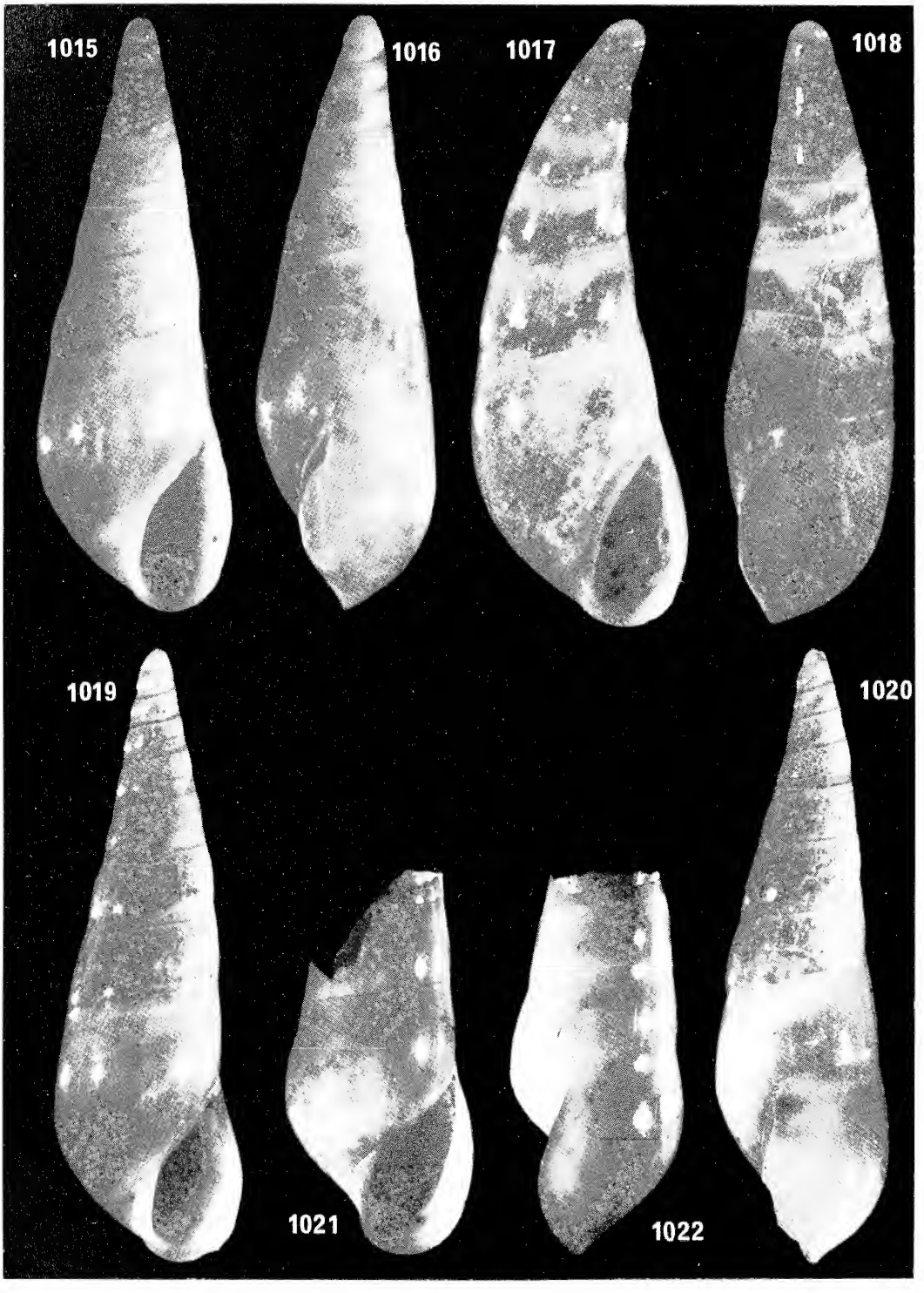
Type material: Holotype and 6 paratypes in MNHN.

Type locality: THALASSA st Z447, 48° 47 N, 11° 13 W, 1490 m.

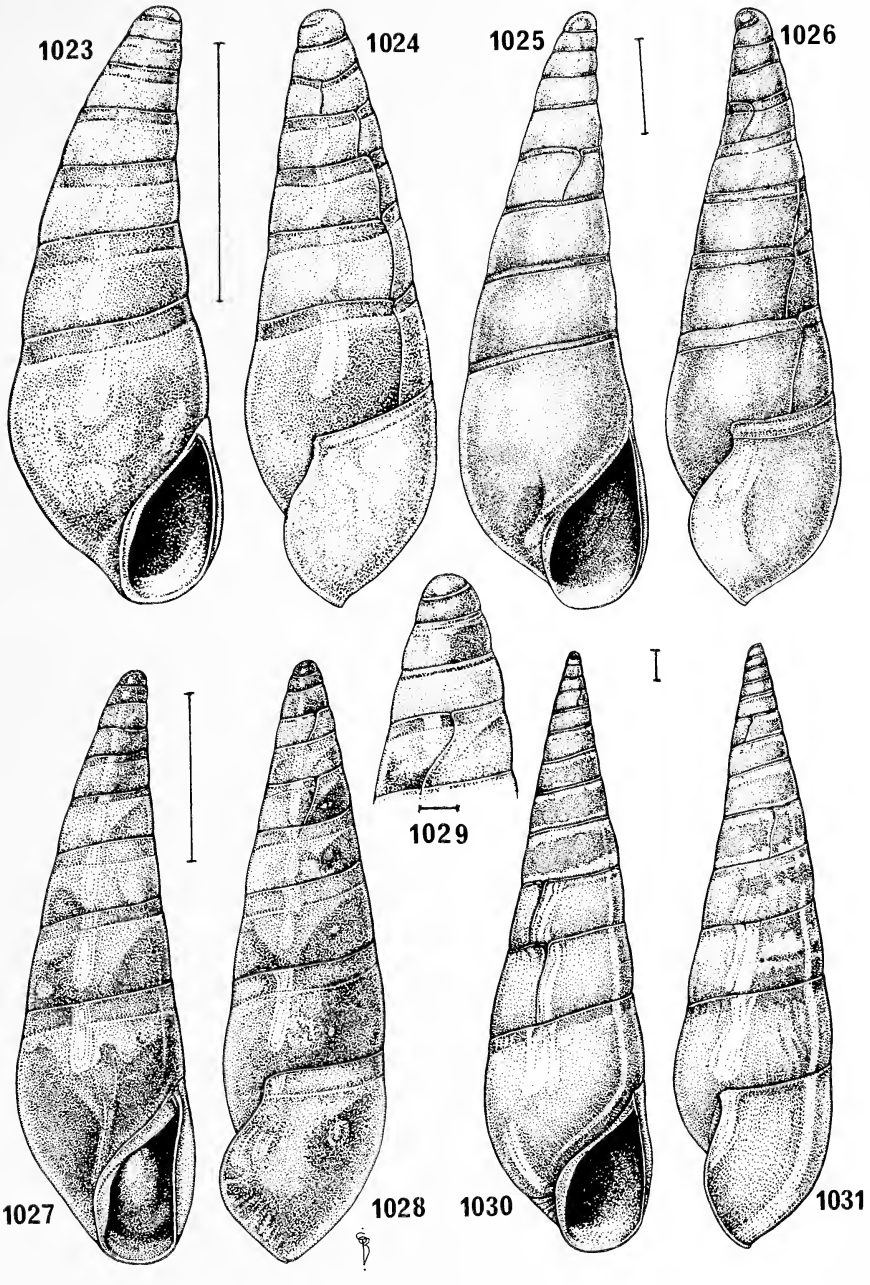
Material examined: The holotype and PORCUPINE 1870 st 17, 39° 42 N, 09° 43 W, 1100-2005 m, 2 shs; THALASSA st Z435, 48° 40 N, 09° 53 W, 1050 m, 2 shs; st Z421, 48° 22 N, 09° 37 W, 950 m, 1 spm.

Distribution: Only known from the material examined, from the Bay of Biscay and off Portugal in 1000-2000 m.

Description: Shell blunt, cylindrical, more or less curved, with slightly convex whorls and a rather small aperture, perfectly transparent and colourless. The larval shell consists of 1.5 large and obtuse whorls, height 480 μm. The holotype has 7.1 slightly convex whorls without any sculpture, except regularly appearing incremental scars, about 1 whorl apart, more or less arranged in a line. The aperture is rather low and broad with a distinct parietal callus. Outer lip distinctly sinuated at the suture, strongly projecting in its lower parts, with the most protruding point situated well below the middle of its height.



Figs 1015-1022. Genus *Eulitoma*. 1015-1016, *E. langfordi*, syntype, USNM 333555, 4.64 and 4.16 mm. 1017-1018, *E. nishimurai*, holotype (?), NSMT 52567, 3.60 mm. 1019-1020, *E. akauni*, syntype (?), NSMT 39830, 4.72 mm. 1021-1022, *E. insignis* (?), 37°54N, 29°45W, 1200-1500 m, 11.1 mm.



Figs 1023-1031. Genus *Eulitoma*. 1023-1024, *E. obtusiuscula*, PORCUPINE 1870 st. 3. 1025-1026, *E. arcus*, holotype. 1027-1029, *E. josephinae*, holotype. 1030-1031. *E. insignis*, MONACO 578. Scale lines: 1 mm, except fig. 1029: 100 μm.

Dimensions: Height of the shell 6.23 mm, diameter 1.81 mm, height of the aperture 1.71 mm, breadth 0.99 mm.
Soft parts: Eyes large, black, situated centrally in the bases of the cylindrical tentacles. Head-foot unusually small, but otherwise normal. No snout. Holotype a female, no penis. Operculum yellowish transparent, smaller than the aperture. Proboscis sheath short and simple, completely retracted.

Remarks: The specimen from THALASSA st Z421 is perfectly straight, but it also deviates in having the scars irregularly dispersed and we find it more likely that this depends on a difference in growth history than on specific level, because other details agree perfectly. The curvature, cylindrical shape and obtuse apex make this species rather characteristic. We have placed it in *Eulitoma* because of similarities in the aperture; we have no other indications of its affinities.

Eulitoma arcus resembles *E. obtusiuscula* somewhat when drawings are compared, but is a larger species with flatter whorls and its apex has a diameter of 300 μm, 0.1 mm from the tip instead of 200 μm as in *obtusiuscula.*

Genus *VITREOLINA* Monterosato, 1884

Type species: Eulima incurva Bucquoy, Dautzenberg & Dollfus, 1883, subsequent designation B., D. & D., 1898.

Remarks: The type species is imperfectly known and the genus has been used for an array of small, curved eulimids. The new species described below shows some resemblance to the species normally included in *Vitreolina*, but this placement does not bear any phylogenetic significance, rather it is simply a place where the species may easily be found.

Vitreolina knudseni n. sp. Figs 1032-1033

Type material: Holotype in ZMC.

Type locality: 37° 14 N, 28° 45 W, 480 m.

Material examined: The holotype.

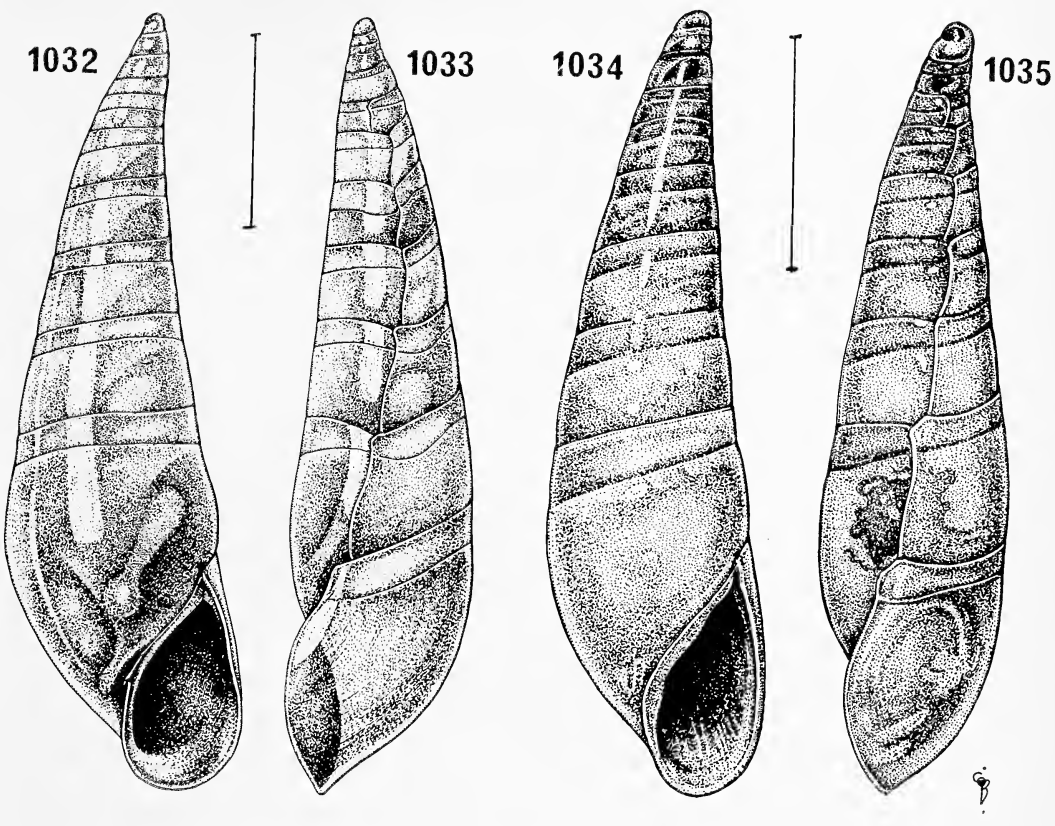
Distribution: Only known from the holotype, from the Azores.

Description: Shell small, slender, pointed, curved, transparent. The larval shell consists of 5 very slightly convex whorls forming an unusually pointed apex. The holotype has 5.1 teleoconch whorls, slightly convex in front view, perfectly flat in side view. The incremental scars form a slightly curved line along the right side of the shell (front view) and the suture makes distinct «dips» at the scars. The diameter of the shell is larger when measured in front view than in side view, as a consequence of the expanded aperture and all scars being placed in a line; the relation of the diameters is 0.88. The aperture is rather small with an unusually straight (front view) outer lip and an evenly rounded lower edge. The columella forms an even arch with the continuous parietal callus. The outer lip is retracted at the suture, orthocline and its lower part is evenly arched with the most projecting part situated at the midpoint of its height.

Dimensions: Height of the shell 3.98 mm, diameter 1.12 mm, height of the aperture 1.16 mm, breadth 0.52 mm.

Remarks: Nothing is known about soft parts or biology. The species may prove to be a shallow water species that has been washed out or eaten by a fish in shallow water.

Among the deep water species, it is only *Curveulima eschara* that resembles *V. knudseni* in having the incremental scars evenly aligned and being curved. That species, however, has a blunt larval shell of 2.5 whorls and has a more slender, distorted looking aperture. *Curveulima macrophthalmica* resembles *V. knudseni* but has a more blunt larval shell (diam. 200 μm 0.1 mm from tip) than *V. knudseni* (130 μm 0.1 mm from tip) and its scars do not form a line, but are scattered all along the spire.



Figs 1032-1035. Genera *Vitreolina* and *Acrochalix*. 1032-1033, *V. knudseni*, holotype. 1034-1035, *A. callosa*, holotype. Scale lines: 1 mm.

Genus *ACROCHALIX* n. gen.

Type species: A. callosa.

Diagnosis: Eulimids with a small, slender, curved shell, several flat whorls of slowly increasing diameter, faintly proso- or orthocline, almost straight outer lip and a well developed callus on the columella and parietal wall, both of which together form an evenly and weakly curved line. Colourless and transparent.

Remarks: This new genus resembles *Eulima* slightly in the shape of the aperture and the thickened inner lip. The laval shell also resembles *Eulima* but is perfectly colourless and it is possible that *Acrochalix* will finally end up as a subgenus of *Eulima*. The soft parts are not known for any species referable nor are the hosts, but until more is known, we find it better to keep this as a generic unit.

The group will in the future include many tropical species, but so far we know only a single described species that fits here, *Eulima rhaeba* Melvill & Standen, 1906, from the Gulf of Oman in 270 m.

Acrochalix callosa n.sp. Figs 1034-1035

Type material: Holotype RMNH 55722.

Type locality: CANCAP st 2.065, 28° 11 N, 13° 57 W, 670 m.

Material examined: The holotype.

Distribution: Only known from the type locality, the Canaries, in 670 m.

Description: Shell small, rather solid, colourless, transparent, pointed, distinctly curved. The larval shell consists of 2.5 whorls and is 380 μm high. Its whorls are evenly convex, colourless and the initial whorl is bluntly rounded. The holotype has 6 postlarval whorls, perfectly smooth and flat. Suture very indistinct. The incremental scars form an almost perfect series, with the second scar on the apex situated less than 0.1 whorl behind (seen along the spire) the outer lip. The distance between the larval and 2nd scar is 0.9 whorls. The right side of the shell is almost perfectly straight, the left side forms an even curve. The shell is distinctly flattened, i.e. the diameter measured from outer lip to opposite side of shell is larger than the diameter measured at a right angle to this. The relation is 0.84. Aperture high and pear-shaped. Outer lip orthocline, joining the suture at a right angle, slightly projecting in its lower part, most so at 2/5 of its height. Inner lip reflected over the columella and parietal wall, as a solid callus. Columella straight in its upper part, curved below, continuous with the parietal wall.
Dimensions: Height of the shell 3.34 mm, diameter 0.88 mm, height of the aperture 1.00 mm, breadth 0.40 mm.

Remarks: This little solid and curved species differs from other curved species of the area by having a slender aperture and unusually straight columella — parietal wall-line, and also a more well developed and solid inner lip. It is known from a single specimen, but this looks full grown when compared with other, tropical species referable to *Acrochalix*.

Genus *CAMPYLORHAPHION* n. gen.

Type species: Eulima famelica Watson, 1883

Diagnosis: Eulimids with a medium sized, curved, tall, slender shell, sometimes with flat whorls, axial riblets, a cylindrical larval shell of 2.0-2.5 whorls, a series of incremental scars along the right side of the shell, unusually large aperture for such a slender spire. Soft parts and hosts unknown.

Remarks: This new genus seems to be rather rich in species, although only two species are known from the area treated here. We have examined several undescribed tropical species and *Eulima flexa* A. Adams, 1861 belongs here.

Young specimens do not have the large ovate aperture so characteristic in adults, but have a comparatively smaller and distinctly rhomboid aperture (figs 1036 and 1040).

The species of *Campylorhaphion* resemble species of *Melanella*, but no *Melanella* species has a cylindrical larval shell of more than 1.7 whorls. The regularly appearing incremental scars and curved spire resemble *Vitreolina* and *Curveulima*, but they have a proportionally larger and more slender aperture.

Campylorhaphion famelicum (Watson, 1883)

Figs 924, 1036-1037, 1040-1041

Eulima famelica Watson, 1883:121.
Eulima famelica, Watson 1886:515, pl. 36, fig. 4.

Type material: Holotype BMNH.

Type locality: CHALLENGER st 75, 38° 38 N, 28° 28 W, 819 m.

Material examined: The holotype and PORCUPINE 1870 st 17, 39° 42 N, 09° 43 W, 1100-2005 m, 2 shs; st 28-28a, 36° 29 N, 07° 16 W, 520-553 m, 2 shs; THALASSA Z400, 47° 33 N, 07° 19 W, 1175 m, 2 spms; Golfo di Napoli, 40° 35 N, 14° 02 E, 192 m, 1 sh, coll. Fasulo; CANCAP 2.074, 28° 02 N, 14° 29 W, 530 m, 1 sh.

Distribution: Only known from the material examined, from the Azores, Bay of Biscay, off Portugal, the Canaries, and Gulf of Naples, in 192-2005 m.

Remarks: Campylorhaphion famelicum can be confused with *Melanella spiridioni* but the latter species has a conical larval shell, more robust and broader teleoconch and a lower aperture, less than twice as high as broad, while the aperture of *C. famelicum* is more than twice as high as broad.

Campylorhaphion famelicum can be distinguished from all the shallow water species of *Vitreolina* and similar genera by the larval shell which in all the similar species known to us consists of more than 2.5 conical, not cylindrical , whorls, with a very small initial whorl.

Campylorhaphion machaeropsis (Dautzenberg & Fischer, 1896) Figs 1038-1039

Eulima machaeropsis Dautzenberg & Fischer, 1896:461, pl. 19, fig. 27.
Eulima machaeropsis, Dautzenberg 1927:168, pl. 5, fig. 12.

Type material: Holotype in MOM.

Type locality: MONACO st 211, 39° 18 N, 33° 32 W, 1372 m.

Material examined: The holotype.

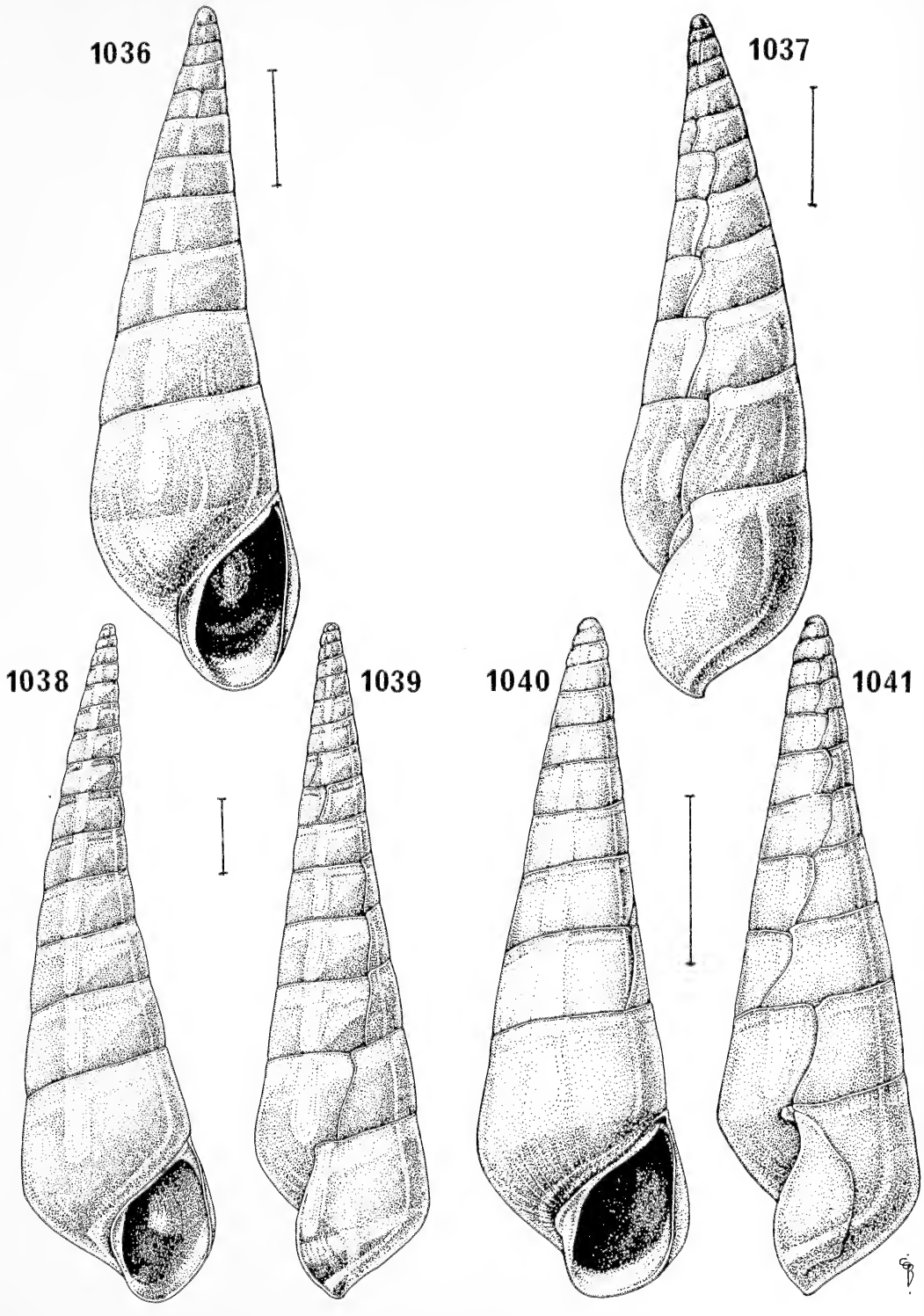
Distribution: Only known from the type locality, the Azores, 1372 m.

Remarks: Campylorhaphion machaeropsis was also recorded (Dautzenberg 1927) from MONACO st 683 and 719. The former specimen (in IRSN) turned out to belong to *Melanella spiridioni*, the latter one was never refound and we consider the record uncertain.

The species was described from a young specimen and it can be expected that the aperture of adult specimens looks more like that of *C. famelicum* than our figures show. It should be added to the original description that the shell is sculptured by thin, axial lines, 40-60 μm apart. These lines do not run parallel to the outer lip, but are almost straight. The larval shell consists of 2.2 whorls, its height is 480 μm, its diameter 340 μm. The holotype has 12 postlarval whorls. There are 4 incremental scars above the outer lip, in a slowly retreating series; on the upper whorls the scars are more irregularly disposed.

Young specimens of *C. machaeropsis* may be confused with some species of *Melanella*, which may have a similar sculpture, but such species of *Melanella* have fewer larval whorls (1.2-1.6). Specimens of *C. famelicum* are shorter, proportionally broader and have only very weak traces of axial lines.

Figs 1036-1041. Genus *Campylorhaphion*. 1036-1037, *C. famelicum*, THALASSA Z400. 1038-1039, *C. machaeropsis*, holotype. 1040-1041, *C. famelicum*, young specimen, THALASSA Z400. Scale lines: 1 mm.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Genus *AURICULIGERINA* Dautzenberg, 1925

Type species: A. miranda Dautzenberg, 1925, by original designation.

Remarks: The type species is the only species known of this genus. No soft parts or hosts are known. It is therefore impossible to say whether this should be considered a good genus or if *A. miranda* should be considered an aberrant species of, for example, *Oceanida* De Folin, a genus exhibiting several similarities in conchological features. Among these is the peculiar occurrence of numerous small pits (fig. 1046) that often are found on shells of these species. This phenomenon is perhaps due to some kind of corrosion, but it has not been observed in other eulimids.

Auriculigerina miranda Dautzenberg, 1925 Figs 1042-1047

Auriculigerina miranda Dautzenberg, 1925:7, figs 5-6.
Auriculigerina miranda, Dautzenberg 1927:170, pl. 5, figs 14-17.

Type material: Several syntypes in MOM and IRSN.

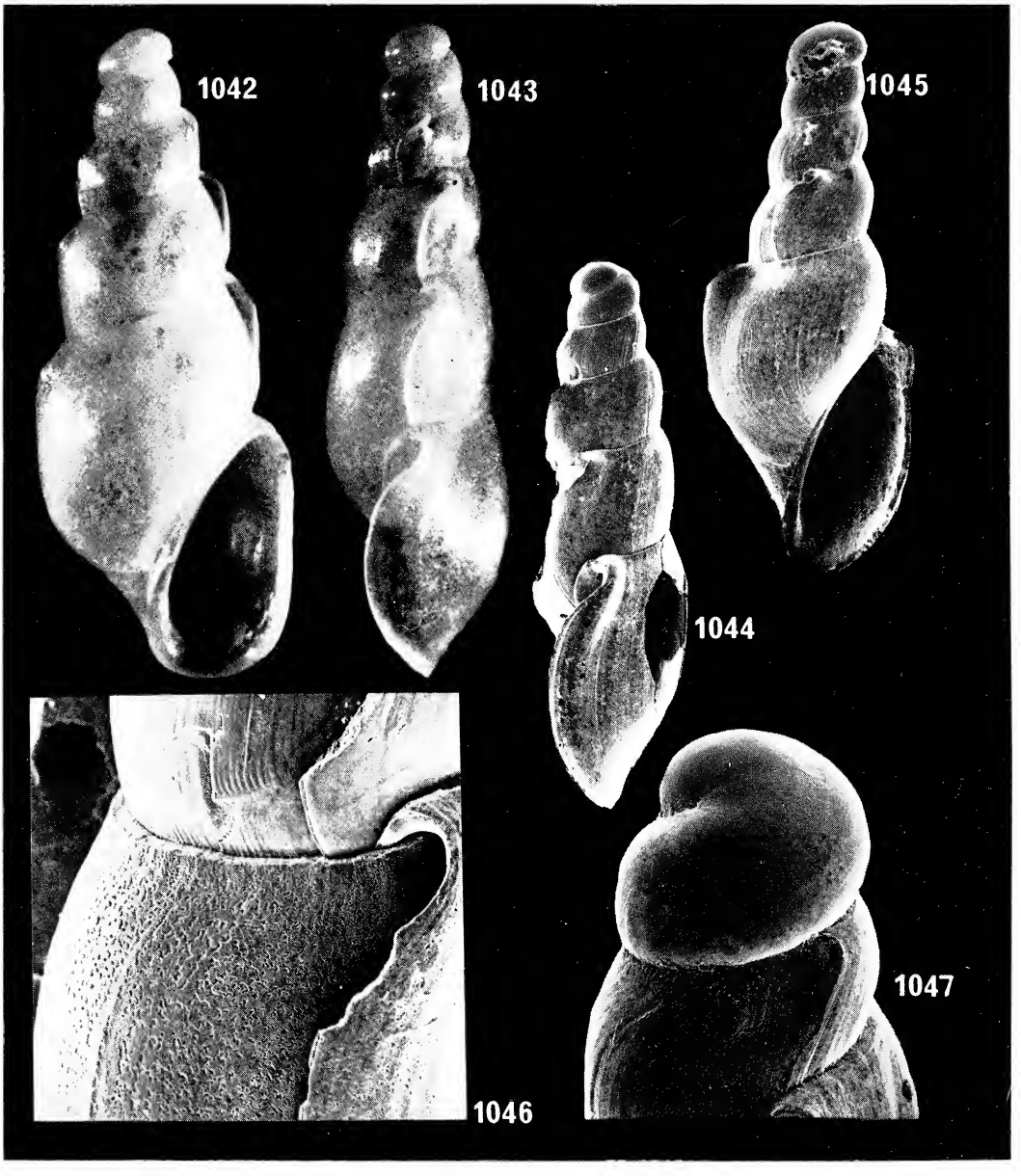
Type locality: MONACO st 1713, 28° 04 N, 16° 50 W, 1430 m.

Material examined: The type material and 5 shs, Isola Lachea, Acitrezza, Sicily, 36 m, coll. G. Spada.

Distribution: A. miranda has been reported from Isola Lachea by Campisi & al. (1971) and Carrozza (1977); no additional records are known to us.

Remarks: The two widely distant localities make it difficult to say if this really is a deep water species, or a shallow water species that was carried out by currents or fish.

No East Atlantic eulimid has labial varices even approaching those of *A. miranda*, which makes them easy to regonize. In the Caribbean area there are some species of *Oceanida* De Folin (*Athleenia* Bartsch), that resemble *Auriculigerina*, but they all have a shorter aperture and less developed labial varices.



Figs 1042-1047. *Auriculigerina miranda*. 1042-1043, Sicily, 2.8 mm. 1044-1045, syntypes, 3.45 mm and 3.35 mm. 1046, detail of shell surface and varix, height 0.57 mm. 1047, larval shell, height 0.56 mm.

Genus *OCEANIDA* De Folin, 1870

Type species: Oceanida graduata De Folin, 1871 by subsequent monotypy.

Synonyms: Spiroclimax Mörch, 1875. Type species *S. scalaris* Mörch, 1875, by monotypy. *Hoplopteropsis* Morgan, 1915. Type species *H. pontilevensis* Morgan, 1915, by monotypy. *Athleenia* Bartsch, 1946. Type species *A. burryi* Bartsch, 1946, by original designation.

Remarks: Nothing is known about soft parts or hosts of *Oceanida*. The genus includes numerous species in tropical waters, in shallow or intermediate depths. *O. ovalis* De Folin, 1884, described from deep water in the Bay of Biscay, is a pyramidellid. Nordsieck (1972:91) synonymized *O. graduata* with *Turbonilla limita* Brusina, 1876 and treated *Oceanida* as a subgenus of *Chrysallida*. This is a result of confusion with *Turbonilla gradata* Bucquoy, Dautzenberg & Dollfus, 1883.

The correct systematic position of *Oceanida* was independently concluded by van Aartsen (1984) who also found the description of the genus from 1870 which previously had escaped notice.

Oceanida confluens n.sp. Figs 1048-1049

Type material: Holotype RMNH 55718.

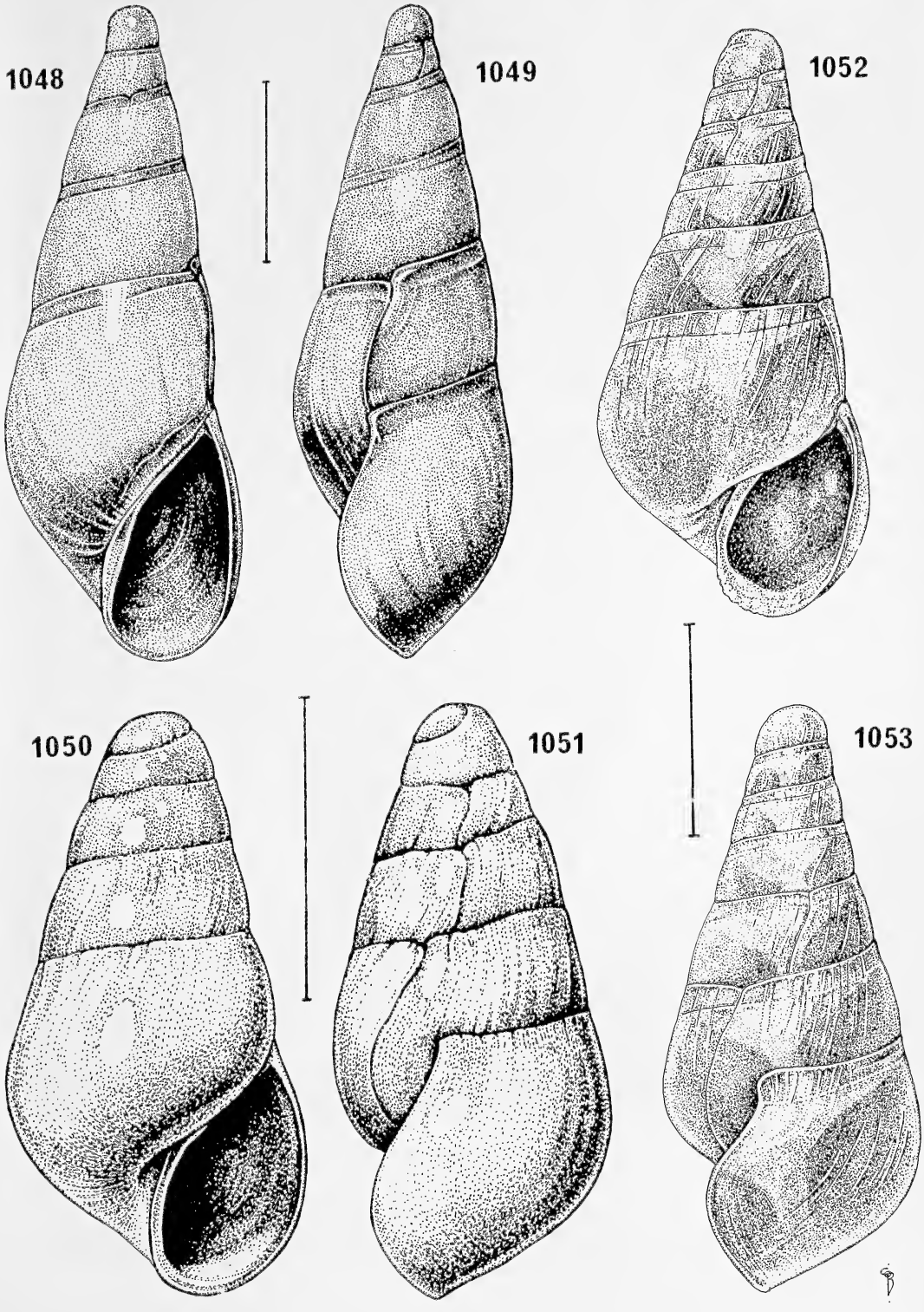
Type locality: CANCAP st 2.160, 27° 36 N, 17° 59 W, 550 m.
Material examined: The holotype (an empty shell) and 1 broken shell from Pantelleria, between Sicily and Tunisia, 710 m (PORCUPINE 1870 st 56).

Distribution: Only known from the material examined from the Mediterranean and the Canaries, in 500-700 m.

Description: Shell small, conical, blunt, with oblique suture and convex whorls. The larval shell consists of 1.2 evenly rounded whorls with a broadly rounded apex and the height is 380 μm. The holotype has 4.1 postlarval, evenly convex whorls sculptured by scattered indistinct incremental lines. There is a single strong incremental scar 1.0 whorls from the outer lip. The suture is very oblique and shallow. Aperture pear-shaped, evenly rounded in the lower part. Columella continuous with the distinct parietal callus. Outer lip shallowly sinuated at the suture, evenly protruding below.
Dimensions: Height of the shell 3.54 mm, diameter 1.24 mm, height of the aperture 1.26 mm, breadth 0.67 mm.

Remarks: This is the only species of *Oceanida* known from the E Atlantic, but the genus is represented by several species in the Caribbean area. Among the E Atlantic eulimids it is easily recognized by its very oblique suture and slightly mucronate larval shell.

Figs 1048-1053. Genera *Oceanida* and *Umbilibalcis*. 1048-1049, *O. confluens*, holotype. 1050-1051, *U. subumbilicata*, holotype. 1052-1053, *U. crassula*, holotype. Scale lines: 1 mm.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Genus *UMBILIBALCIS* n. gen.

Type species: Aclis (supranitida Wood var.?) *lata* Dall, 1889 (figs 1056-1057).

Diagnosis: Eulimids with very regularly conical shell, numerous whorls, low rounded aperture, indistinct sculpture of microscopical axial lines, incremental scars present, a narrow umbilicus resembling that of *Niso*. Ptenoglossate radula present (figs 1054-1055).

Remarks: The type species was described from off Barbados in 182 m. It was described as *Aclis* and was transferred to *Hemiaclis* by Bartsch (1947). It is quite evident from the texture of the shell, which is very glossy and quite solid, that it should be included in Eulimidae, at least as far as we presently known the family. It resembles slightly some species of *Niso*, but is smaller, colourless, has no trace of basal keel, and has an orthocline, curved outer lip.

The species here included in *Umbilibalcis* differ from *lata* in having a larval shell of 1.5 whorls (2.5 in *lata*), a much more curved outer lip and a slightly higher aperture, and it is very likely that they should be referred to different genera. We have, however, preferred to erect a new genus for a species where at least something is known about the soft parts. At the same time, at least provisionally, this genus can be used to harbour the species included here.

In the family Eulimidae there are few umbilicated species. A distinct umbilicus occurs only in the present genus and *Niso* and in a few scattered, poorly known species. It occurs also in *Parastilbe* and *Hemiaclis* but is here much less developed and partly concealed by the inner lip.

Umbilibalcis crassula n.sp. Figs 1052-1053

Type material: Holotype RMNH 55721.

Type locality: CANCAP st 4.124, 28° 29 N, 17° 53 W, 800 m.

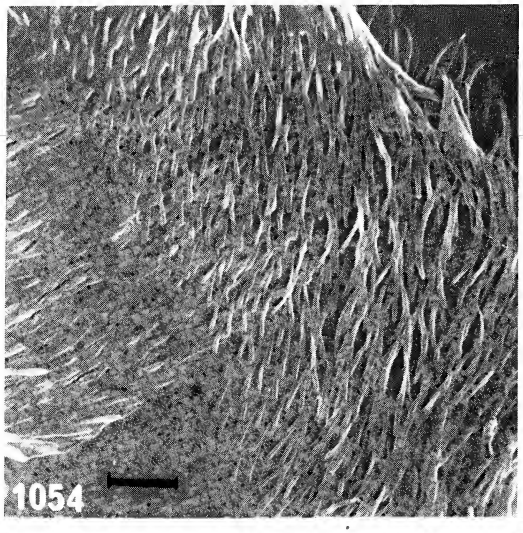
Material examined: The holotype.

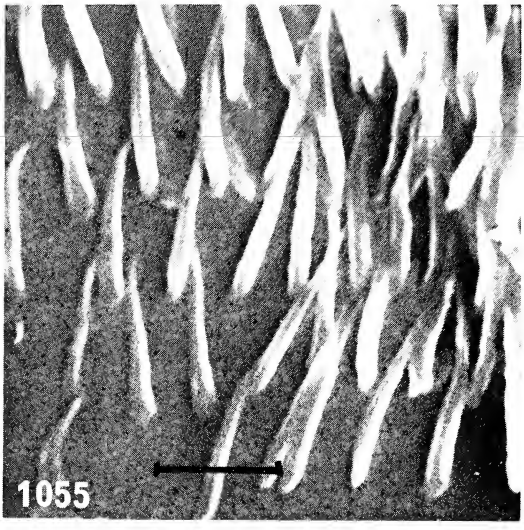
Distribution: Only known from the type locality, the Canaries, in 800 m.

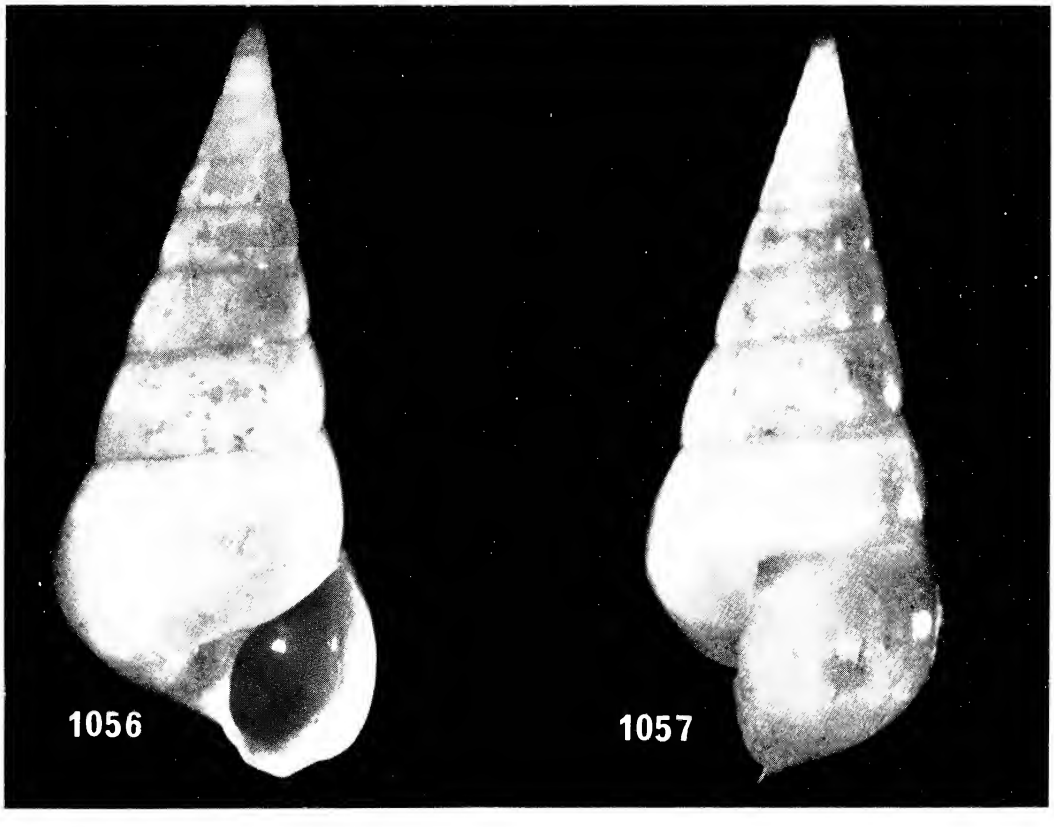
Description: Shell short, broadly conical, umbilicated, transparent, colourless, with a short aperture and blunt apex. The larval shell consists of 1.5 convex whorls, it is broadly conical, blunt and its height is 400 μm, the breadth 370 μm. The holotype has 4.8 postlarval whorls, sculptured by extremely thin and sharp, oblique axial lines, 25-50 μm apart on the body whorl. The teleoconch has 4 incremental scars, unusually indistinct and situated 0.8-1.2 whorls apart. Aperture low and rounded, parietal callus very thin, forming a distinct angle with the columellar part of the inner lip. Outer lip orthocline, very weakly sinuated below the suture, strongly protruding in its lower part, most so at 2/5 of its height.
Dimensions: height of the shell 2.70 mm, diameter 1.24 mm, height of the aperture 0.98 mm, breadth 0.58 mm.

Remarks: We are not sure that the holotype represents an adult specimen, but it is easy to distinguish from *U. subumbilicata* and also from two or three more undescribed species we have seen from the Caribbean area and we find it worth taking the risk of describing a juvenile to draw attention to this group.

Umbilibalcis crassula differs from *U. subumbilicata* by having a lower and broader aperture, weaker incremental scars and more convex whorls.







Figs 1054-1057. Genus *Umbilibalcis*. 1054-1055, *U.* n. sp., Quintana Roo, Mexico, a species closely related to *U. lata*, ptenoglossate radula. Scale lines: 25 μm and 5 μm. 1056-1057, *U. lata*, holotype, USNM 126790, 5.4 mm.

Umbilibalcis subumbilicata (Jeffreys, 1883) Figs 1050-1051

Eulima subumbilicata Jeffreys, 1884:370, pl. 28, fig. 8.

Type material: Holotype BMNH 1885.11.5.2075.

Type locality: PORCUPINE 1870 st 27, 36° 37 N, 07° 33 W, 586 m.

Material examined: The holotype.

Distribution: Only known from the type locality, off S Portugal, in 586 m.

Remarks: Umbilibalcis subumbilicata was recorded by Simpson (1910) from the North Sea, but his comments, that the last whorl was closer to half the height of the shell than two thirds and that the outer lip was not protruding in one of the specimens, make us doubt his identification.

The only eulimid known to us from the area treated here that resembles *U. subumbilicata* is *U. crassula*, which can be separated by having more convex whorls and a slightly concave spire.

Umbilibalcis subumbilicata resembles rather much some undescribed species of *Cima* from deep water, but the species of *Cima* have no incremental scars and lack the glossy, shiny surface texture typical of Eulimidae.

Genus «*MUCRONALIA* A. Adams, 1860»

Under this generic name we include a single species, *Mucronalia mammillata* Dall, 1927. It is only known from a few shells and we do not want to base a new genus on that. It belongs to the genus *Mucronalia* in classical sense, i.e. species of Eulimidae with a more or less cylindrical teleoconch and distinctly set off larval shell. The genus *Mucronalia*, however, is only known from a single shell of the type species and the shell has the outer lip strongly retracted at the suture, in a way resembling some species of *Melanella*, and its systematical position remains unclear.

So far only a single species seems to approach *Mucronalia mammillata* in shell characters, viz. *Mucronalia variabilis* Schepman & Nierstrasz, 1914, described as endo- and ectoparasite of the synaptid holothurian *Synapta ooplax* von Marenzeller, from Zanzibar. No type- or other material of that species has been available for comparison, and our assumption about relationship is based only on the original description of the shell.

«Mucronalia» mammillata Dall, 1927 Figs 1060-1062

Mucronalia mammillata Dall, 1927: 72.
Mucronalia suava Dall, 1927:72.

Type material: M. mammillata, holotype USNM 108040, paratype 108040a; *M. suava*, holotype USNM 108392.

Type localities: M. mammillata, «off Fernandina, Florida, 294 fathoms»; *M. suava*, «off Georgia, 440 fathoms».

Material examined: The type material and PORCUPINE 1870 st 17, 39° 42 N, 09° 43 W, 1100-2005 m, 1 sh.

Distribution: Only known from the material examined, from off Portugal and SE United States, 535-2000 m.

Remarks: The PORCUPINE shell had been badly broken, but repaired by Sykes or Marshall and our identification is tentative. This specimen seems to have a slightly shorter aperture than the American specimens, but there is some variation among the types in this respect. The high, narrow aperture, mucronate larval shell and strongly retracted outer lip make this species easy to recognize among the Atlantic Eulimidae.

Genus *NISO* Risso, 1826

Type species: Niso eburnea Risso, 1826, by monotypy.

Synonyms: Bonellia Deshayes, 1838, not Rolando, 1821. Type species: *Bulimus terebellatus* Lamarck, 1804.
Volusia A. Adams, 1861, not Robineau-Desvoidy, 1830. Type species: *Eulima imbricata* Sowerby, 1834.
Neovolusia Emerson, 1965, new name for *Volusia* A. Adams, 1861.

Remarks: The identity of *Niso eburnea*, the type species, is not satisfactorily determined. It is evidently a *Pliocene* fossil and was described from Nice, S France, but there are several species known that fit the description of Risso and the original description and figure are too rough to allow a positive identification. This, however, creates no problem at present because the genus is very uniform, at least in shell morphology. So far the host has only been reported for a single, undescribed S Pacific species, which was reported to parasitize a starfish (Warén 1984a).

The species of *Niso* are restricted to temperate and tropical areas where they are most common between 20 and 200 m, but a few species occur also deeper.

The species described below is the first one known from the area discussed in this series, but two additional species are known from W Africa and several species occur in the Caribbean area.

Niso foresti n. sp. Figs 1058-1059

Type material: Holotype in MNHN.

Type locality: BIACORES st 147, 37° 40 N, 25° 36 W, 345 m.

Material examined: The holotype.

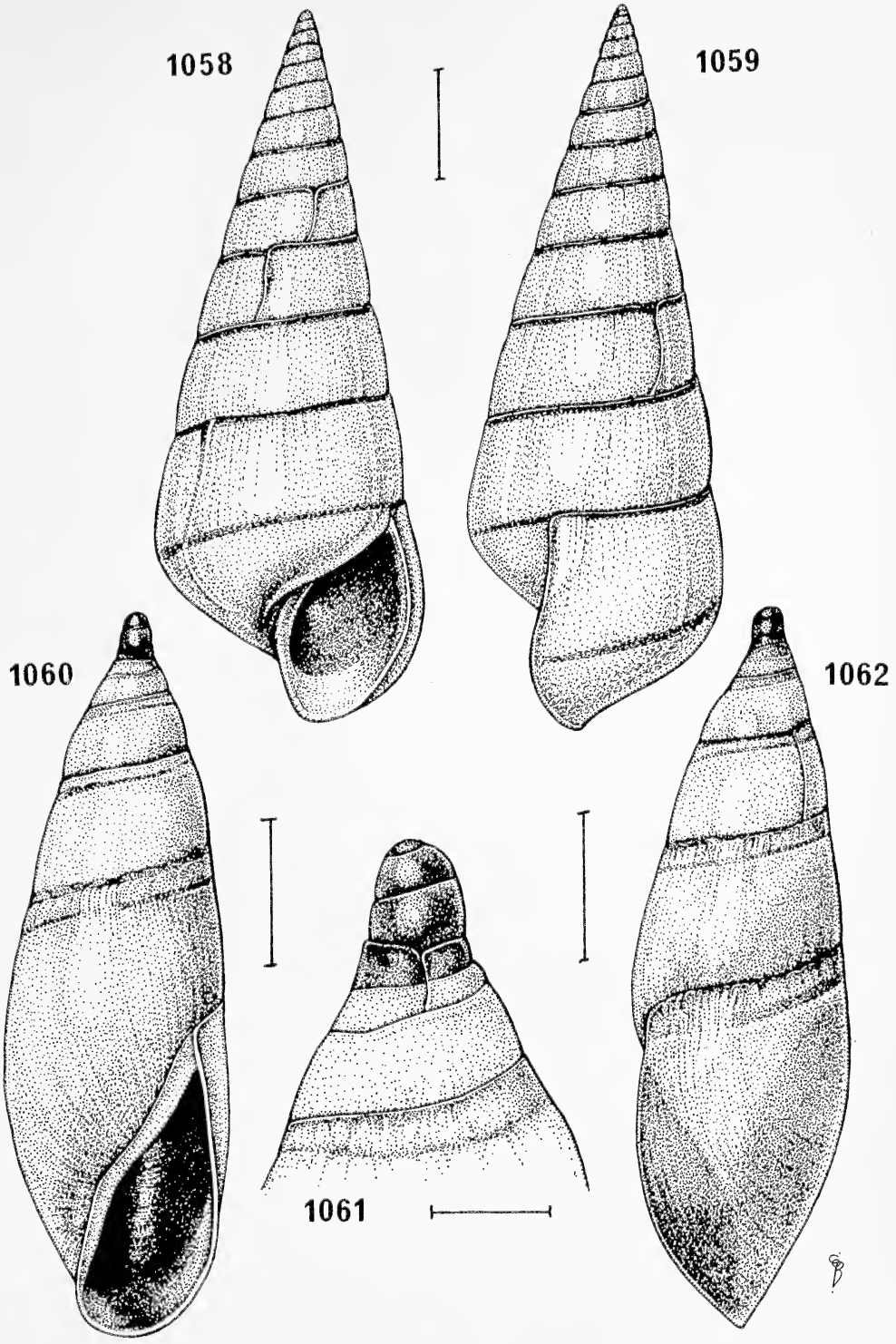
Distribution: Only known from the holotype from the Azores, 345 m.

Description: Shell straight, conical, solid, slightly yellowish with a distinct brown band at the periphery of the whorls. The larval shell consists of 3.0 slightly convex, brownish whorls of a height of 510 μm. The columella and suture are darker than the rest of the whorls. The holotype has 10.4 teleoconch whorls, separated by a rather deep and distinct suture. The first 3 teleoconch whorls are colourless, later whorls have a distinct brown peripheral band and a brown zone along the upper part of the outer lip (and incremental scars). All the shell, except the larval whorls, is opaque. The sculpture consists of a) incremental scars, irregularly dispersed, 0.5-0.75 whorls apart. b) fine axial lines, about 0.2 mm apart and running more straight than the scars from the outer lip. c) spiral lines giving an impression of being composed of small tubercules which towards the sutures fuse axially with each other, giving the edge of the suture a crenulated apparence. Body whorl evenly rounded, without basal keel. Umbilicus narrow, partly concealed by the outer lip. Outer lip retracted at the suture, concave below the suture, with a point of inflexion at the periphery and convex below the periphery. Most protruding point situated close to the extreme basal part.
Dimensions: Height of the shell 13.0 mm, diameter 4.98 mm, height of the aperture 3.32 mm, breadth 2.49 mm.

Remarks: Niso foresti can be separated from the other species of the genus in the E Atlantic by having a coloured peripheral band and by not having a distinct basal keel bordering the umbilicus. The latter characteristic also distinguishes it from several similar Caribbean species.

The holotype is an empty, but perfectly preserved shell and it is impossible to say whether it is a true deep water species or if it represents a deep record of a shallow water species.

Figs 1058-1062. Genera *Niso* and *Mucronalia*. 1058-1059, *N. foresti*, holotype. 1060-1062, *M. mammillata*, paratype, USNM 108040a. Scale lines: 1 mm, except fig. 1061: 0.25 mm.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Genus *COSTACLIS* Bartsch, 1947

Type species: Aclis nucleata Dall, 1889, by original designation.

Remarks: The anatomy has been investigated in *C. mizon* and no major differences were noticed in comparison with *Hemiaclis*.

The genus *Costaclis* was erected by Bartsch for a mixture of slender species with axial ribs, but only the type species can be kept in the genus. The following three species have been examined in addition to the species from our area.

Aclis hyalina Watson, 1881 (= *benedicti* Bartsch, 1947= *nucleata* Dall, 1889) from the Caribbean area and off Brasil in bathyal depths.

Costaclis sp.n., off La Reunion, Indian Ocean, 1150 m (MNHN).

Costaclis sp.n., off Sydney, Australia, 750 m (CHALLENGER, BMNH).

The E Atlantic fauna contains a single species of *Costaclis* known to us, and it is not impossible that it will prove to be the same as *C. hyalina* (Watson).

The (sometimes indistinct) axial ribs, distinct suture and blunt apex makes it easy to recognize *Costaclis* among E Atlantic eulimacean gastropods.

Costaclis mizon (Watson, 1881) Figs 1063-1066

Aclis mizon Watson, 1881:245.

Aclis mizon, Watson 1886:501, pl. 34, fig. 1.

Aclis muchia «Boog Watson» Locard, 1896:159 (unjustified emendation).

Niso joubini Dautzenberg & Fischer, 1897: 166, pl. 3 fig. 16.

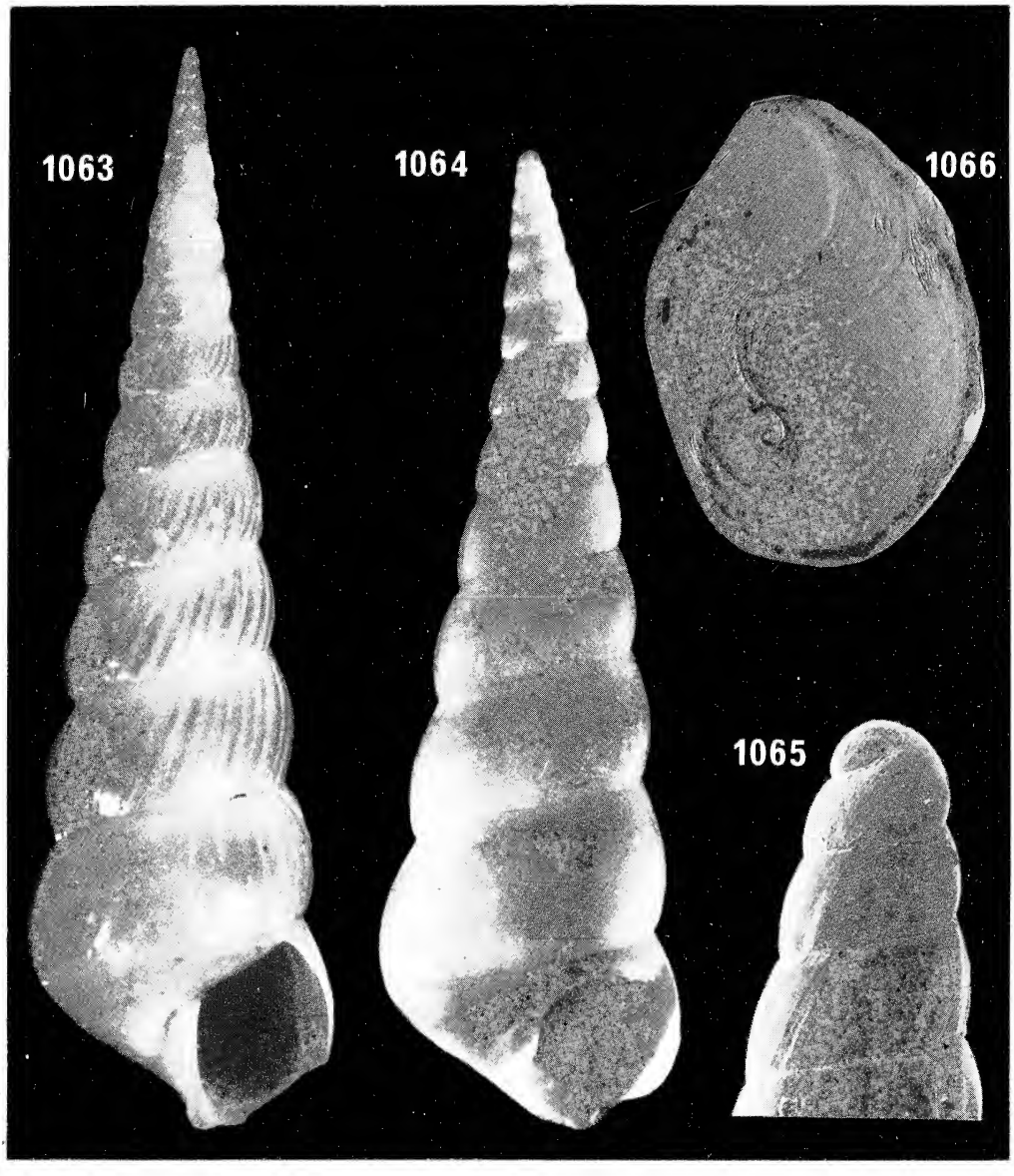
Type material: A mizon, holotype BMNH 1887.2.9.1574; *N. joubini*, holotype in MOM.

Type localities: A. mizon, off the Canaries; *N. joubini*, 39° 11 N, 29° 06 W, 1600 m (the Azores).

Material examined: The types above and TALISMAN dr 79, 25° 01 N, 16° 55 W, 2918-2638 m, 1 sh (det. *Turbonilla macandreae* by Locard); DISCOVERY st 8971, 31° 47 N, 11° 09 W, 2485 m, 2 shs; BIOGAS CP37, 47° 34 N, 08° 40 W, 2175 m, 1 spm (serially sectioned).

Remarks: Watson (1881) described *A. mizon* from Tenerife, «78 fathoms», a depth we find very unlikely and we suspect that the specimen originated from a much greater depth.

The large protoconch indicates no planktotrophic larval life. The stomach of the sectioned specimen contained unidentifiable remains of flesh and a few radiolarian fragments, showing the species to be a carnivore.



Figs 1063-1066. *Costaclis mizon*. 1063, BIOGAS CP37, 22.7 mm. 1064, holotype of *Niso joubini*, 14.7 mm. 1065, apex of specimen in fig. 1063, 1.0 mm. 1066, operculum of the same specimen, maximum diameter 3.6 mm.

Genus *PARASTILBE* Cossmann, 1900

Type species: Stilbe acuta Jeffreys, 1884, by monotypy.

Synonym: Stilbe Jeffreys, 1884 (not de Kay, 1842).

Remarks: The type species is known from a single, empty, somewhat broken shell and no other species conchologically referable to *Parastilbe* are known, so the systematic position of the genus is uncertain. The teleoconch shows some resemblance to *Hemiaclis*; therefore we have placed it in Eulimidae, but the larval shell is quite different from any eulimid known to us. Jeffreys placed the genus in Turritellidae, but we have reassigned it because nobody would look for such a shell in that family.

Parastilbe acuta (Jeffreys, 1884) Fig 1076

Stilbe acuta Jeffreys, 1884:130, pl. 10, fig. 2.

Type material: Holotype BMNH 1889.11.5.1919.

Type locality: PORCUPINE 1870 st 16, 39° 55 N, 09° 56 W, 1800 m.

Material examined: Only known from the holotype.

Distribution: Off Portugal, Bathyal.

Remarks: The «Bulldog specimen» from off Labrador referred to by Jeffreys (1884:130) does not belong to *Parastilbe*, but is an undescribed species of *Hemiaclis*. It is more slender and has lower and more convex whorls than *H. ventrosa*.

Parastilbe acuta can be recognized by the apex which is broad and rounded. The shape of the teleoconch is similar to *Hemiaclis* spp., but it is a much more fragile species.

Genus *HEMIACLIS* G.O. Sars, 1878

Type species: Aclis ventrosa Jeffreys MS, Friele, 1876, subsequent designation Cossmann (1912).

Remarks: Hemiaclis has been used for many of the species included in Aclididae by authors such as Bartsch (1947) and Nordsieck (1967). Of all species previously included here it is only the type species and two additional species described in this paper that with certainty belong here. Several authors have regarded *Stilbe* Jeffreys as a synonym, but the apex differs in being evenly rounded (cf p. 452) and it is here considered a distinct genus of unknown affinity.

In addition to the information in Fretter & Graham (1982) some anatomical investigation have been done to ascertain the systematic position of *Hemiaclis* and specimens of *H. ventrosa* and *H. obtusa* have been serially sectioned.

The foot has a well developed anterior pedal gland, reaching back into the cephalopedal haemocoel, a huge posterior pedal gland that often breaks in preserved specimens leaving a large hole, but there are no kinds of epipodial tentacles or folds. Operculum yellowish and paucispiral with distinct growth-lines (fig. 1071). Head with two short cylindrical - conical tentacles with or without eyes. No snout. Proboscis sheath opening directly under the joint or fused tentacle bases, very solid. Buccal mass solid, with a fairly large ptenoglossate radula (fig. 1070) and solid jaws. Salivary glands small, situated directly behind buccal mass and equipped with short ducts. Oesophagus not as slender as in most Eulimidae, leading to a big stomach with a gastric shield and two digestive glands which differ histologically. Male with a well developed penis and open pallial vas deferens. At a certain size they change sex and a large open pallial oviduct develops.

From these facts it is evident that the group is referrable to the Eulimidae (as far as that family is known), but there is one distinct difference: The stomach of *Hemiaclis* is more well developed and in the specimens sectioned it was filled by solid matter, evidently torn up or cut pieces of meat, not by fluid or coelomocytes as in Eulimidae. Also the more robust construction of the anterior alimentary canal reflects this difference in the mode of feeding.

A more detailed investigation will be done when material of certain other groups becomes available and will probably contribute to the knowledge of the relation of the Eulimidae to other families.

The species of *Hemiaclis* resemble closely certain eulimids, especially those of *Crinolamia* but in addition to anatomical differences (e.g. no radula or jaws, simultaneous hermaphroditism in *Crinolamia*) the flatter suture and straighter outer lip (seen from the side) in *Hemiaclis* are good distinctive characters.

The name *Hemiaclis inflata* Monterosato, 1880 (:66) is a *nomen nudum* and we have not been able to ascertain what the name was based on. It has been repeated in several faunistic lists, but has never been validated.

The three species of *Hemiaclis* treated here resemble each other closely, but can be separated by this key:

A. Shell twice as high as broad (at a size of 4 mm or more)	B
A. Shell 2.5 times as high as broad (at 4 mm or more)	*H. ventrosa* (p. 454)
B. Diameter of first whorl about 0.5 mm, subsutural zone of 3 most apical whorls constitutes 0.5-0.3 of the height of the whorls	*H. major* (p. 458)
B. Diameter of first whorl about 0.4 mm, subsutural zone of 3 most apical whorls constitutes 0.3 - 0.2 of the height of the whorls	*H. obtusa* (p. 456)

Hemiaclis ventrosa (Jeffreys in Friele, 1876) Figs 942, 1067-1071, 1074-1075

Aclis ventrosa Jeffreys MS, Friele, 1876:61, fig. 7.
Aclis ventrosa var. *minor* Friele, 1876:62, fig. 7b. Not *Aclis minor* (Brown, 1827).
Hemiaclis ventrosa, Jeffreys MS, G.O. Sars, 1878:197, pl. 11, fig. 16.
Hemiaclis glabra G.O. Sars, 1878:198, pl. 11, figs 14-15.

Type material: Aclis ventrosa, lectotype USNM 182194, a specimen from Lofoten, sent to Jeffreys by G.O. Sars, selected by Warén (1980).

Type locality: A. ventrosa, Lofoten (NW Norway).

Material examined: The type material and: 200 shells and specimens from the W part of and off Korsfjorden, W Norway, sandy and silty bottoms in 250-400 m, coll. AW; THOR st 99, 61° 15 N, 09° 35 W, 900 m, 5 shs; st 166, 62° 57 N, 19° 58 W, 957 m, 1 sh; INGOLF st 78, 60° 37 N, 27° 52 W, 1505 m, 2 shs; st 90, 64° 45 N, 29° 06 W, 1070 m, 1 sh; st 98, 65° 38 N, 26° 27 W, 267 m, 1 sh; NORBI CP11, 69° 30 N, 10° 30 E, 2945 m, 1 spm; 33° 00 N, 73° 37 W, 1950-1860 m, 8 spms (ZMC); Lödingen, Lofoten, NW Norway, 250-400 m, 3 shs (Tromsö Mus.); VÖRINGEN st 173b, 69° N, 14° E, 540 m, 10 shs; st 192, 70° 55 N, 18° 38 E, 196 m, 5 shs; st 195, 69° 46 N, 16° 15 E, 1187 m, 4 shs; st 290, 72° 27 N, 20° 51 E, 349 m, 1 sh; st 297, 72° 36 N, 05° 12 E, 2341 m, 1 sh; Sagfjord, Lofoten, NW Norway, 200 m, 1 spm (ZMB); Skråva, Lofoten, 360-540 m, G.O. Sars leg., 3 spms (ZMO).

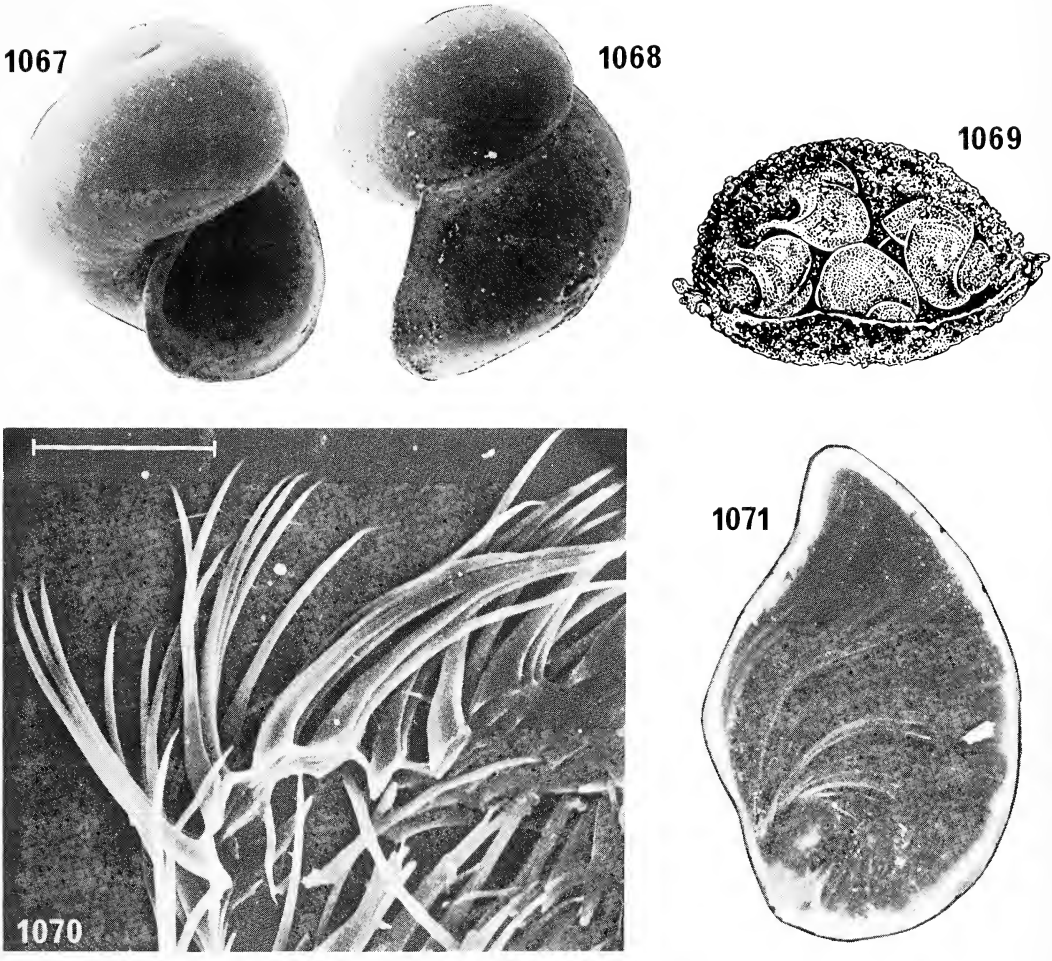
Distribution: The continental shelf and upper bathyal area off Scandinavia and Iceland, also off Georgia (USA), in 196-3000m.

Remarks: We have compared specimens of the two forms described by Friele (1876) and G.O. Sars (1878) and *glabra* (=var. *minor*) was based on small specimens while *ventrosa* was based on unusually big specimens. Most material we have seen is intermediate and we conclude that they belong to the same species.

One egg capsule was found (1973-02-13) off Korsfjorden, W Norway in 250 m and the young inside were identified as belonging to *H. ventrosa* by SEM examination (figs 1067-1069). The capsule was found free in dredged bottom material. It has one flatter side demarcated by a fold; thin, transparent walls covered by sand and contained four young ready to hatch. From this it can be concluded that the species has direct or lecithotrophic development, perhaps with a free-swimming dispersal stage.

Nothing is known about the biology, but from stomach contents, identified in serial sections, it can be concluded that it is carnivorous.

Hemiaclis ventrosa closely resembles *H. obtusa*, but that species grows to a larger size, has a slightly concave spire with proportionally more slender apical whorls. There is some possibility that the two may be conspecific, but the finding of typical specimens of *H. ventrosa* off Georgia makes it less likely that *H. obtusa* simply represents a geographical variation.



Figs 1067-1071. *Hemiaclis ventrosa*. 1067-1068, larval shells dissected out from egg capsule in fig. 1069. 1069, egg capsule, off Korsfjorden, W Norway, 250 m, diameter 1.6 mm. 1070, part of the radula, scale line 10 μm. 1071, operculum, maximum diameter 1.1 mm.

Hemiaclis obtusa n. sp. Fig. 1073

Type material: Holotype in MNHN.

Type locality: BIOGAS st CP01, 47° 35 N, 08° 39 W, 2245 m.

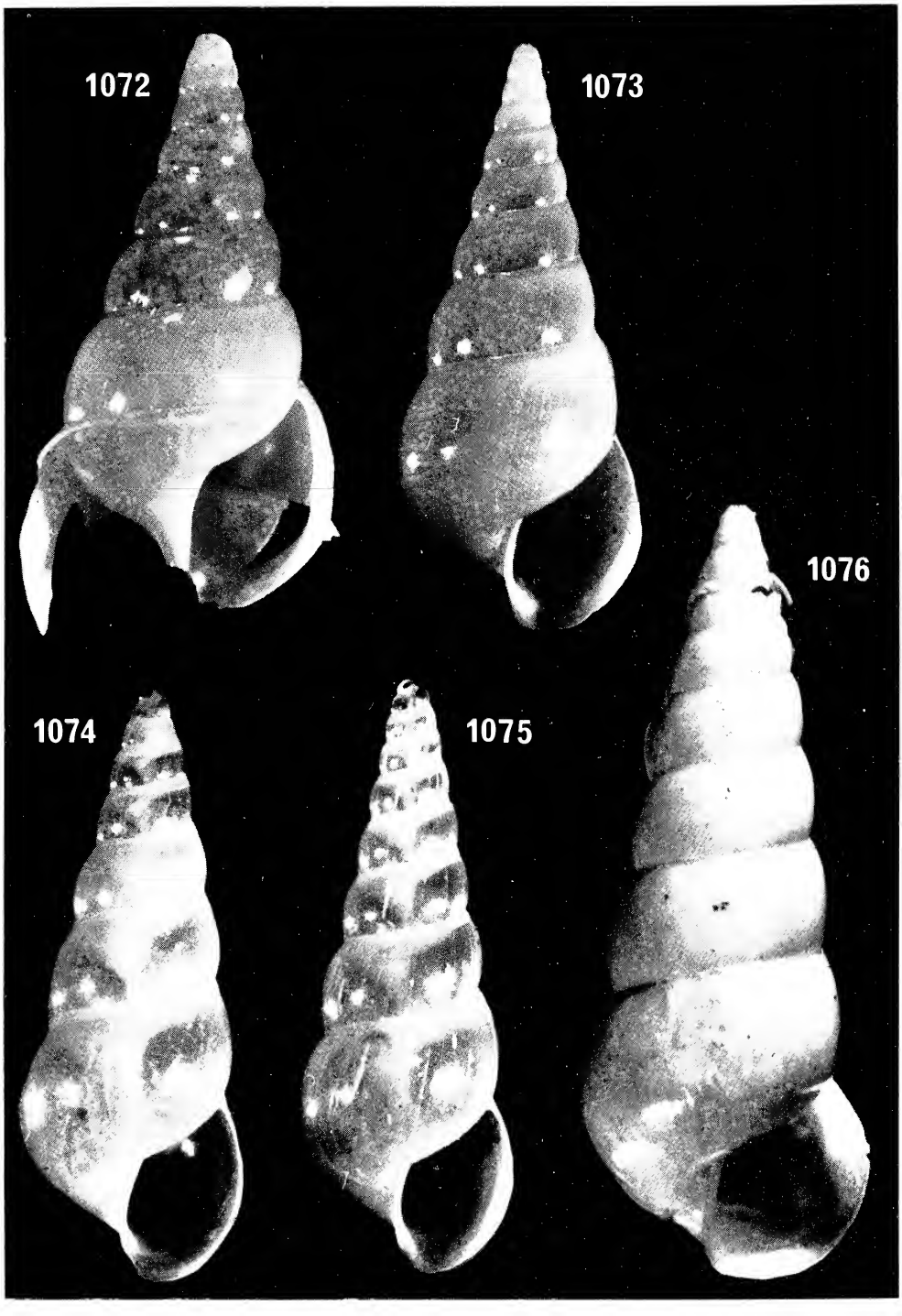
Material examined: POLYGAS DS 15, 47° 35 N, 08° 40 W, 2246 m, 1 spm; BIOGAS CP 08, 47° 33 N, 08° 38 W, 2177 m, 2 spms; CP 25, 44° 05 N, 04° 17 W, 1894 m, 1 sh; CP 37, 47° 34 N, 08° 40 W, 2175 m, 6 spms; DS 62, 47° 33 N, 08° 40 W, 2175 m, 2 shs; DS 63, 47° 33 N, 08° 35 W, 2126 m, 3 spms; DS 64, 47° 29 N, 08° 31 W, 2156 m, 1 spm; KG 147, 47° 33 N, 08° 41 W, 2190 m, 1 sh; KG 151, 47° 34 N, 08° 39 W, 2205 m, 1 sh.

Distribution: Only known from the material examined, from about 2000 m, in the Bay of Biscay.

Description: Shell transparent, tall, rather slender, of slightly concave outline, with a short aperture and blunt apex. The larval shell is well demarcated, consists of 1.5 whorls, and its height is 360 μm. The holotype has 7.7 postlarval whorls, sculptured by very indistinct incremental lines and traces of spiral lines. There are also 1-5 more distinct scars from the outer lip, resembling those of typical eulimids, but weaker. The subsutural zone occupies 0.3 for the first whorl, 0.1 of the height of the last whorl. There is a small umbilical chink behind the reflected inner lip, partly concealed by the bulging body whorl. Outer lip seen from the side, straight, distinctly opisthocline, never thickened.
Dimensions: Height of the shell 6.14 mm, diameter 2.56 mm, height of the aperture 2.00 mm, breadth 1.24 mm.
Soft parts: Described in the introduction to the genus.

Remarks: As mentioned under *H. ventrosa* there is some possibility that *H. obtusa* is simply a geographical form of that species, but we prefer to keep them apart until evidence for this becomes available. The gross morphology is described in the introduction to the genus. Like *H. ventrosa* this species is a carnivore and from the size of the larval shell it can be concluded that there is no planktotrophic larval stage.

Hemiaclis major is a bigger species, proportionally broader and with more distinctly concave outlines of the spire.



Figs 1072-1076. Genera *Hemiaclis* and *Parastilbe*. 1072, *H. major*, holotype, 5.6 mm. 1073, *H. obtusa*, holotype, 6.1 mm. 1074, *H. ventrosa*, off Korsfjorden, W Norway, 255 m, 5.1 mm. 1075, *H. ventrosa*, off Georgia, USA, 5.7 mm. 1076, *P. acuta*, holotype, 7.2 mm.

Hemiaclis major n.sp. Figs 1072

Type material: Holotype and one paratype in ZMC.

Type locality: INGOLF st 11, 64° 34 N, 31° 12 W, 2448 m.

Material examined: Only known from the type material.

Distribution: Only known from the type locality, S of the Denmark strait, between Iceland and Greenland, in 2400 m.

Description: Shell conical, semi-transparent, with a rounded aperture and blunt apex. Larval shell somewhat corroded so the limit between it and the teleoconch can not be seen, but if it consists of the same number of whorls as *H. obtusa* its height is 480 μm. The number of whorls in the teleoconch has been 6-7 but the last whorl is totally crushed. The whorls increase their width faster than those of *H. obtusa*, while the height increases at about the same rate, which gives the spire a broader appearance. The whorls are sculptured by indistinct incremental lines and 5-10 stronger growth scars per whorl. There is hardly any spiral sculpture visible. The subsutural zone occupies about half the height of the first teleoconch whorls, but gradually it becomes more narrow down along the spire, so it occupies only 1/15 of the height of the bodywhorl. The aperture is totally destroyed, but there has been an umbilicus, distinctly wider than in *H. obtusa* and *H. ventrosa.*
Dimensions: Height of the broken holotype 5.6 mm.

Remarks: We have decided to describe this species although the two specimens are broken, because the species seems to be easy to recognize. *Hemiaclis major* is larger and broader than *H. obtusa*; it also has a more distinctly concave shape of the spire. The soft parts are not known.

Genus *BULIMEULIMA* n. gen.

Type species: B. magna n. sp.

Diagnosis: Eulimids with a large, inflated shell of rather few whorls of rapidly increasing height and diameter. Larval shell of a single whorl, colourless or yellowish. Teleoconch white, opaque. Aperture very high, with a long straight columella.

Remarks: Nothing is known about the hosts for this group. The soft parts of the type species were examined after reconstitution but did not yield any information about relationships to other groups.

In addition to the new species here described, we have seen one undescribed species from off New Zealand and *Mucronalia* (?) *bulimuloides* Dall, 1927 (figs 1077-1079) which belong here. *Bulimeulima magna* differs from *bulimuloides* by being much larger, 12.9 mm at 6 teleoconch whorls instead of 6.45 mm at 5.2 postlarval whorls, by having flatter whorls and a somewhat larger larval shell.

Alaba incolorata Thiele, 1912, an Antarctic species, is an Eulimidae and seems to belong to *Bulimeulima*, judging from shell characters.

Another species that possibly belongs to *Bulimeulima* is *Eulima herouvalensis* Cossmann, 1886, from the Paris Basin. It has been placed in *Rostreulima* Cossmann, 1913, but the type species of *Rostreulima* is probably not an Eulimidae (Warén 1984a).

Bulimeulima magna n.sp. Figs 1080-1082

Type material: Holotype in MNHN.

Type locality: BIOGAS st DS79, 46° 30 N, 10° 27 W, 4715 m.

Material examined: The holotype.

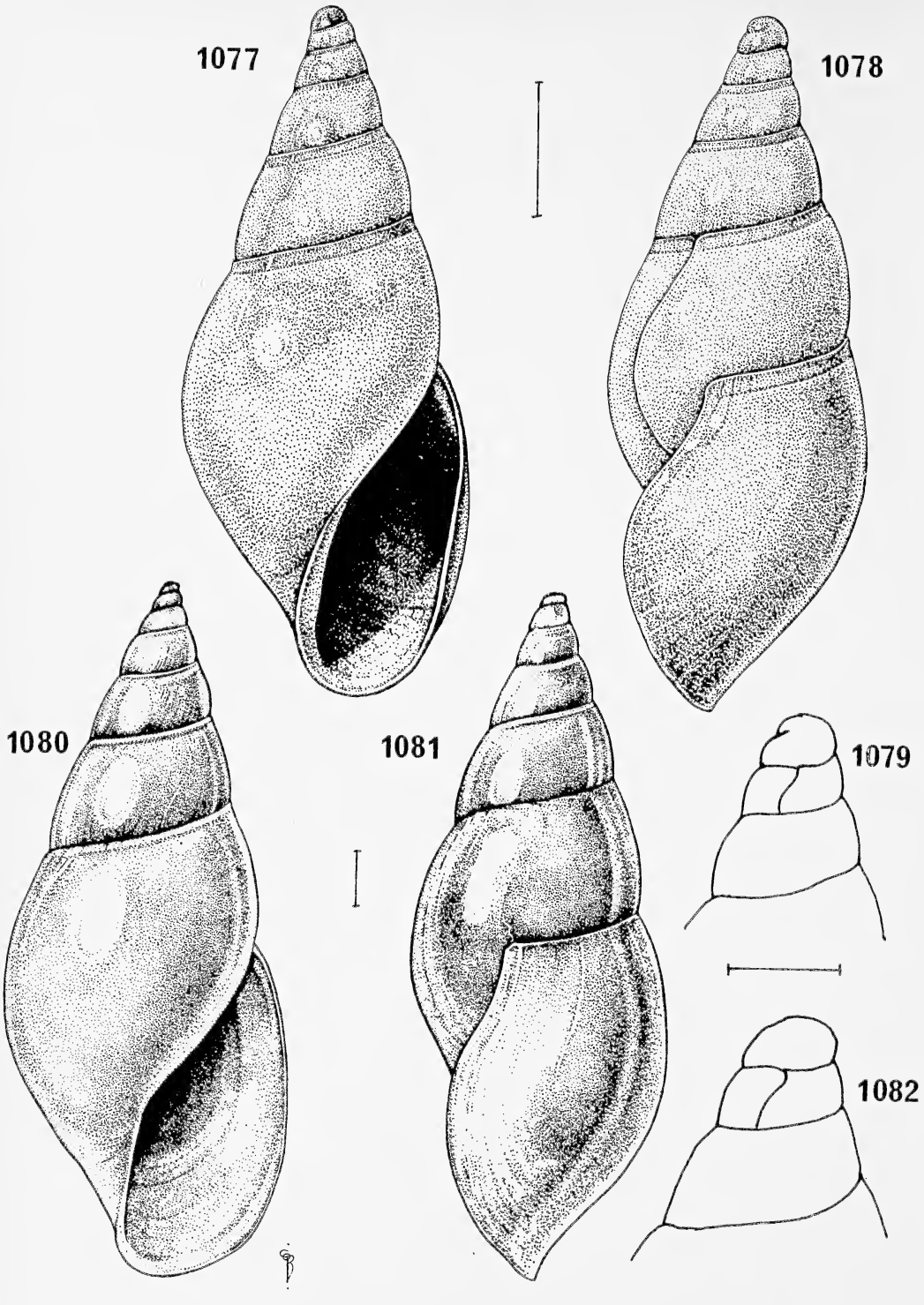
Distribution: Only known from the holotype, from the Bay of Biscay, 4715 m.

Description: Shell somewhat similar in shape to an *Achatina*, with rather convex whorls, blunt apex, large aperture, straight columella; fairly solid and opaque. The larval shell consists of 1.3 low and convex whorls, without a trace of colour or sculpture. The holotype has 5.9 teleoconch whorls, sculptured by very indistinct incremental lines and some traces of spiral sculpture. The incremental scars are not very distinct and irregularly dispersed, 0.2 - 0.7 whorls apart. Suture shallow, flat, distinct. Whorls evenly convex. Aperture high, with a distinct angle between the solid and straight columella and the parietal wall. No parietal callus, outer lip retracted at the suture, most projecting part situated well below the midpoint of its height.

Dimensions: Height of the shell 12.9 mm, diameter 5.40 mm, height of the aperture 6.05 mm, breadth 2.66 mm.

Soft parts: Not visibly reduced at external examination. Foot well developed. Eyes unusually small. Operculum large. No snout.

Remarks: Bulimeulima magna can hardly be confused with any eulimid known from the area discussed. The shape, resembling an *Achatina*, makes it easily recognizable.



Figs 1077-1082. Genus *Bulimeulima*. 1077-1079, *B. bulimuloides*, paratype. 1080-1082, *B. magna*, holotype. Scale lines: 1 mm, except figs 1079 and 1082: 0.25 mm.

«Eulima» confusa n.sp. Figs 1083-1084

Type material: Holotype BMNH 1885.11.5.2018; Paratype BMNH 1970046 (st 17).

Type locality: PORCUPINE 1870 «Atlantic», probably st 16, 17, 17a, at 39° 39-55 N, 09° 43 - 09° 56 W, 1100 - 2005 m, off the Portuguese coast.

Material examined: The holotype and PORCUPINE 1870 st 17, 39° 42 N, 09° 43 W, 1100-2005 m, 1 sh.

Distribution: Only known from the area around the type locality, 1000-2000 m.

Description: Shell conical, slightly irregularly coiled but straight, with a large aperture and distinctly bent columella. Colourless. The larval shell consists of 2.6 distinctly convex, smooth whorls and the height is 400 μm. The holotype has 6.5 postlarval whorls, almost flat, sculptured by very indistinct incremental lines and separated by a shallow but distinct suture. Incremental scars irregularly dispersed, 0.8-1.2 whorls apart, deep and distinct. The whorls are somewhat irregularly coiled, so the sutures are not always running perfectly parallel to one another, and the apical angles of the individual whorls varies. Aperture large, rounded, excavated and constricted in its lower part. Outer lip with a small sinus close to the suture, strongly projecting below, most so at the mid point of its height. Columella solid, curved, strongly bent towards the right. Parietal callus solid close to the columella, thinner, almost disappearing towards the outer lip.
Dimensions: Height of the shell 5.72 mm, diameter 2.22 mm, height of the aperture 2.00 mm, breadth 1.04 mm.

Remarks: The second specimen is considerably more slender than the holotype, but all other characteristics agree and we suppose it to be a male. Such dimorphism is common in eulimids with separate sexes (Warén 1984a).

The holotype was figured by Jeffreys (1884: pl. 28, fig. 6) under the name *Eulima piriformis* Brugnone. The real identity of this name was discussed on page 425, but evidently, relying on direct identification by Jeffreys (Watson 1886:508) or on his figure, several authors have recorded *E. piriformis* from both sides of the Atlantic. We have examined their specimens and found these records to be based on species different from both *E. piriformis* Brugnone and *E. piriformis* sensu Jeffreys (= *confusa*).

«Eulima» confusa is quite similar to *«E.» leptozona* and *«E.» fuscozonata*; from the latter it differs by having a colourless shell which is more solid and by having a conspicuous suture; from the former it differs through the lack of colour and by being broader with a larger aperture.

Jeffreys (1884:369) introduced a varietal name *«bizonata»* for one specimen from PORCUPINE st 6, which was said to differ by having two reddish bands. In USNM there is a sample (no. 133135) which is labelled «*Eulima piriformis* Brugn. + var. *bizonata* Jeffr. sta. 6, 24, 292-358 fms». This sample contained *Halielloides fragilis* and *Batheulima fuscoapicata*, none of which has colour marking, except on the larval shell. It also contained a single specimen of a rather tall eulimid very similar to *«E.» leptozona* but with a much less solid shell and in a rather worn condition. The shell is too worn to be identified and the colour markings (if this is the specimen for which the name was intended) are no longer visible. We have preferred to regard *bizonata* as a *nomen nudum* as there is no formal description, figure, or specimen that the name may have been founded on.

«Eulima» fuscozonata n.sp. Figs 1085-1086

Type material: Holotype BMNH 19700048.

Type locality: PORCUPINE 1870 st 30, 36° 15 N, 06° 52 W, 702 m.

Material examined: The holotype and PORCUPINE st 24, 37° 19 N, 09° 13 W, 531 m, 1 sh.

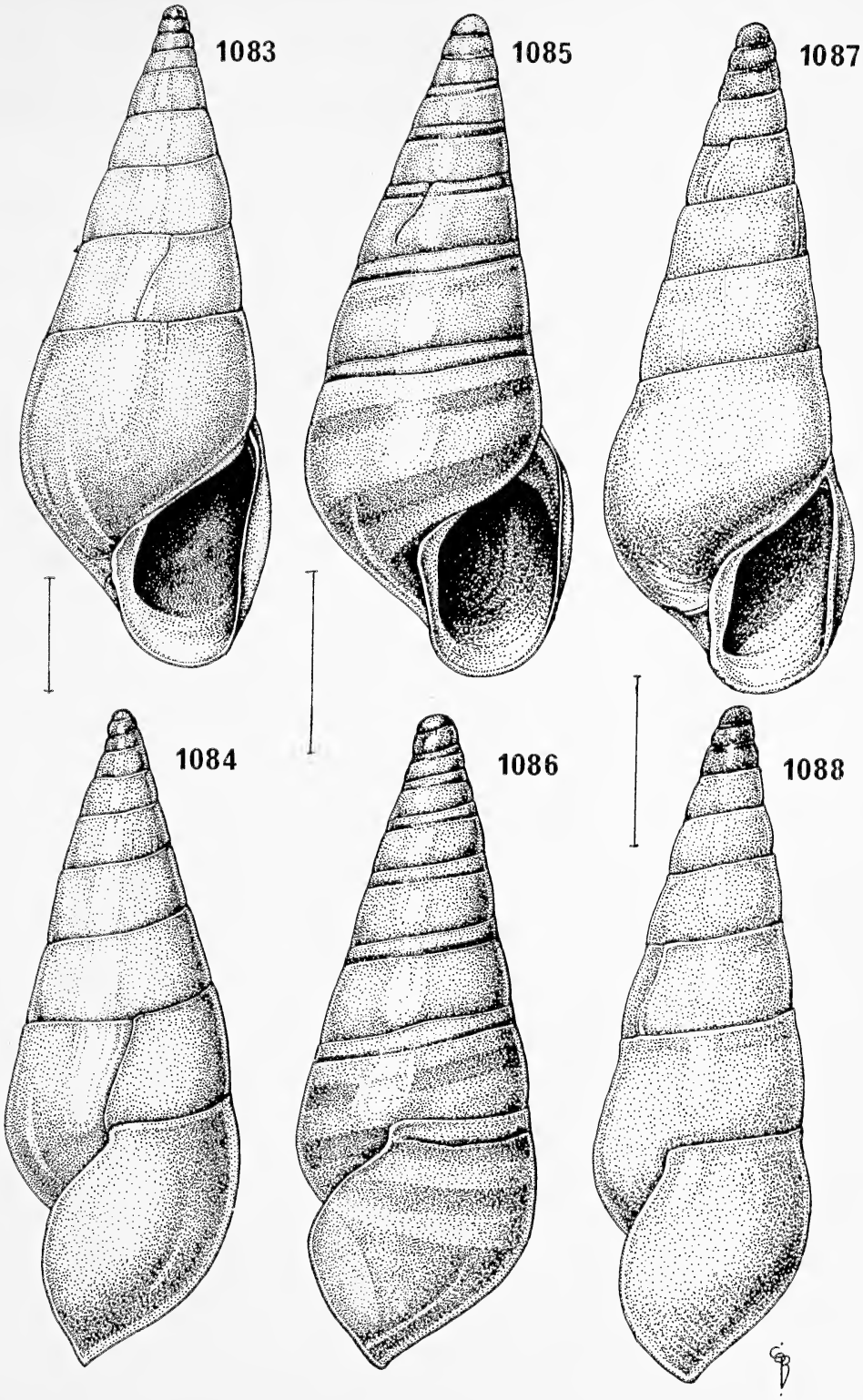
Distribution: Only known from the material examined, from the S Atlantic coast of Spain and Portugal, 531-702 m.

Description: Shell straight, broadly conical with a large aperture and yellowish colour markings. The larval shell consists of about 2.7 smooth, convex whorls of a yellowish colour and the suture is marked by a darker band. The holotype has 5.5 very slightly convex whorls sculptured by indistinct growth lines. The holotype has 2 very indistinct incremental scars 1.6 and 2.7 whorls from the larval shell, but the second specimen which is larger and partly broken has scars also 1.0 and 2.0 whorls from the outer lip. The whorls are marked by an indistinct colour band at the suture, more distinct ones at the middle of the whorls and below the periphery and finally a dark area around the columella. Suture almost invisible. The aperture is large, at the right side it protrudes outside the imagined continuation of the spire; its lower part is remarkably narrow and elongated. Columella straight, its lower part is distinctly bent to the right. Parietal callus extremely thin or absent. Outer lip retracted at the suture, strongly projecting, most so at the midpoint of its height.
Dimensions: Height of the shell 3.60 mm (the specimen from st 24 has probably had a height of 5.1 mm), diameter 1.44 mm, height of the aperture 1.40 mm, breadth 0.70 mm.

Remarks: «Eulima» fuscozonata is only known from one perfect and one broken shell, but we consider it distinct enough to be described. It resembles *«E.» leptozona* in the general shape and the details of the larval shell, but *«E.» leptozona* has a colourless columella, bent to the left and less distinct axial sculpture. *«Eulima» confusa* is very similar, but is colourless, more solid and has a distinct, easily visible suture.

The most characteristic feature of *«Eulima» fuscozonata*, which also is shared with *«E.» confusa* and to some extent *«E.» leptozona*, is the aperture which is remarkably constricted and excavated in its lower part. This gives the aperture a distorted appearance.

Figs 1083-1088. *«Eulima»* species. 1083-1084, *«E.» confusa*, holotype. 1085-1086, *«E.» fuscozonata*, holotype. 1087-1088, *«E.» leptozona*, lectotype. Scale lines: 1 mm.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«Eulima» leptozona Dautzenberg & Fischer, 1896 Figs 914, 1087-1088

Eulima leptozona Dautzenberg & Fischer, 1896:465, pl. 19, fig. 17.
Eulima leptozona, Dautzenberg 1927: 166, pl. 5, fig. 8.

Type material: Lectotype, here selected, the specimen figured by Dautzenberg & Fischer, in MOM.

Type locality: MONACO st 553, 37° 43 N, 25° 05 W, 1385 m.

Material examined: The holotype and 2 additional shells from the type locality; MONACO st 1349, 38° 36 N, 28° 06 W, 1250 m, 1 sh; PORCUPINE 1870, Adventure Bank, between Sicily and Tunisia, 167 m, 1 sh; THALASSA Z435, 48° 40 N, 09° 53 W, 1050 m, 2 shs.

Distribution: Only known from the material examined, from the Mediterranean, the Azores and the Bay of Biscay, in 167 - 1385 m.

Remarks: It can be added to the original description that the larval shell consists of 2.4 convex, slightly yellowish whorls with a darker band at the suture. The height of the larval shell is 400 μm. The holotype has 5.6 postlarval whorls at a height of 3.84 mm.

The shell from Adventure Bank is not adult but is in perfect condition, transparent and shows the colour-pattern well: one indistinct brown zone between the false suture and just above the periphery, another band of approximately the same breadth just below the periphery. The first three postlarval whorls are colourless. The incremental scars are irregularly dispersed, 0.5-1 whorl apart.

«Eulima» leptozona resembles *«E.» fuscozonata* considerably but the latter species has a columella that is distinctly curved to the right, it has distinct incremental lines and a brownish columella. *«Eulima» leptozona* also resembles *Bathycrinicola macrapex* but that species is colourless, has a less solid shell and more curved columella.

«Eulima» devistoma n.sp. Figs 794, 1089-1090

Type material: Holotype in MNHN.

Type locality: BIOGAS st CP09, 47° 33 N, 08° 41 W, 2171 m.

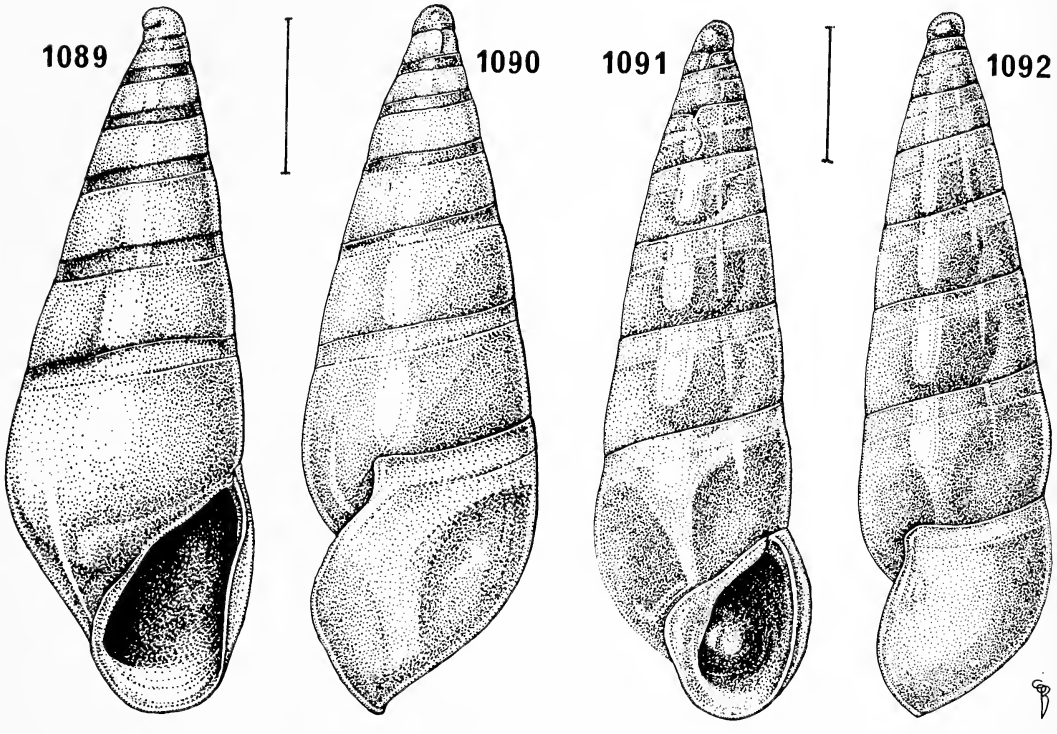
Material examined: The holotype and BIOGAS DS65, 47° 36 N, 08° 41 W, 2360 m, 1 spm; THALASSA Z399, 47° 35 N, 07° 18 W, 825 m, 1 sh.

Distribution: Only known from the material examined from the Bay of Biscay, 800-2400 m.

Description: Shell broadly conical, perfectly colourless and transparent, with a large distinctly oblique aperture and twisted larval shell. The larval shell consists of about 1.2 whorls, of which the initial part is peculiarly upturned and twisted almost as in certain pyramidellids. The height is 280 μm. The holotype has 6.1 perfectly flat and smooth postlarval whorls, separated by a very indistinct suture. Subsutural zone distinct, occupying about 1/7 of the height of the whorls. No incremental scars. Outline of spire distinctly convex. Aperture high, inner and outer sides somewhat parallel, lower part evenly rounded and excavated. Columella thin, almost continuous with the parietal wall. Parietal callus vestigial. Outer lip retracted at the suture, strongly protruding in its lower part. Dimensions: Height of the shell 4.64 mm, diameter 1.64 mm, height of the aperture 1.64 mm, breadth 0.80 mm.

Soft parts (The specimen from DS 65): Tentacles long, slender. No eyes. No snout. Foot and operculum present, large pallial oviduct, no penis.

Remarks: The unique shape of the larval shell (fig. 794) similar only to that of *«E.» strongylostoma*, facilitates the identification of *«E.» devistoma*. It differs from *strongylostoma* by having a less solid and perfectly smooth shell and by having a more narrow aperture. *«Eulima» devistoma* resembles several species in the shape of the shell, e.g. *«E.» confusa* and *Crinophtheiros junii*, but these species have a regularly coiled larval shell.



Figs 1089-1092. *«Eulima»* species. 1089-1090, *«E.» devistoma*, holotype. 1091-1092, *«E.» strongylostoma*, holotype. Scale lines: 1 mm.

«Eulima» strongylostoma n.sp. Figs 1091-1092

Type material: Holotype in MNHN.

Type locality: INCAL st 0S03, 46° 03 N, 10° 19 W, 4798 m.

Material examined: The holotype and INCAL WS09, 47° 28 N, 09° 34 W, 4277 m, 1 spm.

Distribution: Only known from the material examined, from the N part of the Bay of Biscay, 4277-4798 m.

Description: Shell high, cylindrical, apical part conical, perfectly colourless and transparent, with an upturned larval shell, round and solid aperture and indistinct axial ribs. The larval shell consists of 1.4 whorls and its height is 350 μm. The initial part of the whorl is twisted and starts almost vertically like in *«E.» devistoma*. The holotype has 6.8 teleoconch whorls, almost perfectly flat and sculptured by very low and indistinct but broad ribs which disappear on the lower part of each whorl. Suture very shallow and indistinct. No incremental scars. Aperture low and broad, unusually rounded. Columella evenly curved, very solid, forming an indistinct angle with the parietal wall. Parietal callus distinct. Outer lip unusually thickened, indistinctly sinuated at the suture, distinctly protruding in its lower part, most so at 0.27 of the total height, from the base.
Dimensions: Height of the shell 5.09 mm, diameter 1.62 mm, height of the aperture 1.32 mm, breadth 0.72 mm.
Soft parts: The animal has no eyes; operculum present.

Remarks: The apex and the shape of the spire are quite similar to *«E.» devistoma* although the shape of the aperture is very different (figs 1089 and 1091). These two species can also be separated by the axial sculpture of *strongylostoma; devistoma* is perfectly smooth.

From other species, *«E.» strongylostoma* differs by its twisted larval shell and the unusually round and solid aperture.

«Eulima» anonyma n.sp. Figs 1095-1096

Type material: Holotype in MNHN.

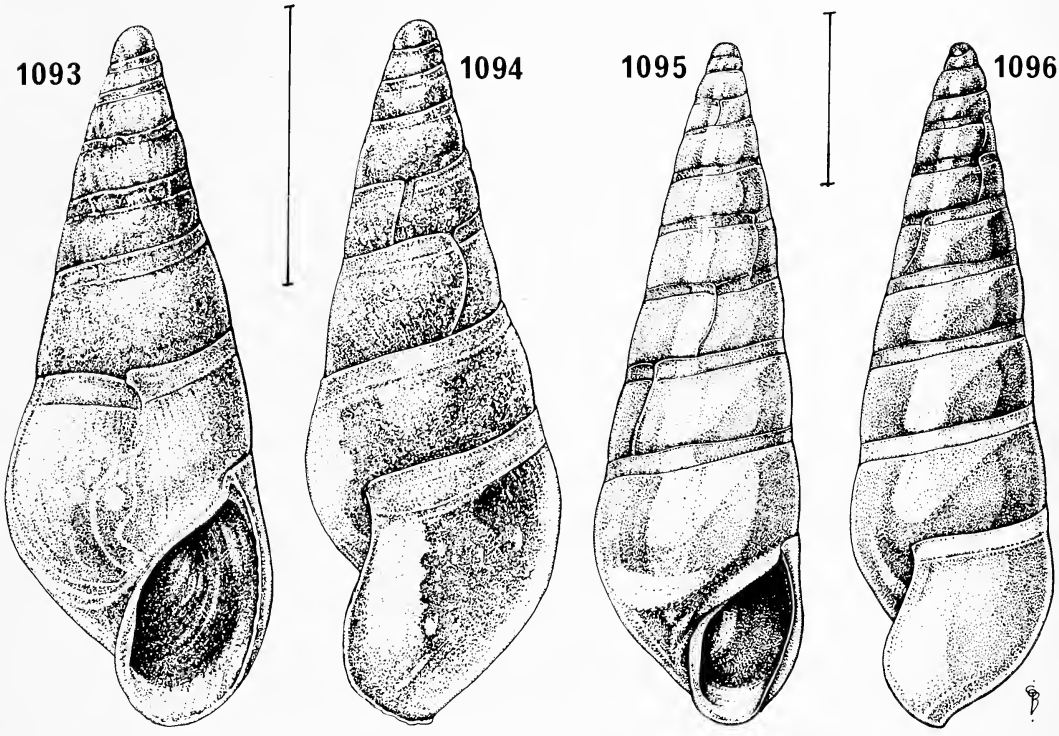
Type locality: BIOGAS st DS52, 44° 06 N, 04° 22 W, 2006 m.

Material examined: The holotype and 1 additional specimen from the type locality; PORCUPINE 1870 st 9, 48° 06 N, 09° 18 W, 986 m, 1 sh; st 17, 39° 42 N, 09° 43 W, 1100-2005 m, 1 sh; BIOGAS DS53, 44° 30 N, 04° 56 W, 4425 m, 1 sh; DS 65, 47° 36 N, 08° 41 W, 2360 m, 1 sh; THALASSA Z435, 48° 40 N, 09° 53 W, 1050 m, 16 spms; Z438, 48° 34 N, 10° 25 W, 1400 m, 1 sh; Z442, 48° 55 N, 11° 02 W, 975 m, 1 spm; LAGARDERE st GCh 6, 46° 17 N, 04° 35 W, 1300-1340 m, 1 spm.

Distribution: Only known from the material examined from off Portugal and the Bay of Biscay, 975-4425 m.

Description: Shell small straight, slender, pointed, perfectly colourless and transparent, with a small aperture and distinctly convex whorls. The larval shell consists of almost 3 convex whorls and its height is 500 μm. The holotype has 6.8 teleoconch whorls, distinctly convex and sculptured by some indistinct incremental lines. Suture shallow and indistinct, subsutural zone distinct. The suture makes conspicuous «dips» at the incremental scars. Incremental scars irregularly dispersed, 0.8 - 1.7 whorls apart. Aperture small, somewhat rhomboid. Columella thin, forming an indistinct angle with the parietal wall, which is covered by a very thin callus. Outer lip sinuated just below the suture, distinctly projecting in its lower part, with the most protruding part situated well below its midpoint. Dimensions: Height of the shell 3.92 mm, diameter 1.24 mm, height of the aperture 1.06 mm, breadth 0.54 mm.
Soft parts: The animal has two small eyes.

Remarks: «Eulima» anonyma is a very inconspicuous and featureless eulimid, just as *chionea*, the species it resembles most and probably is closely related to. It can be recognized by the small, pointed larval shell, slender shape with numerous whorls and incremental scars of the same type as in *Vitreolina*. *«Eulima» chionea* is a smaller species with distinctly larger apical angle.



Figs 1093-1096. *«Eulima»* species. 1093-1094, *«E.» chionea*, holotype. 1095-1096, *«E.» anonyma*, holotype. Scale lines: 1 mm.

«Eulima» chionea n.sp. Figs 1093-1094

Type material: Holotype in MNHN.

Type locality: SEABED st CP20, 19°13 N, 29°49 W, 4950 m.

Material examined: The holotype and 5 additional specimens from the type locality; DEMERABY CP04, 08°11 N, 49°03 W, 4440 m, 2 spms.

Distribution: Only known from the material examined, from the N part of the central Atlantic, abyssal.

Description: Shell small, straight, conical, rather broad, perfectly transparent and colourless with a small aperture and pointed apex. The larval shell consists of 3.5 convex, colourless whorls and its height is 620 μm. The holotype has 3.0 distinctly convex and slightly irregularly coiled whorls. No sculpture except 3 or 4 strong incremental lines, somewhat intermediate between normal scars and incremental lines because no thickening of a former outer lip can be seen. Aperture comparatively large, evenly rounded below. Columella solid, forming an indistinct angle with the parietal wall. Parietal callus very thin. Outer lip distinctly sinuated below the suture, most projecting point well below the middle of its height.

Dimensions: Height of the shell 2.40 mm, diameter 0.96 mm, height of the aperture 0.83 mm, breadth 0.47 mm.

Soft parts: Eyes very small.

Remarks: «Eulima» chionea resembles *«E.» anonyma* in the larval shell, the convexity of the whorls, the shape of the aperture, but it is distinctly broader and has a larger apical angle. The shape is not very different from the species of *Fuscapex*, but the larval shell is colourless and of a very different shape, not at all as broad and blunt as in *Fuscapex*.

«Eulima» chionea has actually not yet been found in the area treated here, but its abyssal occurrence makes it likely that it will be found here also.

«Eulima» anonyma closely resembles *E. sarissa* Watson, 1883 from off SE America, but *E. sarissa* is more slender. The diameter of the whorl where the larval shell connects to the teleoconch (measured with the scar in the middle of the whorl) is 300 μm in *sarissa* and 400 μm in *anonyma*.

Family EPITONIIDAE

The species of Epitoniidae are predators or parasites of Cnidaria Anthozoa.

A review of the associations has been presented by Robertson (1963), supplemented by reports in Albergoni et al. (1970), Kay (1979), Robertson (1981, with references; 1983 a & b) and others. Epitoniidae are now known to parasitize or feed on the orders Zoantharia and Actiniaria (sea anemones and corals) of the class Hexacorallia. Most species seem to be losely associated with their prey- or host-species, which is reflected by the fact that the host species is known for very few epitonids; *Iphitus* however lives more or less permanently in galls of a deep-sea coral.

The family includes numerous species from all parts of the world, but is especially rich in species in tropical areas, the continental shelf and the upper parts of the slope. The species are rare in the abyssal area, but are known down to about 6000m (*Eccliseogyra monnioti*, p. 482).

Classification

There seems to be little variation in morphology among the groups of the family, which probably reflects a low degree of specialization. Some attempts were made to improve the understanding of epitonid classification by dissecting some species with widely different shells (*Eglisia spirata, Claviscala richardi, Epitonium greenlandicum* and *Acirsa eschrichti*), but the differences between these species and those described by Taki (1956, 1957) and Fretter & Graham (1962) were very minor, and can hardly be used until the anatomy of the family is known in more detail. Presently it seems to be only *Alexania* (Habe 1943, as *Habea*) and *Iphitus* (Beu & Climo 1974, as *Sculptifer*) that can be recognized from the morphology of the soft parts.

Based on shell characters, several classifications have been proposed for the family. De Boury (1909), with much emphasis on the shallow water species, divided the genus *Scala*, encompassing the whole family, into two groups, *Pretiosi* and *Carinati*. Cossmann (1912) recognized 5 subfamilies (Euscalinae, Acrillinae, Clathroscalinae, Opalinae and Acirsinae), while Thiele (1929) and Wenz (1940) kept a single unit. Clench & Turner (1952) divided the family in Epitoniinae and Nystiellinae. The Nystiellinae were said to have a protoconch with strong axial ribs, while Epitoniinae were said to have a fairly smooth larval shell. We agree that there are two clearly distinct groups of larval shells in the family, as outlined by Clench & Turner, and we have seen no intermediate types. It must, however, be added that this is true only for species with planktotrophic type of larval shell. In species with direct development, the larval shells look similar in the two groups.

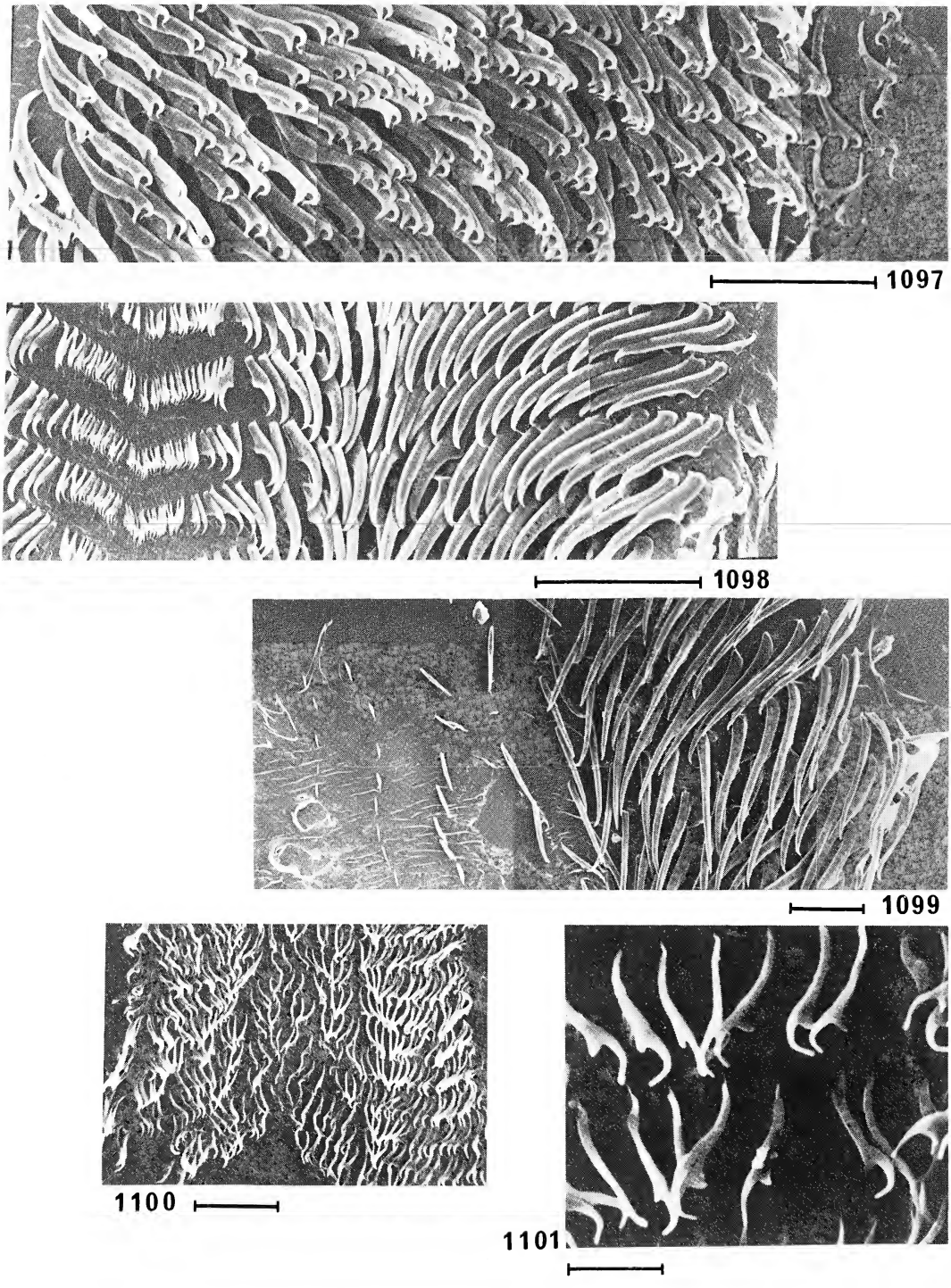
Clench & Turner also suggested (after examining one radula in the Nystiellinae) that the radulae of Epitoniinae and Nystellinae differ substantially. This character is discussed below.

In this regional revision, we have had access to a limited number of forms, encompassing only a part of the morphological types encountered in the family. We can not therefore express an opinion on the subfamilial classification of the whole family. We tentatively use the division into Nystiellinae and Epitoniinae and give below the characters on which we based our generic and specific classification.

We have had valuable discussions with Dr R. Kilburn about epitoniid taxonomy, and we thank him for his remarks on our manuscript and for letting us have access to his unpublished revision of «The family Epitoniidae in southern Africa and Mozambique».

Radula

The radula of Epitoniidae is generally considered very uniform within the family and of little taxonomical value. This is probably not completely true judging from published descriptions and figures (Thiele 1928, Clench & Turner 1952, Taki 1956, 1957, Azuma 1971) and our own observations (figs 1097-1105). There appears to be 4 major types of radular morphology in the family:



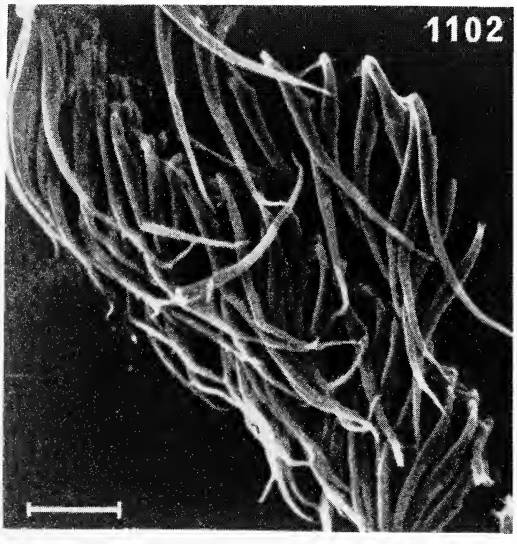
Figs 1097-1101. Epitoniid radulae. 1097, *Claviscala richardi*, THALASSA Z447. 1098, *Acirsa subdecussata*, CapBreton, SW France. 1099, *Epitonium celesti*, BALGIM CP25. 1100-1101, *Acirsa eschrichti*, Greenland. Scale lines, 1097-1100: 100 μm; 1101: 25 μm.

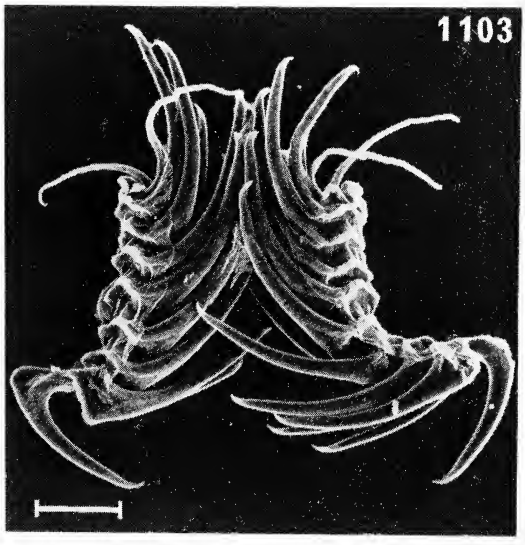
(a) *Couthouyella* Bartsch, 1909 has about 15 flat, bifurcated teeth on each side of the plough-shaped central tooth (Warén 1980b). This is the only genus with a well developed central tooth. We have found no similar radulae in the NE Atlantic epitoniids that we have examined.

(b) The central tooth is vestigial or absent, and a large number (30-150/row) of marginal teeth, similar in shape, are present. The teeth are bi- or tricuspid, with the secondary cusp situated towards the tip (as in *Claviscala richardi*: fig. 1097) or towards the base (as in *Epitonium celesti*: fig. 1099) of the tooth. This is apparently the most common radular type in Epitoniidae, and it has been decribed in many «genera».

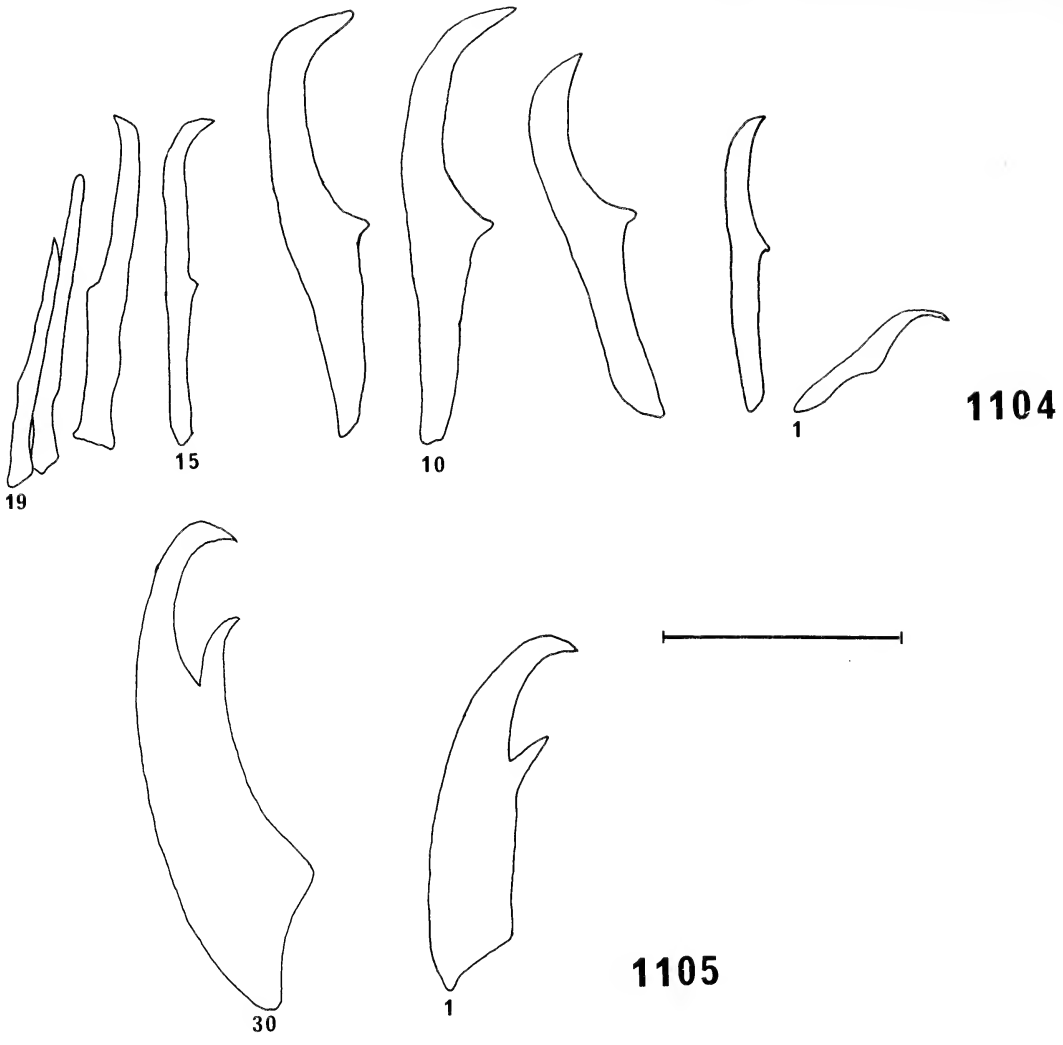
(c) The central tooth is absent and a small number (4/row) of marginal teeth, similar in shape, are present. The teeth are unicuspid, with a strong base. This type has been observed in *Eccliseogyra performosa* (Clench & Turner 1952:354, as *Solutiscala formosissima*) and in *E. pyrrhias* (fig. 1103). Teeth of similar shape, but more numerous (150 per row), have been described in *Cirsotrema rugosa* (Azuma 1971:97), but other *Cirsotrema* have been described with type (b) radula (Thiele 1928:91, *C. varicosum*; Clench & Turner 1952:354, *C. dalli*). This type (c) of radula was regarded by Clench & Turner as characteristic for the Nystiellinae when they introduced the subfamily. This may or may not be true, too few radulae of species with an axially ribbed protoconch are known.

(d) The radula is completely lost in *Iphitus* (Beu & Climo 1974 and own observations of *I. tuberatus*). This condition is probably related to the parasitic condition of *Iphitus*.





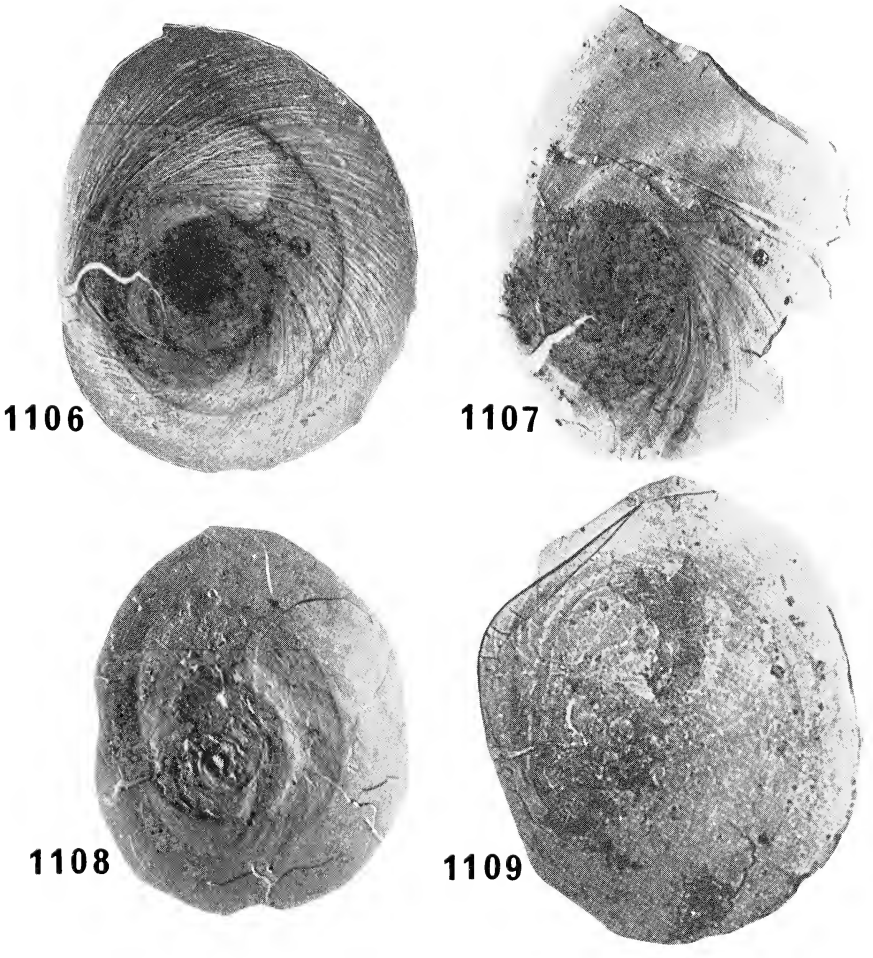
Figs 1102-1103. Epitoniid radulae. 1102, *Papuliscala* n.sp., Gulf of Mexico. 1103, *Eccliseogyra pyrrhias*, CHAIN 50 st 87. Scale lines: 50 μm.



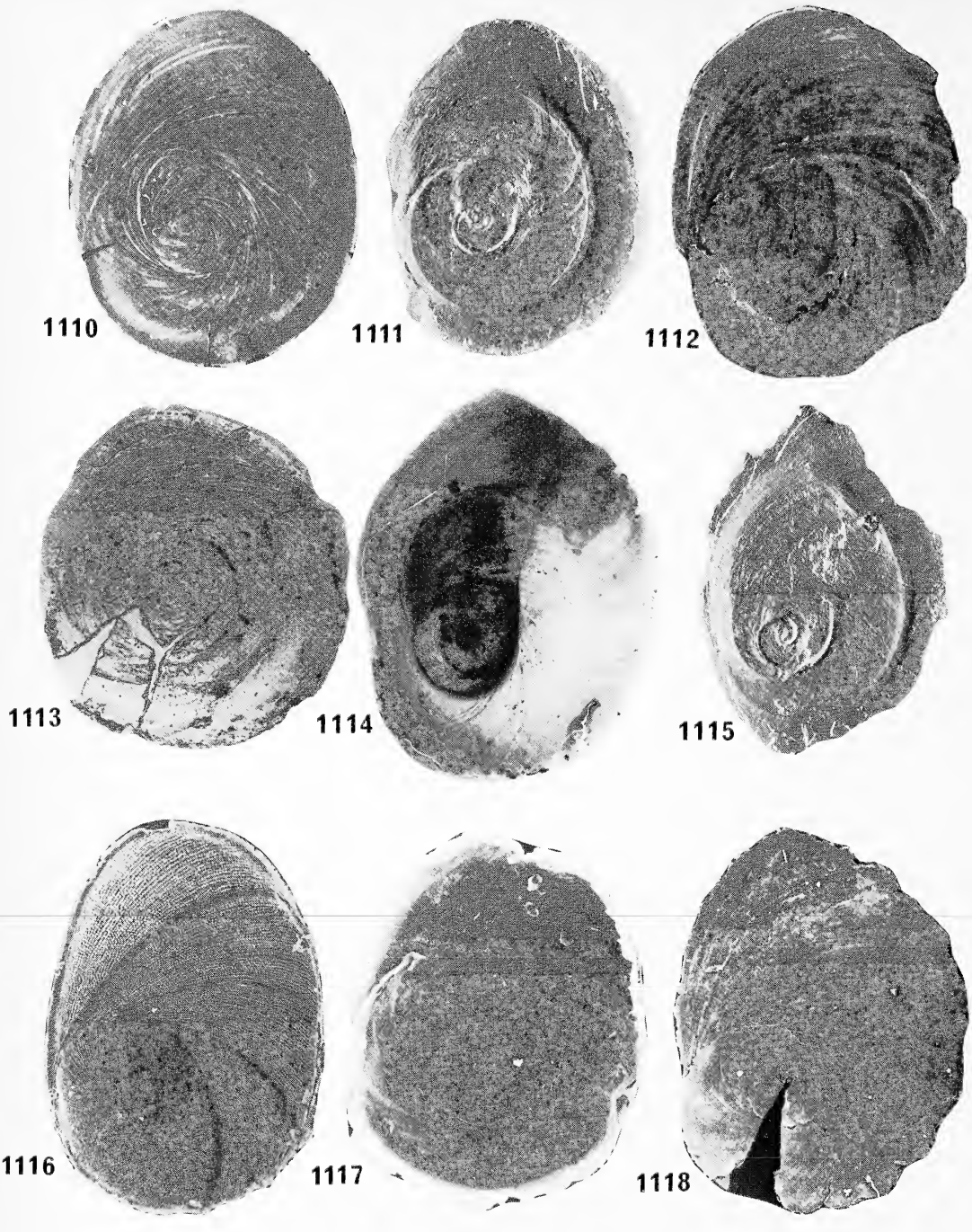
Figs 1104-1105. Epitoniid radulae. 1104, *Acrilloscala lamyi*, Bay of Biscay. 1105, *Gregorioiscala exfoliata*, holotype. Scale line, 1104: 100 μm; 1105: 25 μm.

Operculum

An operculum is always present in Epitoniidae, including species like *Iphitus* that are permanent parasites in coral calices. We have observed opercula with light microscopy and SEM; the results often appear quite different when using the two techniques for the same species (*Claviscala richardi*, fig. 1111 light microscpy and fig. 1112 SEM; *Acirsa eschrichti*, fig. 1115 light microscopy and *Acirsa subdecussata*, fig. 1118 SEM). Usually the operculum is paucispiral, but an operculum with up to 5-6 whorls is present in *Stenorhytis* (Clench & Turner 1950:246) and *Gregorioiscala exfoliata* (fig. 1113). The surface is smooth in all opercula examined except *Opalia hellenica*, in which it is very minutely beaded (fig. 1116). The same observation was made by Clench & Turner (1950: 246) for *Opalia pumilio* and by us in several tropical species of *Opalia* and *Cirsotrema*.



Figs 1106-1109. Epitoniid opercula. 1106, *Epitonium greenlandicum*, Greenland, 8.4 mm. 1107, *Acrilloscala lamyi*, Bay of Biscay, 4.0 mm. 1108, *Eccliseogyra pyrrhias*, CHAIN 50 st 87, 1.8 mm. 1109, *Iphitus tuberatus*, THALASSA Z435, 0.75 mm.



Figs 1110-1118. Epitoniid opercula. 1110, *Epitonium celesti*, BALGIM CP25, 4 mm. 1111-1112, *Clavicala richardi*, Bay of Biscay, 4.7 mm. 1113, *Gregorioiscala exfoliata*, holotype, 2.8 mm. 1114, *Periapta siapnoi*, holotype, 7.7 mm. 1115, *Acirsa eschrichti*, Greenland, 4.4 mm. 1116, *Opalia hellenica*, Oran, Algeria, 1.0 mm. 1117, *Cylindriscala acus*, MONACO st 578, 0.6 mm. 1118, *Acirsa subdecussata*, CapBreton, SW France, 2.5 mm.

Shell characters

Protoconch

There are 3 types of protoconch morphology in the family: (1) protoconch paucispiral, composed of 1-1.5 smooth whorls, (2) protoconch multispiral, composed of 3-4 whorls with strong axial ribs, and (3) protoconch multispiral, composed of 3-4 whorls that appear smooth under the microscope, although a microsculpture is often present.

Type (1) corresponds to species without planktotrophic larval development and can arise independently in different lineages. In the NE Atlantic it is present in *Epitonium greenlandicum* (figs 1212-1213), *Acirsa eschrichti, A. coarctata* and all species of *Papuliscala* (fig. 1161). In *Epitonium* and *Acirsa*, this character appears at species level only and is probably a consequence of life in high latitude environments, while in *Papuliscala* the loss of the planktonic stage may have occurred a long time ago and the protoconch morphology may be of generic value.

Type (2) corresponds to species with planktotrophic larval development and defines the Nystiellinae. In this group of species, protoconch morphology is rather uniform; specific characters are the number of whorls, convexity of the whorls, direction of the axial ribs and strength of the spiral sculpture (figs 1131-1138).

Type (3) corresponds to species with planktotrophic larval development and defines the Epitoniinae. Because many species placed in *Epitonium* s.l. appear similar, protoconch characters are often necessary for a good specific identification. The protoconch often appears quite smooth under the dissecting microscope and protoconch characters are best observed with SEM, but most details can be seen with a compound microscope. Important characters are the general shape of the protoconch which can be high and conical (fig. 1167) or low and broad (fig. 1180), convexity of the whorls, size and sculpture. All protoconchs of Epitoniinae have a discrete sculpture of axial grooves which are difficult to see without SEM; a subsutural spiral thread may be present or absent, or there can be a series of spiral grooves and ridges in the subsutural region (figs 1169-1170). Occasionally there exists also a suprasutural spiral thread (fig. 1176).

Axial sculpture

The lamellar axial sculpture that popularly characterizes the family Epitoniidae is not uniform in the family and may be absent (e.g. *Alora, Iphitus*). When present, the axial sculpture can consist of thin raised lamellae in *Eccliseogyra* and *Epitonium*, of low incremental lamellae in *Periapta*, or of broad strong ribs in several genera, such as *Opaliopsis, Cylindriscala, Claviscala, Acirsa* etc... Occasionally several lamellae or ribs are coalesced into varices (e.g. *Acrilloscala lamyi, Gregorioiscala pachya*). The raised lamellae can be straight and sharp as in most *Epitonium* or slightly undulated as in *Eccliseogyra.* In *Epitonium* a spine can be present on the lamella near the periphery; presence or absence of this spine is a good specific character, but one should be cautious with empty shells where it often is worn off.

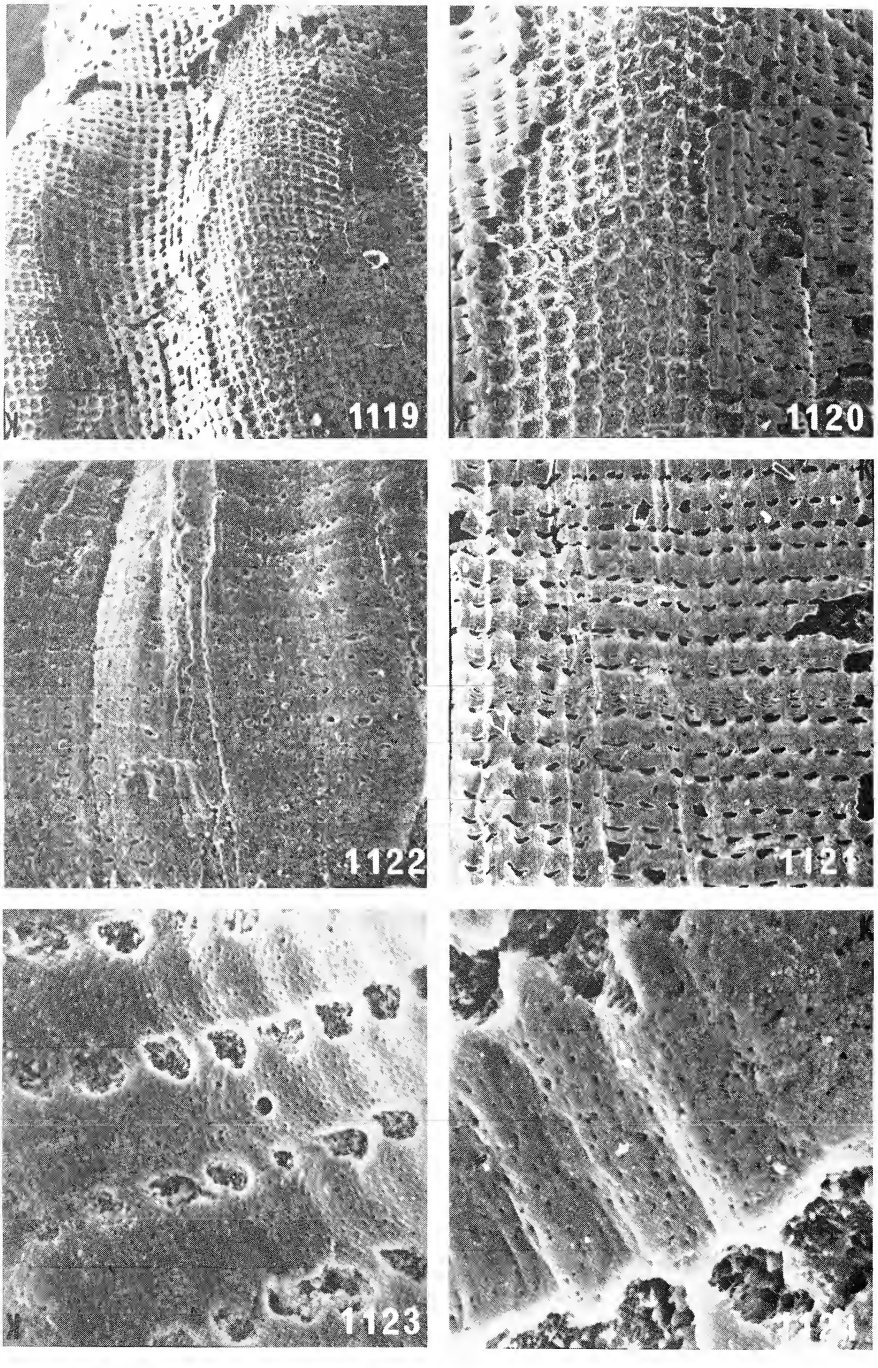
Robertson (1983c) has given evidence for significant intraspecific variation in the number of lamellae per whorl in an *Epitonium* from the West Indies. There are no species in the NE Atlantic that we separate only by the number of lamellae per whorl; when other characters are used to separate species, we have nevertheless found the number of lamellae per whorl to be fairly constant within species and it is a good character to separate juveniles of *E. algerianum* and *E. tiberii* for instance.

Spiral sculpture

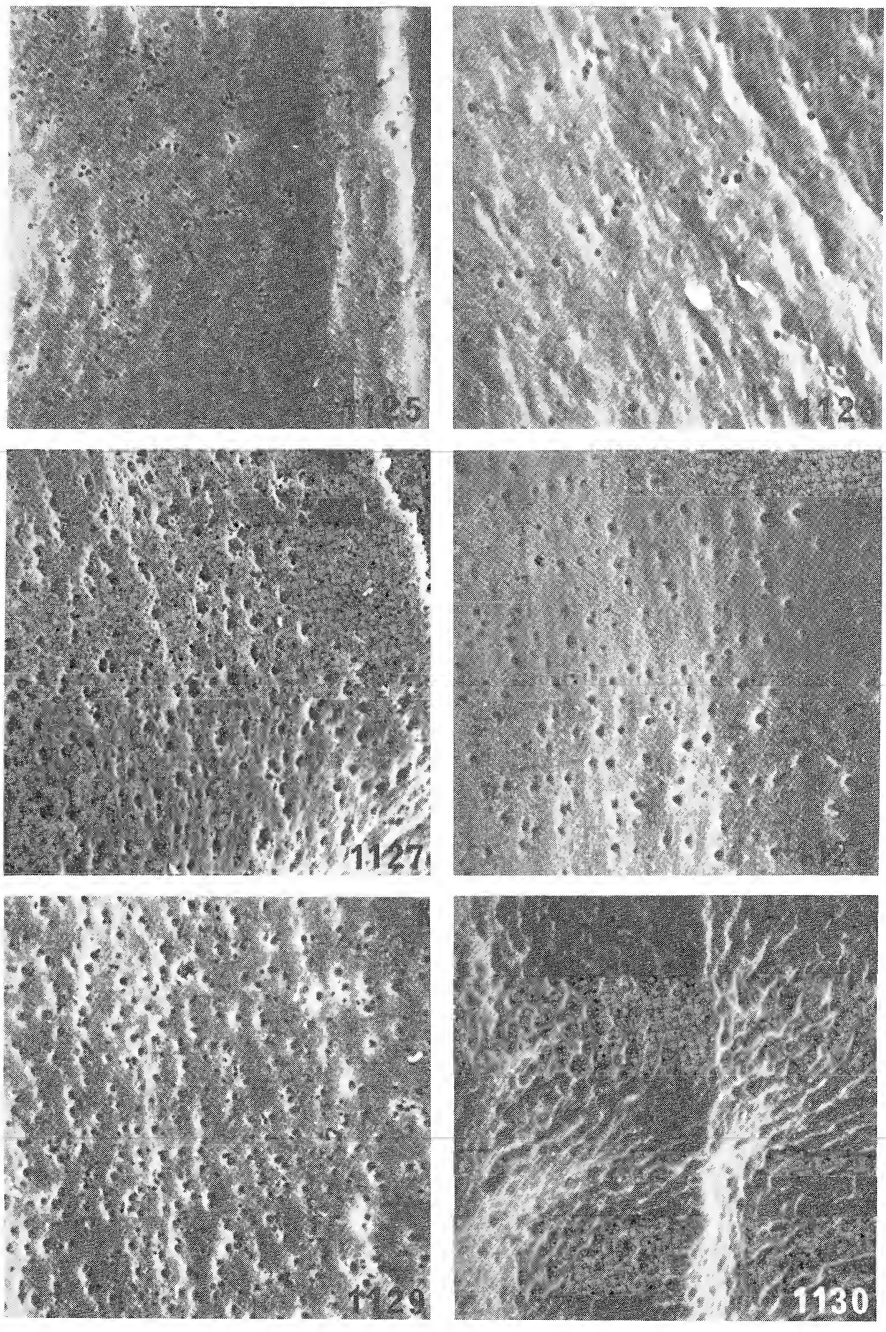
The spiral sculpture is the dominant sculpture in *Alora* and *Iphitus* and it is of equal strength as the axial sculpture in *Narrimania* and some *Papuliscala.* In such species it consists of strong cords or ridges.

In other genera it is usually more discrete or can be totally absent. When present in *Arcisa* it consists of spiral grooves or spiral threads which may transverse the axial sculpture.

More rarely a fine spiral microsculpture of interrupted lines is present: in *Narrimania* and *Iphitus* this is visible only with SEM.



Figs 1119-1124. Shell microstructure of Epitoniidae. 1119-1121, *Gregorioiscala pachya*, respectively x 28, x 57 and x 57, showing the pitted intact intritacalx and shell portions where it has been worn off. 1122, *Gregorioiscala sarsi*, intritacalx, x 120. 1123-1124, *Punctiscala cerigottana*, intritacalx (?), respectively x 570 and x 1200.



Figs 1125-1130. Shell microstructure of Epitoniidae. 1125, *Periapta polygyrella*, x 1200. 1126, *Periapta gracilis*, x 2850. 1127, *Cylindriscala guernei*, x 1200. 1128, *Cylindriscala acus*, x 1200. 1129, *Cylindriscala vicina*, x 1200. 1130, *Claviscala richardi*, x 1200.

A more complex sculpture of incremental lines and spiral threads may be present between the lamellae and give the shell a finely reticulated appearance: such sculpture occurs in *Epitonium vittatum* and *Acrilloscala geniculata* (figs 1194, 1223) for instance.

Incremental lines

Between the lamellae a finer axial sculpture may be present and it is interpreted as incremental lines. Such incremental lines can be seen under the dissecting microscope, but are best studied with SEM (figs 1152, 1245). They are present in *Opaliopsis, Cylindriscala mirifica*; they usually do not occur in *Eccliseogyra* and *Epitonium*, where their presence constitutes a good specific character (*E. vittatum*).

Shell structure

The shell of Epitoniidae occasionally presents an outer chalky layer that is easily worn off. This layer is called intritacalx in Muricidae and we have used the term here for Epitoniidae. An intritacalx is present in *Opalia* and *Gregorioiscala.* It is probably present (but worn off) in the species we include in *Punctiscala.* The intritacalx is perforated with numerous pores. When it is worn off, a different sculpture can appear below the intritacalx (figs 1119-1122). Usually it is this secondary sculpture that will be preserved in worn and fossil shells.

We have also observed minute pores to be present in the shell of *Cylindriscala* and *Periapta* (figs 1125-1129); the pores are two orders of magnitude smaller than those in *Opalia* (0.5 μm vs. 10 μm) and the shell does not form an intritacalx. Several species of *Epitonium* have been scanned for this character but all species had a perfectly smooth shell.

At the same magnification, the shell of *Claviscala richardi* appears finely hammered (fig. 1130).

Basal disc

The body whorl can be regularly convex or a basal, more or less concave disc can be present. It is sometimes separated from the rest of the whorl by a basal cord. The axial sculpture can extend onto the basal disc or be restricted to the part of the whorl above the basal cord. On earlier whorls, when the basal cord is covered it can appear as a suprasutural cord (*Periapta gracilis*, fig. 1250).

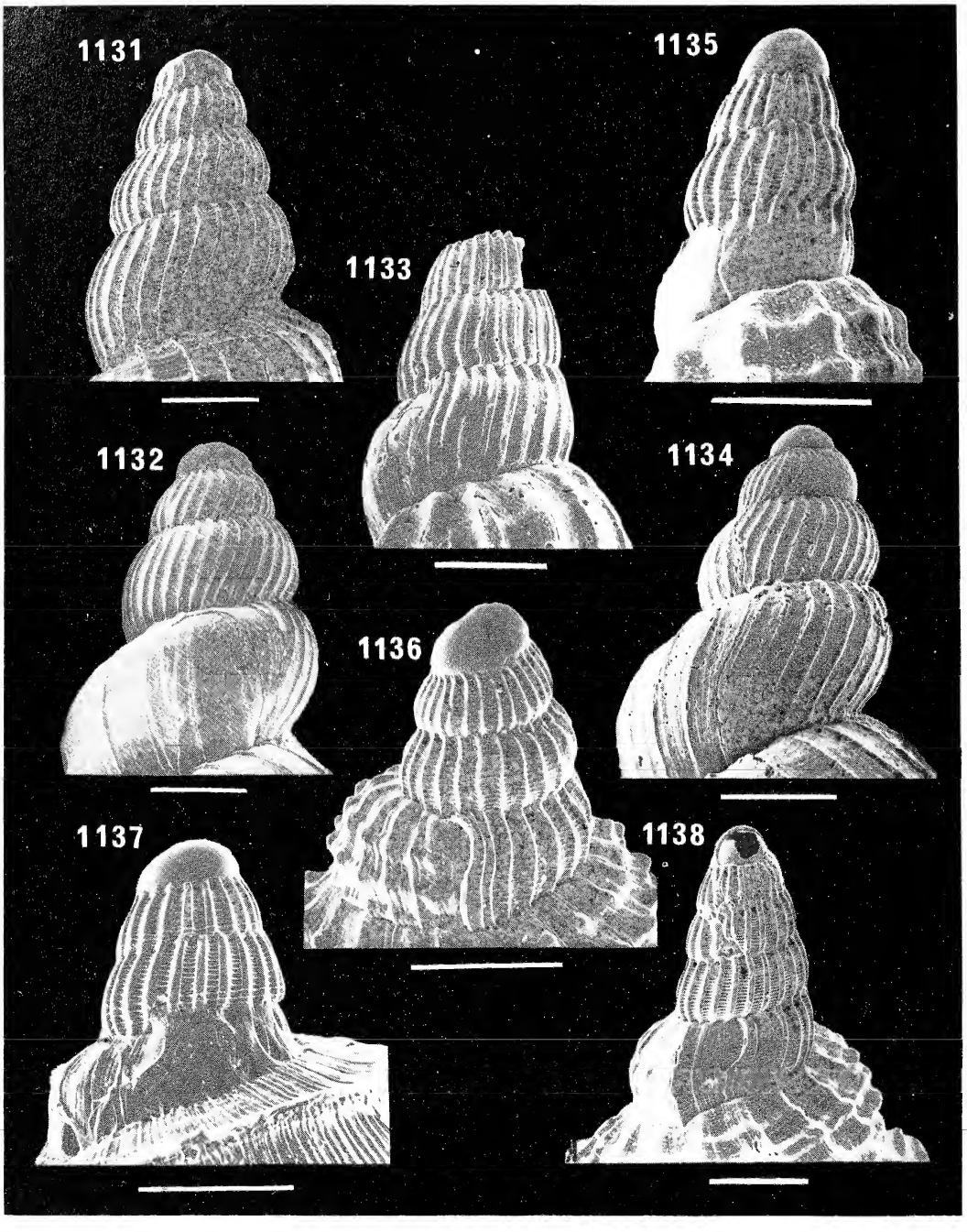
Coiling

Although most species of Epitoniidae have joined whorls, some species have the whorls free from each other, or partly free from each other. Such «open» or partly «open» coiling occurs in *Eccliseogyra nitida, E. monnioti* and *Epitonium semidisjunctum.* It is a good specific character, but has no generic value and can occur independantly in several lineages (several tropical species are listed by Rex & Boss 1976).

In species with joined whorls, a small umbilicus can be present. This is also of specific value.

KEY TO THE GENERA OF NE ATLANTIC DEEP-WATER EPITONIIDAE

A. Protoconch multispiral with strong axial ribs	B
A. Protoconch multispiral almost smooth, or protoconch paucispiral	E
B. Axial sculpture consisting of fragile somewhat undulated lamellae	*Eccliseogyra* (p. 481)
B. Axial sculpture different	C
C. Shell globular, as broad as high	*Iphitus* (p. 491)
C. Shell slender, much higher than broad (h/d $\geq$ 2)	D
D. Axial and spiral sculpture of equal strength, forming deep squares	*Narrimania* (p. 490)
D. Axial sculpture consisting of ribs much stronger than the spiral cords	*Opaliopsis* (p. 489)
E. Shell globular, as broad as high	*Alora* (p. 540)
E. Shell slender, much higher than broad (h/d $\geq$ 2)	F
F. Axial sculpture of broad ribs	G
F. Axial sculpture of thin lamellae, occasionally forming varices	K
G. Intritacalx present	*Gregorioiscala* (p. 544), *Opalia* (p. 550), *Punctiscala* (p. 548)
G. No intritacalx	H
H. Shell with a poorly defined basal disc	*Acirsa* (p. 526)
H. Basal disc well defined, basal cord present	I
I. Shell large (several centimeters), very solid, with little convex whorls	*Claviscala* (p. 538)
I. Convexity of whorls normal	J
J. Protoconch paucispiral; spiral and axial sculpture of equal or nearly equal strength	*Papuliscala* (p. 494)
J. Protoconch multispiral; axial sculpture much stronger than spiral sculpture	*Cylindriscala* (p. 530)
K. Basal disc present	L
K. No basal disc	*Epitonium* (p. 498)
L. Axial lamellae widely spaced; reticulated microsculpture between the lamellae	*Acrilloscala* (p. 524)
L. Axial lamellae close set; no microsculpture between them	*Periapta* (p. 539)



Figs 1131-1138. Protoconchs of Nystiellinae. 1131, *Eccliseogyra folini*, MONACO 683. 1132, *Eccliseogyra exquisita*, holotype. 1133, *Opaliopsis atlantis*, BALGIM DW50. 1134, *Eccliseogyra formosissima*, MONACO 2214. 1135, *Narrimania concinna*, syntype. 1136, *Iphitus tuberatus*, THALASSA Z435. 1137, *Iphitus marshalli*, BALGIM DR152. 1138, *Iphitus cancellatus*, DISCOVERY 7975. Scale lines: 200 μm.

Subfamily NYSTIELLINAE

The subfamily Nystiellinae was erected by Clench & Turner (1952) to contain the genera *Nystiella* and *Solutiscala*. Although *Nystiella* is now considered a synonym of *Opaliopsis* (see below), the subfamily name stays as Nystellinae (ICZN § 40).

The nystielline epitonids are all deep water species; there are now about 20 described species but we have seen many undescribed ones from the Indo-Pacific deep water.

Six genera are known in the subfamily, of which only *Murdochella* does not occur in the N Atlantic. A key to genera is given in the introduction to the family.

The subfamily Nystiellinae is based on the axially ribbed protoconch, but a paucispiral protoconch, derived from the ancestral axially ribed protoconch, is present in *Papuliscala* and *Murdochella*. A radula with uniscupid teeth may also be characteristic for the family (see discussion p. 471).

Genus *ECCLISEOGYRA* Dall, 1892

Eccliseogyra Dall, 1892:307.
Type species: (by original designation) *Delphinula nitida* Verrill & Smith, 1885.

Synonyms:
Solutiscala de Boury, 1909:482. Type species: (by original designation) *Scalaria dissoluta* P. Fischer in Locard, 1897.

Abyssiscala de Boury, 1911:212. Type species: (by original designation) *Scalaria folini* Dautzenberg & de Boury, 1897.

Eccliseogyra was originally considered an archeogastropod and was transferred to the family Epitonidae as a subgenus of *Epitonium* by Rex & Boss (1973).

The genus is characterized by an axially ribbed protoconch and a sculpture of undulating axial lamellae and raised spiral threads. It seems to be a rather natural group of deep water species. Beside the NE Atlantic species treated here, we have also examined the types of the following species and include them in *Eccliseogyra: Scalaria pyrrhias* Watson, 1886, *Scala fragilissima* Schepman, 1909 and *Scala performosa* de Boury, 1917. *Scala aethiopica* Thiele, 1925 probably also belongs here (type not examined).

Foratiscala de Boury, 1887 has often been used for Recent species of *Eccliseogyra*, but the type of *Foratiscala* is *Scalaria cerithiformis* Watelet, a species unrelated to *Eccliseogyra*, and not *S. formosissima* as claimed by Clench & Turner (1952) or *S. striatissima* Monterosato as claimed by Kobelt (1902).

We have prepared a radula of *E. pyrrhias* from the W Atlantic; the teeth are of ptenoglossate type, but there are only 2 teeth per half row (fig. 1103).

Key to species of *Eccliseogyra*

A. Shell globular, almost as broad as high (h/d ≤ 1.2)	*E. monnioti* (p. 482)
A. Shell slender, considerably higher than broad (h/d ≥ 1.5)	B
B. Whorls almost free from each other	*E. nitida* (p. 482)
B. Coiling normal	C
C. Whorls evenly rounded	*E. sericea* (p. 485)
C. Whorls with an angular periphery	D
D. Umbilicus broad; size up to 15 mm	*E. formosissima* (p. 483)
D. Umbilicus narrow or indistinct; size below 10 mm	E
E. Axial lamellae with a spine at the periphery	*E. exquisita* (p. 486)
E. Axial lamellae without spine	*E. folini* (p. 485)

Eccliseogyra nitida (Verrill & Smith, 1885) Fig 1139

Delphinula nitida Verrill & Smith, in Verrill, 1885: 424, pl. 44, fig. 11.
Scalaria vermetiformis Watson, 1886:142, pl. 9, fig. 6.
Scalaria dissoluta P. Fischer in Locard, 1897a: 3; 1897: 407, pl. 19, fig. 13.

Type material: D. nitida, holotype USNM 44648 (destroyed); *S. vermetiformis*, holotype in BMNH; *S. dissoluta*, holotype in MNHN.

Type locality: D. nitida, USFC st 2229, 37° 39N, 73° 16W, 2600 m; *S. vermetiformis*, CHALLENGER st 122, 09° 05S, 34° 50W, 645 m; *S. dissoluta*, TRAVAILLEUR 1881 dr 3, 39° 48N, 09° 51W, 3307 m.

Material examined: The type material and CHAIN 50 st 85, 37° 59N, 69° 26W, 3834 m, 1 spm; CHAIN 58 st 103, 39° 44N, 70° 37W, 2022 m, 1 spm.

Distribution: The bathyal and abyssal zones of the Atlantic (Bayer 1971, Rex & Boss 1973).

Remarks: Only one other NE Atlantic species has open coiling, viz. *Epitonium semidisjunctum*, which however is more slender, has sharp spiny axial lamellae and an epitonine protoconch.

Eccliseogyra monnioti n.sp. Figs 1140-1141

Type material: Holotype in MNHN.

Type locality: ABYPLAINE st DS4, 34° 54N, 21° 26W, 5160 m (Madeira abyssal plain).

Material examined: The holotype and VEMA st KG15, 10° 48N, 42° 41W, 5100 m, 1 fragment; st DS4, 10° 47N, 42° 42W, 5100 m, 1 fragm.; st DS11, 11° 37N, 32° 53W, 5867 m, 1 fragm.; DISCOVERY st 8524 (6), 20° 43N, 22° 44W, 4415 m, 1 sh; st 9541 (1), 20° 07N, 21° 25W, 3850 m, 4 shs; st 9541 (3), 20° 08N, 21° 41W, 3910 m, 1 sh; st 10145, 25° 51N, 28° 44W, 4255 m, 1 sh + fragm.

Distribution: The E Atlantic south of 35°N, abyssal.

Description: Shell small, fragile, trochiform, consisting of 3.5 whorls. The apex has been corroded so that the protoconch is missing, and on the first preserved teleoconch whorl the sculpture is also corroded. The earlier whorls are rather loosely coiled, with impressed suture. The coiling of the body whorl is completely open. Sculpture of numerous undulating axial lamellae and strong spiral threads evenly distributed over the surface of the whorl (except umbilical region of body whorl, where the axial lamellae are more close set); the spiral threads are of about the same breadth as the interspaces between them. Aperture rounded, a little angular towards the base. Umbilicus large. Colour of the shell white.
Dimensions: height 4.0 mm, breadth 3.6 mm; aperture height 1.5 mm, breadth 1.4 mm.
Animal unknown.

Remarks: E. monnioti differs from *E. nitida* by its less open coiling, the upper whorls being loosely but not openly coiled, and by its more numerous axial lamellae.

Even in the absence of a protoconch there is no doubt that this is an *Eccliseogyra* and not an open coiled *Epitonium* near *E. semidisjunctum* (Jeffreys): the sculpture of undulating axial lamellae instead of straight vitreous lamellae is the same as in other species of *Eccliseogyra.*

Eccliseogyra formosissima (Jeffreys, 1884) Figs 1134, 1142

Scalaria formosissima Jeffreys, 1884: 140, pl. 10, fig. 10.

Type material: 2 syntypes in USNM (Waren 1980:30); 3 syntypes in BMNH, including the figured syntype selected as lectotype by Clench & Turner (1952:345).

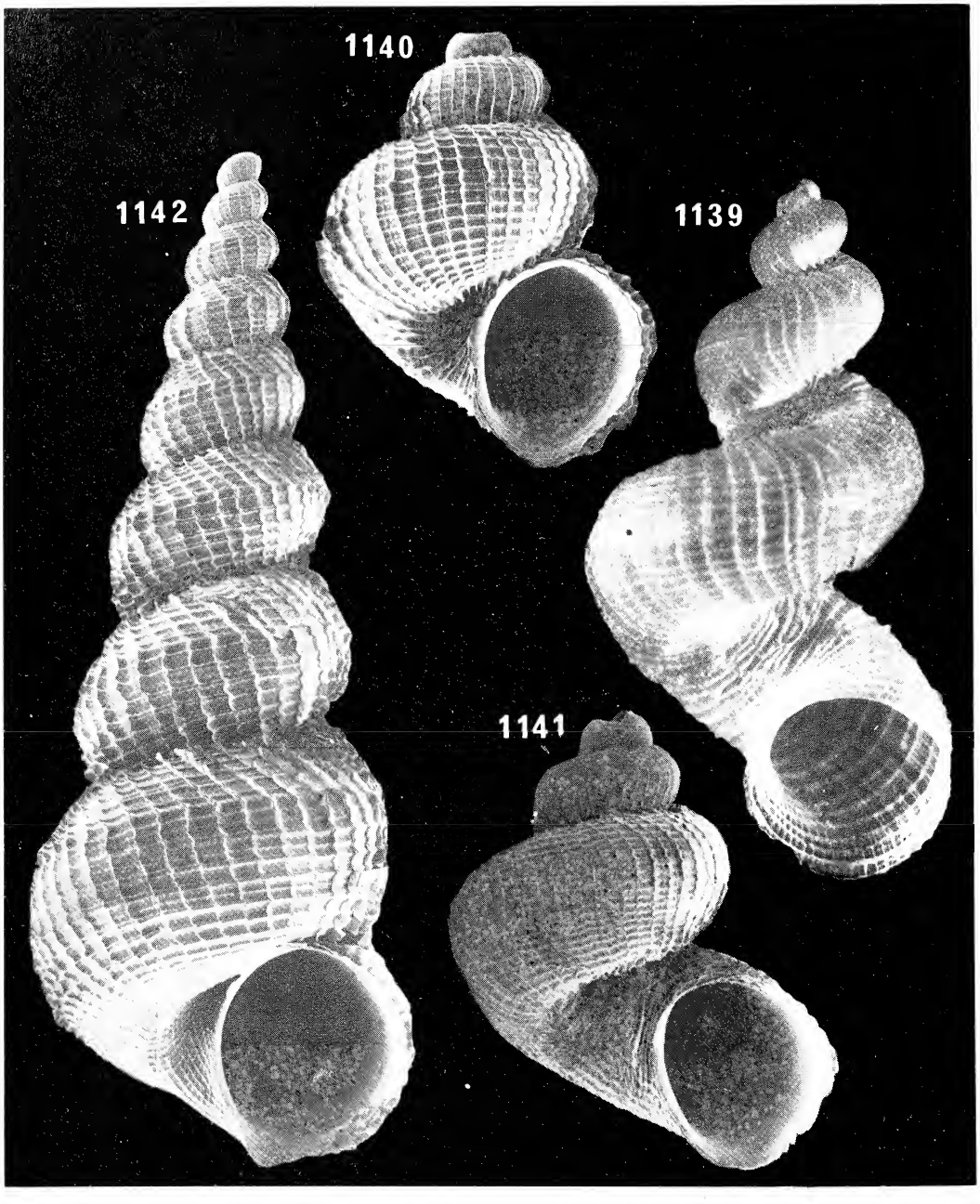
Type locality: PORCUPINE st 16-17, 39° 39 to 39° 55N, 09° 39 to 09° 56W, 1100-2005 m.

Material examined: The lectotype in BMNH; MONACO st 553, 37° 43N, 25° 05W, 1385 m, 1 sh; st 2214, 39° 26N, 31° 22W, 650-915 m,1 sh; BIACORES st 231, 36° 55N, 25° 10W, 380-440 m, 1 sh; DISCOVERY st 8003, 22° 31N, 17° 21W, 725-744 m, 1 sh.

Distribution: Only known from the material examined, off Portugal, the Azores and Morocco; bathyal.

Remarks: Jeffreys' description is based on 5 syntypes belonging to 2 different species. The figured specimen («one lovely specimen») is in BMNH; the other syntypes («a few more or less perfect, but much smaller») belong to *folini.* A part of the protoconch of the lectotype is broken off and obviously Jeffreys' description of the protoconch was based on the smaller shells of *folini.*

E. formosissima reaches a larger size than *E. folini* (15 vs 9 mm), is proportionally broader and has a distinct umbilicus. Only one complete protoconch was available to us for comparison with *folini.* It has fewer, more convex whorls (fig. 1134) in *formosissima.*



Figs 1139-1142. Genus *Eccliseogyra*. 1139, *E. nitida*, CHAIN 58 st 103, 6.2 mm. 1140, *E. monnioti*, DISCOVERY 9541.1, 3.1 mm. 1141, *E. monnioti*, holotype, 4.0 mm. 1142, *E. formosissima*, BIACORES 231, 13.4 mm.

Dautzenberg & de Boury (1897b:66) claim that this is a synonym of *Scalaria striatissima* Monterosato, but that one belongs to Epitoniinae. The species reported by Dall (1889: 319, pl. 18 fig. 11) under Jeffreys' name has been renamed *Scala performosa* de Boury, 1917. We have examined the holotype (USNM 106909); this (fig. 1150) and the material cited under *formosissima* by Clench & Turner (1952: 344) is a distinct species, with a more blunt protoconch, and a broader teleoconch with fewer spiral threads, and a small umbilicus, for which de Boury's name should be kept.

Eccliseogyra folini (Dautzenberg & de Boury, 1897) Figs 1131, 1143-1144

Scalaria folini Dautzenberg & de Boury, 1897a: 31; 1897: 65, pl. 2, figs 1-2; Dautzenberg 1927: 160, pl. 4, figs 21-22.

Type material: Lectotype, here selected, the figured specimen in MOM.

Type locality: MONACO st 703, 39° 21N, 31° 06W, 1360 m.

Material examined: the type material and MONACO st 112, 38° 34N, 28° 06W, 1287 m, 1 sh; st 203, 39° 27N, 30° 55W, 1557 m, 1 sh; st 211, 39° 18N, 31° 12W, 1372 m, 2 shs; st 233, 38° 33N, 28° 09W, 1300 m, 2 shs; st 578, 38° 26N, 26° 31W, 1165 m, 8 shs; st 683, 38° 20N, 28° 05W, 1550 m, 4 shs; st 703, 39° 21N, 31° 06W, 1360 m, 2 shs; st 719, 39° 11N, 29° 06W, 1600 m, 4 shs; PORCUPINE st 16-17, 39° 55 N, 09° 56W, 1100-2005 m, 8 shs + fragm.; J. CHARCOT MADERE st 49, 32° 27N, 16° 32W, 450-500 m, 1 sh.

Distribution: Cited from 2 other MONACO stations in the Azores by Dautzenberg (1927; material not found); bathyal of Portugal, Madeira and the Azores.

Remarks: See under *formosissima.* The material cited by Bouchet (1977:950) as *formosissima* is *folini.*

Eccliseogyra sericea n.sp. Figs 1145-1146

Type material: Holotype in MNHN.

Type locality: BIOGAS st CP21, 44° 21N, 04° 49W, 4453m (Bay of Biscay).

Material examined: The type material and BIOGAS st CV29, 47° 26N, 09° 38W, 4158m, 1 sh; st CP17, 46° 31N, 10° 19W, 4706m, 1 sh; st CP20, 44° 23N, 04° 51W, 4459m, 2 shs; DISCOVERY st 10115-1, 49° 46N, 13° 56W, 3900-3950m, 1 sh; st 9541 (1), 20° 07N, 21° 25W, 3850m, 1 sh.

Distribution: Bay of Biscay to Mauretania, abyssal. Only known from the material examined.

Description: Shell large, fragile, turriculate consisting of 7 whorls. The apex is broken and the protoconch and early teleoconch whorls are missing. Teleoconch whorls convex, with impressed suture. Sculpture consisting of numerous fine crisp axial lamellae and raised spiral threads of even size. Axial lamellae not spiny. No distinct basal disc. Very narrow umbilicus. Aperture rounded, lip thin, simple, reflected over columella. Colour of the shell white.

Dimensions: height 25.9mm, breadth 11.9mm; aperture height 7.3mm, breadth 6.3mm.

Remarks: Although the protoconch is missing the allocation to *Eccliseogyra* is not doubtful because of the close similarity in teleoconch sculpture of *formosissima, folini* and *sericea. E. sericea* can be separated by its evenly convex whorls, without a peripheral angle (present in *folini* and *formosissima*), its indistinct basal disc and narrow umbilicus (as in *folini*). It reaches a much larger size than the other two species.

Eccliseogyra exquisita n.sp. Figs 1132, 1147-1148

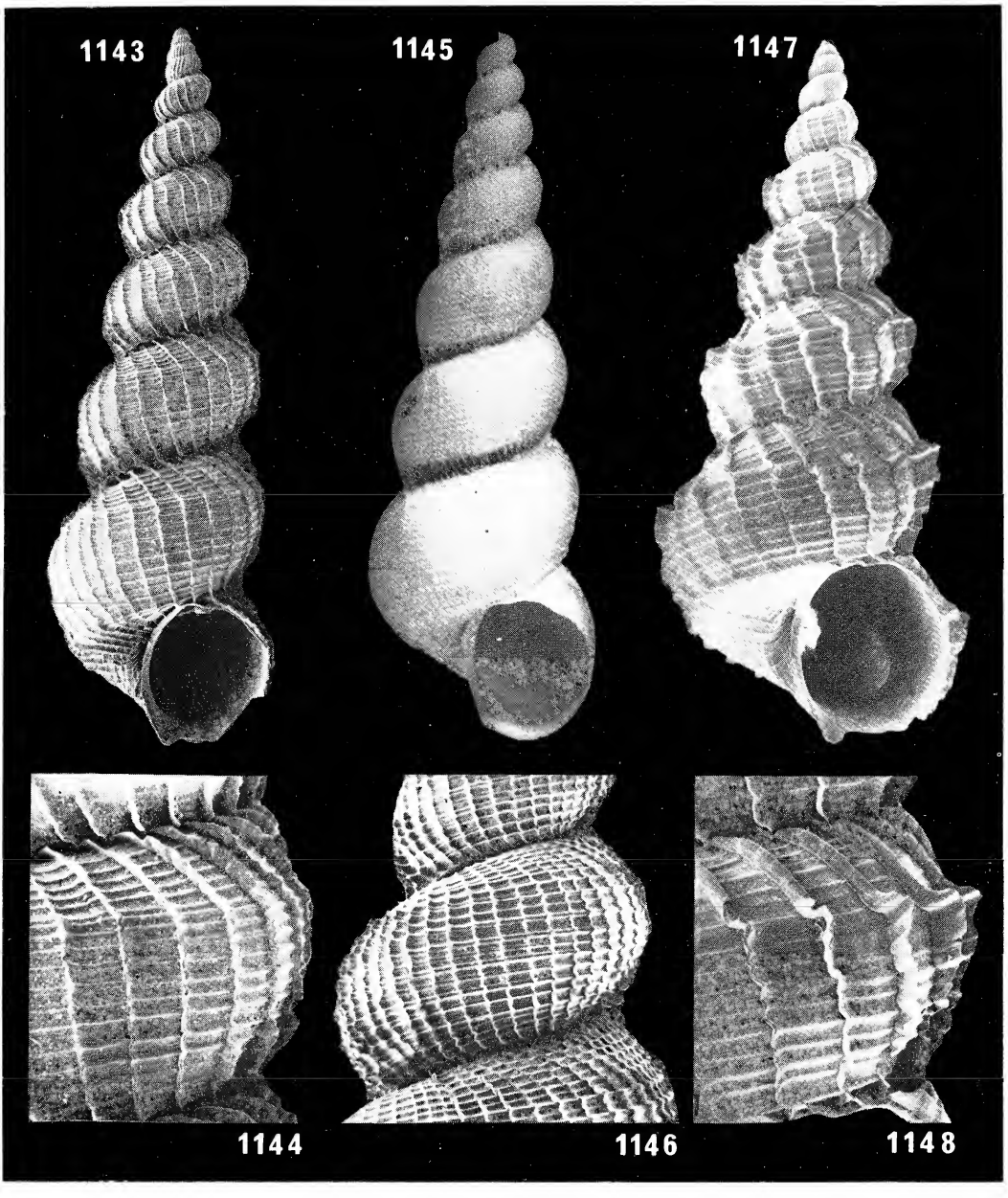
Type material: Holotype in RMNH 55789.

Type locality: CANCAP st 4.063, 28° 49N, 13° 42W, 875m (Canaries).

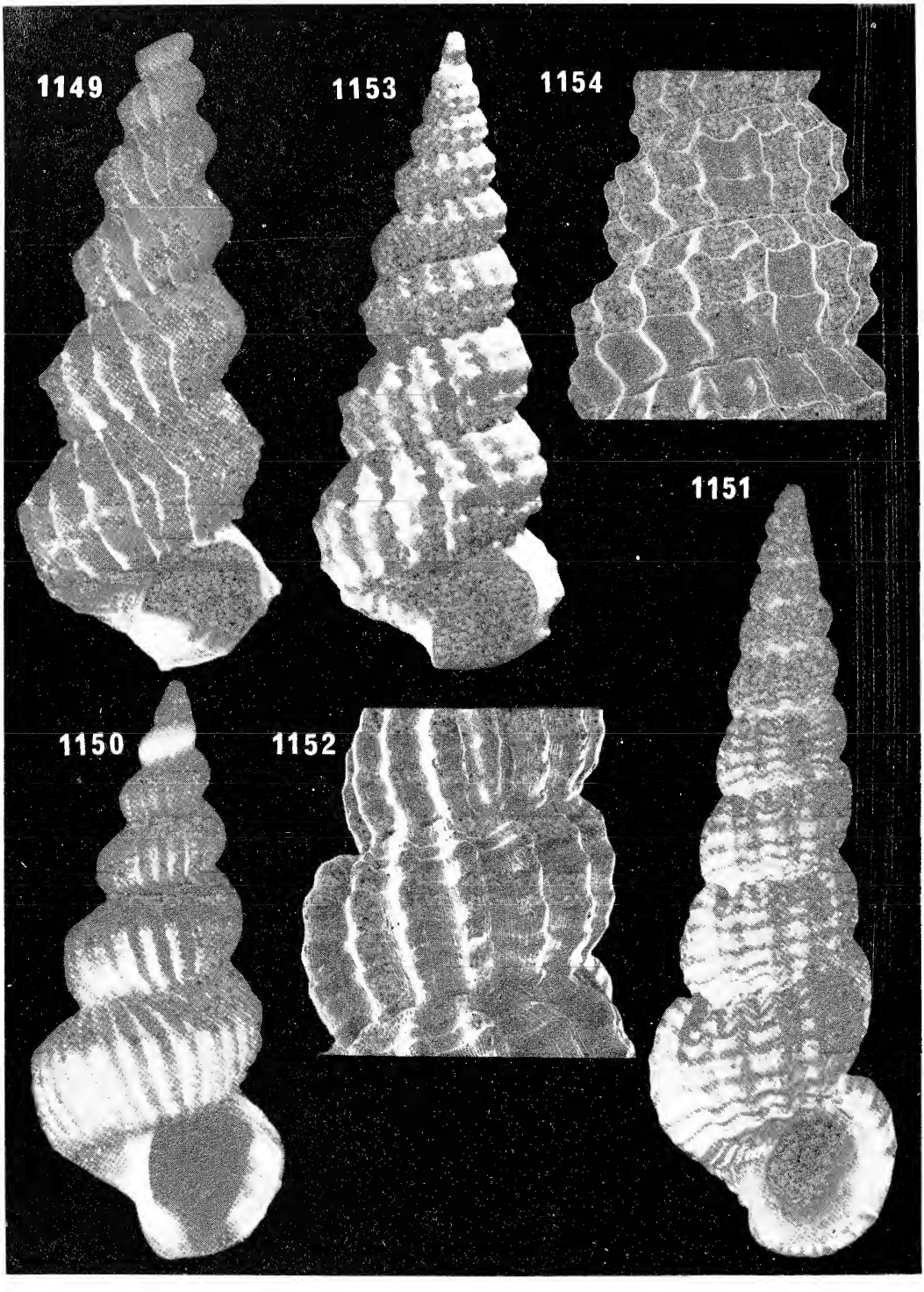
Material examined: Only known from the holotype.

Description: Shell small, fragile, turriculate consisting of 2.5 protoconch and 6 teleoconch whorls. Protoconch (fig. 1132) of 2.5 convex whorls sculptured with sigmoid axial ribs and fine spiral threads. Teleoconch whorls convex with angulation at the periphery and the base. The peripheral angulation is situated slightly above the middle of the whorl. The sculpture consists of spiral cords and axial lamellae. There are about 15 cords on the penultimate and body whorl, plus 8 on basal disc. Axial lamellae prosocline, the portion above the periphery is charp, simple and reflected backwards. At the periphery each lamella has a projecting spine; below the periphery it is fringed by the spiral cords which continue across the lamellae. The lamellae are simple and low on the basal disc. Aperture rounded, outer lip thin. A small umbilicus is present. Colour of the shell whitish, protoconch brown. Dimensions: height 6.9mm, breadth 3.1mm; aperture diameter 1.5mm.

Remarks: E. exquisita resembles 3 other *Eccliseogyra* species from the North Atlantic. *E. pyrrhias* (Watson), from the W Atlantic, has fewer lamellae and the spiral cords do not occur above the periphery of the whorls (fig. 1149).
E. formosissima has a much wider umbilicus and its lamellae do not form a spiny projection at the periphery. It also reaches a larger size.
E. folini is more slender, with a smaller basal disc; it has more numerous lamellae (that do not form a projecting spine) and more numerous spiral cords.



Figs 1143-1148. Genus *Eccliseogyra*. 1143-1144, *E. folini*, MONACO 683, 9.1 mm. 1145-1146, *E. sericea*, holotype, 25.9 mm. 1147-1148, *E. exquisita*, holotype, 6.9 mm.



Figs 1149-1154. Nystiellinae. 1149, *Eccliseogyra pyrrhias*, CHAIN 50 st 87, 8.3 mm. 1150, *Eccliseogyra performosa*, BLAKE st 43, holotype, 4.1 mm. 1151-1152, *Opaliopsis atlantis*, holotype, 9.7 mm, and microsculpture of a shell from BIACORES. 1153-1154, *Narrimania concinna*, Sicilian Channel, 6.1 mm.

Genus *OPALIOPSIS* Thiele, 1928

Opaliopsis Thiele, 1928:92.
Type species: (by original designation) *Scala elata* Thiele, 1925.

Synonym:
Nystiella Clench & Turner, 1952:337. Type species: (by original designation) *Epitonium opalinum* Dall, 1927.

Opaliopsis belongs to Nystiellinae; it has a solid shell and broad axial ribs (not lamellae); a spiral sculpture may or may not be present. There are few described species but we have seen several undescribed ones from the Indo-Pacific, deep water. Clench & Turner (1952) included 5 species in the W Atlantic, of which *N. azelotes* has been transferred to *Narrimania* (Taviani 1984).

The synonymy of *Nystiella* and *Opaliopsis* was pointed out to us by Dr R. Kilburn.

Opaliopsis atlantis (Clench & Turner, 1952) Figs 1133, 1151-1152

Nystiella atlantis Clench & Turner, 1952:343, pl. 168.

Type material: Holotype MCZ 187988.

Type locality: ATLANTIS st 3330, 22° 09N, 81° 10W, 425-488m (S. of Cuba).

Material examined: The holotype and one paratype from off Florida (USNM 417386); BIACORES st 240, 37° 35N, 25° 32W, 810-825m, 1 sh; BALGIM st DR49, 35° 53N, 06° 33W, 518-524m, 4shs; st DW50, 35° 53N, 06° 32W, 518-526m, 1 sh; st DR153, 35° 56N, 05° 35W, 568-604m, 1 sh.

Distribution: In the W. Atlantic, known from Florida to Cuba in deep water (Clench & Turner 1952: 344), in the E. Atlantic, only known from the material examined, from the Azores and the Strait of Gibraltar.

Remarks: The shells from the Strait of Gibraltar and the W. Alboran Sea look fossil and were indeed collected on a bottom of fossil shells and corals, probably Würmian. The species may be still living in the E. Atlantic, but is probably extinct in the Mediterranean.

Our specimens show considerable variation in the number of spiral cords, from 6 to 10.

Genus *NARRIMANIA* Taviani, 1984

Narrimania Taviani, 1984:240.

Type species: Cerithiopsis concinna Sykes, 1925 (by original designation).

Remarks: Narrimania is a genus of Nystiellinae with slender turriculate shells and a sculpture of equally strong axial and spiral ridges. No axial ribs form varices. For a discussion of the genus, see Taviani 1984. *Epitonium azelotes* Dall, 1927 is a W Atlantic *Narrimania*, closely related to the type species of the genus (see discussion below). *Fenella xanthacme* Melvill, 1904 may be a *Narrimania* (see Houbrick 1980: 26).

Narrimania concinna (Sykes, 1925) Figs 1135, 1153-1154

Cerithiopsis concinna Sykes, 1925:184, pl. 9, fig. 1.

Type material: Syntypes in BMNH.

Type locality: Adventure Bank, between Sicily and Tunisia, 170m (PORCUPINE).

Material examined: The type material and the material listed by Taviani (1984); off Siracusa, Sicily, 130-250m, 1 sh (coll. Piani).

Distribution: Only known from the material examined, from the deep shelf of the Sicilo-Tunisian Strait.

Remarks: We have compared the Mediterranean material with the holotype of *Epitonium azelotes* Dall, 1927 (figured by Clench & Turner 1952: 342) from off Florida, 810m. The protoconch of *E. azelotes* is incomplete but otherwise it is similar to that of *N. concinna*. *E. azelotes* differs by its sharper sculpture, producing a deeper, channelled suture; it has only 3 spiral cords while a fourth one is present on the 6th postlarval whorl of *concinna* (7 postlarval whorls are present in the type of *azelotes*). The basal disc is worn and its sculpture cannot be compared. The 2 species are certainly congeneric, but with a single shell known from the American side it is difficult to interprete these differences as interspecific or intraspecific variation.

Genus *IPHITUS* Jeffreys, 1883

Iphitus Jeffreys, 1883b:113.

Type species: (by monotypy) *Iphitus tuberatus* Jeffreys, 1883.

Synonyms:
Iphitella Thiele, 1925: 59. (A replacement name for *Iphitus* Jeffreys, 1883 non Rafinesque, 1815. Rafinesque's name, however, is a *nomen nudum* and does not preoccupy *Iphitus* Jeffreys).
Sculptifer Beu & Climo, 1974:323. Type species: (by original designation) *Stilifer neozelanica* Dell, 1956. Synonymized with *Iphitus* by Beu (1978).

Remarks: Iphitus was originally described as a fossarid, and later placed in the Littorinidae by Thiele (1929) and Wenz (1940). Beu (1978) transferred it to the Epitoniidae, a decision with which we agree.

No radula is present in *I. tuberatus*. The operculum resembles other epitonid opercula, and we have also observed the same purple hypobranchial gland in the mantle cavity as is observed in many typical Epitoniidae.

We suspect that what has been interpreted by Beu & Climo (1974) as a penis is a pallial appendage, as we have observed in *Papuliscala*.

The habitat of *Iphitus neozelanicus* was described by Beu (1978); it lives deep inside calyces of the branching ahermatypic coral *Goniocorella dumosa*.

Gegania whipplei Ladd, 1970 from the Eocene of Tonga may belong to *Iphitus*.

Key to species of *Iphitus*

A. Sculpture reticulated	*I. cancellatus* (p. 492)
A. Spiral sculpture stronger than axial	B
B. Spiral sculpture of thin lamellae	*I. marshalli* (p. 492)
B. Spiral sculpture of broad nodulous cords	*I. tuberatus* (p. 491)

Iphitus tuberatus Jeffreys, 1883 Figs 1109, 1136, 1155

Iphitus tuberatus Jeffreys, 1883b:114, pl. 20, fig 12.

Type material: Holotype in BMNH (Warén 1980:21).

Type locality: PORCUPINE st 6, 48° 26N, 09° 44W, 660m.

Material examined: The type material and MONACO st 233, 38° 33N, 28° 09W, 1300m, 1sh; st 1349, 38° 36N, 28° 06W, 1250m, 8 shs (both IRSN); THALASSA st Z413, 48° 03N, 08° 29W, 805m, 9 shs; st Z417, 48° 12N, 09° 09W, 865m, 59 shs; st Z420, 48° 20N, 09° 38W, 507m, 1 sh; st Z421, 48° 22N, 09° 33W, 950m, 4 shs; st Z426, 48° 28N, 09° 39W, 860m, 1 spm; st Z430, 48° 37N, 09° 52W, 1080m, 2 shs; st Z431, 48° 38N, 09° 47W, 800m, 5 shs; st Z435, 48° 40N, 09° 53W, 1050m, 17 spms+shs; st Z442, 48° 55N, 11° 02W, 975m, 8 spms+shs; st Z459, 48° 37N, 09° 53W, 1180m, 11 shs; DISCOVERY st 7984, 25° 26N, 16° 10W, 811-890m, 1 spm, 4 shs; and the 3 shs reported on by Taviani & Sabelli (1983).

Distribution: Only known from the continental slope of N Bay of Biscay and the Azores. Glacial fossil in the Mediterranean (Taviani & Sabelli 1983).

Remarks: Iphitus tuberatus is common on the slope of the northern part of Bay of Biscay in *Lophelia* reefs and an association is probable although no gall with gastropod was ever observed in the scleractinian material from the same stations (Zibrowius pers. comm.). The more than 100 shells observed agree well with figures published by Bouchet (1977:957) and there is no reason to suppose, as Beu (1978) has done, that the specimens are immature.

Iphitus tuberatus resembles *I. cancellatus* but has much weaker axial sculpture.

Dall (1927:116) recorded *I. tuberatus* from the W Atlantic but examination of his material from off Georgia (USNM 108418) shows they are worn specimens of *Alora tenerrima* (D. & F.).

Iphitus marshalli (Sykes, 1925) Figs 1137, 1158-1159

Cithna marshalli Sykes, 1925: 190, pl. 9, fig. 4-4a.

Type material: 2 syntypes, both fragmentary, in BMNH.

Type locality: PORCUPINE st 17, 39° 42N, 09° 43W, 1100-2005m (off Portugal).

Material examined: The type material and BALGIM st DR152, 35° 57N, 05° 35W, 534-560m, 1 spm.

Distribution: Only known from the material examined, off Portugal and the Straits of Gibraltar, bathyal.

Remarks: This is probably the most remarkable of all European epitonids, with its globular appearance and strong spiral sculpture. Sykes described it in the genus *Cithna* Adams, then placed in the Littorinidae, and compared it to *Cithna cincta* Jeffreys, 1883 which however is a «cyclostrematid» (Warén 1980:20). The protoconch is of nystielline type with strong axial ribs and fainter spiral threads.

I. marshalli resembles species of *Alora* (figs 1251-1252) which also have strong spiral sculpture, but a very different, almost smooth protoconch. Other species of *Iphitus* have a more solid teleoconch sculpture, with less dominant spiral sculpture.

Iphitus cancellatus Dautzenberg & H. Fischer, 1896 Figs 1138, 1156-1157

Iphitus cancellatus Dautzenberg & H. Fischer, 1896: 450, pl. 19, fig. 1; Dautzenberg 1927: 119, pl. 3, fig. 29.
Iphitus reticulatus Dall, 1927: 116.

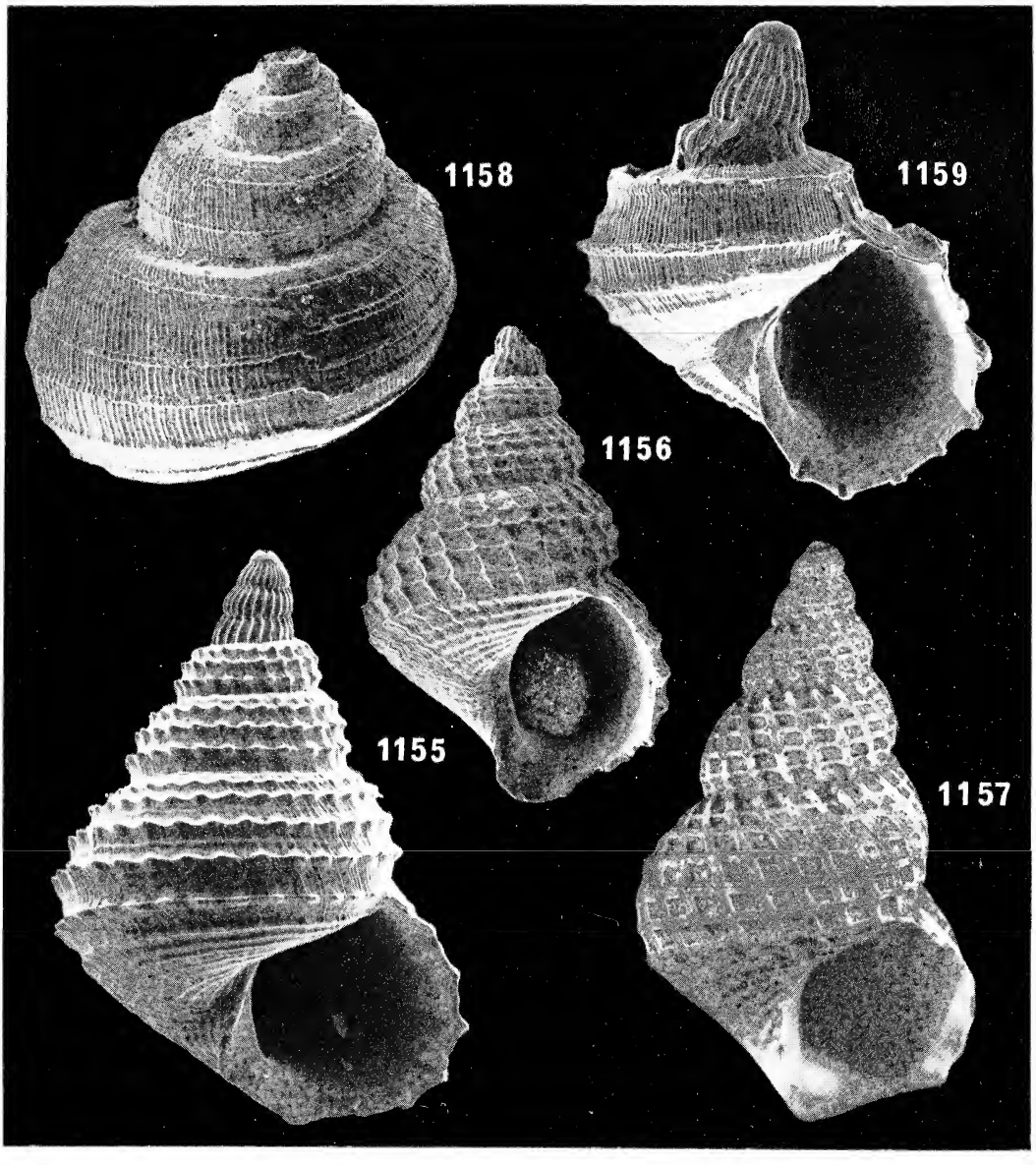
Type material: I. cancellatus, holotype in MOM; *I. reticulatus,* 2 syntypes USNM 108315.

Type locality: I. cancellatus, MONACO st 233, 38° 33N, 28° 09W, 1300m (Azores); *I. reticulatus*, ALBATROSS st 2415, 30° 44N, 79° 26W, 948m (off Georgia).

Material examined: The type material and MONACO st 1349, 38° 36N, 28° 06W, 1250m, 1 sh; DISCOVERY st 7975, 26° 24N, 14° 51W, 785-834m, 1 sh.

Distribution: Only known from the material examined, bathyal off Morocco, the Azores and Georgia.

Remarks: The reticulated sculpture of *I. cancellatus* is unique in N Atlantic Epitoniidae and there is no species that can be confused with it. The protoconch is conical, with one whorl more than in *I. tuberatus.*



Figs 1155-1159. Genus *Iphitus*. 1155, *I. tuberatus*, THALASSA Z435, 2.2 mm. 1156, *I. cancellatus*, holotype 2.7 mm. 1157, *I. cancellatus*, syntype of *I. reticulatus*, USNM 108315, 5.3 mm. 1158, *I. marshalli*, syntype, 2.5 mm. 1159, *I. marshalli*, BALGIM DR152, 1.25 mm.

Genus *PAPULISCALA* de Boury, 1911

Papuliscala de Boury, 1911:220.

Type species: (by original designation) *Acirsa praelonga* Jeffreys, 1877.

Synonym: Pustuliscala de Boury in Cossmann & Peyrot, 1921:124. Type species: (by original designation) *Acirsa praelonga* Jeffreys, 1877.

Papuliscala is here used for a group of Atlantic deep water Epitoniidae with a sculpture of broad, non-lamellar, axial ribs and rather strong spiral threads. They have a distinct basal disc and the aperture is angular at the base. The radula has been examined in an undescribed Caribbean species, and is ptenoglossate, with about 10 teeth per row (fig. 1102). All Recent species here included in *Papuliscala* have paucispiral larval shell.

The genus *Murdochella* Finlay, 1927 is similar to *Papuliscala* and differs mainly in having numerous close set axial lamellae. The shape of the aperture and the protoconch are very similar. *Papuliscala* and *Murdochella* have lost a planktotrophic stage. We have observed an undescribed *Papuliscala* from the upper Oligocene of SW France (coll. Lozouet) with the axially ribbed multispiral protoconch characteristic of Nystiellinae. On this basis we include *Papuliscala* in the subfamily Nystiellinae.

Key to species of *Papuliscala*

A. Two thick spiral cords present	*P. tavianii* (p. 496)
A. More than two spiral cords per whorl	B
B. Basal disc with spiral sculpture	*P. cerithielloides* (p. 497)
B. Basal disc smooth	C
C. Periphery of the whorl spiny, 3 spiral cords	*P. elongata* (p. 494)
C. Whorls regularly convex, more than 3 cords	*P. praelonga* (p. 496)

Papuliscala elongata (Watson, 1881) Figs 1160-1161

Fenella elongata Watson, 1881:249; 1886:621, pl. 34, fig. 4.

Type material: Lectotype, here selected, BMNH 1887.2.9.2057; 2 paralectotypes BMNH 1887.2.9.2056.

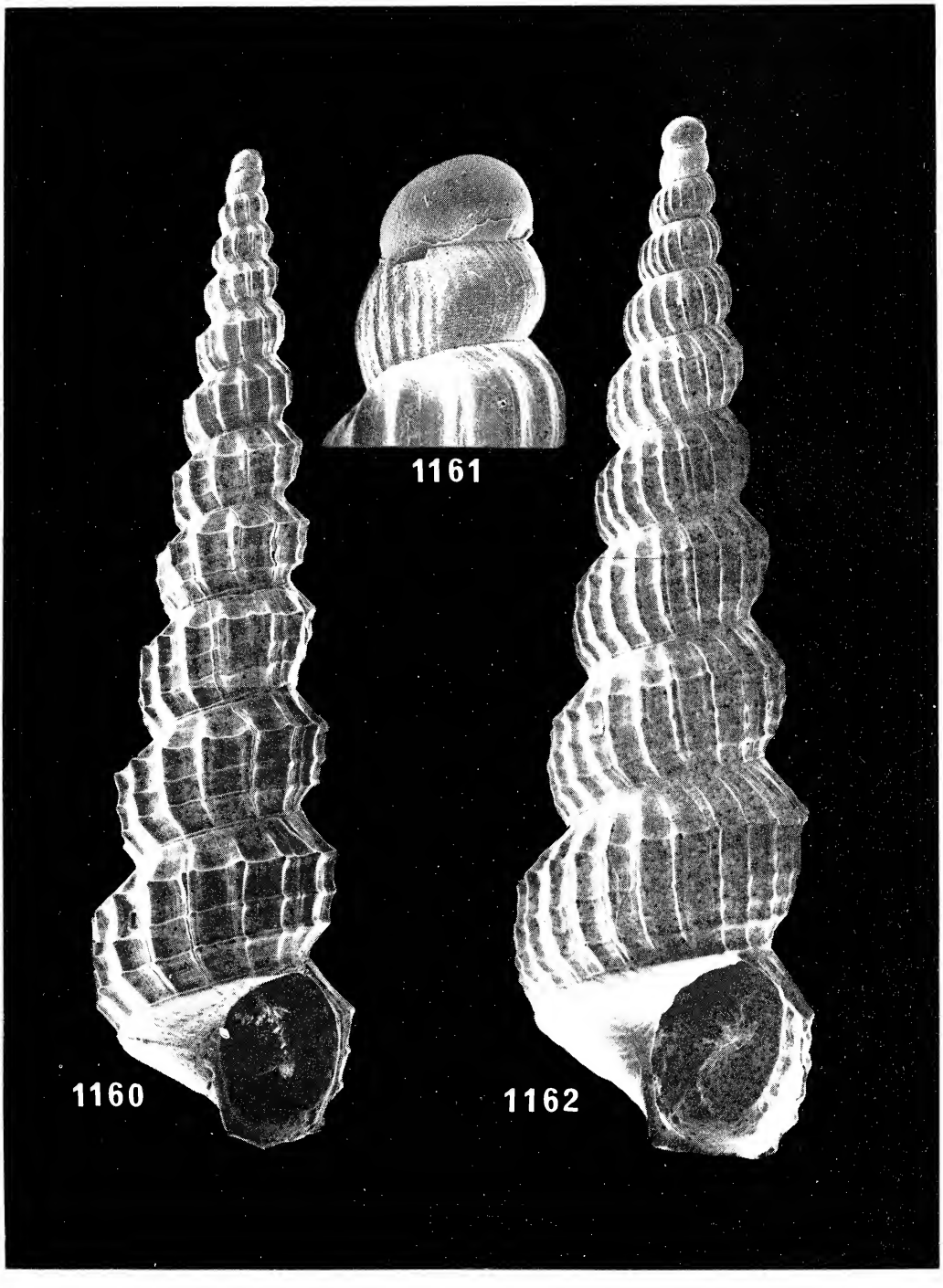
Type locality: CHALLENGER st 78, 37° 26N, 25° 13W, 1830m (the Azores).

Material examined: The type material and MONACO st 624, 38° 59N, 28° 18W, 2102m, 3 shs; st 698, 39° 11N, 30° 45W, 1846m, 1 sh; BALGIM st DW100, 34° 28N, 07° 42W, 1680-1702m, 1 sh.

Distribution: Bathyal zone of SW Europe and the Azores.

Remarks: The paralectotypes of *F. elongata* originate from CHALLENGER st 24 in the West Indies and belong to *Papuliscala praelonga.*

For comparison with *P. praelonga*, see that species.



Figs 1160-1161. Genus *Papuliscala*. 1160-1161, *P. elongata*, BALGIM DW100, 7.6 mm. 1162, *P. praelonga*, MONACO 698, 6.5 mm.

Papuliscala praelonga (Jeffreys, 1877) Fig. 1662

Acirsa praelonga Jeffreys, 1877b:241; 1884:141, pl. 10, fig. 11.
Dunkeria scalariformis de Folin, 1887:205, pl. 4, fig. 3.

Type material: A. praelonga, lectotype, here selected, the figured syntype in BMNH, paralectotypes in USNM (Warén 1980:30); *D. scalariformis*, 2 syntypes in MNHN.

Type localities: A. praelonga, PORCUPINE st 16, 39° 55N, 09° 56W, 1800m; *D. scalariformis*, TALISMAN dr 40, 30° 03N, 11° 42W, 2212m.

Material examined: The type material and INGOLF st 10, 64° 24N, 28° 50W, 1484m, 1 sh; MONACO st 698, 39° 11N, 30° 45W, 1846m, 1 sh; st 719, 39° 11N, 29° 06W, 1600m, 1 fragm.; CHALLENGER st 24, 18° 38N, 65° 03W, 718m, 2 shs (paralectotypes of *Fenella elongata* Watson).

Distribution: Bathyal zone of the Atlantic, E and W basins.

Remarks: P. praelonga is similar to *P. elongata* but has a larger apical angle, and has more numerous axial and spiral ribs. The peripheral cord is sharper and more spiny in *P. elongata.*

Papuliscala tavianii n.sp. Fig. 1163

Type material: Holotype in Museo di Zoologia, Univ. di Bologna.

Type locality: BANNOCK st CS73/7, 36°53N, 13°06E, 410-695m.

Material examined: The holotype and CANCAP st 3.070, 30°07N, 15°54W, 645m, 1 sh.

Distribution: Only known from the type locality (Sicilian Channel) and the Canaries.

Description: Shell small, solid, turriculate, consisting of 6.5 whorls. Protoconch paucispiral, with a smooth apical nucleus, followed by one convex whorl sculptured with 16 opisthocyrt axial ribs. Teleoconch with rounded convex whorls and impressed suture. The sculpture consists of very strong, not lamellar, axial ribs and spiral cords of the same strength. There are 12 axial ribs per whorl, from first postlarval whorl to body whorl. There are two spiral cords situated towards the middle of the whorl, plus one cord barely covered by the abapical suture. The intersection of the two kinds of sculptures is a little nodulous and the interspaces form deep squares. Basal disc very distinct, slightly concave, sculptured by incremental lines and obsolete spiral threads. No umbilicus. Aperture angular where the outer lip meets the body whorl and columella. Columella straight. Inner lip indistinct.
Dimensions: height 3.7mm, breadth 1.4mm; aperture height 0.85mm, breadth 0.65 mm.

Remarks: According to Dr Marco Taviani who collected the material, the bottom at the type locality consisted of mud with large quantities of dead scleractinians; after C-14 dating of the corals (Delibrias & Taviani 1985) this thanatocoenosis belongs to the latest Pleistocene (last Glacial). The species may be extinct in the Mediterranean.

Papuliscala tavianii is unique among all E. Atlantic Epitoniidae in its extremely broad axial ribs and spiral cords, and can hardly be confused with any species.

Papuliscala cerithielloides n.sp. Fig. 1164

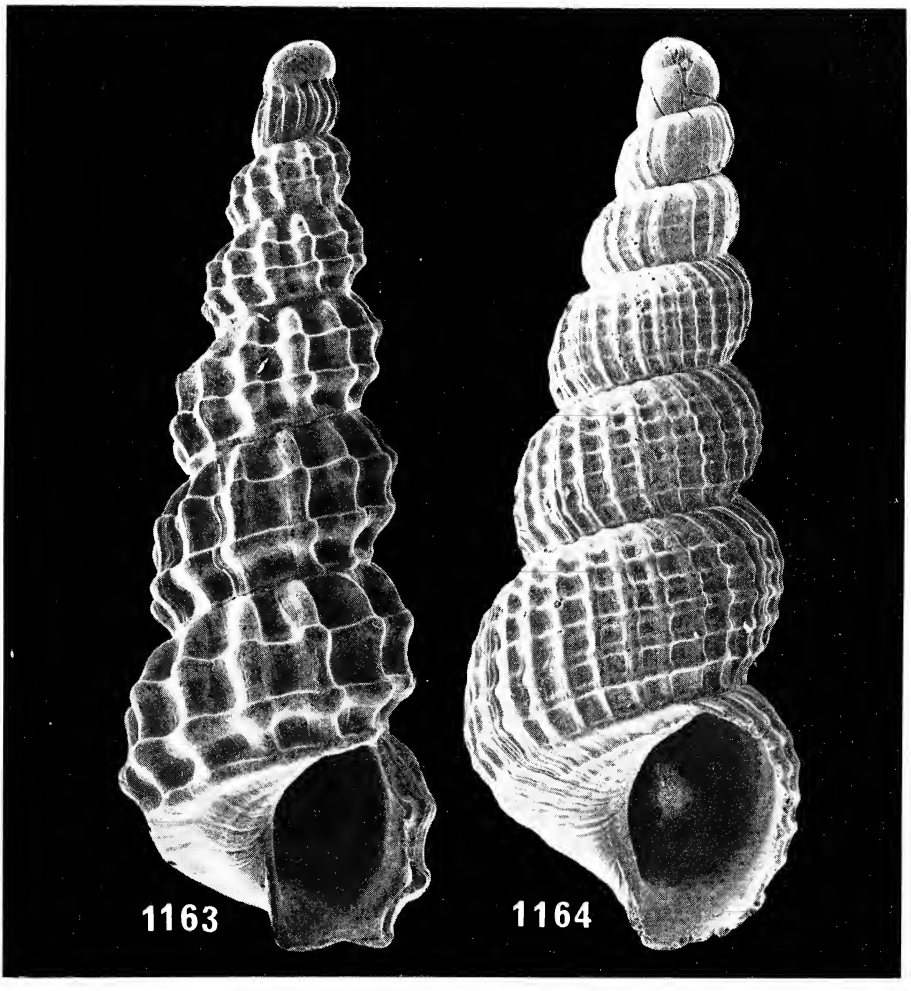
Type material: Holotype in BMNH.

Type locality: PORCUPINE st 17, 39° 42N, 09° 43W, 1100-2005 m.

Material examined: The holotype and 4 fragmentary shells from the type locality.

Distribution: Only known from the type locality.

Description: Shell small, solid, turriculate, consisting of 6.5 whorls. Protoconch paucispiral, with a little less than 1.5 smooth whorls. Teleoconch with rounded convex whorls and impressed suture. The sculpture consists of sigmoid, non lamellar, axial ribs crossed by slightly smaller spiral cords. The intersection of spiral and axial sculpture forms small nodules. There is a rather indistinct spiral



Figs 1163-1164. Genus *Papuliscala*. 1163, *P. tavianii*, holotype, 3.7 mm. 1164, *P. cerithielloides*, holotype, 3.6 mm.

cord in the subsutural zone, then 4 (on early teleoconch whorls) or 5 (on penultimate and body whorls) distinct cords on the middle of the whorl, and finally one cord partly covered by the abapical suture. The basal disc is distinct, with a sculpture of incremental lines and 3 indistinct spiral cords. No umbilicus. Aperture oval-rounded, with straight columella and slightly angular base. Inner lip indistinct, outer lip thin, simple. Colour white.
Dimensions: height 3.6mm, breadth 1.5mm; aperture height 0.95mm, breadth 0.7mm.

Remarks: P. cerithielloides has a sculpture resembling that of several Cerithiacea, especially *Cerithiella*, but the aperture has no siphonal canal. It can be separated from other *Papuliscala* by its rounded whorls without peripheral keel and its reticulated sculpture.

Subfamily EPITONIINAE

The subfamily Epitoniinae contains by far the largest number of genera in the family, and also the majority of the species. We have not tried to evaluate the value of the subfamilies recognized by Cossmann (1912), because too many supra-specific taxa from tropical and/or shallow waters are involved.

As used here, the subfamily Epitoniinae is based on the presence of a multispiral protoconch without axial ribs, appearing smooth at magnifications up to x 100 (for a discussion of the microsculpture see p. 478 and figs 1119-1130), or similarity to species with such a larval shell.

A key to the genera present in the bathyal and abyssal zones of the NE Atlantic is presented p. 479.

Genus *EPITONIUM* Röding, 1798

Type species: Turbo scalaris Linnaeus, 1758, by subsequent designation by Suter (1913).

The three names *Scalaria* Lamarck, 1801, *Scala* Auctorum and *Epitonium* Röding, 1798 have been used as and considered to be synonyms, which is not necessarily the case. The latest discussion of the problems concerning these names was in Clench & Turner (1951:251), but it has also been discussed by de Boury (1886), Dall (1889:299, 1917). The case is particularly important in view of the many replacement names that have been proposed in the family on the assumption that *Scalaria, Scala* and *Epitonium* are synonyms.

Epitonium Röding, 1798 was introduced as a new generic name for a large number of valid species from what are now considered to belong to different families. Dall (1906) mentioned that *scalaris* Gmelin was the «first species», but considered the case complicated because species of Turritellidae and Terebridae were also listed under *Epitonium* by Röding. After Dall's paper, various authors began to use *Epitonium* instead of *Scala* and *Scalaria*, but Suter (1913) was the first to formally designate a type species.

Scalaria Lamarck, 1801 was introduced with *S. conica* Lamarck, 1801 (= *scalaris* Linnaeus) as the only species mentioned. Lamarck's new specific name was presumably introduced to avoid tautonomy, which then was not allowed in nomenclature. *Scalaria* thus is an objective junior synonym of *Epitonium*.

Scala auctorum was used during the last part of the 19th century and later as a synonym of *Scalaria* and *Epitonium*. It was first introduced by Klein (1753) but this work is pre-Linnean and has no nomenclatorial status. According to ICZN Opinion 5, a pre-Linnean name becomes eligible under the Code if it is re-inforced by adoption or acceptance by an author publishing the reprint of the name. Under these conditions, citations of *Scala* by Bruguière (1792: 532), de Blainville (1827), Deshayes (1832: 929), Reeve (1842) or Herrmannsen (1847) do not qualify as re-inforcement of the name *Scala*.

Clench & Turner (1951: 251) suggested that Mörch (1852: 48) in the Yoldi catalogue has validly introduced *Scala*. In this catalogue Mörch divided *Scalaria* Lamarck into 4 sections:

Epitonium Kl. *Aciona* Leach
Scala Kl. *Clathrus* Ocken
Clathrus Gray
Cirsotrema n.

Adoption of this catalogue as the first valid introduction of *Scala* leads to nomenclatural difficulties:

(1) *Clathrus* Oken, 1815 has been introduced in a rejected work (Opinion 417, 1956).

If *Scala* Klein is considered a replacement name, it must take the same type species, which by tautonomy is *Turbo clathrus* Linnaeus, 1758. There have been expressed some doubts about the identity of this name but Hanley (1855), who can be considered «first reviser», solved the problem by identifying it with *Scalaria communis* Lamarck. *Scalaria communis* and *S. scalaris* then become type species of respectively *Scala* Mörch and *Scalaria* Lamarck and synonymy of these two generic names is subjective. When the family Epitoniidae is better known it is probable that *S. communis* and *S. scalaris* will need two different genera.

Many replacement names proposed in the family on the basis of primary homonymy between *Scala a-us* and *Scalaria a-us* will then become unnecessary and this will lead to name changes, obviously a case of nomenclatural unstability.

(2) Mörch (1876) himself did not consider *Scala* as different from *Scalaria* and it can be doubted that it was really his intention in 1852 to introduce *Scala* as a new supraspecific unit.

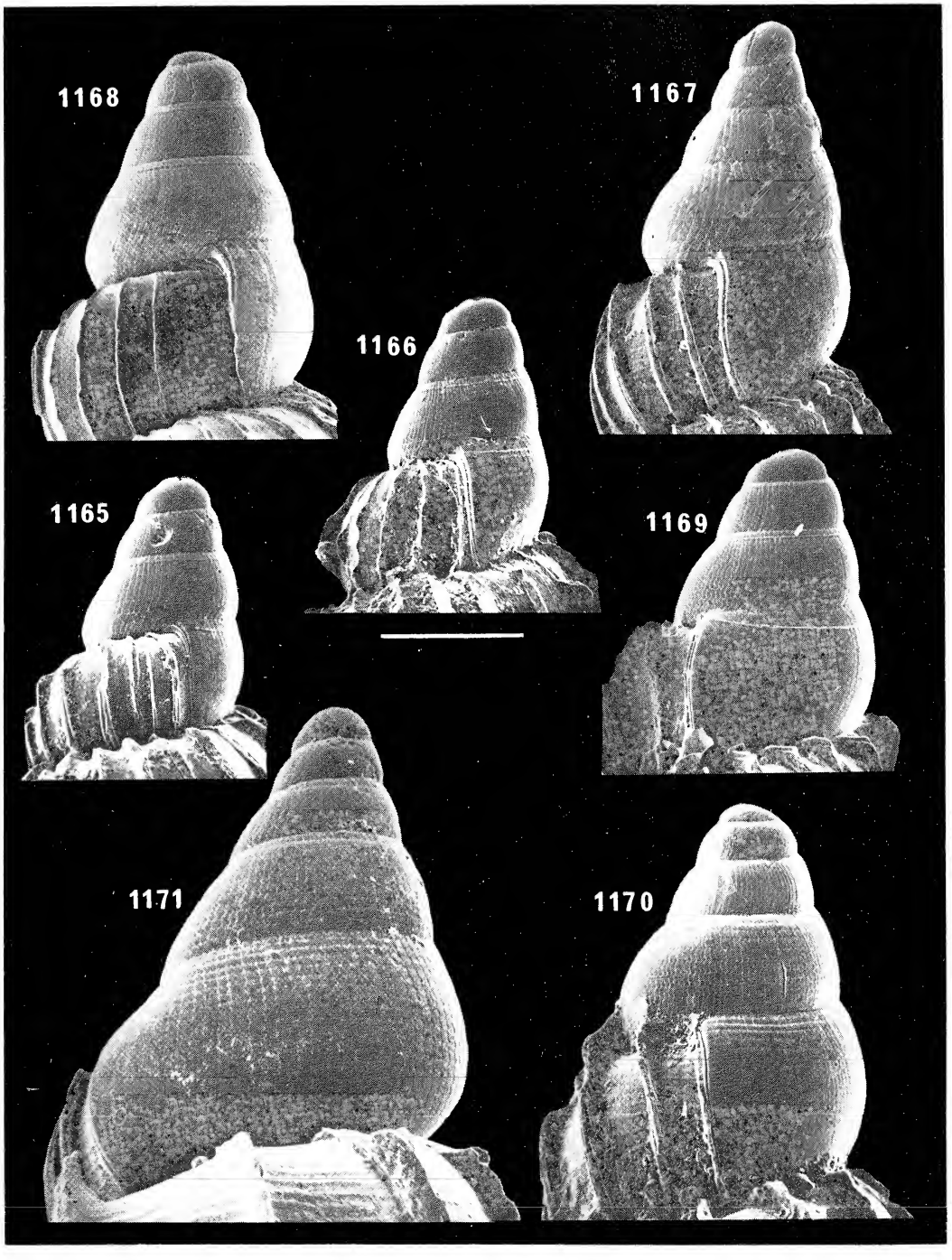
(3) We believe that these problems were not foreseen by the Commission when the Yoldi catalogue was validated (Opinion 714) in spite of the fact that this work was not published for the purposes of zoological nomenclature.

We will therefore present a request to the International Commission of Zoological Nomenclature to invalidate *Scala* Mörch, 1852 and place *Scala* on the list of rejected names in zoological nomenclature.

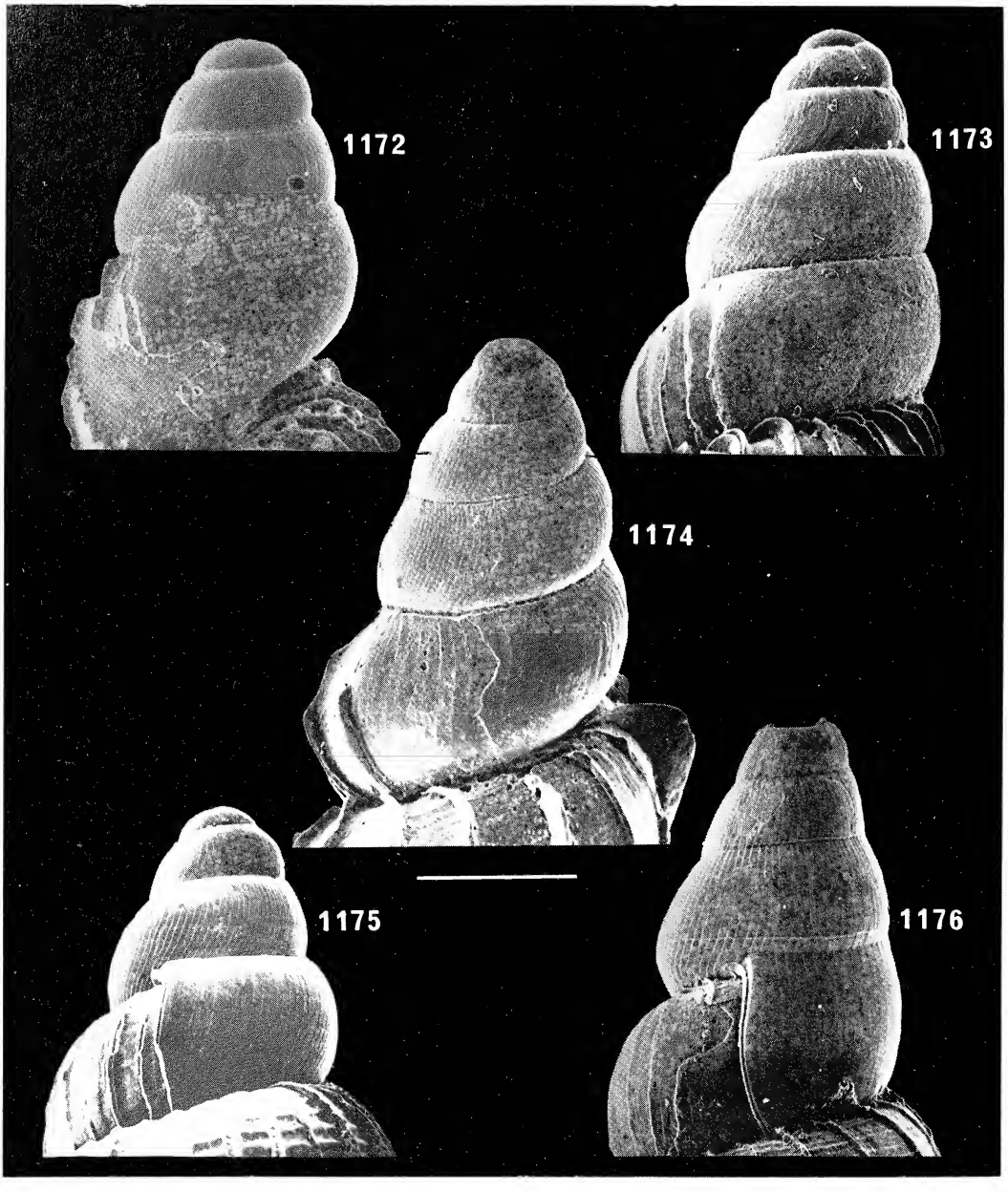
We are here using *Epitonium* in a very wide sense, similar to Clench & Turner (1951-1952). The reason for this is that our attempts to divide the group have not been successfull and further attempts would have necessitated a review on a world-wide basis. We have however noted under each species if it has been designated a type of a genus. The names *Arctoscala, Boreoscala, Evolutiscala, Lepidiscala, Linctoscala, Liriscala, Minutiscala, Parviscala* and *Sphaeroscala* are based on species occuring in the NE Atlantic, and are here treated as synonyms of *Epitonium*.

KEY TO THE NE ATLANTIC DEEP WATER SPECIES OF *EPITONIUM*

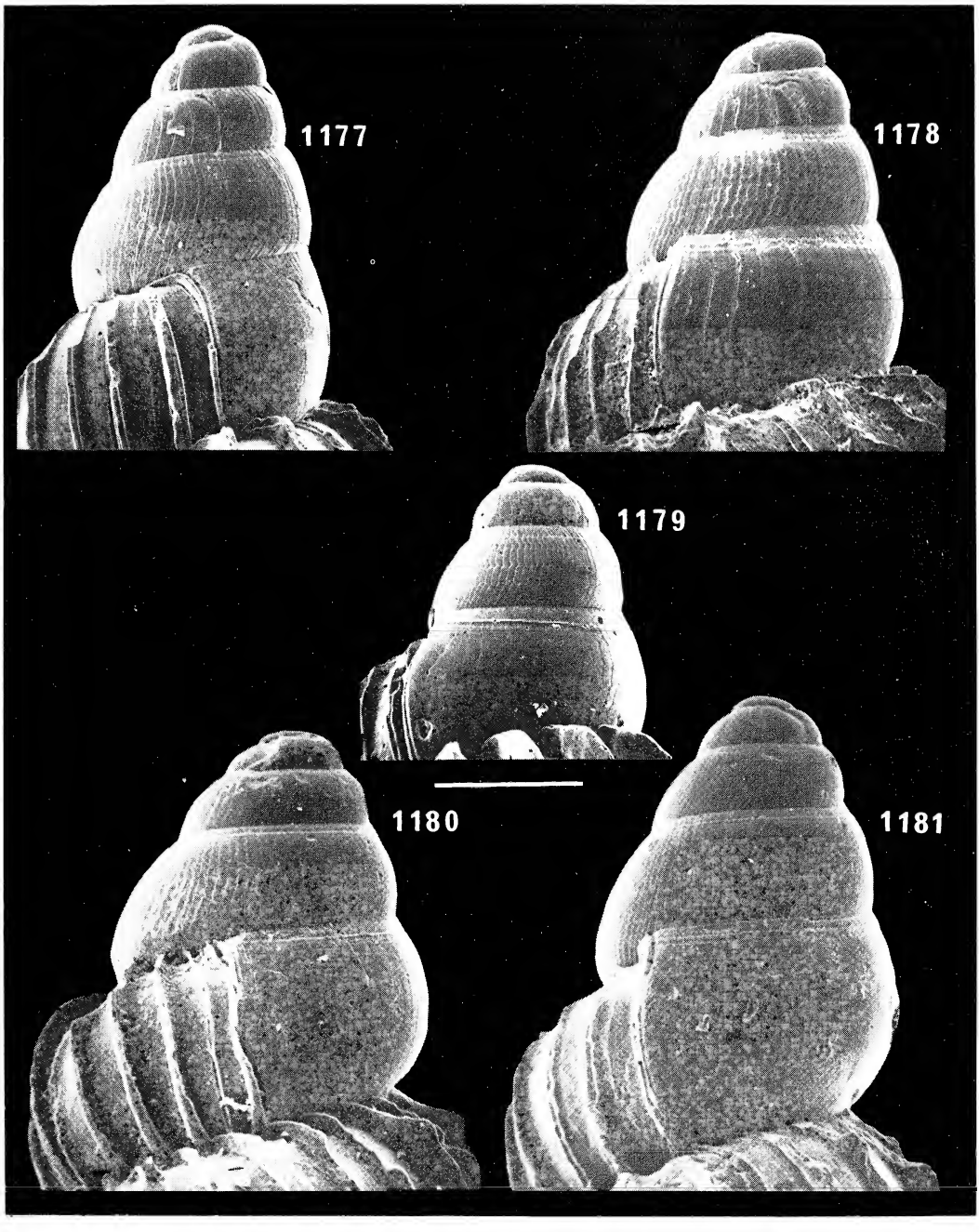
A. Axial lamellae with spine	B
A. Axial lamellae without spine	N
B. Spiral sculpture present	F
B. No spiral sculpture	C
C. Adult shell smaller than 4mm, spine low on the lamella	*E. hispidulum* (p. 504)
C. Adult shell larger than 5mm, spine high on the lamella	D
D. Fewer than 15 lamellae per whorl	*E.* sp.A (p. 523)
D. More than 15 lamellae per whorl	E
E. Protoconch with a strong subsutural spiral thread	*E. dallianum* (p. 512)
E. Protoconch without subsutural spiral thread	*E. linctum* (p. 514)
F. Whorls almost free from one another	*E. semidisjunctum* (p. 511)
F. Coiling normal	G
G. Protoconch paucispiral, shell very solid with strong spiral groves	*E. greenlandicum* (p. 518)
G. Protoconch multispiral	H
H. Shell umbilicate, adult size smaller than 5mm, protoconch smaller than 400 μm	*E. tryoni* (p. 504)
H. Shell not distinctly umbilicate, adult size 3-13 mm, protoconch larger than 400 μm	I
I. Shell pinkish to violet, with reticulate microsculpture between the lamellae	*E. vittatum* (p. 510)
I. Shell white or whitish, only spiral sculpture between the lamellae	J
J. Protoconch large ($\geqslant$ 600 μm) and teleoconch broad (h/d $\leqslant$ 1.8)	*E. celesti* (p. 509)
J. Protoconch 600 μm or smaller and teleoconch slender (h/d $\leqslant$ 1.9)	K
K. Protoconch without subsutural spiral thread or sulcus	*E. fischeri* (p. 511)
K. Protoconch with subsutural spiral thread or sulcus	L
L. Protoconch ca. 400-450 μm with one subsutural thread	*E. tiberii* (p. 506)
L. Protoconch ca. 550 μm high	M
M. Protoconch with convex whorls and several subsutural sulci	*E. algerianum* (p. 506)
M. Protoconch with less convex whorls and a single subsutural sulcus (fig. 1168)	*E.* sp.B (p. 523)
N. Spiral sculpture present	O
N. No spiral sculpture	*E. nanum* (p. 520)
O. Axial lamellae finely undulating	*E. striatissimum* (p. 521)
O. Axial lamellae not finely undulating	P
P. Shell white, smaller than 3mm, protoconch with one subsutural spiral thread	*E. pseudonanum* (p. 519)
P. Shell light tan in colour, reaching an adult size over 5mm, protoconch with very convex whorls without spiral thread	*E. dendrophylliae* (p. 522)



Figs 1165-1171. Protoconchs of *Epitonium*. 1165, *E. tryoni*, Madeira, syntype, NMW 1955.158.1021. 1166, *E. hispidulum*, Adventure Bank, USNM 185528. 1167, *E. fischeri*, Madeira, syntype, NMW 1955.158.1017. 1168, *E.* sp. B, BALGIM CP95. 1169, *E. tiberii*, THALASSA Z392. 1170, *E. algerianum*, Madeira, NMW 1955.158.1020. 1171, *E. celesti*, Madeira, NMW 1955.158.1019. Scale line: 200 μm.



Figs 1172-1176. Protoconchs of *Epitonium* and *Acrilloscala*. 1172, *E. semidisjunctum*, MONACO 683. 1173, *A. lamyi*, THALASSA Z416. 1174, *E. vittatum*, Senegal, 50 m. 1175, *E. dendrophylliae*, Madeira, holotype. 1176, *E. striatissimum*, Madeira. Scale line: 200 μm.



Figs 1177-1181. Protoconchs of *Epitonium*. 1177, *E. linctum*, Tuscan archipelago. 1178, *E. nanum*, MONACO 578. 1179, *E. pseudonanum*, TRAVAILLEUR, USNM 182460. 1180-1181, *E. dallianum*, THALASSA Z435. Scale line: 200 μm.

Epitonium tryoni (de Boury, 1913) Figs 1165, 1182-1183

Scalaria smithi Watson, 1897: 253, pl. 19, fig. 20 (not *Scalaria smithii* Tryon, 1887).
Scala tryoni de Boury, 1913b: 108 (new name for *S. smithi* Watson).

Type material: Lectotype, here selected, in National Museum of Wales, Cardiff.

Type locality: Madeira.

Material examined: The type material and about 40 additional shells from Madeira, mostly in Cardiff Mus.; Palermo, Sicily, 3 shs (coll. Sykes, BMNH); Adventure Bank, between Sicily and Tunisia, 170m, 4 shs (BMNH); off Algeria, 200m, 4 shs; St. Raphaël, SE France, 120-150m, 1 sh; Calvi, Corsica, 70-150m, 2 shs.

Distribution: The deep shelf of the western Mediterranean and nearby Atlantic; only known with certainty from the material examined. We have checked the material from Sao Thomé referred by Tomlin & Shackleford (1914) to *Amaea smithi* (Watson, 1897): it is a different, possibly undescribed, species of *Epitonium*.

Remarks: In the western Mediterranean, *E. tryoni* lives on the deep shelf together with *E. hispidulum* with which it has been confused (and erroneously synonymized by Nofroni (1982)). See comparative remarks under *E. hispidulum*.

E. tryoni also resembles *E. fischeri* but that species has a stronger spiral sculpture present over all the whorl, and not only on the lower part as in *tryoni*. *E. fischeri* also has a larger protoconch, with 4 whorls (3 in *tryoni*) and without a subsutural spiral thread (present in *tryoni*). Fresh shells of *E. tryoni* have a very light brown spiral band that is lacking in *hispidulum* and *fischeri*.

E. tryoni differs from young *E. tiberii* by its thinner, more fragile shell, more slender outlines, more orthocline axial lamellae and by the spiral colour band. The two species however have similar protoconch.

Epitonium hispidulum (Monterosato, 1874) Figs 1166, 1184

Scalaria hispidula Monterosato, 1872: 39 (*nomen nudum*); 1874: 264.
Hyaloscala finitima Monterosato, 1890: 150.

Type material: Lectotypes of both names here selected among material sent by Monterosato to de Boury, in MNHN.

Type locality: S. hispidula, described from Cape San Vito, Palermo and Napoli, lectotype from Palermo, Sicily; *H. finitima*, Palermo.

Material examined: The type material and Palermo, 8 shs (coll. Sykes and de Boury, *ex* Monterosato; coll. Sabelli); golfo di Napoli, 134m, 1 sh (coll. Fassulo); Capraia, Tuscan archipelago, 150-160m, 4 shs (coll.Giannini); Capo Comino, E Sardinia, 210m, 1 sh (coll. Crovato); Augusta, Sicily, 20m, 1 sh (coll. Ebreo); west of Porto Empedocle, Sicily, 224m, 10 shs (IRSN, MOM); Adventure Bank, between Sicily and Tunisia, 170m, 8 shs (BMNH); Calvi, Corsica, 70-150m, 4 shs; St. Raphaël, SE France, 120-150m, 46 shs (MNHN, IRSN *ex* Claudon); PORCUPINE st 3, 48° 31N, 10° 03W, 1250m, 6 shs (BMNH; Jeffreys 1884: 136 as *S. clathratula*); st 16, 39° 42N, 09° 43W, 1800m, 3 shs; MONACO st 1311, 37° 27N, 25° 21W, 1187m, 1 sh; THALASSA st X378, 44° 08N, 04° 44W, 620-680m, 1 sh; st Z439, 48° 42N, 10° 23W, 500m, 1 sh; Tuscan archipelago, 180m, 2 shs; Tuscan archipelago, S part, 300-450m, 2 shs (coll. Piani); CANCAP st 2.058, 27° 58N, 13° 15W, 500m, 1 sh; st 2.082, 28° 00N, 14°

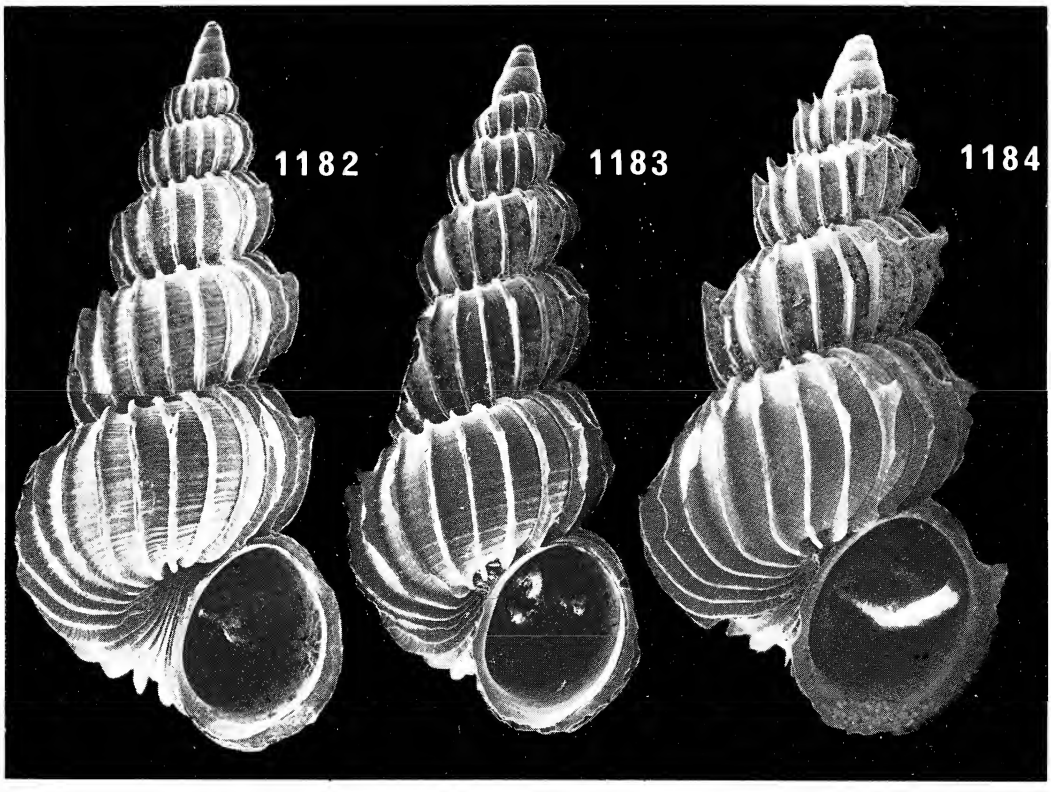
26W, 1130m, 2 shs; st 3.070, 30° 07N, 15° 54W, 645m, 1 sh; st 4.055, 28° 45N, 13° 20W, 1209-1338m, 1 sh; st 4.060, 28° 48N, 13° 45W, 590m, 1 sh.

Distribution: The lower shelf and bathyal zones of SW Europe from the Bay of Biscay to the W Mediterranean, the Canaries and the Azores; apparently deeper in the Atlantic than in the Mediterranean.

Remarks: E. hispidulum and *E. tryoni* are not rare on the deeper parts of the shelf in the western Mediterranean, but the lack of good comparative descriptions and figures has led to much confusion in their taxonomy; Monterosato used *hispidulum* and *finitima* for both species and his descriptions are almost useless. Kobelt (1903: 32, pl. 63 figs 17-18) published the only drawing of *hispidulum* (copied by Nordsieck 1968: pl. 13 fig. 65), but this does not make a positive identification possible.

E. hispidulum is recognized by its small adult (2-4 mm) size, uniform shiny white colour, slightly sinuous, spiny axial lamellae and total lack of spiral sculpture. *E. tryoni* reaches a larger adult size (3-5 mm) and has a distinct spiral sculpture, which is best developed on the lower part of the whorls; on fresh specimens, there is also a very light orange-brown band in the middle of the whorls. Even old specimens of *E. hispidulum* with worn lamellae can rather easily be identified by their lack of spiral sculpture and slightly sinuous lamellae.

The protoconch of *E. hispidulum* consists of 3 brownish whorls with one strong subsutural spiral thread.



Figs 1182-1184. Genus *Epitonium*. 1182, *E. tryoni*, Madeira, syntype, NMW 1955.158.1021, 4.2 mm. 1183, *E. tryoni*, Calvi, Corsica, 70-150 m, 3.4 mm. 1184, *E. hispidulum*, Calvi, Corsica, 70-150 m, 2.9 mm.

Epitonium algerianum (Weinkauff, 1866) Figs 1170, 1186, 1188-1190

Scalaria algeriana Weinkauff, 1866: 247.

Type material: 1 syntype in USNM 182512 (Jeffreys coll. *ex* Weinkauff).

Type locality: Coasts of Algeria.

Material examined: The type material and Aegean Sea, 70-110m, 1 sh (USNM 182527); off Tunis, 180m, 1 sh; Adventure Bank, between Sicily and Tunisia, 170m, 6 shs; W of Porto Empedocle, Sicily, 224m, 2 shs; off Siracusa, Sicily, 130-250m, 1 sh (coll. Piani); Palermo, Sicily, 4 shs; Acitrezza, Sicily, 50m, 2 shs; Porto Cesareo, S Italy, 120m, 1 spm (coll. Piani); Napoli, S Italy, 2 shs; Capraia, Tuscan archipelago, 45m, 1 sh; Tuscan archipelago, S part, 300-450m, 4 shs; Bastia, Corsica, 70m, 3 shs; Ajaccio, Corsica, 1 spm; St Raphaël, SE France, 40m, 3 shs; St Raphaël, 120m, 1 sh; Mers el Kebir, Algeria, 1 spm, 3 shs; Madeira, 17 shs; Bay of Rufisque, Senegal, 18-20m, 1 sh; THALASSA st Z398, 47° 36N, 07° 17W, 330m, 1 sh.

Distribution: The continental shelf, from about 50m (locally more shallow) to about 400m; from the northern part of Bay of Biscay to Senegal and Madeira in the South, including E and W Mediterranean.

Remarks: Although it is not a bathyal species, *E. algerianum* has been included here because its taxonomy has been misunderstood, it has often been confused with *E. tiberii* and *E. celesti.*

E. algerianum is most similar to *E. tiberii* (fig. 1185), but they are easily separated by their protoconchs (figs 1169-1170): the protoconch of *algerianum* usually has half a whorl more, and it is 1.2 - 1.5 the size of the protoconch of *tiberii*; it has several subsutural spiral furrows while there is only one thread in *tiberii.* When both species are present in a sample, this character is very easy to use. When a single species is present, the best is to measure the height of the protoconch: 400-450 μm = *tiberii*, 500-550 μm = *algerianum.*

Juveniles are easy to separate, *algerianum* being more slender with fewer ribs and a conical protoconch, *tiberii* having more numerous ribs and a more styliform protoconch. Adults can look extremely similar and, in the absence of a protoconch, may be impossible to identify. *E. algerianum* however attains a larger size, most adult specimens are 6-7 mm high with exceptional individuals reaching 13 mm; most adult *tiberii* are 3-3.5 mm high with exceptional individuals reaching 6 mm.

E. algerianum has also been confused with juveniles of *E. celesti* (fig. 1187). *E. celesti* has a still larger protoconch (fig. 1171), 620-660 μm high, without subsutural spiral threads; the juvenile teleoconch is also broader with fewer axial lamellae.

For comparison with *E. fischeri*, see that species.

Jeffreys (1884:134) claimed that *Scalaria schultzii* Weinkauff, 1868 is a synonym, and this name has since then been maintained in the synonymy of *algerianum.* We have, however, examined a syntype of *schultzii* (USNM 182533: coll. Jeffreys *ex* Weinkauff): it is very worn and, although a positive identification cannot be made, it is certainly not a synonym of *algerianum* because it has no spiral sculpture.

E. algerianum is the type species of *Parviscala* de Boury, 1887 (by original designation).

Epitonium tiberii (de Boury, 1890) Figs 1169, 1185, 1191-1192

Scalaria soluta Tiberi, 1863: 159, pl. 6, fig. 3 (non *Scala soluta* A. Adams, 1862).
Parviscala tiberii de Boury, 1890: 326 (new name for *S. soluta* Tiberi).

Type material: Lectotype, here selected, in MNHN (coll. Petit de la Saussaye *ex* Tiberi).

Type locality: Bay of Naples, Italy, 50-60 m.

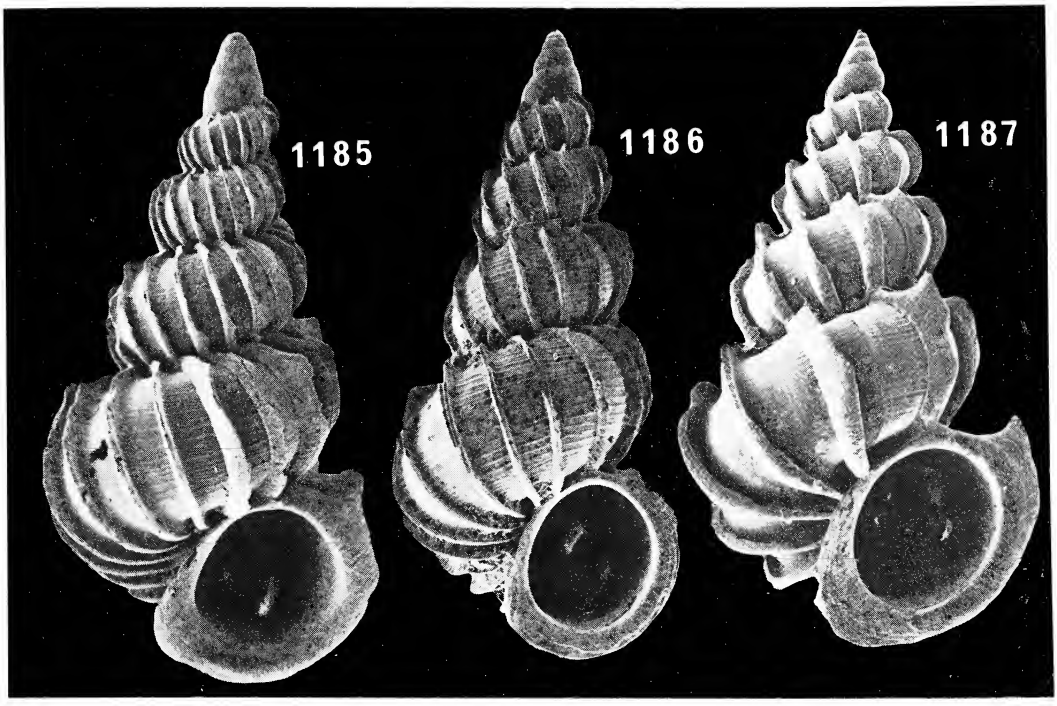
Material examined: The type material and Palermo, Sicily, 11 shs; Acitrezza, Sicily, 7 shs; Taormina, Sicily, 40m, 1 sh; Siracusa, Sicily, 60m, 1 sh; Siracusa, 130-250m, 2 shs; Porto Cesareo, S Italy, 120m, 1 sh; Adventure Bank, between Sicily and Tunisia, 170m, 14 shs; off Tunis, 90-180m, 7 shs; off Crete, 125-220m, 1 sh; Capraia, Tuscan archipelago, 200m, 7 shs; Tuscan archipelago, various depths, 16 shs; Tuscan archipelago, S part, 300-450m, 3 shs; Calvi, Corsica, 70-150m, 5 shs; St Raphaël, SE France, 120m, 2 shs; off Algeria, 2 shs; THALASSA st Z392, 47° 35N, 07° 01W, 390m, 2 shs; st Z458, 48° 42N, 09° 53W, 350m, 1 sh.

Distribution: The continental shelf of S Europe, from the northern part of Bay of Biscay to E and W Mediterranean; in the Atlantic, known only from the 2 THALASSA stations listed, probably more widespread on the lower shelf.

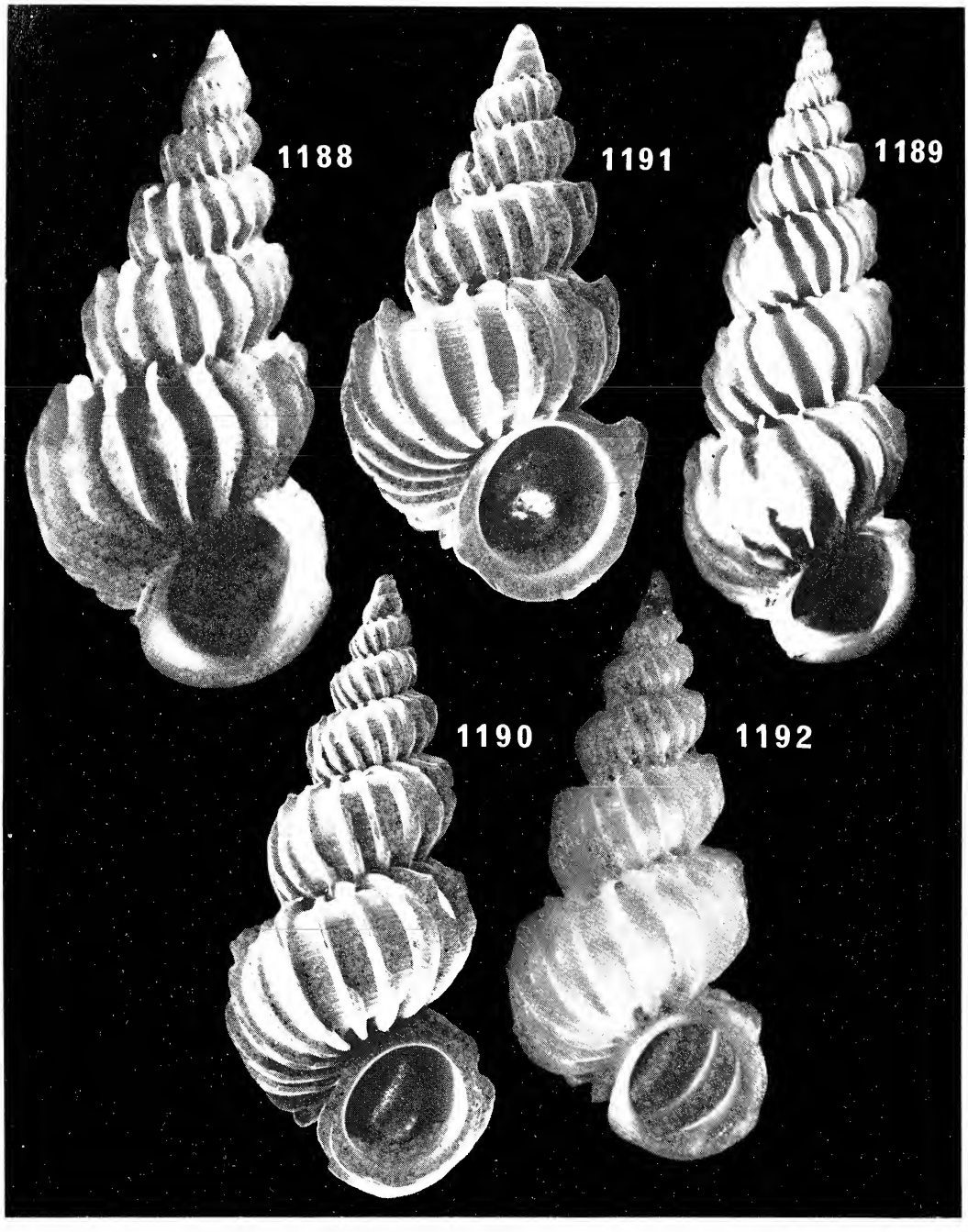
Remarks: Tiberi probably included under the name *soluta*, not only the present species but also *E. algerianum* and young *E. celesti*, and this confusion is very apparent in his 1868 paper (Tiberi 1868: 84, pl. 5, fig. 3). Therefore it was felt necessary to select a lectotype to stabilize nomenclature.

For distinction from its nearest relative, *E. algerianum*, see that species. Juveniles of *E. celesti* (fig. 1187) resemble slightly *E. tiberii* but they have a much larger protoconch (620-660 μm vs. 400-450 μm in *tiberii*) without any subsutural spiral thread (one very distinct thread in *tiberii*). Teleoconch whorls of *celesti* are much broader with fewer axial lamellae. For distinction from *tryoni*, see that species (p. 504).

E. tiberii is the type species of *Evolutiscala* de Boury, 1909 (by original designation).



Figs 1185-1187. Genus *Epitonium*. 1185, *E. tiberii*, Palermo, Italy, 3.5 mm. 1186, *E. algerianum*, Madeira, NMW 1955.158.1020, 4.2 mm. 1187, *E. celesti*, juvenile, Madeira, NMW 1955.158.1019, 5.1 mm.



Figs 1188-1192. Genus *Epitonium*. 1188-1190, *E. algerianum*, 1188, Mers el Kebir, Algeria, 21 m, 6.1 mm; 1189, Ajaccio, Corsica, 13.0 mm; 1190, THALASSA Z398, 5.3 mm. 1191-1192, *E. tiberii*, 1191, St Raphaël, SE France, 120 m, 3.1 mm; 1192, Calvi, Corsica, 70-150 m, 5.7 mm.

Epitonium celesti (Aradas, 1854)
Figs 1099, 1110, 1171, 1187, 1195

Scalaria celesti Aradas, 1854:12, fig. 1.
Scalaria pumila Libassi, 1859:23, fig. 11.
Scalaria pourtalesii Verrill & Smith, 1880:395; Verrill 1882:527, pl. 57 fig. 32.

Type material: S. celesti and *S. pumila*, no type material left; *S. pourtalesii*, holotype in USNM 44801.

Type locality: S. celesti, off Acitrezza, Sicily; *S. pumila*, Pliocene of Altavilla, Sicily; *S. pourtalesii*, FISH HAWK st 874, 40° 00N, 70° 57W, 160m (off New Jersey, NE United States).

Material examined: The type material of *pourtalesii* and several other shells from the W Atlantic (USNM, ZMC); PORCUPINE st 26, 36° 44N, 08° 08W, 670m, 2 shs; st 27, 36° 37N, 07° 33W, 595m, 2 shs; st 28-28a, 36° 29N, 07° 16W, 530-560m, 5 shs; st 29, 36° 20N, 06° 47W, 420m, 1 sh; st 30, 36° 15N, 06° 52W, 715m, 5 shs; st 36, 35° 55N, 06° 26W, 130-235m, 1 sh; st 58, 36° 43N, 13° 36E, 490m, 1 sh; Adventure Bank, between Sicily and Tunisia, 170m, 3 shs; off Algeria, 90m, 1 sh; TRAVAILLEUR 1882 dr 25, 38° 06N, 09° 11W, 460m, 1 fragm. sh; dr 34, 35° 42N, 06° 20W, 112m, 1 fragm. sh; MONACO st 1311, 37° 37N, 25° 21W, 1187m, 1 sh; st 1349, 38° 35N, 28° 06W, 1250m, 1 sh; CALYPSO st SME701, 36° 25N, 22° 57E, 280-285m, 1 sh; st SME1290, 35° 30N, 03° 16W, 225-370m, 1 sh; Madeira, 8 shs; off Cap Ferrat, SE France, 170m, 1 sh; BIACORES st 12, 38° 36N, 27° 04W, 220m, 1 sh; st 39, 37° 43N, 29° 03W, 420m, 2 shs; st 207, 37° 16N, 25° 47W, 70-130m, 1 sh; CANCAP st 4.116, 28° 26N, 17° 51W, 420m, 1 sh; Capraia, Tuscan archipelago, 50-60m, 1 spm (coll. Ebreo); BALGIM st CP25, 36° 41N, 07° 19W, 544m, 3 spms.

Distribution: The deep shelf and upper bathyal zones of the Mediterranean (E and W basins) and subtropical N Atlantic: S Portugal, Madeira, Azores; on the American side from New Jersey to the Virgin Islands (Clench & Turner 1952: 313).

Remarks: Monterosato (1872: 39) and Jeffreys (1884: 136) identified the present species with the British Crag fossil *Scalaria frondosa* J. Sowerby, 1829. De Boury (1890: 296, 306) showed that the fossil is a different species, which has been figured from the type locality by Harmer (1920: 532, pl. 48, figs 21-22). Jeffreys (1884) also considered several other names to be synonyms, but they refer either to fossils allied to *S. frondicula* S. Wood, 1848 (*eximia* Pecchioli, 1864 and *pecchioliana* Issel, 1877) or have no nomenclatorial status (*rugosa* Costa, *crispa* Scacchi and *gravitellensis* Seguenza). The synonymy with the American *S. pourtalesii* was already suggested by Monterosato (1890) and is confirmed here.

E. celesti can be recognized by its very broad shell with almost disjunct whorls, few orthocline, high axial lamellae and faint but always distinct spiral sculpture. The protoconch is among the largest for E Atlantic Epitoniidae, more than 620 μm high, and without subsutural spiral thread. It resembles most the W African *E. trochiformis* (von Maltzan, 1885) but that species has a polished white shell without spiral sculpture and still fewer axial lamellae that are not spiny.

E. celesti is the type species (by monotypy) of *Sphaeroscala* Monterosato, 1890.

Epitonium vittatum (Jeffreys, 1884) Figs 1174, 1193-1194

Scalaria vittata Jeffreys, 1884: 133, pl. 10, fig. 4.

Type material: 15 syntypes in USNM 182416.

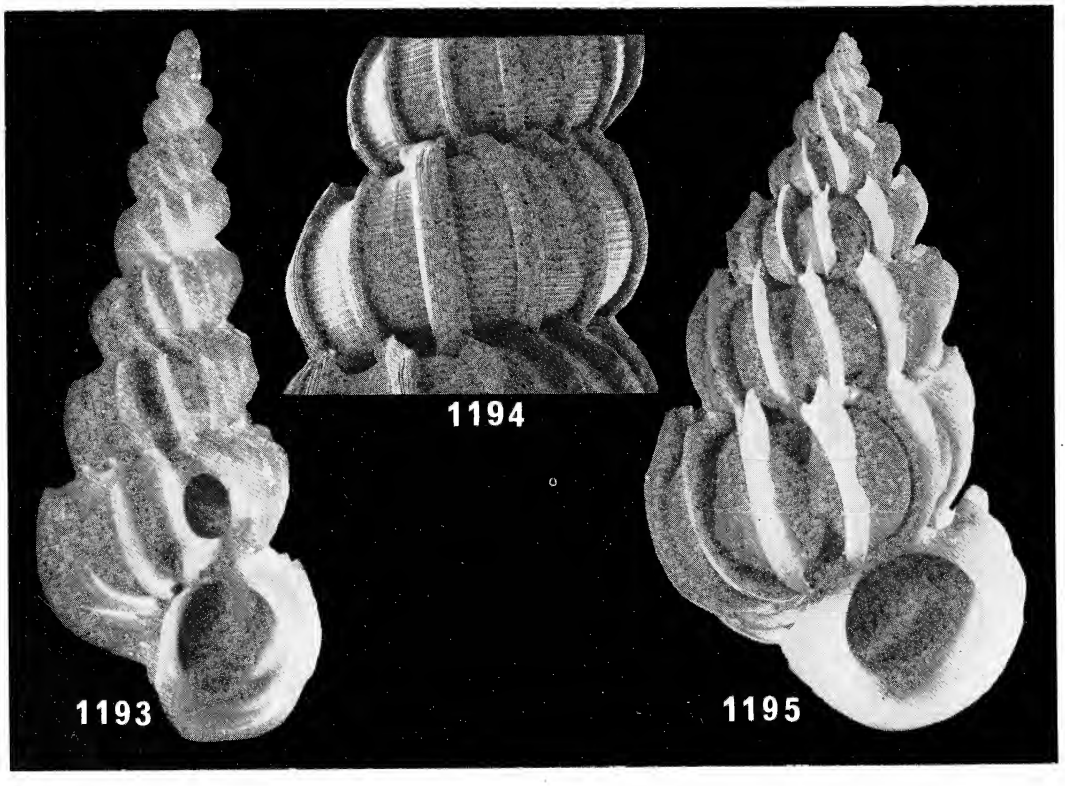
Type locality: PORCUPINE st 50, off Algeria, and off Bizerte, N Tunisia, 75-120 m.

Material examined: The type material and off Algeria, 85m, 10 shs; off Algeria, 205m, 5 shs; off Bizerte, N Tunisia, 75-120m, 2 shs; off Tunis, 185m, 2 shs; many samples from the continental shelves of Mauritania (Richer de Forges coll., MNHN), Senegal (Marche-Marchad coll., MNHN) and Ivory Coast (Le Loeuff coll., MNHN).

Distribution: In the Mediterranean only off the NW African coasts; in the E Atlantic as far south as Ivory Coast, continental shelf.

Remarks: E. vittatum has only been cited from Oran (Pallary 1900) since Jeffreys' description although it is apparently not rare within its range. The description by Franchini (1975:7) is not clear and his figure depicts a shell that is too broad to be *E. vittatum*.

E. vittatum can be recognized by its rather solid shell, pinkish in colour, with thick axial lamellae, some of which form varices. The lamellae have a weak but distinct spiny projection. A strong microsculpture, more or less reticulated, is present between the ribs. The protoconch has 4 whorls, with no subsutural spiral thread (fig. 1174).



Figs 1193-1195. Genus *Epitonium*. 1193-1194, *E. vittatum*, off Bizerte, Tunisia, 6.8 mm. 1195, *E. celesti*, BALGIM CP25, 25.0 mm.

It is not similar to other deep water Epitoniidae treated here, and resembles most the upper shelf species *E. cantrainei* (Weinkauff) (fig. 1208) and *E. turtonis* (Turton) from which it differs by the microsculpture (fig. 1194) and/or spiny lamellae.

Epitonium semidisjunctum (Jeffreys, 1884) Figs 1172, 1196

Scalaria semidisjuncta Jeffreys, 1884:135, pl. 10 fig. 7.

Type material: 7 syntypes in USNM and BMNH, as listed by Warén 1980:30.

Type locality: The syntypes are from 3 different PORCUPINE stations, st 16, 17, 17a, 39° 39 to 39° 55N, 09° 39 to 09° 56W, 1100-2005m.

Material examined: The type material and 7 additional shs from PORCUPINE st 17; MONACO st 211, 39° 18N, 31° 12W, 1372m, 2 shs; st 553, 37° 43N, 25° 05W, 1385m, 1 sh; st 683, 38° 20N, 28° 05W, 1550m, 1 sh; st 703, 39° 21N, 31° 06W, 1360m, 17 shs; BARTLETT 37° 16N, 33° 19W, 1600m, 1 sh.

Distribution: The bathyal zone of Portugal and the Azores; only cited from one other MONACO station in the Azores (Material not seen).

Remarks: E. semidisjunctum cannot be confused with any other species in the N. Atlantic. Species of *Eccliseogyra* have broader shells, with undulating, not spiny axial lamellae; no other species has open coiling.

The protoconch has about 3 whorls with one distinct subsutural spiral thread and 1-2 rather indistinct groves just below that thread (fig. 1172).

Epitonium fischeri (Watson, 1897) Figs 1167, 1197

Scalaria fischeri Watson, 1897: 252, pl. 19, fig. 19.
Scala pauli de Boury, 1913b: 95 (new name for *S. fischeri* Watson, 1897 non *S. fischeriana* Tapparone-Canefri, 1876).

Type material: Lectotype, here selected, in the National Museum of Wales, Cardiff.

Type locality: Madeira, «deepish water».

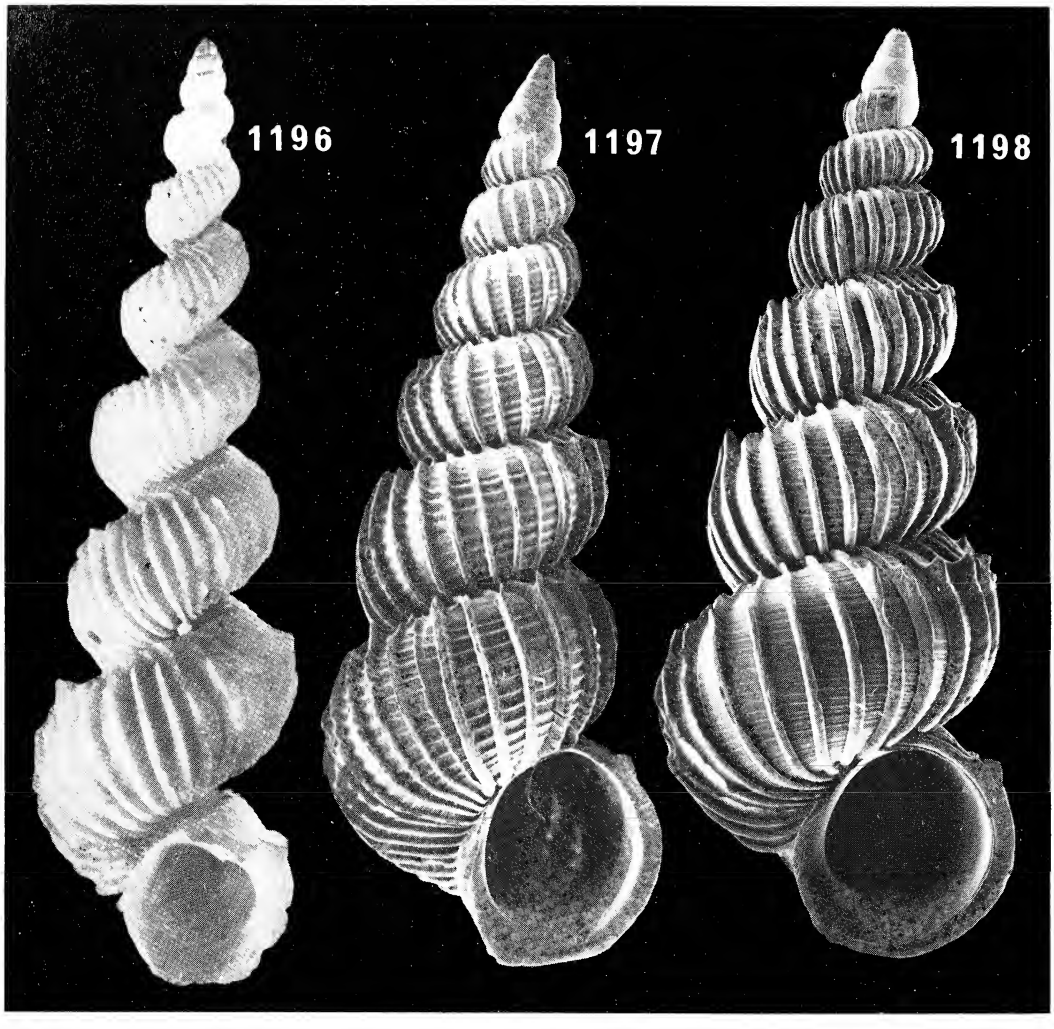
Material examined: The type material and 20 other shells from Madeira, mostly in Cardiff Museum.

Distribution: Only known from Madeira.

Remarks: For comparative remarks with *E. tryoni* see that species (p. 504).

A very strong spiral sculpture similar to that of *E. fischeri* is also present in *E. algerianum*, but that species has fewer, more prosocline axial lamellae, broader outlines, and a protoconch with several subsutural spiral furrows (fig. 1170). *E. dendrophylliae* is broader, has non spiny axial lamellae and spiral colour bands. *E. tiberii* is broader, with fewer but more developped axial lamellae and a smaller protoconch with one subsutural spiral thread.

De Boury's name is unnecessary since *fischeri* and *fischeriana* are not homonyms.



Figs 1196-1198. Genus *Epitonium*. 1196, *E. semidisjunctum*, MONACO 703, 7.7 mm. 1197, *E. fischeri*, Madeira, 4.5 mm. 1198, *E.* Sp. B, BALGIM CP95, 5.0 mm.

Epitonium dallianum (Verrill & Smith, 1880)
Figs. 1180-1181, 1199-1200, 1203

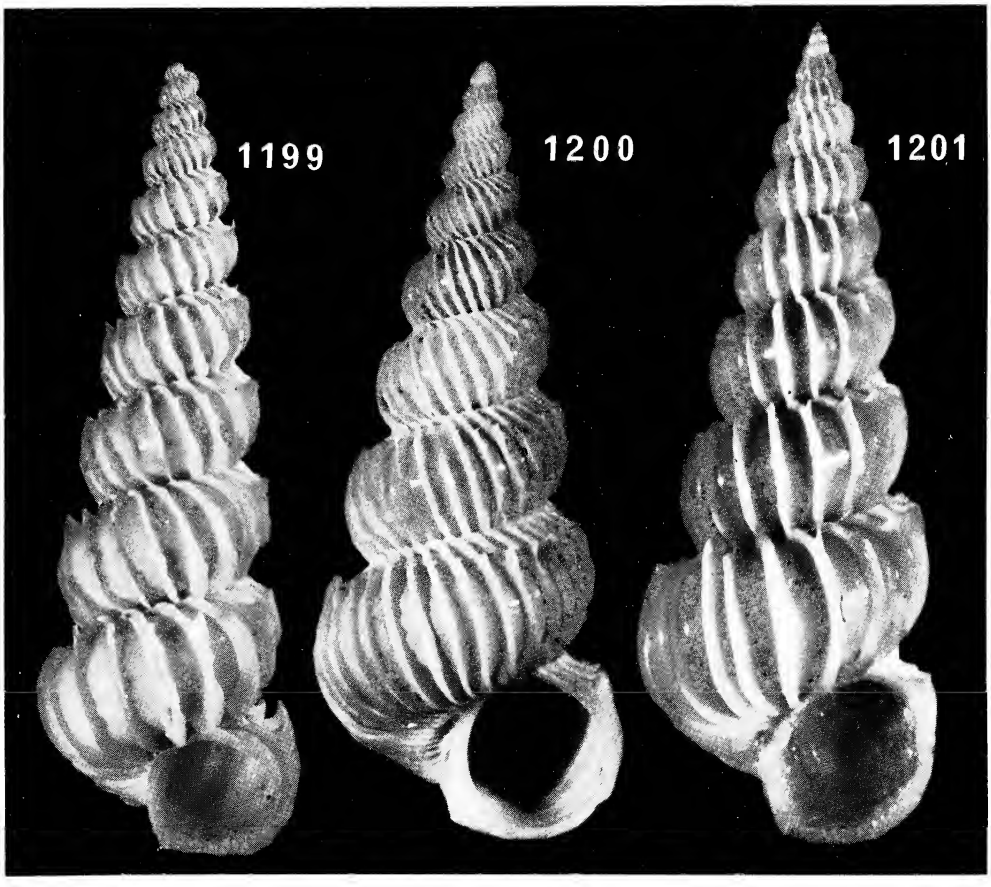
Scalaria dalliana Verrill & Smith, 1880:395; Verrill & Smith 1882:527, pl. 57, fig. 33.
Scalaria clathratula var. *producta* Jeffreys, 1884:136; Waren 1980: pl. 4, fig. 21-22.
Scalaria (Hyaloscala) problematica Dautzenberg & de Boury, 1897a: 31; 1897: 62, pl. 2, figs 11-12; Dautzenberg 1927: 157, pl. 4, figs 30-31.

Type material: S. dalliana, lectotype selected by Clench & Turner (1952:278) USNM 44795; *S. clathratula* var. *producta*, syntypes USNM 182715, 182728; *S. problematica*, figured syntypes in MOM.

Type locality: S. dalliana, FISH HAWK st 869, 40° 02N, 70° 23W, 353m (off New Jersey); *S. clathratula* var. *producta*, PORCUPINE st 16, 39° 55N, 09° 56W, 1800m (off Portugal); *S. problematica*, MONACO st 553, 37° 43N, 25° 05W, 1385m (Azores).

Material examined: The type material; about 60 shs from the type locality of *S. problematica*; TRAVAILLEUR 1880 dr 6, 43° 38N, 04° 09W, 1353m, 1 sh; 1882 dr 16, 42° 48N, 09° 37W, 627m, 1 sh; THOR st 93, 49° 25N, 12° 20W, 1180-1275m, 1 sh; SARSIA st 7614, 43° 43N, 03° 38W, 1100m, 1 sh; BIACORES st 148, 37° 34N, 25° 34W, 847-870m, 1 sh; st 240, 37° 35N, 25° 32W, 810-825m, 2 spms; THALASSA st Y380, 41° 29N, 09° 15W, 780m, 1 sh; st Z392, 47° 35N, 07° 01W, 390m, 1 sh; st Z397, 47° 34N, 07° 13W, 511m, 3 shs; st Z399, 47° 35N, 07° 18W, 825m, 1 sh; st Z400, 47° 33N, 07° 19W, 1175m, 3 shs; st Z402, 47° 39N, 07° 18W, 450m, 1 sh; st Z414, 48° 05N, 08° 30W, 650m, 1 sh; st Z417, 48° 12N, 09° 09W, 865m, 13 shs; st Z421, 48° 22N, 09° 33W, 950m, 2 shs; st Z431, 48° 38N, 09° 47W, 800m, 1 sh; st Z435, 48° 40N, 09° 53W, 1050m, 10 shs; st Z436, 48° 40N, 09° 56W, 1210 m, 1 sh; st Z442, 48° 55N, 11° 02W, 975m, 6 shs; st Z457, 48° 38N, 09° 53W, 800m, 3 shs.

Distribution: The continental slope of W. Europe, the Azores and the W. Atlantic. Not known in the Mediterranean.



Figs 1199-1201. Genus *Epitonium*. 1199-1200, *E. dallianum*, respectively 1199, THALASSA Z457, 15.2 mm and 1200, THALASSA Z400, 10.8 mm. 1201, *E. linctum*, off Bonifacio, Corsica, 13.7 mm.

Remarks: E. dallianum is characterized by its sculpture consisting of axial lamellae equipped with a spine and absence of spiral sculpture. In dead shells the lamellae are often eroded (fig. 1203) and the spine is lacking (this was the condition of Jeffreys' specimens): such shells may resemble *E. clathratulum* (fig. 1204) but they have more numerous lamellae and their base is more concave than in *clathratulum*.

The protoconch is rather blunt, brownish, and consists of 3 - 3.5 whorls with one strong subsutural thread (figs 1180-1181). In *E. linctum*, the protoconch is slightly more conical and consists of 3.5 whorls without a strong subsutural thread (fig. 1177).

De Boury (1917: 329) included *S. problematica* in the new subgenus *Lepidiscala*, with *S. biali* de Boury as type species. *Scala biali* is a manuscript name and *S. problematica* becomes the type species of *Lepidiscala* by monotypy.

Epitonium linctum (de Boury & Monterosato, 1890) Figs 1177, 1201-1202

Scalaria frondicula of authors on Recent Mediterranean molluscs, not S. Wood, 1848.
Scalaria lincta de Boury & Monterosato, in de Boury, 1890:303.

Type material: Lectotype, here selected, in MNHN (coll. de Boury): fig. 1202.

Type locality: The label accompanying the lectotype only says «Sicily»; it probably originates from the Palermo or San Vito localities of Monterosato.

Material examined: The type material and Siracusa, Sicily, 50-60m, 1 spm, 1 sh (coll. Ebreo); Bocche di Bonifacio, Corsica, from stomach of *Astropecten*, 1 sh (coll. Giannini); N'DIAGO st 245, 17°54N, 16°29W, 145m, 1 sh; st 305, 19°06N, 16°44W, 200m, 1 sh (both MNHN).

Distribution: The species is known with certainty only from the W Mediterranean (Monterosato 1872:39, 1878:90; Jeffreys 1884:137 and the material listed above) and from the Mauretanian shells listed above. In the original description, de Boury (1890:302) also referred to Atlantic material from off Arcachon, Bay of Biscay, which could not be found; this record is considered doubtful.

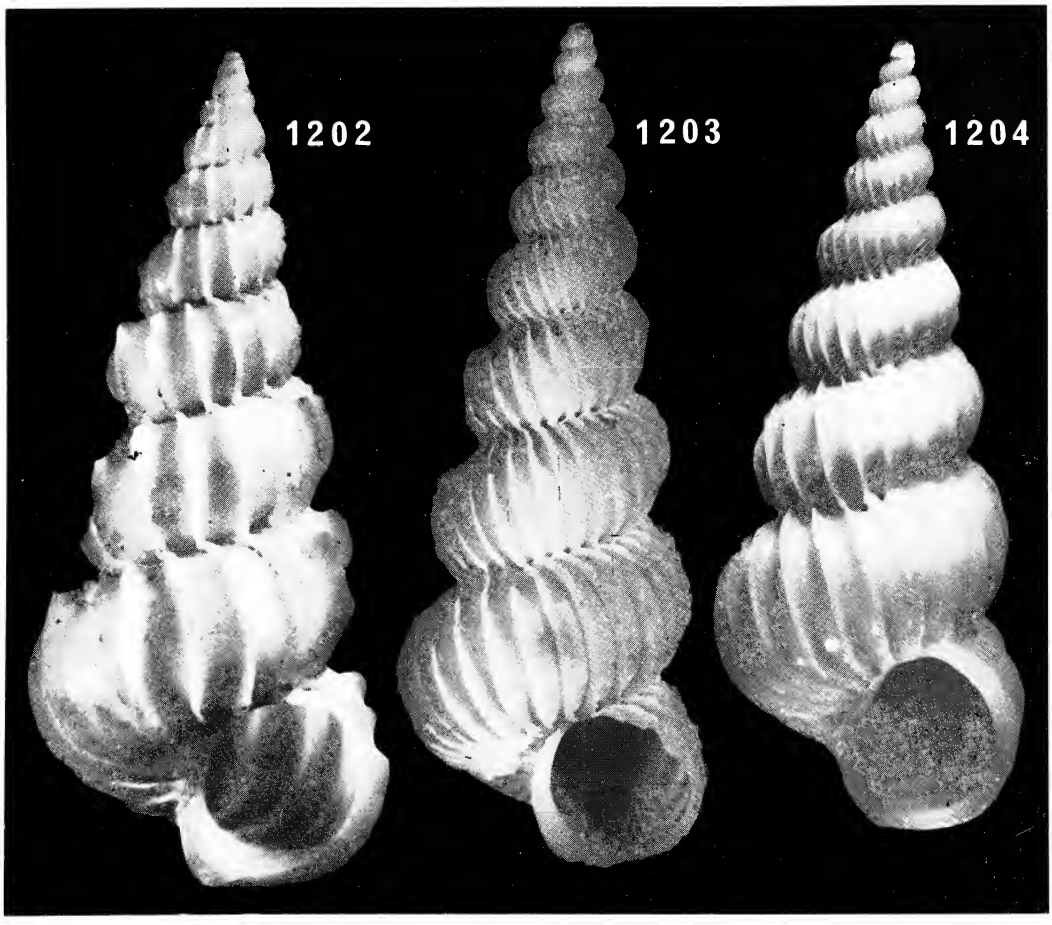
Remarks: This is another very rare species that was not figured until Franchini figured it (1976:3, center figure), despite a good original description by de Boury.

E. linctum is characterized by its smooth polished white shell, with no trace of spiral sculpture, its axial lamellae, each with a spiny projection and very small umbilicus. This combination of characters is found in only one other Mediterranean species, *E. hispidulum*, which has a smaller protoconch, more numerous flexuous lamellae and which has the spiny projection situated much lower on the whorl.

The most similar species is *E. dallianum* (figs 1199-1200) which differs by having more numerous axial lamellae; in *E. linctum* the whorls are a little disjunct while coiling is more normal in *dallianum*. The protoconchs are also different (figs 1177, 1180-1181).

Epitonium sp.A differs by its broader shell, fewer lamellae and stronger spiny projection; the lamellae of one whorl are attached to the lamellae of the whorl above and below.

E. linctum is the type species of *Linctoscala* Monterosato, 1890 by subsequent designation by de Boury (1891:209).



Figs 1202-1204. Genus *Epitonium*. 1202, *E. linctum*, lectotype, 7.5 mm. 1203, *E. dallianum*, MONACO 553, shell with worn spines, 10.6 mm. 1204, *E. clathratulum*, Bay of Biscay, 112 m, 8.6 mm.

Epitonium spiniferum (Seguenza, 1876) Figs 1205-1206

Scalaria spinifera Seguenza, 1876:96; de Boury 1890:242.
Linctoscala lacerata Monterosato, 1890: 149.
Linctoscala spinifera, de Boury 1891:192, pl. 4 fig. 1.
Scala phyllonota Brugnone in Cossmann, 1912: pl. 1, fig. 32.

Type material: S. spinifera, not known (the Seguenza collection was destroyed early this century); *L. lacerata*, syntypes in coll. de Boury, MNHN; *S. phyllonota*, probably in coll. Cossmann, Université Paris 6 (not seen).

Type locality: S. spinifera and *L. lacerata*, Pleistocene of Ficarazzi, Sicily; *S. phyllonota*, Pliocene of Altavilla, Sicily.

Material examined: 5 samples (12 shells) from Ficarazzi and Altavilla, some of them sent by Monterosato and labelled *spinifera, lacerata* or *phyllonota*; 2 shs from Monte Mario.

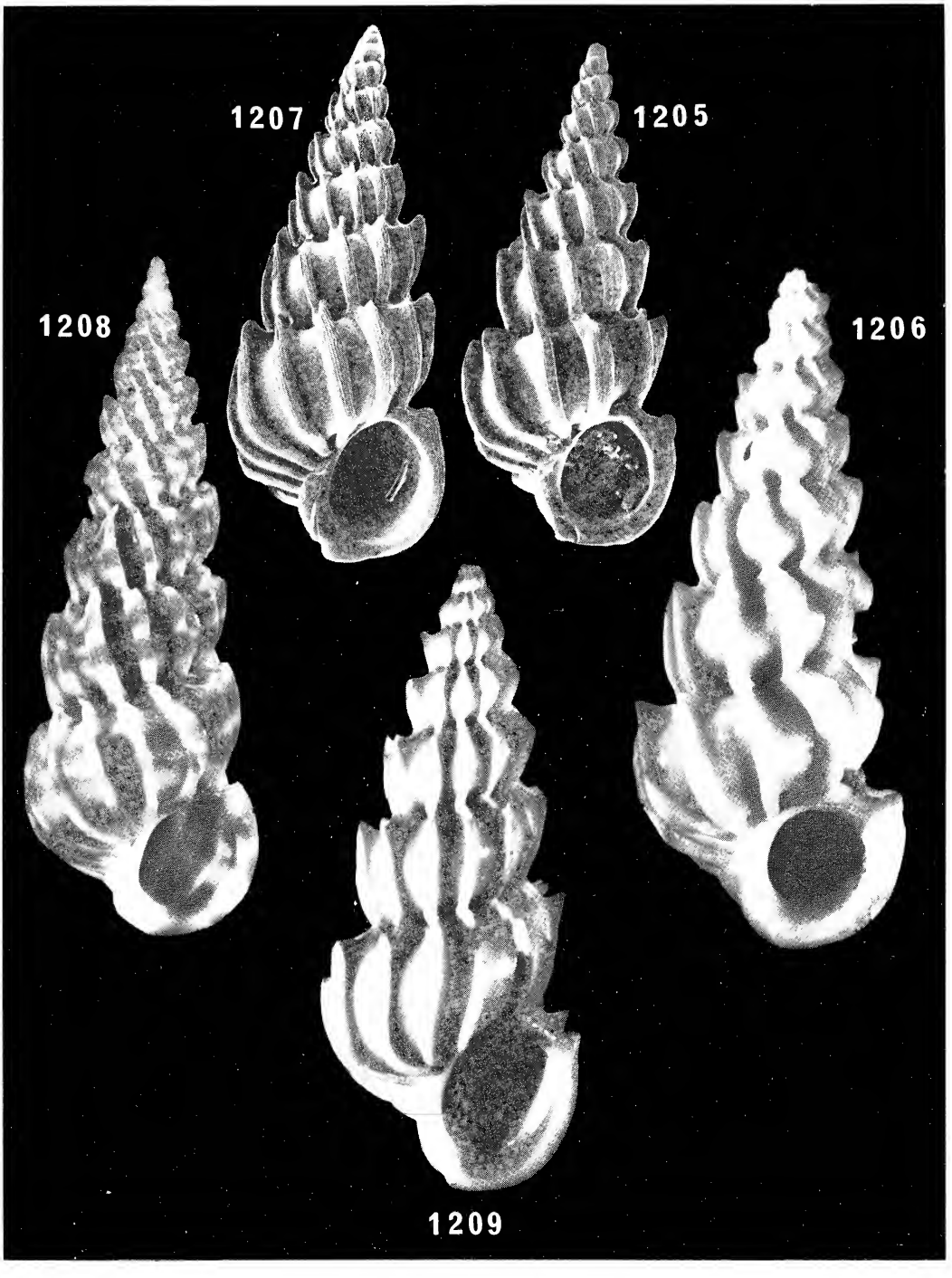
Remarks: This species was never recorded as Recent by Monterosato who is usually given credit for listing *E. spiniferum* in deep water off Palermo. All published figures (by Kobelt, Nordsieck, Franchini) are copied from de Boury (1891) who figured a fossil from Ficarazzi. Stolfa Zucchi (1970:47) cites *Scala spinifera* as Recent in the N. Adriatic but her figures show *E. cantrainei*; the same remark applies to the shell figured as *E. spiniferum* by Albanesi et al. (1979).

Epitonium spiniferum is apparently the direct ancestor to *E. cantrainei*; they have the same colour band and the lamellae form the same projections. Juveniles of the two species are almost indistinguishable, but adults of *spiniferum* are broader with fewer, more developed lamellae (figs 1205-1208).

We have not tried to investigate the relations between *E. spiniferum* and the fossil species sometimes described as *E. muricatum* (Risso), since this was beyond the scope of this work, and would not affect the taxonomy of Recent European Epitoniidae.

Epitonium spiniferum should be excluded from Mediterranean faunistical lists.

Figs 1205-1209. Genus *Epitonium*. 1205, *E. spiniferum*, Monte Mario, Italy, young specimen, 7.1 mm. 1206, *E. spiniferum*, «Palermo» (coll. de Boury), 22.7 mm. 1207, *E. cantrainei*, St Raphaël, SE France, young specimen, 4.6 mm. 1208, *E. cantrainei*, Adventure Bank, 13.0 mm. 1209, *E.* sp.A, Tuscan archipelago, 21.3 mm.

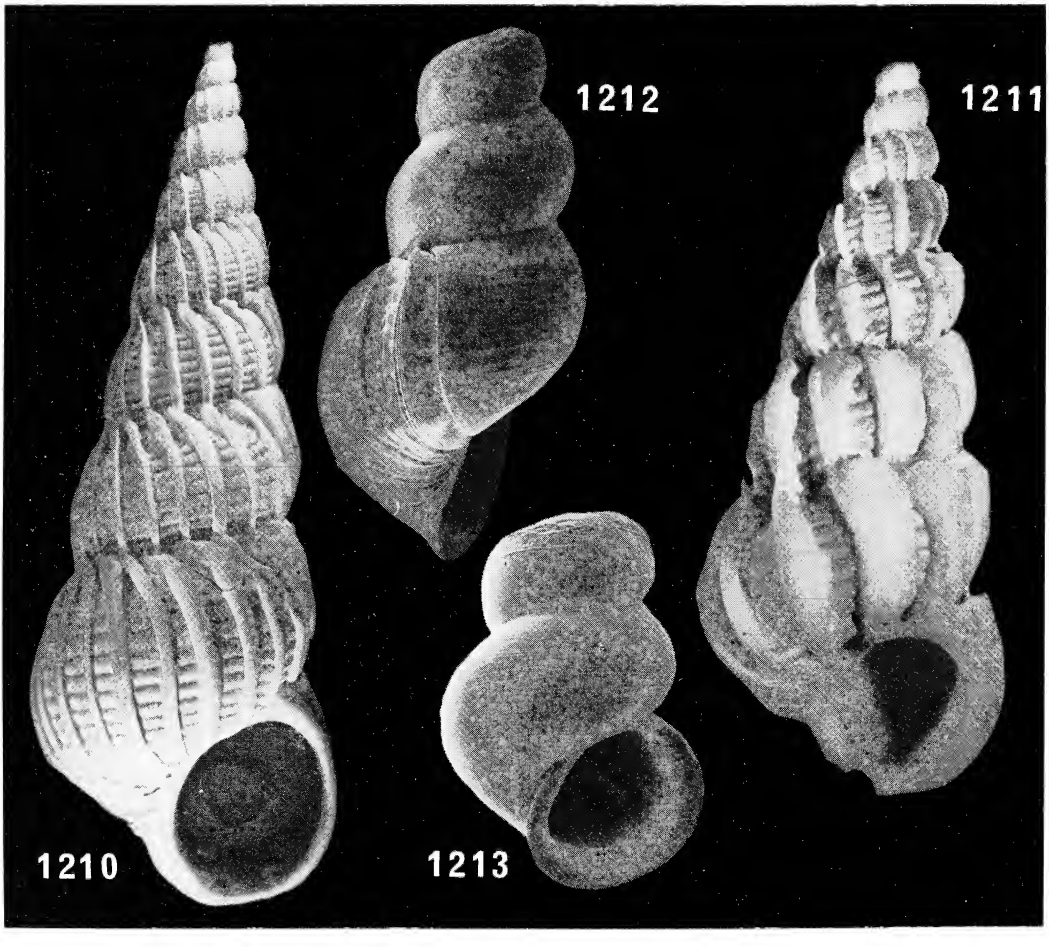

1207
1205
1208
1206
1209

Epitonium greenlandicum (Perry, 1811) Figs 1106, 1210-1213

Scalaria greenlandica Perry, 1811:pl. 28, fig. 8.
Scalaria subulata Couthouy, 1838:93, pl. 3, fig. 4.
Scalaria planicosta Kiener, 1839:18, pl. 7, fig. 21.
Scalaria groenlandica var. *crebricostata* G.O. Sars, 1878:194, pl. 23, fig. 1.
Scalaria lovenii A. Adams, 1856:1.
Scalaria groenlandica var. *major* and var. *angustior* Kobelt, 1888:77.
Scalaria groenlandica var. *ornata* Friele & Grieg, 1901:79 (non *Scalaria ornata* Baily, 1855).
Epitonium greenlandicum norvegicum Clench & Turner, 1952:323 (new name for *S. groenlandica* var. *ornata* Friele & Grieg).

Type material: S. greenlandica, not located; *S. loveni*, Cambridge Museum.

Type locality: S. greenlandica, restricted by Clench & Turner (1952:320) to Godthaab, SW Greenland.



Figs 1210-1213. *Epitonium greenlandicum*. 1210, Greenland, 39 mm. 1211, 66°23N, 20°15W, 80 m, 20.0 mm. 1212, very young specimen, Trondheimfjord, Norway, 1.95 mm. 1213, recently hatched juvenile, Bergen area, Norway, 1.4 mm.

Material examined: Several hundred spms + shs from the N. Atlantic part of the distribution area.

Distribution: From Spitzbergen (Knipowitsch 1902) along the coasts of Norway to Oslofjord (Sars 1878; numerous records, material in ZMO, ZMC), N, E and W coasts of Iceland (Thorson 1941 and material in ZMC and SMNH); very rare or absent in E Greenland (Thorson 1944:42); W Greenland (Posselt 1898 and material in ZMC), along NE America to 41° N (Clench & Turner 1952). Also around the Arctic basin (Herzenstein 1885:684; Aurivillius 1886:330; McGinitie 1959: 83) and in the N Pacific south to British Columbia (material in USNM) and the Sea of Japan (Golikov & Scarlato 1967). From 20 to 650 m.

The southernmost record off Europe is LIGHTNING st 2, 60° 24N, 06° 38W, 310m, S of Faeroes (Jeffreys 1884: 137).

Remarks: This is a very characteristic species, reaching 60 mm although usually much smaller in the European part of its range. The shell is solid, heavy, with strong spiral sculpture and broad, thickened axial lamellae. The names *loveni* and *norvegicum* reflect only individual variation.

E. greenlandicum has direct development; the larval shell resembles rissoids (fig. 1213). The ecology and feeding behavior has been studied by Perron (1978) in NE United States, where it feeds preferentially on the sea-anemone *Metridium senile.*

Epitonium greenlandicum is the type species of *Boreoscala* Kobelt, 1902. Synonyms: *Arctoscala* Dall, 1909 and *Liriscala* de Boury, 1909, based on the same type species.

Epitonium pseudonanum n.sp. Figs 1179, 1214

Scalaria pulcherrima Monterosato, 1872: 39 (*nomen nudum*), non *Scalaria pulcherrima* Sowerby, 1844.
Scalaria formosa Monterosato, 1875: 12 (*nomen nudum*); 1878: 90 (*n. n.*); 1890: 150 (*n. n.*).
Epitonium or *Scalaria nana* of Mediterranean authors, not Jeffreys, 1884.

Type material: Holotype in MNHN.

Type locality: Off Oran, Algeria, 60m (Pallary coll.).

Material examined: The type material and TRAVAILLEUR 1881, no station number (but judging from the depth, probably dr 1, 43° 01N, 09° 37W, 2018m), 1 sh (USNM 182460: Jeffreys 1884: 135); Pantellaria, between Sicily and Tunisia, 75m, 1 spm (BMNH); Siracusa, Sicily, 50m, 1 sh (coll. Ebreo); golfo di Napoli, Italy, 72m, 1 sh (coll. Fassulo, figured in Albanesi et al. 1979: 8); Capraia, Tuscan archipelago, 160-200m, 7 shs (coll. Giannini, figured 1975: pl. 1, fig. 2); Tuscan archipelago, 180m, 1 sh (coll. Piani); Secca delle Vedove, Tuscan archipelago, 90-120m, 2 shs; Cà dell'Oro, Portofino, N Italy, 40m, 1 sh (coll. Piani).

Distribution: The continental shelf of the W Mediterranean, 50-200m; the record from Bay of Biscay requires confirmation as mixing of samples might have occured.

Description: Shell small, solid, pupiform, consisting of 3 larval and 3.5 postlarval whorls. Protoconch with convex whorls, opisthocyrt incremental lines and one subsutural spiral thread (fig. 1179). Teleoconch with convex whorls and impressed suture; the sculpture consists of thick axial lamellae and raised spiral cords. There are 22 lamellae on the body whorl. No basal cord, no basal disc. Aperture ovate, with peristome continuous over the parietal area, thickened outer lip. No umbilicus. Colour of the shell creamy white, protoconch light brown.
Dimensions: height of the shell 2.2 mm, breadth 1.2 mm; aperture height 0.8 mm.

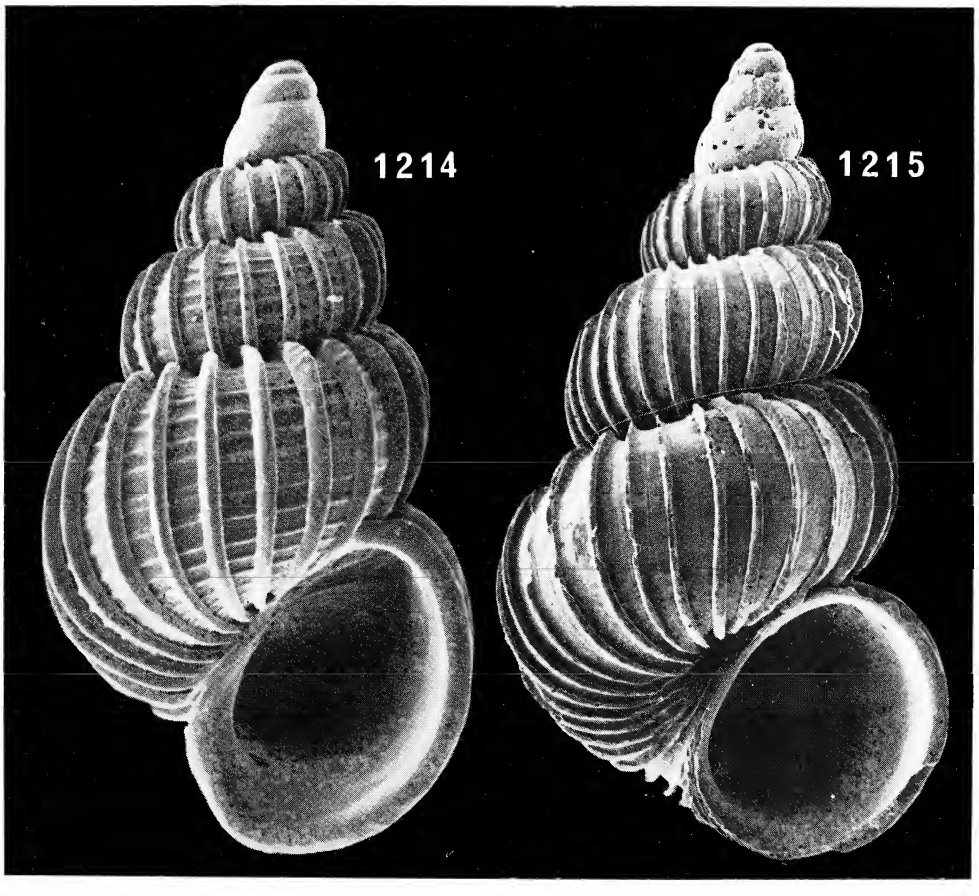
Remarks: This species has been figured several times recently in the Italian literature under the name *Epitonium nanum* (Giannini 1975: pl. 1, fig. 2; Carrozza 1975: pl. 1, figs. 2-3; Franchini 1975: 6; Albanesi et al. 1979: 8; Terreni 1981: pl. 2, fig. 14). It differs from *E. nanum* (which does not live in the Mediterranean) by its more solid shell, thicker and fewer axial lamellae and spiral sculpture. *E. pseudonanum* is a very characteristic species and can hardly be confused with any other Mediterranean species.

Epitonium nanum (Jeffreys, 1884) Figs 1178, 1215

Scalaria nana Jeffreys, 1884: 134, pl. 10, fig. 6.

Type material: Lectotype, here selected, in USNM 182462; paralectotypes (USNM, BMNH: see Warén 1980: 30) belonging to several species.

Type locality: The lectotype is from PORCUPINE st 9, 48° 06N, 09° 18W, 985m (N of Bay of Biscay).



Figs 1214-1215. Genus *Epitonium*. 1214, *E. pseudonanum*, Oran, Algeria, holotype, 2.2 mm. 1215, *E. nanum*, MONACO 1311, 2.7 mm.

Material examined: The type material and PORCUPINE st 16, 39° 55N, 09° 56W, 1800 m, 3 shs; st 17, 39° 42N, 09° 43W, 1100-2005m, 23 shs; st 17a, 39° 39N, 09° 39W, 1355m, 3 shs; MONACO st 233, 38° 33N, 28° 09W, 1300m, 3 shs; st 578, 38° 26N, 26° 31W, 1165m, 1 sh; st 1311, 37° 37N, 25° 21W, 1187m, 4 shs; BIACORES st 64, 38° 43N, 28° 29W, 1200-1240m, 1 sh; CHAIN 50 st 87, 39° 49N, 70° 41W, 1102m, 1 spm.

Distribution: The bathyal zone of the NE Atlantic, from the Bay of Biscay to the Azores. Not in the Mediterranean. Only known with certainty from the material examined.

Remarks: This is not *E. nanum* of Mediterranean authors, see under *E. pseudonanum*. *E. nanum* is characterized by its small adult size (max. 3.2 mm) with 3.5 postlarval whorls. It has numerous axial lamellae which are not spiny and it has no spiral sculpture. The umbilicus is always open. The protoconch has 3 whorls with two rather indistinct subsutural spiral threads (figs 1178).

It differs from *E. hispidulum* by its more numerous and spineless lamellae; in *hispidulum* the lamellae are distinctly spiny and slightly sinuous. In general shape, *E. nanum* is also much broader.

E. nanum is the type species of *Minutiscala* de Boury, 1909 by original designation.

Epitonium striatissimum (Monterosato, 1878) Figs 1176, 1216

Scalaria striatissima Monterosato, 1878b: 151.
Scala rushii Dall, 1889: 313; Clench & Turner 1952: 296, pl. 136.

Type material: S. striatissima, holotype (or syntype) in ZMR; *S. rushii*, holotype USNM 83698.

Type locality: S. striatissima, Palermo, Sicily; *S. rushii*, ALBATROSS st 2596, 35° 08N, 75° 10W, 90m (off Cape Hatteras, North Carolina).

Material examined: The type material of *S. rushii*. (We have not been able to examine Monterosato's type material in Roma, the collection being unavailable since Prof. Settepassi's death. However Dr Sabelli and Mr Fasulo kindly put at our disposal notes and photos of the type material they had made several years ago.); Acitrezza, Sicily, 1 sh; Haifa Bay, Israël, 33-40 m, 5 shs; Madeira, 23 shs; several lots from the W Atlantic, cited by Clench & Turner (1952: 297).

Distribution: The continental shelf of the southern Mediterranean, Madeira, and of the SE United States from North Carolina to Florida. Monterosato (1880: 69) cites material from Alger and the Canaries, but confusion with *E. dendrophylliae* is possible.

Remarks: E. striatissimum was never figured by Monterosato or any of his contemporaries. The description is very short and has been interpreted erroneously by Jeffreys (1884: 140) and Dautzenberg (1927: 148). The first and only figure was published by Franchini (1975: 17) on the basis of material from the Israeli coast.

Except perhaps off Israël (Mienis 1981: 199) *E. striatissimum* is a very rare species and few specimens exist either in Museum or private collections. It has almost always been confused with *E. dendrophylliae*. *E. striatissimum* is a more slender species, with less convex whorls; its axial lamellae are very thin and fragile and become higher in the subsutural zone (in *dendrophylliae* the lamellae are stronger and remain unchanged in the subsutural zone). The spiral cords are more numerous in *striatissimum*, and there is a distinct microsculpture of incremental lines (absent in *dendrophylliae*).

Acrilloscala lamyi also has a superficial resemblance to the present species, but is more slender, has fewer axial lamellae, some of which form varices, and it has a basal disc.

Epitonium dendrophylliae n.sp. Figs 1175, 1217-1218

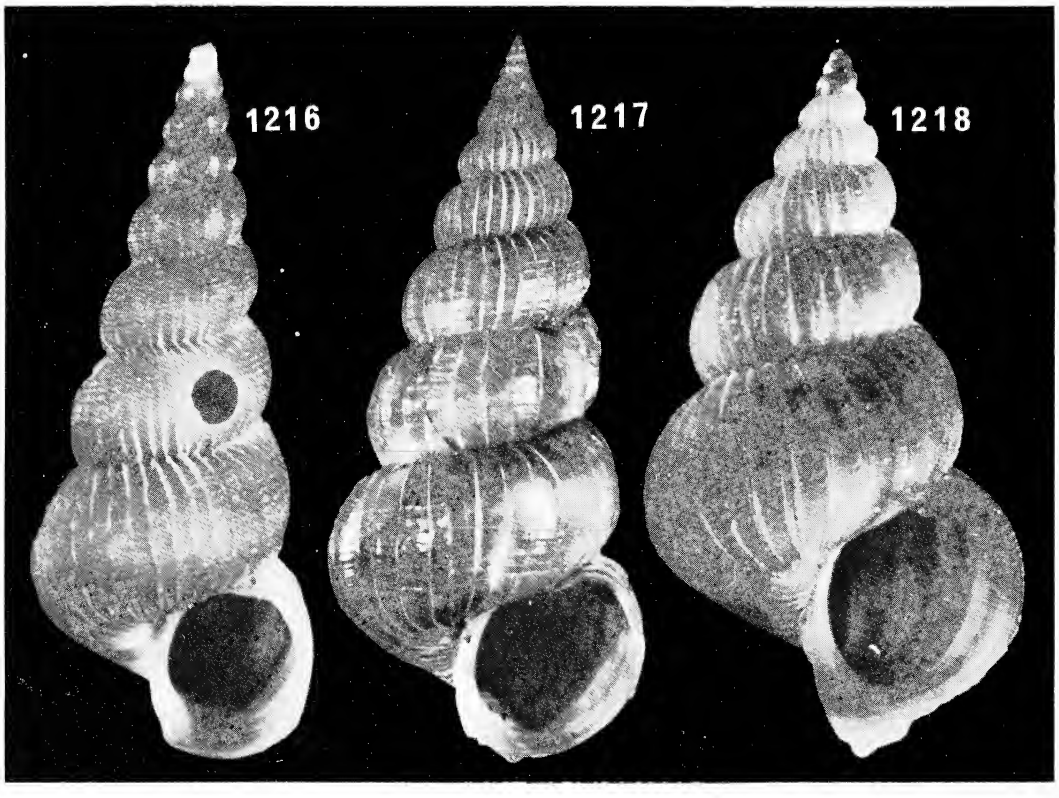
Type material: Holotype and one paratype in NMW.

Type locality: Madeira, depth unknown.

Material examined: The type material and off Siracusa, Sicily, 40-50 m, on *Dendrophyllia ramea* (Linné, 1758), 1 spm (coll. Ebreo); Adventure Bank, between Sicily and Tunisia, 170m, 2 fragments; Capraia, Tuscan archipelago, 120-150m, 1 sh (coll. Giannini); Pleistocene deposits near Reggio Calabria, S Italy, 1 sh (coll. Crovato); Asilah, Atlantic coast of Morocco, deep shelf, on *Dendrophyllia ramea*, 2 spms (Gofas coll.); BALGIM st DW157, 36°21N, 07°56W, 1108m, on *Balanophyllia cellulosa* Duncan, 1878, 2 spms; Ilha de Luanda, Angola, 40-60m, on *Dendrophyllia* sp. (*D. anastomozans* sensu Monod 1954), 1 spm (Gofas coll.).

Distribution: The deep shelf and bathyal zones of the E Atlantic and W Mediterranean, parasitic on the corals *Dendrophyllia* and *Balanophyllia.* Only known from the material examined.

Description: Shell of medium size, thin, fragile, consisting of 3 larval and 5.5 postlarval whorls. Protoconch with very convex whorls, a sculpture of opisthocyrt incremental lines and no subsutural spiral thread. Teleoconch with very convex whorls and deep suture. Sculpture of rather



Figs 1216-1218. Genus *Epitonium.* 1216, *E. striatissimum*, Haifa Bay, Israël, 33 m, 8.5 mm. 1217, *E. dendrophylliae*, off Siracusa, Sicily, 40-50 m (coll. Ebreo), 15.7 mm. 1218, *E. dendrophylliae*, Madeira,holotype, 5.6 mm.

strong, not spiny, axial lamellae and very distinct but fainter spiral cords. There are about 28 lamellae per whorl, more close set in the earlier whorls, and about 12 spiral cords on the penultimate whorl. Aperture rounded. Outer lip thin (a little broken), inner lip reflected over the columellar zone. No umbilicus. Colour yellowish white with 2 rather indistinct brown spiral bands. Protoconch glossy, light brown.
Dimensions: height 5.6mm, breadth 3.0mm; aperture diameter 1.5mm.

Remarks: The specimen in coll. Ebreo has 9 postlarval whorls and is 15.2mm high. It has the characters of the holotype, with secondary weaker spiral cords on the body whorl (fig. 1217).

E. dendrophylliae is a rare species that was confused by Monterosato with his own *striatissimum* (ms. label by Monterosato with the Adventure bank sample in BMNH). For distinction of the two species, see under *striatissimum.*

Juveniles of *E. dendrophylliae* resemble *E. pseudonanum*, but have a broader shell with a brownish background colour instead of whitish. The protoconch of *pseudonanum* has one subsutural spiral thread (none in *dendrophylliae).*

The coral hosts were identified by Dr H. Zibrowius, who also brought to our attention an epitoniid that he found attached to *Balanophyllia stimpsoni* (Verrill, 1865) in the Indian Ocean (INVESTIGATOR: 06°01N, 81°16E, 60m; BMNH). This is a very similar species, with a similar sculpture of spineless axial lamellae and distinct spiral cords.

Epitonium billeeanum (DuShane & Bratcher, 1965), also a parasite of *Dendrophyllia* and *Tubastraea* (Robertson & Schutt 1984), differs mostly by its open umbilicus. These species are certainly related and this might be an indication that the characters of the sculpture have taxonomical value.

Epitonium sp.A — Fig 1209

Material examined: one shell from Capraia, Tuscan archipelago, depth unknown (coll. Ebreo).

Remarks: This unique shell cannot be identified with any other described European species. It differs from *E. spiniferum* by being totally white, without trace of spiral band or colour marks; it has more numerous, flexuous, axial lamellae.

It does not appear to be a freak or deviant, but further work on it must await collection of a second specimen.

Epitonium sp.B — Figs 1168, 1198

Material examined: BALGIM st CP95, 34° 24N, 07° 39W, 1378m, 1 sh.

This *Epitonium* is characterized by its spiral sculpture and axial lamellae with spines. In this respect it belongs to the group of species comprising *E. algerianum, E. tiberii, E. tryoni* and *E. fischeri*, but differs from them by the following characters:
E. algerianum and *E. tiberii* are proportionally broader and have fewer lamellae; *E. tryoni* has a very distinct umbilicus and small protoconch; *E. fischeri* has the same proportions of the shell, but its spiral sculpture is stronger and its larval shell is more conical, without any subsutural thread.

Epitonium sp.B is probably a distinct, undescribed species.

Genus *ACRILLOSCALA* Sacco, 1891

Acrilloscala Sacco, 1891:86.

Type species: (by monotypy) *Turbo geniculatus* Brocchi, 1814.

Sacco introduced *Acrilloscala* as a subgenus of *Clathroscala* de Boury, 1890, but in that genus the basal disc is very distinct and the axial ribs extend across it. The axial ribs are sometimes thickened to form varices, and there is a finely reticulate microsculpture between the lamellae. We do not know the taxonomic value of these characters, but follow Cossmann (1912:65) who regarded them as distinct genera, with *Bifidoscala* Cossmann, 1888 as a subgenus of *Acrilloscala*. We do not know the relations between *Acrilloscala* and *Bifidoscala*.

Acrilloscala can be used for a group of Pliocene and Recent E. Atlantic species characterized by a poorly defined basal disc over which the axial ribs extend.

Acrilloscala lamyi (de Boury, 1909)

Figs 1104, 1107, 1173, 1219-1221

Scala or *Scalaria geniculata* of authors on Recent molluscs, not Brocchi, 1814.
Scala lamyi de Boury, 1909b: 480.

Type material: Holotype in MNHN.

Type locality: Bay of Biscay, *ex* Locard (probably from CAUDAN or TRAVAILLEUR dredgings in the southern part).

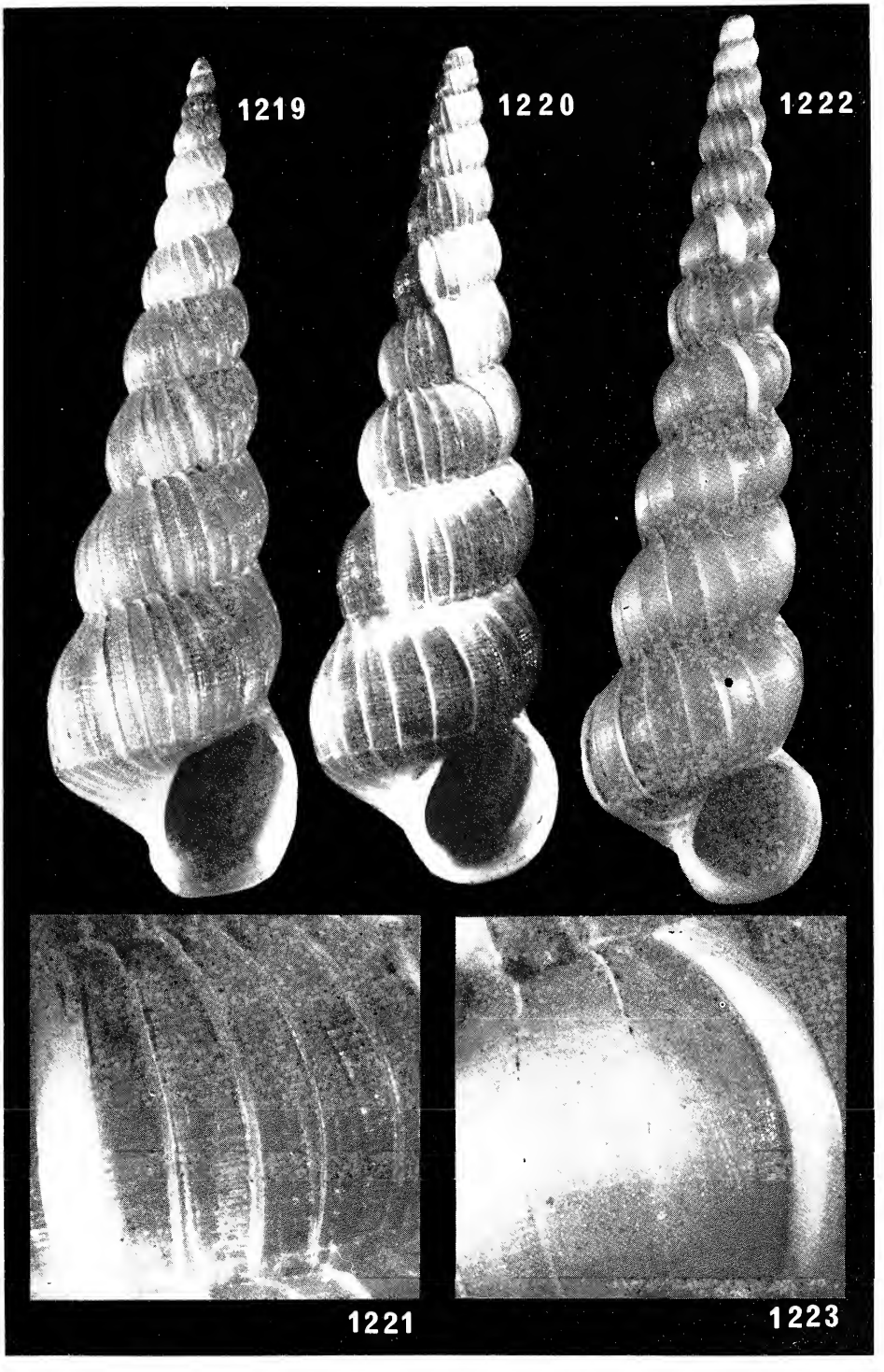
Material examined: The type material and PORCUPINE st 50-50a, off Algeria, 4 shs; st 3, 48°31N, 10°03W, 1260m, 2 shs; st 6, 48°26N, 09°44W, 650m, 2 shs; Bay of Biscay, 185m, 1 spm (Jeffreys 1884: 133); THALASSA st Z416, 48°13N, 09°07W, 480m, 2 shs; st Z458, 48°42N, 09°53W, 350m,1 sh; st J563, 49°09N, 09°04W, 143m, 1 sh; N'DIAGO st 339, 19°45N, 17°24W, 85m, 1 sh; Ficarazzi, Sicily, Pleistocene fossil, *ex* Monterosato, 1 sh; Saracinello (Calabria), S Italy, Tyrrhenian (Pleistocene) fossil, 1 sh (coll. Crovato).

Distribution: Deep shelf and upper bathyal zones of S and SW Europe, from the Bay of Biscay to Mauritania, including the Mediterranean.

Remarks: A. lamyi has consistently been confused with the Pliocene *A. geniculata* (fig. 1222), except by de Boury who introduced the name *lamyi* for the Recent European species. The distinction however seems to have been overlooked by subsequent authors. De Boury (1913:282) commented again on the distinction between the European Pliocene and Recent forms and considered *A. tenuisculpta* (von Martens, 1882) to be the descendant of *A. geniculata* now living on the continental shelf of West Africa. We agree with this conclusion, but we should remark, after our examination of the type material of *fusca* in BMNH, that *tenuisculpta* is a synonym of *A. fusca* (Sowerby, 1844).

The holotype of *A. geniculata* Brocchi was figured by Pinna & Spezia (1978: pl. 57, fig. 3). *A. lamyi* differs from *A. geniculata* by having more numerous axial lamellae and stronger spiral microsculpture (figs 1221, 1223). It reaches 35mm.

The protoconch of *lamyi* is multispiral and indicates planktonic larval development (fig. 1173).



Figs 1219-1223. Genus *Acrilloscala*. 1219, *A. lamyi*, Atlantic coast of Morocco, 5.2 mm. 1220-1221, *A. lamyi*, Bay of Biscay, 180 m, USNM 182469, 21.7 mm, 1222-1223, *A. geniculata*, Pliocene of Piacenza, specimen figured in Cossmann's Essais, 29.3 mm.

Genus *ACIRSA* Mörch, 1857

Acirsa Mörch, 1857:77.

Type species: Mörch included only one species *Scalaria borealis* Beck, which is a *nomen nudum*, and as synonyms «*Scalaria eschrichti* Holb. & Møll.» and «*S. undulata* Sow.». All type designations involving the names *borealis* Beck and *costulata* Mighels & Adams are therefore invalid, and *Scalaria eschrichti* Holböll in Möller, 1842 is here formally designated as type species.

Synonyms:
Hemiacirsa de Boury, 1890:268. Type species: *Turbo lanceolatus* Brocchi, 1814 (by original designation).
Plesioacirsa de Boury, 1909:256. Type species: *Scalaria subdecussata* Cantraine, 1835 (by original designation).
Pseudacirsa Kobelt, 1903:26. Type species: *Scalaria coarctata* Jeffreys, 1884 (subsequent designation by Nordsieck 1968:75).
Other genera based on fossil type species may be synonyms.

Species of *Acirsa* are characterized by a solid shell with broad axial ribs, and the absence of a basal cord and basal disc. Spiral sculpture of incised spiral groves is usually present.

Of the 3 species treated here, none is a bathyal or abyssal species. *A. subdecussata* and *A. coarctata* live on the deeper shelf and occasionally on the upper continental slope. *A. eschrichti* is a littoral species from the NW Atlantic and is included for comparison with *A. coarctata.*

Acirsa coarctata (Jeffreys, 1884) Fig. 1224

Scalaria obtusicostata Wood: G.O. Sars 1878:195, pl. 22, fig. 9.
Scalaria coartata Jeffreys, 1884:139 (*pars*). The spelling *coartata* is incorrect and *coarctata* is a justified emendation.

Type material: Jeffreys's name applies to an unrecognizable fragment from PORCUPINE st 16 (BMNH) and to the 2 shells figured by Sars (1878: pl. 22, fig. 9, pl. 34 fig. 9). Kobelt (1903:26) restricted the name *coarctata* to the shell figured on plate 22, which we formally designate lectotype. It is in ZMO D952.

Type locality: Vadsö, Norway.

Material examined: The type material and another shell from Vadsö, from a fish stomach (coll. Sykes, BMNH); Porsangerfjord, 200m, 1 sh; Balsfjordgrunden, Tromsö, 75m, 1 sh (Sparre Schneider 1897:106, right fig.); Vardö, 265m, 1 sh (Ibid.: left fig.; both in Tromsö Museum); Vardö, 8 shs, from fish stomachs; Tromsö, 2 shs (one figured by Kobelt 1902: pl. 62 fig. 8, in SMF); 72° 10N, 20° 37E, 350-400m, 1 sh (SMNH).

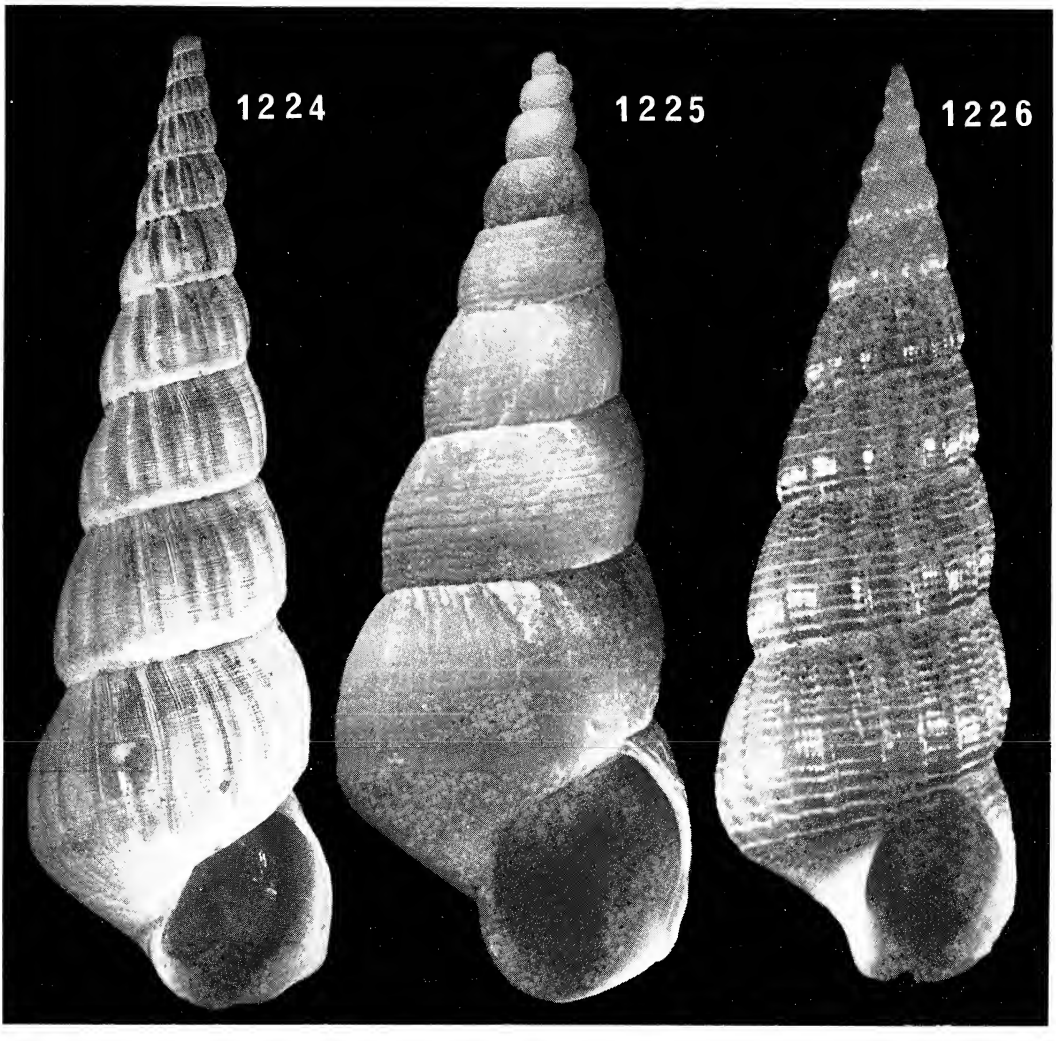
Distribution: Restricted to northernmost Norway, in 70-400m; beside the material examined there is a single reliable record from 72° 34N, 17° 20E, 385m (Knipowitsch 1902:543).

Remarks: A. coarctata was recorded (as *S. obtusicostata*) by Thorson (1941: 48) from Iceland and by Clarke (1974:6) from off S Greenland. We have examined the material on which these records were based (in ZMC and National Museum of Canada respectively) and they prøved to be *Eumetula arctica* (Mörch) (Cerithiellidae). *A. coarctata* was also recorded by Dautzenberg

(1927:154) from 3 stations off the Azores: we could find the material from one station only and it proved to be *Gregorioiscala sarsi.*

Kobelt (1903:26) restricted Jeffreys' name to the present species and renamed Sars' *S. varicosa* (1878: pl. 34, fig. 9) *S. sarsii.* He also copied pl. 60, fig. 14 from Sars and pl. 63, figs 7,9 from Sparre Schneider (1897: 106) but erroneously attributed fig. 9 to *Gregorioiscala sarsi.*

Acirsa coarctata is characterized by its axial ribs and spiral sculpture of raised threads, not grooves as in *A. eschrichti* or *A. subdecussata.* The protoconch indicates direct development.



Figs 1224-1226. Genus *Acirsa.* 1224, *A. coarctata*, Vardö, Norway, Tromsö Museum 13945, 53.8 mm. 1225, *A. eschrichti*, Davis Strait, lectotype, 20.1 mm. 1226, *A. subdecussata*, Madeira, 450-500 m, 7.9 mm.

Acirsa eschrichti (Holböll in Möller, 1842) Figs 1100-1101, 1115

Scalaria borealis Beck in Lyell, 1842:120 (nomen nudum).
Scalaria eschrichti Holböll in Möller, 1842:83.
Turritella costulata Mighels & Adams, 1842:50 (not *T. costulata* Borson, 1825).
Scalaria undulata Sowerby, 1844: 104, pl. 35, fig. 136 (*fide* Clench & Turner 1950).

Type material: S. eschrichti, lectotype, here selected, and 4 paralectotypes in Zoologisk Museum, Copenhagen.

Type locality: Davis Strait (ZMC label), Greenland.

Material examined: The type material and ca. 130 spms and shells from all over the distributional area.

Distribution: From Hudson Bay, N Canada (Macpherson 1971:41) and W Greenland from about 70°N (Thorson 1951: 103) to Massachussets, U.S.A. (Clench & Turner 1950: 230), on the shelf.

Remarks: A. eschrichti is known from the glacial deposits of Sweden (Thudén 1866:58; Odhner 1927: 107) and Pleistocene deposits in Great Britain (Harmer 1920:558), but is not known in Norway. It does not occur as Recent in the E Atlantic including Iceland and E Greenland.

This is not a deep water NE Atlantic species, but it is included here for comparison with *A. coarctata*, from which it differs by its coarser spiral sculpture and absence of axial ribs.

Acirsa subdecussata (Cantraine, 1835) Figs 1098, 1118, 1226

Scalaria subdecussata Cantraine, 1835:388; 1841: pl. 6 fig. 24.
Turritella philippii Aradas & Maggiore, 1844:353 (*fide* Monterosato 1878:90).
Mesalia striata A. Adams, 1851:279.
Mesalia plicata A. Adams, 1855:123.
Scala (Hemiacirsa) vayssierei Dautzenberg, 1910:205, pl. 10 fig. 3-4.

Type material: S. subdecussata, not known (not in IRSN); *T. philippii*, presumably lost; *M. striata*, 2 syntypes in BMNH; *M. plicata*, holotype in BMNH; *S. vayssierei*, holotype in MNHN.

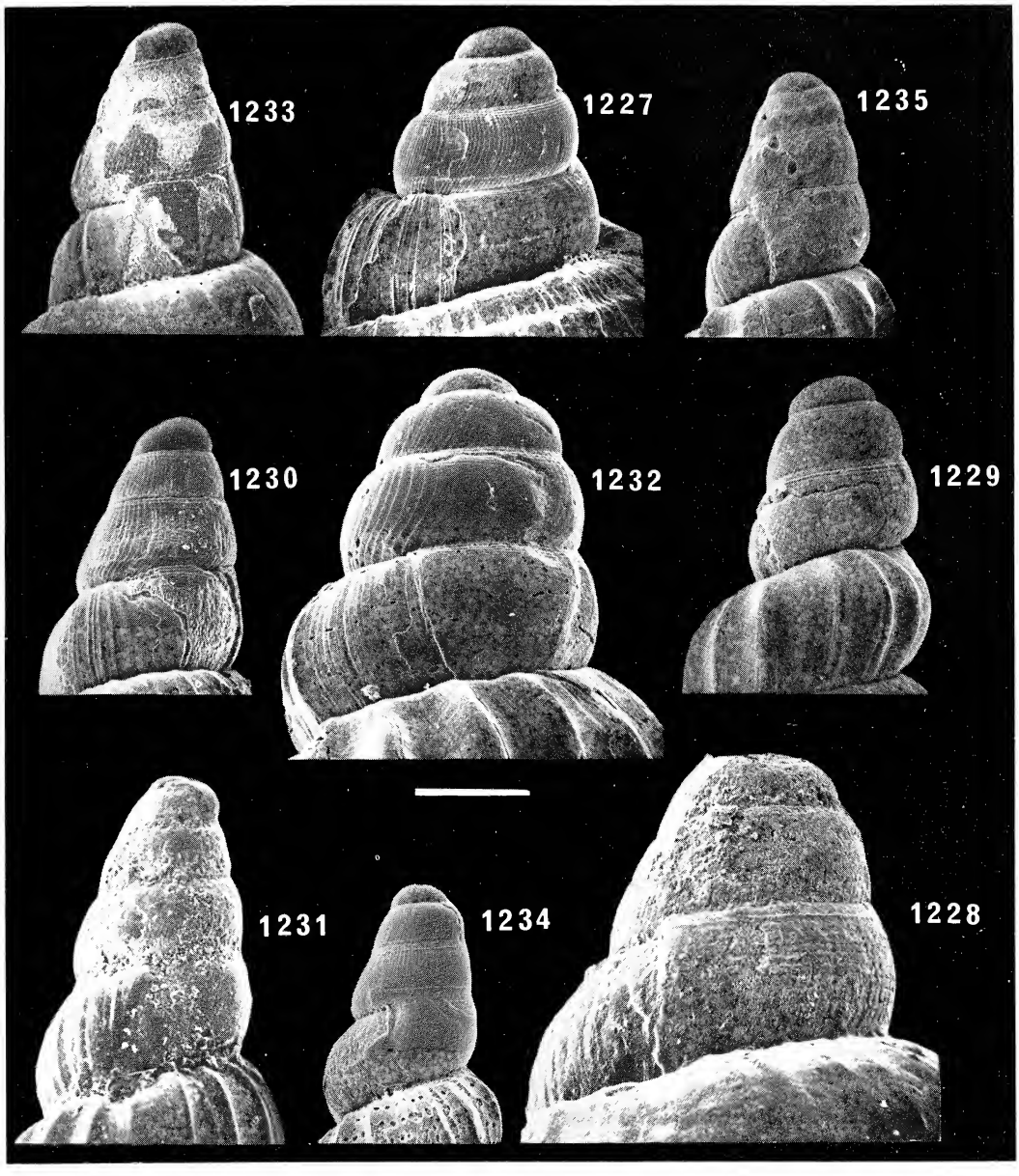
Type locality: S. subdecussata, Sea of Sardinia; *T. philippii*, Acitrezza, Sicily; *M. striata*, said to be from the Philippines (erroneous!); *M. plicata*, Tenerife, Canaries; *S. vayssierei*, Carry-le-Rouet, near Marseille, S France.

Material examined: The type material and about 40 spms and shells from all the distributional area.

Distribution: The continental shelf of S Europe from N Bay of Biscay (Belle-Ile: coll. Locard, MNHN), to Madeira, the Canaries (Nordsieck & Talavera 1979:94) and Principe Is. (material in MNHN) in the south, and the western Mediterranean (Monterosato 1890:149, Locard 1886:195, Coppini 1974, Terreni 1981:26). Depth range: from 12m (Pallary 1902:21) to 450-500m (1 fresh sh from Madeira in MNHN).

Remarks: De Boury (1890:267) claimed that *Turritella pelagica* Risso, 1826 was an older name for this species but examination of type material in MNHN by Arnaud (1978:128, pl. 8, fig. 42) shows that it is a turritellid, not an epitoniid.

The protoconch is multispiral and indicates planktonic larval development.



Figs 1227-1235. Protoconchs of Epitoniinae. 1227, *Alora tenerrima*, lectotype. 1228, *Alora retifera*, holotype. 1229, *Cylindriscala acus*, MONACO 213. 1230, *C. jeffreysi*, MONACO, 203. 1231, *C. guernei*, MONACO 553. 1232, *Claviscala richardi*, BIACORES 148. 1233, *Opalia fortunata*, holotype. 1234, *O. abbotti*, Calvi, 70-150 m. 1235, *Punctiscala cerigottana*, Adventure Bank. Scale line: 200 μm.

Genus *CYLINDRISCALA* de Boury, 1909

Cylindriscala de Boury, 1909:256.

Type species: Scala fulgens de Boury, 1909 (by original designation).

De Boury did not give a definition of *Cylindriscala* when he introduced the name (as a subgenus of *Scala*) in 1909. It was later used by de Boury (1913:169), Cossmann (1912:23) and Wenz (1940:799), but did not include species other than *C. acus* (=*fulgens*, see below). Clench & Turner (1952:331) included several W Atlantic deep water species.

We are here using *Cylindriscala* for tall, slender epitoniids with broad, not lamellar axial ribs and well defined basal disc; protoconch multispiral, smooth. The type species has very minute pits in the shell (fig. 1128), which, however, does not have an intritacalx. The taxonomic value of these pits is not known but it is present in *C. vicina* and *C. guernei*, which are conchologically very similar. Our material of *C. mirifica* and *C. jeffreysi* is too corroded to allow examination of this character. These two species, and *C. aurantia* and *C. thalassae*, are included in *Cylindriscala* on the basis of general resemblance.

KEY TO NE ATLANTIC SPECIES OF *CYLINDRISCALA*

A. Spiral sculpture present	B
A. Spiral sculpture absent	F
B. Whorls regularly convex	C
B. Whorls shouldered at periphery	*C. mirifica* (p. 536)
C. Axial sculpture present on earlier whorls, becoming indistinct on body- and penultimate whorl	*C. jeffreysi* (p. 536)
C. Axial sculpture present on all whorls	D
D. A fine axial sculpture of incremental lines is present	E
D. No incremental lines	*C. guernei* (p. 532)
E. 15 axial ribs on the body whorl	*C. aurantia* (p. 534)
E. 18 axial ribs on the body whorl	*C. thalassae* (p. 534)
F. Peristome rounded, complete; strong basal keel	*C. vicina* (p. 531)
F. Peristome ovate, interrupted over the columellar area; basal cord simple	*C. acus* (p. 531)

Cylindriscala acus (Watson, 1883) Figs 1117, 1128, 1229, 1236

Scalaria acus Watson, 1883:608; 1886:140, pl. 9, fig. 2.
Scala fulgens de Boury, 1909: 483.
Scala acus var. *parcicostata* (sic! err. pro *paucicostata*) Dautzenberg & de Boury, 1897b: 71.

Type material: S. acus, holotype in BMNH; *S. fulgens,* holotype in IRSN.

Type locality: S. acus, CHALLENGER st 73, 38° 30N, 31° 14W, 1850m; *S. fulgens*, MONACO st 578, 38° 26N, 26° 31W, 1165m (both from the Azores).

Material examined: The type material and MONACO st 213, 32° 23N, 31° 25W, 1384m, 1 sh; st 203, 39° 27N, 30° 55W, 1557m, 1 sh; st 578, cf above, 1 sh; st 698, 39° 11N, 30° 45W, 1846m, 1 sh; PORCUPINE st 16, 39° 55N, 09° 56W, 1800m, 1 sh; st 17, 39° 42N, 09° 43W, 1100-2005m, 1 sh; CANCAP st 2.026, 27° 50N, 14° 29W, 1980-2200m, 1 sh; st 4.086, 28° 54N, 13° 33W, 785m, 1 sh.

Distribution: The bathyal zone of Portugal, the Canaries and the Azores. We could not find and check the material from CHALLENGER st 24 (West Indies) cited by Watson.

Remarks: The history of the name *acus* is a series of misunderstandings and confusion. Watson described it in 1883 but did not figure it until 1886; his description and figure are correct and agree perfectly with the holotype in BMNH. In the material from PORCUPINE st 16-17, Jeffreys (1884:139, pl. 10 fig. 8) uses the name *acus* for 3 shells: 2 are in UNSM and are *acus* of Watson, 1 is in BMNH and is *guernei* Dautzenberg & de Boury, 1897. Jeffreys' figure and description refer to *guernei.* Strangely enough Watson agreed (1886:140) that *acus* is spirally striated, which is incorrect. The result was a misunderstanding of the real *acus*, which lead de Boury to describe it as *fulgens* in 1909.

Two *nomina nuda* are sometimes cited by Mediterranean authors in connection with the name *acus* Watson. Monterosato (1877) used *Scalaria solidula* Jeffreys ms., and de Boury (1890:310; 1891:149) used *Scala monterosatoi* de Stefanis ms.; they were not described or figured but seem to be the basis for citing *Cylindriscala acus* in Mediterranean faunal lists. In the Jeffreys collection there are 2 fragments (USNM 182423, 182425) of *C. guernei* labelled *solidula* Jeff.ms. = *acus* Watson. One is from PORCUPINE st 17, one is marked «Medit.?». *C. acus* should not, on this basis, be considered a Mediterranean species.

Cylindriscala acus is characterized by its total absence of spiral sculpture, its few, broad axial ribs and smooth basal disc. The protoconch is brown, multispiral and indicates a planktotrophic larva (fig. 1229).

Scalaria acus was erroneously cited by Kobelt (1902:3) as type species of *Pliciscala* de Boury, 1887.

Cylindriscala vicina (Dautzenberg & de Boury, 1897)
Figs 1129, 1237-1238

Scalaria vicina Dautzenberg & de Boury 1897a:33; 1897:72, pl. 2, figs 8-9; Dautzenberg 1927:159, pl. 4, figs 33-34.

Type material: Lectotype, here selected, the specimen figured by Dautzenberg & de Boury, in MOM.

Type locality: MONACO st 553, 37° 43N, 25° 05W, 1385m (Azores).

Material examined: The type material and about 40 additional shells from the type locality; PORCUPINE st 17, 39° 42N, 09° 43W, 1100-2005m, 2 shs.

Distribution: The bathyal zone of Portugal and the Azores; only known from the material examined.

Remarks: see under *C. guernei.*

Cylindriscala guernei (Dautzenberg & de Boury, 1897)
Figs 1127, 1231, 1239-1240

Scalaria guernei Dautzenberg & de Boury, 1897a:33; 1897: 71, pl. 2, figs 6-7; Dautzenberg 1927: 152, pl. 4, fig. 25.

Type material: Lectotype, here selected, the specimen figured by Dautzenberg & de Boury, in MOM.

Type locality: MONACO st 553, 37° 43N, 25° 05W, 1385m (Azores).

Material examined: The type material and about 25 additional shells from the type locality; MONACO st 578, 38° 26N, 26° 31W, 1165m, 1 sh; st 703, 39° 21N, 31° 06W, 1360m, 3 shs; st 719, 39° 11N, 29° 06W, 1600m, 2 shs; PORCUPINE station unknown (mixed station numbers), probably st 16-17, off Portugal, 1100-2005m, 1 sh.

Distribution: The bathyal zone of Portugal and the Azores.

Remarks: As was already noted by Dautzenberg (1927:153), this is the species figured by Jeffreys (1884: pl. 10, fig. 8) under the name *S. acus.*

C. guernei is most closely related to *C. vicina*, but differs in its less developed basal cord and disc, its stronger spiral sculpture and thin outer lip. Together 65 shells of the two species were taken at MONACO st 553 and there are no intermediate specimens.

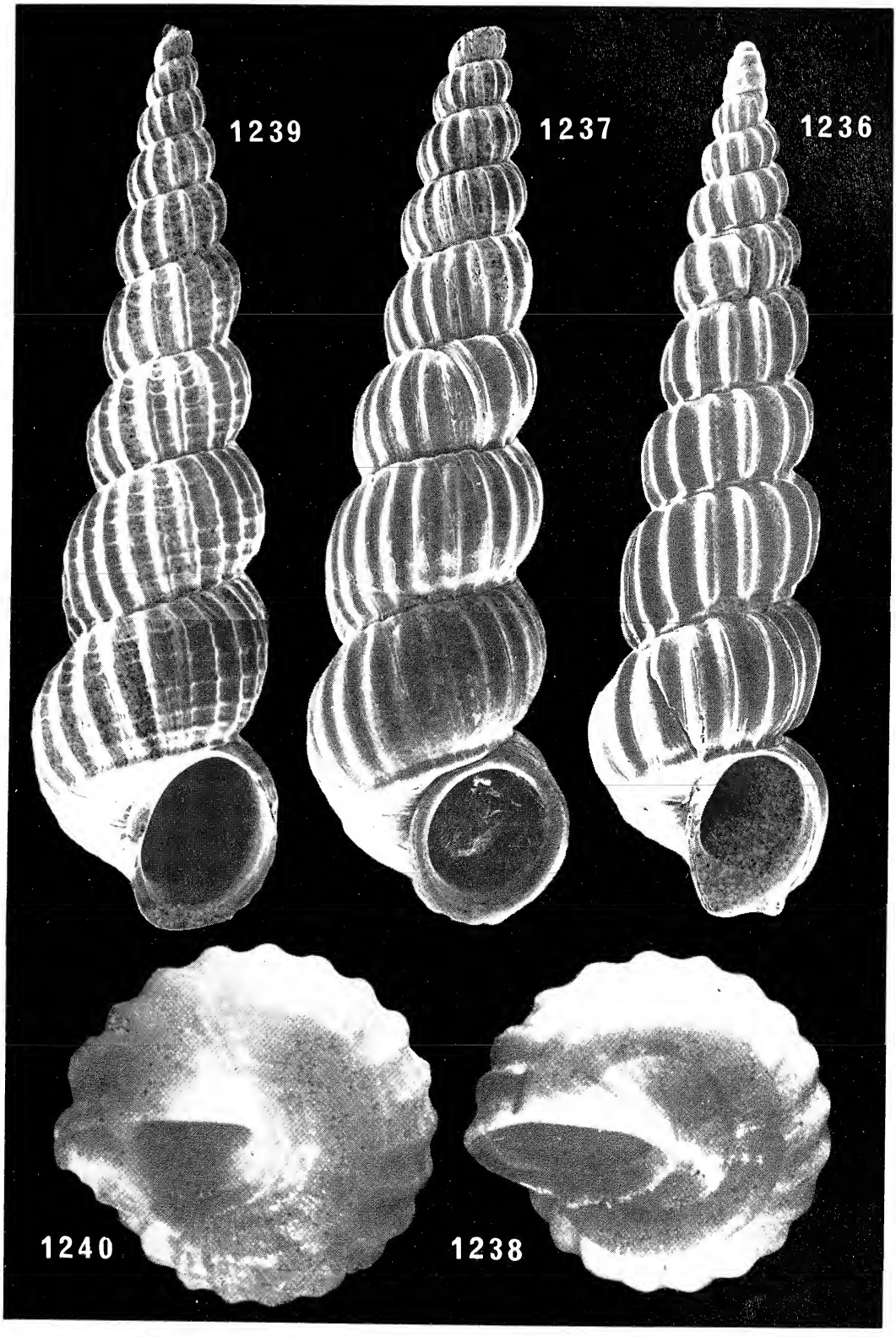
C. guernei and *C. vicina* are more slender than all other *Cylindriscala* and the microsculpture of incremental lines is very indistinct or absent.

The protoconch of *C. guernei* is multispiral and indicates planktotrophic larval development (fig. 1231).

A species related to the *guernei-vicina* group has been found in the bathyal zone of the Indian ocean in cavities bored in Scleractinian branches by the sea-anemone *Milneedwardsia*; Related species of corals and *Milneedwardsia* exist around the Azores (H. Zibrowius pers. comm.) and an association between the epitoniids and one of these hosts is probable.

The W Atlantic *C. andrewsi* (Verrill, 1882) is a similar species that differs by its more convex whorls with deeper suture, and the presence of a few axial ribs thickened into varices.

Figs 1236-1240. Genus *Cylindriscala.* 1236, *C. acus*, holotype of *C. fulgens*, 4.9 mm. 1237-1238, *C. vicina*, MONACO 553, height 6.6 mm, diameter 2.2 mm. 1239-1240, *C. guernei*, MONACO 553, height 8.2 mm, diameter 2.5 mm.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Cylindriscala thalassae n.sp. Fig. 1241

Type material: Holotype in MNHN.

Type locality: THALASSA st Z405, 47° 43N, 08° 08W, 1055m (N part of Bay of Biscay).

Material examined: Only known from the holotype.

Description: Shell large, solid, turriculate, consisting of 11 whorls. The protoconch and earliest teleoconch whorls are missing. Teleoconch with rounded convex whorls and impressed suture. The sculpture consists of strong, non lamellar, axial ribs separated by interspaces of about the same breadth as the ribs; there are 17 ribs per whorl on the earlier whorls, 18 on the body whorl. There is also a fine axial microsculpture of incremental lines. The spiral sculpture is quite distinct and consists of rather broad spiral cords separated by poorly defined grooves; there are about 8 such cords on earlier whorls, 12 on the body whorl and 7 on the basal disc. Basal disc very distinct. No umbilicus. The aperture has been damaged, but its base was probably angular. Inner lip a callus on parietal wall. Colour of the shell greyish white with the area of the basal disc more brownish.
Dimensions: height of the shell 16.0 mm, breadth 5.2 mm; aperture height 3.5 mm, breadth 2.5 mm.

Remarks: C. thalassae resembles *C. aurantia* but has more numerous, less distant axial ribs and stronger, better defined spiral sculpture. It differs from *C. mirifica* by being less slender and by its regularly convex, not shouldered axial ribs.

Cylindriscala aurantia n.sp. Fig. 1242

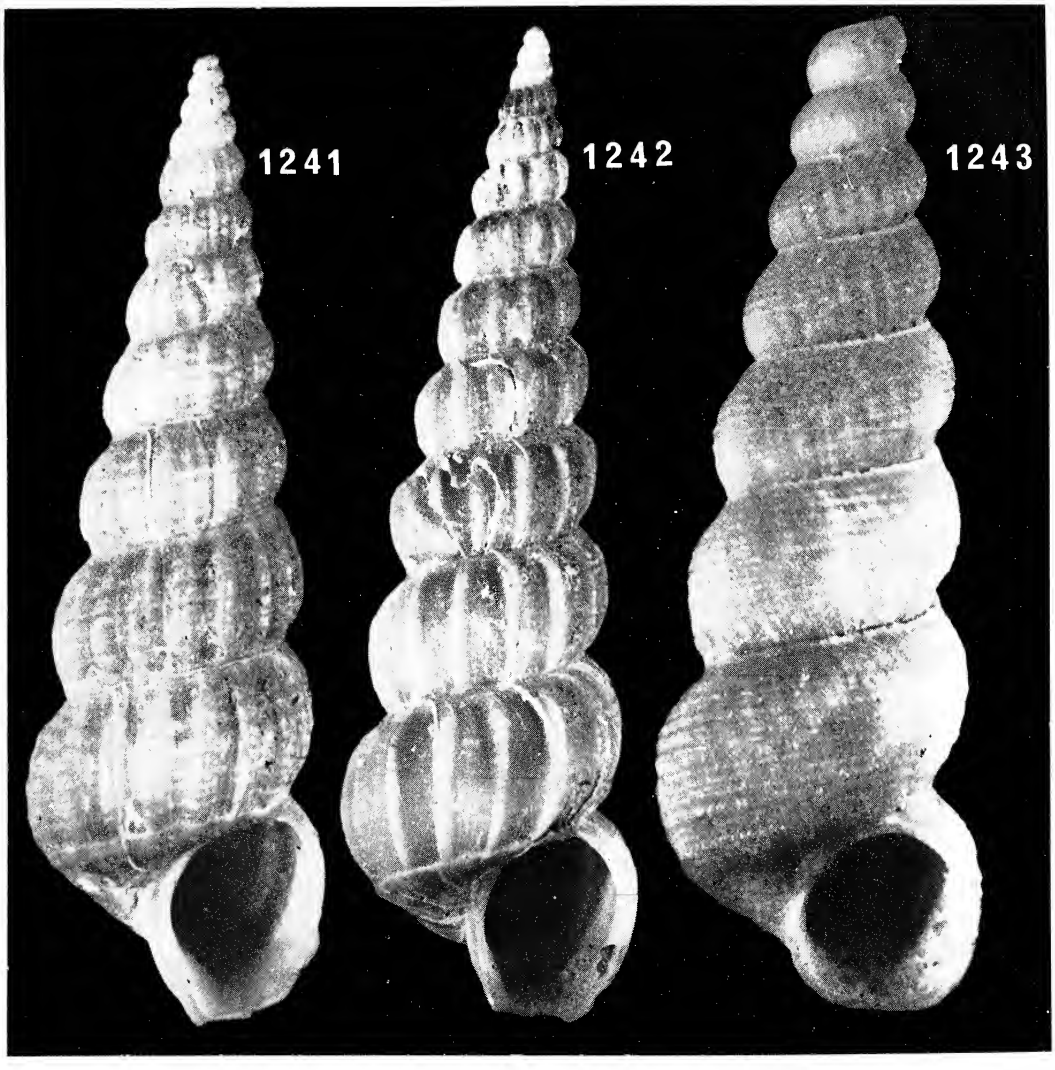
Type material: Holotype in MNHN.

Type locality: BIACORES st 206, 37° 21N, 25° 28W, 2085-2095m (Azores).

Material examined: Only known from the holotype.

Description: Shell large, solid, turriculate, consisting of 12 whorls. The protoconch and earliest teleoconch whorls are missing. Teleoconch with rounded convex whorls and impressed suture. The sculpture consists of strong nonlamellar, axial ribs separated by interspaces twice as broad as the ribs; there are about 15 ribs per whorl except on the first (extant) two or three whorls, where there are 17-18 ribs per whorl. There is also a fine axial microsculpture of incremental lines. The spiral sculpture is very indistinct and consists of 12-13 poorly defined spiral grooves. Basal disc sculptured only with incremental lines. No umbilicus. Aperture rather quadrangular. Inner lip a very distinct callus reflected on parietal wall. Colour of the shell orange brown, except the apex which is whitish.
Dimensions: height of the shell 19.2 mm, breadth 6.0 mm; aperture height 3.7 mm, breadth 3.0 mm.

Remarks: C. aurantia resembles *C. tortilis* Watson, 1883 from the bathyal zone of the West Indies, but it has a larger apical angle and fewer axial ribs. In the NE Atlantic, *C. aurantia* resembles *C. mirifica, C. jeffreysi* and *C. thalassae*, which all have in common distinct axial microsculpture. From this group *C. aurantia* is distinguished by its very indistinct spiral sculpture and fewer, more spaced axial ribs.



Figs 1241-1243. Genus *Cylindriscala*. 1241, *C. thalassae*, holotype, 16.5 mm, 1242, *C. aurantia*, holotype, 19.9 mm. 1243, *C. jeffreysi*, holotype of *C. grimaldii*, 12.0 mm.

Cylindriscala jeffreysi (Tryon, 1887) Figs 1230, 1243

Scalaria tenera Jeffreys, 1884: 139, pl. 10, fig. 9.
Scalaria jeffreysi Tryon, 1887:62, *nom. nov.* pro *S. tenera* Jeffreys, 1884 non *Scala tenera* H. Adams, 1873.
Scalaria grimaldii Dautzenberg & de Boury, 1897a:32; 1897: 67, pl. 2, figs 3-4; Dautzenberg 1927: 151, pl. 4, figs 23-24.

Type material: S. tenera, 4 fragmentary syntypes, of which one is here selected as lectotype, in BMNH (two fragments are *Periapta gracilis* (Verrill, 1880)); *S. grimaldii*, holotype in MOM.

Type locality: S. tenera, PORCUPINE st 16, 39° 55N, 09° 56W, 1800m (off Portugal); *S. grimaldii*, MONACO st 703, 39° 21N, 31° 06W, 1360m (Azores).

Material examined: The type material and MONACO st 203, 39° 27N, 30° 55W, 1557m, 1 sh; st 1311, 37° 37N, 25° 21W, 1187m, 1 sh; st 1713, 28° 04N, 16° 49W, 1340-1530m, 1 sh.

Distribution: The bathyal zone of Portugal, the Azores and the Canaries. Only known from the material examined.

Remarks: Jeffreys' syntypes are in poor condition and his drawing is a reconstruction from several specimens. *C. jeffreysi* is characterized by its solid shell, broad axial ribs, spiral cords and small umbilical chink. It is most similar to *C. guernei* but differs by its much broader whorls and very distinct strong incremental lines.

The protoconch is multispiral, with rather flat whorls, and indicates planktotrophic larval development (fig. 1230).

Cylindriscala mirifica (P. Fischer in Filhol, 1886) Figs 1244-1245

Scalaria mirifica P. Fischer in Filhol, 1886: 179, pl. 5; Locard 1897a: 2; 1897b: 399, pl. 18, figs 27-30.

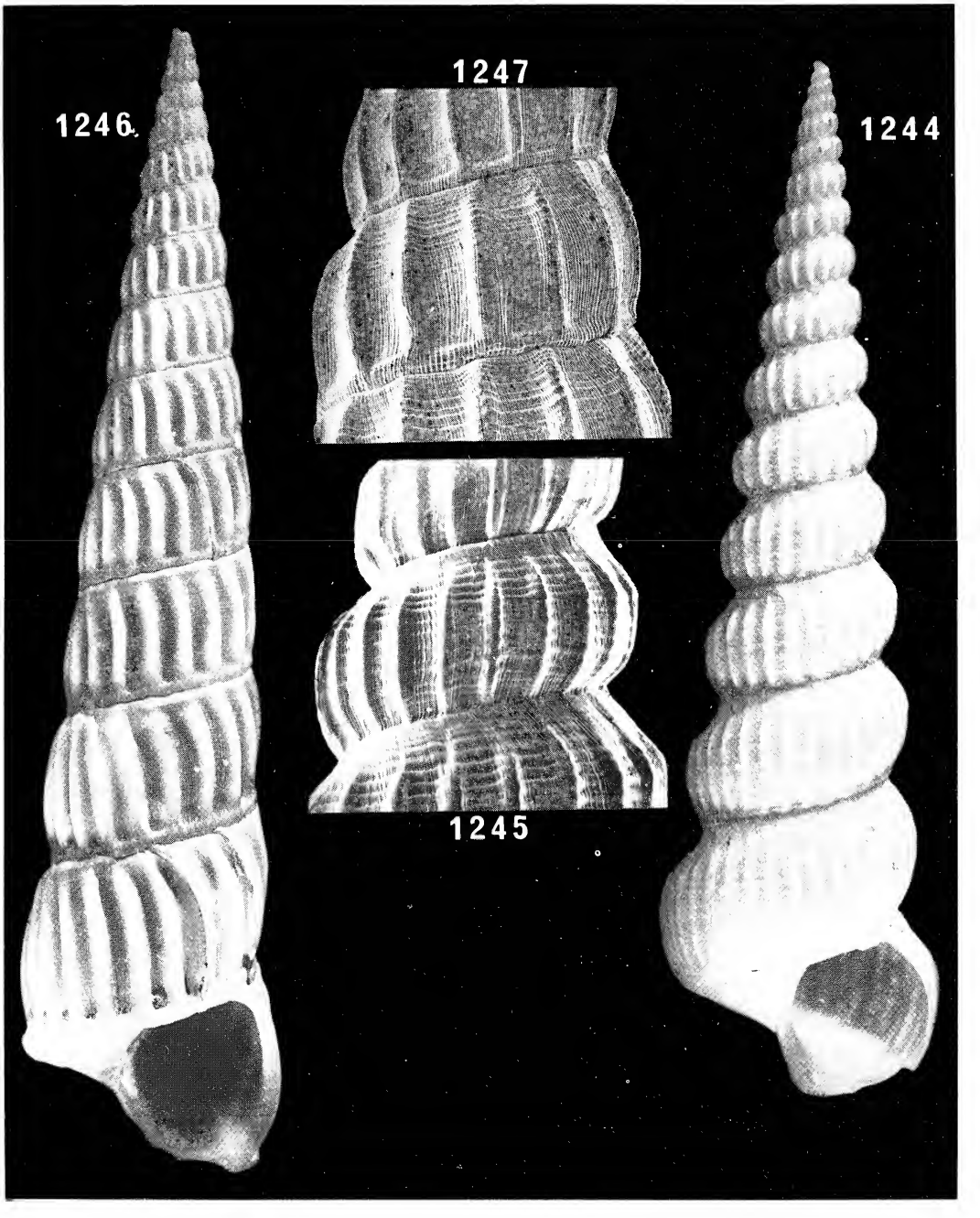
Type material: 2 syntypes in MNHN.

Type locality: TALISMAN drag. 43, 29° 52N, 11° 44W, 2075m.

Material examined: the type material and CANCAP st 5.042, 36° 50N, 24° 42W, 2700-2950m, 1 sh; st 5.043, 36° 46N, 24° 44W, 2800-2950m, 1 sh.

Distribution: Only known from the Canaries and the Azores, bathyal.

Remarks: C. mirifica is easily identified by its sculpture (fig. 1245) of numerous broad axial ribs, spiral threads, and its large (30 mm) adult size. The protoconch is unknown.



Figs 1244-1247. Genera *Cylindriscala* and *Claviscala*. 1244-1245, *Cylindriscala mirifica*, syntype, 29.4 mm. 1246-1247, *Claviscala richardi*, THALASSA Z407, 55.4 mm.

Genus *CLAVISCALA* de Boury, 1909

Type species: (by original designation) *Scalaria richardi* Dautzenberg & de Boury, 1897.

Claviscala is a characteristic genus of deep water Epitoniidae with strong, solid shell, broad, non lamellar axial ribs and strong basal keel. It differs from *Cylindriscala* by its flat whorls and much larger adult size.

Beside the type species, *Claviscala* includes *C. kuroharai* Kuroda in Azuma, 1960, *C. midwayensis* Habe & Kosuge, 1970, both from deep water of the NW Pacific, and *Opalia terebralioides* Kilburn, 1975 from deep water of the SW Indian Ocean. *Scala concava* Dall, 1889 known only from the poorly preserved holotype possibly belongs here.

Claviscala richardi (Dautzenberg & de Boury, 1897)
Figs 1097, 1111-1112, 1130, 1232, 1246-1247

Scalaria richardi Dautzenberg & de Boury, 1897a: 32; 1897: 68, pl. 2, fig. 5; Dautzenberg 1927: 149, pl. 4, figs 27-29.

Type material: Lectotype, here selected, the specimen figured by Dautzenberg & de Boury, in MOM.

Type locality: MONACO st 242, 38° 48N, 27° 57W, 861m (Azores).

Material examined: The type material and MONACO st 227, 38° 23N, 28° 27W, 1135m, 1 sh; st 553, 37° 43N, 25° 05W, 1385m, 1 sh; st 578, 38° 26N, 26° 31W, 1165m, 1 sh; st 618, 38° 53N, 28° 06W, 1143m, 2 shs; st 866, 38° 53N, 27° 23W, 599m, 1 sh; st 1338, 38° 41N, 28° 45W, 950m, 1 sh; st 2210, 39° 25N, 31° 22W, 1229m, 1 sh; BIACORES st 148, 37° 34N, 25° 34W, 847-870m, 3 spms+sh; THALASSA st Z407, 47° 34N, 08° 07W, 1085-1115m, 1 spm; st Z413, 48° 03N, 08° 29W, 805m, 2 shs; st Z414, 48° 05N, 08° 30W, 650m, 1 sh; st Z421, 48° 22N, 09° 33W, 950m, 3 shs; st Z435, 48° 40N, 09° 53W, 1050m, 7 shs; THOR st 83, 44° 25N, 12° 20W, 1180-1270m, 1 sh; st 93, 49° 25N, 12° 20W, 1180-1275m, 2 spms; PORCUPINE 1869 st 45, 51° 01N, 11° 21W, 843m, 1 sh; TALISMAN dr 129, 38° 00N, 27° 03W, 2155-2220m, 1 spm; PROCELT 1 st 55, 50° 26N, 11° 04W, 650m, 1 sh.

Distribution: The bathyal zone of southwestern Europe from 51° 36N (Massy 1930) and the Azores. Not known in the Mediterranean. The shallowest record is 440m (Reynell 1909).

Remarks: This is one of the most common bathyal species of Epitoniidae and it reaches a size of 75 mm. Juveniles differ from adults by their more convex whorls and stronger spiral sculpture. The protoconch (fig. 1232) is multispiral and indicates planktonic larval development.

C. richardi was recorded by Locard (1897:400) as *S. torulosa* Brocchi and by Jeffreys (1884:132) as *S. longissima* Seguenza (*pars*).

Genus *PERIAPTA* gen. nov.

Type species: Scalaria polygyrella Fischer in Locard, 1897.

The genus *Periapta* is proposed for tall, slender, Epitoniidae with convex whorls with a sculpture of strong incremental lamellae and a basal disc. The lamellae are very low, they are sigmoid in the subsutural region and they are sometimes coalescent into broad varices. Spiral sculpture present or absent. Protoconch and radula unknown.

Periapta superficially resembles *Crebriscala* de Boury, 1909. Examination of *S. crebrilamellata* Mayer-Eymar, type species of the genus, however shows that in *Crebriscala* there is no basal disc and the axial lamellae, although close set, resemble lamellae in *Epitonium* s.l. In particular the lamellae are not sigmoid below the suture and they are higher than in *Periapta.*

Periapta also has a superficial resemblance to *Acrilla* but *Acrilla* has evenly rounded axial ribs, much broader than the narrow lamellae of *Periapta.*

The affinities of *Periapta* may be closer to *Cylindriscala*, with which it has in common a well defined basal disc and the presence of minute punctuations in the outer shell layer (not forming an intritacalx). The taxonomic value of this character is not known, but it is not present in fresh *Epitonium* s.l. shells we have examined.

The protoconch and radula being unknown, it cannot be excluded that *Periapta* will be found to belong to the Nystiellinae when these characters are known.

Periapta polygyrella (P. Fischer in Locard, 1897)

Figs 1125, 1248-1249

Scalaria polygyrella P. Fischer in Locard, 1897a:3; 1897:403, pl. 18, fig. 31.

Type material: Holotype in MNHN.

Type locality: TALISMAN drag. 136, 44° 20N, 17° 11W, 4255m (between bay of Biscay and mid-Atlantic ridge).

Material examined: The type material and BIACORES st 249, 45° 50N, 17° 23W, 3995m, 3 shs; NORATLANTE st B5, 55° 43N, 49° 20W, 3676m, 1 sh; DEMERABY st KG11, 08° 11N, 49° 04W, 4440m, 1 juv. sh; WALVIS st CP5, 33° 23S, 02° 36E, 4500m, 1 sh; WALTER HERWIG cruise 45, st 3, 43° 24N, 15° 06W, 4700m, 1 sh, 1 fragm.; st 47, 45° 50N, 17° 14W, 4730m, 2 shs; st 66, 43° 20N, 19° 21W, 4280 m, 1 sh; DISCOVERY st 9131-9, 20° 18N, 21° 43W, 4010m, 1 sh; st 9131-10, 20° 15N, 21° 35W, 3950m, 1 sh; st 9131-11, 20° 09N, 20° 40W, 3921m, 1 sh; st 9131-12, 20° 07N, 21° 26W, 3860m, 4 shs; st 9541-1, 20° 07N, 21° 25W, 3850m, 5 shs; st 9541-3, 20° 08N, 21° 41W, 3910m, 1 sh.

Distribution: The abyssal zone of the temperate and tropical Atlantic, between 3600 and 4700m.

Remarks: The largest shell, from NORATLANTE material, is 44mm high but has a broken apex, so the species certainly reaches 50mm. *P. polygyrella* cannot be confused with any other Atlantic epitoniid, because of its numerous close set lamellate incremental lines.

We have examined the holotype of *Amaea luxus* Okutani, 1964 from 3150-3350m off S. Japan: it is not distinguishable from our Atlantic specimens of *P. polygyrella.* Another related species is *Amaea siapnoi* DuShane, 1977 from 4430m off California (fig. 1114); we have examined the holotype (San Diego Museum of Natural History 65482), which differs by having fewer, more distant axial ribs and rather strong spiral grooves.

Periapta gracilis (Verrill, 1880) Figs 1126, 1250

Acirsa gracilis Verrill, 1880:377; 1882:528, pl. 57, fig. 31.
Epitonium pandion Clench & Turner, 1952:326 (unnecessary replacement name).

Type material: Holotype in USNM 44813.

Type locality: FISH HAWK st 894, 39°53N, 70°58W, 672m (off New Jersey, U.S.A.).

Material examined: The type material and a few other shells from the W Atlantic; DISCOVERY st 10112-1, 50°26N, 13°18W, 2640-2660m, 2 shs; PORCUPINE st 16, 39°55N, 09°56W, 1800m, 2 fragments (type lot of *Scalaria tenera* Jeffreys, 1884).

Distribution: Bathyal zone of E United States; in the E Atlantic only known from the material examined.

Remarks: Epitonium pandion is a replacement name for *Acirsa gracilis* Verrill, 1880 which is a secondary homonym of *Scalaria gracilis* Sowerby, 1844. Sowerby's species is an *Epitonium* s.l. but we cannot accept a placement of Verrill's species in *Epitonium* even in a very broad sense: the basal cord and disc are well defined and the axial lamellae are very low, not raised as in *Epitonium.*

P. gracilis is easily identified by the axial ribs that are much stronger in the subsutural zone and become indistinct in the lower part of the whorl, a character noted by Clench & Turner (1952:326).

Genus *ALORA* H. Adams, 1861

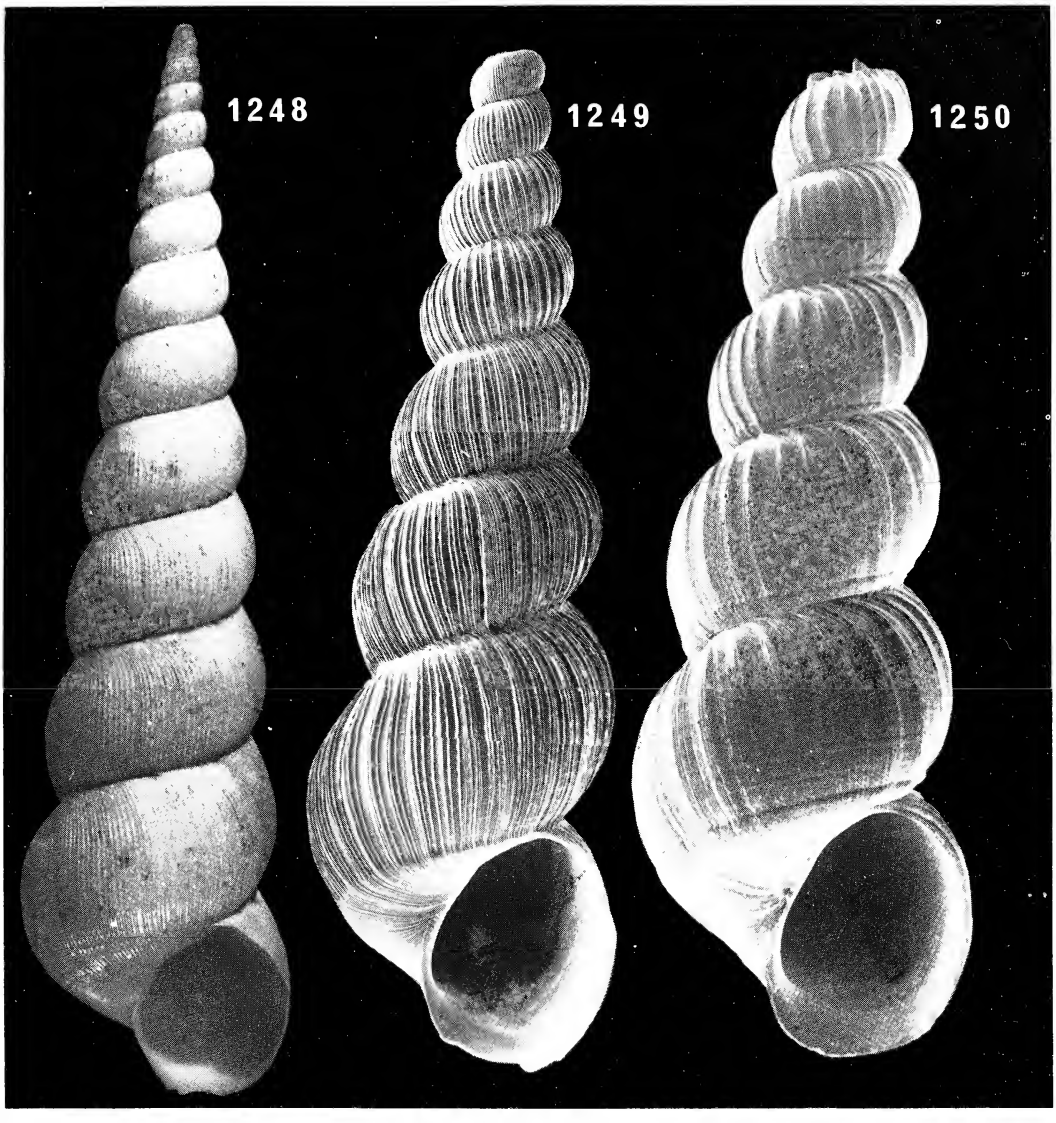
Alora H. Adams, 1861:272.

Type species: Trichotropis gouldi A. Adams, 1856 (by monotypy).

Synonym:
Teramachiacirsa Kuroda & Ito, 1961:263. Type species: (by original designation) *Teramachiacirsa annulata* Kuroda & Ito, 1961 (fig. 1253).

The genus *Alora* was described as a trichotropid and it remained in that family until Keen (1969) transferred it to Epitoniidae.

The two species here included in *Alora* resemble the 2 or 3 described Indo-Pacific species in their very broad outlines and distinct spiral sculpture. This grouping may be artificial, but these species are too poorly known to suggest an alternative classification. In particular, the presence of a basal cord is often regarded as a character of supraspecific importance: it is present in *A. retifera*, absent in other species of *Alora.*



Figs 1248-1250. Genus *Periapta*. 1248, *P. polygyrella*, holotype, 40.6 mm. 1249, *P. polygyrella*, DISCOVERY 9131.11, young specimen, 7.0 mm. 1250, *P. gracilis*, DISCOVERY 10112.1, 6.4 mm.

Alora tenerrima (Dautzenberg & Fischer, 1896) Figs 1227, 1251

Iphitus tenerrimus Dautzenberg & H. Fischer, 1896: 450, pl. 19, fig. 2; Dautzenberg 1927: 120, pl. 3, fig. 30.

Type material: Holotype in MOM.

Type locality: MONACO st 553, 37° 43N, 25° 05W, 1385m (Azores).

Material examined: The type material and TRAVAILLEUR 1881 drag. 1, 43° 01N, 09° 38W, 2018m, 1 sh; ALBATROSS st 2415, 30° 44N, 79° 26W, 948m, 2 shs (USNM 108418; Dall 1927: 116 as *Iphitus tuberatus*).

Distribution: Only known from the material examined. The other records in Dautzenberg (1927:121) refer to *A. retifera.*

Remarks: A. tenerrima somewhat resembles *Iphitus marshalli* in having a dominating spiral sculpture. Their protoconchs are very different (figs 1137, 1227) and in *I. marshalli* the umbilicus is wider and the axial microsculpture is much finer.

For distinction from *A. retifera*, see that species.

Alora retifera n.sp. Figs 1228, 1252

Type material: Holotype in IRSN.

Type locality: MONACO st 1349, 38° 36N, 28° 06W, 1250m (Azores).

Material examined: The type material and MONACO st 698, 39° 11N, 30° 45W, 1846m, 1 sh.

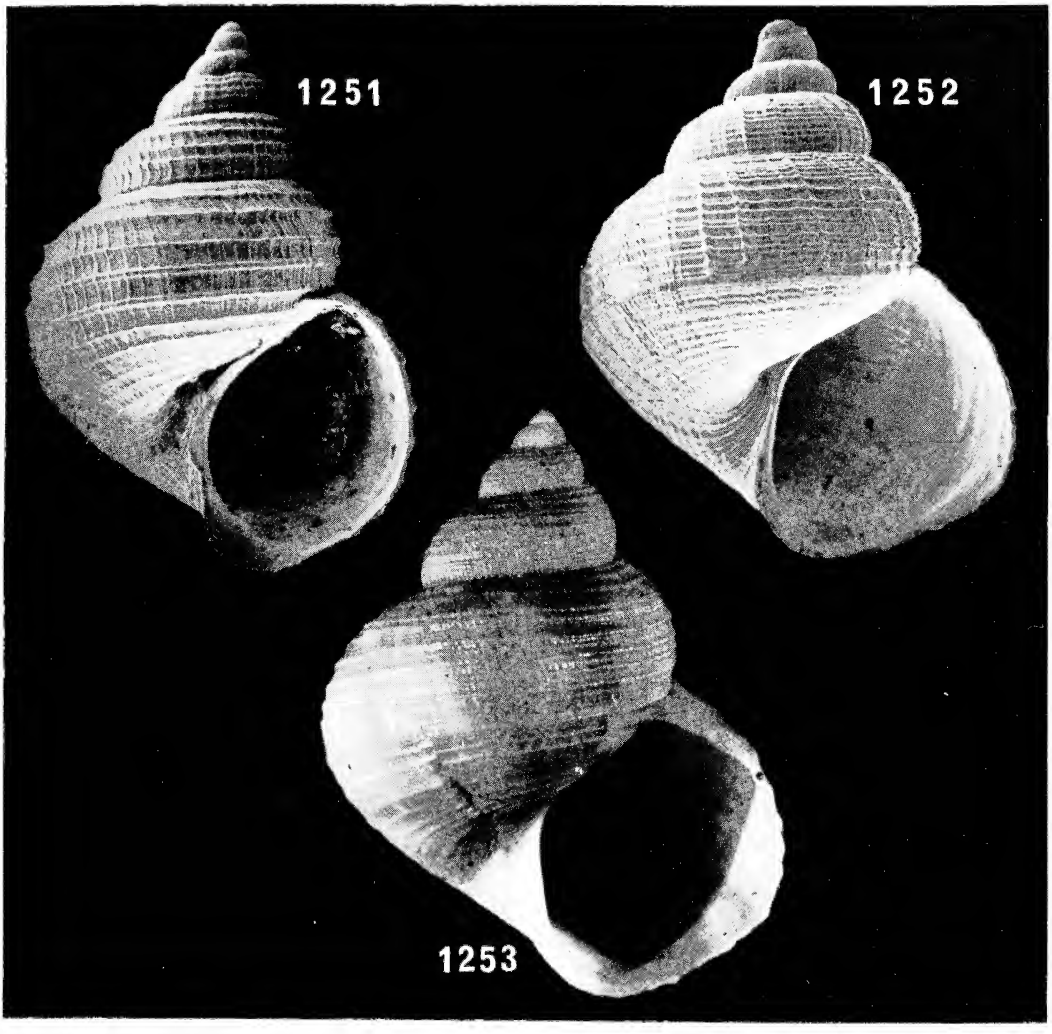
Distribution: Only known from the material examined, from the bathyal zone of the Azores.

Description: Shell small, thin, fragile, consisting of an unknown number of protoconch whorls and 3 1/4 teleoconch whorls. Protoconch with earlier whorls missing, but probably consisting of 3 whorls: a little more than one is present on the holotype, about 2 on the other shell; these whorls are not very convex, they are sculptured with fine axial incremental lines and one subsutural thread. Teleoconch whorls very convex and of rapidly increasing diameter. The body whorl has a strong basal cord, but the sculpture is the same below and above it. This sculpture consists of raised spiral cords and axial ribs, forming rectangular intervals. There are 14 spiral cords on the body whorl above the basal cord and about the same number below it. The axial ribs are not lamellate, but resemble the spiral cords in structure; they are rather irregularly disposed. Umbilicus narrow but distinct. Aperture large, rather quadrangular. Columella forming an angle with the body whorl; outer lip thin, rather angular at the level of the basal cord. Colour white, protoconch brown.

Dimensions: height 3.8mm, diameter 3.2mm; aperture height 1.9mm, breadth 1.6mm.

Remarks: A. retifera differs from *A. tenerrima* by its well defined basal cord, while the whorls are regularly convex in *A. tenerrima*; it also has a more narrow umbilicus and more numerous spiral cords (ca. 28 on the body whorl in *retifera*, ca. 10 in *tenerrima*).

A. tenerrima bears no superficial resemblance to *Iphitus* or any other known Atlantic species of Epitoniidae.



Figs 1251-1253. Genus *Alora*. 1251, *A. tenerrima*, holotype, 4.4 mm. 1252, *A. retifera*, holotype, 3.8 mm. 1253, *A. annulata*, type species of *Teramachiacirsa*, holotype, 15.7 mm.

Genus *GREGORIOISCALA* Cossmann, 1912

Bria de Gregorio, 1890:8.

Type species: (by monotypy) *Scalaria romettensis* de Gregorio, 1890 (Miocene of S. Italy).

Gregorioiscala Cossmann, 1912:80. New name for *Bria* de Gregorio, 1890 non *Bria* Giebel, 1856.

Synonym:
Compressiscala Masahito & Habe, 1976. Type species: (by original designation) *Compressiscala japonica* Masahito & Habe, 1976.

Remarks: Although the original description and illustration of *S. romettensis* refer to a fossil with only the last two whorls, the name *Bria* was interpreted by de Boury (1913:27) and Cossmann (1912) as applicable to the Recent deep-water species *S. pachya* and *S. unilateralis* von Martens, 1902. We agree with this interpretation and use *Gregorioiscala* for species with a strongly defined basal cord, thickened outer lip, and thick pitted intritacalx. There are thickened axial ribs forming varices, at least in adult specimens.

As used here, *Gregorioiscala* resembles *Opalia* which also has a pitted intritacalx and sometimes has a strong basal disc (the type species of *Opalia* has a very strong and distinct basal disc). In *Opalia* the axial ribs form crenulations at the suture. The two genera are probably related but *Opalia* is apparently restricted to the continental shelf, while the known species of *Gregorioiscala* are definitely bathyal.

Punctiscala differs only in that the axial ribs of subsequent whorls are not aligned in a row of varices. Juveniles of *G. pachya* lack varices and resemble *Punctiscala* very much. See remarks under *Punctiscala.*

Compressiscala japonica is very similar to the species here included in *Gregorioiscala*, at least in shell characters. Masahito and Habe did not compare their new genus with *Gregorioiscala*, so we assume that they were not aware of this name. Because of the similarity we consider them synonyms.

Gregorioiscala pachya (Locard, 1897) Figs 1119-1121, 1254-1255

Scalaria pachya Locard, 1897a:2; 1897b: 398, pl. 18, fig. 23; var. *minor* Locard, 1897b: 399.

Type material: 8 syntypes in MNHN.

Type locality: TALISMAN dr 127, 38°37N, 28°21W, 1258m (Azores).

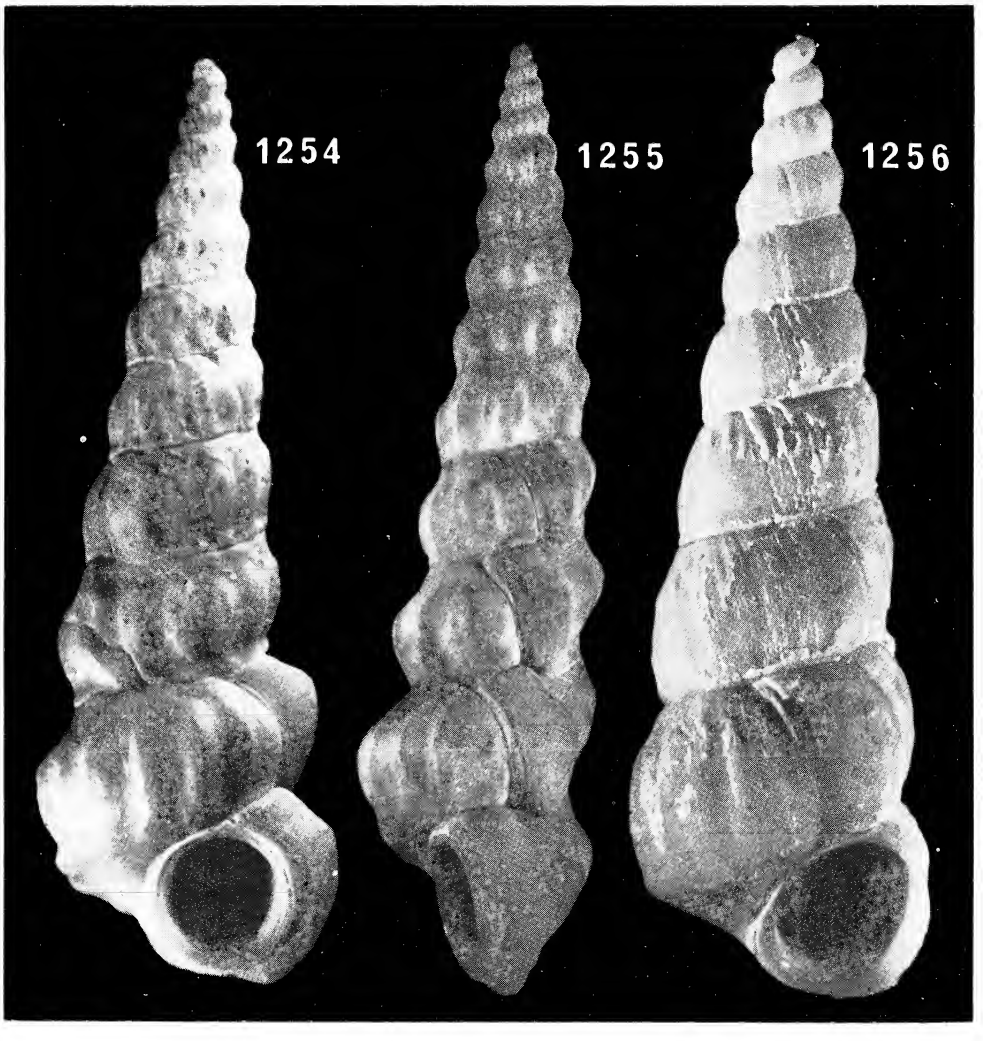
Material examined: The type material and one additional shell from the type locality figured by Jeffreys 1884: pl. 10, fig. 3) (USNM); MONACO st 233, 38°33N, 28°09W, 1300m, 1 sh; st 553, 37°43N, 25°05W, 1385m, 3 shs; st 578, 38°26N, 26°31W, 1165m, 1 sh; st 112, 38°35N, 28°06W, 1287m, 1 sh; PORCUPINE st 16, 39°55N, 09°56W, 1800m, 1 sh; THALASSA st W344, 44°20N, 02°18W, 890m, 1 sh; st Y374, 41°31N, 09°20W, 1250m, 2 shs.

Distribution: SW Europe and the Azores, bathyal. Only known from the material examined.

Remarks: Before it was described by Locard, the TALISMAN material was mentioned by Jeffreys (1884: 132) and de Boury (1890: 176) under the name *S. longissima* Seguenza, 1879, a Pliocene species that has never been figured or properly described. The specimen from PORCUPINE 1869 st 45 (Jeffreys 1884: 132), examined by de Boury (1890: 177) in BMNH is *Claviscala richardi.*

Three juveniles from MONACO st 553 have parts of a multispiral protoconch left which, however, are too worn to warrant a photo.

The intritacalx is easily worn off and a different, finely reticulate, sculpture appears below (figs 1119-1121). *G. pachya* is easily recognized by its very solid, heavy shell, with few broad axial ribs, some thickened to form varices and rather flat, shouldered whorls. It resembles most *Compressiscala japonica* Masahito & Habe and *Scala unilateralis* von Martens, both from Indo-Pacific deep water. All three have a curved columellar axis. This group of species seems to be represented in the Pliocene of Italy by *Scalaria abrupta* de Cristofori & Jan, 1832 (lectotype figured in Pinna & Spezia 1978: pl. 44, fig. 2).



Figs 1254-1256. Genus *Gregorioiscala*. 1254, *G. pachya*, MONACO 233, 22.2 mm. 1255, *G. pachya*, TALISMAN 127, 33 mm. 1256, *G. exfoliata*, holotype, 16.1 mm.

Gregorioiscala exfoliata n.sp. Figs 1105, 1113, 1256

Type material: Holotype in MNHN.

Type locality: BIOGAS st DS52, 44° 06N, 04° 22W, 2006m (Bay of Biscay).

Material examined: Only known from the live taken holotype.

Description: Shell of moderate size, very solid, turriculate consisting of 9 whorls. The apical part of the shell has been dissolved, so that the protoconch and early postlarval whorls are not known. Teleoconch with rather flat whorls and rather deep, slightly grooved suture. The intritacalx has been dissolved on large parts of the teleoconch, but remains on small surfaces near the suture and the whole basal disc. The axial ribs are low and broad and there are about 20 per whorl. The intritacalx is minutely pitted; where it has been dissolved the sculpture appears as a rather poorly defined reticulation. The intritacalx on the basal disc has few pores. Aperture rounded with thickened peristome, inner lip continuous. The basal cord forms an angle at the base of aperture. No umbilicus. Colour of the shell chalky white.
Dimensions: height 15.9 mm, breadth 5.2 mm; aperture diameter 2.8 mm.
Operculum fig. 1113.
Radula fig. 1105.

Remarks: This is the deepest occurring species of *Gregorioiscala* from the NE Atlantic and it is the one where the fragile intritacalx has suffered the most from corrosion despite the holotype being live taken. *G. exfoliata* is distinguished from other *Gregorioiscala* by its less convex whorls, with low axial ribs that do not from varices or nodules.

Gregorioiscala sarsi (Kobelt, 1903) Figs 1122, 1257-1258

Scalaria varicosa, G.O. Sars 1878: 348, pl. 34, fig. 9.
Scalaria coarctata Jeffreys, 1884: 139 (*pars*).
Scala (Pseudacirsa) sarsii Kobelt, 1903: 28, pl. 60, figs 12-13 (copied from Sars), not pl. 62, fig. 9 (= *coarctata* s.s.).

Type material: S. sarsi, holotype in ZMO.

Type locality: Moldö, N Norway, 180-270m.

Material examined: The holotype and MONACO st 1349, 38° 35N, 28° 06W, 1250m, 1 sh; THALASSA st Z430, 48° 37N, 09° 52W, 1080m, 1 spm.

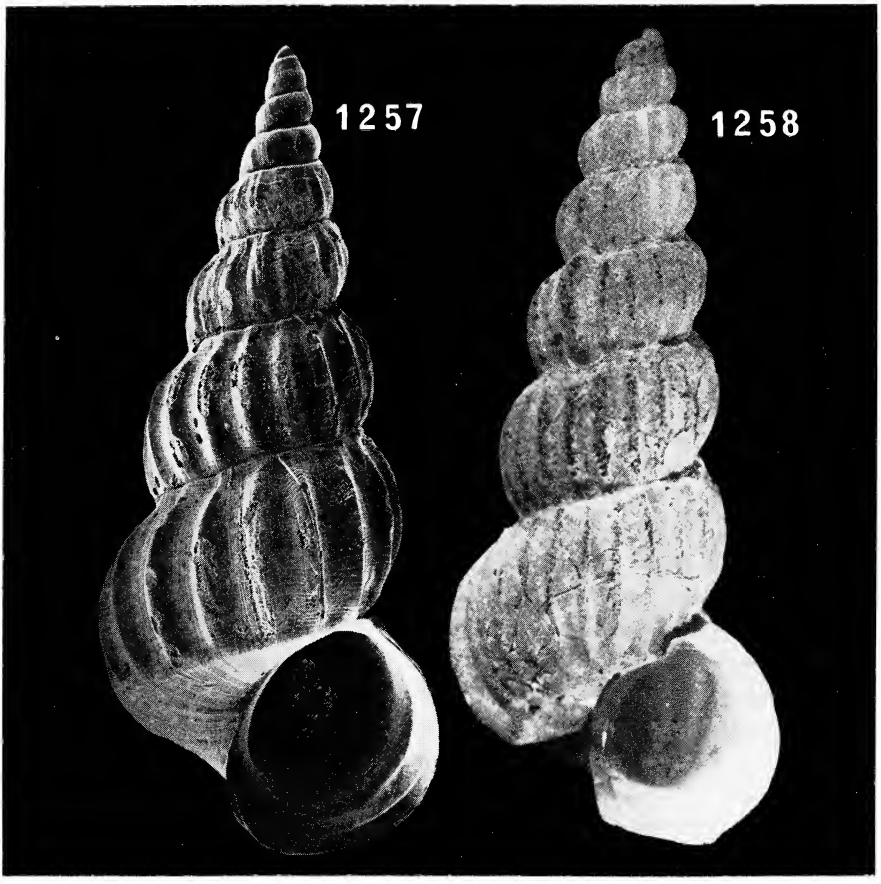
Distribution: Only known from the material examined.

Remarks: This is an extremely rare species, known only from 3 shells from geographically widely distant European localities. The record by Schneider (1897) attributed by Kobelt (1903:29) to *sarsi* represents the true *coarctata*. Under the name *Scalaria coarctata*, Jeffreys included two species, formerly separated by G.O. Sars. Kobelt (1903), the first reviser, restricted Jeffreys' name to the species figured by Sars under the name *Scalaria obtusicostata*, and renamed the other *sarsi*.

The protoconch of the THALASSA specimen, although slightly corroded, is clearly multispiral and indicates planktonic larval development.

From *Gregorioiscala pachya, G. sarsi* can be distinguished by its less solid shell with fewer, non nodulous axial ribs and angular peristome (in *pachya* the apertural varix is angular at the base, but the peristome is perfectly rounded). *G. exfoliata* has less convex whorls, lower, more indistinct axial ribs, that do not form varices.

Acirsa annectens Powell, 1951 has pores in the intritacalx and belongs to the same species group as *G. sarsi* and *G. exfoliata* (holotype examined in BMNH).



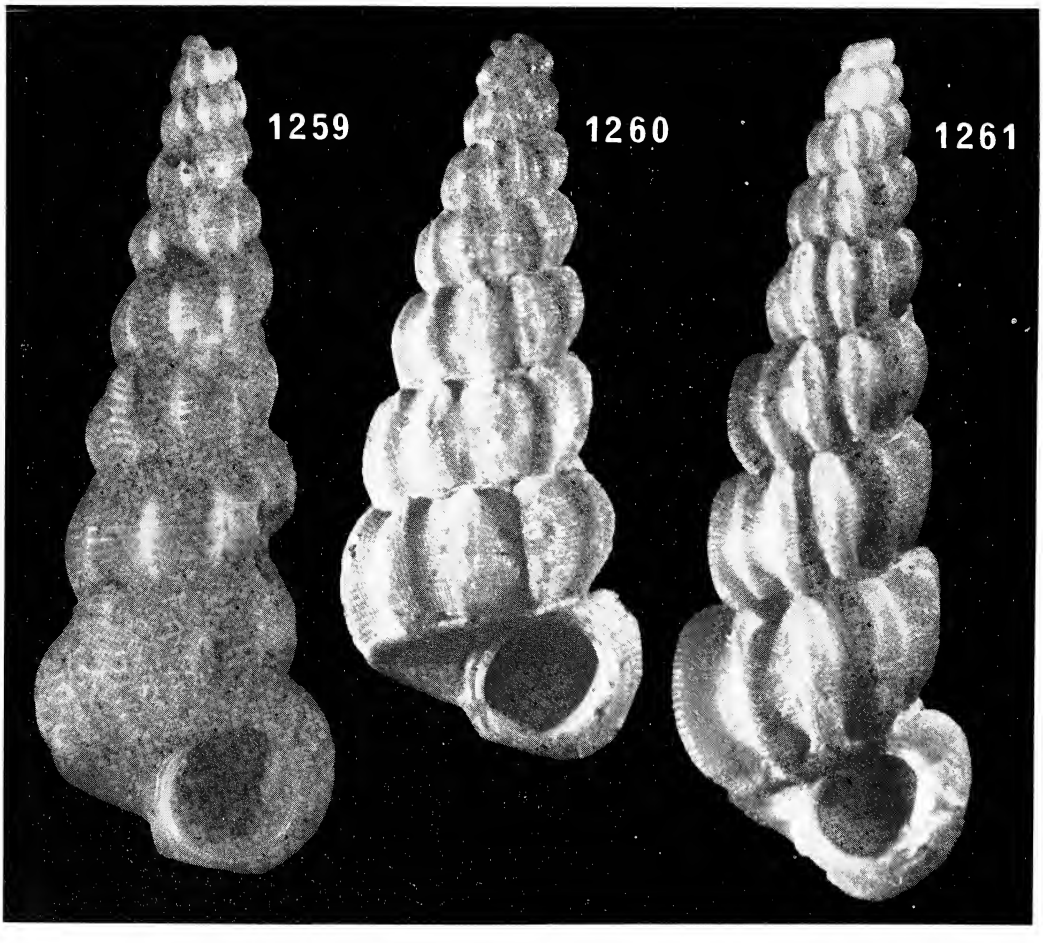
Figs 1257-1258. *Gregorioiscala sarsi.* 1257, THALASSA Z430, 6.4 mm. 1258, holotype, 12.4 mm.

Genus *PUNCTISCALA* de Boury, 1890

Type species: (by original designation) *Scalaria plicosa* Philippi, 1844.

Punctiscala plicosa is a fossil species from Sicily, of which we have examined a specimen from the Pliocene of Altavilla (fig. 1259). It has a well defined basal disc over which the axial sculpture does not extend; the axial sculpture consists of broad ribs and the outer lip is thickened. There is a pitted intritacalx.

The relationship between *Punctiscala* and *Gregorioiscala* is not clear. *Punctiscala* is used here because the Recent species *funiculata* and *cerigottana* resemble the type species of the genus very much; *Gregorioiscala* is used because there is obviously a group of related species around *pachya (unilateralis, japonica)* that resemble the type species very much. However, it may be that these are only species groups within a broader genus and more information on these epitoniids is needed before a stable classification can be reached.



Figs 1259-1261. Genus *Punctiscala*. 1259, *P. plicosa*, type species of the genus, Pliocene of Altavilla, 8.5 mm. 1260, *P. funiculata*, holotype, 5.1 mm. 1261, *P. cerigottana*, Adventure Bank, 7.0 mm.

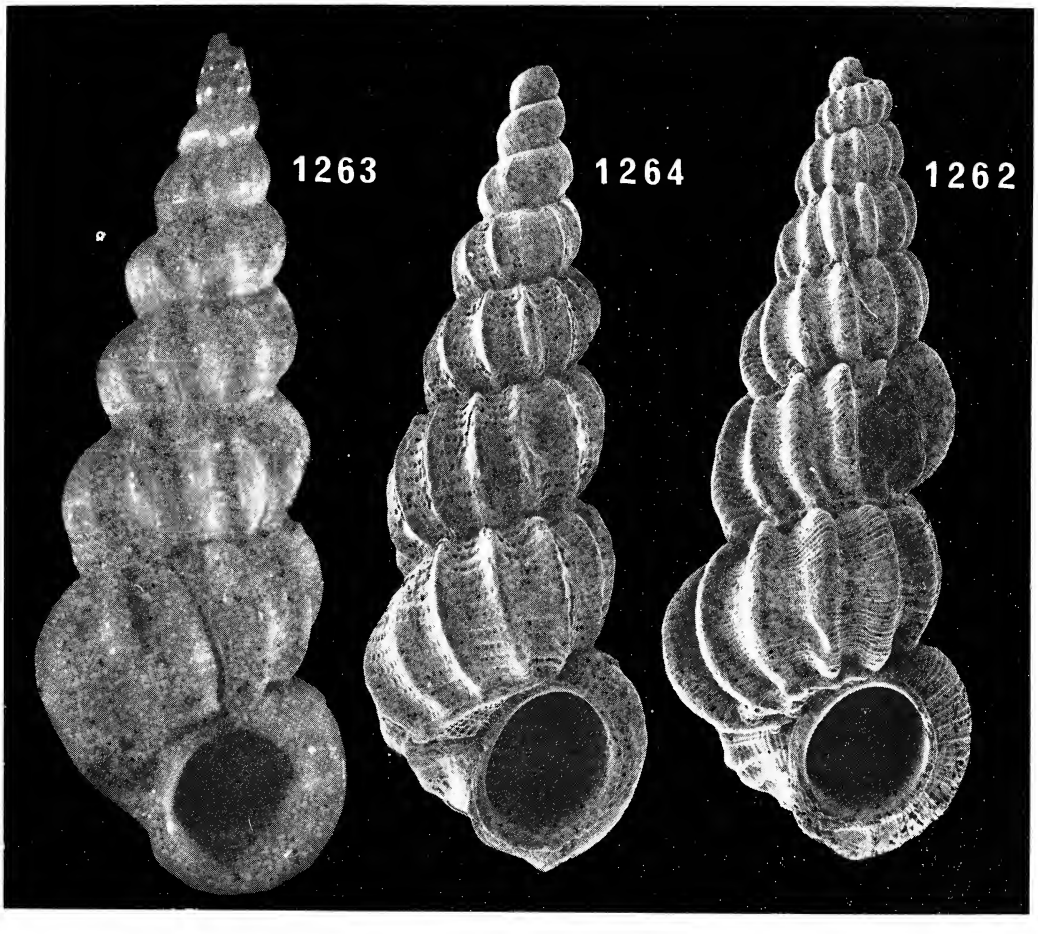
Punctiscala cerigottana (Sturany, 1896)
Figs 1123-1124, 1235, 1261-1262

Scalaria cerigottana Sturany, 1896:9, pl. 1, fig. 3-4.
Scalaria aspera Watson, 1897: 251, pl. 19, fig. 18.

Type material: S. cerigottana, holotype in Naturhistorisches Museum, Wien; *S. aspera*, holotype in National Museum of Wales, Cardiff.

Type locality: S. cerigottana, POLA st 194, 36° 03N, 23° 06E, 160m (S. Greece); *S. aspera*, Funchal Bay, Madeira, 90m.

Material examined: The type material and Adventure Bank, between Sicily and Tunisia, 170m, 10 shs (coll. Sykes); off Algeria, 95m, 2 shs (coll. Sykes); off Taranto, S Italy, 180m, 1 sh (coll. Fassulo); Siracusa, 50m, 1 sh (coll. Ebreo); between Sicily and Tunisia, 350-600m, 1 fragm. (coll. Piani); Tuscan archipelago, S part, 300-450m, 1 sh (coll. Piani); off West Sardinia, 100-150m, 1 sh (coll. Cirella); EOLIS st 316, off Sand Key, Florida, 220m, 1 sh (USNM 417429; Clench & Turner 1952: 332, pl. 160).



Figs 1262-1264. Genera *Punctiscala* and *Opalia*. 1262, *P. cerigottana*, Madeira, holotype of *P. aspera*, 5.0 mm. 1263, *O. abbotti*, holotype, 4.2 mm. 1264, *O. abbotti*, Algeria, 100 m, 3.5 mm.

Distribution: The deep shelf of the southern Mediterranean and the tropical/subtropical N Atlantic. Only known from the material examined.

Remarks: P. cerigottana has persistently been confused with *Opalia abbotti*, see that species.

Clench & Turner (1952:332) identified their material with *Scalaria funiculata* Watson, 1883 but that species has fewer, more distant axial ribs, a much larger basal disc and a distinctly reticulate microsculpture. It should be noted that *S. funiculata* Watson, 1883 is not preoccupied by *Cirsotrema funiculata* Carpenter, 1857; even if one admits only a limited number of epitoniid genera they are not secondary homonyms because Carpenter's species is now regarded as an *Opalia* (Keen 1971, DuShane, 1974). *Punctiscala funiculata* is figured here for comparison (fig. 1260).

Genus *OPALIA* H.&A. Adams, 1853

Opalia H.&A. Adams, 1853:222.

Type species: Scalaria australis Lamarck, 1822 (by subsequent designation by de Boury 1886).

Opalia is generally used for shallow water epitonids with or without basal disc, that have a pitted intritacalx. The type species has a strong basal disc, but there seems to exist all transitions between species with a basal disc and species without it (see for example DuShane 1974, figs 122-145). Axial sculpture is generally present in the form of broad ribs, but again all transitions seem to exist between species with strong axial sculpture and species with no axial sculpture at all. Finally, the character that best characterizes *Opalia* is the pitted intritacalx. Often the intritacalx extends a little over the adapical suture and the suture appears adpressed; this is particularly apparent in the case of species with axial ribs, where these ribs form crenulations at the suture.

None of the characters enumerated above can be used to separate *Opalia* from *Gregorioiscala* and *Punctiscala.* We have however preferred to treat them as different genera, because their type species belong to species groups that are bathymetrically distinct. There are no bathyal or abyssal species known with the characters of shallow water *Opalia.* The two species treated here are probably shelf species; they are included in the revision because their taxonomy was until now confused, at the species level, with *Punctiscala cerigottana.*

Opalia abbotti (Clench & Turner, 1952) Figs 1234, 1263-1265

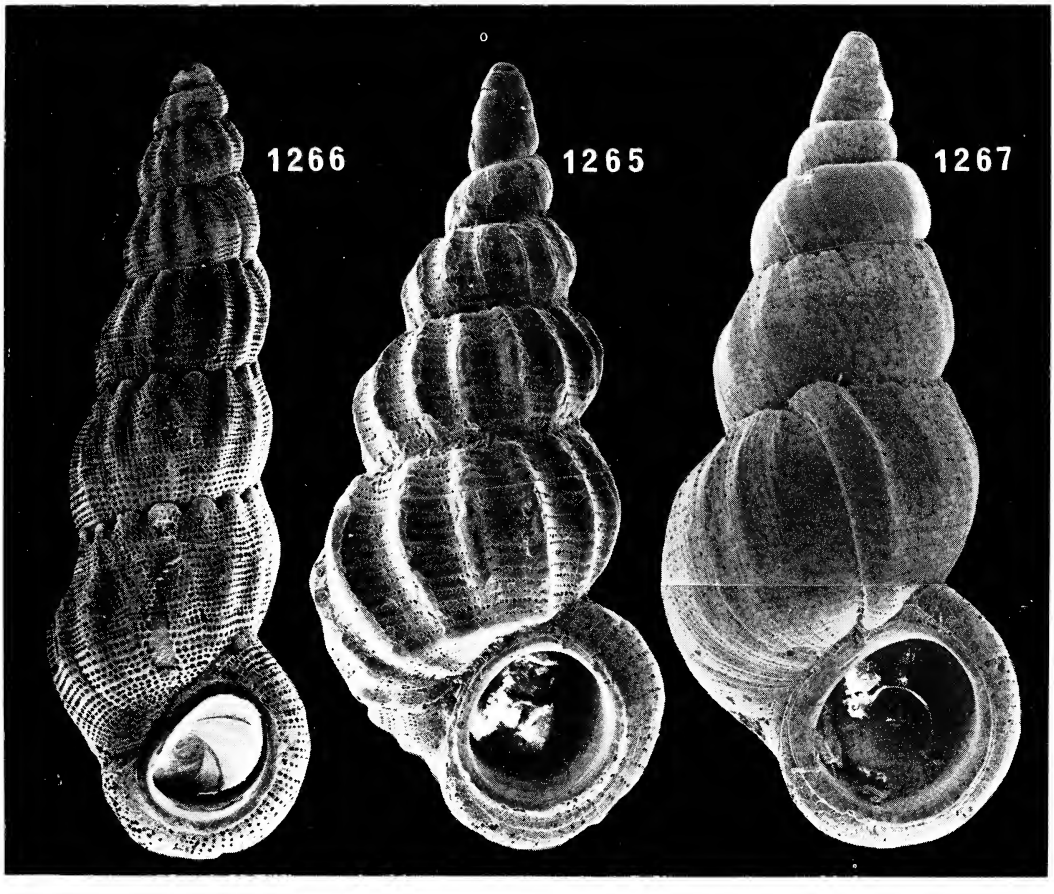
Scalaria or *Cirsotrema fusticulus* Monterosato, 1875: 30 (*nomen nudum*); 1878: 90 (*n.n.*); 1890: 30 (*n.n.*); de Boury 1891: 212 (*n.n.*); Kobelt 1903: 48 (*n.n.*).
Opalia abbotti Clench & Turner, 1952: 348, pl. 171.
Opalia cerigottana nicolayi Nordsieck, 1974: 12, fig. 9.

Type material: O. abbotti, holotype in MCZ 184511; *O. cerigottana nicolayi*, holotype in coll. Giannini.

Type locality: O. abbotti, ATLANTIS st 3374, 20°45N, 75°19W, 550m (off Cuba); *O. cerigottana nicolayi*, off Capo Camino, Sardinia, 200-220m.

Material examined: The type material and St Raphaël, SE France, 120m, 4 shs; Calvi, Corsica, 70-150m, 4 shs; Bocche de Bonifacio, Corsica, 200m, 1 sh (coll. Giannini); Tuscan archipelago, 150-180m, 3 shs (coll. Piani); Tuscan archipelago, S part, 300-450m, 1 sh (coll. Piani); Capo Camino, Sardinia, 210m, 1 sh (coll. Crovato); W of Sardinia, 100-150m, 2 shs (coll. Cirella); Napoli, Italy, 1 sh (coll. Sabelli); Adventure Bank, between Sicily and Tunisia, 170m, 1 sh; off Algeria, 93m, 1 sh (both coll. Sykes); off Rinaldo's Chair, N Africa, 110-290m, 1 sh (USNM 182472); Madeira, 2 shs (BMNH, coll. Norman); CANCAP st 2.065, 28°11N, 13°57W, 670m, 1 sh; st 2.074, 28°02N, 14°29W, 530m, 1 sh.

Distribution: Deep shelf and upper bathyal of the Mediterranean and tropical/subtropical N Atlantic; on the American side known from S Florida and N Cuba (Clench & Turner 1952: 349).



Figs 1265-1267. Genus *Opalia*. 1265, *O. abbotti*, CANCAP 2.074, 2.7 mm. 1266, *O. hellenica*, Oran, Algeria, 35 m, 6.3 mm. 1267, *O. fortunata*, holotype, 3.0 mm.

Remarks: O. abbotti is rare and has been confused with another rare species, *Punctiscala cerigottana.* The two species are small (maximum 7mm) and live on the deeper parts of the shelf. Fresh specimens, however, are easily separated by the punctuate intritacalx of *O. abbotti*; when the punctuations are not taken into consideration, *O. abbotti* still differs by being more slender, with fewer, less thickened axial ribs. It is also a smaller form (5mm vs. 7mm).

Two shells from the Canaries (fig. 1265) differ a little by their broader shape, but all other characters, including the protoconch, are identical.

Opalia hellenica (Forbes, 1844) has a poorly defined basal disc, axial ribs that form crenulations at the suture and more numerous spiral rows of pores (fig. 1266).

The larval shell (fig. 1234) is brown, multispiral, with one distinct supra- and another subsutural spiral thread.

Opalia fortunata n.sp. Figs 1233, 1267

Type material: Holotype RMNH 55790 and 2 paratypes in RMNH 55791.

Type locality: CANCAP st 2.155, 27°35N, 17°59W, 700m.

Material examined: Only known from the type material.

Description: Shell small, rather solid, consisting of 3 larval and 4 postlarval whorls. Protoconch with less convex whorls than teleoconch, with an indistinctly cancellated sculpture. Teleoconch with regularly convex whorls totally covered by a smooth (not chalky) finely pitted intritacalx. There is no spiral sculpture. The axial sculpture consists of ribs and incremental varices; the axial ribs are low, indistinct and hardly extend below the middle part of the whorl; incremental varices are strong and form broad prosocline ribs. There is a single such varix on the holotype, situated approximately one whorl before the aperture, and respectively 1 and 2 varices on the 2 paratypes. There is no basal cord or basal disc and the base of the shell is regularly convex. No umbilicus. Peristome thickened, complete; aperture ovate.
Dimensions of the shell: height 3.0mm, breadth 1.32mm; diameter of the aperture 0.7mm.

Remarks: Opalia fortunata is easily recognized from among Atlantic *Opalia* by its small size and very smooth general appearance. It is possible that the 3 known shells are not adult, although they are all approximately of the same size.

All three shells were collected empty and it may be living in more shallow water.

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Italic type indicates valid taxa as used here.
Names in Roman type are synonyms or superseded names.
Names of valid genera are in CAPITAL letters.

Table 4. Distribution of the species.

The bathymetrical distribution is indicated in two ways, either by figures or lines. The heading indicates 100 metres intervals, and the figures the number of samples from the preceding interval. For some species of which numerous samples are known, a solid line indicates the normal distribution (when there are two such lines, the upper line indicates the distribution in the northern part of the area, the lower one in the southern part).
n is the number of samples examined. After the mean depth, the standard deviation is given.
This gives some indication of the bathymetrical range.

Species	W. Arctic	E. Arctic	W. Atlantic	Europe	Mediterr.	Azores	Max °S	Max °N	3	5	10	15	20	25	30	35	40	45	50	50+	n	Mean depth (m)	σ	Faunal assemblage
Aclis sarsi				☆			33°N	71°N	2	3	6	2	2								15	785	490	shelf, bathyal
Aclis walleri				☆			44°N	68°N	3	4	5		8	6							26	1361	783	bathyal
Aclis attenuans					☆		35°N	42°N	—			·												shelf
Eulima dysnoeta						☆	38°N					1									1	1385	—	bathyal
Eulima grimaldii						☆	38°N					2									2	1317	95	bathyal
Eulima bilineata				☆	☆		35°N	71°N	—	—														shelf
Eulima incolor				☆			44°N							1							1	2006	—	bathyal
Sticteulima lata				☆			30°N				1										1	600	—	bathyal
Fuscapex major				☆		☆	25°N	40°N			1	1	1								3	1363	578	bathyal
Fuscapex talismani				☆		☆	39°N	49°N				6									6	1230	145	bathyal
Fuscapex baptocephala				☆		☆	29°N	49°N				10									10	1317	135	bathyal
Fuscapex cabiochi				☆			49°N				2	4									6	1143	361	bathyal
Fuscapex microcostellata				☆		☆	39°N					3	2								5	1480	242	bathyal
Batheulima abbreviata				☆			40°N					1	1								2	1668	455	bathyal
Batheulima fuscoapicata			☆	☆		☆	31°N	48°N			1	3	6	1							11	1495	405	bathyal
Batheulima thurstoni							33°S	20°N								1		1	1		3	4531	655	abyssal
Haliella stenostoma		☆	☆	☆	☆		28°N	71°N	—	—	—	—	—	—										shelf, bathyal
Haliella canarica				☆			30°N				1										1	590	—	bathyal ?
Halielloides ingolfiana				☆			39°N	71°N	2			1	2								5	998	788	bathyal
Halielloides fragilis				☆	☆		37°N		1	1											2	365	332	bathyal ?
Rectilabrum lanceolatum			☆	☆			38°N	59°N					4	3	3	2	1	4	4		21	3282	1136	abyssal
Ophieulima minima			☆	☆			31°N	54°N													5	1370	649	bathyal
Ophiolamia fragilissima				☆			55°N	57°N							3						3	2647	220	abyssal

segue: Tab. 4

Species	W. Arctic	E. Arctic	W. Atlantic	Europe	Mediterr.	Azores	Max °S	Max °N	3	5	10	15	20	25	30	35	40	45	50	50+	n	Mean depth (m)	σ	Faunal assemblage
Melanella martynjordani				☆			40°N	59°N			2	3	1								6	1172	406	bathyal
Melanella obtusoapicata				☆			40°N	44°N			1	1									2	988	506	bathyal
Melanella pseudoglabra				☆			40°N	44°N				2	1								3	1327	574	bathyal
Melanella turrita				☆			63°N			1											1	300	—	shelf ?
Melanella frielei				☆	☆		28°N	71°N																shelf, bathyal
Melanella lucida			☆	☆			38°N	57°N					1	2	7	1	2				13	2896	529	abyssal
Melanella reticulata						☆	38°N	39°N				2	1								3	1428	155	bathyal
Melanella charissa			☆	☆			38°N	64°N				1	4		10	2	2				19	2703	653	abyssal
Melanella laurae		☆		☆			61°N	70°N				2									2	1118	97	bathyal
Melanella densicostata				☆			13°N	47°N									1	3			4	4133	314	abyssal
Melanella glypta					☆		37°N				1										1	550	—	bathyal ?
Melanella jeffreysi				☆			29°N	49°N	1	1	2	3	1								8	904	600	bathyal
Melanella orphanensis	☆	☆					40°N	68°N	4	1	2	3	3								13	879	621	bathyal
Melanella similior				☆			40°N	49°N				1	1	1							3	1682	547	bathyal
Melanella costellata						☆	39°N						1								1	1600	—	bathyal
Melanella turbonilloides				☆			40°N	47°N					1					1	1		3	3696	1503	abyssal
Melanella gagei				☆			57°N						1		1						2	2155	544	bathyal
Melanella insculpta			☆	☆			40°N	64°N			1	4	1								6	1337	399	bathyal
Melanella microsculpta				☆	☆		36°N	37°N	1		1										2	434	378	shelf ?
Melanella planisutis						☆	39°N					1	1	2							4	1765	413	bathyal
Melanella spiridioni				☆	☆	☆	28°N	49°N			4	7	4								15	1249	282	bathyal
Melanella myriotrochi				☆			56°N								1						1	2591	—	abyssal
Melanella doederleini				☆	?		36°N				1										1	550	—	shelf ?
Melanella richardi						☆	38°N					1									1	1385	—	bathyal
Melanella halorhaphe						☆	39°N			1											1	454	—	shelf ?

segue: Tab. 4

Species	W. Arctic	E. Arctic	W. Atlantic	Europe	Mediterr.	Azores	Max °S	Max °N	3	5	10	15	20	25	30	35	40	45	50	50+	n	Mean depth (m)	σ	Faunal assemblage
Pisolamia brychia			☆	☆			37°S	50°N						1		1	3	6	2		12	4517	640	abyssal
Megadenus oneirophantae				☆			46°N	48°N										2			2	4810	20	abyssal
Molpadicola sp.				☆			48°N											1			1	4829	—	abyssal
Entocolax sp.							60°N				1										1	700	—	bathyal ?
Enteroxenos oestergreni							59°N	60°N	—	—														shelf
Crinolamia dahli		☆					65°N	77°N					1	2	3	6					15	3254	377	abyssal
Crinolamia angustispira				☆			35°N	55°N					1	2			1				4	3100	1009	abyssal
Crinophtheiros junii						☆	39°N				1										1	1257	—	bathyal
Curveulima macrophthalmica				☆			25°N	68°N	—		2	2	1	1								1216	785	shelf ?, bathyal
Curveulima marshalli				☆			40°N					1									1	1990	—	bathyal
Curveulima obliquistoma				☆		☆	39°N	44°N			1	2									3	1740	424	bathyal
Curveulima eschara				☆			26°N			1											1	850	—	bathyal ?
Bathycrinicola talaena				☆		☆	35°N	49°N			2		2								4	1630	435	bathyal
Bathycrinicola micrapex				☆		☆	39°N	49°N			2	2	2								6	1754	514	bathyal
Bathycrinicola curta				☆			60°N	63°N	2	1											3			shelf
Bathycrinicola macrapex				☆		☆	39°N	44°N			1	2									3	1718	407	bathyal
Bathycrinicola media				☆			28°N			1											1	500	—	bathyal
Fusceulima minuta				☆	☆		36°N	44°N	8	4											12	265	223	shelf, bathyal
Fusceulima thalassae				☆			44°N	48°N		3											3	818	103	bathyal
Fusceulima projectilabrum				☆			44°N				1										1	1490	—	bathyal
Fusceulima ingolfiana	☆						62°N			1											1	913	—	bathyal

segue: Tab. 4

Species	W. Arctic	E. Arctic	W. Atlantic	Europe	Mediterr.	Azores	Max °S	Max °N	3	5	10	15	20	25	30	35	40	45	50	50+	n	Mean depth (m)	σ	Faunal assemblage
Pelseneeria stylifera			?	☆			44°N	65°N																shelf
Pelseneeria profunda						☆	39°N					1	1								2	1716	331	bathyal
Pelseneeria media						☆	37°N	39°N				1	6								7	1744	150	bathyal
Pelseneeria minor				☆	☆	☆	33°N	38°N	6												6	110	71	shelf
Pelseneeria striata						☆	37°N	39°N	1	2	3										6	460	120	bathyal ?
Sabinella bonifaciae				☆	☆		36°N	48°N	8			1									9	264	353	shelf, bathyal
Sabinella pachya						☆	38°N					1									1	1385	—	bathyal
Eulitoma insignis			☆			☆	23°N	39°N			2	2									4	1037	267	bathyal
Eulitoma josephinae				☆			37°N		1												1	200	—	shelf
Eulitoma obtusiuscula				☆			49°N					3									3	1236	176	bathyal
Eulitoma arcus				☆			40°N	49°N			1	2	1								4	1370	475	bathyal
Vitreolina knudseni						☆	37°N			1											1	480	—	shelf ?
Acrochalix callosa				☆			28°N				1										1	670	—	bathyal ?
Campylorhaphion famelicum				☆	☆	☆	28°N	47°N	1		3	1	1								6	874	638	bathyal
Campylorhaphion machaeropsis						☆	39°N					1									1	1372	—	bathyal
Auriculigerina miranda				☆	☆		37°N	38°N	1			1									2	733	986	shelf, bathyal ?
Oceanida confluens				☆	☆		27°N	37°N			2										2	655	78	bathyal
Umbilibalcis crassula				☆			28°N				1										1	800	—	bathyal
Umbilibalcis subumbilicata				☆			37°N				1										1	586	—	bathyal ?
"Mucronalia" mammillata			☆	☆			30°N	40°N			2		1								3	1105	777	bathyal
Niso foresti						☆	38°N			1											1	345	—	shelf ?
Costaclis mizon				☆			25°N	48°N					1	2	1						4	2252	494	bathyal

segue: Tab. 4

Species	W. Arctic	E. Arctic	W. Atlantic	Europe	Mediterr.	Azores	Max °S	Max °N	3	5	10	15	20	25	30	35	40	45	50	50+	n	Mean depth (m)	σ	Faunal assemblage
Parastilbe acuta				☆			40°N						1								1	1800	—	bathyal
Hemiaclis ventrosa			☆	☆			33°N	73°N	——		3	2	2	1	1						16	966	831	shelf, bathyal
Hemiaclis obtusa				☆			44°N	48°N					1	9							10	2159	100	bathyal
Hemiaclis major	☆						65°N							1							1	2448	—	abyssal
Bulimeulima magna				☆			46°N										1				1	4175	—	abyssal
"Eulima" confusa				☆			40°N						2								2	1541	635	bathyal
"Eulima" fuscozonata				☆			36°N	37°N			2										2	616	121	bathyal
"Eulima" leptozona				☆	☆	☆	37°N	49°N	1			3									4	963	548	bathyal
"Eulima" devistoma				☆			48°N				1			2							3	1785	837	bathyal
"Eulima" strongylostoma				☆			46°N	47°N									1	1			2	4537	368	abyssal
"Eulima" anonyma				☆			40°N	49°N			2	3	1	2			1				9	1835	1093	bathyal
"Eulima" chionea			☆				08°N	19°N									1	1			2	4695	361	abyssal
Eccliseogyra nitida			☆	☆			09°S	40°N		2				1	2	3	5		2		15	3132	1207	bathyal, abyssal
Eccliseogyra sericea				☆			20°N	50°N									2	3	1		6	4258	337	abyssal
Eccliseogyra monnioti				☆			11°N	35°N									2	2		3	1 8	4707	709	abyssal
Eccliseogyra folini				☆		☆	32°N	39°N		1		6	4								11	1365	369	bathyal
Eccliseogyra exquisita				☆			29°N				1										1	875	—	bathyal
Eccliseogyra formosissima				☆		☆	22°N	40°N		1	2	1	1								5	1062	626	bathyal
Opaliopsis atlantis				☆	☆	☆	22°N	38°N		1	4										5	580	140	bathyal
Narrimania concinna						☆	36°N		4												4	283	214	shelf ?, bathyal ?

segue: Tab. 4

Species	W. Arctic	E. Arctic	W. Atlantic	Europe	Mediterr.	Azores	Max °S	Max °N	3	5	10	15	20	25	30	35	40	45	50	50+	n	Mean depth (m)	σ	Faunal assemblage
Iphitus tuberatus				☆		☆	25°N	49°N			9	5									14	938	222	bathyal
Iphitus marshalli				☆	☆		36°N	40°N			1		1								2	1270	1004	bathyal
Iphitus cancellatus			☆	☆		☆	26°N	39°N			2	2									4	1074	240	bathyal
Papuliscala elongata				☆		☆	34°N	40°N					4	1							5	1860	147	bathyal
Papuliscala praelonga			☆	☆		☆	19°N	64°N			1	1	2	1							5	1572	553	bathyal
Papuliscala cerithielloides				☆			40°N						1								1	1970	—	bathyal
Papuliscala tavianii				☆	☆		30°N	37°N			2										2	597	67	bathyal
Epitonium hispidulum				☆	☆	☆	28°N	49°N	10		5	4	1								20	605	550	shelf, bathyal
Epitonium tryoni				☆	☆		33°N	43°N	6												6	154	39	shelf
Epitonium fischeri				☆			33°N		1												1	?	—	shelf ?
Epitonium algerianum				☆	☆		14°N	48°N	19	1											20	122	96	shelf
Epitonium tiberii				☆	☆		37°N	49°N	17	2											19	164	114	shelf
Epitonium celesti			☆	☆	☆	☆	18°N	44°N	11	5	5	2									23	432	318	shelf, bathyal
Epitonium nanum				☆		☆	38°N	48°N			1	6	2								9	1345	332	bathyal
Epitonium pseudonanum				?	☆		36°N	43°N	8												8	87	53	shelf
Epitonium semidisjunctum				☆		☆	37°N	40°N				3	3								6	1539	234	bathyal
Epitonium striatissimum			☆	☆	☆		25°N	38°N	8												8	—	—	shelf
Epitonium linctum				☆	☆		18°N	41°N	4												4	—	—	shelf
Epitonium vittatum				☆	☆		04°N	37°N	7												7	115	61	shelf
Epitonium dendrophylliae				☆	☆		09°N	37°N	6			1									7	301	454	shelf, bathyal
Epitonium dallianum			☆	☆		☆	34°N	49°N		3	12	7	1								23	913	354	bathyal
Epitonium greenlandicum	☆	☆					60°N	80°N														—	—	shelf
Epitonium sp. A					☆		43°N		1												1	—	—	shelf
Epitonium sp. B				☆			34°N					1									1	1378	—	bathyal

segue: Tab. 4

Species	W. Arctic	E. Arctic	W. Atlantic	Europe	Mediterr.	Azores	Max °S	Max °N	3	5	10	15	20	25	30	35	40	45	50	50+	n	Mean depth (m)	σ	Faunal assemblage
Acrilloscala lamyi				☆	☆		20°N	49°N	4	2	1	1									7	460	400	shelf, bathyal
Acirsa subdecussata				☆	☆		02°N	47°N	—	1														shelf
Acirsa coarctata		☆					69°N	73°N	3	2											5	257	129	shelf
Acirsa eschrichti	☆						42°N	70°N	—															shelf
Cylindriscala acus				☆		☆	28°N	40°N			1	2	5	1							9	1611	429	bathyal
Cylindriscala guernei				☆		☆	38°N	39°N				3	1								4	1377	178	bathyal
Cylindriscala vicina				☆		☆	38°N	40°N				1	1								2	1667	399	bathyal
Cylindriscala jeffreysi				☆		☆	28°N	40°N				3	2								5	1505	298	bathyal
Cylindriscala thalassae				☆			48°N					1									1	1055	—	bathyal
Cylindriscala aurantia						☆	37°N							1							1	2090	—	bathyal
Cylindriscala mirifica				☆		☆	30°N	37°N						1	2						3	2592	448	abyssal
Claviscala richardi				☆		☆	38°N	52°N			8	9									17	1011	220	bathyal
Periapta polygyrella			☆	☆			33°S	56°N								7	5	2			14	4148	336	abyssal
Periapta gracilis			☆	☆			40°N	50°N			1		1			1					3	1767	1006	bathyal
Alora tenerrima			☆	☆		☆	31°N	43°N			1	1		1							3	1450	538	bathyal
Alora retifera						☆	39°N					1	1								2	1548	421	bathyal
Gregorioiscala pachya				☆		☆	38°N	44°N			1	6	1								8	1294	259	bathyal
Gregorioiscala sarsi		?		☆		☆	38°N	68°N	1			2									3	852	549	bathyal
Gregorioiscala exfoliata				☆			44°N							1							1	2006	—	bathyal
Punctiscala cerigottana			☆	☆	☆		25°N	40°N	9												9	143	57	shelf
Opalia abbotti			☆	☆	☆		20°N	43°N	13		3										16	278	203	shelf
Opalia fortunata				☆			27°N				1										1	700	—	bathyal ?

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