REVISION OF THE NORTH-EAST ATLANTIC BATHYAL AND ABYSSAL TURRIDAE (MOLLUSCA, GASTROPODA)

PHILIPPE BOUCHET
Muséum national d'Histoire naturelle, Paris
and
ANDERS WAREN
Zoologiska Institutionen, Göteborg

SUPPLEMENT 8
THE JOURNAL OF MOLLUSCAN STUDIES
DECEMBER 1980

ABSTRACT

A revision, primarily on the specific level, of the N.E. Atlantic species of the family Turridae is presented. The area surveyed covers the Atlantic ocean North of *c.* 33°N, East of the Mid-Atlantic ridge, including the Norwegian and Mediterranean seas. Only species normally occurring below 300 m are included. All published materials, plus material taken by the French, British and German deep-sea programmes has been examined. All named species from the area are figured and diagnostic characters presented; the larval shell and radula of most species are figured. The value of taxonomical characters in the family is discussed, as also the distribution of the species.

The fauna contains 102 species in 25 genera. About 220 names are synonymized into 85 species. Thirteen new specific and two new generic names are introduced.

CONTENTS

GENERAL INTRODUCTION

This revision of the family Turridae is the first of a series dealing with the NE Atlantic bathyal and abyssal gastropods.

We not only have used the material collected during recent expeditions, but we have also revised as much as could be traced of the historical expeditions. Knudsen (1970) has compiled a list of the major deep-sea expeditions and we refer to this paper for further informations on station lists.

Lightning and *Porcupine* expeditions (1868-1870)
The malacological collections were first published by Jeffreys; additional samples were sorted by Marshall, and then published by Sykes. The material is in USNM and BMNH. A station list will be found in Warén (1980).

Challenger expedition (1873-1876)
The bulk of the collection is of course in BMNH, but additional samples are present in USNM (Jeffreys coll.), ZMB (sent to Friele by Watson) and National Museum of Wales (Watson coll.).

Valorous expedition (1875)
The material was published by Jeffreys and is in USNM and BMNH. A station list is in Warén (1980).

Travailleur (1880-1882) and *Talisman* (1883) expeditions
The material was published by Locard and is in MNHN; additional samples are present in the Jeffreys coll., because he participated in the first expedition in the bay of Biscay and because he also exchanged material with De Folin: these samples are in USNM. The station list should be used with much care because of a confused numbering system and because the positions are indicated west of Paris. From handwritten labels in the collection, it is apparent that Dautzenberg and H. Fischer studied this material some time at the beginning of this century. The samples first studied by P. Fischer have then been relabelled by Locard and have been difficult to trace.

Hirondelle and *Princesse-Alice* expeditions (1886-1913) (Referred to as MONACO)
The material was worked up and published by Dautzenberg and H. Fischer. The bulk of the collections is in MOM but many additional samples are in IRSN (Dautzenberg coll.) and MNHN (H. Fischer coll. and material sent by the prince to Joubin). The station lists published by Dautzenberg (1927) and Richard (1934) are correct but the positions given by Dautzenberg & H. Fischer in the early papers are west of Paris.

Ingolf expeditions (1895-1896)
The gastropod material of these expeditions had never been worked up. It is preserved in ZMC.

Deutsche Tiefsee Expedition (1898-1899)
The material was worked up partly by von Martens, then by Thiele. It is in ZMHU.

Michael-Sars North Atlantic Deep-sea Expedition (1910)
The material, worked up by Grieg, is in ZMB.

Pola expeditions (1890-1894)
The material was studied and published by Sturany and is in NHMW.

Norwegian North-Atlantic expedition (1876-1878)
Material worked up partly by Friele, then by Grieg, in ZMB.

Caudan expedition (1895)
The material was studied by Locard and kept in the collections of the Univ. of Lyon; however on our visit there only a very few samples and not a single type could be found. Scattered samples are present in the Locard coll. (MNHN) and in ZMB, probably sent by Koehler, leader of the expedition, to Friele or Sars.

Triton expedition (1882)
Material has been published by Jeffreys and is in USNM and BMNH. A station list is in Warén (1980).

Thor (1903) expedition
The malacological material has never been published; it is in ZMC.

Among the historical expeditions, the only one we have been unable to locate and study is the Italian *Washington* expedition in the Mediterranean; our seach for the material in the Genoa Museum and the Monterosato coll. (Rome), as well as requests to the curator of the collections in Naples, failed to reveal any material from this expedition. Therefore we consider that three turrids described by Jeffreys (1882), *Defrancia nodulosa, D. tenella* and *D. convexa,* are *nomina dubia,* because they are impossible to recognize without illustration or type material. They are probably synonyms of species treated in this revision.

We have studied all the samples of deep-water Turridae from these expeditions, including of course all the types. But the revision was mainly made possible by the large amount of material, comprising many samples and specimens, which has been dredged and trawled during recent years by various French expeditions:
— a number of cruises organized by the Centre Océanologique de Bretagne on N.O. *Jean-Charcot,* mainly at abyssal depths: Noratlante (1969), Polymède (1970), Walda (1971), Biogas (1972-1974), Norbi (1975, a joint Swedish-French expedition), Incal (1976, a French-British expedition); also on N.O. *Jean-Charcot* the Biaçores (1971) expedition organized by MNHN. This part of the material is contribution no 32 to the "résultats scientifiques de la campagne Biaçores". All this material now is MNHN.

— a number of cruises during the years 1970-1973 aboard N.O. *Thalassa* have been organized by the Station Biologique, Roscoff, mainly at bathyal depths. All this material now in MNHN.

We have also examined additional samples from other European deep-sea sampling programmes, mainly:
— *Challenger II* cruises (1973), organized by the Scottish Marine Biological Association; material now in RSM.
— *Sarsia* sampling programme in the Santander canyon (1976), organized by the Marine Laboratory, Plymouth. Material now in BMNH.
— material collected in the Horseshoe abyssal plain, by the German *Meteor* expeditions, and published by Fechter (1979); material now in the Bayerischen Staates Museum, Munich.

Other material was kindly submitted to us from various sources, among others material collected by Dr Lagardère on the continental slope off W. France (now in MNHN), several samples from the Azores collected by R.U. Bartlett (now in ZMC), one sample collected by R.V. *Discovery II* off Mauritania (now in IOS), samples collected during the Cineca III cruise of N.O. *Jean-Charcot* (now in MNHN) and some samples gathered by Dr Arnaud from various sources in the Mediterranean and around the Azores.

The material of the *Jean-Charcot* and *Thalassa* expeditions has been sorted by the Centre national de tri d'Océanographie biologique and the present revision owes very much to the skilfull work of the technicians of this centre.

Table 1 shows the bathymetrical distribution of the dredge hauls from which molluscs were obtained, originating from the expeditious above.

Table 1

SUMMARY OF THE BATHYMETRICAL DISTRIBUTION OF MOLLUSC YIELDING STATIONS 1880 – 1977

Depth (m)	300 – 500	500 – 1000	1000 – 1500	1500 – 2000	2000 – 2500	2500 – 3000	3000 – 3500	3500 – 4000	4000 – 4500	4500 – 5000	5000 – 5500
MONACO	6	25	39	19	6	1	1	2	6	1	4
TRAVAILLEUR											
1880	15	23	15	5	3	2					
1881	13	19	14	8	9	5	2				1
1882	15	27	11	8	7	3		3	1	2	
TALISMAN	6	32	37	13	22	13	4	4	6	3	1
THALASSA											
W	35	57	5		1						
X	6	62	7	7	1						
Y	20	36	9								
Z	14	26	28	1							
BIACORES	34	49	32	24	29	14	12	3	4	2	
NORATLANTE	14	8	18	5	8	9	7	9	4	6	3
BIOGAS		1	3	12	46	15	6	3	37	16	
INCAL		2			13	20			17	24	
NORBI					2	14	13	4			
	176	371	218	102	146	96	45	28	75	52	9

Total : 1315 hauls

INTRODUCTION TO THE FAMILY TURRIDAE

The family Turridae, together with the two more tropical families Conidae and Terebridae constitute the group Toxoglossa. They are characterized by having a strongly modified alimentary system. The salivary glands are transformed to poison glands, producing a poison which is injected into the prey with the aid of the radular teeth. As a consequence of this the teeth are strongly modified, reaching their highest specialization in the Conidae and some groups of Turridae, where they are stored more or less free from each other in the radular sac and used singly, by being transported to the extreme tip of the proboscis, where they are used as a syringe, to inject poison. The prey is killed by it and swallowed complete.

Some groups of turrids, in our material represented by *Spirotropis,* have a more primitive or original radula, with both central and lateral teeth beside the marginals, which also here are used to inject the poison. In some species, in our material *Irenosyrinx,* the lateral and central teeth have joined and form a thin membrane, connecting the two rows of marginals, with a small cusp remaining of the central tooth.

This radula with originally five teeth in each row indicates a taenioglossate origin of the group, which was suggested by Fretter & Graham (1962).

The earliest known turrids appear in late Cretaceous deposits, but even by then many of the different groups were represented, for which reason the origin must be much earlier.

The development of this way of feeding has evidently been very successful, because the group is at present one of the largest groups of prosobranchs and by far the largest group living on prey.

Turrids live mainly in and on soft bottoms, at all depths and in all geographical areas, even if they ar emost richly represented in the tropical areas and in the bathyal zone. At bathyal and abyssal deptsh they are far the largest group of prosobranch with respect to the number of species and, in the abyss, also usually with regard to the number of specimens.

Turrids live mainly in and on soft bottoms, at all depths and in all geographical areas, even if they are most richly represented in the tropical areas and in the bathyal zone. At bathyal and abyssal depths they are by far the largest group of prosobranchs with respect to the number of species and, in the abyss, also usually with regard to the number of specimens.

Historical

Originally most of the turrids were placed in a single genus, *Pleurotoma* Lamarck, 1799 (= *Turris* Röding, 1798), and it was not until G.O. Sars (1878) and Verrill (1882, 1884, 1885) started to look at the radula that any kind of organized division into genera was carried out. This work was, however, neglected by all later authors working on the group in European waters, except Thiele.

The exploration of the deep sea turrid fauna started with the deep-sea expeditions during the later third of the last century, with the works of Watson and Verrill, who worked up the collections of United States Fishery Commission and the Challenger Expedition. Later a number of species were described by Dautzenberg & Fischer and Locard, from the expeditions of Prince Albert of Monaco and Milne-Edwards.

It is understandable that Verrill did not identify any of the species described by Watson, from deep water in the West Indies and from the Azores, as, at the time of Verrill's papers, they were only incompletely described and not figured. It is more difficult to understand why Locard and Dautzenberg & Fisher, except occasionally, never tried to use the names given by Watson and especially by Verrill, whose descriptions and figures are really good. Locard even largely neglected the descriptions of Dautzenberg & Fischer. Two reasons might have contributed: it was important for the results of the expeditions to describe as many new species as possible and they, especially Locard, could not even imagine such a large distribution of a species. It is more understandable in the case of Dall, who described as new many species which were already described: he never had time to check earlier works (*cf.* Boss *et al.,* 1968: 4).

After these authors only a few scattered records and descriptions of deep-water turrids have appeared. This, in combination with the fact that the turrids constitute one of the most abundant and diversified families made us start working up the rich French material of gastropods brought together during the last ten years of exploration off Western Europe.

Some remarks on the taxonomy above the species level in Turridae

The genera of Turridae were revised by Powell (1966) and arranged in subfamilies. Another important recent contributor to the knowledge of the family is McLean (1971), who, however, is mostly concerned with shallow-water species.

The classification of the family seems mainly to be based on grouping species together with some more or less randomly selected shell characters in common. Nothing seems to have been done to evaluate these characters or to try new ways. In a group of species as large as the turrids, it is always possible to find some species which have the labial sinus at a certain level, put them together and add some further species in which the labial sinus is different but which resemble this group more than other ones and then call it a subfamily. Nothing seems to be done about the function of the labial sinus, for which reason we do not know to what extent the sinus is a function of the biology of the species or the genus.

We are, however, aware that in several cases we have synonymized, with aid from additional information about the soft parts and larval shell, genera which by Powell were placed in different subfamilies.

We are also aware that to make a new arrangement of the family, it is not enough to add some information, from the selected group of species we have dealt with, to the arrangement of Powell and make some changes. What is needed is a much more careful study of the complete family and further knowledge of the functional morphology, so as to evaluate the great differences in e.g. the digestive system, which are known from a few, very similar species.

Therefore, we have not tried to make any grouping of the genera into subfamilies.

The same problems are repeated at the generic level, but here we have been forced to try to arrange the species into genera. As a base for this, we have tried to use as many characters as possible, weighted against the work and time needed to obtain the information. On account of this, we have left out anatomical investigations and restricted the examination of the soft parts to presence of eyes and operculum and study of the radula. Differences in single shell characters were not used to separate genera (i.e. presence or absence of a single kind of sculpture, a little higher or lower subsutural zone). Neither were even rather great differences in the radula considered enough to separate genera. It must be remembered that the radula is an organ for capture of food, and thus has a good reason for being different in different species, much more so than other organs which not are so directly connected with the details separating the niches of species.

It has often been emphasized that the type of larval shell is of generic or subgeneric value (e.g. Powell, 1966: 6). We suppose that the difference between direct and planktotrophic development, i.e. a pauci-and multispiral larval shell, must be smaller than the difference (and taxonomical importance at the supraspecific level) between two different larval shells of the same type of development. In the former case, it is merely a question of changing the size of the eggs, in the latter, a change in the growth of the larva.

The result of these considerations has been that the species are mainly grouped according to the general appearance of the shell, except in some cases, where there were basic differences in the construction of the radula.

We realise that this is probably only partly an arrangement which shows relations between species, but at least, it is a practicl system which facilities identification.

Some remarks on the specific characters

A. The larval shell. There are two main types of larval shell, the paucispiral and the multispiral. They indicate respectively direct and planktotrophic development. The paucispiral larval shell usually consists of 1—1.5 whorls, often has some kind of sculpture and usuallly is rather constant in size; we have not seen a variation of more than about ± 20%..The shape may be rather variable.

Multispiral larval shells are of four main types, which can be exemplified by *Benthomangelia* spp., *Famelica* spp., *Corinnaeturris* and *Gymnobela* spp. The shape of the larval shell and whorls is very constant in all the species examined by us. The sculpture, especially of the last whorl and the size are more variable. This variation of size is directly connected with a variation in the number of whorls. This probably indicates different length of the planktonic life.

B. The start of the postlarval shell. The limit between the larval and postlarval shell can hardly be used, as the outer lip of the larval shell has usually been broken at metamorphosis. But the postlarval

sculpture seems to start in a very characteristic way, both in species with direct and planktonic development. Sometimes it starts with a single spiral rib, sometimes with two, sometimes the rib starts at the middle of the whorl, sometimes it starts at the lower part and runs obliquely up to the middle and stays there etc.

C. Subsutural zone and labial sinus. The depth of the labial sinus and the position of the deepest part are good characters. The position can easily be given as the ratio of the distance to the suture above to the height of the whorl. The subsutural zone of some species is concave, in others flat; in some species it is well defined, in others hardly present. These different modifications seem to be very constant.

D. Sculpture. The sculpture is rather variable in many turrids and too much attention should not be paid to differences in the sculpture, except when a large collection is available and shows persistent differences. It should also be remembered that the difference between a sculpture of spiral ribs and spiral furrows is not very great: when the ribs get broader than the spaces in between, the surface becomes sculptured by furrows.

E. The aperture. It is usually difficult to use the aperture, because it is often damaged, but when it is complete it seems to be constant in its proportions. One detail which easily escapes notice is the depth of the siphonal canal.

F. The size. Many turrids seem to have a well defined maximal size, e.g. *Oenopota* spp., *Drilliola* s.str., *Benthomangelia* spp., some *Gymnobela* and *Pleurotomella,* while in other species e.g. *Theta vayssierei* and *Phymorhynchus alberti* the maximal size of single specimens exceed by far the normal maximal size. We cannot explain this by anything else than that they have unlimited growth and that predation limits the maxmial size. In some species, even in species of which we have many specimens e.g. *Gymnobela subaraneosa,* we have seen only shells with about 2 postlarval whorls and without the thickened outer lip etc., which usually indicate maturity. But this should not necessarily be taken as a sign that they are not adult because rather few deep-water turrids show this indication of being full-grown.

G. Operculum. We have seen comparatively few species with an operculum. In fact it is only in *Spirotropis, Drilliola* and *Micropleurotoma,* that we have more than one species in a genus with operculum. Here we have not been able to see differences in the operculum, but have noticed intraspecific variation in colour, thickness and sculpture, even if the type of operculum is the same.

H. The radula. The variation of the teeth is rather great inside species and we have noticed this especially concerning the basal part of the teeth and their softness. The size of the teeth is proportional to the size of the specimen, but often differences in size between species are more distinct than differences in shape. All our radula drawings are prepared from normal sized specimens.

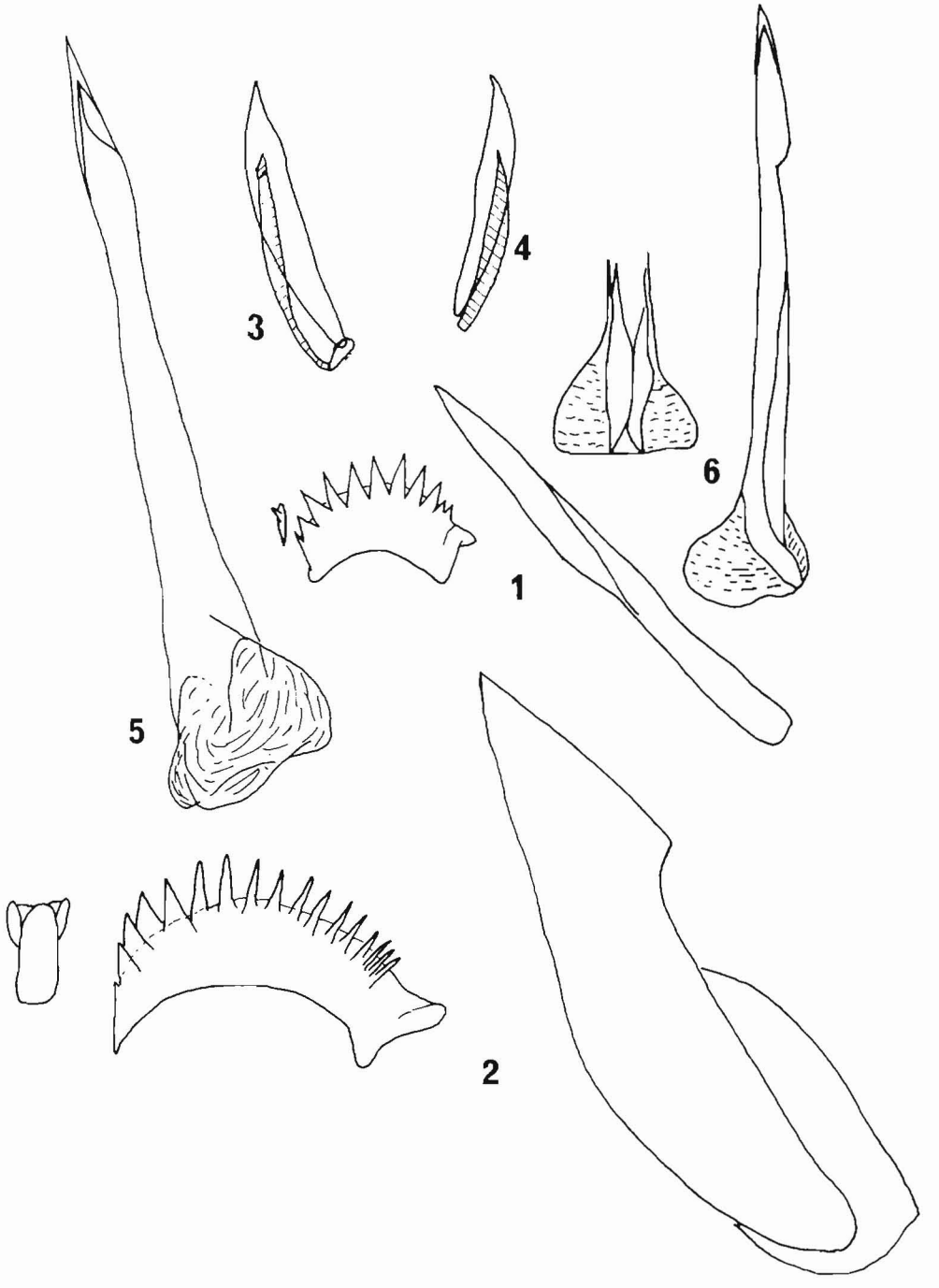
I. Eyes. The presence and development of eyes seem to be constant and according to our experience with some common species do not vary with depth; we have therefore used it for some species of which we have only few specimens.

J. Colour. Some species have colour patches on the columella which seem to be very regularly present, but we have seen them lacking them also. A few species, e.g. *Gymnobela pyrrhogramma,* have colour markings over large parts of the shell, which seem to be present, at least to some degree, in every specimen. The colour of the soft parts in our material (which has been preserved in alcohol) is very uniform, except that in a few cases we have noticed the presence of coloured glands, the colour of which is still present even after 100 years in alcohol or dried.

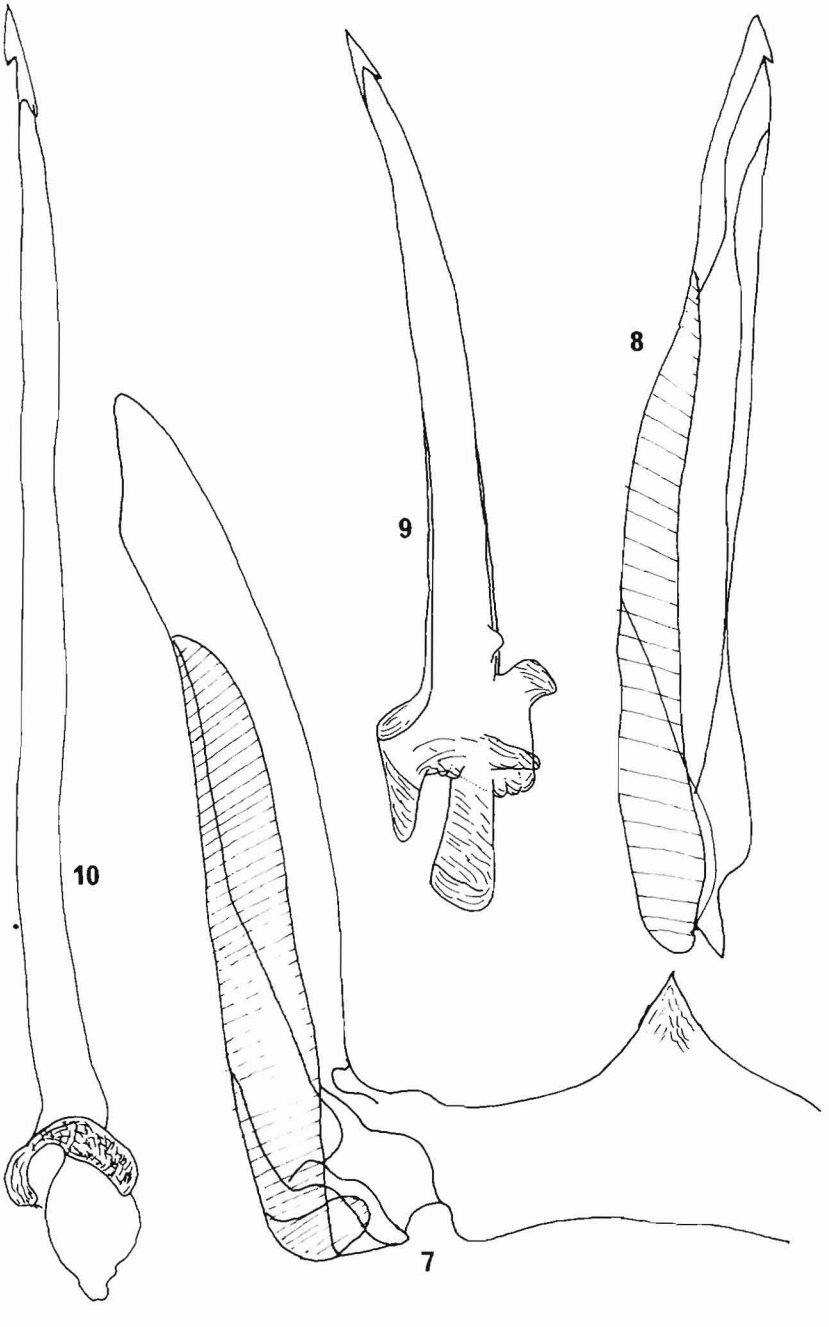
Non-turrid genera and species

The following genera and species, traditionally included in the family Turridae, are here rejected on the basis of radular and other characters, and will be treated elsewhere.

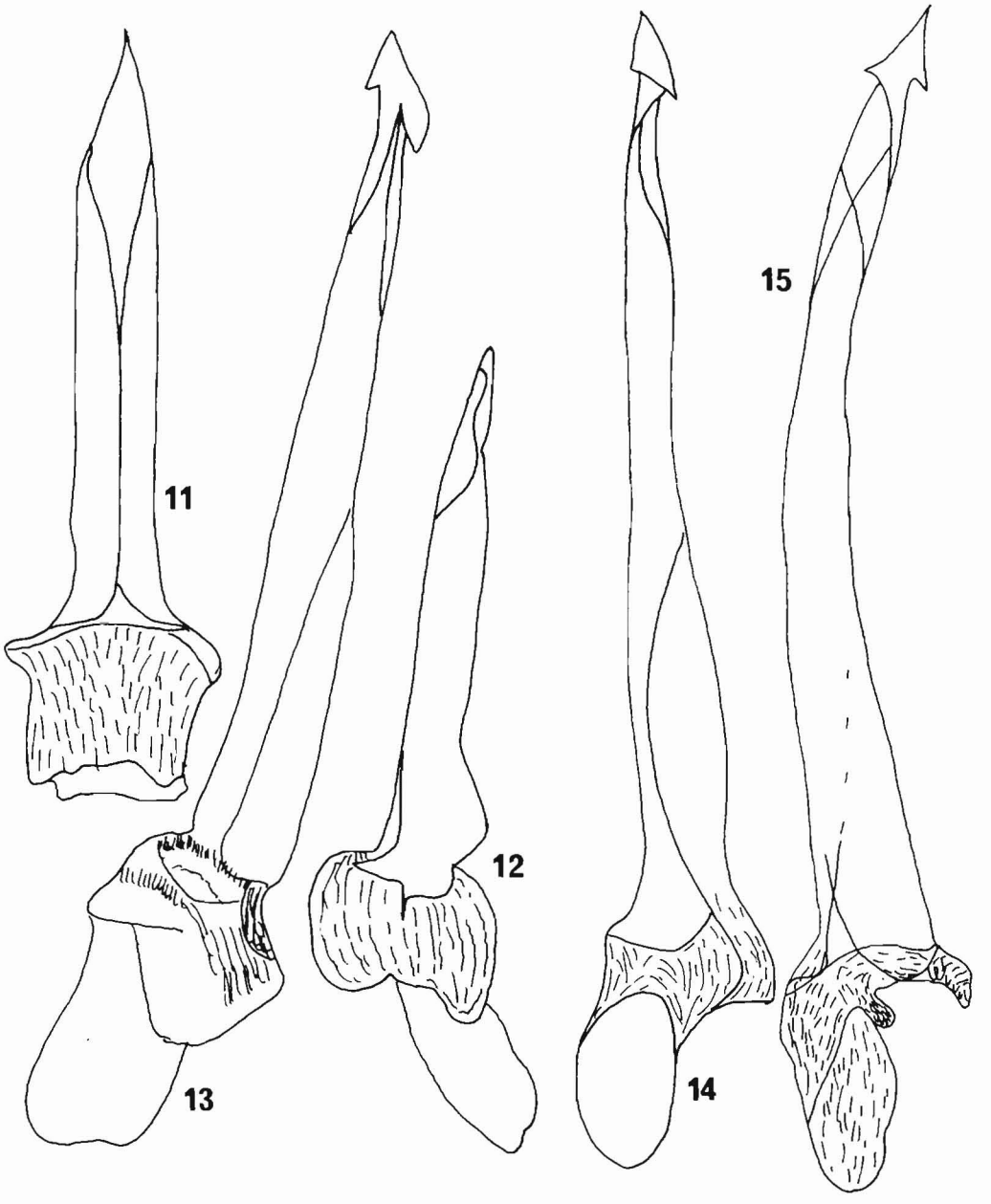
Kryptos Dautzenberg & Fischer, 1896
type species : *K. elegans* D. & F., 1896
Our study of the radula makes familial placement uncertain but it certainly does not belong to Turridae.



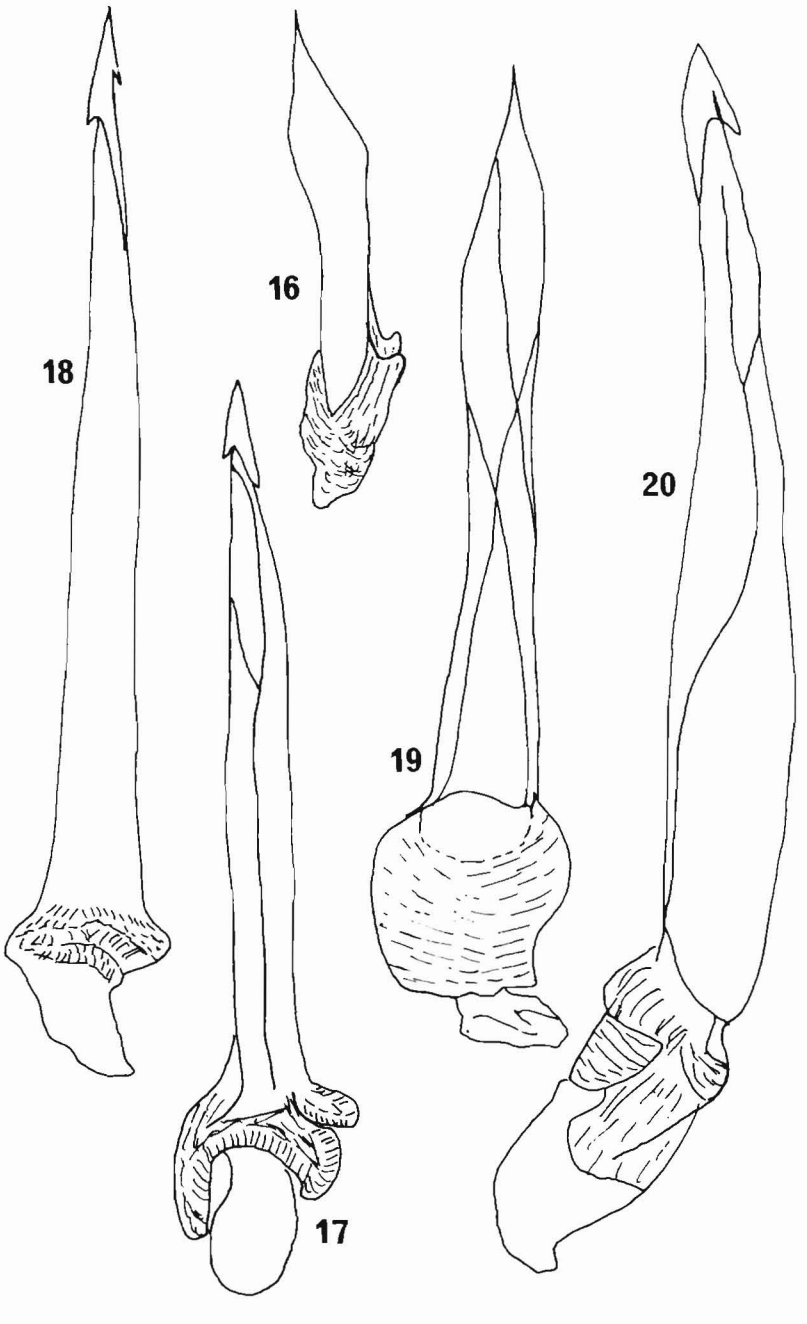
Figs 1-6. Radulae of: 1 — *Spirotropis azorica,* 150 μm (marginal). 2 — *Spirotropis centimata,* 350 μm (marginal). 3 — *Micropleurotoma melvilli,* 75 μm. 4 — *Micropleurotoma spirotropoides,* 65 μm. 5 — *Borsonia hirondelleae,* 300 μm. 6 — *Mitrolumna olivoidea,* 180 μm.



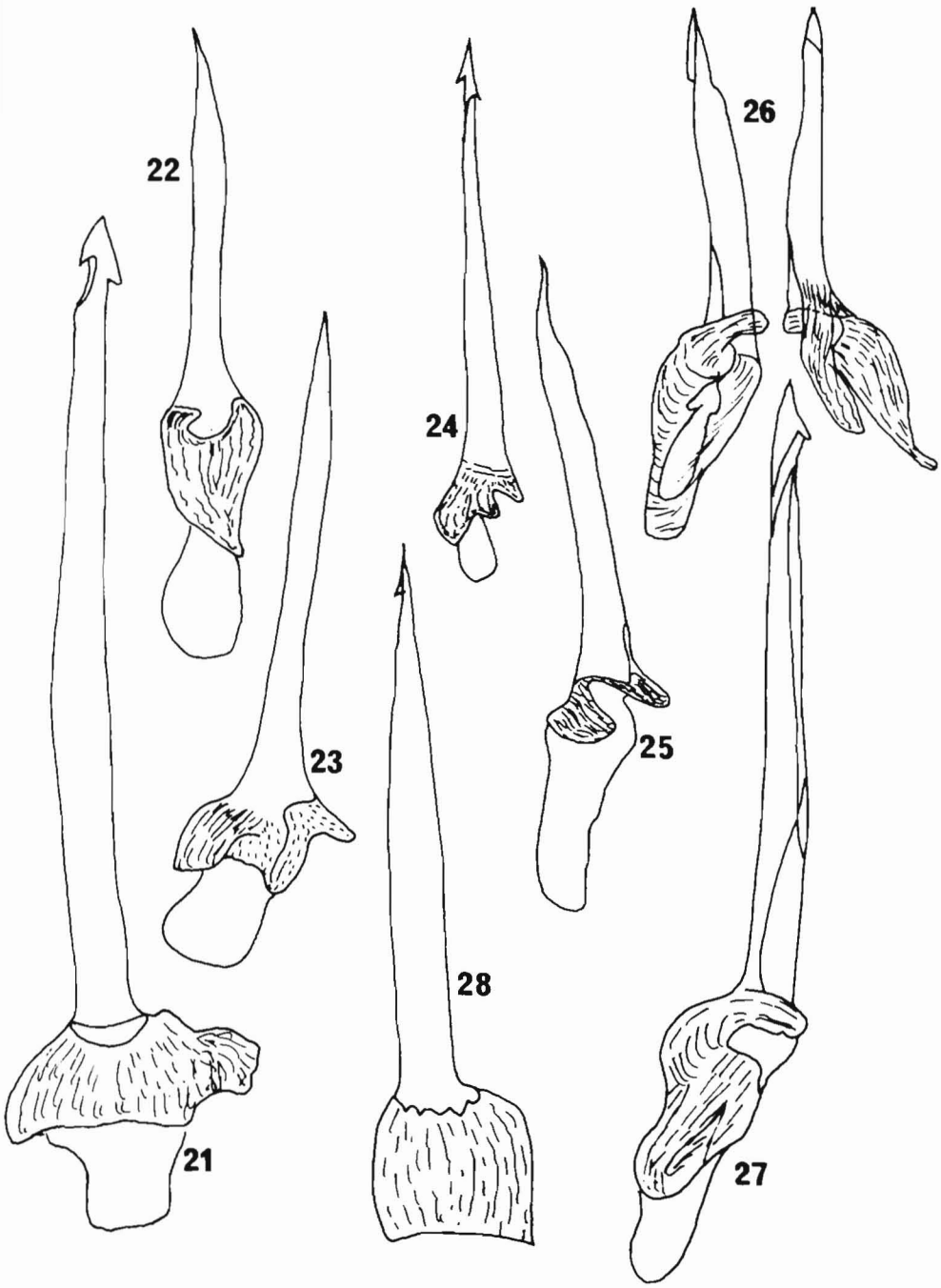
Figs 7-10. Radulae of: 7 — *Irenosyrinx hypomela*, 420 μm (marginal). 8 — *Leucosyrinx verrilli*, 250 μm. 9 — *Xanthodaphne membranacea*, 290 μm. 10 — *Gymnobela pyrrhogramma*, 700 μm.



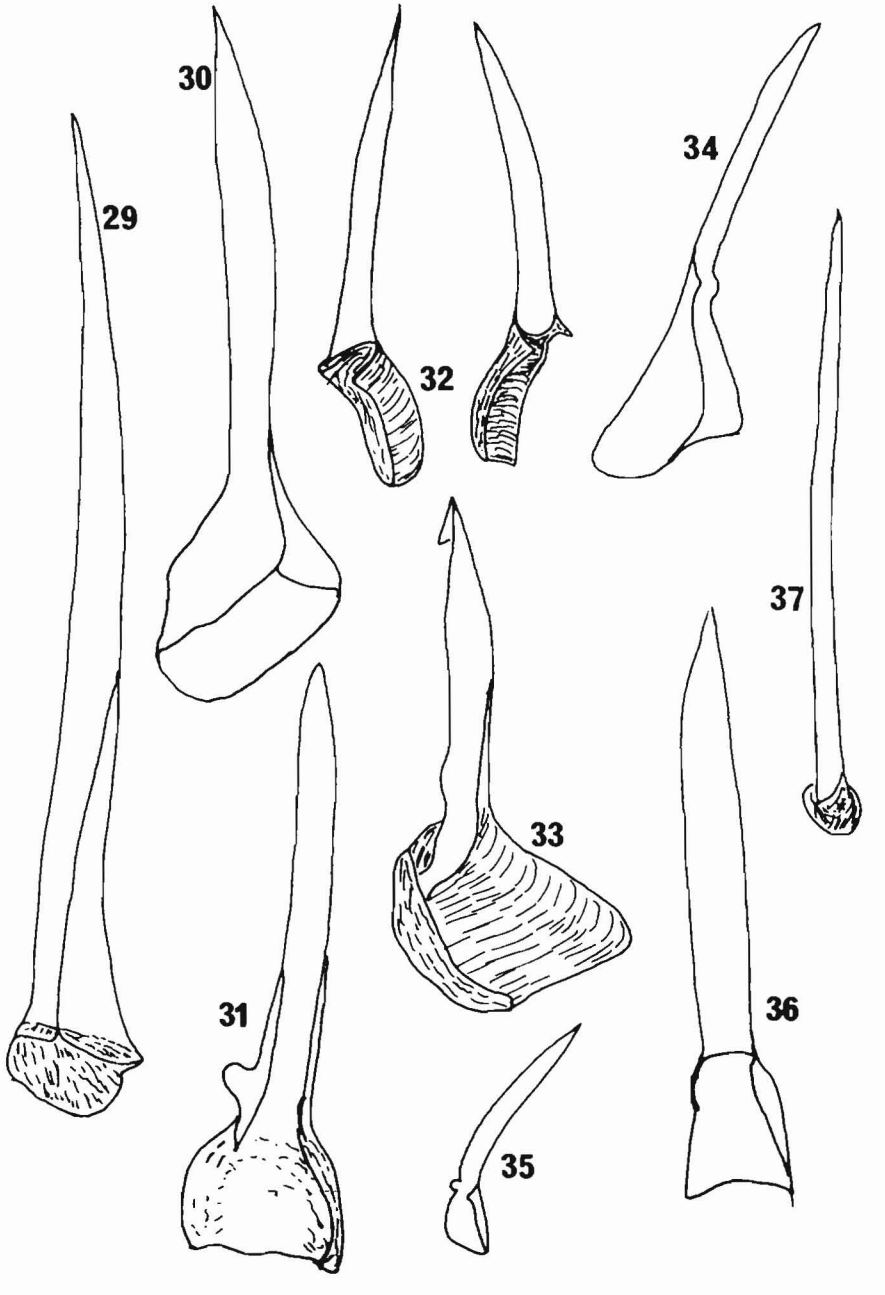
Figs 11-15. Radulae of: 11 — *Xanthodaphne leptalea,* 250 μm. 12 — *Xanthodaphne bruneri,* 250 μm. 13 — *Theta lyronuclea,* 420 μm. 14 — *Theta chariessa,* 400 μm. 15 — *Speoides yoshidai,* 550 μm.



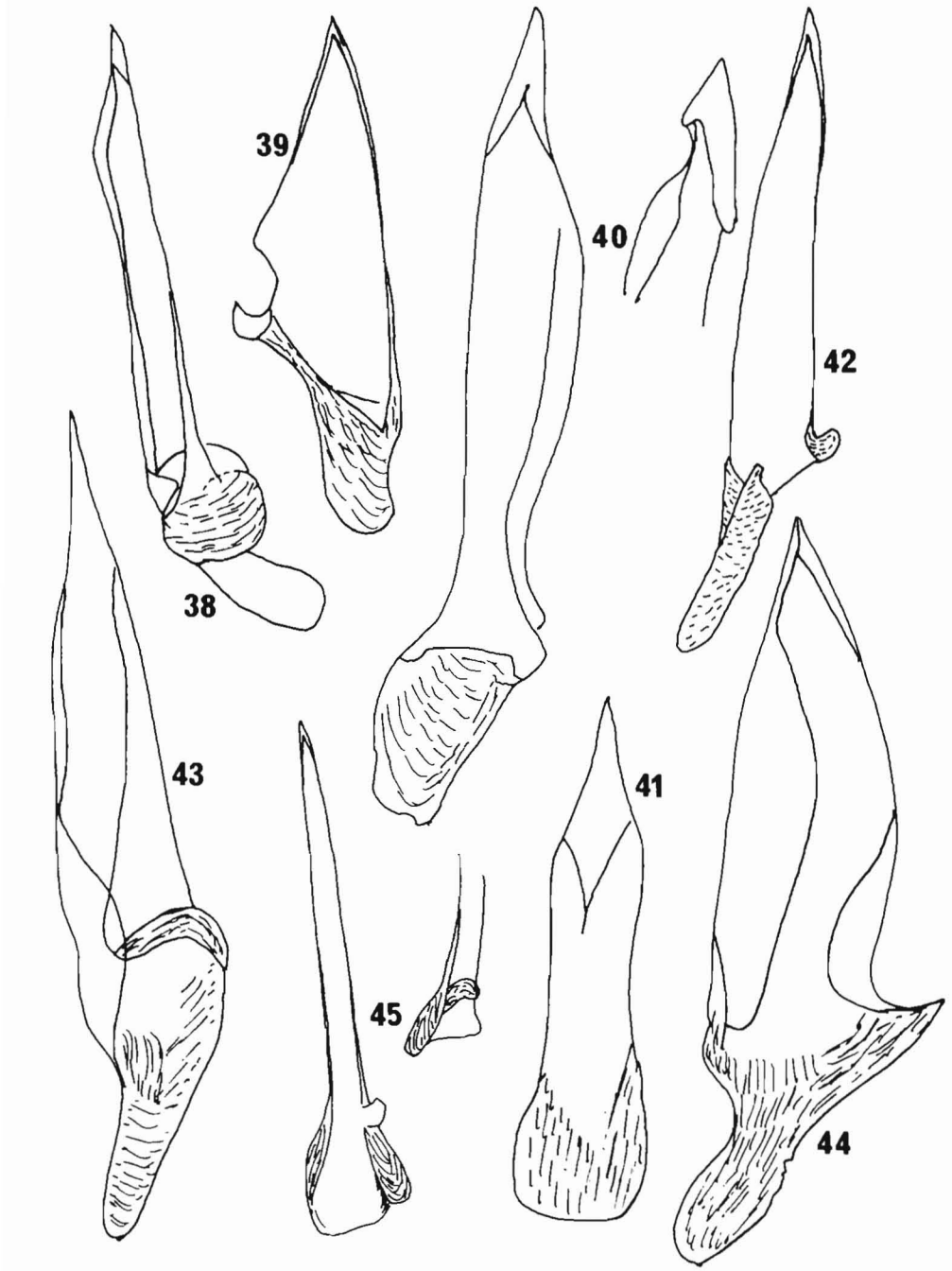
Figs 16-20. Radulae of: 16 — *Bathybela nudator*, 160 μm. 17 — *Bathybela tenellunum*, 465 μm. 18 — *Gymnobela homeotata*, 330 μm. 19 — *Gymnobela abyssorum*, 300 μm. 20 — *Gymnobela aquilarum*, 340 μm.



Figs 21-28. Radulae of: 21 — *Gymnobela emertoni*, 600 μm. 22 — *Gymnobela phyxanor*, 190 μm. 23 — *Gymnobela subaraneosa*, 210 μm. 24 — *Gymnobela fulvotincta*, 190 μm. 25 — *Gymnobela agassizi*, 200 μm. 26 — *Gymnobela engonia*, 170 μm. 27 — *Gymnobela frielei*, 380 μm. 28 — *Xanthodaphne dalmasi*, 250 μm.



Figs 29-37. Radulae of: 29 — *Drilliola emendata,* 320 μm. 30 — *Drilliola pruina,* 230 μm. 31 — *Pleurotomella packardi,* 160 μm. 32 — *Pleurotomella benedicti,* 160 μm. 33 — *Pleurotomella lottae,* 160 μm. 34 — *Pleurotomella coeloraphe,* 160 μm. 35 — *Thesbia nana,* 60 μm. 36 — *Nepotilla amoena* juv., 60 μm. 37 — *Corinnaeturris leucomata,* 90 μm.



Figs 38-45. Radulae of: 38 — *Oenopota graphica,* 150 μm. 39 — *Oenopota dictyophora,* 140 μm. 40 — *Phymorhynchus alberti,* 350 μm. 41 — *Phymorhynchus sulcifera,* 105 μm. 42 — *Mangelia serga,* 160 μm. 43 — *Benthomangelia decapitata,* 280 μm. 44 — *Benthomangelia antonia,* 230 μm. 45 — *Neopleurotomoides* sp.A, 130 μm.

Belomitra Fischer, 1882
type species: *B. paradoxa* Fischer, 1882

Bathyclionella Kobelt, 1905
type species: *Pleurotoma quadruplex* Watson, 1881
We consider these two genera to be synonyms and include them in the family Buccinidae.

Clathurella rugosissima Locard, 1897
is certainly a fasciolariid, although we do not have preserved material.

Pleurotomella koehleri Locard, 1896:6; *Pleurotomella, atlantica* Locard, 1897: 240, and *Pleurotomella demulcata* Locard, 1897: 243 are all synonyms of *Kryptos elegans* Dautzenberg & Fischer, 1896 *(cf. supra).*

Bela limatula Locard, 1896: 141, pl. 5 fig. 3 is *Amphissa haliaeeti* (Jeffreys, 1867), a columbellid.

Bela grimaldii Dautzenberg, 1889: 26-27, pl. 2 fig. 2 is *Amphissa haliaeeti.*

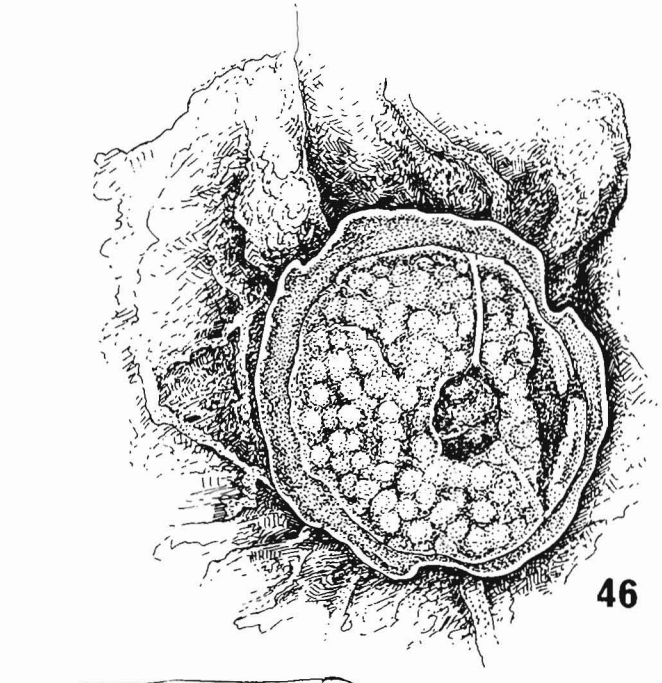
We have also excluded from the revision a number of records of shallow-water species from the deep continental slope; it is not infrequent to find rissoids with plant debris down to 2000—3000 m washed down the canyons of Western Europe. These samples sometimes include littoral Turridae and even land-snails.

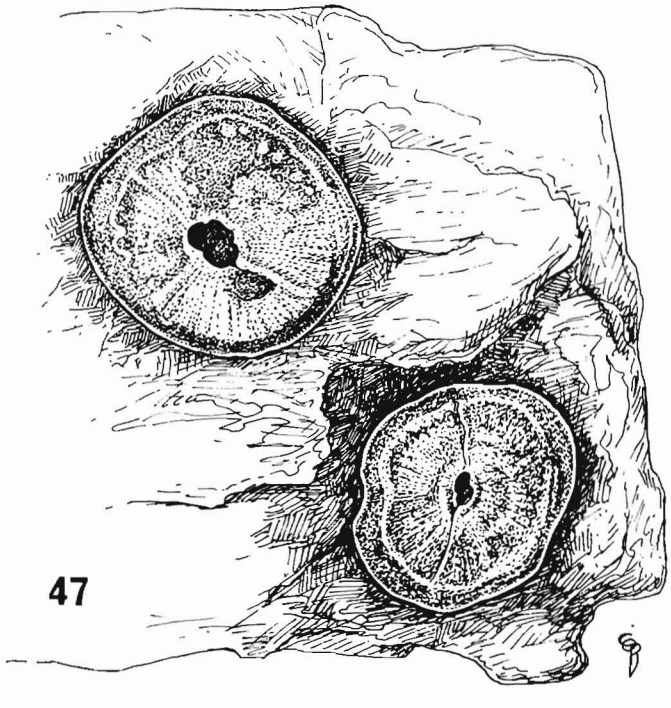
Similarly are excluded from the revision a few shallow-water species which were *originally* described from deep water, for instance *Pleurotoma eritmeta* Watson from the Azores or *Clathurella marshalli* Sykes from Portugal.

Finally a word should be said about a number of books and papers published by Nordsieck in recent years. The new names appear to have been validly published, and we have therefore considered them. But his records of deep-sea turrids in shallow water (especially a station in Ibiza, 20 m!) are completely unreliable. This would not be important if Nordsieck was not considered a serious reference by many writers; this has resulted in France, Spain and Italy in a number of fantasis papers, with additional records of deep water species, up into the intertidal zone! We have not considered them as part of the scientific literature and they are not cited in the bibliography.

List of Abbreviations

spm,spms	live-taken specimen(s)
sh,shs	shell(s) only
st	station
BMNH	British Museum (Natural History), London
IOS	Institute of Oceanographical Sciences, Wormley, U.K.
IRSN	Institut Royal des Sciences Naturelles, Brussels
MCZ	Museum of Comparative Zoology, Harvard
MNHM	Muséum National d'Histoire Naturelle, Paris
MOM	Musée Océanographique, Monaco
NHMW	Natural History Museum, Vienna
SMNH	Swedish Museum of Natural History, Stockholm
USFC	United States Fisheries Commission
USNM	United States National Museum, Washington D.C.
ZMB	Zoological Museum, Bergen
ZMC	Zoological Museum, Copenhagen
ZMHU	Zoological Museum of the Humboldt University, Berlin
ZMO	Zoological Museum, Oslo





Figs 46-47. Egg capsules of deep-water Turridae. 46 — Egg capsule with developing embryos, BIOGAS st DS76, 47°35N, 09°33W, 4228 m; diameter of the capsule 2.6 mm. 47 — Empty egg capsules after hatching, BIOGAS st CP21, 44°21N, 04°49W, 4453 m; diameter of the capsules 4.0—4.2 mm.

TAXONOMICAL PART

Genus *SPIROTROPIS* Sars, 1878

Type species of the genus: *Spirotropis monterosatoi* Locard (= *S. carinata* Sars 1878, not Bivona, 1838), by monotypy.

Spirotropis azorica **n.sp.** Figs 1, 48-51, 59, 192.

Type material: holotype in MNHN.

Type locality: BIACORES st 146, 37°40N, 25°36W, 330 m.

Material examined: MONACO st 198, 38°26N, 28°39W, 800 m, 1 sh; st 234, 39°02N, 30°16W, 454 m, 4 spms; BIACORES st 39, 37°44N, 27°03W, 420 m, 3 shs; st 68, 38°34N, 27°57W, 220-230 m, 1 spm; st 79, 39°00N, 27°54W, 360-380 m, 1 spm; st 156, 37°38N, 25°55W, 350 m, 2 spms; st 197, 37°50N, 25°02W, 815 m, 1 sh; st 229, 37°02N, 25°14W, 600 m, 1 spm.

Distribution. The upper bathyal of the Azores. Only known from the material examined.

Description. The shell is solid, whitish, semi-transparent, high and turreted. The larval shell consists of 1.5 not very convex whorls and has a diameter of about 860 μm. Its last half whorl is sculptured by a few very indistinct incremental lines. The postlarval whorls are 6.8 in number in the holotype. They are sculptured by distinct incremental lines, running from suture to suture. At the subsutural zone they are sinuated, with the most retracted part situated just below the middle of the zone. There is also an almost imperceptible spiral sculpture of very indistinct lines. The area above the spiral keel is decidedly concave; below, it is convex. The spiral keel varies in its development from specimen to specimen but is always present. The labial notch is well developed and deep, as usual in the genus. The siphonal canal is deep and rather long.

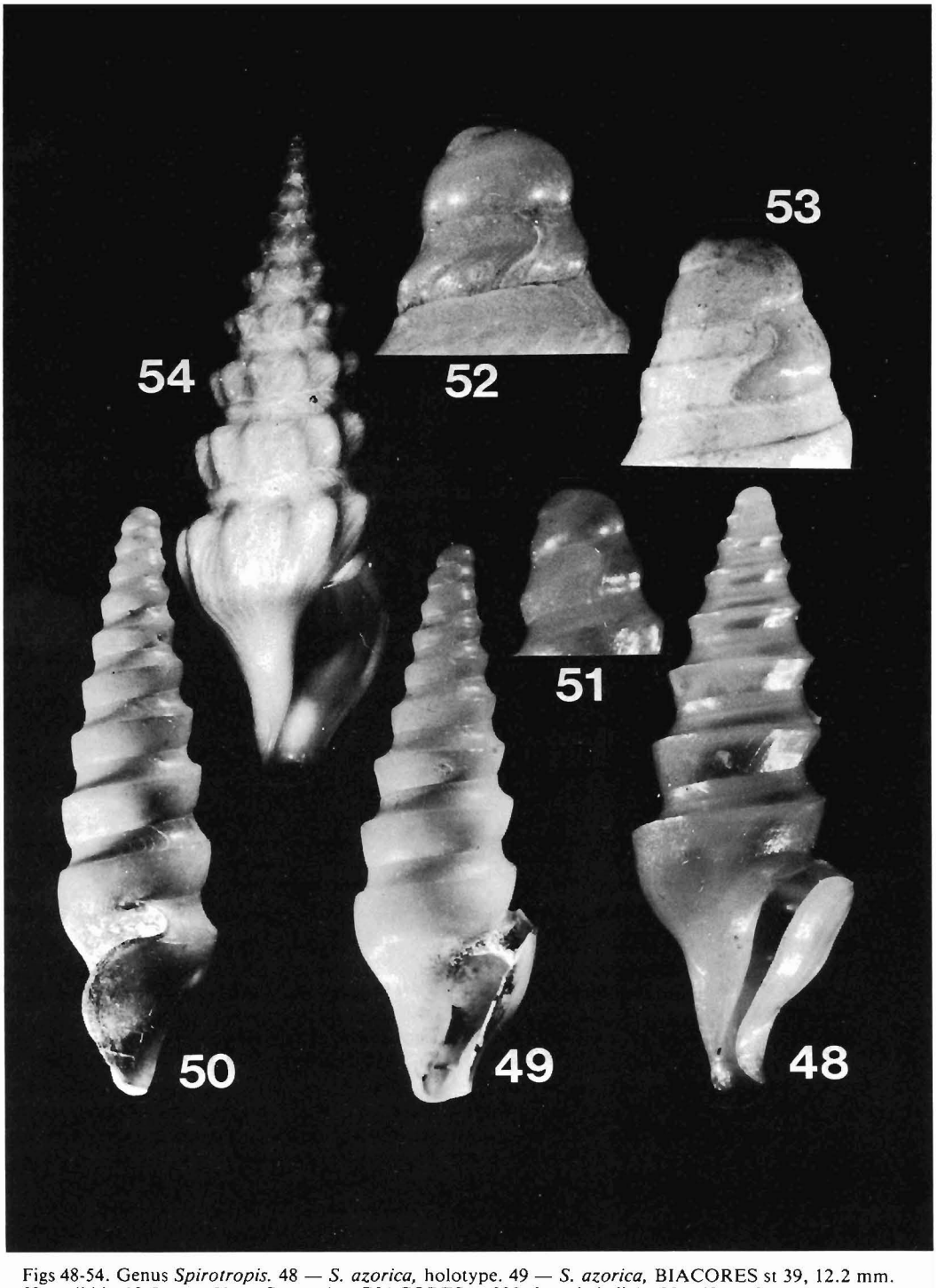
Dimensions: height of the shell 11.2 mm, breadth 4.45 mm; height of the aperture 3.8 mm, breadth 1.2 mm.

Remarks. S. azorica most probably has an ancestor in common with *S. monterosatoi;* the larval shells have the same shape (but not size), the labial sinuses are the same, and the general outlines similar. We have however separated them as the larval shell of *S. monterosatoi* has 0.4 whorl more and a diameter of more than 1200 μm. *S. azorica* is also much more constant in the proportions of the shell. There does not seem to be any connection between the isolated *S. azorica,* known only from comparatively shallow water, and *S. monterosatoi* which inhabits the upper bathyal zone of Europe and North Africa.

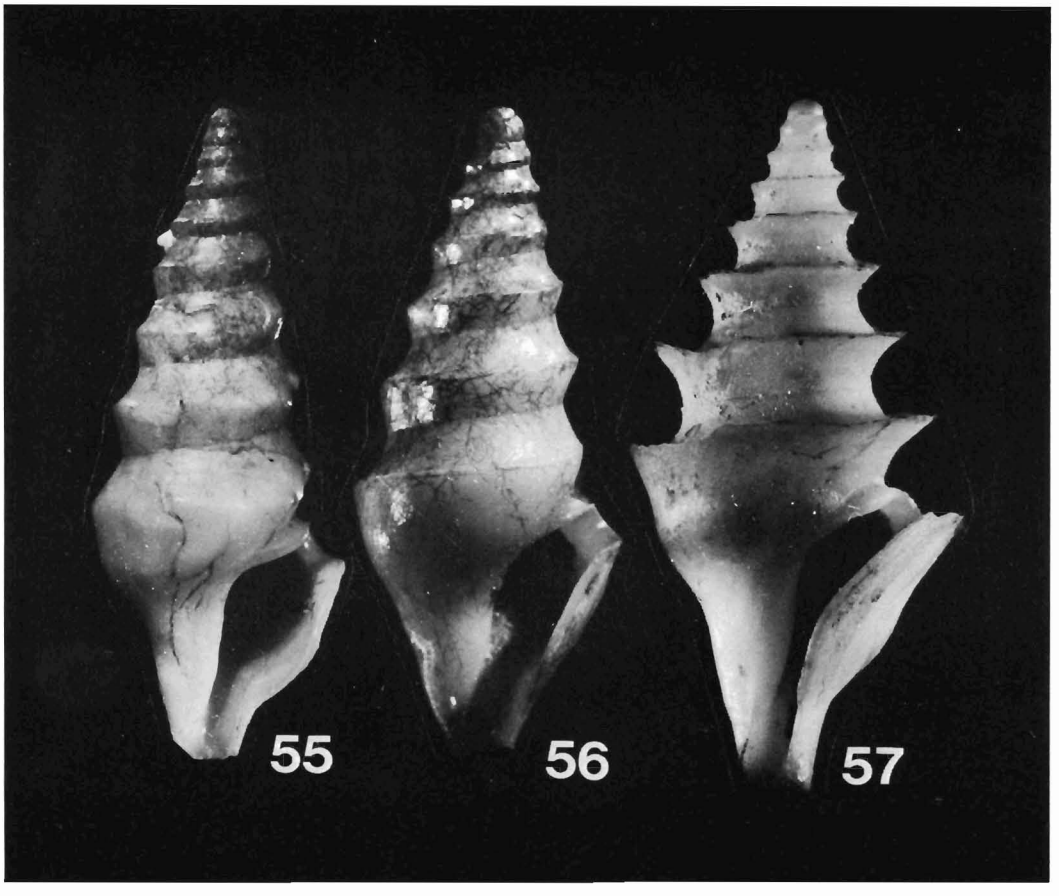
Spirotropis monterosatoi (Locard, 1897) Figs 52—53, 55—58, 193.

Mangelia eburnea M. Sars, 1859: 84 (non *Mangelia eburnea* Bivona, 1838).
Pleurotoma and *Spirotropis carinata* of recent authors, not *Pleurotoma carinata* Bivona, 1838.
Pleurotoma and *Spirotropis modiola* of recent authors, not *Fusus modiolus* Jan, 1832.
Spirotropis sarsi Warén, 1975: 49, fig. 1a-f (new name for *S. carinata* sensu Sars 1878).
Pleurotoma monterosatoi Locard, 1897: 209, pl. 9, 22—26.
Type material: lectotype of *P. monterosatoi* in MNHN.
Type locality: TRAVAILLEUR 1882 st 65, 34°13N, 07°43W, 636 m.

Material examined: the type material and about 100 spms + shs from the Bergen area, Norway, 120—400 m, coll. AW; TRAVAILLEUR 1881 dr 1, 43°02N, 05°18E, 555 m, 2 shs; 1882, dr 19, 44°04N, 09°25W, 115 m, 1 sh; dr 33, 44°10N, 10°19W, 2000 m, 1 sh; st ?, 300—500 m, 10 shs; st ?, 2000—2500 m, 5 shs; TALISMAN dr 32, 32°34N, 12°09W, 1590 m, 3 shs; dr 33, 32°31N, 09°48W, 1350 m, 15 shs; MONACO st 475, 37°52N, 09°16W, 552 m, 1 spm; st 503, 47°11N, 05°50W, 748—1262 m, 1 sh; st 1052, 65°41N, 09°30E, 440 m, 1 sh; JEAN-CHARCOT 1968 st 18, 47°45N, 07°55W, 800—920 m, 1 spm; LAGARDERE coll. 44°07N, 02°01W, 200 m, 1 sh; 45°42N, 03°10W, 142 m, 2 spms; 45°29N, 02°46W, 132 m, 2 shs; 44°54N, 02°13W, 200 m, 1 sh; 44°35N, 02°07W, 410 m, 1 spm, 3 shs; THALASSA st X340, 44°07N, 04°30W, 860—910 m, 2 shs; st X342, 44°08N, 04°37W, 700 m, 1 spm; st X343, 44°07N, 04°39W, 545 m, 4 spms; st X361, 44°06N, 04°50W, 590 m, 1 spm; st X409, 47°43N, 08°04W, 1035-1080 m, 1 spm; st W351, 44°39N, 01°55W, 185 m, 3 spms; st W392, 44°07N, 04°49W, 600-1130 m, 1 spm; st Y378, 41°31N, 09°16W, 1000 m, 1 sh; st Y400, 44°46N, 09°19W, 1040 m, 1 sh; st Z393, 47°33N, 07°05W, 750 m, 1 sh; st Z421, 48°23N, 09°34W, 950 m, 1 sh; st Z427, 48°27N, 09°39W, 860 m, 1 spm; st Z437, 48°35N, 10°24W, 610 m, 1 sh; SARSIA st 7614, 43°43N, 03°38W, 1100 m, 1 sh; st 7615, 43°42N, 03°34W, 290 m, 1 sh; THOR 1904 st 99, 61°15N, 09°35W, 900 m, 3 spms; POLA st 36, 32°47N,



Figs 48-54. Genus *Spirotropis*. 48 — *S. azorica*, holotype. 49 — *S. azorica*, BIACORES st 39, 12.2 mm. 50 — *ibid.*, 13.5 mm. 51 — *S. azorica*, BIACORES st 229, larval shell (×20). 52 — *S. monterosatoi*, Bergen area 60°09N, 04°59'5E, 276-290 m, larval shell (×20). 53 — *S. monterosatoi*, CINECA III st B33, larval shell (×20). 54 — *S. centimata*, BIACORES st 86, 29.0 mm.



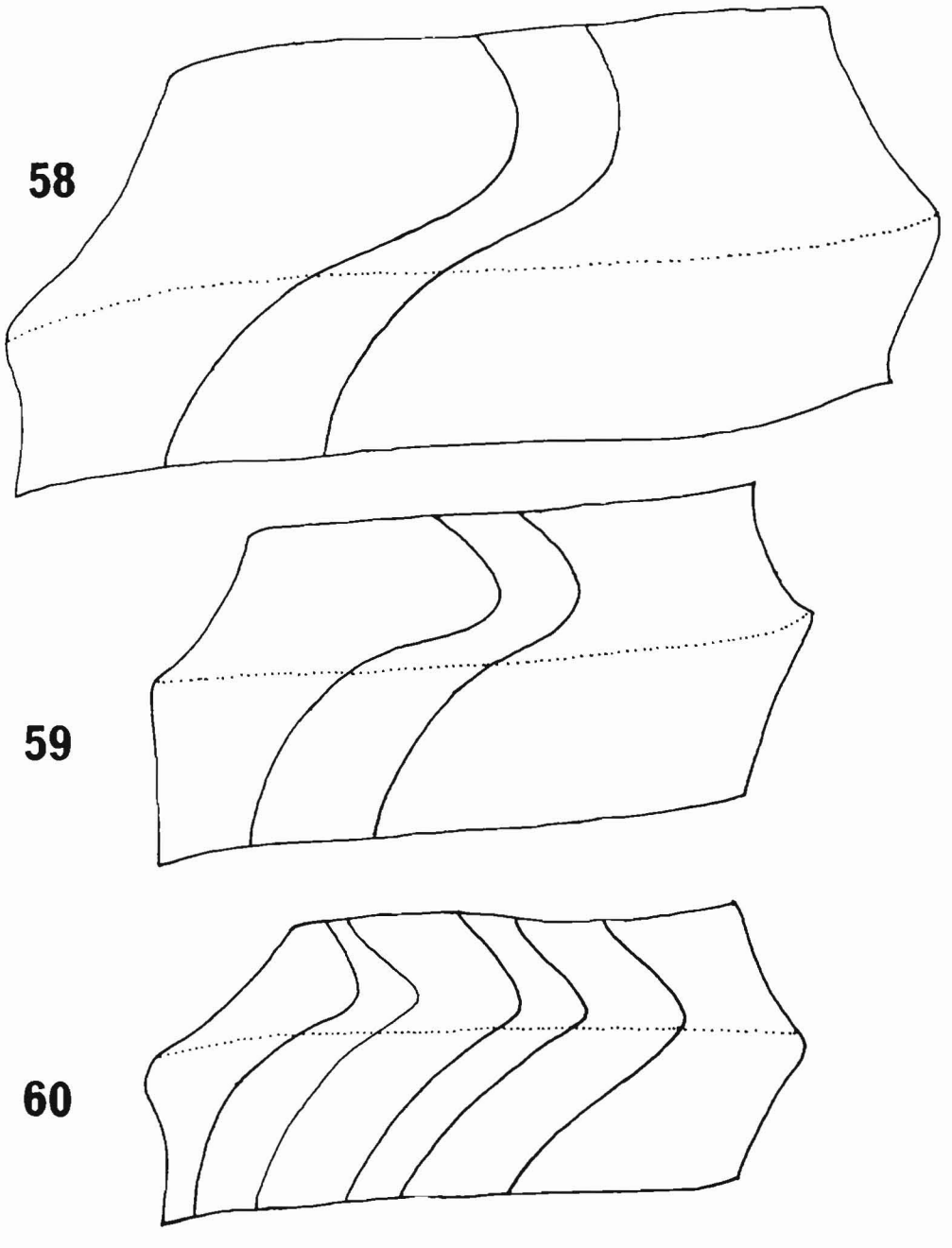
Figs 55-57. *Spirotropis monterosatoi.* 55 — THALASSA st X409, 26 mm. 56 — THALASSA st X343, 14.3 mm. 57 — Holotype, 14.1 mm.

19°59E, 680 m, 1 sh; VANNEAU st 53, 33°54N, 08°10W, 160 m, 1 sh; METEOR st 36-97, 25°30N, 16°01W, 409 m, 2 spms; st 36—103, 21°24N, 17°55W, 1125 m, 1 sh; st 36—104, 21°23N, 17°32W, 415 m, 1 sh.

Distribution. Eastern Atlantic from Norway to Morocco, including the Mediterranean, in 100—1000 m.

Remarks. The anterior part of the alimentary tract, the radula and operculum have been figured by Sars (1878) who described the genus.

This is a most variable species, but completely different from the Italian Tertiary fossils *Pleurotoma carinata* and *Fusus modiolus,* with which it has been identified for a long time (see Warén, 1975). In the northern part of its distribution the spiral keel is less developed; further to the south it becomes more prominent and in West Africa it reaches the extreme development which induced Locard to describe a new species, *P. monterosatoi.* This southern form also has a greater variation in size than the northern one. We decided to unite and treat them as a single species, as we could not find any persistent difference; the larval shell looks the same throughout the material, the sinus has the same construction, with the most retracted part around the middle of the subsutural zone, and the transition between the different degrees of carination is continuous.



Figs 58-60. Position of the sinus in *Spirotropis* and *Micropleurotoma*. 58 — *S. monterosatoi*. 59 — *S. azorica*. 60 — *M. spirotropoides*.

Spirotropis centimata (Dall, 1889) Figs 2,54,191,203.

Drillia? (Cymatosyrinx) centimata Dall, 1889: 95, pl. 36, fig. 9.
Pleurotoma centimata var. *major* Locard, 1897: 172, pl. 6, figs 24-29.
Type material: not located.
Type locality: BLAKE st 31, 24°33N, 84°23W, 3590 m.

Material examined: TRAVAILLEUR 1881 dr 34, 38°18N, 09°25W, 1300 m, 1 spm; TALISMAN st 43-44, 29°52N, 14°06W, 2075 m, 4 spms, 2 shs; st 122, 37°35N, 29°26W, 1440 m, 1 sh; st 130, 37°55N, 29°22W, 2235 m, 1 spm; MONACO st 203, 39°27N, 30°55W, 1557 m, 1 sh; st 211, 39°18N, 33°32W, 1372 m, 1 sh; st 536, 37°54N, 24°43W, 2178 m, 1 sh; st 624, 38°57N, 30°40W, 2102 m, 2 shs; st 663, 37°29N, 25°32W, 1732 m, 2 shs; st 698, 39°11N, 30°45W, 1846 m, 2 shs; st 703, 39°21N, 31°06W, 1360 m, 1 sh; st 863, 39°22N, 26°56W, 1940 m, 1 sh; st 1334, 39°30N, 29°02W, 1900 m, 2 shs; st 2044, 32°28N, 16°38W, 2286 m, 2 spms, 2 shs; BIACORES st 86, 39°25N, 28°01W, 1670 m, 1 sh; st 179, 38°06N, 25°46W, 1590-1665 m, 1 spm; st 185, 38°00N, 24°57W, 2150-2440 m, 1 sh; st 191, 37°56N, 24°50W, 1650-1750 m, 2 shs; st 206, 37°21N, 25°29W, 2090 m, 2 shs; st 217, 37°05N, 24°53W, 1750 m, 6 spms + shs; st 227, 37°10N, 25°20W, 2170 m, 6 shs.

Distribution. North Carolina to Gulf of Mexico, the Azores, off West Africa, bathyal.

Remarks. We have placed this species in *Spirotropis* as the radula and aperture agree with the type species of the genus, while the type species of *Cymatosyrinx, C. lunata* (Lea, 1843), to us seems closer to *Cerodrillia* Bartsch & Rehder, 1934.

S. centimata is recognized among N. Atlantic Turridae by its solid shell, high spire, sculptured almost only by axial knobs, and the strongly developed subsutural notch, which resembles that of *S. monterosatoi.* The operculum is also quite characteristic, being regularly pear-shaped to ovate, with an evenly rounded apical part.

Genus *MICROPLEUROTOMA* Thiele, 1931

Type species: *Pleurotoma spirotropoides* Thiele, 1925.

The shell of *Micropleurotoma* closely resembles that of *Spirotropis* but the radulae are very different. The shell of *Micropleurotoma* has the labial notch very close to or at the peripheral keel, whereas it is in the middle of the subsutural zone in *Spirotropis.*

Micropleurotoma spirotropoides (Thiele, 1925) figs 4,60-62.

Pleurotoma spirotropoides Thiele, 1925: 179, pl. 23, fig. 18.
Type material: syntypes in ZMHU.
Type locality: not designated, but from about 35°S, 19°E.
Material examined: PORCUPINE st 17, 39°39N, 09°43W, 1980 m, 6 shs; Adventure Bank, 180 m, 20 shs; off Pantelleria, SW of Sicily, 720 m, 1 sh; TRAVAILLEUR 1881 st 1, 43°01N, 09°38W, 2028 m, 2 shs; 1882 off Cape Cantin, 112-750 m, 7 shs; MONACO st 2717, 36°42N, 08°40W, 750 m, 1 sh; BIOGAS st DS52, 44°06N, 04°22W, 2006 m, 1 spm; SARSIA st 7614, 43°43N, 03°38W, 1100 m, 1 sh.

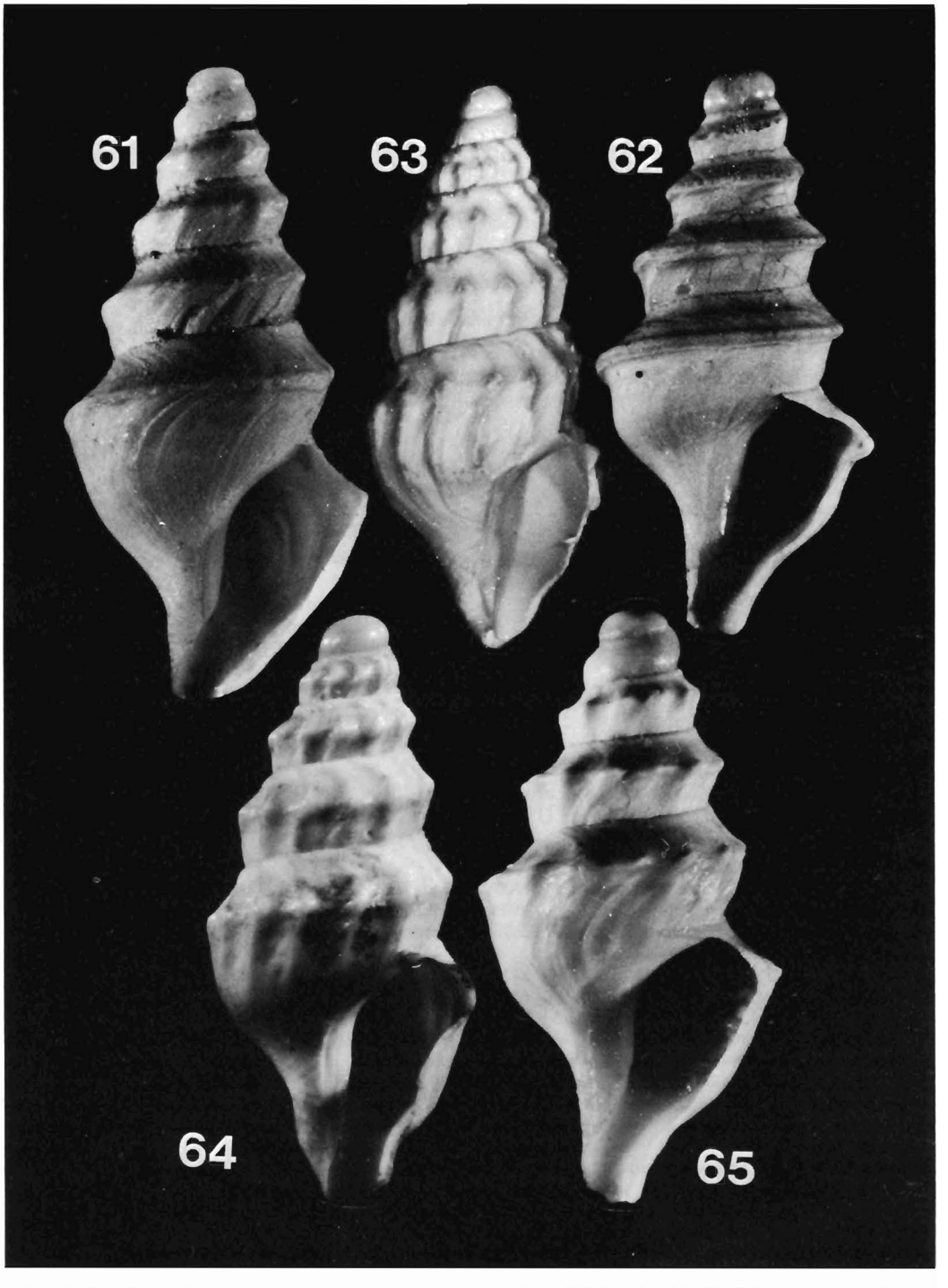
Distribution. Only known from the material examined.

Remarks. This species is very easily confused with *Spirotropis monterosatoi* but that species is much larger and the position of the labial notch is different (Figs 58-60). *M. spirotropoides* is a rather variable species, with extreme specimens having nearly a second keel in the lower part of the body-whorl.

Micropleurotoma melvilli (Sykes, 1906) Figs 3,65.

Spirotropis melvilli Sykes, 1906: 183, pl. 16, fig. 4.
Pleurotoma nana Thiele, 1925: 178, pl. 23, fig. 16, textfig. 30.
Type material: S. melvilli: holotype and 18 paratypes in BMNH; *P. nana:* holotype ZMHU 60099.
Type localities: S. melvilli: PORCUPINE st 17, 39°39N, 09°39W, 1300-2000 m; *P. nana:* VALDIVIA st 63, 02°00N, 08°43E, 2492 m.
Material examined: the type material and: PORCUPINE off Portugal, 1300-2000 m, 4 shs; MONACO st 899, 37°57N, 20°15W, 200 m, 4 shs; TRAVAILLEUR 1882 st 43, 42°48N, 09°22W, 627 m, 1 sh; DISCOVERY st 8521, 20°47N, 18°53W, 3060 m, 1 spm; CINECA III st B31, 29°36N, 11°04W, 1500 m, 6 shs; st B32, 29°27N, 10°53W, 920 m, 8 shs.

Distribution. Only known from the material examined.



Figs. 61-65. Genus *Micropleurotoma*. 61 — *M. spirotropoides,* BIOGAS st DS52, 8.0 mm. 62 — *M. spirotropoides,* SARSIA st 7614, 5.9 mm. 63 — *M. travailleuri,* MONACO st 2717, 9.2 mm. 64 — *M. travailleuri,* lectotype. 65 — *M. melvilli,* MONACO st 899, 5.7 mm.

Remarks. M. melvilli recalls *M. travailleuri* a little but that species has a larval shell which is very distinctly set off from the postlarval whorls, the axial ribs are angulated at the periphery and turn sharply forwards above it instead of being flexuous, and its outlines are more slender than those of *melvilli.*

Micropleurotoma travailleuri **nom. nov.** Figs 63-64.

Pleurotoma obtusa Locard, 1897: 202, pl. 9, figs 12-16 (not *Pleurotoma obtusa* Reeve, 1846).
Type material: lectotype in MNHN.
Type locality: not known because of confused labels.
Material examined: the type material and MONACO st 2717, 36°42N, 08°40W, 740 m, 2 shs; st 2048, 32°33N, 17°02W, 1968 m, 2 shs; CINECA III st B31, 29°36W, 11°04W, 1500 m, 5 shs; PORCUPINE off Cadiz, 710 m, 3 shs; off Cape St Vincent, 530 m, 2 shs; st 24, 37°19N, 09°13W, 530 m, 2 shs.

Distribution. Only known from the material examined.

Remarks. The systematic position of this species is most uncertain. We do not believe that it belongs to *Micropleurotoma,* but we have placed it here as it recalls a little the other species included here. A more precise systematic location requires an examination of the radula and operculum.

Genus *IRENOSYRINX* Dall, 1908

Type-species: *Leucosyrinx goodei* Dall, 1890.

Although *Irenosyrinx* has been synonymized with *Aforia* Dall 1889 by Powell (1966:43), we have preferred to use this genus because its type-species is an E. Pacific abyssal species. The type-species of *Aforia* is a shallow-water boreal N. Pacific species. We do not exclude however the possibility that the two genera are indeed synonymous. Radulae of *Aforia* are figured by Powell (1966:10) and McLean (1971: fig 34-35). The central part of the radula has been interpreted by Powell as being formed only by the central tooth, while we consider it as the result of the fusion between the central and the laterals.

Irenosyrinx hypomela (Dall, 1889) Figs 7,66,196,201.

Aforia? hypomela Dall, 1889:99.
Surcula tenerrima (P. Fischer ms.) Locard, 1897: 216, pl. 9, figs 30-33.
Type material: A. hypomela, holotype USNM 93831. *S. tenerrima,* 3 syntypes in MNHN.
Type locality: A hypomela: South of Cuba, 19°45N, 75°04W, 2910 m. *S. tenerrima:* TALISMAN 1883, 42°19N, 21°16W, 4010-4060 m.
Material examined: the type material and BIACORES st 252, 47°35N, 08°47W, 2550-2700 m, 2 spms; THALASSA st X333, 44°10N, 04°32W, 1900-1950 m, 1 sh; NORATLANTE st B4, 52°06N, 45°34W, 4170-4450 m, 7 spms; st B5, 55°43N, 49°25W, 3676 m, 1 spm; st B7, 58°51N, 53°10W, 3350 m, 1 spm, 1 sh; st B16, 45°35N, 03°51W, 3950-4150 m, 1 spm, 1 sh; st B17, 45°13N, 05°31W, 4700 m, 5 spms; BIOGAS st DS19, DS40, DS57, CP10, CP11, 47°34N, 09°05W, 2900-3350 m, 11 shs; st CV28, CP13, CP14, 47°34N, 09°37W, 4025-4135 m, 2 spms, 1 sh; st CP17, 46°31N, 10°19W, 4706 m, 2 spms; st CP19, CP21, 44°24N, 04°50W, 4434-4453 m, 3 spms, 2 shs; MICHAEL-SARS st 10, 45°26N, 09°20W, 4700 m, 1 spm (Grieg, 1931:14, figs 11-12); MONACO st 3006, 43°21N, 10°02W, 2779 m, 1 sh; TALISMAN 1883, 31°34N, 41°15W, 3125 m, 1 sh; INCAL st CP05, 55°00N, 12°29W, 2884 m, 13 spms and shs; st CP06, 55°02N, 12°41W, 2890 m, 4 spms, 3 shs; st CP07, 55°04N, 12°46W, 2895 m, 2 spms; st CP09, 50°15N, 13°16W, 2690 m, 2 spms, 14 shs; st CP11, 48°21N, 15°14W, 4823 m, 1 spm; st 0S02, 48°19N, 15°16W, 4829 m, 1 sh; st WS08, 47°31N, 09°34W, 4300 m, 1 sh.

Distribution. Only known from the material examined.

Remarks. This large species is easily recognized by its very long siphonal canal and by having direct development. There is a large elliptical operculum. The animal has no eyes. It has an intensely violet gland on its right side, just behind the mantle cavity. The radula (Fig. 7) has a very small central tooth.

We have classified it in the genus *Irenosyrinx* Dall because it very closely resembles *I. goodei* (Dall), the type-species of the genus, living in deep water in the E. Pacific.

Genus *ANCISTROSYRINX* Dall, 1881

Type species: *A. elegans* Dall, 1881.

The position of *clytotropis* is rather doubtful. It is probably congeneric with a group of species classified in *Surcula* by some European palaeontologists.

Ancistrosyrinx clytotropis (Sykes, 1906) Fig. 67.

Spirotropis clytotropis Sykes, 1906: 183, pl. 16, fig. 4.
Type material: holotype in BMNH.
Type locality: PORCUPINE st 17, 39°42N, 09°43W, 1980 m.
Material examined: the type material and THALASSA st X327, 44°07N, 04°45W, 700-1120 m, 1 sh; st Y374, 41°31N, 09°20W, 1250 m, 1 sh.

Distribution. Only known from the material examined.

Remarks. Both the type and the *Thalassa* material seem to be fossils. The species is easy to identify with its strong spiral keel and long siphonal canal. It comes close to the Hungarian Miocene *"Surcula" sopronensis* Hörnes (Strausz, 1966).

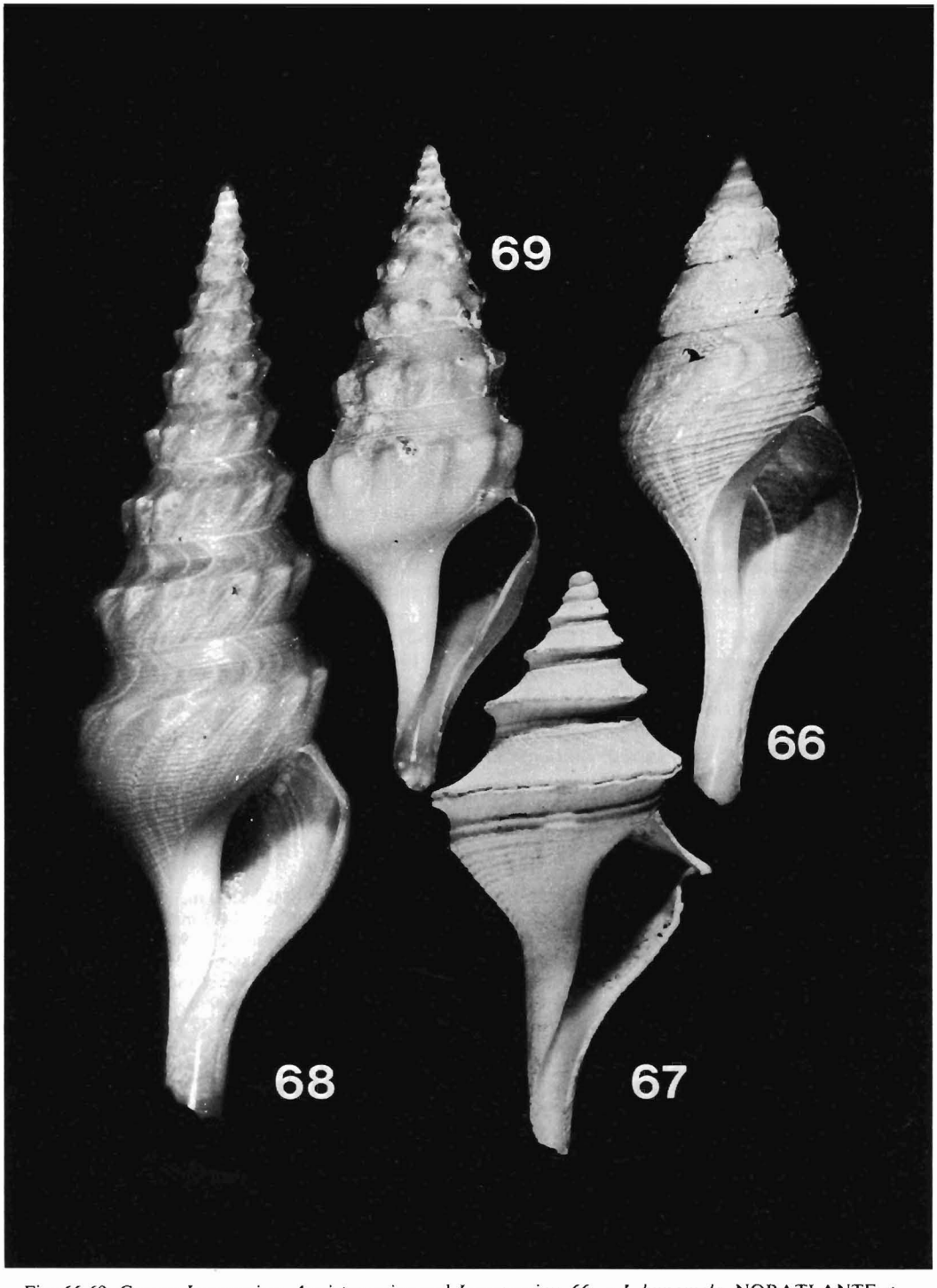
Genus *LEUCOSYRINX* Dall, 1889

Type species: *Pleurotoma verrilli* Dall, 1881.

Leucosyrinx verrilli (Dall, 1881), Figs 8,68-69,197,202.

Pleurotoma (Pleurotomella) verrilli Dall, 1881: 57.
Pleurotoma (Leucosyrinx) verrilli Dall, 1889: 75, pl. 10, fig 5.
Pleurotoma (Pleurotomella) sigsbeei Dall, 1881: 57; *P. (Leucosyrinx) sigsbeei* Dall, 1889: 76, pl. 11, fig. 10.
Pleurotoma talismani Locard, 1897: 160, pl. 5, figs 20-27; and var. *attenuata, curta, elongata:* 162.
Pleurotoma devestitum Locard, 1897: 169, pl. 6, figs 19-23.
Surcula gradata Thiele, 1925: 211, pl. 23, figs 13-15.
Leucosyrinx janetae Bartsch, 1934, 11, pl. 3, figs 3,11-12.
Type material: P. verrilli: holotype in MCZ 7032; *P. sigsbeei:* holotype in MCZ 7034; *P. talismani:* syntypes in MNHN; *P. devestitum:* holotype in MNHN; *S. gradata:* holotype in ZMHU 60078; *L. janetae:* holotype in USNM 429834.
Type locality: P. verrilli: off Bahia Honda, Cuba, 1550 m; *P. sigsbeei:* off Campeche Bank, Yucatan, 2825 m; *P. talismani:* TALISMAN st 130, 37°35N, 29°26W, 1442 m; *P. devestitum:* TALISMAN st 79, 25°01N, 16°55W, 2638 m; *S. gradata:* VALDIVIA st 56, 03°10N, 05°28E, 2278 m; *L. janetae:* 18°37N, 65°04W, 490-600 m.
Material examined: the type material and TALISMAN dr.16, 34°01N, 08°32W, 2190 m, 1 sh; st 20, 33°43N, 09°02W, 1105 m, 2 shs; st 33-34, 32°34N-33°31N, 09°49W, 1350-1590 m, 1 sh; st?. 1493 m, 12 spms, 1 sh; st 90, 22°03N, 17°33W, 1013 m, 1 spm, 3 shs; st 104, 17°16N, 16°59W, 1550 m, 1 spm; st?. 495 m, 3 spms, 1 sh; st 131, 37°35N, 29°26W, 1440 m, 3 spms, 2 shs; st 127, 38°38N, 28°21W, 1258 m, 3 spms, 30 shs; st 143, 37°55N, 27°02W, 2235 m, 2 spms, 3 shs; MONACO st 114, 38°38N, 28°08W, 620 m, 1 spm; st 184, 40°05N, 27°28W, 1850 m, 1 spm; st 203, 39°27N, 33°15W, 1557 m, 1 spm; st 233, 38°33N, 30°29W, 1300 m, 1 sh; st 244, 38°34N, 30°40W, 1260 m, 2 shs; st 553, 37°43N, 27°26W, 1385 m, 1 spm, 1 sh; st 684, 38°20N, 30°25W, 1550 m, 1 spm; st 698, 39°11N, 33°05W, 1846 m, 1 spm; st 703, 39°21N, 33°26W, 1360 m, 1 sh; st 738, 37°40N, 26°26W, 1919 m, 1 sh; st 743, 37°36N, 27°28W, 1484 m, 1 sh; st 1123, 27°41N, 17°54W, 1786 m, 1 spm; st 1116, 31°44N, 10°47W, 2165 m, 1 sh; st 1190, 15°14N, 23°04W, 628 m, 1 sh; st 1193, 15°17N, 23°02W, 1311 m, 1 sh; st 1331, 38°40N, 26°01W, 1805 m, 1 spm; st 1334, 39°30N, 29°02W, 1900 m, 1 spm; st 1344, 38°46N, 28°08W, 1095 m, 1 sh; st 1349, 38°36N, 28°06W, 1250 m, 1 spm; st 2044, 32°18N, 16°38W, 2886 m, 1 sh; st 2990, 43°46N, 09°41W, 2320 m, 1 spm; st 3150, 38°01N, 25°21W, 1740 m, 1 sh; NORATLANTE st B12, 36°22N, 08°43W, 2875 m, 2 shs; BIACORES st 120, 39°04N, 32°44W, 2100 m, 1 sh; st 129, 38°58N, 33°27W, 3030 m, 3 spms; st 163, 37°27N, 26°03W, 2350 m, 1 spm; st 176, 38°01N, 26°22W, 2440-2720 m, 1 spm; st 179, 38°06N, 25°46W, 1590-1665 m, 2 spms; st 202, 37°27N, 25°00W, 2900 m, 1 spm, 1 sh; st 217, 37°05N, 24°53W, 1735 m, 2 spms; st 227, 37°10N, 25°20W, 2170 m, 6 spms, 3 shs; st 235, 37°19N, 25°33W, 2085-2115 m, 3 spms; BARTLETT st 21, 37°54N, 29°45W, 1200-1500 m, 1 spm.

Distribution. East and West Atlantic, from the Azores, Spain and North Carolina south to about 10°N, in 1000-3000 m, occasionally shallower in the western part.



Figs 66-69. Genera *Irenosyrinx, Ancistrosyrinx* and *Leucosyrinx*. 66 — *I. hypomela,* NORATLANTE st B17, 59 mm. 67 — *A. clytotropis,* THALASSA st X327, 25 mm. 68 — *L. verrilli,* BIACORES st 235, 40 mm. 69 — *L. verrilli,* TALISMAN st 131, 30.5 mm.

Remarks. The animal has eyes. A part of the snail, just behind the mantle cavity, on the right side of the body, has an intense carmine colour, seen also in alcohol-preserved specimens from the *Talisman* expedition. The operculum is yellowish-brown. The radula was examined in both the *sigsbeei* and typical form and was found identical.

L. verrilli is easily recognized by the high shell, consisting of many whorls, sculptured by fine to coarse, slightly irregular, spiral lines and axial knobs or short ribs. The typical form has a heavy, solid shell; the *sigsbeei* form has a much thinner shell.

L. verrilli has a very distinct variation in the outlines and sculpture of the shell, which seems to be the same in the eastern and western Atlantic. In the more shallow part of its distribution, the shell is heavy and solid, the colour whitish-greyish and the spiral sculpture rather indistinct. This is the typical *verrilli* (or *talismani*) form. Around 1800 m, the shell gradually becomes more slender, whiter and thinner, less solid *(janetae).* In the deepest part of its distribution, it is more transparent, brownish, has a less solid shell and stronger spiral sculpture *(sigsbeei = devestitum).*

L. tenoceras (Dall) from the Caribbean resembles *L. verrilli,* but can be separated by having the whorls encircled by a band of small, short axial riblets, just below the suture. *Borsonia hirondelleae* differs by having a broader subsutural zone, a broader sinus and unshouldered whorls.

Genus *PHYMORHYNCHUS* Dall, 1908

Type species: *Pleurotomella castanea* Dall, 1895.

The type species, *P. castanea* (= *P. speciosus* Olsson, 1971 = ? *clarinda* Dall, 1908 = ? *cingulata* Dall, 1889) is very close to *P. alberti* and we are not convinced that they will not prove to be synonymous; then the name of Dall, 1889 is the oldest one.

The differences from *Pontiothauma* are not very great, nor are those from *Bathybela* and perhaps all these genera should be united. We consider, however, that our present knowledge about the family is much too incomplete to allow this.

Kosuge (1967) pointed out that *Phymorhynchus tenuis* Okutani, 1966, is a buccinid. There are however no doubts concerning *Phymorhynchus castanea.* The radula was figured by Powell (1966); this was probably not seen by Olsson (1971:60) who placed the genus in the family Buccinidae.

Phymorhynchus sulcifera (Bush, 1893), Figs 41,70,238.

Pleurotomella sulcifera Bush, 1893: 207, pl. 2, fig. 4.
Pleurotoma adelpha Dautzenberg & H. Fischer, 1896: 414, pl. 17, fig. 3.
Pleurotoma decoloratum Locard, 1897: 184, pl. 7, figs 26-30.
Pleurotoma fischeri Locard, 1897: 158, pl. 5, figs 16-19; var. *costulata:* 160.
Pleurotoma imum Locard, 1897: 185, pl. 8, figs 1-4.
Pleurotoma milneedwardsi Locard, 1897: 156, pl. 5, figs 13-15.

Type material: P. sulcifera: holotype in MCZ 119050; *P. adelpha:* holotype in MOM; *P. decoloratum, fischeri, imum* and *milneedwardsi:* holotypes or syntypes in MNHN.

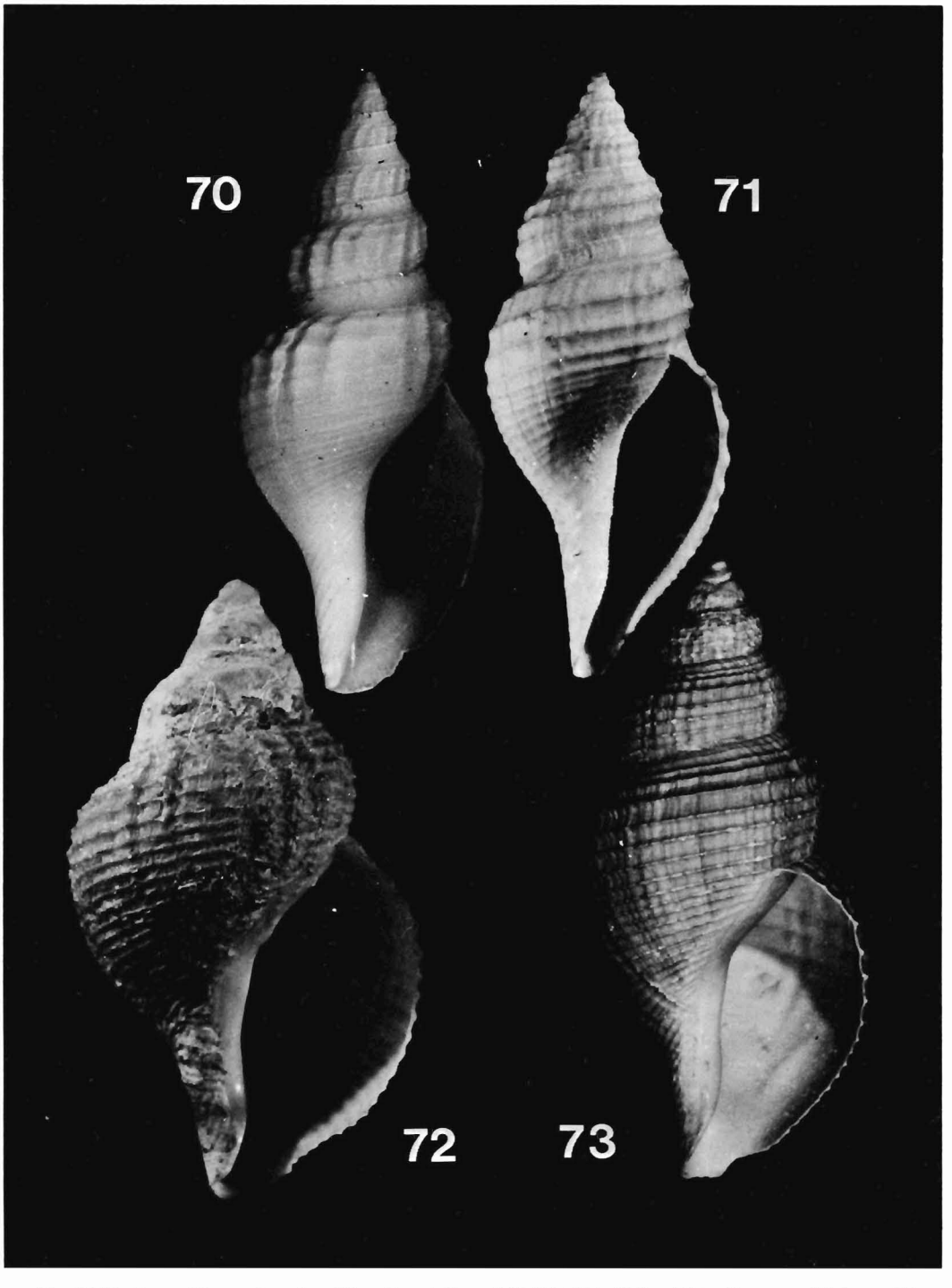
Type locality: P. sulcifera: BLAKE st 325, 33°35N, 76°00W, 1165 m; *P. adelpha:* MONACO st 233, 38°33N, 28°09W, 1300 m; *P. decoloratum:* TALISMAN, off Cape Cantin, depth unknown; *P. fischeri:* TALISMAN, off Cape Merik, Sahara, 2324 m; *P. imum:* TALISMAN, off Cape Ghir, Morocco, depth unknown; *P. milneedwardsi:* TALISMAN st 46, 29°58N, 11°41W, 2075-2104 m.

Material examined: TALISMAN, off Morocco, 2100-2200 m, 4 spms; off Cape Cantin, Morocco, 1350-1590 m, 2 shs; drag. 41, 30°01N, 11°46W, 2115 m, 1 spm; st 139, 38°38N, 28°21W, 1257 m, 2 shs; MONACO st 663, 37°29N, 25°32W, 1732 m, 1 sh; st 719, 39°11N, 29°06W, 1600 m, 1 sh; st 1116, 31°44N, 10°47W, 2165 m, 1 sh; st 1269, 36°06N, 07°56W, 1742 m, 1 sh; st 1331, 38°40N, 26°01W, 1805 m, 3 shs; st 3150, 38°01N, 25°21W, 1740 m, 1 sh; BIACORES st 179, 38°06N, 25°46W, 1590-1665 m, 1 sh; THALASSA st X339, 44°10N, 04°30W, 1520-1600 m, 1 sh and the type material.

Distribution. From the southern part of the bay of Biscay and southwards in the Eastern Atlantic, bathyal. Only known from the material examined.

Remarks. The radula of *P. adelpha* is unusually small, the teeth being only *c.* 100 μm long. The animal has big, well-developed eyes, furnished with a lens. No operculum.

P. adelpha can hardly be confused with any known E. Atlantic turrid, except *P. chevreuxi* (see that species) and perhaps *Belomitra* or *Vexithara richardi* (Dautzenberg & Fischer), but that species has a more solid shell, direct development and much stronger spiral sculpture.



Figs 70-73. Genus *Phymorhynchus*. 70 — *P. sulcifera,* TALISMAN off Cap Ghir, Morocco, 37.4 mm. 71 — *P. chevreuxi,* MONACO st 719, 20.7 mm. 72 — *P. alberti,* NORATLANTE st B18, 19.5 mm. 73 — *P. alberti,* BIOGAS st CP20, 37 mm.

Phymorhynchus alberti (Dautzenberg & Fischer, 1906) Figs 40,72-73,239.

Pleurotoma alberti Dautzenberg & H. Fischer, 1906: 16, pl. 1, figs 8-10.
Type material: holotype in MOM.
Type locality: MONACO st 1150, 16°12N, 24°44W, 3890 m.
Material examined: the type material and NORATLANTE st B17, 45°13N, 05°30W, 4700 m, 1 spm; st B18, 46°40N, 10°08W, 4690 m, 1 spm; MICHAEL-SARS st 10, 45°26N, 09°20W, 4700 m, 1 spm (Grieg 1920: 13, figs 9-10 as *Bathybela nudator*); BIOGAS st CP16, CP17, 46°30N, 10°22W, 4700-4825 m, 6 spms, 1 sh; st CP19, CP20, CP22, 44°24N, 04°52W, 4435-4475 m, 4 spms, 3 shs; st DS55, CP04, CP14, CV28, 47°35N, 09°36W, 4023-4237 m, 7 spms; st CV18, 47°32N, 09°37W, 4120 m, 1 sh; st CV32, 44°07N, 04°16W, 1895 m, 1 spm; INCAL st CP13, 46°02N, 10°15W, 4800 m, 1 sh; st CP15, 47°26N, 09°35W, 4182 m, 2 spms; SARSIA st 7603, 44°19N, 03°35W, 3860 m, 2 spms.

Distribution. Northeast Atlantic, abyssal. Only known from the material examined.

Remarks. The holotype of *P. alberti* is a severely broken shell with corroded surface, so that the original sculpture is not visible; however its general outlines make it completely identifiable with the present material, in which some of the shells show the same corrosion of the shell surface and apex. Not a single one has a completely preserved protoconch but there are remains indicating planktotrophic larval development. *Phymorhynchus alberti* is the largest turrid from our area, with a maximum size of 95 mm. It can be separated from *Bathybela nudator,* of the same size, by its lack of axial sculpture and by the presence of spiral sculpture also on the subsutural zone.

Phymorhynchus chevreuxi (Dautzenberg & Fischer, 1897) Fig. 71.

Pleurotoma chevreuxi Dautzenberg & H. Fischer, 1897: 150, pl. 3, fig. 2.
Type material: holotype in MOM.
Type locality: MONACO st 719, 39°11N, 29°06W, 1600 m.
Material examined: The type and one additional shell from the type locality.

Distribution. Only known from the type locality.

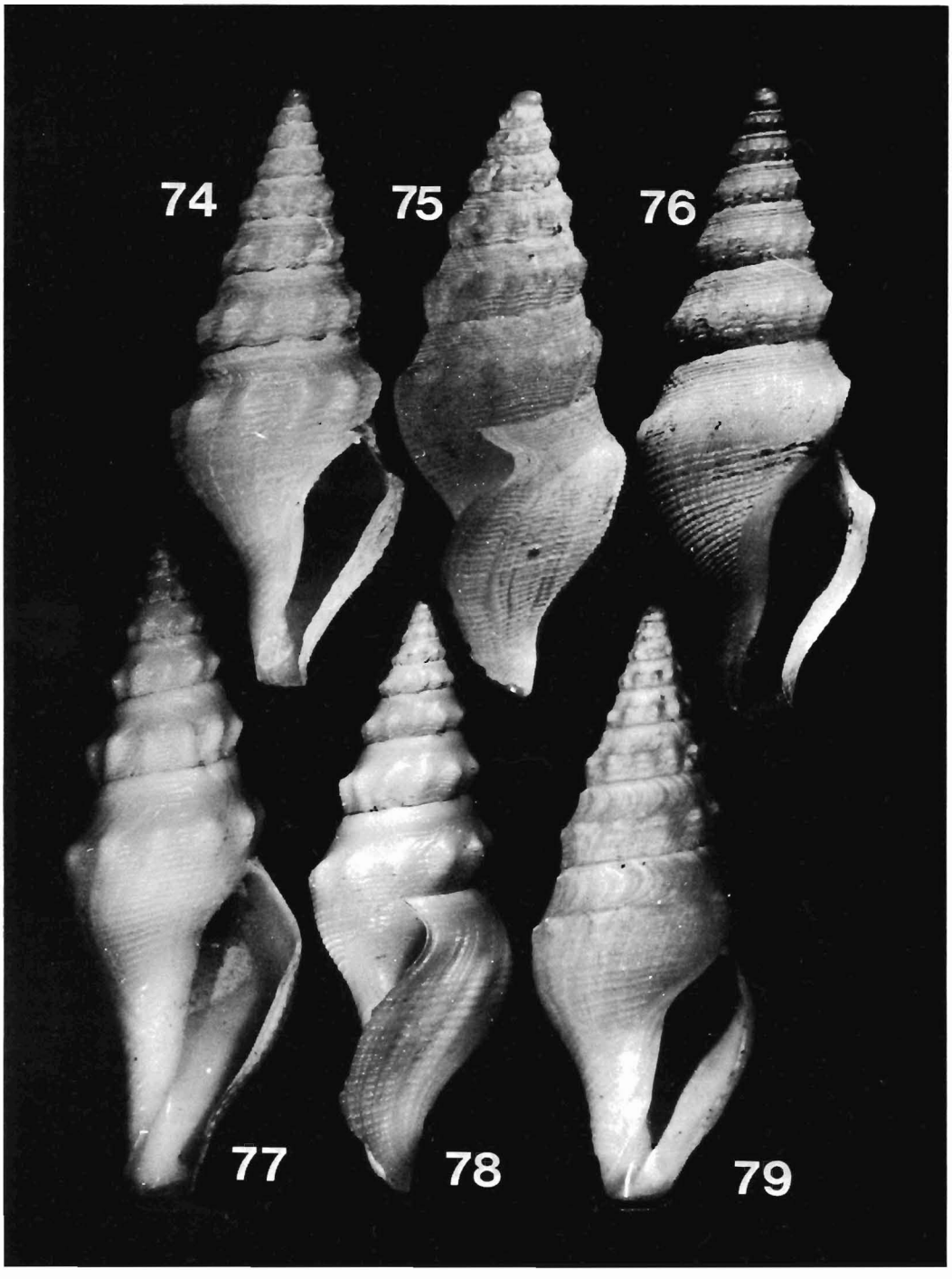
Remarks. The placement of *chevreuxi* in *Phymorhynchus* is provisional until something is known of the soft parts. It can be separated from *P. alberti* by being more slender, by having a better marked subsutural zone without spiral ribs and by having fainter axial sculpture. *P. adelpha* has a distinct axial sculpture of broad ribs which separate it from *chevreuxi.*

Genus *TYPHLOMANGELIA* G. O. Sars, 1878

Type species: *Pleurotoma nivale* Lovén, 1846

Typhlomangelia nivalis (Lovén, 1846) Figs 74-76,200.

Pleurotoma nivalis Lovén, 1846: 146.
Pleurotoma compsospira Dautzenberg & H. Fischer, 1896: 409, pl. 16, fig. 6.
Pleurotoma peregrinum Locard, 1897: 167, pl. 6, figs 11-15.
Pleurotoma neotericum Locard, 1897: 172, pl. 7, figs 1-6.
Pleurotoma nexosulum Locard, 1897: 178, pl. 7, figs 17-21.
Pleurotoma vacantivum Locard, 1897: 180, pl. 7, figs 22-25.
Type material: P. nivalis: syntypes in SMNH; *P. compsospira:* holotype in MOM; *P. peregrinum, neotericum, nexosulum* and *vacantivum:* lectotypes in MNHN.
Type locality: P. nivalis: Bergen, Norway; *P. compsospira:* MONACO st 184, 40°05N, 27°28W, 1850 m; *P. peregrinum:* TALISMAN st 34, 32°31N, 09°48W, 1350 m; *P. neotericum:* TALISMAN st 100, 19°12N, 17°57W, 2324 m; *P. nexosulum:* TALISMAN st 137, 38°37N, 28°21W, 1258 m; *P. vacantivum:* TALISMAN st 143, 37°55N, 27°02W, 2995 m.
Material examined: the type material and about 100 spms + shs from S. Scandinavia, 100-400 m, coll. AW; TRAVAILLEUR 1881 st 1, 43°03N, 05°19E, 550 m, 2 shs; TRAVAILLEUR 1882 st 19, 41°63N, 06°09W, 940 m, 3 shs; TALISMAN st 117, 16°53N, 25°06W, 589 m, 1 sh; MONACO st 703, 39°21N, 31°06W, 1360 m, 2 shs; st 1193, 15°17N, 23°02W, 1311 m, 1 sh; st 2044, 32°28N, 16°38W, 2286 m, 1 spm; st 3293, 38°47N, 30°16W, 1331 m, 1 sh; INGOLF st 10, 64°24N, 28°50W, 1450 m, 1 sh; st 76, 49°27N, 13°33W, 2100 m, 1 sh; st 90, 64°45N, 29°06W, 1070 m, 1 sh; MICHAEL-SARS st 48, 61°00N, 02°53W, 270 m, 2 shs; THOR 43°37N, 02°08W, 480-1500 m, 5 spms, 2 shs; BIACORES st 120, 39°04N, 32°44W, 2100 m, 1 spm; st 176, 38°01N, 26°22W, 2440-2720 m, 2 shs; st 202, 37°27N, 25°00W, 2900 m, 1 sh; THALASSA st X340, 44°07N, 04°30W, 860-910 m, 1 spm; st X341, 44°07N, 04°31W, 820 m, 1 spm; st X353, 44°07N, 04°45W, 645 m, 1 spm; st Y401,



Figs 74-79. Genera *Typhlomangelia* and *Borsonia*. 74 — *T. nivalis*, BIOGAS st CP01, 17.3 mm. 75 — *T. nivalis*, 60°07N, 04°50E, 330 m (Bergen area), 12.5 mm. 76 — *T. nivalis*, THALASSA st X340, 15.2 mm. 77 — *B. hirondelleae*, TALISMAN 1883 st 33-34, 32 mm. 78 — *B. hirondelleae*, TALISMAN off Cape Cantin, Morocco, 32 mm. 79 — *B. hirondelleae*, MONACO st 2214, 16.8 mm.

40°37N, 09°22W, 1040 m, 2 shs; st Z405, 47°43N, 08°08W, 1055 m, 1 spm; st Z409, 47°43N, 08°02W, 1035-1080 m, 2 shs; st Z420, 48°20N, 09°38W, 507 m, 1 spm; st Z441, 48°35N, 10°32W, 1180 m, 1 spm; POLYMEDE st CV4, 38°01N, 07°31E, 2824 m, 3 spms; BIOGAS st CP01, 47°35N, 08°39W, 2245 m, 3 spms; st CP07, 44°10N, 04°16W, 2170 m, 2 shs; st CP08, 47°33N, 08°39W, 2177 m, 1 spm; st CP11, 47°30N, 09°07W, 3056 m, 2 shs; st DS62, 47°33N, 08°40W, 2175 m, 1 sh; 44°35N, 02°07W, 410 m, 1 sh, Lagardère coll.; 45°19N, 03°13W, 400-800 m, Lagardère coll.; INCAL st CP04, 56°33N, 11°12W, 2500 m, 1 spm; BIOGAS st CP26, 47°33N, 08°33W, 2115 m, 1 spm.

Distribution. The whole Northeast Atlantic, including the Mediterranean, in 45-400 m (N. Europe and Siberia) to 600-3000 m in the southern part of its distribution.

Remarks. This is a most confusing species. In the northern part of its distribution and in shallow water in the Bay of Biscay, it is rather constant in its appearance and size and it has always a white protoconch. In deeper water, around 1000 m, it starts to become more variable in the size and the colour of the larval shell which is sometimes yellowish. This is still more pronounced in the Azores. Going further to the south, in its shallow occurrence, the axial sculpture becomes more pronounced and riblike, and a subsutural, rounded spiral keel becomes more common. This has led authors to describe a number of different species, reflected above in the synonymy. We have tried to separate these different names, but found it impossible to keep them for any present specific of subspecific use. It is possible that in the future, when the species is better known, it will be possible to recognize subspecies, but that requires more material than we have access to.

Genus *BORSONIA* Bellardi, 1839

Type species: *Borsonia prima* Bellardi, 1839, by monotypy.

Pleurotoma hirondelleae Dautzenberg fits very well the description of *B. prima,* both the original description of Bellardi and the redescription of Cossmann (1896: 96). Already Cossmann had recognized that this species (then undescribed) should be referred to *Borsonia,* as he mentioned an undescribed species taken by *l'Hirondelle* in the Azores.

Borsonia hirondelleae (Dautzenberg, 1891), Figs 5,77-79,195,198.

Pleurotoma hirondelleae Dautzenberg, 1891: 613.
Pleurotoma hirondellei Dautzenberg & H. Fischer, 1896: 408, pl. 16, fig. 2.
Pleurotoma denudatum Locard, 1897: 176, pl. 7, figs 12-16.
Pleurotoma erraneum Locard, 1897: 163, pl. 6, figs 1-5.
Pleurotoma scitulinum Locard, 1897: 165, pl. 6, figs 6-10.
Pleurotoma circumcinctum Locard, 1897: 174, pl. 7, figs 7-11.
Type material: P. hirondelleae: holotype in MOM; *P. hirondellei:* holotype in MOM; *P. denudatum:* holotype in MNHN; *P. circumcinctum:* 2 syntypes in MNHN; *P. erraneum:* holotype in MNHN; *P. scitulinum:* holotype in MNHN.
Type locality: P. hirondelleae: MONACO st 45, 45°48N, 05°38E, 160 m; *P. hirondellei:* MONACO st 203, 29°37N, 33°15W, 1557 m; *P. denudatum:* TALISMAN st 137, 38°37N, 28°21W, 1258 m; *P. erraneum:* TRAVAILLEUR 1882 st 67, 33°09N, 09°38W, 1900 m; *P. scitulinum:* TALISMAN st 131, 37°35N, 29°26W, 1440 m; *P. circumcinctum:* TALISMAN st 33-34, off Cape Cantin, Morocco, 1223-1350 m.
Material examined: the type material and TALISMAN st 31-33, off cape Cantin, Morocco, 886-1350 m, 4 spms, 12 shs; st 44, 29°52N, 11°47W, 2083 m, 1 sh; st 106, 15°48N, 20°23W, 3655 m, 1 spm; MONACO st 211, 39°18N, 33°32W, 1372 m, 1 spm; st 618, 38°51N, 28°06W, 1143 m, 1 sh; st 703, 39°21N, 31°06W, 1360 m, 5 shs; st 719, 39°11N, 32°45W, 1600 m, 3 spms, 4 shs; st 2214, 39°26N, 31°22W, 650-914 m, 2 shs; st 3150, 38°01N, 25°21W, 1740 m, 2 shs; st 3293, 38°47N, 30°16W, 1331 m, 2 spms; THALASSA st Y395, 41°19N, 09°14W, 810 m, 1 sh; stY401, 40°37N, 09°22W, 1040 m, 1 sh; METEOR st 36-97, 25°30N, 16°01W, 409 m, 1 spm.

Distribution. Subtropical eastern Atlantic, bathyal.

Remarks. The history of the names of this species is a little unfortunate. Dautzenberg (1891:613) described it as a new species from the Bay of Biscay. Five years later, he described it again together with H. Fischer (1896:408), with a slightly different spelling and without any reference to his earlier description, but distinctly as a new species, *Pleurotoma hirondellei* Dautzenberg & Fischer, sp.n. He

does not refer to the earlier paper in his publication of 1927 (p.29). The specimen figured (1896: pl. 16, fig. 2) is marked type. The first description is based on an old worn (fossil?) shell.

This species is rather variable, but the solid shell and broad labial notch makes it easily recognizable. *Pleurotoma syngenes* Watson, 1881, from Sombrero Island, is closely related but has no spiral sculpture and is more slender. *B. hirondelleae* also resembles *Leucosyrinx tenoceras* (Dall) a little but that species is higher and has a subsutural band sculptured with short axial riblets.

Genus *MANGELIA* Risso, 1826

Type species: *M. striolata* Risso, 1826.

The genus consists of shallow-water Eastern Atlantic species. Only the following two species can be considered upper bathyal elements.

Mangelia serga (Dall, 1881) Figs 42,80,214.

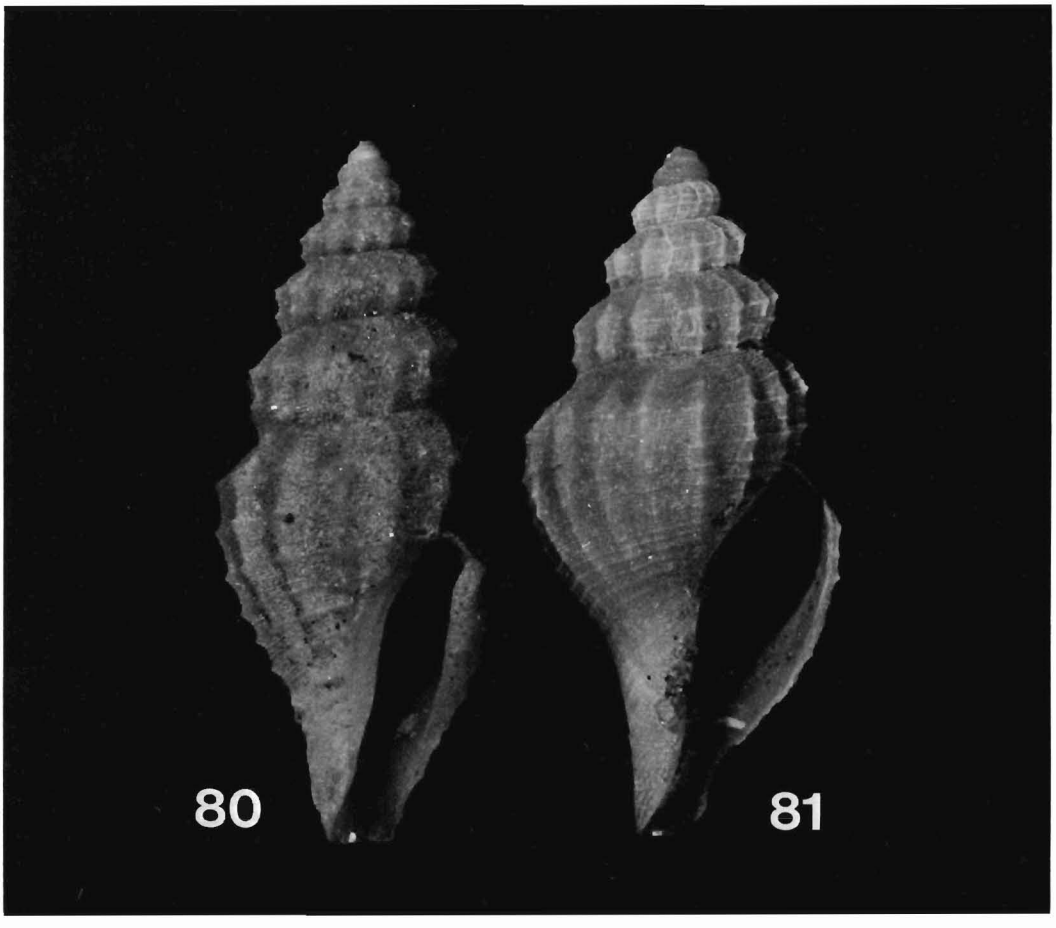
Pleurotoma (Drillia) serga Dall, 1881 (August): 65; 1886: pl. 9, fig. 4.
Pleurotoma (Mangilia) acanthodes Watson, 1881 (October): 433; 1886: 342, pl. 23, fig. 3.
Pleurotoma (Mangilia) corallina Watson, 1881: 435; 1886: 343, pl. 23, fig. 1.
Mangilia serga var. *elongata* Locard, 1897: 233.
Acmaturris vatovai Nordsieck, 1971: 190, fig. 4.
Type material: P. serga: apparently lost; *P. acanthodes:* syntypes BMNH 1887.2.9. 1059-60; *P. corallina:* holotype BMNH 1887.2.9.1061; *M. serga* var. *elongata:* syntypes MNHN.
Type locality: P. serga: Bed of the Gulf Stream, 810 m; *P. acanthodes:* CHALLENGER st 56, 32°09N, 64°59W, 1935 m; *P. corallina:* CHALLENGER st 24, 18°38N, 65°05W, 702 m; *A. vatovai:* Gulf of Taranto, 185 m.
Material examined: the types of Watson, Locard and: THOR 43°37N, 02°08W, 480-1500 m, 1 sh; MONACO st 198, 38°26N, 28°39W, 800 m, 1 sh; st 203, 39°27N, 30°55W, 1557 m, 1 sh; st 234, 39°02N, 27°55W, 454 m, 1 sh; st 553, 37°43N, 25°05W, 1385 m, 3 shs; st 1349, 38°35N, 28°06W, 1250 m, 3 shs; st 2210, 39°25N, 31°22W, 1229 m, 1 sh; st 2214, 39°26N, 31°21W, 650-914 m, 4 shs; st 3250, 38°23N, 28°23W, 1153 m, 2 shs; BIACORES st 148, 37°34N, 25°34W, 847-870 m, 4 spm and shs; st 159, 37°26N, 25°51W, 525-600 m, 1 spm, 1 sh; st 229, 37°01N, 25°14W, 600 m, 5 spm and shs; st 240, 37°35N, 25°32W, 810-825 m, 1 spm; TRAVAILLEUR 32°34N, 09°49W, 1590 m, 2 shs; 41°32N, 09°21W, 1350 m, 1 sh; 38°06N, 09°07W, 440 m, 3 shs; 38°23N, 28°50W, 560 m, 1 sh; PORCUPINE st 24, 37°19N, 09°13W, 540 m, 2 shs; st 17, 39°42N, 09°43W, 1980 m, 1 sh; Pantellaria, 710 m, 1 sh; Cadiz, 720 m, 3 shs; SARSIA st 7614, 43°43N, 03°38W, 1100 m, 1 sh; E. Mediterranean, 36°25N, 22°57E, 280-285 m, 1 sh.

General distribution. The upper bathyal zone of northern Mid-Atlantic, including the Mediterranean.

Remarks. Many other species have a sculpture of spiral rows of granules but they do not have the long, slender aperture and angular whorls of the present species. The two species of *Mangelia* treated here can easily be separated from other genera by the larval shell, which resembles that of *Benthomangelia,* but has fewer whorls and coarser axial sculpture. *M. serga* has no operculum. The protoconch indicates planktotrophic larval development.

Mangelia nuperrima (Tiberi, 1855) Figs 81,215.

Pleurotoma decussatum Philippi, 1844: 174, pl. 26, fig. 23 (non *Pleurotoma decussata* Couthouy 1839).
Pleurotoma nuperrimum Tiberi, 1855: 14, pl. 2, figs 7-9.
Raphitoma nuperrima var. *corallinoides* and var. *pseudacanthodes* Sturany, 1896: 10, pl. 2, figs 6-7.
Raphitoma peregrinator Locard, 1897: 229, pl. 10 figs 28-31.
?Pleurotoma lyciaca Forbes, 1843: 139 (nom.nud.); 1844 (in Reeve): *Pleurotoma* no 160, pl.19 (*fide* Monterosato).
Raphitoma reconditum Locard, 1892: 59.
Type material: P. nuperrimum: one syntype USNM 189973; *R. nuperrima* var. *corallinoides* and *pseudacanthodes:* NHMW; *R. peregrinator:* holotype in MNHN; *P. lyciaca:* not found in BMNH; *R. reconditum:* 8 syntypes in MNHN.



Figs 80-81. Genus *Mangelia*. 80 — *M. serga*, BIACORES st 229, 10.4 mm. 81 — *M. nuperrima*, 44°54N, 02°11W, 150 m, 10.2 mm.

Type locality: P. nuperrimum: Naples; *R. peregrinator:* TRAVAILLEUR 1882, dr 12, 44°06N, 07°09W, 550 m; *P. lyciaca:* Cape Artimesium, 165 m; *R. reconditum:* Atlantic coast of France.

Material examined: the type material and: THALASSA st W368, 43°37N, 03°36W, 137-400 m, 3 shs; st W411, 43°50N, 06°06W, 260-320 m, 1 sh; st Y375, 41°35N, 09°15W, 460 m, 1 sh; st Y398, 40°46N, 09°17W, 220 m, 1 sh; NORATLANTE st B15, 44°07N, 04°08W, 1884-1911 m, 1 sh; PORCUPINE st 6, 48°26N, 09°44W, 645 m, 3 shs; POLA st 213, 36°47N, 26°29E, 597 m, 1 sh; METEOR st 36-97, 25°30N, 16°01W, 409 m, 1 spm; st 36-104, 21°23N, 17°32W, 415 m, 1 sh; VANNEAU st 79, 30°31N, 09°51W, 104 m, 1 sh; off Cape Corse, 90-150 m, 8 shs, coll. Carrozza; off Arcachon, 2 shs; off La Rochelle, 1 sh; 44°54N, 02°11W, 150 m, 3 shs, Lagardère coll.; 45°28N, 02°46W, 132-250 m, 1 sh; CINECA III stB15, 29°05N, 10°33W, 54 m, 1 sh; st B33, 29°23N, 10°50W, 132 m, 1 sh.

Distribution. The upper bathyal of the Mediterranean and lusitanian regions.

Remarks. M. nuperrima has planktotrophic larvae; the animal has no operculum.

At present we cannot give distinctive details of all the shallow-water species of the *Mangelia*-type, because we do not know them well enough, but the coarsely granulated surface of *M. nuperrima* and *M. serga* seem to be enough to separate them from everything except the species around *M. brachystomum*. That group resembles *serga* in having shouldered whorls, but has a much shorter aperture; *M. nuperrima* seems to be unique in having coarse granulation and rounded whorls.

Genus *DRILLIOLA* (Monterosato ms.) Locard, 1897

Type species: *Taranis emendata* Monterosato, 1872, by subsequent designation, Cossmann, 1896. *Synonyms: Microdrillia,* Casey, 1903: 276. Type species: *Pleurotoma cossmanni* Meyer, 1887. *Acrobela,* Thiele, 1925: 238. Type species: *Bela (Acrobela) optima* Thiele, 1925. *Acropota* Nordsieck, 1977: 18. New name for *Acrobela* Thiele, 1925, non Foerster, 1862.

We have placed a rather wide variety of species in this genus, but there are no doubts that *D. emendata* and *D. loprestiana* are closely related, so we have united the genera listed above. The other species referred to *Drilliola* look rather different but have a similar radula and operculum; we have therefore preferred to keep them in *Drilliola,* rather than placing them in any of the perhaps more similar, but anatomically unknown genera listed by Powell (1966) in different subfamilies.

Drilliola loprestiana (Calcara, 1841) Figs 82,208-209.

Pleurotoma loprestiana Calcara, 1841:7.
Pleurotoma trecchi Testa, 1842 (*fide* Monterosato 1874).
Pleurotoma tarentini Philippi, 1844: 175, tertiary fossil (*fide* Monterosato 1874).
Pleurotoma tricinctum Brugnone, 1862, tertiary fossil (*fide* Monterosato 1874).
Raphitoma barbierii Brusina, 1866:64 (*fide* Dautzenberg 1927).
Pleurotoma loprestiana var. *minor* Monterosato, 1875:42 (nomen nudum).
Taranis pulchella Verrill, 1880: 368; 1882: 487, pl. 57, fig. 17; 1884: 267, pl. 29, fig. 8.
Pleurotoma (Mangelia) tiara Watson, 1881: 440; 1886, 347, pl. 21, fig. 7.
Pleurotoma (Mangelia) comatotropis Dall, 1881: 58; 1889: 116, pl. 11, fig. 12.
Type material: the types of Calcara are said to be in the Monterosato coll., Rome (not seen); *T. pulchella:* holotype USNM 37841; *P. comatotropis:* paratypes USNM 87439; *P. tiara:* holotype BMNH 1887.2.9.1070.

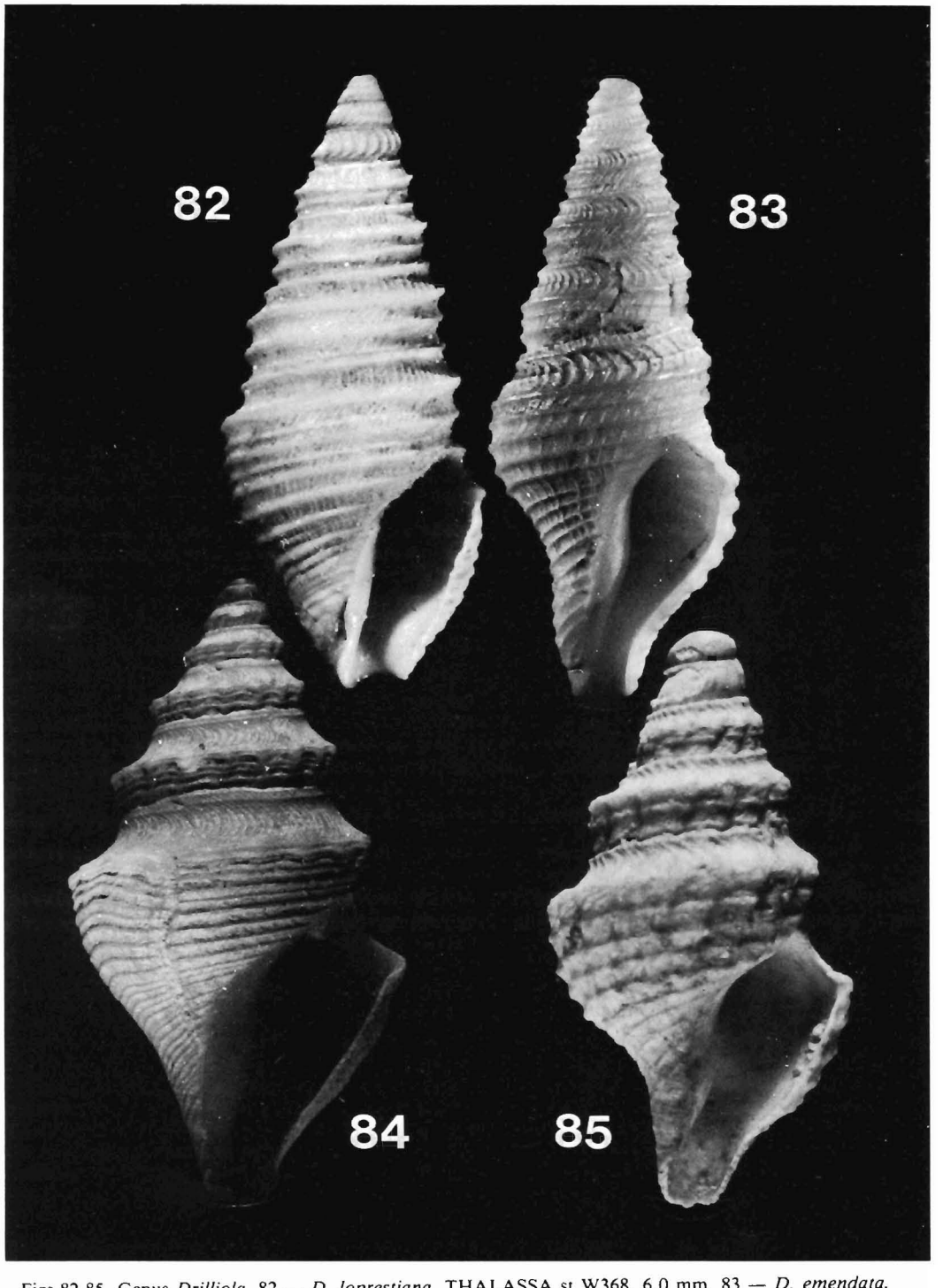
Type locality: we have not seen the original paper by Calcara, but the type locality is probably Sicily.
Material examined: the types mentioned above and: about 12 samples with 75 spms and shs from the Azores, 300-1550 m (Dautzenberg 1927: 35); POLA st 36, 32°46N, 19°58E, 680 m, 1 sh; st 194, 36°03N, 23°06E, 160 m, 1 sh; st 213, 36°47N, 26°29E, 597 m, 1 sh; SARSIA st 7615A, 43°42N, 03°43W, 330 m, 2 shs; TRAVAILLEUR 1881-82, off Portugal and Morocco, 5 shs; THALASSA st W368, 43°37N, 03°36W, 137-400 m, 5 shs; st Y378, 41°31N, 09°16W, 1000 m, 1 sh; THOR 43°37N, 02°08W, 480-1500 m, 2 shs; MICHAEL-SARS st 21, 35°31N, 06°35W, 535 m, 1 sh; VANNEAU st 35, 34°05N, 07°40W, 160 m, 3 shs; METEOR st 36-97, 25°30N, 16°01W, 409 m, 2 spms; BARTLETT 37°14N, 28°45W, 480 m, 2 shs; CHALLENGER off Fayal, 810 m, 1 spm; 44°35N, 02°07W, 410 m, 1 sh, Lagardère coll.; off Cape Corse, 90-150 m, 2 shs, coll. Carrozza; 36°25N, 22°57E, 280 m, 2 shs; South of Cape Matapan, 355 m, 1 sh; off Pantellaria, 710 m, 5 shs.

Distribution. The upper bathyal zone on both sides of the North Atlantic, including the Mediterranean; in the N.E. Atlantic, it reaches as far north as the middle part of the Bay of Biscay. It apparently occurs shallower in certain parts of the Mediterranean; a depth of only 45 m has been given by Gianinni (1975:90) off Corsica.

Remarks. The species shows little variation and the various names of Verrill, Watson and Dall are more a consequence of simultaneous publication than of polymorphic appearance; we have found no trace of geographical variation among the material from all parts of its distribution area in the NE Atlantic and the Mediterranean. The protoconch is evidence of planktotrophic larval development.

Drilliola emendata (Monterosato, 1872) Figs 29,83,207.

Pleurotoma renieri Scacchi, of Philippi, 1844: 176, pl. 26, fig. 22; not *P. renieri* of Scacchi, 1835.
Pleurotoma crispata of authors on Recent Mollusca, not De Cristofori & Jan, 1832.
Taranis emendata Monterosato, 1872: 17, 34.
Pleurotoma emendatum var. *atlantica* Locard, 1897: 214.
Taranis albatrossi Nordsieck, 1971: 189, fig. 3.
Type material: T. emendata: lectotype in MNHN.
Type locality: T. emendata: Palermo, Sicily.
Material examined: Casablanca, 130 m, 1 sh; MONACO st 738, 37°40N, 26°26W, 1919 m, 2 shs; st 2717, 36°42N, 08°40W, 750 m, 1 sh; Algeria, 90 m, 3 shs; Capo de Gata, 70-125 m, 1 sh; PORCUPINE st 16, 39°55N, 09°56W, 1800 m, 2 shs; VANNEAU st 10, 29°54N, 09°58W, 1100 m, 3 shs; METEOR st 36-97, 25°30N,



Figs 82-85. Genus *Drilliola*. 82 — *D. loprestiana*, THALASSA st W368, 6.0 mm. 83 — *D. emendata*, CINECA III st B7, 8.9 mm. 84 — *D. pruina*, BIOGAS st CW3, 12.3 mm. 85 — *D. megalacme*, syntype, 5.3 mm.

16°01W, 409 m, 1 spm; st 36-104, 21°23N, 17°32W, 415 m, 1 sh; off Cape Corse, 90-150 m, 1 sh, coll. Carrozzaa; plus *c.* 25 shs from the Mediterranean and the Atlantic, without good locality data.

Distribution. The bathyal zone of the Mediterranean; apparently restricted in the Atlantic to the continental slopes of Iberia and N.W. Africa. The shallowest record is 45 m in Corsica (Gianinni, 1975: 90).

Remarks. Drilliola emendata has a sculpture basically similar to that of *D. loprestiana,* but it is more slender and has an obtuse, carinated, whitish protoconch. The protoconch of *loprestiana* is pointed and composed of three brownish whorls with bent axial ribs. *D. emendata* has direct or lecithotrophic larval development.

We have tried to check *P. renieri* and *P. crispata,* to be sure that the new name *emendata* introduced by Monterosato for the species described by Philippi and for the Recent Mediterranean species was not an unnecessary addition to the list of names. The types of Scacchi (of whom there are a few types in MNHN) and De Cristofori & Jan (Pinna, 1971: 424) are lost. Both species were described as tertiary fossils and knowing the great similarity between even unrelated species of Turridae, we have preferred to use the name of Monterosato, and to stabilize it by selection of a lectotype from material sent to Locard by the author.

Drilliola megalacme (Sykes, 1906) Figs 85,206.

Spirotropis megalacme Sykes, 1906: 183, pl. 16, fig. 5-5a.
Type material: holotype and 3 paratypes in BMNH.
Type locality: PORCUPINE st 17, 39°42N, 09°43W, 1980 m.
Material examined: the type material.
Distribution. Only known from the type locality.
Remarks. D. megalacme can be distinguished from *D. pruina* by having direct development and stronger axial sculpture below the main keel.

Drilliola pruina (Watson, 1881) Figs 30,84,194,204-205.

Pleurotoma (Thesbia) pruina, Watson, 1881: 453.
Pleurotoma (Pleurotomella) pruina Watson, 1886: 336, pl. 24, fig. 4.
Typhlomangelia tanneri Verrill & Smith, 1884: 163, pl. 31, fig. 8. Turridae sp. B. Bouchet 1977:951, pl. 8.
Type material: P. pruina: holotype in BMNH 1887.2.9.1051. *T. tanneri:* holotype in USNM 38067.
Type locality: P. pruina: Azores, 37°26N, 25°13W, 1800 m. *T. tanneri:* off New England, 40°17N, 67°05W, 2320 m.
Material examined: the type material and BIACORES st 126, 39°19N, 33°47W, 3360 m, 1 spm; st 245, 40°57N, 22°16W, 4270 m, 1 spm; BIOGAS st CW3, 47°31N, 08°17W, 1100 m, 3 shs; st CV37, 47°33N, 09°14W, 3000 m, 1 spm; st CP01, 47°35N, 08°39W, 2245 m, 2 spms, 4 shs; st CP09, 47°33N, 08°44W, 2171 m, 1 sh; st DS71, 47°34N, 08°34W, 2194 m, 1 spm; NORATLANTE st B15, 44°07N, 04°09W, 1884 m, 1 sh; st B19, 47°29N, 08°24W, 2047-2149 m, 1 spm, 1 sh; INCAL st CP08, 50°15N, 13°14W, 2644 m, 2 spms; st OS01, 50°14N, 13°11W, 2634 m, 1 spm; st CP09, 50°15N, 13°16W, 2690 m, 1 sh; st WS01, 50°19N, 13°07W, 2550 m, 2 shs.
Distribution. Only known from the material examined.

Remarks. The animal has an operculum.

Genus *PLEUROTOMELLA* Verrill, 1872

Type species: *P. packardi* Verrill, 1872.
We have used the name *Pleurotomella* in a much more restricted sense than Powell (1966) who used it for a mixture of deep-water species. The species included by us are characterized by a multispiral larval shell, a deep siphonal canal, thin shell, usually swollen whorls with a strong axial and fainter spiral sculpture. The animals lack, as far as we have seen, an operculum. The radula seems to be of the same type throughout the group.

The species of *Pleurotomella* may look rather similar, but there are no problems in separating them. We believe that more species will be found as some of our species are known only from very few specimens, and we have seen unknown larval shells which evidently belong to the genus; if the characteristics given below do not fit, it might be an undescribed species, as well as variation.

The following characteristics may facilitate identification: *P. packardi* has a very blunt larval shell, swollen whorls and a sculpture of oblique, distant axial ribs, crossed by several big, and by 2-3 times as many smaller, spiral ribs.

P. coelorhaphe has a similar sculpture, but a pointed larval shell and still more convex whorls.
P. lottae has almost only spiral sculpture, a very broad and inflated, but pointed larval shell. The whorls rapidly increase in diameter, but they are rather flat.
P. megalembryon has almost only spiral sculpture, a pointed, not very broad larval shell and convex, not very rapidly increasing postlarval whorls.
P. anceyi has almost only spiral sculpture and a slender, pointed larval shell, almost flat, but distinctly angulated whorls, which slowly increase in diameter and have a concave subsutural zone. The form of the shell is rather regularly conical.
P. sandersoni has a rather big larval shell (diam. *c.* 800 μm), rather regularly conical profile and a sculpture of axial ribs which start very abruptly, just below the subsutural zone and then decrease in height. The spiral sculpture consists of equal-sized spiral ribs which make small nodules at their intersections with the axial ribs. The surface of the shell is rather distinctly granular.
P. benedicti has a rather big (diam. *c.* 800 μm) and broad larval shell. The sculpture consists of strong axial ribs, highest at the middle of the whorls and a few stronger and several smaller spiral cords which form small nodules at the intersections with the axial ribs. The shape is rather slender and the whorls distinctly convex.
P. bureaui has a rather small, (diam. *c.* 600 μm) and slender larval shell. The general shape of the shell is rather conical. The axial sculpture is similar to that of *benedicti;* the spiral sculpture consists of two axial ribs on the upper whorls; on the later whorls, there is one more above, one between and one below these two.
P. obesa has a rather small (diam. *c.* 600 μm) larval shell with rather convex whorls. The shell is rather obese and the whorls very convex. The sculpture consists of poorly developed axial ribs and 3-4 spiral ribs with a smaller one between each of these.
P. eurybrocha resembles rather closely some species of *Philbertia* e.g. *P. purpurea;* it should perhaps be placed in *Philbertia.* The larval shell is slender and pointed, the diameter (100 μm from the apex) is about 200 μm. The postlarval whorls rapidly increase in diameter.
P. demosia also resembles *Philbertia.* The postlarval whorls increase in their diameter rather slowly. The larval shell is rather blunt, diameter (100 μm from the apex) 320 μm.

P. gibbera has a rather high (*c.* 800 μm) and broad larval shell of convex, distinctly and coarsely cancellated whorls. The axial sculpture of the postlarval whorls consists of broad, obtuse, rather distant axial ribs. The spiral sculpture consists of 3-4 major spiral lines, which cross the axial sculpture without forming knobs. The shell is brownish and glossy.

Pleurotomella anceyi (Dautzenberg & Fischer, 1897) Fig. 90.

Pleurotoma anceyi Dautzenberg & H. Fischer, 1897: 151, pl. 3, fig. 3.
Type material: holotype in MOM.
Type locality: MONACO st 703, 39°21N, 31°06W, 1360 m.
Material examined: the type material.
Distribution. Only known from the type locality.
Remarks. This species is closest to *P. sandersoni,* which has more convex whorls, distinct axial ribs and a bigger larval shell.

Pleurotomella benedicti Verrill & Smith, 1884 Figs 32,86-87.

Pleurotomella benedicti Verrill & Smith, 1884: 148, pl. 31, fig. 2.
Type material: holotype in USNM.
Type locality: off New England, 40°17N, 67°05W, 2320 m.
Material examined: the type material and BIOGAS st CP01, 47°35N, 08°39W, 2245 m, 2 spms; st CP07, 44°10N, 04°16W, 2170 m, 1 spm; st DS65, 47°36N, 08°40W, 2360 m, 1 sh.
Distribution. Only known from the material examined.
Remarks. This species can easily be separated from *P. packardi* by being more slender and by its pointed, not obtuse, protoconch. It resembles *P. bureaui* very much, but that species has a smaller

protoconch and a number of spiral threads in the subsutural zone, which are absent in *benedicti.* From *demosia,* also rather close, it can be separated by its bigger protoconch and longer siphonal canal. *P. eurybrocha* resembles *benedicti* considerably, but *benedicti* has a much coarser spiral sculpture of 2-3 primary ribs and numerous secondary smaller ribs on both sides and between them, while *eurybrocha* has a single secondary spiral or none at all between the primary ribs. Also the larval shell is considerably smaller in *eurybrocha.*

Pleurotomella bureaui (Dautzenberg & Fischer, 1897) Figs 88,218.

Pleurotoma bureaui Dautzenberg & H. Fischer, 1897: 149, pl. 3, fig. 1; Dautzenberg 1927: 45, pl. 2, fig. 20.
Mangilia? sericifila Dall, 1927: 29.
Type material: P. bureaui: holotype in MOM; *M. sericifila:* holotype in USNM 108302.
Type locality: P. bureaui: MONACO st 719, 38°11N, 29°06W, 1600 m; *M. sericifila:* off Georgia, USA.
Material examined: the type material and MONACO st 203, 39°27N, 30°55W, 1557 m, 1 sh; st 211, 39°18N, 31°12W, 1372 m, 1 sh; st 703, 39°21N, 31°06W, 1360 m, 2 shs; CINECA III st B31, 29°36N, 11°04W, 1500 m, 1 sh.

Distribution. Only known from the material examined.

Remarks. P. bureaui resembles *P. perpauxilla* (Watson) from the West Indies but that species has a protoconch with coarser sculpture, and the adult whorls increase less rapidly. It also resembles *P. anceyi, P. sandersoni* and *P. benedicti,* from which species it can be separated in the following way:

P. anceyi has no axial ribs, except very thin and sharp ones, while *bureaui* has strong ones.
P. sandersoni has a bigger larval shell and thin, sharp, rather closely set axial lines resembling those of *Drilliola* which are lacking in *bureaui.*
P. benedicti has more evenly rounded whorls.

Pleurotomella lottae Verrill, 1885 Figs 33,94,217.

Pleurotomella lottae Verrill, 1885: 415, pl. 44, fig. 7.
Type material: holotype USNM 40498.
Type locality: USFC st 2221, 39°06N, 70°45W, 2750 m.
Material examined: the holotype and BIOGAS st CP01, 47°35N, 08°39W, 2245 m, 3 shs; st DS64, 47°29N, 08°37W, 2156 m, 3 shs; WALDA, no loc., 6 shs, 2 spms; SARSIA st 7627, 43°47N, 03°46W, 1925-1990 m, 1 sh; METEOR st 36-100, 21°27N, 18°16W, 2049-2110 m, 1 sh.

Distribution. Only known from the material examined.

Remarks. The species is easily recognized by the broad outlines, the short aperture, flat whorls and very inflated larval whorls.

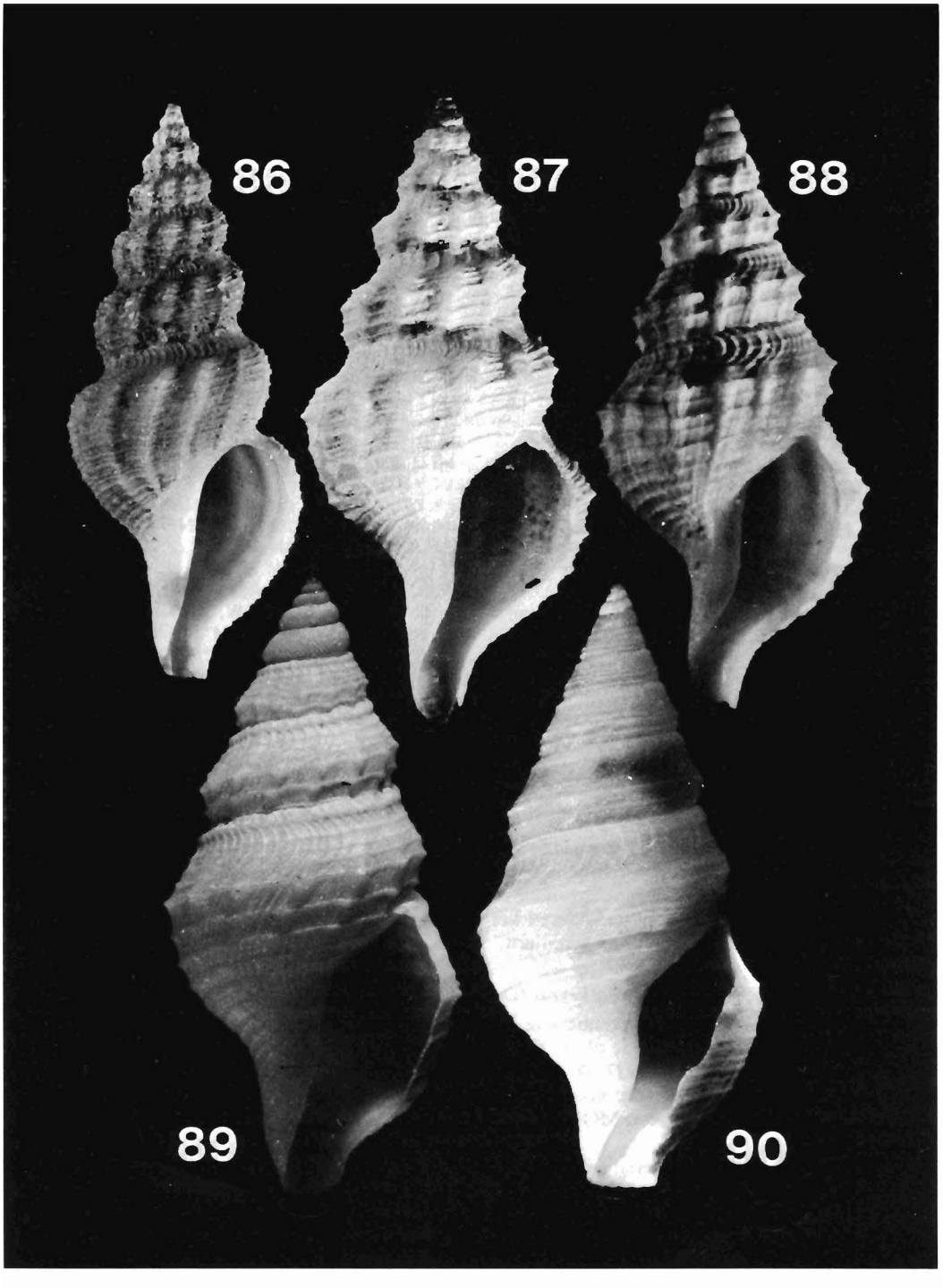
The animal is blind and has no operculum. The radula shows that it belongs to something close to *Pleurotomella* s.s. but we have not seen any genus resembling *P. lottae;* we provisionally keep it in *Pleurotomella.*

Pleurotomella sandersoni Verrill, 1884 Figs 89,219.

Pleurotomella sandersoni Verrill, 1884: 149, pl. 31, fig. 3.
Type material: holotype in USNM.
Type locality: off New England, 40°17N, 67°05W, 2320 m.
Material examined: the type material and NORATLANTE st B5, 55°44N, 49°24W, 3676 m, 1 sh; st B15, 44°07N, 04°09W, 1884 m, 2 shs; st E8, 36°49N, 27°06W, 3663 m, 1 sh; BIOGAS st DS55, 47°35N, 09°41W, 4125 m, 1 sh; st DS60, 47°27N, 09°07W, 2742 m, 1 sh; METEOR st 3-AT4, 42°06N, 14°42W, 5330 m, 1 sh; INCAL st OS06, 46°27N, 09°36W, 4316 m, 1 sh; st OS07, 47°31N, 09°34W, 4250 m, 1 sh; st OS08, 47°30N, 09°38W, 4327 m, 1 sh; st WS03, 48°19N, 15°23W, 4830 m, 1 sh; st WS08, 47°31N, 09°34W, 4300 m, 4 spms, 3 shs; st WS09, 47°28N, 09°34W, 4277 m, 1 sh; st WS10, 47°28N, 09°40W, 4354 m, 4 spms; POLYGAS st DS15, 47°35N, 08°40W, 2246 m, 1 sh.

Distribution. Known from a few other stations off New England at abyssal depths.

Remarks. The material shows some variation in the strength of the axial threads between the strong axial ribs; under close examination some specimens show a finely granular surface. This character is obsolete in other shells. Some shells are also broader and have a stronger subsutural spiral line.



Figs 86-90. Genus *Pleurotomella*. 86 — *P. benedicti*, BIOGAS st CP07, 22.4 mm. 87 — *P. benedicti*, BIOGAS st CP10, 11.05 mm. 88 — *P. bureaui*, MONACO st 719, 8.3 mm. 89 — *P. sandersoni*, BIOGAS st DS15, 7.3 mm. 90 — *P. anceyi*, holotype, 7.6 mm.

Pleurotomella packardi Verrill, 1872 Figs 31,96-97,216.

Pleurotomella packardi Verrill, 1872: 15; 1874: 48; 1882: 453, pl. 43, fig. 9, pl. 57, fig. 5.
Pleurotoma formosa Jeffreys, 1883: 397, pl. 44, fig. 9.
Pleurotoma formosa var. *curta* Locard, 1897: 235.
Pleurotomella saffordi Verrill & Smith, 1884: 151, pl. 31, fig. 4.
Pleurotoma diastropha Dautzenberg & H. Fischer, 1896: 426, pl. 15, fig. 11.
Turridae sp. D Bouchet 1977: 952, pl. 6, figs B-E, pl. 7, figs E-F.
Type material: P. packardi: holotype in USNM 37874; *P. formosa:* syntypes in BMNH and USNM; *P. saffordi:* holotype in USNM 38308; *P. diastropha:* holotype in MOM.
Type locality: P. packardi: off New England 200 m; *P. formosa:* TRITON st 13, 59°51N, 08°18W, 1030 m; *P. saffordi:* off New England, 40°17N, 67°05W, 2320 m; *P. diastropha:* MONACO st 553, 37°43N, 25°05W, 1385 m.
Material examined: the type material and MONACO st 806, 32°39N, 16°41W, 1425 m, 1 sh; SARSIA st 7612, 43°44N, 03°41W, 1540 m, 1 sh; st 7614, 43°43N, 03°38W, 1100 m, 1 sh; THALASSA st Z426, 48°28N, 09°39W, 860 m, 1 sh; st Z438, 48°34N, 10°25W, 1400 m, 4 spms; st Z445, 48°52N, 11°07W, 1200 m, 1 sh; st Z446, 48°47N, 11°08W, 1420 m, 1 spm; st Z447, 48°47N, 11°13W, 1430 m, 1 spm; st Z457, 48°38N, 09°53W, 800 m, 2 shs; st Z459, 48°37N, 09°53W, 1180 m, 1 sh; BIACORES st 227, 37°10N, 25°19W, 2180 m, 1 spm, 2 shs; st 251, 47°38N, 08°56W, 3360 m, 1 spm; TRAVAILLEUR 1880, dr 2, 43°36N, 14°45W, 1000 m, 1 sh; TRAVAILLEUR 1881, dr 42, 44°01N, 07°05W, 896 m, 2 shs; NORBI st CP02, 64°26N, 01°36E, 2714 m, 1 sh; st CP03, 65°16N, 00°02W, 2904 m, 4 shs; st DS08, 69°14N, 04°18E, 3213 m, 4 spms; st CP07, 69°05N, 04°42E, 3213 m, 4 spms; st CP08, 69°07N, 04°40E, 3213 m, 5 spms; st DS11, 69°33N, 10°22E, 2957 m, 1 spm; st DS13, 76°54N, 01°49E, 3193 m, 1 sh; THOR 1903 st 164, 61°20N, 11°00W, 1300 m, 1 sh; 61°15N, 09°35W, 900 m, 2 shs; METEOR st 191, 33°46N, 15°33W, 3920-4002 m, 1 spm (Fechter, 1979); BIOGAS st DS13, 47°34N, 08°40W, 2165 m, 1 spm; st DS15, 47°35N, 08°40W, 2246 m, 6 spms; st DS61, 47°35N, 08°39W, 2250 m, 2 spms, 2 shs; st DS62, 47°33N, 08°40W, 2175 m, 6 spms + shs; st DS63, 47°33N, 08°35W, 2126 m, 6 spms + shs; st DS64, 47°29N, 08°30W, 2156 m, 4 shs; st DS71, 47°34N, 08°34W, 2194 m, 5 spms; st CP01, 47°35N, 08°39W, 2245 m, 17 spms + shs; st CP02, 47°33N, 08°41W, 2177 m, 1 spm; st CP08, 47°33N, 08°38W, 2177 m, 4 spms + shs; st DS55, 47°35N, 09°41W, 4125 m, 1 sh; st DS26, 44°08N, 04°15W, 2076 m, 1 spm; st DS87, 44°05N, 04°19W, 1913 m, 5 shs; st DS52, 44°06N, 04°22W, 2006 m, 2 shs; st DS53, 44°30N, 04°56W, 4425 m, 1 spm; st CP25, 44°05N, 04°17W, 1894 m, 5 spms + shs; INCAL st CP01, 57°58N, 10°55W, 2068 m, 1 spm; st DS01, 58°00N, 10°40W, 2091 m, 9 spms; st DS02, 57°59N, 10°49W, 2081 m, 6 spms; st DS05, 56°28N, 11°12W, 2500 m, 1 sh; st DS06, 56°27N, 11°10W, 2494 m, 9 spms; st DS09, 55°08N, 12°53W, 2897 m, 1 sh; st DS16, 47°30N, 09°33W, 4268 m, 1 sh; st OS01, 50°14N, 13°11W, 2634 m, 1 spm; st OS05, 47°32N, 09°35W, 4290 m, 2 shs; st OS06, 46°27N, 09°36W, 4316 m, 1 sh; st OS07, 47°31N, 09°34W, 4250 m, 3 shs; st WS01, 50°19N, 13°07W, 2550 m, 2 shs; st WS07, 47°31N, 09°36W, 4280 m, 2 spms; st WS08, 47°30N, 09°34W, 4287 m, 3 spms; st WS09, 47°29N, 09°34W, 4277 m, 3 spms + sh; st WS10, 47°28N, 09°40W, 4354 m, 3 spms + shs.

Distribution. Common in the bathyal of the North Atlantic, excluding the Mediterranean.

Remarks. P. packardi shows some variation in the sculpture of the adult shell but is always easy to identify because of its blunt protoconch. This character is also present but not so pronounced in *P. cala* Watson from the S.E. Atlantic, which is very similar. *P. eurybrocha* and *coeloraphe* are the most similar species in the area considered here but both have pointed larval shells.

The animal is blind and has no operculum.

Pleurotomella megalembryon (Dautzenberg & Fischer, 1896) Figs 95,227.

Pleurotoma megalembryon Dautzenberg & H. Fischer, 1896: 420, pl. 18, fig. 14; 1897: 147; Sykes 1906: 182; Dautzenberg 1927: 33, pl. 3, fig. 4.
Mangilia? percompacta Dall, 1927: 40.
Type material: P. megalembryon: holotype in MOM; *M. percompacta:* holotype in USNM 108301.
Type locality: P. megalembryon: MONACO st 553, 37°43N, 25°05W, 1385 m; *M. percompacta:* off Georgia.
Material examined: the type material and 3 shs from the type locality of *megalembryon;* MONACO st 683, 38°20N, 28°05W, 1550 m, 2 shs; st 703, 39°21N, 30°06W, 1360 m, 1 sh; st 719, 39°11N, 29°06W, 1600 m, 1 sh; THALASSA st Z400, 47°33N, 07°19W, 1175 m, 1 sh.

Distribution. Only known from the material examined.

Remarks. P. megalembryon has a sculpture which recalls that of *Teretia teres* but can easily be separated by having a larger number of spiral keels, a broader subsutural sinus zone and a bigger larval shell.

Pleurotomella demosia (Dautzenberg & Fischer, 1896) Figs 91,226.

Pleurotoma demosia Dautzenberg & H. Fischer, 1896: 429, pl. 15, fig. 12; Dautzenberg 1927: 43, pl. 3, fig. 8.
Mangilia bulbulinula Locard, 1897: 235, pl. 11, fig. 15-17.
Type material: P. demosia: holotype in MOM; *M. bulbulinula:* holotype in MNHN.
Type locality: P. demosia: MONACO st 233, 38°33N, 28°09W, 1300 m; *M. bulbulinula:* TRAVAILLEUR 1881, 38°18N, 09°24W, 1224 m.
Material examined: the type material and 2 shs from the type locality of *demosia;* MONACO st 234, 39°02N, 27°55W, 454 m, 1 sh; st 244, 38°34N, 28°19W, 1266 m, 1 sh; st 553, 37°43N, 25°05W, 1385 m, 2 shs; st 1234, 32°34N, 17°03W, 1500 m, 1 sh; st 1349, 38°36N, 28°06W, 1250 m, 1 sh; st 2214, 39°26N, 31°21W, 650 m, 1 sh; TRAVAILLEUR 1881, no loc., 1 sh; PORCUPINE st 17, 39°42N; 09°43W, 1980 m, 5 shs.

Distribution. Only known from the material examined.

Remarks. P. demosia can be separated from many other species of *Pleurotomella* by its larval shell which consists of only two whorls and has a comparatively big embryonic shell. The postlarval sculpture does not form smooth rectangular interspaces as it does in *coeloraphe.*

P. gibbera has a bigger larval shell (height 700 μm instead of 550 μm), more slender outlines and fewer and bigger axial ribs (10 instead of 16 on the third whorl). The columellar zone of *P. demosia* has about 4 spiral ribs instead of the 8 in *gibbera.*

P. obesa has a much less developed axial sculpture and its columella has about 8 spiral cords, instead of the 4 of *demosia.*

P. eurybrocha has a more spiny appearance, a smoother surface with distinct, rectangular interspaces between the ribs. It also has an almost smooth subsutural zone.

Pleurotomella coeloraphe (Dautzenberg & Fischer, 1896) Figs 34,99,222-223.

Pleurotoma coeloraphe Dautzenberg & H. Fischer, 1896: 425, pl. 15, fig. 13.
Type material: holotype in MOM.
Type locality: MONACO st 553, 37°43N, 25°05W, 1385 m.
Material examined: the type material and MONACO st 211, 39°18N, 31°12W, 1372 m, 1 sh; st 233, 38°33N, 38°09W, 1300 m, 1 sh; st 703, 39°21N, 31°06W, 1360 m, 1 sh; st 1349, 38°36N, 28°08W, 1250 m, 12 shs; PORCUPINE st 17, 39°42N, 09°43W, 1980 m, 25 shs.

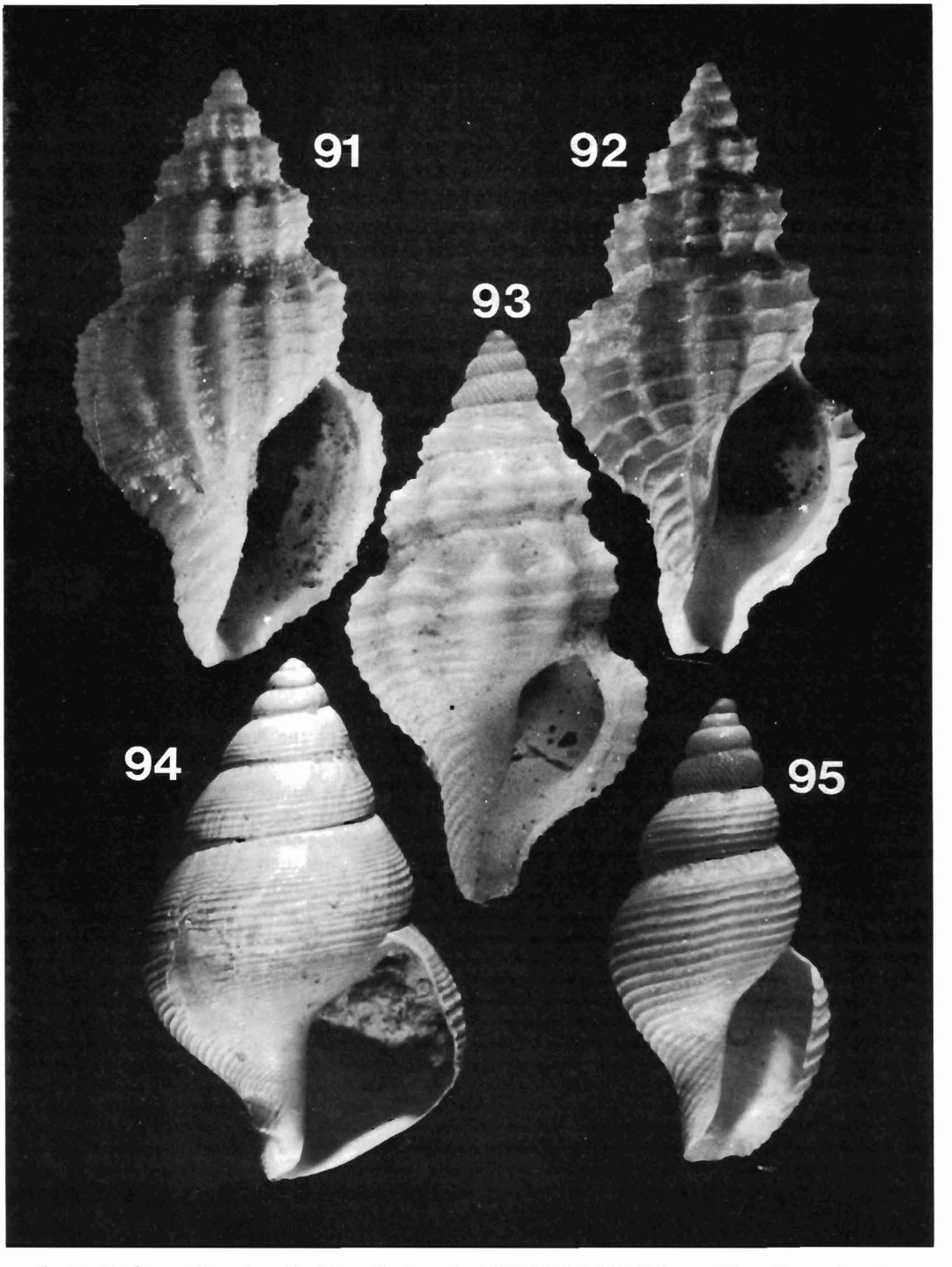
Distribution. Known from two other stations in the bathyal of the Azores, from the Prince of Monaco expeditions.

Remarks. P. coeloraphe can be separated from *packardi* by its pointed, not obtuse, larval shell. Adults are always broader than *eurybrocha* and *demosia,* which species also have a less distinct subsutural zone. Fresh shells of *coeloraphe* are vitreous while those of *eurybrocha* are opaque, more solid. Juveniles of *coeloraphe* and *eurybrocha* are very similar, but then the larval shell can be used to separate them: *P. coeloraphe* has a reticulated embryonic shell and a fine net of oblique reticulation in the lower part of the larval whorls; *P. eurybrocha* has a granulated embryonic shell and a coarser, nearly spiny, sculpture in the lower part of the larval whorls. The larval shell of *coeloraphe* is also more stout, but this is difficult to see without having both species side by side.

Neopleurotomoides callembryon is a parallel species, differing nearly only by its larval shell.

Pleurotomella eurybrocha (Dautzenberg & Fischer, 1896) Fig. 92,224-225.

Pleurotoma eurybrocha Dautzenberg & H. Fischer, 1896: 427, pl. 15, fig. 14.
Defrancia implicisculpta Sturany, 1896: 12, pl. 1, figs 10-12.
Pleurotomella? lineola Dall, 1927: 31 (pars: see remarks under *Neopleurotomoides callembryon).*
Type material: P. eurybrocha: holotype in MOM; *D. implicisculpta:* holotype in NHMW; *P. lineola:* syntypes in USNM.
Type locality: P. eurybrocha: MONACO st 233, 38°33N, 28°09W, 1300 m; *D. implicisculpta:* POLA st 82, 32°30N, 29°08E, 2420 m; *P. lineola:* off Fernandina, Florida.
Material examined: the type material and CHALLENGER st 73, 38°30N, 31°14W, 1830 m, 1 sh; st 78, 37°26N, 25°13W, 1830 m, 2 shs; PORCUPINE st 17, 39°42N, 09°43W, 1980 m, 8 shs; MONACO st 211, 39°18N, 31°12W, 1372 m, 1 sh; st 203, 39°27N, 30°55W, 1557 m, 1 sh; st 553, 37°43N, 25°05W, 1385 m, 3 shs; st 698, 39°11N, 30°45W, 1846 m, 1 sh; st 1349, 38°35N, 28°06W, 1250 m, 1 sh; THALASSA st Z446, 48°47N,



Figs 91-95. Genus *Pleurotomella*. 91 — *P. demosia*, MONACO st 233, 8.3 mm. 92 — *P. eurybrocha*, MONACO st 233, 5.7 mm. 93 — *P. gibbera*, holotype. 94 — *P. lottae*, BIOGAS st DS64, 10.4 mm. 95 — *P. megalembryon*, THALASSA st Z400, 3.52 mm.

11°08W, 1420 m, 1 sh; st Z447, 48°47N, 11°12W, 1430 m, 5 spms + shs; CINECA III st B31, 29°36N, 11°04W, 1500 m, 1 sh.

Distribution. Only known from the material examined.

Remarks. The name *implicisculpta* has been used wrongly sometimes in recent years, following an error of Sykes (1906: 179) who synonymized *implicisculpta* and *gibbera,* a nomen nudum of Jeffreys. Carrozza (1975: 190) has figured for the first time *gibbera* under the name *implicisculpta.*

P. eurybrocha and *gibbera* can however be separated by the solid, coloured shell of *gibbera,* and its sculpture of numerous spiral lines which do not form a net of squares with the more distant, stronger, axial ribs; also in *gibbera* the subsutural sinus zone is lined just below the suture by a spiral thread.

P. eurybrocha has been compared with *coeloraphe* and *demosia* under these species.

Pleurotomella gibbera (Jeffreys ms) **n.sp.** Fig.93,220.

Type material: holotype in BMNH.

Type locality: Adventure Bank, 166 m (PORCUPINE 1870).

Material examined: about 100 shs from the type locality; Pantellaria, 720 m, 8 shs; Tunis, 180 m, 1 sh; Sardinia, 100-200 m, 3 shs, coll. Carrozza; MONACO st 344, 37°14N, 12°52E, 224 m, 10 shs; METEOR st 36-97, 25°30N, 16°01W, 409 m, 1 sh.

Distribution. The central and western Mediterranean and NW Africa, lower shelf to upper bathyal. Only known from the material examined.

Description. Shell rather solid, slender, a little nodulous, consisting of 3.5 postlarval whorls. The larval shell has 4 whorls and is about 800 xm high; it is brownish and sculptured by oblique axial ribs in the upper part of the whorls with an oblique reticulation below. The postlarval whorls are angulated, with a moderately deep suture and sculptured with distant strong axial ribs and three rather evenly spaced spiral lines on the penultimate whorl; on the body-whorl additional spiral lines appear below them. Subsutural zone well marked, furnished with spaced, curved growth lines. At the suture there is a rather strong spiral cord, separating the zone from the suture. The outer lip is distinctly constricted at the beginning of the siphonal canal, which is rather long. Parietal wall forming an angle. Colour of the adult shell very light brown-yellowish.

Dimensions of the shell: height 4.72 mm, breadth 2.40 mm; height of the aperture 2.16 mm, breadth 0.80 mm.

Remarks. This species has been included here, although its main distribution is in comparatively shallow water, because it resembles *P. eurybrocha* and because the name *gibbera* ms. of Jeffreys was placed by Sykes (1906: 181, with references) in the synonymy of *implicisculpta* Sturany, which is not the case. See under *eurybrocha* for differences between the two species.

Pleurotomella obesa **n.sp.** Figs 98,221.

Type material: holotype in BMNH.

Type locality: PORCUPINE st 17, 39°42N, 09°43W, 1980 m.

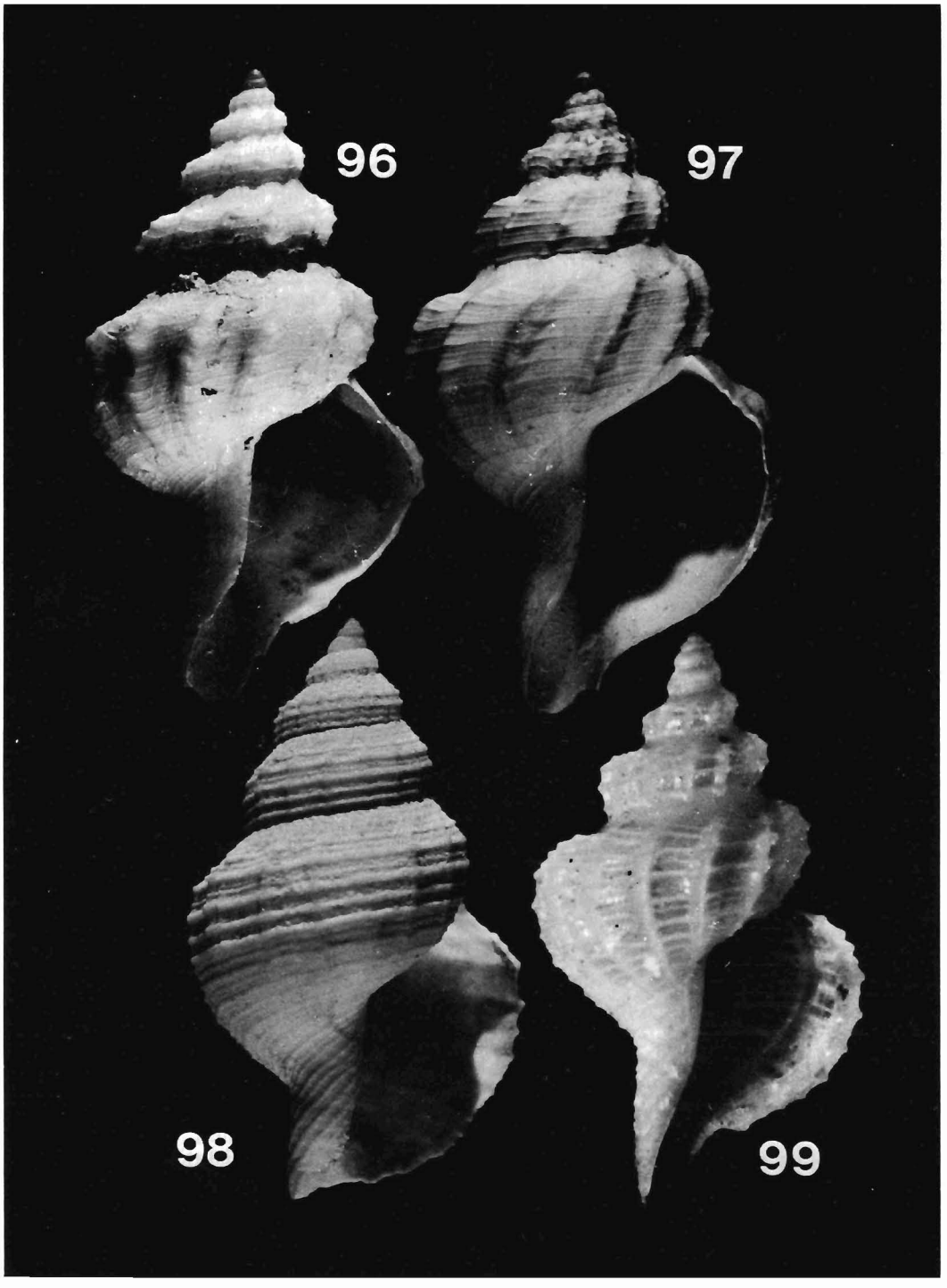
Material examined: one more shell from the type locality; MONACO st 1349, 38°35N, 28°06W, 1250 m, 1 sh.

Distribution. Only known from the material examined.

Description. Shell thin, broad, composed of 2.5 larval and 4.75 postlarval whorls, which are evenly convex and rapidly increasing. The subsutural sinus zone is not well defined, being of the same convexity as the rest of the whorl. The sculpture consists of a net of spiral lines and more distant axial ribs of about the same importance. There are also secondary spiral lines and very fine axial threads which give the surface a granular appearance. Larval shell brownish, furnished with an obliquely reticulated sculpture in the lower part of the whorl, and only axial threads in the upper part. Outer lip very convex. Siphonal canal very short. Parietal wall regularly curved. Colour of the adult shell whitish.

Dimensions of the shell: height 10.50 mm, breadth 6.07 mm; height of the aperture 5.62 mm, breadth 2.70 mm.

Remarks. Pleurotomella obesa is easily separable from any species around *P. ceoloraphe* by its convex, rapidly increasing whorls, ill-defined sinus zone and granular appearance of the surface.



Figs 96-99. Genus *Pleurotomella*. 96 — *P. packardi,* BIACORES st 227, 22.5 mm. 97 — *P. packardi,* NORBI st CP03, 21.5 mm. 98 — *P. obesa,* holotype. 99 — *P. coeloraphe,* MONACO st 553, 7.4 mm.

Genus *NEOPLEUROTOMOIDES* Shuto, 1971

Shuto (1971:5) created *Neopleurotomoides* for *Clathurella rufoapicata* Schepman, 1913, a bathyal species from Indonesia. The general appearance of the adult shell is *Pleurotomella*-like; the protoconch is similar to those of *callembryon* D.& F. and *distincta* n.sp. For these reasons the genus *Neopleurotomoides* is here tentatatively used in the North Atlantic. Shuto compares his new genus to *Etremopsis* Powell, 1942 but that genus is apparently more closely related to *Pleurotomoides* Bronn, as used by Glibert (1954:56).

The radula (Fig. 45) is basically the same as in *Pleurotomella.* The sculpture of the adult shells of the four known species from our area parallels that of *Pleurotomella* from the same area. It seems that the two genera have had a parallel evolution and diverged not long ago through a minor difference in the protoconch structure, and too much emphasis should not be stressed on this character for classification at higher taxonomic levels.

Neopleurotomoides distincta **n.sp.** Figs 102-103,233

Type material: holotype in BMNH.
Type locality: PORCUPINE st 16 or 17 (confused labels), 39°42N, 09°43W, 1980 m or 39°55N, 09°56W, 1800 m.
Material examined: besides the type material, also 3 shs from the same sample, USNM; MONACO st 233, 38°33N, 28°09W, 1300 m, 2 shs; BIACORES st 126, 39°19N, 33°47W, 3360 m, 1 sh.

Distribution. Only known from the material examined.

Description. Shell solid, composed of 4 larval and 3 postlarval whorls. Larval shell brownish with a spiral keel and perpendicular axial ribs on the lower part of the whorls below the keel. On the postlarval whorls, the subsutural zone is well defined and marked with bent axial riblets indicating previous positions of the sinus. The rest of the whorls have a sculpture of strong, distant axial ribs and less coarse spiral lines which together delimit elongate, rectangular areas. Suture moderately deep. Outer lip seen from the front regularly curved. Siphonal canal of medium length. Parietal wall gently curved. Colour of adult shell dirty white-yellowish (dead specimen).

Dimensions of the shell: height 7.95 mm, breadth 3.75 mm; height of the aperture 3.85 mm, breadth 1.85 mm.

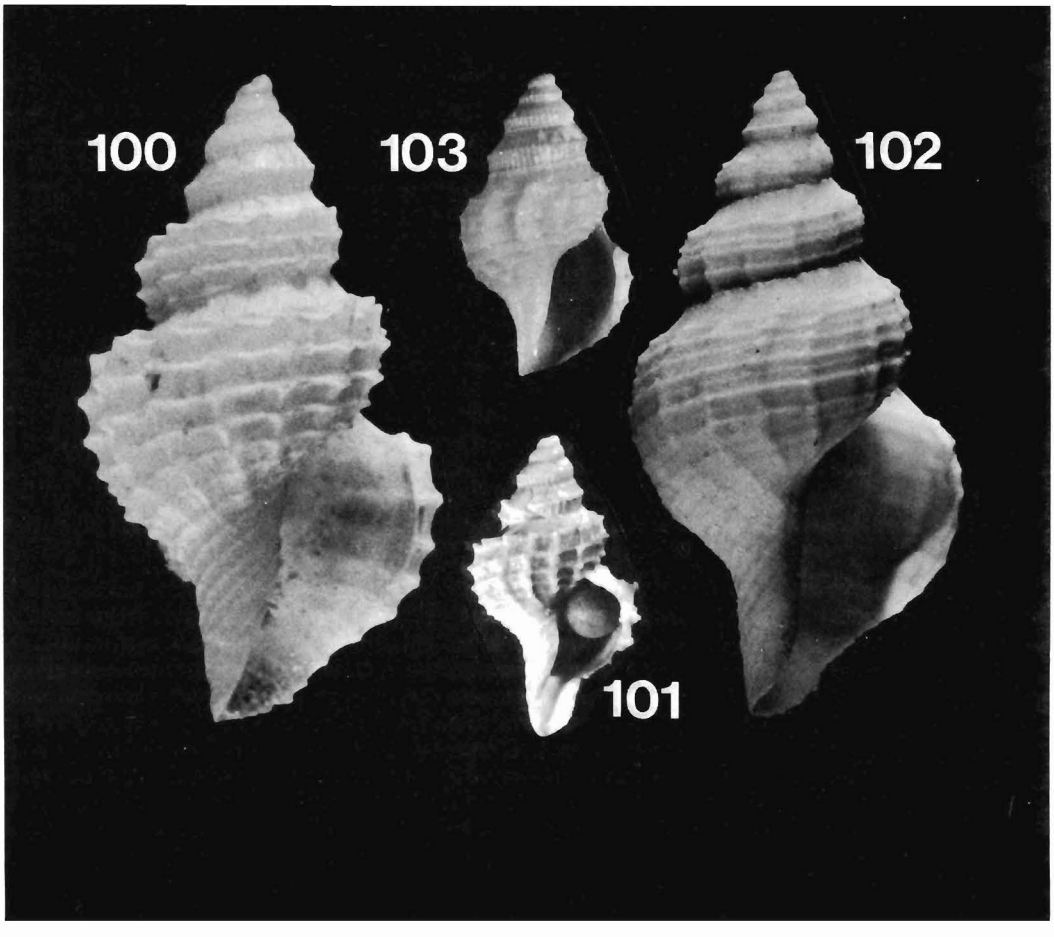
Remarks. N. distincta and *N. callembryon* have the same sculpture of the larval shell but different adult sculpture: in *distincta* the axial ribs are much stronger than the spiral lines and their intersections form elongate surfaces; in *callembryon* the axial and spiral sculpture are of equal stength, make spiny projections where they cross and their interspaces form rather rectangular spaces. Specimens devoid of protoconch are difficult to separate from several species of *Pleurotomella.*

Neopleurotomoides callembryon (Dautzenberg & Fischer, 1896) Figs 100-101,232.

Pleurotoma callembryon Dautzenberg & H. Fischer, 1896: 428, pl. 15, fig. 15; Dautzenberg 1927: 42, pl. 3, fig. 7; Sykes 1906: 179.
Pleurotomella? lineola, Dall 1927: 31 (pars).
Type material: P. callembryon: holotype in MOM; *P. lineola:* 3 syntypes in USNM.
Type locality: P. callembryon: MONACO st 553, 37°43N, 25°05W, 1385 m; *P. lineola:* off Fernandina, Florida.
Material examined: the type material and 10 shs from MONACO st 553; st 233, 38°33N, 28°09W, 1300 m, 2 shs; st 698, 39°11N, 30°45W, 1846 m, 1 sh; st 703, 39°21N, 31°06W, 1360 m, 1 sh; st 1349, 38°35N, 28°06W, 1250 m, 1 sh; st 203, 39°27N, 30°55W, 1557 m, 2 shs; THALASSA st Z400, 47°33N, 07°19W, 1175 m, 1 sh; PORCUPINE st 17, 39°42N, 09°43W, 1980 m, 35 shs.

Distribution. Only known from the material examined.

Remarks. Sykes (1906) mentioned that Marshall had recognized four varieties among the material of *callembryon* from the *Porcupine* expedition; one of them is probably our *distincta* n.sp. *N. callembryon* has some resemblance to many species of *Pleurotomella,* especially *P. eurybrocha:* they can easily be separated by the sculpture of the larval shell.



Figs 100-103. Genus *Neopleurotomoides*. 100 — *N. callembryon,* holotype. 101 — *N. callembryon* juv., PORCUPINE st 17, 3.25 mm. 102 — *N. distincta,* holotype. 103 — *N. distincta* juv., BIACORES st 126, 3.12 mm.

The type material of *P. lineola* Dall consists of three shells: one is *Neopleurotomoides callembryon* (D.&F.); one is *Pleurotomella eurybrocha* (D.& F.); one is a *Gymnobela cf. subaraneosa* (D.&F.), however distinct from this species.

Neopleurotomoides sp.A. Fig. 45.

A single specimen from INCAL st WS10, 47°27N, 09°40W, 4354 m is specifically distinct. The sculpture of the adult recalls that of *Pleurotomella packardi.* The species is not described here but the radula is figured (Fig. 45).

Neopleurotomoides sp. B.

A single shell from INCAL st OS07, 47°32N, 09°34W, 4249 m is also specifically distinct. The sculpture of the adult parallels that of *Pleurotomella obesa.*

Genus BENTHOMANGELIA Thiele, 1925.

Type species: *Surcula trophonoidea* Schepman, 1913.
Synonyms:
Clinuropsis Thiele, 1931, type species *Clinura monochorda* Dall, 1908.
Not *Clinuropsis* Vincent, 1913.
Anticlinura Thiele, 1935, new name for *Clinuropsis.*
Clinuromella Beets, 1943, new name for *Clinuropsis.*
Metuonella Sorgenfrei, 1958, type species *Daphnella grippi* Kautsky, 1925.

Remarks. Benthomangelia is a widely distributed genus of bathyal and abyssal occurrence. Numerous species have been described from the Atlantic, the Pacific and also some fossil species.

The genus is characterized by the radula, the larval shell, the angulated whorls and a greenish, yellowish or transparent periostracum, which gives the shell a polished appearance.

We know three species from the NE Atlantic, of which one is described as new here. They might be separated in the following way:

B. decapitata has strongly angulated whorls, the axial ribs are rather straight, the apex is almost always lacking and it is a true abyssal species.
B. macra has a more slender shell, the whorls are more rounded, the axial ribs fainter and more curved, compared with *B. decapitata.* It is a bathyal species.
B. bandella is broader than the other two species and the height of the aperture is more than half of the height of the shell, while it is less than half of the height of the shell in *B. macra* and *B. decapitata.*

Benthomangelia antonia (Dall, 1881) Figs 44,106,211.

Pleurotoma (Mangilia) antonia Dall, 1881: 59 (August); 1889: 116, pl. 10, fig. 4, pl. 11, fig. 11.
Pleurotoma (Mangelia) incincta Watson, 1881: 438 (October); 1886: 346, pl. 24, fig. 7.
Pleurotomella diomedae Verrill, 1884: 152, pl. 31, fig. 5-5a.
Pleurotoma mericiacum Locard, 1897: 199, pl. 9, figs 7-11.
Mangelia innocens Thiele, 1925: 188, pl. 27, fig. 11.
Type material: P. incincta: holotype in BMNH 1887.2.9.1069; *P. diomedae:* holotype in USNM 34828; *P. mericiacum:* 2 syntypes in MNHN; *M. innocens:* syntypes in ZMHU.
Type locality: P. antonia: off Cape San Antonio, Cuba, 1150 m; *P. incincta:* CHALLENGER st 78, 37°26N, 25°13, 1800 m; *P. diomedae:* USFC st 2041, 39°23N, 68°25W, 2900 m; *P. mericiacum:* TALISMAN st ?, off Cape Meric, Sahara, 2324 m; *P. innocens:* 02°00N, 08°04E, 2492 m.
Material examined: the type material and MONACO st 738, 37°40N, 26°26W, 1919 m, 1 sh; WALDA st DS20, 02°32S, 08°18E, 2514 m, 4 spms; st DS30, 04°04N, 03°42E, 3109 m, 1 spm; st DS11, 18°34S, 10°36E, 3575 m, 1 spm; st DS13, 14°21S, 09°46E, 3985 m, 1 sh; st DS15, 12°27S, 11°01E, 3367 m, 1 sh; NORATLANTE st B5, 55°43N, 49°21W, 3676 m, 1 spm; PORCUPINE st 22, 38°15N, 09°33W, 1300 m, 1 sh; BIOGAS st CV16, 44°07N, 04°17W, 1909 m, 1 spm; st CV18, 47°32N, 09°37W, 4120 m, 1 spm, 2 shs; st CV23, 47°33N, 08°34W, 2034 m, 3 spms; st CV27, 47°34N, 09°32W, 4023 m, 1 sh; st CV36, 47°34N, 09°39W, 4209 m, 1 spm; st CV41, 47°27N, 09°01W, 3800 m, 7 spms; st CW03, 47°31N, 08°18W, 1100 m, 1 spm; st CP01, 47°35N, 08°39W, 2245 m, 6 spms; st CP02, 47°33N, 08°41W, 2177 m, 1 sh; st CP08, 47°33N, 08°39W, 2177 m, 3 spms; st CP16, 46°27N, 10°26W, 4825 m, 1 spm; st CP17, 46°31N, 10°20W, 4706 m, 1 spm; st CP20, 44°23N, 04°51W, 4459 m, 2 spms; st CP25, 44°05N, 04°17W, 1894 m, 1 sh; st DS53, 44°30N, 04°56W, 4425 m, 1 sh; st DS57, 47°31N, 09°08W, 2906 m, 1 sh; st DS63, 47°33N, 08°35W, 2126 m, 1 spm; st DS75, 47°28N, 09°08W, 3250 m, 2 spms; st DS76, 47°35N, 09°33W, 4228 m, 3 spms; BIACORES st 126, 39°20N, 33°47W, 3360 m, 11 spms; st 130, 38°55N, 33°22W, 2950 m, 1 spm; SARSIA st 7603, 44°19N, 03°35W, 3860 m, 1 spm; DISCOVERY st 8521, 20°47N, 18°53W, 3060 m, 21 spms + shs; INCAL st WS07, 47°31N, 09°36W, 4280 m, 5 spms + shs; st WS08, 47°31N, 09°34W, 4300 m, 7 spms + 6 shs; st WS09, 47°28N, 09°34W, 4277 m, 5 spms + shs; st WS10, 47°28N, 09°40W, 4354 m, 5 spms + shs; st OS07, 47°31N, 09°34W, 4250 m, 2 spms; st OS08, 47°30N, 09°39W, 4327 m, 1 sh; METEOR st 36-99, 21°38N, 18°41W, 2971 m, 1 sh; st 36-100, 21°27N, 18°16W, 2050-2110 m, 1 sh.

Distribution. North and Mid Atlantic abyssal.

Remarks. The animal has neither operculum, nor eyes.

B. antonia can be separated from the other two species of the genus by being broader and having flatter whorls. Also the height of the aperture of adult specimens exceeds half the height of the total shell.

Benthomangelia macra (Watson, 1881) Figs 104-105,212-213.

Pleurotoma (Mangelia) macra Watson, 1881: 437; 1886: 345, pl. 23, fig. 6.

Type material: holotype in BMNH.

Type locality: not designated, but the two stations where the Challenger found it are off the Azores, in 1800 m.

Material examined: the type material and POLA st 19, 35°56N, 22°50E, 1010 m, 1 sh; st 62, 35°48N, 23°34E, 660 m, 1 sh; st 213, 36°47N, 26°29E, 597 m, 1 sh; PORCUPINE st 17, 39°42N, 09°43W, 1980 m, 16 shs; WALDA st DS30, 04°04N, 03°42E, 3109 m, 1 spm; BIACORES st 173, 37°57N, 26°08W, 3225 m, 2 shs; numerous shells and specimens from the following MONACO stations: st 184, 40°05N, 27°28W, 1850 m; st 203, 39°27N, 30°55W, 1557 m; st 211, 39°18N, 31°12W, 1372 m; st 213, 32°23N, 31°25W, 1384 m; st 233, 38°33N, 28°09W, 1300 m; st 553, 37°43N, 25°05W, 1385 m; st 578, 38°26N, 26°31W, 1165 m; st 616, 38°48N, 28°17W, 1022 m; st 624, 38°59N, 28°18W, 2018 m; st 683, 38°20N, 28°05W, 1550 m; st 698, 39°11N, 30°45W, 1846 m; st 703, 39°21N, 31°06W, 1360 m; st 719, 39°11N, 29°06W, 1600 m; st 738, 37°40N, 26°26W, 1919 m; st 861, 38°53N, 26°41W, 1935 m; st 1116, 31°44N, 10°47W, 2165 m; st 1349, 38°36N, 28°06W, 1250 m; BIOGAS st CP01, 47°35N, 08°39W, 2245 m, 1 sh.

Distribution. Northeast Atlantic bathyal, including the Mediterranean, where it has a broader bathymetric range (Carrozza 1975: 190; Geronimo & Panetta 1973: 87).

Remarks. B. macra resembles *B. bandella* but is more slender and has more convex whorls.

Benthomangelia decapitata **n.sp.** Figs 43,107-108,210.

Type material: holotype in MNHN.

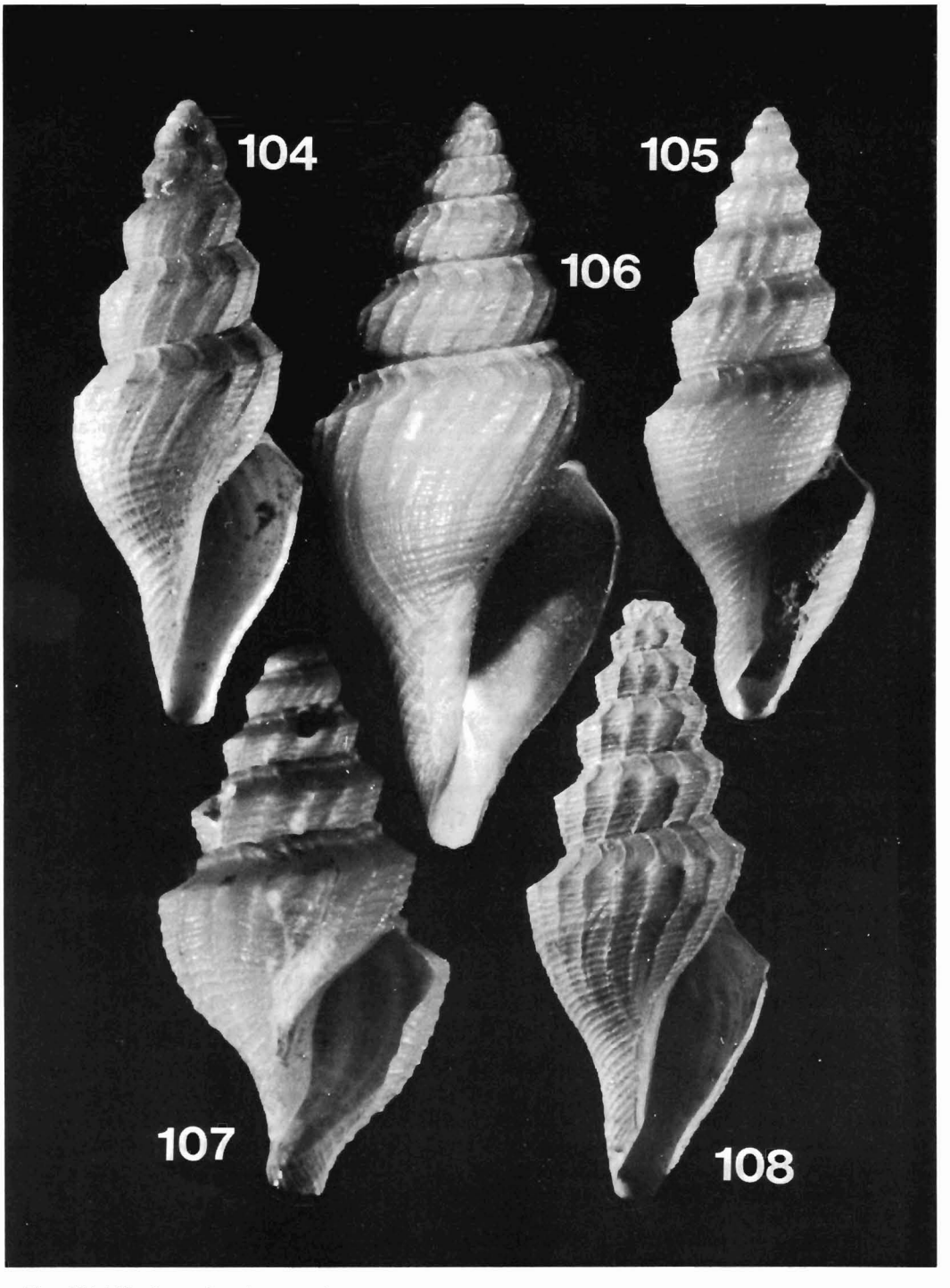
Type locality: BIOGAS st CP19, 42°25N, 04°51W, 4434 m.

Material examined: the holotype and NORATLANTE st B5, 55°45N, 49°21W, 3676 m, 1 spm, 2 shs; BIACORES st 126, 39°20N, 33°47W, 3360 m, 2 spms; st 245, 40°57N, 22°16W, 4270 m, 2 spms; st 251, 47°38N, 08°56W, 3360-3600 m, 1 spm; BIOGAS st CV18, 47°32N, 09°37W, 4120 m, 1 sh; st CV27, 47°34N. 09°34W, 4023 m, 1 spm, 1 sh; CV28, 47°35N, 09°36W, 4023 m, 1 sh; st CV30, 46°33N, 10°20W, 4518 m, 4 spms + shs; st CV34, 44°27N, 04°49W, 4406 m, 2 spms; st CP13, 47°34N, 09°38W, 4134 m, 1 sh; st CP14, 47°32N, 09°36W, 4237 m, 1 spm, 1 sh; st CP16, 46°27N, 10°26W, 4825 m, 1 spm; st CP17, 46°31N, 10°20W, 4706 m, 1 spm; st CP19, 44°25N, 04°51W, 4434 m, 1 spm; st DS55, 46°31N, 09°41W, 4125 m, 1 spm; st DS67, 47°31N, 09°35W, 4150 m, 1 spm; st DS76, 47°35N, 09°33W, 4228 m, 1 sh; st DS77, 47°32N, 09°35W, 4240 m, 1 spm; st DS78, 46°31N, 10°24W, 4706 m, 1 spm; st DS79, 46°30N, 10°27W, 4715 m, 1 spm; INCAL st WS03, 48°19N, 15°23W, 4830 m, 2 shs; st WS05, 46°03N, 10°16W, 4804 m, 1 spm; st WS07, 47°31N, 09°36W, 4280 m, 3 spms + sh; st WS08, 47°31N, 09°34W, 4300 m, 12 spms + shs; st WS09, 47°28N, 09°34W, 4277 m, 12 spms + shs; st WS10, 47°28N, 09°40W, 4354 m, 11 spms + shs; st OS04, 46°04N, 10°13W, 4822 m, 4 spms; st OS05, 47°32N, 09°35W, 4250 m, 1 spm; st OS06, 46°27N, 09°36W, 4316 m, 1 spm; st OS07, 47°31N, 09°34W, 4250 m, 1 sh; st OS08, 47°30N, 09°39W, 4327 m, 3 shs; st DS12, 46°02N, 10°11W, 4796 m, 1 spm; st DS13, 46°02N, 10°18W, 4822 m, 2 spms; st DS14, 47°33N, 09°35W, 4250 m, 1 sh; st DS16, 47°30N, 09°33W, 4268 m, 2 spms; st PE2, 46°02N, 10°19W, 4796 m, 1 sh; st KR11, 48°20N, 15°17W, 4829 m, 1 spm; st CP13, 46°02N, 10°15W, 4800 m, 1 sh; WALDA st DS25, 02°20N, 07°49E, 2470 m, 1 spm; METEOR st 3-AT2, 42°27N, 14°49W, 5325 m, 7 spms; st 3-AT4, 42°06N, 14°42W, 5330 m, 2 spms.

Distribution. North-east Atlantic abyssal. Only known from the material examined.

Description. Shell greyish, chalky, rather solid, high with angular whorls. The larval shell (of which we have seen remains only) is of the type common in the genus, yellowish, multispiral with the last whorl sculptured by axial, oblique, a little arched, distinct ribs. A young specimen of 7.5 whorls consists of 4.0 postlarval whorls, the holotype of more than 7 whorls counted from the aperture. The whorls are very distinctly angulated just below the subsutural zone. This zone is sculptured with sharp, rather high, equidistant, curved ribs forming small knobs at the angulation of the whorls. There are also much fainter incremental lines, running parallel to these ribs. The spiral sculpture consists of one stronger rib just below the suture, which forms small knobs at the intersection with the axial ribs. After this one there are 3—4 fainter spirals, which disappear at the intersections. Below the angle of the whorls, there are 5 more spiral ribs of about the same strength and sometimes a smaller one between these primary ones. The aperture is very long and slender in the adult, shorter and broader in young specimens. The labial sinus is regularly U-shaped and not very deep. Seen from the side, the outer lip is rather regularly projecting, with the most projecting part situated just below the middle part of the aperture. Periostracum thin, brownish, No operculum.

Dimensions: height of the shell 18.5 mm, breadth 6.90 mm; height of the aperture 8.8 mm, breadth 2.8 mm.



Figs. 104-108. Genus *Benthomangelia*. 104 — *B. macra*, MONACO st 719, 8.0 mm. 105 — *B. macra*, BIOGAS st CP01, 13.5 mm. 106 — *B. antonia*, BIOGAS st CP01, 16.3 mm. 107 — *B. decapitata* juv., NORATLANTE st B5, 7.0 mm. 108 — *B. decapitata*, holotype.

Remarks. B. decapitata seems to lose its larval shell by corrosion during its early benthic life.

B. decapitata resembles *B. macra,* but that species is bathyal, is more slender, has less angulated whorls and a much less spiny appearance. The surface of the shell is glossy in *marcra,* while it is dull and a little chalky in *decapitata.*

Genus *GYMNOBELA* Verrill, 1884

Type species: *G. engonia* Verrill, 1884, by subsequent designation, Cossmann 1896:63.

Gymnobela has here been used in a wide sense, for species with a rather short and broad shell, often with shouldered whorls and rather strong sculpture. The surface of the shell is dull (*cf. Theta,* where the shell is more or less polished), and usually the shell is rather solid. The animal sometimes has eyes, an operculum is always lacking. The radular teeth have a rather uniform shape and the basal part is very similar throughout the species here placed in *Gymnobela.* All the species known to us have a planktotrophic larval development, and a medium-sized larval shell with rounded whorls and oblique, cancellate sculpture.

The species of the group are not always easy to separate and identify, as they are sometimes quite variable and resemble each other. The larval shell is a good aid for the determination as also the presence of colour on the columella or other colour markings. Some of the more important characteristics are summarized below.

G. fulvotincta: columella usually reddish or brownish, never colourless. Whorls more or less angulated, sculptured by an even spiral sculpture below the subsutural zone. Axial sculpture only knobs at the periphery, which usually are present on the body-whorl.

G. emertoni: columella sometimes coloured, sometimes (in deep-water specimens) colourless. The sculpture consists mainly of spiral ribs of unequal size. Upper whorls more or less keeled, lower ones evenly rounded. Sometimes axial knobs on the upper whorl. These two species should not be confused with *Xanthodaphne* spp. which have more rounded and swollen whorls.

G. agassizi: has a red-spotted columella, a very broad and solid shell, with low, broad axial ribs and irregular spiral sculpture.

G. abyssorum: shell light brown — brownish white. The sculpture consists of short, low and broad axial ribs and a spiral sculpture of rather equal-sized spiral lines. It is much more distinctly shouldered than *G. agassizi.*

G. pyrrhogramma: the shell is covered by irregular brownish axial spots; the shell is high and distinctly shouldered. The sculpture consists of equal-sized spiral ribs and close set, rounded axial ribs.

G. phyxanor: the shell is thin and pinkish brown. The whorls are rapidly increasing and sculptured with spiral lines and more distinct, rather close set, short axial ribs giving a reticulate appearance to the upper whorls.

G. lamyi: the shell is colourless and has a distinctly reticulated sculpture. The whorls are very rapidly increasing and distinctly shouldered.

G. leptoglypta: the shell is high and slender, the whorls evenly rounded; the sculpture is more or less distinctly reticulated on the lower whorls, the axial sculpture dominates on the upper whorls.

G. chyta: the shell is white, high and sharply shouldered. The ribs are less close set, compared with *G. pyrrhogramma* and the spiral sculpture more distant and irregular.

G. subaraneosa: has a colourless shell, very thin and fragile, sculptured with low axial ribs and fainter spiral lines and one spiral keel at the shoulder. Sometimes the sculpture is very faint, but usually the keel remains. The whorls are rather rapidly increasing.

G. frielei: shell white or greyish colourless. It is rather high and the shape a little reminiscent of that of *G. agassizi,* but that species has more angulated whorls; it is also smaller than that species and has more close set, higher and more curved axial ribs.

G. watsoni: shell sometimes a little greyish brown, to colourless. It is a small species, with a decussated sculpture with a faintly spiny appearance. The larval shell is much smaller than in *G. aquilarum,* the young of which it resembles.

G. engonia: a rather short and stout species with distinctly angulated whorls and a rather sharp sculpture. The shell is much thinner than in *G. abyssorum* and *G. agassizi,* which have a solid shell. The subsutural zone is more concave than in *G. watsoni,* which it might resemble.

G. aquilarum: shell small, short, very stout, of a dull greyish or whitish colour. The sculpture consists of rounded axial ribs and narrow incised V-shaped lines, which sometimes are broader and channelled. The apex is usually eroded.
G. homeotata: shell thin, pinkish brown. Whorls distinctly shouldered, sculptured by spiral lines and broader, oblique, short axial ribs.

Some turrid genera resemble *Gymnobela* very much in shell morphology viz. *Marshallaria* Finlay & Marwick, 1937, *Acamptogenotia* Rovereto, 1899, *Belophos* Cossmann, 1901, *Belatomina* Powell, 1942, *Mioawateria* Vella, 1954, etc. These genera were based on fossil species and are now for various, rather doubtful, reasons placed in different groups of Turridae. Such an arrangement certainly does not facilitate the understanding of variation in the family but rather increases the difficulties, by forcing the student to select and discard all erroneous information.

Nordsieck (1968:181—184) introduced some new genera for turrids. As they have been published so that they fulfil the requirements of ICZN, we feel that we are forced to mention them (see also discussion under *Lusitanops*).
Watsonaria. Type species *Pleurotomella watsoni.* No indications are given about how it differs from any genera.
Majox. Type species *Pleurotomella bairdi* Verrill & Smith, 1884. Description (translated): "The big species are here separated. Also they are very different from each other".

The type species and four other, very different species are included.
Azorilla. Type species *Pleurotoma megalembryon* Dautzenberg & Fischer.

Here he included *pycnoides* and *blanchardi.*
Azorita. Type species *Pleurotoma bureaui* Dautzenberg & Fischer.

Here he included *anceyi, chevreuxi* and *dalmasi.*

As far as we have been able to find out, the author had never seen any material of any species included by him in his new subfamily Pleurotomellinae, in which the new names mentioned above were placed. According to our concept of the genera of Turridae, *Watsonaria* becomes a synonym of *Gymnobela, Majox* also of *Gymnobela; Azorilla* and *Azorita* of *Pleurotomella.*

Creating new genera in this way was popular 100 years ago, and there are no doubts that an author doing so is able to immortalize his family name ten times faster than other authors can synonymize his new names.

Gymnobela abyssorum (Locard, 1897) Figs 19,113,246.

Pleurotoma torquata of Jeffreys and other authors, not of Philippi, 1844.
Bela abyssorum Locard, 1897: 246, pl. 13, fig. 17-22.
Pleurotomella bairdi of European authors, not of Verrill & Smith, 1884.
Type material: lectotype in MNHN.
Type locality: unknown; datas on label do not fit, but perhaps from off Northern Spain.
Material examined: the type material and TRAVAILLEUR 1882 st 5, 44°07N, 07°55W, 564 m, 1 sh; st 7, 44°05N, 07°56W, 608 m, 1 sh; TALISMAN st 123, 38°23N, 28°50W, 560 m, 1 sh; PORCUPINE, off Tripoli, 70-220 m, 4 shs; SHEARWATER, Skerki Bank, 50-220 m, 1 sh; MONACO st 203, 39°27N, 30°55W, 1557 m, 1 sh; st 233, 38°33N, 28°09W, 1300 m, 3 shs; st 234, 39°02N, 27°55W, 454 m, 1 sh; st 344, 37°14N, 12°52W, 224 m, 1 sh; st 503, 47°10N, 05°47W, 748-1262 m, 1 sh; st 553, 37°43N, 25°15W, 1385 m, 5 shs; st 602, 38°39N, 28°13W, 1230 m, 1 sh; st 866, 38°53N, 27°23W, 599 m, 1 spm; st 1150, 16°12N, 24°44W, 3890 m, 1 sh; st 1193, 15°17N, 23°02W, 1311 m, 1 spm, 1 sh; st 1209, 16°34N, 23°03W, 1477 m, 1 sh; st 1304, 36°41N, 14°12W, 208 m, 2 shs; st 1311, 37°37N, 25°21W, 1187 m, 1 sh; st 1349, 38°36N, 28°06W, 1250 m, 4 shs; st 2214, 39°26N, 31°22W, 650-914 m, 1 sh; BIACORES st 39, 37°44N, 29°03W, 420 m, 1 sh; st 88, 39°03N, 28°07W, 400-450 m, 1 sh; st 110, 39°33N, 31°18W, 300-350 m, 1 sh; st 148, 37°35N, 25°35W, 860 m, 1 spm; st 150, 37°37N, 25°35W, 550-600 m, 3 shs; st 151, 37°38N, 25°40W, 780 m, 1 sh; st 157, 37°34N, 25°44W, 787-826 m, 2 spms; st 168, 37°49N, 25°54W, 665-800 m, 1 spm; st 180, 37°58N, 25°33W, 1069-1235 m, 1 spm; st 181, 37°53N, 25°36W, 450-620 m, 1 spm; st 199, 37°55N, 25°08W, 770-800 m, 1 spm; st 204, 37°40N, 25°16W, 1074-1170 m, 1 sh; st 239, 37°29N, 25°45W, 635 m, 1 spm; st 240, 37°35N, 25°33W, 815 m, 8 spms + shs; st 241, 37° 38N, 25°33W, 395-463 m, 1 sh; THALASSA st W368, 43°37N, 03°46W, 137-400 m, 2 shs; st X343, 44°07N, 04°39W, 600-655 m, 1 sh; st Z393, 47°33N, 07°04W, 750 m, 1 spm; st Z400, 47°33N, 07°19W, 1175 m, 1 sh; st Z450, 48°40N, 10°36W, 1170 m, 1 spm; st Z452, 48°40N, 10°54W, 1450 m, 1 spm; SARSIA st 7616, 43°43N, 03°43W, 590-640 m, 1 sh; BARTLETT st 21, 37°34N, 29°45W, 1200-1500 m, 3 shs; CALYPSO st SME1014, 36°04N, 29°41E, 370-400 m, 1 sh; Capo Comino, Sardinia, 200-300 m, 5 shs, coll. Carrozza; 44°02N, 02°12W, 610 m, 1 sh, Lagardère coll.

Distribution. The upper bathyal of the Bay of Biscay and southwards, including the Mediterranean.

Remarks. This characteristic species has almost constantly been misidentified with *G. bairdi* and *G. pyrrhogramma. G. bairdi* is a North American species about twice as big; it resembles *Bathybela tenellunum* but has a broader spire. For differences from *G. pyrrhogramma,* see under that species. *G. abyssorum* also resembles *Drilliola pruina* a little, but that species has a very blunt apex and no coarse axial ribs.

The animal lacks operculum and eyes.

Gymnobela agassizi (Verrill & Smith, 1880) Figs 25,112.

Pleurotoma (Pleurotomella) agassizi Verrill & Smith, in Verrill, 1880: 394; Verrill 1882: 454, pl. 57, fig. 3-3a.
Pleurotoma (Pleurotomella) brychia Watson, 1881: 451; 1886: 335, pl. 19, fig. 4.
Pleurotomella vitrea Verrill, 1885: 414, pl. 44, fig. 6.
Pleurotomella agassizi var. *permagna* Dall, 1890: 308.
Type material: P. agassizi: holotype in USNM 37828; *P. brychia:* holotype in BMNH.1887.2.9.1050; *P. vitrea:* holotype in USNM 44654; *P.a.* var. *permagna:* syntypes in USNM 87543.
Type locality: P. agassizi: off New England, 900 m; *P. brychia:* CHALLENGER st 106, 01°47N, 24°26W, 3300 m; *P. vitrea:* USFC st 2212, off New England, 775 m.
Material examined: the type material and MONACO st 1209, 16°34N, 23°03W, 1477 m, 1 sh; st 2990, 43°46N, 09°41W, 2320 m, 2 shs; st 3473, 42°37N, 36°37W, 1332 m, 1 sh; WALDA st DS10, 18°40S, 10°56E, 1432 m, 2 spms; THALASSA st X308, 44°08N, 05°00W, 780-1080 m, 1 sh; NORATLANTE st E12, 36°25N, 08°49W, 2573-2820 m, 1 sh; st B15, 44°07N, 04°09W, 1884 m, 6 spms + shs; BIOGAS st CV16, 44°07N, 04°17W, 1909 m, 1 sh; st CV39, 47°34N, 08°45W, 2350 m, 1 spm; st CP01, 47°35N, 08°39W, 2245 m, 1 spm; st CP02, 47°33N, 08°41W, 2177 m, 1 sh; st CP07, 44°10N, 09°31W, 2170 m, 9 spms + shs; st CP25, 44°05N, 04°17W, 1894 m, 1 sh; st DS51, 44°11N, 04°15W, 2430 m, 1 sh; TALISMAN st 34, 32°27N, 12°15W, 1123 m, 1 sh; BIACORES st 227, 37°10N, 25°20W, 2170 m, 1 spm; SARSIA st 7626, 43°47N, 03°32W, 2100-2500 m, 2 spms; METEOR st 36-99, 21°38N, 18°41W, 2971 m, 1 spm.

Distribution. North Atlantic Bathyal.

Remarks. The animal lacks operculum and has no eyes.

G. agassizi has a reddish or brownish colour patch restricted to the columella. The young may be recognized by its very rapidly increasing diameter, in which character it resembles *G. phyxanor,* but that species has a much less solid shell and more rounded outlines. *G. abyssorum* has a more solid shell, heavier sculpture and is smaller.

Gymnobela fulvotincta (Dautzenberg & Fischer, 1896) Figs 24,109,251.

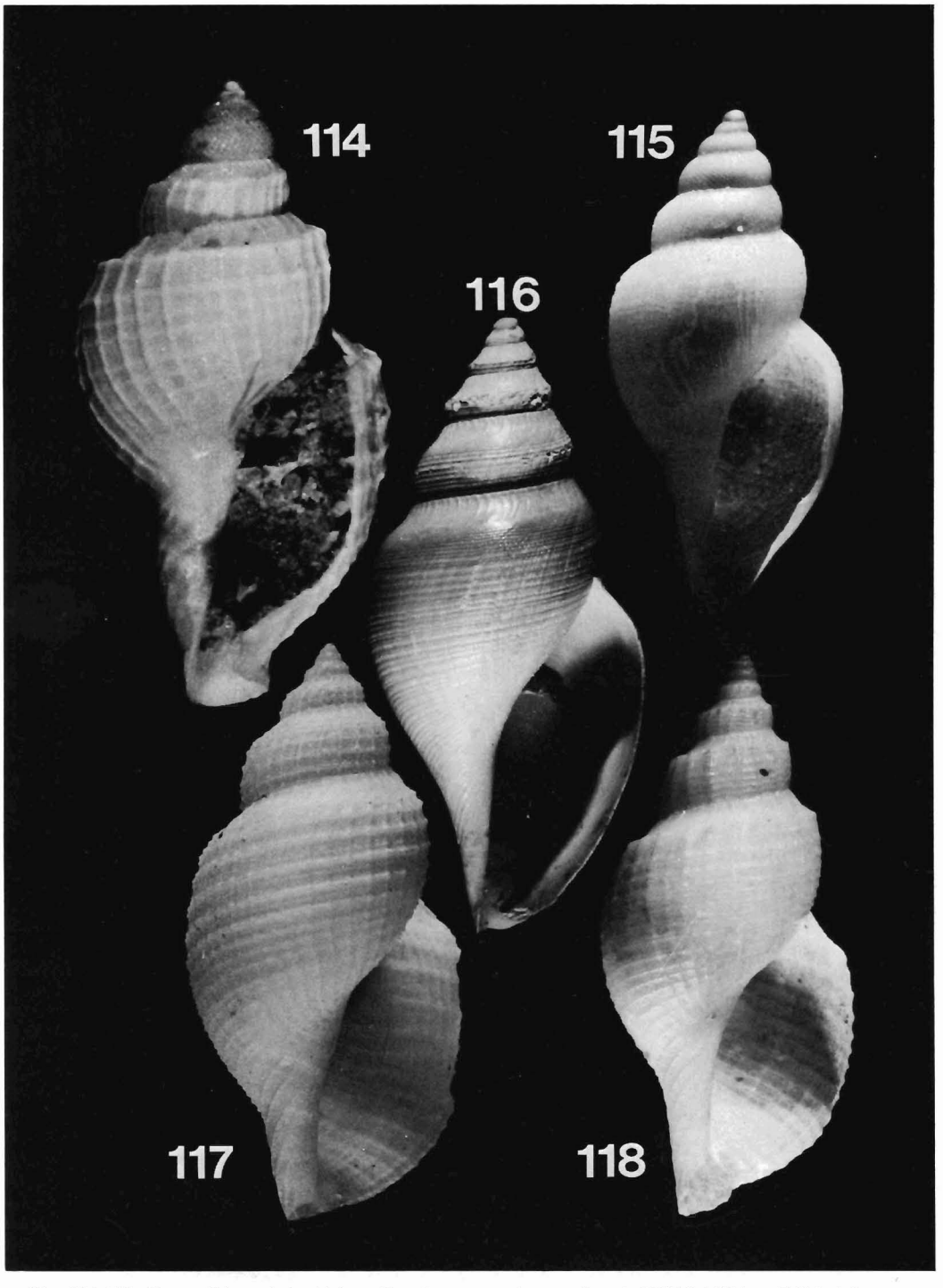
Pleurotoma fulvotincta Dautzenberg & H. Fischer, 1896: 410, pl. 16, fig. 9.
Type material: holotype in MOM.
Type locality: MONACO st 553, 37°43N, 25°06W, 1385 m.
Material examined: the holotype and 2 shs from the type locality; MONACO st 203, 39°27N, 30°55W, 1557 m, 1 sh; st 211, 39°18N, 31°12W, 1372 m, 2 shs; st 244, 38°34N, 28°19W, 1266 m, 8 shs; st 602, 38°39N, 28°13W, 1230 m, 2 shs; st 616, 38°48N, 28°17W, 1022 m, 2 shs; st 618, 38°53N, 28°06W, 1143 m, 1 sh; st 703, 39°21N, 30°06W, 1360 m, 6 shs; st 743, 37°36N, 25°17W, 1494 m, 1 sh; st 1334, 39°30N, 29°02W, 1900 m, 1 sh; st 1349, 38°36N, 28°06W, 1250 m, 1 sh; TALISMAN st 126, 38°37N, 28°21W, 1258 m, 1 sh; st 131, 38°38N, 27°26W, 2995 m, 1 sh; BIACORES st 16, 38°39N, 27°21W, 880-990 m, 1 spm; THALASSA st X340, 44°07N, 04°30W, 860-910 m, 1 sh; st Z400, 47°33N, 07°19W, 1175 m, 1 spm; st Z410, 47°51N, 08°09W, 1180 m, 1 spm; st Z452, 48°40N, 10°54W, 1450 m, 1 spm.

Distribution. Northeast Atlantic bathyal. Only known from the material examined.

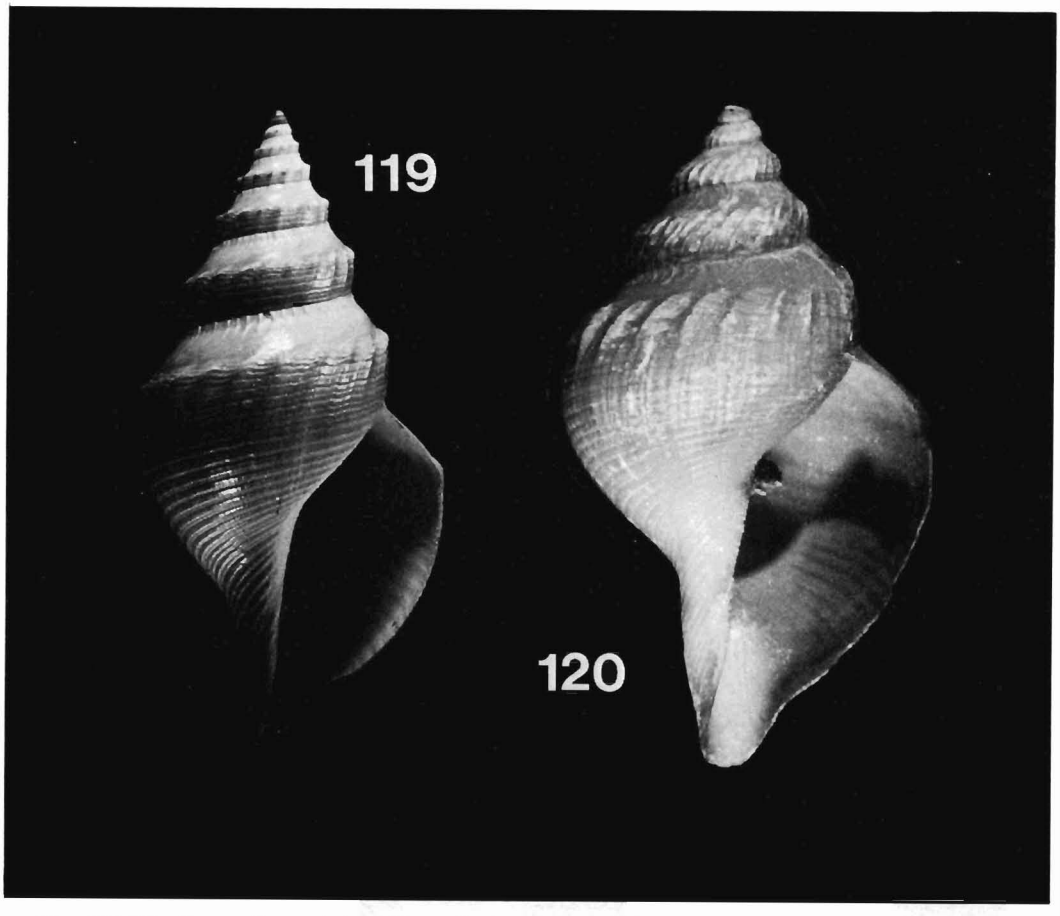
Remarks. This species resembles *G. emertoni* rather closely, a species which is quite variable but always has a broad, thin callosity on the columella, while the callous deposit in *fulvotincta* is narrow and runs parallel to the almost straight inner lip. *G. abyssorum* and *Drilliola pruina* have a much duller shell with coarser sculpture.

G. fulvotincta has well-developed eyes with a lens, but lacks an operculum.

Figs. 109-113. Genus *Gymnobela*. 109 — *G. fulvotincta*, BIACORES st 16, 26.0 mm. 110 — *G. chyta*, BIOGAS st DS17, 24.0 mm. 111 — *G. pyrrhogramma*, BIACORES st 150, 28.0 mm. 112 — *G. agassizi*, BIOGAS st CP01, 38.0 mm. 113 — *G. abyssorum*, BIACORES st 240, 15.7 mm.



Figs 114-118. Genus *Gymnobela*. 114 — *G. subaraneosa* (coarse form), THALASSA st Z435, 4.6 mm. 115 — *G. subaraneosa* (smooth form), BIOGAS st DS65, 4.4 mm. 116 — *G. emertoni*, BIOGAS st CP20, 31.0 mm. 117 — *G. lamyi*, holotype. 118 — *G. leptoglypta*, MONACO st 1349, 15.4 mm.



Figs 119-120. Genus *Gymnobela*. 119 — *G. homeotata*, WALDA (no loc.), 28.2 mm. 120 — *G. phyxanor*, BIOGAS st CP13, 25.0 mm.

Gymnobela lamyi (Dautzenberg, 1925) Figs 117,241.

Pleurotoma (Pleurotomella) lamyi Dautzenberg 1925: 2, figs 3-4; 1927: 61, pl. 3, figs 12-13.
Type material: holotype in MOM.
Type locality: MONACO st 1349, 38°35N, 28°06W, 1250 m.
Material examined: the holotype and 8 additional shells from the type locality.

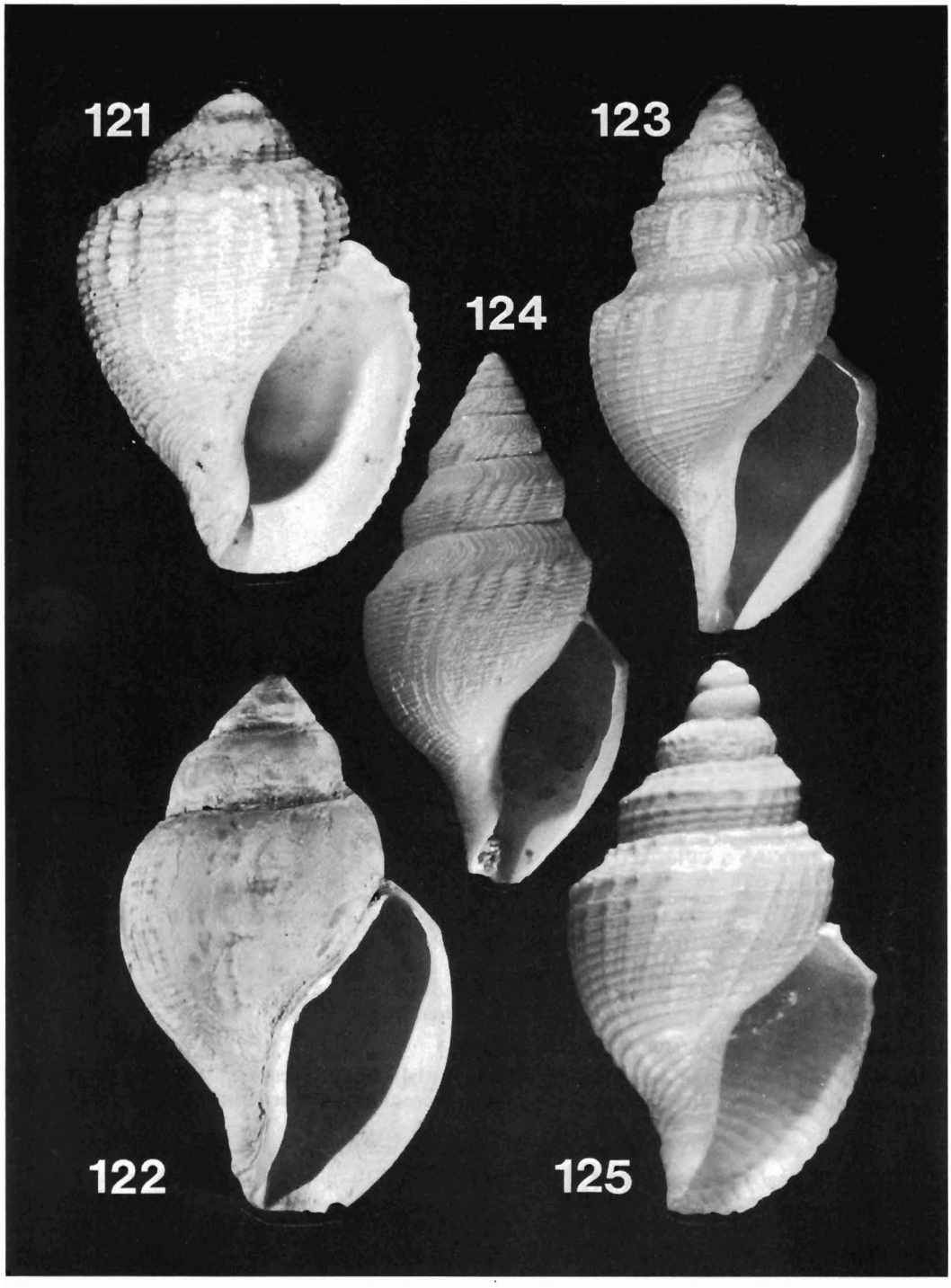
Distribution. Only known from the type locality.

Remarks. The placement of *lamyi* in *Gymnobela* is only tentative because no soft parts are known and the shell characters diverge considerably from those of other species in the genus.

Gymnobela leptoglypta (Dautzenberg & Fischer, 1896) Figs 118,242.

Pleurotoma leptoglypta Dautzenberg & H. Fischer, 1896: 416, pl. 17, fig. 10.
Pleurotomella gregaria Sykes, 1906: 180, pl. 16, fig. 2.
Type material: P. leptoglypta: holotype in MOM; *P. gregaria:* holotype in BMNH.
Type locality: P. leptoglypta: MONACO st 233, 38°33N, 28°09W, 1300 m; *P. gregaria:* PORCUPINE st 17, 39°42N, 09°43W, 1980 m.
Material examined: the type material and MONACO st 719, 39°11N, 29°06W, 1600 m, 6 shs; st 1349, 38°35N, 28°06W, 1250 m, 1 sh.

Distribution. Only known from the material examined.



Figs 121-125. Genus *Gymnobela*. 121 — *G. aquilarum*, BIOGAS st CV23, 12.1 mm. 122 — *G. aquilarum*, WALDA (no loc.), 25.0 mm. 123 — *G. engonia*, NORATLANTE st B3, 21.3 mm. 124 — *G. frielei*, BIOGAS st CP01, 21.5 mm. 125 — *G. watsoni*, BIOGAS st DS15, 5.2 mm.

Remarks. G. leptoglypta was originally described from a rather worn adult; *gregaria* was based on a young worn shell.

Gymnobela pyrrhogramma (Dautzenberg & Fischer, 1896) Figs 10,111,243.

Pleurotoma pyrrhogramma Dautzenberg & H. Fischer, 1896: 415, pl. 17, fig. 6.
Pleurotoma pyrrhogramma var. *robusta* Dautzenberg & H. Fischer, 1896: 416, pl. 17, fig. 7.
Pleurotoma pyrrhogramma var. *multicostata* Dautzenberg & H. Fischer, 1896: 416, pl. 17, fig. 8.
Bela recondita "Tiberi ms." Locard, 1897: 248, pl. 12, figs 18-22.
Bela holomera Locard, 1897: 252, pl. 12, figs 23-27.
Type material: P. pyrrhogramma: holotype in MOM; *B. recondita:* lectotype in MNHN; *B. holomera:* 2 syntypes inMNHN.
Type locality: P. pyrrhogramma: MONACO st 234, 39°02N, 27°56W, 454 m; *B. recondita:* TRAVAILLEUR 1881 st 39, 44°05N, 07°07W, 1226 m; *B. holomera:* TRAVAILLEUR 1882 st 1, 43°47N, 05°57W, 112 m.
Material examined: the type material and MONACO st 198, 38°26N, 28°39W, 800 m, 1 sh; st 234, 39°02N, 27°55W, 454 m, 1 sh; st 553, 37°43N, 26°05W, 1385 m, 1 sh; st 587, 38°37N, 27°17W, 793 m, 1 sh; st 618, 38°53N, 28°06W, 1143 m, 1 sh; BIACORES st 79, 39°00N, 27°54W, 360-380 m, 1 sh; st 88, 39°03N, 28°07W, 400-450 m, 1 sh; st 150, 37°37N, 25°35W, 550-600 m, 5 spms + sh; st 161, 37°40N, 25°51W, 590 m, 6 spms; st 157, 37°34N, 25°44W, 787-826 m, 1 sh; st 181, 37°53N, 25°36W, 450-620 m, 1 spm; st 197, 37°50N, 25°02W, 815 m, 1 spm; st 231, 36°55N, 25°10W, 585 m, 2 spms; st 238, 37°25N, 25°45W, 506 m, 1 spm; st 240, 37°35N, 25°33W, 810-825 m, 1 spm; st 241, 37°38N, 25°33W, 395-463 m, 1 spm; THALASSA 44°04N, 04°28W, 750-850 m, 2 shs; st Y428, 44°12N, 08°41W, 500 m, 1 sh; CINECA III st B31, 29°36N, 11°04W, 1500 m, 4 shs; BARTLETT st 21, 37°54N, 29°45W, 1200-1500 m, 2 shs.

Distribution. The upper bathyal of Spain and southwards, including the Azores. Only known from the material examined.

Remarks. The name *recondita* Tiberi ms. was used previously to Locard by Monterosato (1890:27, nom.nud.) but Tiberi and Monterosato were probably meaning *G. abyssorum* because *pyrrhogramma* is absent from the Mediterranean.

This species may be recognized by its rather slender shell, of a light brownish colour, with numerous, thin, rounded axial ribs. It resembles most closely *G. chyta,* from which it can be separated by its more numerous spiral ribs on the columella and more regular and close set axial ribs.

The animal lacks operculum and has two distinct eyes.

Gymnobela emertoni (Verrill & Smith, 1884) Figs 21,116,248.

Pleurotomella emertoni Verrill & Smith, in Verrill, 1884: 154, pl. 31 fig. 6.
Pleurotomella tincta Verrill, 1885: 412, pl. 44, fig. 4.
Pleurotoma leptoconchum Fischer ms., Locard, 1897: 191, pl. 8, fig. 14-21; and var. *curta* Locard,1897: 192.
Type material: P. emertoni: holotype in USNM 35232; *P. tincta:* holotype in USNM 44652; *P. leptoconchum:* syntypes in MNHN.
Type locality: P. emertoni: USFC st 2097, 37°56N, 70°58W, 3400 m; *P. tincta:* USFC st 2265, 36°06N, 69°52W, 4500 m; *P. leptoconchum:* TALISMAN st 115, 30°17N, 42°47W, 3530 m.
Material examined: the type material and TALISMAN st 131, 38°38N, 25°06W, 2995 m, 1 spm; NORATLANTE st B4, 52°06N, 45°33W, 4300 m, 1 spm; st B16, 45°35N, 03°51W, 3952-4152 m, 4 spms; BIACORES st 252, 47°35N, 08°47W, 2600 m, 1 spm; BIOGAS st DS40, 47°36N, 09°04W, 3345 m, 1 spm; 47°30N, 09°10W, 3000 m, 1 sh; 44°25N, 04°50W, 4450 m, 1 spm; st CV30, 46°33N, 10°20W, 4518 m, 1 spm; st CP04, 47°35N, 09°31W, 4200 m, 1 spm; st CP05, 46°29N, 10°20W, 3850 m, 8 spms + shs; st CP11, 47°30N, 09°07W, 3056 m, 1 spm; st CP16, 46°27N, 10°26W, 4825 m, 6 spms; st CP17, 46°31N, 10°20W, 4706 m, 7 spms; st CP18, 46°31N, 10°26W, 4721 m, 1 spm; st CP20, 44°23N, 04°51W, 4459 m, 3 spms; st CP21, 44°21N, 04°49W, 4453 m, 2 spms; st CP23, 44°05N, 04°21W, 1980 m, 1 spm; METEOR st 191, 33°46N, 15°33W, 3920-4002 m, 3 spms (Fechter, 1979).

Distribution. North-Atlantic abyssal. Only known from the material examined.

Remarks. The animal lacks operculum and has two small eyes. One of the specimens of which the radula was examined had a radula of *Drilliola pruina* in its stomach.

G. emertoni resembles *Xanthodaphne bruneri* a little but that species is broader and has a much more deeply sinuated outer lip. It also lacks the axial ribs and angulated upper whorls which are characteristic of *Gymnobela* species.

Gymnobela watsoni (Dautzenberg, 1889) Figs 125,245.

Clathurella watsoni Dautzenberg 1889: 29, pl. 2, fig. 10a-d.
Type material: holotype in MOM.
Type locality: MONACO st 112, 38°35N, 28°07W, 1287 m.
Material examined: the holotype and MONACO st 233, 38°33N, 28°09W, 1300 m, 2 shs; st 553, 37°43N, 25°05W, 1385 m, 10 shs; st 578, 38°26N, 26°31W, 1165 m, 3 shs; st 698, 39°11N, 30°45W, 1846 m, 1 sh; st 703, 39°21N, 30°06W, 1360 m, 1 sh; st 719, 39°11N, 30°24W, 1600 m, 1 sh; st 683, 38°20N, 28°05W, 1550 m, 1 spm; BIOGAS st DS15, 47°35N, 08°40W, 2246 m, 1 sh.

Distribution. Northeast Atlantic bathyal. Only known from the material examined.

Remarks. G. watsoni resembles closely the young of *G. abyssorum,* but that species has more distant axial ribs, less sharp sculpture and a much more solid shell. For differences from *G. aquilarum* and *G. engonia,* see under these species. We have also seen an apparently undescribed, very similar species from comparatively shallow (100-200 m) water in Florida. That species has a much smaller larval shell and a little less coarse sculpture.

Gymnobela aquilarum (Watson, 1881) Figs 20,121-122,247.

Buccinum (?) *aquilarum* Watson, 1881: 359; 1886: 213, pl. 13, fig. 4.
Gymnobela curta Verrill, 1884: 158, pl. 31, fig. 10.
Gymnobela curta var. *subangulata* Verrill, 1884: 159.
Gymnobela brevis Verrill, 1885: 417 (not *Pleurotoma brevis* Bellardi, 1847, which is a *Gymnobela).*
Bela hebes Verrill, 1884: 459, pl. 57, fig. 7.
Pleurotoma pinguis (Jeffreys 1880: 318, nom.nud.) Locard, 1897: 211, pl. 9, figs 27-29.
Gymnobela rhomboidea Thiele, 1925; 221, pl. 29, fig. 6.
Type material. B. aquilarum: holotype BMNH 1887.2.9.724; *G. curta:* holotype USNM 37795; *G. curta* var. *subangulata:* no type material found; *G. brevis:* no type material found; *B. hebes:* holotype USNM 34847; *P. pinguis:* 3 syntypes in MNHN: *G. rhomboidea:* holotype in ZMHU.
Type locality: B. aquilarum: CHALLENGER st 78, 37°26N, 25°13W, 1800 m; *G. curta:* USFC st 2084, off Martha's Vineyard, 2300 m; *G. curta* var. *subangulata:* off Martha's Vineyard, 2500-3500 m; *B. hebes:* off Newport, Rhode Island, 350-900 m; *G. brevis:* not designated, but recorded from off Virginia, 2000-3000 m; *P. pinguis:* Locard's type material has labels from 6 different stations of the PORCUPINE and TRAVAILLEUR 1881 expeditions; *G. rhomboidea:* erroneous (Thiele gives VALDIVIA st 71, off Congo, 44 m!).
Material examined: TRAVAILLEUR or TALISMAN, no st data, 1 sh; BIACORES st 54, 38°12N, 28°15W, 1810 m, 18 spms; st 95, 39°04N, 28°26W, 2440 m, 1 spm; THALASSA st Z409, 47°31N, 08°04W, 1035-1080 m, 2 shs; BIOGAS st CV23, 47°33N, 08°34W, 2034 m, 1 sh; st CV28, 47°35N, 09°36W, 4023 m, 1 spm; st CV39, 47°34N, 08°45W, 2350 m, 1 sh; st CP07, 44°10N, 04°16W, 2170 m, 1 spm; st DS53, 44°30N, 04°56W, 4425 m, 1 sh; st DS75, 47°28N, 09°08W, 3250 m, 1 spm; st DS76, 47°35N, 09°33W, 4228 m, 1 spm; st DS82, 44°25N, 04°53W, 4462 m, 1 sh; st DS87, 44°05N, 04°19W, 1913 m, 1 sh; WALDA st DS16, 10°31S, 11°58E, 1787 m, 1 spm; DISCOVERY st 8521, 20°47N, 18°53W, 3070 m, 4 spms; SARSIA st 7603, 44°19N, 03°35W, 3860 m, 1 sh; st 7627, 43°47N, 03°46W, 1925-1990 m, 1 spm; METEOR st M36-99, 21°38N, 18°41W, 2971 m, 1 spm; INCAL st WS02, 50°19N, 12°56W, 2498 m, 1 spm; st WS01, 50°19N, 13°07W, 2550 m, 1 sh; st WS08, 47°31N, 09°34W, 4300 m, 1 sh; st WS09, 47°28N, 09°34W, 4277 m, 2 shs; st OS06, 46°27N, 09°34W, 4316 m, 1 spm; st OS08, 47°30N, 09°39W, 4327 m, 1 sh; st DS02, 57°59N, 10°49W, 2081 m, 3 spms; and the type material.

General distribution. North Atlantic, bathyal-upper abyssal.

Remarks. This species is quite variable and the adult looks rather different from the young. If is however recognized by its short, broad shape, which is in common with *G. watsoni.* That species has the uppermost spiral keel furnished with spines at the intersection with the axial ribs, and the postlarval sculpture starts with a single spiral keel instead of two as in *aquilarum. G. engonia* has a distinctly concave subsutural zone, not flat as *aquilarum,* and higher spire.

Gymnobela frielei (Verrill, 1885) Figs 27,124,250.

Pleurotomella frielei Verrill, 1885: 413, pl. 44, fig. 5.
Pleurotoma polysarca Dautzenberg & H. Fischer, 1896: 422, pl. 17, figs 11-12.
Bela polysarca var. *minor, ventricosa, major* Locard, 1897: 246.
Type material: P. frielei: holotype in USNM 44653; *P. polysarca:* 2 syntypes in MOM.

Type locality: P. frielei: USFC st 2208, 39°33N, 71°16W, 2100 m; *P. polysarca:* not designated but either MONACO st 527, 38°09N, 28°15W, 4020 m or st 624, 38°59N, 28°18W, 2102 m.

Material examined: the type material and MONACO st 536, 37°54N, 24°43W, 2178 m, 1 sh; st 650, 36°54N, 20°46W, 4400 m, 1 sh; st 719, 39°11N, 29°06W, 1600 m, 1 sh; TALISMAN 1883 st 133, 42°15N, 21°17W, 4000 m, 1 sh; st 142, 38°00N, 27°13W, 2200 m, 1 spm; st 144, 38°38N, 25°06W, 2995 m, 4 spms+shs; NORATLANTE st B10, 36°58N, 26°20W, 2771-2917 m, 1 sh; st B16, 45°32N, 03°52W, 3952 m, 4 spms; BIACORES st 176, 38°01N, 26°22W, 2440-2720 m, 1 sh; st 235, 37°19N, 25°33W, 2085-2115 m, 2 spms; BIOGAS st CV10, 47°31N, 08°41W, 2103 m, 1 spm; st CV34, 44°27N, 04°29W, 4406 m, 1 spm; st CV41, 47°21N, 09°01W, 3800 m, 1 spm; st DS15, 47°35N, 08°40W, 2215 m, 1 spm; st DS40, 47°36N, 09°04W, 3345 m, 1 sh; st DS71, 47°34N, 08°34W, 2194 m, 1 spm; st CP01, 47°35N, 08°39W, 2245 m, 7 spms+shs; st CP08, 47°33N, 08°39W, 2177 m, 1 spm; 1 sh; st CP12, 47°33N, 09°12W, 2925 m, 1 sh; st CP17, 46°31N, 10°20W, 4706 m, 1 sh; DISCOVERY st 8521, 20°47N, 18°53W, 3070 m, 3 spms; INCAL st WS01, 50°19N, 13°07W, 2550 m, 2 shs; st WS02, 50°20N, 12°56W, 2498 m, 1 sh; st DS02, 57°59N, 10°49W, 2081 m, 5 spms; st OS05, 47°32N, 09°35W, 4250 m, 1 sh; st OS06, 46°28N, 09°36W, 4316 m, 1 sh; st CP02, 57°58N, 10°44W, 2091 m, 1 spm.

Distribution. The lower bathyal and abyssal of the North Atlantic.

Remarks. G. frielei has been recorded from Cameroun, 2492 m (Martens 1903: 7) but this record has been corrected by Thiele (1925: 221). It resembles *engonia* very much, but that species has stronger sculpture, straighter columella and is less regularly conical.

Gymnobela engonia Verrill, 1884: Figs 26,123,249.

Gymnobela engonia Verrill, 1884: 157.

Type material: holotype in USNM 34835.

Type locality: USFC st 2041, 68°25N, 39°23W, 2900 m.

Material examined: the holotype and TALISMAN st 147, 42°19N, 22°16W, 4010-4060 m, 1 spm; WALDA st DS11, 18°34S, 10°36E, 3575 m, 2 spms; NORTALANTE st E3, 52°10N, 45°33W, 4100 m, 1 spm; st B4, 52°06N, 45°33W, 4166-4452 m, 1 spm; st B16, 45°32N, 03°52W, 3952 m, 4 spms; st B17, 45°13N, 05°31W, 4700 m, 2 spms; BIACORES st 249, 45°50N, 17°33W, 4620-4690 m, 1 spm; st 251, 46°38N, 08°56W, 3360-3600 m, 3 spms; BIOGAS st DS21, 47°32N, 09°40W, 4196 m, 2 spms; st CV14, 47°33N, 09°36W, 4246 m, 2 spms; st CV27, 47°34N, 09°32W, 4023 m, 2 spms; st CV30, 46°33N, 04°53W, 4293 m, 1 spm; st CV41, 47°27N, 09°01W, 3800 m, 4 spms; st CP04, 47°35N, 09°31W, 4200 m, 1 spm; st CP05, 46°29N, 10°20W, 3850 m, 1 spm; st CP06, 44°20N, 04°54W, 4460 m, 1 spm; st CP10, 47°33N, 08°44W, 2878 m, 1 spm; st CP13, 47°34N, 09°38W, 4134 m, 2 spms; st CP15, 46°32N, 10°29W, 4715 m, 1 spm, 1 sh; st CP16, 46°27N, 10°26W, 4825 m, 3 spms; st CP17, 46°31N, 10°20W, 4706 m, 8 spms; st CP19, 44°25N, 04°51W, 4434 m, 5 spms; st CP20, 44°23N, 04°51W, 4459 m, 13 spms; st CP21, 44°21N, 04°29W, 4453 m, 3 spms; st CP22, 44°23N, 04°55W, 4475 m, 2 spms; INCAL st WS03, 48°19N, 15°23W, 4830 m, 2 shs; st WS05, 46°03N, 10°16W, 4804 m, 1 spm; st WS07, 47°31N, 09°36W, 4280 m, 8 spms+shs; st WS08, 47°31N, 09°34W, 4300 m, 7 spms+shs; st WS09, 47°28N, 09°34W, 4277 m, 8 spms+shs; st WS10, 47°28N, 09°40W, 4354 m, 5 spms; st CP13, 46°02N, 10°14W, 4800 m, 1 spm; st CP15, 46°26N, 09°35W, 4182 m, 1 spm; st OS07, 47°31N, 09°34W, 4250 m, 2 shs; st OS08, 47°30N, 09°39W, 4327 m, 1 sh; DISCOVERY st 8521, 20°47N, 18°53W, 3064 m, 3 spms; SARSIA st 7603, 44°19N, 03°35W, 3860 m, 2 spms; METEOR st 36-99, 21°38N, 18°41W, 2971 m, 1 spm.

Distribution. Mid North Atlantic, abyssal.

Remarks. For separation from *G. frielei,* see that species. *G. watsoni* is a much smaller and more shallow-water species, with brownish shell instead of greenish or greyish opaque. The postlarval sculpture of that species starts with a single spiral rib, while that of *engonia* starts with two.

Gymnobela homeotata (Watson, 1886) Figs 18,119,240.

Clathurella homeotata Watson, 1886: 362, pl. 26, fig. 12.

Type material: holotype in BMNH 1887.2.9.1115.

Type locality: CHALLENGER st 106, 01°47N, 24°26W, 3300 m.

Material examined: the holotype and TALISMAN st 34, 32°27N, 09°55W, 1123 m (probably wrong locality), 1 spm; WALDA, no loc., 2 spms; BIOGAS st CP16, 46°27N, 10°26W, 4825 m, 1 spm; st DS48, 44°29N, 04°54W, 4203 m, 1 spm; DISCOVERY st 8521, 20°47N, 18°53W, 3070 m, 1 spm.

Distribution. Only known from the East Atlantic, probably only abyssal.

Remarks. The animal has neither eyes nor operculum.

This species resembles *Theta chariessa,* which can be separated by having a much smaller, reticulated larval shell and by having a greyish white shell instead of more or less brownish as in *G.*

homeotata. From *T. vayssierei* it differs by its reticulated larval shell and coloured adult shell, while *vayssierei* has a larval shell with only axial sculpture and a whitish adult shell.

Gymnobela subaraneosa (Dautzenberg & Fischer, 1896) Figs 23,114-115,244.

Pleurotoma subaraneosa Dautzenberg & H. Fischer, 1896: 422, pl. 16, figs 11-12.

Type material: lectotype in MOM.

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

Material examined: the type material and MONACO st 233, 38°33N, 28°09W, 1300 m, 1 sh; st 578, 38°26N, 26°31W, 1163 m, 1 sh; st 703, 39°21N, 31°06W, 1360 m, 1 sh; st 719, 39°11N, 30°24W, 1600 m, 12 shs; BIOGAS st DS11, 47°35N, 08°34W, 2205 m, 1 sh; st DS15, 47°35N, 08°40W, 2246 m, 3 shs; st DS18, 47°32N, 08°45W, 2138 m, 1 sh; st DS31, 47°32N, 09°04W, 2813 m, 1 spm; st DS32, 47°32N, 08°05W, 2138 m, 2 shs; st DS52, 44°06N, 04°22W, 2006 m, 2 spms; st DS53, 44°30N, 04°56W, 4425 m, 1 spm; st DS58, 47°34N, 09°08W, 2775 m, 4 shs; st DS59, 47°32N, 09°06W, 2790 m, 3 spms; st DS62, 47°33N, 08°40W, 2175 m, 6 shs; st DS63, 47°33N, 08°35W, 2126 m, 2 shs; st DS64, 47°29N, 08°31W, 2156 m, 2 shs; st DS74, 47°33N, 09°08W, 2777 m, 15 spms; st DS86, 44°05N, 04°19W, 1950 m, 1 spm; st DS87, 44°05N, 04°19W, 1913 m, 10 spms; st CP01, 47°35N, 08°39W, 2245 m, 1 spm; st CP08, 47°33N, 08°38W, 2177 m, 2 spms; st CP09, 47°33N, 08°44W, 2171 m, 3 spms; st CP25, 44°05N, 04°17W, 1894 m, 3 spms; st CP26, 47°33N, 08°33W, 2115 m, 1 spm; THALASSA st Y435, 48°40N, 09°53W, 800 m, 1 sh; TRAVAILLEUR 1881 dr. 4, 38°09N, 09°44W, 2505 m, 3 shs; NORATLANTE st E1, 53°55N, 17°53W, 2420 m, 1 sh; st E16, 47°33N, 08°31W, 1970 m, 1 sh; INCAL st DS06, 56°27N, 11°10W, 2494 m, 3 shs; st DS07, 55°01N, 12°31W, 2884 m, 1 sh; st WS01, 50°19N, 13°07W, 2550 m, 4 shs; st WS02, 50°19N, 12°56W, 2498 m, 12 spms; st OS01, 50°14N, 13°11W, 2634 m, 4 shs; st CP08, 50°15N, 13°14W, 2644 m, 27 shs; st CP09, 50°15N, 13°16W, 2890 m, 1 sh; CHALLENGER II st 12, 56°49N, 10°15W, 2076 m, 21 spms; PORCUPINE st 16, 39°55N, 09°56W, 1800 m, 1 sh; 46°08N, 05°01W, 3950 m, 1 sh, Lagardère coll.

Distribution. The bathyal zone of the N.E. Atlantic, including the Mediterranean.

Remarks. This species is very close to *Pleurotoma araneosa* Watson, from the West Indies, which has a sculpture very similar in the adult whorls; however the protoconch has a smaller number of whorls and is more conical, not swollen as in *subaraneosa.*

G. subaraneosa exhibits considerable variation in the sculpture of the adult shell, from rather coarsely sculptured specimens around the Azores to nearly smooth shells in the northern part of its range and the Mediterranean; it may then resemble *Xanthodaphne dalmasi,* but *dalmasi* has the subsutural sinus zone less distinctly set off from the lower part of the whorl. In *subaraneosa* these two parts of the whorl are clearly separated by a more or less angulated keel.

The protoconch was figured as Turridae sp. A by Bouchet (1977: 951).

The animal is blind and has no operculum. One of the specimens of which the radula was examined had a radula, probably of *Benthonella tenella* (Jeffreys) in the stomach.

Gymnobela chyta (Watson, 1881) Fig. 110.

Pleurotoma (Defrancia) chyta Watson, 1881: 446.

Clathurella chyta Watson, 1886: 358, pl. 18, fig. 4.

Type material: holotype in BMNH 1887.2.9.1108.

Type locality: CHALLENGER st 73, 38°30N, 31°14W, 1800 m.

Material examined: the holotype and MONACO st 2990, 43°46N, 09°41W, 2320 m, 1 sh; BIOGAS st DS17, 47°32N, 08°46W, 2138 m, 1 spm.

Description. Watson's description being based on a broken worn shell and the illustration of the protoconch being incorrect, a new description based on the BIOGAS specimen is presented below.

Shell high, slender, white. The larval shell consists of at least three convex, rapidly increasing whorls, with an oblique, reticulated sculpture; its colour is dark yellowish brown and it is about 800 μm high. This specimen has 7.5 rather slowly increasing postlarval whorls. The suture is distinct, but not very deep. The subsutural zone occupies a little more than one fourth of the height of the whorls, it is distinctly concave and sculptured by deeply sinuated incremental lines. The axial sculpture consists of incremental lines and big rounded axial ribs. The incremental lines are not very distinct and of varying strength, they are strongly and regularly curved, more curved than the ribs which are obliquely placed and only very slightly curved, more curved than the ribs which are obliquely placed and only very slightly curved. They are highest just below the subsutural zone, where they start almost as a knob, then they get lower and disappear more or less at the lower suture. The spiral sculpture consists of low ribs, a little irregularly running and V-shaped in cross-section. There are 11

on the penultimate whorl and a single one on the first postlarval whorl. The parietal callus is thin and covers about one fourth of the columella. The siphonal canal is deep and rather long.

Dimensions: height of the shell 24.0 mm, breadth 9.0 mm; height of the aperture 10.2 mm, breadth 4.2 mm.

Remarks. The animal lacks an operculum and is blind.

It differs from most *Gymnobela* species by its low aperture and slender, slightly concave spire. It comes closest to *G. pyrrhogramma* but the colour of the shell, the spiral sculpture and radula make separation easy. Also *G. pyrrhogramma* has eyes.

Gymnobela phyxanor (Watson, 1886) Figs 22,120.

Clathurella phyxanor Watson, 1886: 364, pl. 26, fig. 14.
Type material: holotype in BMNH 1887.2.9.1117.
Type locality: CHALLENGER st 106, 01°47N, 24°26W, 3300 m.
Material examined: the holotype and BIOGAS st CP13, 47°34N, 09°38W, 4134 m, 1 sh; WALDA st DS16, 10°31S, 11°58E, 1787 m, 1 spm; INCAL st CP15, 47°26N, 09°35W, 4182 m, 1 spm.

Distribution: Only known from the material examined.

Remarks. G. phyxanor was based on a young, broken shell but the identification of our material seems to be certain: we do not know any similar species in the Atlantic and the specimens agree completely. The species can be recognized by its broad, swollen appearance with a distinct axial sculpture.

Genus *THETA* Clarke, 1959

Type species: *Pleurotomella (Theta) lyronuclea* Clarke, 1959.

We have used this name for a group of species which agree rather well with *Gymnobela,* except for having a more polished, greyish semitransparent shell, almost of vitreous structure, instead of a dull, chalky, brownish or porcellaneous structure. The upper postlarval whorls are strongly shouldered. The sculpture consists of axial ribs and/or spiral lines or may be absent at least on the last whorls. All these species attain a considerable size, 40—60 mm. The species placed here seems to form a natural group.

The genus *Speoides* Kuroda & Habe, 1962 is very similar. The type species *S. yoshidai* Kuroda & Habe, 1962 resembles *T. chariessa* very much in shell characters. Fig. 15 is drawn from the radula of a specimen from the Philippines. The animal has no operculum but two distinct eyes. We must consider it a synonym of *Theta.*

Theta vayssierei (Dautzenberg, 1925) Figs 126-127,253.

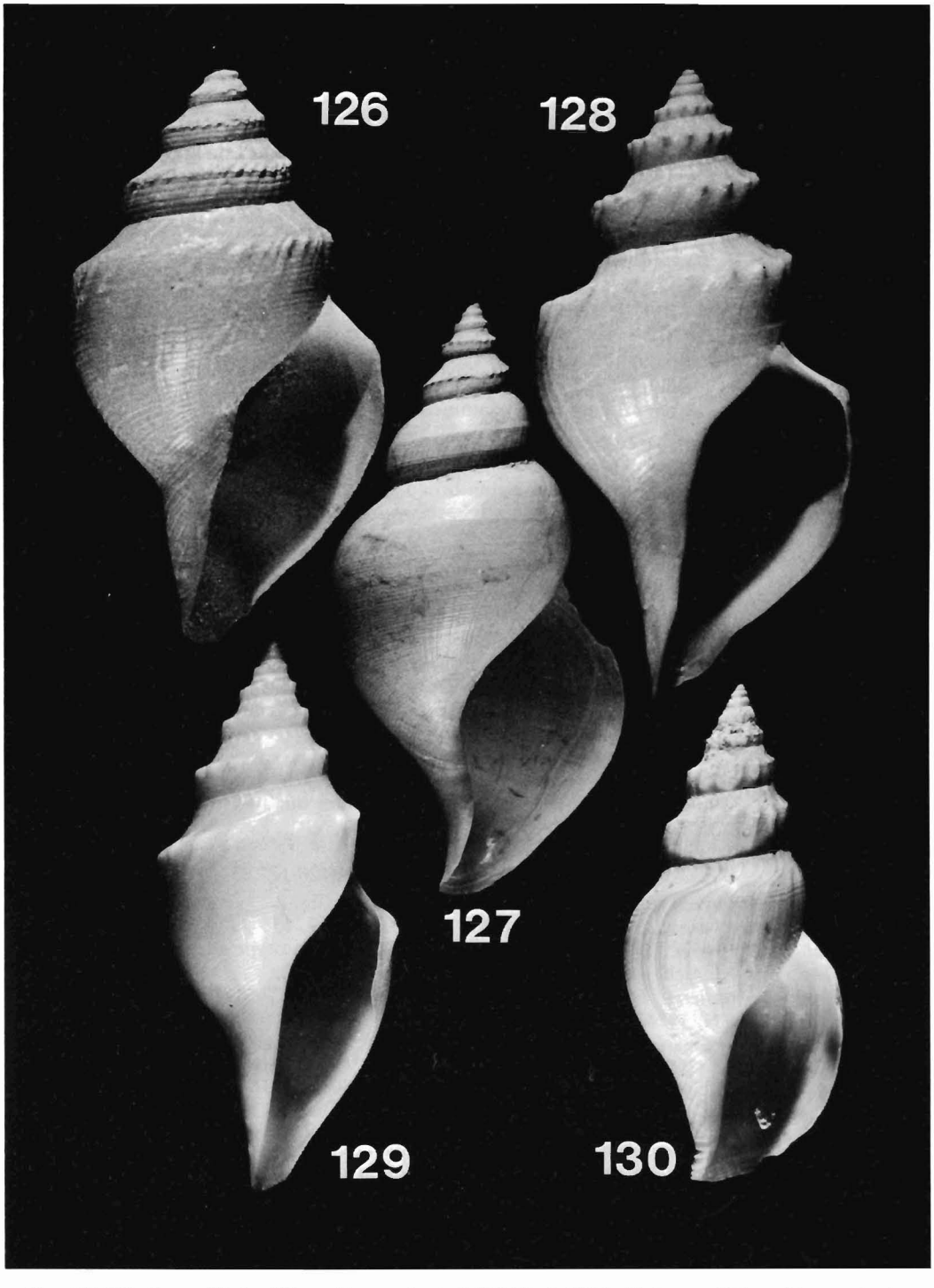
Pleurotoma (Pleurotomella) vayssierei Dautzenberg, 1925: p. 1, fig. 2.
Pleurotomella (Theta) bathyiberica Fechter, 1976: 70, figs 1-3, 8-9, 13.
Type material: P. vayssierei: holotype in MOM; *P. bathyiberica:* holotype and 10 paratypes in the Zoological Museum, Munich.
Type locality: P. vayssierei: MONACO st 1787, 31°07N, 23°03W, 5413 m; *P. bathyiberica:* METEOR st 37, 42°06N, 14°42W, 5330 m.
Material examined: the type material and MONACO st 527, 38°09N, 23°16W, 4020 m, 1 sh; WALDA, no loc., 1 sh; BIOGAS st CP13, 47°34N, 09°38W, 4134 m, 1 sh; st CP17, 46°31N, 10°20W, 4706 m, 1 spm; DISCOVERY st 8521, 20°47N, 18°53W, 3070 m, 1 sh; INCAL st WS08, 47°31N, 09°34W, 4300 m, 1 sh.

Distribution. Only known from the material examined.

Remarks. The holotype of *vayssierei* is a large adult of which only the upper whorls show axial ribs. *T. vayssierei* can be separated from *Gymnobela homeotata* (which it resembles) by its whitish, uncoloured shell and by the protoconch having only axial curved lines. From *T. lyronuclea* which has the same type of larval shell, it differs by the strong spiral sculpture of the postlarval whorls.

Theta chariessa (Watson, 1881) Figs 14,129-130,254-255.

Pleurotoma (Defrancia) chariessa Watson, 1881: 458.
Pleurotomella jeffreysi Verrill, 1885: 411, pl. 44, fig. 3.
Clathurella chariessa Watson, 1886: 352, pl. 20, fig. 6.



Figs 126-130. Genus *Theta*. 126 — *T. vayssierei*, BIOGAS st CP13, 21.0 mm. 127 — *T. vayssierei*, holotype. 128 — *T. lyronuclea*, BIOGAS st CP13, 27.0 mm. 129 — *T. chariessa*, NORATLANTE st B15, 24.5 mm. 130 — *T. chariessa*, BIOGAS st DS19, 29.5 mm.

Pleurotomella chariessa var. *tellea* Dall, 1889: 123.
Pleurotomella? catasarca Dall, 1889: 124.
Pleurotoma gisota Dautzenberg & H. Fischer, 1896: 412, pl. 17, figs 4-5.
Pleurotoma urinator Locard, 1897: 195, pl. 8, figs 22-29.
Pleurotoma turrisulcatum Locard, 1897: 205, pl. 9, figs 17-21.
Pleurotomella stearina Dall, 1927: 29.
Type material: P. chariessa: holotype in BMNH 1887.2.9.1098-99; *P. jeffreysi:* holotype in USNM 44650; *P. chariessa* var. *tellea:* USNM 93428; *P. gisota:* 2 syntypes in MOM; *P. urinator:* syntypes in MNHN; *P. turrisulcatum:* holotype in MNHN; *P. stearina:* holotype in USNM 108310.
Type locality: P. chariessa: CHALLENGER st 73, 38°30N, 31°14W, 1800 m; *P. jeffreysi:* USFC st 2230, 38°27N, 73°02W, 2100 m; *P. chariessa* var. *tellea:* off Cape Fear, North Carolina, 1250 m; *P. gisota:* MONACO st 184, 40°05N, 29°48W, 1850 m; *P. urinator:* TALISMAN st 131, 38°38N, 22°06W, 2995 m; *P. turrisulcatum:* same as *urinator; P. stearina:* off Georgia, 800 m.
Material examined: the type material and TRAVAILLEUR 1882, drag. 40, 43°24N, 11°41W, 400 m, 1 sh; TALISMAN st 38, 30°09N, 11°41W, 2210 m, 1 spm; st 47, 29°02N, 12°29W, 1163 m, 1 spm + 2 shs; st 76, 29°01N, 16°55W, 2637 m, 2 shs; st 96, 19°19N, 18°00W, 2330 m, 1 sh; st 122, 37°35N, 29°26W, 1440 m, 1 sh; st 126, 38°37N, 28°21W, 1258 m, 5 spms + 38 shs; st 131, 38°38N, 25°06W, 2995 m, 2 shs; numerous shs and spms from the following MONACO stations: st 112, 38°35N, 28°06W, 1287 m; st 203, 39°27N, 30°55W, 1557 m; st 184, 40°05N, 27°28W, 1850 m; st 233, 38°33N, 28°09W, 1300 m; st 553, 37°43N, 28°05W, 1385 m; st 602, 38°39N, 28°13W, 1230 m; st 575, 38°27N, 26°30W, 1165 m; st 624, 38°59N, 28°18W, 2102 m; st 683, 38°20N, 28°05W, 1550 m; st 698, 39°11N, 30°45W, 1846 m; st 703, 39°21N, 31°06W, 1360 m; st 702, 39°21N, 31°06W, 1360 m; st 719, 39°11N, 29°06W, 1600 m; st 738, 37°40N, 26°26W, 1919 m; st 743, 37°36N, 25°17W, 1494 m; st 1306, 37°16N, 20°12W, 4275 m; st 1311, 37°37N, 28°21W, 1187 m; st 1334, 38°46N, 29°02W, 1900 m; st 1344, 38°46N, 28°08W, 1095 m; st 1349, 38°36N, 28°06W, 1250 m; st 2044, 32°28N, 16°38W, 2286 m; st 3006, 43°21N, 10°02W, 2779 m; st 3293, 38°47N, 30°16W, 1331 m; BIACORES st 4, 38°12N, 22°39W, 1200 m, 1 sh; st 66, 38°35N, 28°20W, 1250 m, 4 spms + shs; st 95, 38°04N, 28°05W, 2440 m, 2 shs; st 163, 37°27N, 26°03W, 2350 m, 1 spm; st 165, 37°33N, 25°58W, 2050 m, 1 spm; st 176, 38°01N, 26°22W, 2500 m, 1 sh; st 185, 38°01N, 24°58W, 2200 m, 1 sh, 1 spm; st 206, 37°21N, 25°29W, 2090 m, 7 spms + shs; st 217, 37°05N, 24°53W, 1735 m, 1 spm; st 227, 37°10N, 25°20W, 2180 m, 15 spms + shs; st 235, 37°19N, 25°33W, 2100 m, 4 shs; st 252, 47°36N, 08°47W, 2600 m, 1 sh; NORATLANTE st B11, 38°20N, 25°22W, 2750-2850 m, 1 spm; st B15, 44°07N, 04°09W, 1900 m, 5 spms + shs; BIOGAS st DS15, 47°35N, 08°40W, 2246 m, 2 spms; st DS16, 47°36N, 08°41W, 2325 m, 3 spms; st DS19, 47°34N, 09°04W, 2865 m, 2 shs; st DS65, 47°36N, 08°41W, 2360 m, 2 shs; st DS48, 44°29N, 04°54W, 4203 m, 1 sh; st CV06, 47°31N, 08°16W, 2200 m, 1 sh; st CV16, 44°07N, 04°17W, 1909 m, 3 spms; st CV23, 47°33N, 08°34W, 2034 m, 1 spm; st CV39, 47°34N, 08°45W, 2350 m, 1 sh; st CW03, 47°31N, 08°18W, 1100 m, 1 spm; st CP01, 47°35N, 08°38W, 2245 m, 9 spms; st CP07, 44°10N, 04°16W, 2170 m, 12 spms + shs; st CP09, 47°33N, 08°44W, 2171 m, 2 spms; st CP10, 47°30N, 09°05W, 2878 m, 1 spm; st CP23, 44°07N, 04°21W, 1980 m, 1 spm; st CP24, 44°08N, 04°16W, 1995 m, 1 spm; SARSIA st 7626, 43°47N, 03°43W, 2300 m, 2 spms; WALDA st CY23, 00°45N, 08°27E, 2231 m, 1 sh; METEOR st 36-99, 25°38N, 18°41W, 2971 m, 1 sh; st 191, 33°46N, 15°33W, 3920-4002 m, 1 spm (Fechter, 1979); INCAL st CP09, 50°15N, 13°16W, 2690 m, 2 spms; st WS08, 47°31N, 09°34W, 4300 m, 1 spm.

Distribution. North Atlantic bathyal.

Remarks. We have not seen any possibility of keeping apart the numerous forms enumerated in the synonymy. The species is quite variable, from broad, thick-shelled specimens with strong sculpture (the form known as *jeffreysi*) to more thin-shelled, more slender and less sculptured specimens, the typical *chariessa.* We also believe that the form described by Locard as *turrisulcatum* belongs here: the sculpture and larval shell indicate that, even if the appearance of the shell is rather anomalous.

The animal lacks an operculum, but has two small but distinct eyes.

T. chariessa may resemble a little the colourless specimens of *Gymnobela pyrrhogramma,* but that species has a coarser sculpture, more closely set axial ribs and a shorter aperture. *T. vayssierei* has a similar surface structure but almost no spiral sculpture and much more shouldered whorls. *G. emertoni* differs by having the adult whorls much more evenly rounded and completely destitute of axial sculpture.

Theta lyronuclea (Clarke, 1959) Figs 13,128,252.
Pleurotomella (Theta) lyronuclea Clarke, 1959: 234, pl. 13, figs 1-2.
Type material: holotype in MCZ 218184.
Type locality: THETA st 9, 31°42N, 68°08W, 5300 m.
Material examined: the holotype and BIACORES st 126, 39°20N, 33°47W, 3360 m, 3 spms; st 249, 45°50N, 17°33W, 4650 m, 2 spms; st 251, 47°38N, 08°56W, 3330 m, 1 spm; st 245, 40°57N, 22°16W, 4270 m, 4 spms;

WALDA, no loc., 10 spms + shs; NORATLANTE st B13, 35°59N, 09°33W, 4206-4250 m, 2 spms; BIOGAS st CV13, 47°32N, 09°34W, 4252 m, 2 shs; st CV14, 47°32N, 09°36W, 4232 m, 1 spm, 1 sh; st CP13, 47°34N, 09°38W, 4134 m, 3 spms; st CP15, 46°32N, 10°29W, 4715 m, 1 sh; st CP16, 46°27N, 10°26W, 4825 m, 1 spm; st CP17, 46°31N, 10°20W, 4706 m, 1 spm; INCAL st WS05, 46°03N, 10°16W, 4804 m, 2 spms; st WS10, 47°28N 09°40W, 4354 m, 2 spms; st CP13, 46°02N, 10°15W, 4800 m, 1 spm; st CP15, 46°26N, 09°35W, 4182 m, 1 spm; DISCOVERY st 8521, 20°47N, 18°53W, 3064-3070 m, 2 spms, 2 shs.

Distribution. North Atlantic abyssal. Only known from the material examined.

Remarks. The animal has small eyes and lacks an operculum.

Theta lyronuclea resembles *T. chariessa* very much, but the larval shell of *lyronuclea* is twice the size of that of *chariessa* and has only axial ribs on its last whorl, instead of an obliquely reticulate sculpture. *T. lyronuclea* is also more sharply shouldered. It also resembles *vayssierei* but lacks the spiral sculpture of that species. From *Gymnobela homeotata,* it differs by the uncoloured shell, lacking the strong spiral striation and its larval shell devoid of reticulate sculpture.

Genus *BATHYBELA* Kobelt, 1905

Type species: *Thesbia nudator* Locard, 1897, by subsequent designation, Dall, 1918.
Synonym: *Bathypota* Nordsieck, 1977: 28.
Type species: *tenellula* (sic!) Locard, 1897.

The shell morphology of *Bathybela* is close to that of *Gymnobela,* of which it perhaps should be a subgenus. The main difference from *Gymnobela* is the large size and bigger aperture. Some species of *Pontiothauma* Smith, 1895 should perhaps be referred here.

Bathybela nudator (Locard, 1897) Figs 16,133.

Thesbia nudator Locard, 1897: 218, pl. 10, figs 5-8.
Type material: lecto- and paralectotype in MNHN.
Type locality: TALISMAN st 134, 42°19N, 21°17W, 4060 m.
Material examined: the type material and NORATLANTE st B4, 52°06N, 45°33W, 4300 m, 2 spms; BIACORES st 251, 47°38N, 08°56W, 3400 m, 1 spm; INCAL st CP10, 48°26N, 15°10W, 4823 m, 1 spm.

Distribution. Only known from the material examined.

Remarks. The animal lacks operculum and has two big, distinct eyes with a lens. The proboscis is very short and goes directly into the functional stomach, which is situated in the frontmost part of the animal, starting just behind the tentacles. Radula slides were prepared from two specimens, both containing partly digested polychaetes. The protoconch is strongly corroded in the material examined.

It differs from *B. tenellunum* by its fainter sculpture on the spire and its less solid shell.

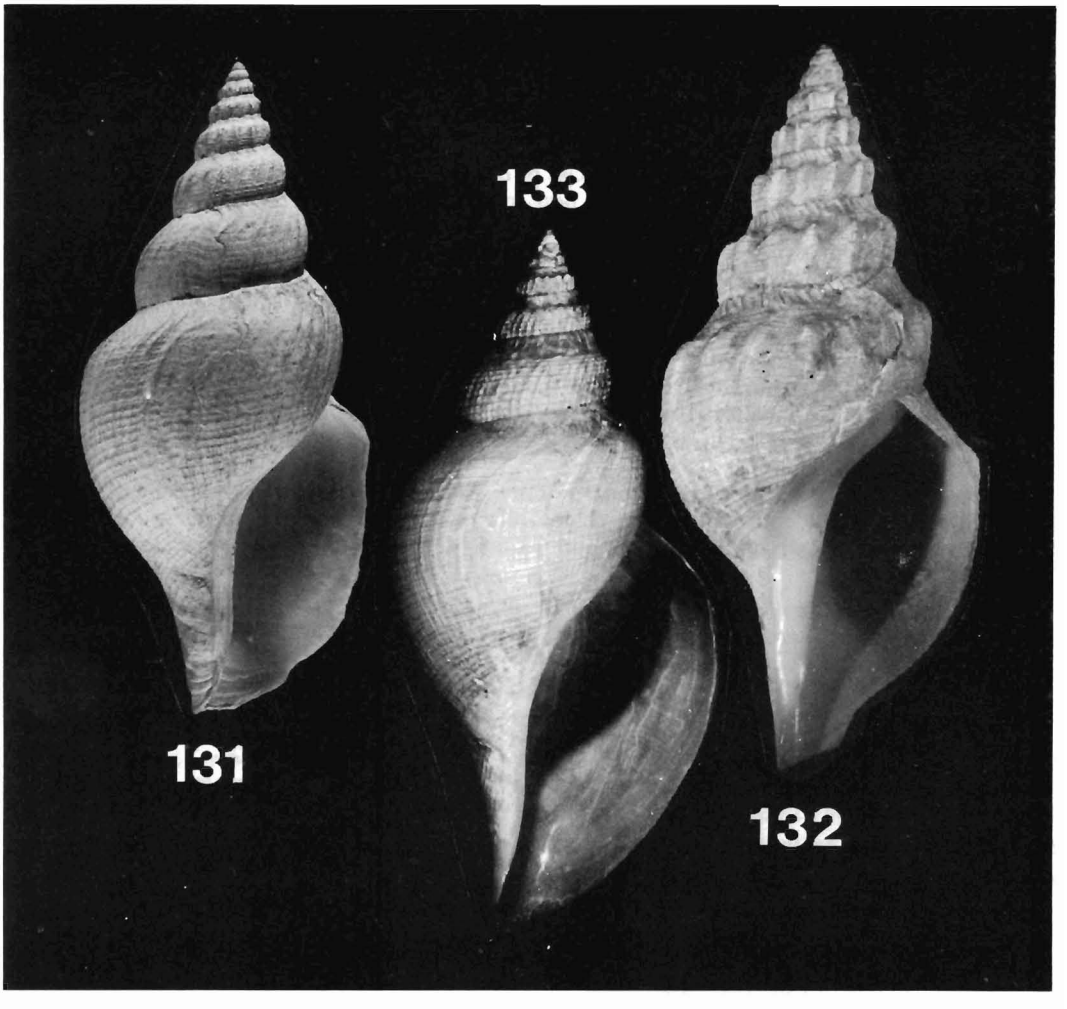
Bathybela tenellunum (Locard, 1897), Figs 17,131-132.

Pleurotoma tenellunum Locard, 1897: 193, pl. 8, figs 5-13.
Pleurotomella costlowi Petuch, 1974: 42, figs 11-12.
Type material: P. tenellunum: lectotype in MNHN. *P. costlowi:* holotype in Dept. of Geology, California Academy of Sciences.
Type locality: P. tenellunum: TALISMAN st 118, 36°46N, 33°51W, 3175 m. *P. costlowi:* 34°45N, 73°31W, 3000 m.
Material examined: the type material and NORATLANTE st B11, 38°20N, 25°22W, 2756-2844 m, 1 sh; st B12, 36°22N, 08°44W, 2875 m, 2 spms, 3 shs; MONACO st 2111, 31°45N, 42°43W, 3465 m, 1 spm; WALDA, no loc., 2 shs.

Distribution. Only known from the material examined.

Remarks. The animal is blind and lacks operculum. The snout is big and funnel-shaped with the mouth opening in the bottom of the funnel. The protoconch is always strongly corroded in the material examined but it was probably of the planktotrophic type.

This species resembles a little the W. Atlantic *Gymnobela bairdi,* but that species has a less solid shell and broader spire. *G. bairdi* of European authors is *Gymnobela abyssorum* (Locard). *B. tenellunum* is rather like *B. nudator* but can be separated by the spire, which is heavily sculptured by axial ribs in *tenellunum,* while it has spiral and axial sculpture of about the same strength in *nudator.*



Figs 131-133. Genus *Bathybela*. 131 — *B. tenellunum,* NORATLANTE st B11, 61.9 mm. 132 — *B. tenellunum,* NORATLANTE st B12, 32.0 mm. 133 — *B. nudator,* BIACORES st 251, 49.0 mm.

Genus *XANTHODAPHNE* Powell, 1942

Type species: *Pleurotoma membranacea* Watson, 1886.

We have examined this species from the bathyal of New Zealand (Fig. 9). The N. Atlantic species differ only in the fact that their protoconch is obliquely reticulate, while the sculpture is mainly axial in *membranacea. Lusitanops* may grossly resemble *Xanthodaphne* but it has no distinct sinus zone. *Xanthodaphne* differs from *Gymnobela* by having evenly rounded whorls and a smoother shell, mainly sculptured by thin furrows.

Xanthodaphne heterogramma (Odhner, 1960) Fig. 136.

Pleurotomella heterogramma Odhner, 1960: 389, pl. 2, figs 20-21.

Type material: holotype in the Naturhistoriska Museet, Göteborg.
Type locality: 02°26N, 39°26W, 4430-4474 m.
Material examined: the holotype and BIACORES st 202, 37°26N, 25°00W, 2900 m, 2 shs.

Distribution. Only known from the material examined.

Remarks. Because Odhner described his species from a very poor fragment, it is not possible to know whether he actually had the present species or *charcotiana.* Because of the geographic position of the type locality, we have considered it best to use the name *heterogramma* for the species depicted in Fig. 136, the description of which follows.

Shell thin but solid, of a general orange-brown colour, which is more vivid on the columellar region. Shell composed of 3 larval and 4.5 postlarval whorls. The embryonic and early larval shell is corroded but the rest of the larval shell (height = 820 μm) is obliquely reticulated. Adult whorls rather regularly convex, with a moderately deep suture. There is a broad sinus zone, which has not the same degree of convexity as the rest of the whorl. The axial sculpture consists of incremental lines, which are much stronger in the subsutural zone. Spiral sculpture of a few evenly spaced punctulated grooves. Columella and body whorl gently curved. Outer lip broken. The siphonal canal is rather long. Dimensions: height of the shell 24,7 mm, breadth 11.0 mm; height of the aperture 14.6 mm, breadth 5.0 mm.

X. heterogramma can be separated from the other *Xanthodaphne* species by its slightly reddish pink colour, less shouldered whorls and sculpture consisting of few punctulate spiral lines. *X. charcotiana* has the same sculpture but the outlines are broader, the siphonal canal shorter and the spiral lines stronger.

Xanthodaphne bruneri (Verrill, 1884) Figs 12,134,234.

Pleurotomella bruneri Verrill, 1884: 155, pl. 31, fig. 7-7a.
Type material: holotype in USNM 34846.
Type locality: USFC st 2038, 38°31N, 69°08W, 3400 m.
Material examined: the holotype and NORATLANTE st B17, 45°13N, 05°31W, 4700 m, 1 spm; BIACORES st 202, 37°26N, 25°00W, 2900 m, 1 sh; BIOGAS st CV30, 47°26N, 10°20W, 4518 m, 1 spm, 1 sh; st CP16, 46°27N, 10°26W, 4825 m, 2 spms; st CP22, 44°23N, 04°55W, 4475 m, 1 spm; INCAL st WS05, 46°03N, 10°16W, 4804 m, 1 sh; st CP13, 46°02N, 10°15W, 4800 m, 2 shs; METEOR st 36-99, 21°38N, 18°41W, 2971 m, 1 spm; WALDA, no loc., 2 shs; CINECA III st B31, 29°36N, 11°04W, 1500 m, 1 larval sh.

Distribution. North Atlantic, abyssal.

Remarks. The animal is blind and lacks an operculum.

X. bruneri is easily recognized by its evenly rounded whorls and extremely deep subsutural sinus.

Xanthodaphne leptalea (Bush, 1893) Figs 11,139.

Pleurrotoma leptalea Bush, 1893: 208, pl. 2, fig. 5-5a.
Thesbia folini Locard, 1897: 220, pl. 10, figs 1-4.
Type material: P. leptalea: holotype in MCZ 119127; *T. folini:* holotype in MNHN.
Type locality: P. leptalea: BLAKE st 325, 33°35N, 76°00W, 1165 m; *T. folini:* TALISMAN st 40, 30°03N, 11°46W, 2212 m.
Material examined: the type material and MONACO st 3006, 43°21N, 10°02W, 2779 m, 1 sh; BIACORES st 163, 37°27N, 26°03W, 2350 m, 1 sh.

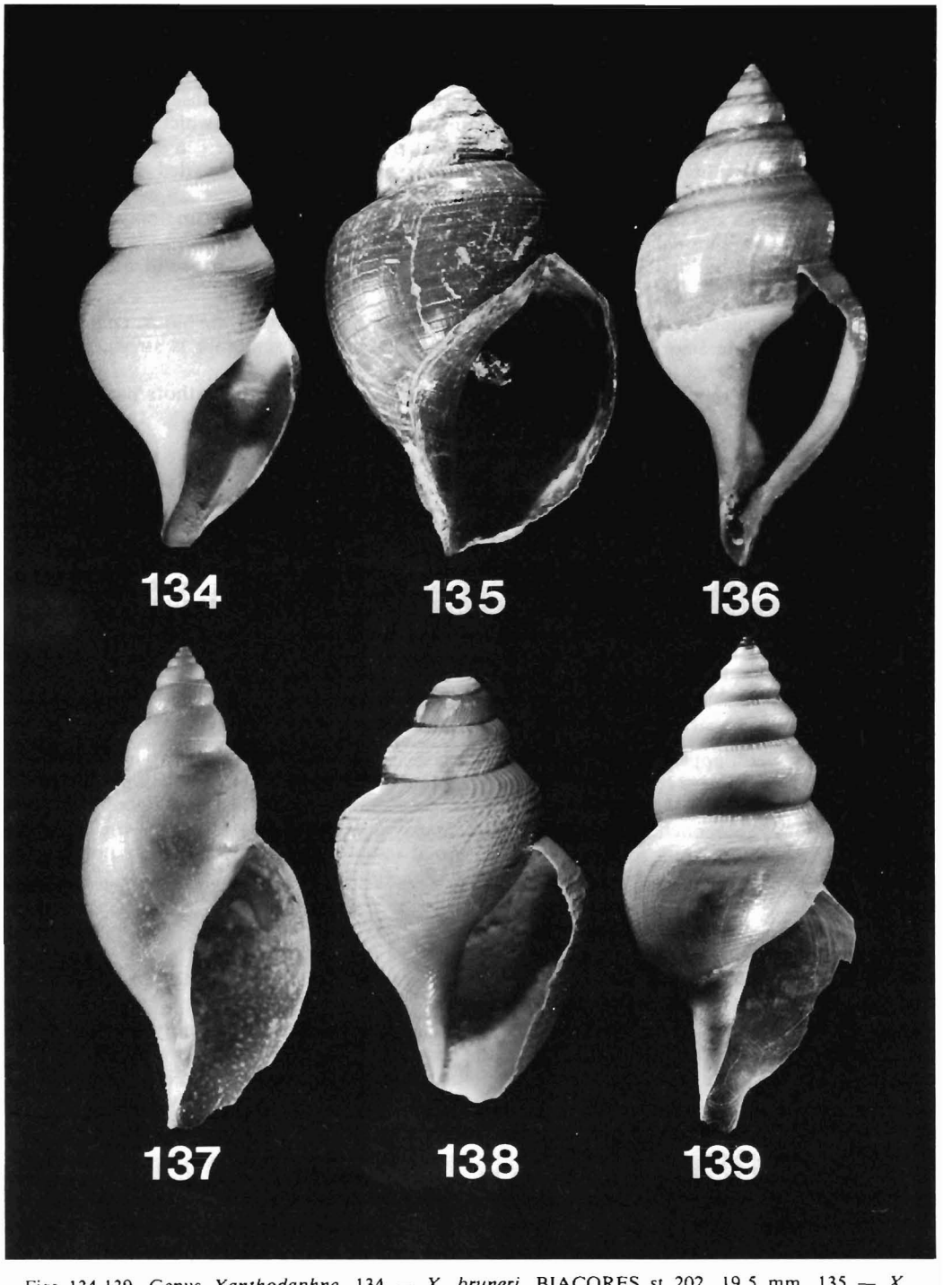
Distribution. Only known from the material examined.

Remarks. The animal lacks operculum and eyes.

X. leptalea resembles slender specimens of *X. bruneri* but that species has more inflated larval whorls, stronger sculpture and a dull, rather coarse and greyish shell, instead of a polished light shell. *X. dalmasi* has a more slender shell and fainter sculpture than *leptalea:* its larval shell is also larger with the whorls more inflated than in *leptalea.* Possibly *leptalea* and *tolini* may prove not to be conspecific, but the variation of the material examined makes us more inclined to unite them.

Xanthodaphne charcotiana **n.sp.** Fig. 135.

Type material: holotype in MNHN.
Type locality: INCAL st WS07, 47°31N, 09°37W, 4280 m.
Material examined: the holotype and INCAL st WS03, 48°19N, 15°23W, 4829 m, 1 spm; st WS08, 47°30N, 09°34W, 4287-4301 m, 1 spm.



Figs 134-139. Genus *Xanthodaphne*. 134 — *X. bruneri,* BIACORES st 202, 19.5 mm. 135 — *X. charcotiana,* holotype. 136 — *X. heterogramma,* BIACORES st 202, 24.7 mm. 137 — *X. dalmasi,* holotype. 138 — *X.* n.sp., INCAL st 0S01, 7.6 mm. 139 — *X. leptalea,* TALISMAN st 40 (holotype of *folini*).

Distribution. Only known from the material examined.

Description. Shell solid, of a general pinkish brown colour, composed of 4.5 postlarval whorls. The apex, that is the larval shell and probably some part of the first post-larval whorls, is strongly corroded. The whorls are very convex with a moderately deep suture. The subsutural sinus zone is broad and slightly concave. The axial sculpture consists of incremental lines, which are stronger just below the suture and rather obsolete on the main part of the whorl. There is a spiral scupture of punctulate grooves, which are rather widely spaced, although more crowded just below the subsutural zone. The aperture is broken but, judging from incremental scars, is evenly convex in profile. The columella and the body whorl form a regular curve, with the inner lip thinly covering the columellar wall. The siphonal canal is short and broad.
Dimensions: height of the shell 25.8 mm, breadth 14.5 mm; height of the aperture 16.6 mm, breadth 7.9 mm.

Remarks. The punctulate spiral sculpture is shared only with *X. heterogramma* but *X. charcotiana* is broader at comparable sizes, with more convex whorls; its spiral sculpture is stronger and the siphonal canal is shorter.

The specific name honours N.O. *Jean-Charcot,* on board of which the authors participated in "campagne INCAL".

Xanthodaphne dalmasi (Dautzenberg & Fischer, 1897) Figs 28,137,236-237.
Pleurotoma dalmasi Dautzenberg & H. Fischer, 1897: 153, pl. 3, fig. 4.
Type material: holotype in MOM.
Type locality: MONACO st 184, 40°05N, 27°28W, 1850 m.
Material examined: the holotype and BIACORES st 202, 37°26N, 25°00W, 2900 m, 1 sh; MONACO st 211, 39°18N, 31°12W, 1372 m, 1 sh; st 233, 38°33N, 28°09W, 1300 m, 8 shs; st 553, 37°43N, 25°05W, 1385 m, 1 sh; st 578, 38°26N, 26°31W, 1165 m, 3 shs; st 624, 38°59N, 28°18W, 2102 m, 2 shs; st 683, 38°20N, 28°05W, 1550 m, 2 shs; st 698, 39°11N, 30°45W, 1846 m, 1 sh; st 703, 39°21N, 31°06W, 1360 m, 2 shs; st 719, 39°11N, 29°06W, 1600 m, 1 sh; st 1334, 39°30N, 29°02W, 1900 m, 1 sh; st 1349, 38°35N, 28°06W, 1250 m, 4 shs; st 1713, 28°04N, 16°50W, 1340-1530 m, 6 shs; PORCUPINE st 17, 39°42N, 09°43W, 1980 m, 14 shs.

Distribution. Only known from the material examined.

Remarks. The general appearance of *X. dalmasi* is a little reminiscent of that of some *Lusitanops,* but can readily be separated by the presence of a subsutural sinus zone, which, however, is fainter in *dalmasi* than in other *Xanthodaphne* species. The most similar species are *Lusitanops hyaloides,* which has a blunt protoconch, not pointed as in *dalmasi,* and *Gymnobela subaraneosa* which has a well-defined subsutural sinus zone and stronger spiral (axial sometimes wanting) sculpture. The species mentioned as *P. dalmasi* by Geronimo & Panetta 1973:88, pl. 2, fig. 1 is *Gymnobela subaraneosa.*

Xanthodaphne **n.sp.** Figs 138,235.
Material examined: INCAL st OS01, 50°14N, 13°11W, 2634 m, 1 sh; SARSIA st 7614, 43°43N, 03°38W, 1100 m, 1 sh; CINECA III st B31, 29°36N, 11°04W, 1500 m, 2 shs.

Remarks. The four shells examined are young or very young specimens, evidently belonging to an undescribed species of *Xanthodaphne,* but in the absence of an adult we prefer not to describe it. The larval shell is sculptured by thin perpendicular axial ribs and spiral lines, and is bigger than in all species except *X. dalmasi.* The whorls increase rapidly. The adult probably has a red-tinted columella. It is excluded that this can be the young of *X. charcotiana.*

Genus *OENOPOTA* Mörch, 1852

Type species: *Fusus pleurotomarius* Couthouy, 1838, subsequent designation Dall, 1918.

We follow Powell (1966) and Bartsch (1941) and regard *Lora* as a substitute for *Defrancia,* the type of which is *D. pagoda,* which species to us seems to be close to *Philbertia* as Glibert (1954) supposed.
Synonyms:
Propebela Iredale, 1918, type species *Murex turricula* Montagu, 1803, original designation.

Turritoma Bartsch, 1941, type species *Turritoma exquisita* Bartsch, 1941, original designation. (Not *Turritoma* Ulrich & Scofield, 1897).
Turritomella Bartsch, 1941a, a new name for *Turritoma* Bartsch, 1941.
Nodotoma Bartsch, 1941, type species *Pleurotoma impressa* Mörch, 1869.
Funitoma Bartsch, 1941, type species *F. areta* Bartsch, 1941, original designation.
Cestoma Bartsch, 1941, type species *Funitoma (Cestoma) eurybia* Bartsch, 1941, original designation.
Granotoma Bartsch, 1941, type species *Bela krausei* Dall, 1886, original designation.
Nematoma Bartsch, 1941, type species *N. hokkaidoensis* Bartsch, 1941, original designation.
Curtitoma Bartsch, 1941, type species *C. hecuba* Bartsch, 1941, original designation.
Venustoma Bartsch, 1941, type species *V. harucoa* Bartsch, 1941, original designation.
Canetoma Bartsch, 1941, type species *C. tersa* Bartsch, 1941, original designation.
Belalora Powell, 1951, type species *B. thielei* Powell, 1951, original designation.
Lorabela Powell, 1951, type species *Bela pelseneeri* Strebel, 1908, original designation.
Having examined Bartsch's type material in USNM and also having some experience of the variation of arctic species of *Oenopota,* we cannot accept any of the genera proposed by Bartsch (1941). We are also convinced that if Powell had seen such species as *O. tenuicostata, O. elegans, O. declivis* and *O. pyramidalis,* which show all transitions from sinuated to nonsinuated outer lip, even within the species, he would never have proposed his genera. He also misinterpreted the larval shell of *Belalora* and considered 1.5 postlarval whorls as belonging to the larval shell.

Even if the species enumerated here are variable, everyone who has been in contact with arctic shallow-water material of the group will know that their variability is small compared with what appears in arctic forms. The variable physical conditions of the arctic area and the strong tendency for a species there to be split into isolated populations, in combination with the direct development, are factors strongly promoting high variation.

The genus as treated here is certainly not homogeneous, but its division into groups certainly does not follow the outlines drawn up by Bartsch (1941) and Powell (1966): *Oenopota convexigyra* goes into a group by itself, *O. ovalis* into another group and finally, the remaining species into one group.

The species of *Oenopota* are not very easy to separate as the large degree of variation tends to hide the limits of the species, but the following remarks may perhaps make separation easier:
O. convexigyra is more slender than any other species; it has sinuated axial ribs, or better, incremental lines; the whorls are very slowly increasing and the spiral sculpture very regular.
O. tenuicostata has a sculpture of sinuated axial ribs, a smooth rounded larval shell and a very broad and well-defined, slightly-excavated callous deposit on the body whorl.
O. elegans also has sinuous axial ribs, but the shell is much more slender and the larval shell has some strong spiral keels.
O. dictyophora has much the same outlines as *O. tenuicostata* and also a smooth, rounded larval shell, but the axial ribs are not sinuous, and run straight from the suture to the periphery where they are distinctly angulated and go on straight downwards. Also the callus of the parietal wall differs in being much less developed and more narrow.
O. ovalis has a short rounded aperture, poorly developed siphonal canal, smooth rounded larval shell and almost straight axial ribs.
O. scalaris is the biggest species. The shell is usually white or greyish white. The subsutural zone is well defined and usually rather flat but the whorls are well and evenly rounded below it. The outline is less cylindrical or ovate than in any other species of the genus, but instead rather rhombic.
O. violacea has a very poorly developed subsutural zone, which is strongly sloping and almost unnoticeably merges with the main part of the whorl. The sculpture is most variable but usually a few spiral cords are dominant. The larval shell is rather pointed and upturned and has some low spiral ribs.
O. turricula has very strong axial sculpture of solid, straight, broad and high ribs. The larval shell is high and upturned. The whorls are strongly shouldered. This is a shallow water species.
O. graphica has strongly shouldered whorls, a sharp sculpture, a low aperture and straight or very slightly curved axial ribs which are strongly angulated at the periphery.
O. trevelliana has rather ovate outlines, a not very well defined subsutural zone, a rather low and flattened larval shell and a not very heavy sculpture.
O. bergensis has distinctly shouldered whorls, a rather low larval shell, cylindrical whorls and a distinct siphonal canal.

A number of species of *Oenopota* have been excluded from the area. They are arctic and the records from the area treated here depend on misidentifications.
O. declivis: Sykes 1906: 175. The material in BMNH consisted of a mixture of species treated in this paper.
O. decussata: Sykes (1906). Ditto.
O. exarata: Sykes (1906). Ditto.
O. harpularia: Grieg 1931: 5. This is *Amphissa haliaeeti* (Jeffreys).
O. nobilis: Locard 1896: 139. The material has not been found, but knowing that hardly a single specimen of *Oenopota,* beside the probable types, had been correctly identified, and then probably only by chance, we do not consider this record of any value.
O. simplex: Locard 1896: 140, as *Bela simplicata.* This is *Amphissa haliaeeti.*

Oenopota ovalis (Friele, 1877) Figs 144,258-259.

Pleurotoma ovalis Friele, 1877: 9, fig. 5.
Bela pygmaea Verrill, 1882: 460, pl. 57, fig. 8.
Pleurotoma exigua Jeffreys, 1883: 399, pl. 44, fig. 10.
Bela pygmaea var. *attenuata* Locard 1897: 143.
Type material: P. ovalis: lectotype and *c.* 12 paralectotypes in ZMB; *B. pygmaea:* holotype in USNM 37858; *P. exigua:* holotype in BMNH 85.11.5.4580.
Type locality: P. ovalis: Norwegian North-Atlantic expedition st 40, 63°22N, 05°29W, 2222 m; *B. pygmaea:* not designated, but one of few USFC stations off New England, bathyal; *P. exigua:* TRITON st 13, 59°51N, 08°18W, 1020 m.
Material examined: the type material and about 25 samples from the abyssal parts (930-2700 m) of the Norwegian sea (Bouchet & Warén, 1979); THOR st 76, 49°27N, 13°33W, 2100 m, 1 sh; st 167, 63°05N, 20°07W, 557 m, 1 sh; CAUDAN st 3, 46°26N, 06°58W, 1710 m, 2 shs; THALASSA st Z400, 47°33N, 07°19W, 1175 m, 3 shs; st Z407, 47°44N, 08°07W, 1085-1115 m, 4 spms + shs; st Z409, 47°43N, 08°02W, 1035-1080 m, 7 shs; CHALLENGER II st 12, 56°49N, 10°15W, 2076 m, 19 spms + shs; NORATLANTE st E1, 53°55N, 17°53W, 2440 m, 4 shs; BIOGAS st DS23, 46°33N, 10°21W, 4734 m, 1 sh; st DS58, 47°34N, 09°08W, 2775 m, 5 spms + shs; st DS65, 47°36N, 08°40W, 2360 m, 1 spm; st DS74, 47°33N, 09°08W, 2777 m, 1 sh; INCAL st DS01, 57°59N, 10°40W, 2091 m, 50 spms + shs; st DS02, 57°59N, 10°49W, 2081 m, 55 spms; st DS03, 57°25N, 11°04W, 609 m, 1 sh; st CP01, 57°57N, 10°55W, 2068 m, 7 spms; st CP02, 57°58N, 10°44W, 2091 m, 5 spms.

Distribution. Beside the material examined, *Oenopota ovalis* has been mentioned from West of the British Isles by Sykes (1906: 177) and Massy (1930: 322) and from off Portugal (Sykes 1906). It would thus seem that the species is widespread in the whole northern N. Atlantic.

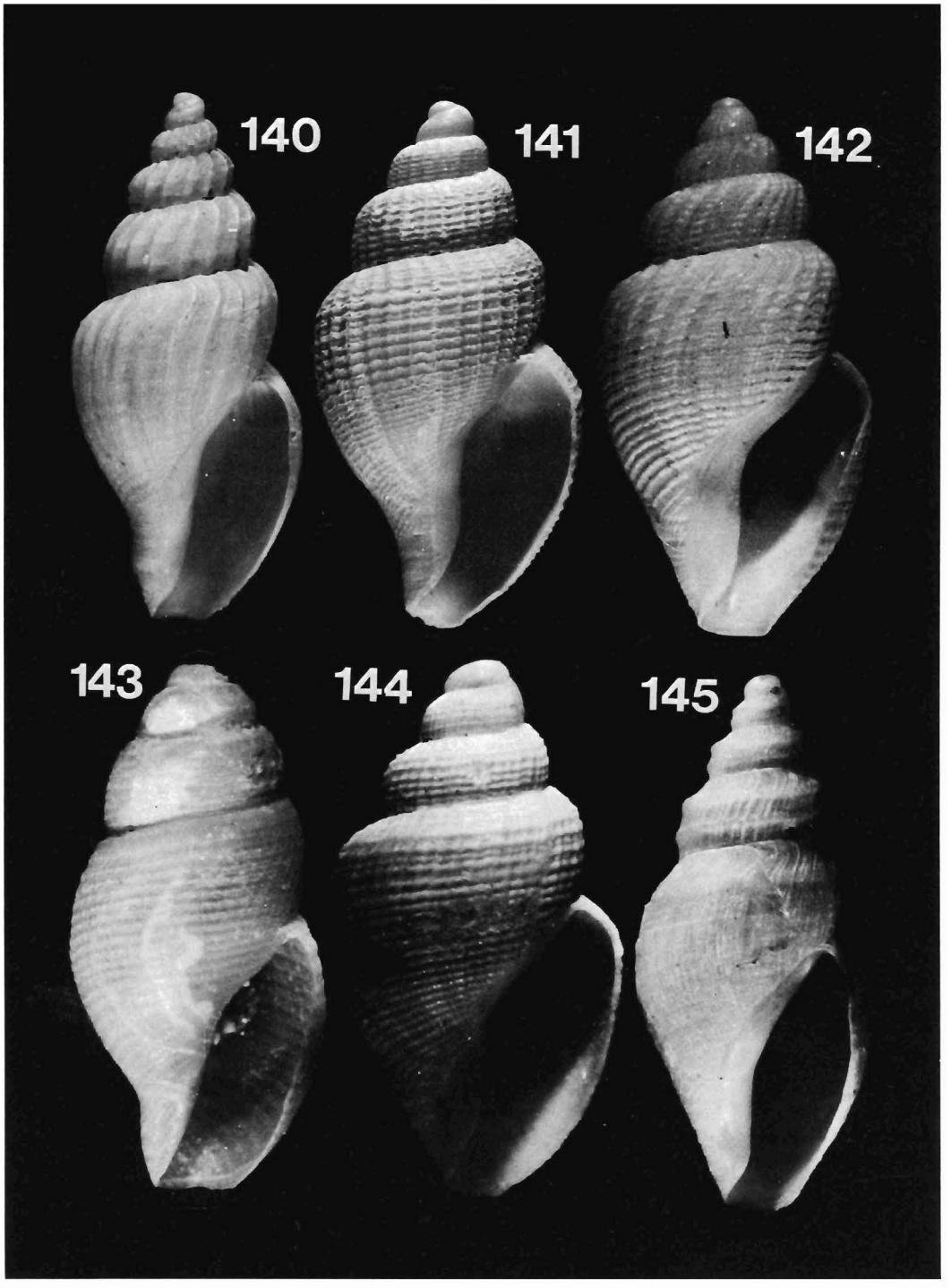
Remarks. This species is nearest to *O. dictyophora* but may be separated by its short siphonal canal, fainter sculpture and more regularly rounded aperture. The protoconch shows considerable variation in size: diameter 840—880 μm in the Norwegian sea and the deepest stations in the W. European basin, only 660 μm in a population from the upper bathyal of the Bay of Biscay; all intermediates, however, have been observed. The species has direct or lecithotrophic larval development.

Juveniles of *Admete inflata* Friele (Cancellariidae) are very similar but can be separated by their umbilical chink.

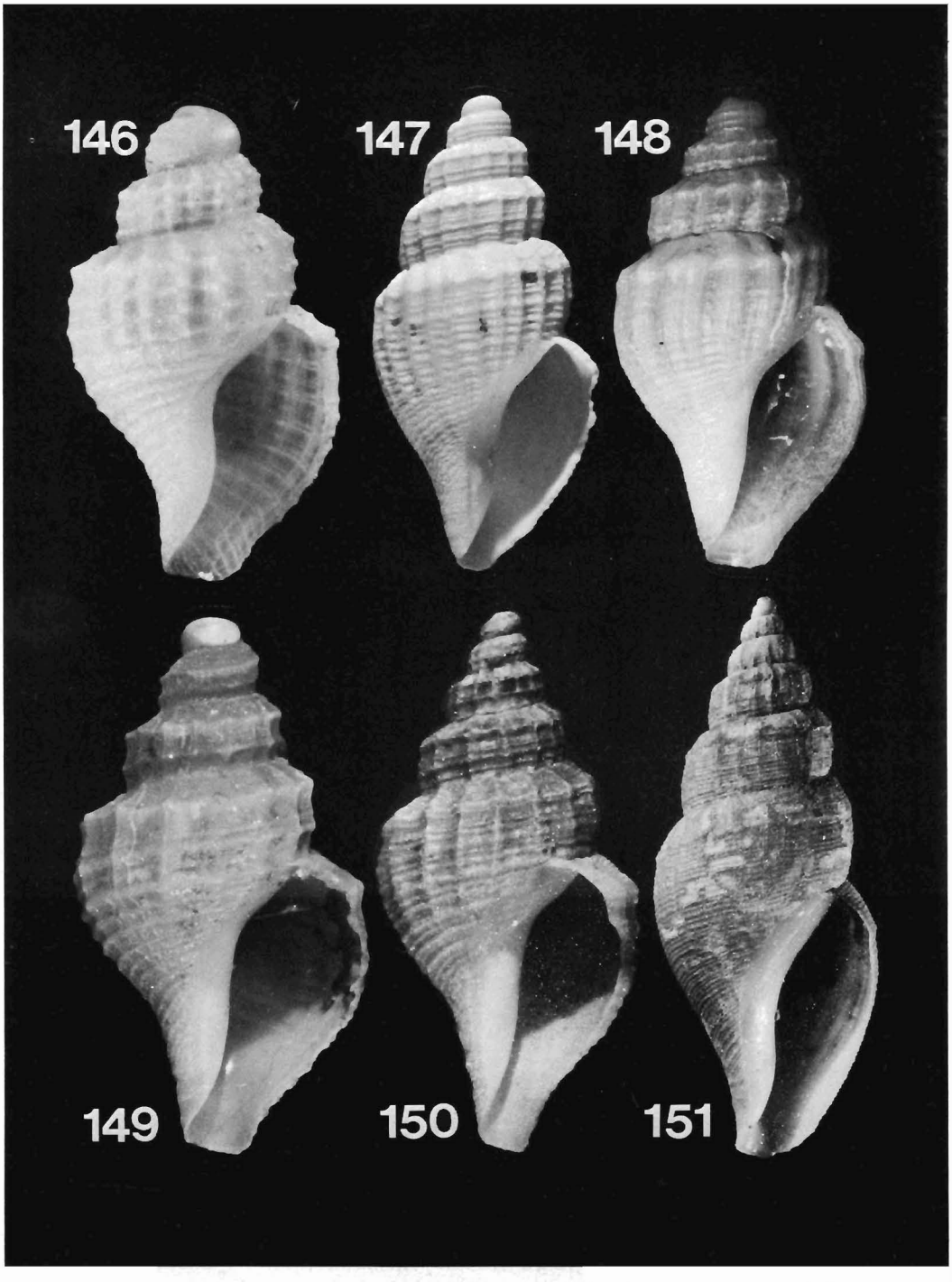
Oenopota dictyophora **n.sp.** Figs 39,141,260.

Type material: holotype and 14 paratypes in MNHN.
Type locality: northern part of the bay of Biscay, 47°36N, 08°40W, 2360 m.
Material examined: the type material and BIOGAS, DS 16, 47°36N, 08°40W, 2325 m, 1 sh; DS 52, 44°06N, 04°22W, 2006 m, 6 spms and shs; NORATLANTE, B 20, 47°41N, 08°06W, 1160 m, 2 shs; INGOLF, st 90, 64°45N, 29°06W, 1070 m, 1 sh; st 10, 64°24N, 28°50W, 1484 m, 7 shs; CHALLENGER II, 56°49N, 10°15W, 2076 m, 2 shs; THOR 1903, st 76, 49°27N, 13°33W, 2100 m, 2 spms; st 164, 62°10N, 19°36W, 1900 m, 1 sh.

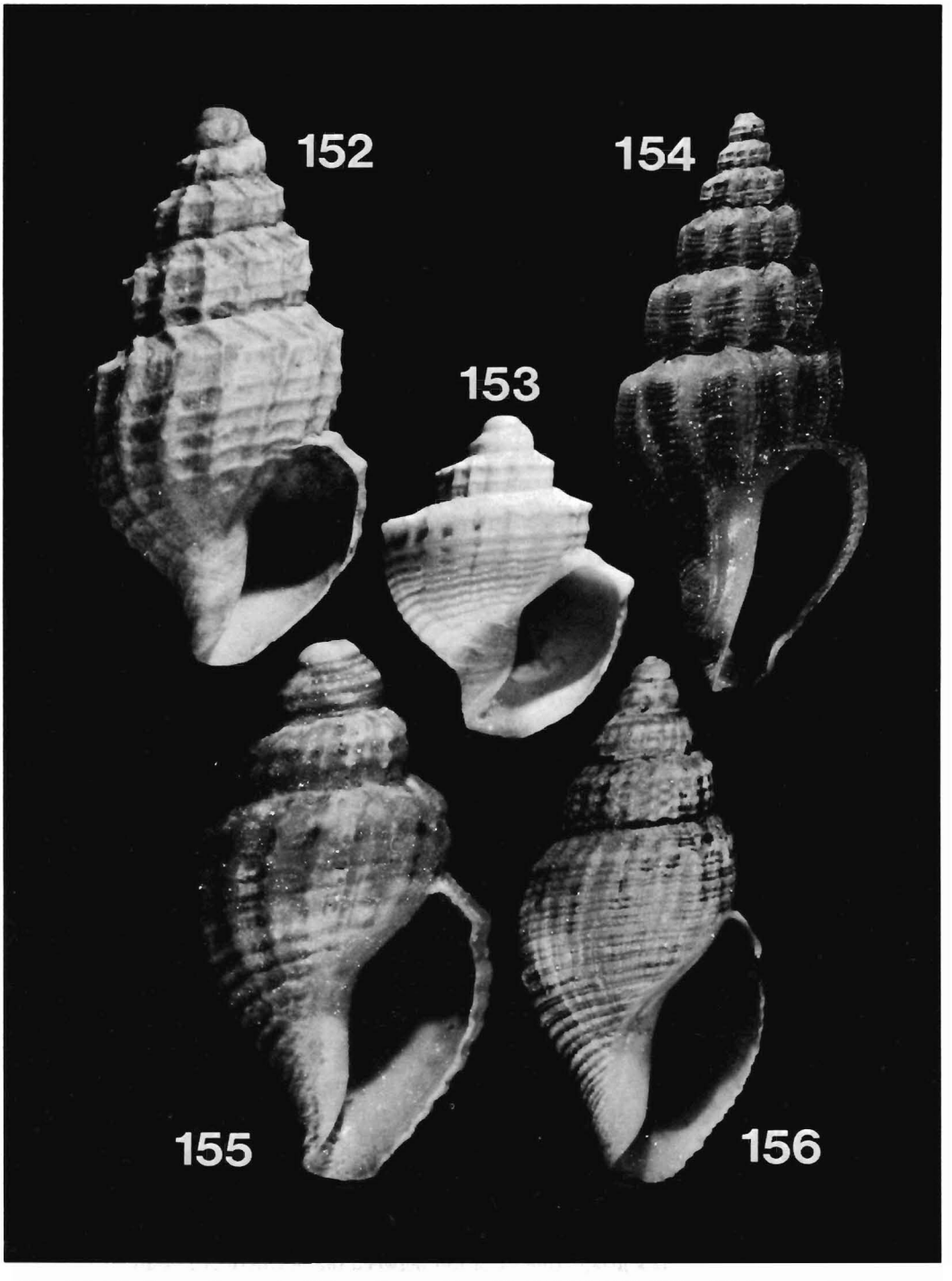
Distribution. Only known from the material examined.
Description. Shell solid, chalky white, consisting of 4-5 whorls, roughly ovate in outline. Apex blunt, almost smooth although very fine spiral lines appear under the microscope. The sculpture consists of axial, nearly straight, ribs crossed by fainter spiral threads, giving the surface a reticulate appearance. Sinus zone not marked. Whorls convex in their upper half, more cylindrical below.



Figs 140-145. Genus *Oenopota*. 140 — *O. elegans*, Bergen area 270 m, 13.6 mm. 141 — *O. dictyophora*, holotype. 142 — *O. tenuicostata*, Bergen area 245 m, 7.9 mm. 143 — *O. convexigyra*, holotype. 144 — *O. ovalis*, THALASSA st Z409, 4.3 mm. 145 — *O. violacea*, Bergen area 440-500 m, 8.15 mm.



Figs 146-151. Genus *Oenopota*. 146 — *O. bergensis,* Bergen area 300-330 m, 4.2 mm. 147 — *O. bergensis,* same locality, 8.5 mm. 148 — *O. bergensis,* THALASSA st X345, 8.07 mm. 149 — *O. scalaris,* INGOLF st 35, 4.1 mm. 150 — *O. scalaris,* Bergen area 285 m, 16.9 mm. 151 — *O. scalaris,* INGOLF st 138, 22.9 mm.



Figs 152-156. Genus *Oenopota*. 152 — *O. graphica,* TRAVAILLEUR 1882 off Morocco, 6.45 mm (southern form). 153 — *O. graphica,* CHALLENGER II st 13, 4.14 mm (northern form). 154 — *O. turricula,* Bergen area, 12.7 mm. 155 — *O. trevelliana,* Bergen area, 4.2 mm. 156 — *O. trevelliana,* Öresund 20-30 m, 8.5 mm.

Suture deep. Aperture ovate, angulated at the junction between body whorl and columella. Siphonal canal comparatively long, curved towards the columella.
Dimensions: height of the shell 7.35 mm, breadth 3.7 mm; height of the aperture 3.9 mm, breadth 1.35 mm.

Remarks. An operculum is present. The animal is blind. *O. dictyophora* resembles *O. tenuicostata* a little but is easily separated from that species by having straight ribs instead of curved ones. From *O. ovalis,* it can be separated by having reticulated instead of mainly spiral sculpture.

Oenopota convexigyra **n.sp.** Fig 143.

Type material: the holotype and one paratype in MNHN (both empty shells).
Type locality: BIACORES st 126, 39°19N, 33°47W, 3360 m (west of Flores I., Azores).
Material examined: only known from the type material.

Description. Shell solid, glassy, dirty white, consisting of at least 3 whorls (apex corroded), ovate in general outline. Whorls very evenly convex, suture moderately deep. The sinus zone does not differ from the other parts of the shell. The sculpture consists of regular spiral lines crossed by fainter, flexuous, axial threads marking the position of the sinus. Aperture regularly ovate. There is no marked angle between the columella and the body whorl. Siphonal canal very short.
Dimensions: height of the shell 3.8 mm (apex corroded), breadth 2.0 mm; height of the aperture 2.0 mm, breadth 0.72 mm.

Remarks. This species is probably not an *Oenopota* but is more similar to some species of this genus than to other genera. It has also some resemblance to *Thesbia. Oenopota convexigyra* can be separated from *O. ovalis* by being much more slender, the whorls regularly convex and not shouldered.

Oenopota turricula (Montagu, 1803), Figs 154,267.

Murex turricula Montagu, 1803: 262, pl. 9, fig. 1.
Type material: holotype in Royal Albert Museum, Exeter.
Type locality: Sandwich, Kent, Great Britain.
Material examined: about 20 samples with 50 spms and shs from Southern Scandinavia, Öresund to Bergen area, in 20-130 m, coll. AW.

Distribution. We do not know the distribution of *O. turricula* since many other species have sometimes been reported under this name. Records of the species south of the British Isles refer probably to fossil shells (e.g. Locard, 1897: 250; Monterosato, 1881: 2); a shell from THALASSA st Z398, 47°36N, 07°17W, 330 m was collected together with glacial deposits of *Chlamys islandicus.*

Remarks. The species has its main distribution well above 300 m but has been included here because of risks of confusion with other species.

Oenopota graphica (Locard, 1897) Figs 38,152-269.

Bela graphica Locard, 1897: 257, pl. 13, figs 1-6, with var. *ventricosa* Locard, 1897: 259.
Taranis monterosatoi Locard, 1897: 376, pl. 18, figs 15-17.
Type material: B. graphica: 2 syntypes in MNHN; *T. monterosatoi:* lectotype in MNHN.
Type locality: B. graphica: TRAVAILLEUR 1882, drag. 40, 33°09N, 09°38W, 1900 m; *T. monterosatoi:* TRAVAILLEUR 1881, drag. 1, 43°01N, 09°38W, 2018 m.
Material examined: the type material and 5 shs from TRAVAILLEUR 1882 off Portugal and/or Morocco (confused labels); INCAL st DS01, 58°00N, 10°40W, 2091 m, 27 spms; st DS02, 57°59N, 10°49W, 2081 m, 17 spms; st CP01, 57°58N, 10°55W, 2068 m, 4 spms; CHALLENGER II st 12, 56°49N, 10°15W, 2076 m 3 spms; st 14, 56°45N, 09°46W, 1770 m, 9 spms; PORCUPINE 1870, off Cadiz, 700 m, 5 shs; st 17, 38°42N, 09°43W, 1980 m, 4 shs; TRAVAILLEUR 1881, drag. 35, 38°18N, 09°24W, 1367 m, 5 shs.

Distribution. Only known from the material examined.

Remarks. The species exhibits considerable variation between the northern and southern part of its distribution in the broadness of the shell. In this respect we had considered the populations from West of the British Isles a distinct species until we studied the PORCUPINE material, which made us feel that there is continuous variation along the continental slope of Western Europe.

O. graphica can be identified by its short aperture and shouldered whorls.

Oenopota bergensis (Friele, 1886) Figs 146-148,265.

Bela rugulata var. *bergensis* Friele, 1886: 4, pl. 7, fig. 5, pl. 9, figs 7-8.
Bela furfuraculata Locard, 1897: 254, pl. 21, figs 9-11.
Bela detegata Locard, 1897: 256, pl. 21, figs 12-14.
Type material: B. rugulata var. *bergensis:* syntypes in ZMB and BMNH; *B. detegata* and *furfuraculata:* holotypes in MNHN.
Type locality: bergensis: Bergen area in 180 m; *furfuraculata:* TRAVAILLEUR 1882, drag. 40, 33°09N, 09°38W, 1900 m; *detegata:* TRAVAILLEUR 1881, drag. 37, 44°10N, 10°38W, 400 m.
Material examined: the types mentioned above and THALASSA st X304, 44°05N, 05°05W, 515-532 m, 1 sh; st X343, 44°07N, 04°39W, 600-655 m, 1 sh; st X345, 44°06N, 04°41W, 525-550 m, 1 spm; INGOLF st 8, 63°56N, 24°40W, 256 m, 1 sh; st 85, 63°21N, 25°21W, 320 m, 1 spm, 1 sh; THOR st 166, 62°57N, 19°58W, 957 m, 4 shs; 44°35N, 02°07W, 400-420 m, 1 sh, Lagardère coll.; 23 samples with about 90 spms and shs from the Bergen area, 150-350 m, coll. AW; TRAVAILLEUR 1882 (mixture of stations), 18 shs.

Distribution. Beside the material examined, *O. bergensis* is known from Sognefjord and Ramsdalfjord, north of Bergen.

Remarks. Oenopota bergensis can be separated by its big, obtuse protoconch, 850-1000 μm in diameter, and the glassy whitish shell. In *O. turricula* the protoconch is smaller (680-740 μm), more pointed, and the adult shell is chalky and often reddish.

Oenopota elegans (Möller, 1842) Figs 140,266.

Defrancia elegans Möller, 1842: 86.
Type material: in ZMC.
Type locality: Western Greenland.
Material examined: about 25 samples with 140 spms and shs from Southern Scandinavia, 150-545 m, coll. AW; INGOLF st 54, 63°08N, 15°40W, 1301 m, 1 spm, 1 sh; st 126, 67°19N, 15°52W, 552 m, 4 spms; THOR st 99, 61°15N, 09°35W, 900 m, 3 shs; st 164, 62°10N, 19°36W, 1900 m, 2 shs; THALASSA st Y409, 40°34N, 09°22W, 405 m, 2 shs; st Z409, 47°43N, 08°02W, 1035-1080 m, 1 sh; st Z422, 48°21N, 09°39W, 1175 m, 1 sh; st Z435, 48°40N, 09°53W, 1050 m, 1 spm; NORBI st CP11, off Tromsö, 350 m, 1 spm.

Distribution. Norway, Iceland, W. Greenland, the Kara sea, Novaya Zemlya, the Siberian arctic sea and the Bering sea (Thorson, 1941:99); the present material extends the known distribution south of the Wyville-Thomson ridge to the Bay of Biscay.

Remarks. O. elegans may always be identified by its strongly carinated protoconch and the strong flexuous axial ribs.

Oenopota scalaris (Möller, 1842) Figs 149-151,268.

Defrancia scalaris Möller, 1842: 85.
Type material: probably in ZMC (not seen).
Type locality: Western Greenland.
Material examined: INGOLF st 27, 64°54N, 55°10W, 740 m, 1 sh; st 32, 66°35N, 56°38W, 599 m, 2 spms, 1 sh; st 35, 65°16N, 55°05W, 682 m, 5 spms; st 59, 65°00N, 11°16W, 584 m, 1 spm, 1 sh; st 105, 65°34N, 07°31W, 1435 m, 1 sh; st 116, 70°05N, 08°26W, 699 m, 1 spm, 2 shs; st 124, 67°40N, 15°40W, 932 m, 1 sh; st 126, 67°07N, 09°30W, 835 m, 1 sh; st 167, 63°05N, 20°07W, 557 m, 1 sh; west of Faeroes, from stomach of *Anarrhichas latifrons,* 420 m, 1 spm; about 30 samples with 80 spms and shs, mainly from the Bergen area, 150-300 m, coll. AW.

Distribution. No general distribution can be given for *O. scalaris* which has usually been mixed up with several other species of the genus.

Remarks. We have not included any synonymy because of the confusion of the genus in the arctic area.

Young *O. scalaris* may be identified by their very strong, almost spiny, sculpture and by the sculpture of the early postlarval shell. The surface of the juvenile whorls is often corroded in adult specimens, but these may then be identified by their large size, up to 32 mm, and the rhomboid outlines of the shell.

Oenopota tenuicostata (G.O. Sars, 1878) Figs 142,262-263.

Pleurotoma tenuicostata M. Sars 1868: 259 (nomen nudum); G.O. Sars 1873: 80 (nom. nud.); Friele 1874: 308 (nom. nud.); Jeffreys, 1877: 329 (nom. nud.).

Bela tenuicostata G.O. Sars, 1878: 237, pl. 17, fig. 1.
Pleurotoma (Bela) willei Friele, 1877: 9; 1879: 276, pl. 4, fig. 4; 1886: 14, pl. 8, figs 16-17.
Type material: B. tenuicostata: syntypes in ZMO; *P. willei:* syntypes in ZMB.
Type locality: B. tenuicostata: Lofoten, Norway, 540 m; *P. willei:* see below under remarks.
Material examined: the type material and about 50 samples with 230 spms and shs from the Bergen area, Norway, 200-400 m, coll. AW; INGOLF st 11, 64°34N, 31°12W, 2448 m, 1 sh; st 36, 61°50N, 56°21W, 2702 m, 14 shs; st 37, 60°17N, 54°05W, 3229 m, 1 spm, 1 sh; st 59, 65°00N, 11°16W, 584 m, 1 sh; st 126, 67°19N, 15°52W, 552 m, 3 shs; st 138, 63°26N, 07°56W, 887 m, 1 spm; st 139, 63°36N, 07°30W, 1322 m, 18 spms and shs; THOR st 99, 61°15N, 09°35W, 900 m, 40 spms and shs; st 167, 63°05N, 20°07W, 557 m, 1 sh; MICHAEL-SARS st 70, 42°59N, 51°15W, 1100 m, 6 spms; INCAL st DS02, 57°59N, 10°49W, 2081 m, 6 spms, 1 sh; st CP02, 57°58N, 10°44W, 2091 m, 1 spm; and the material of Friele.

Distribution. Panarctic (Thorson, 1941: 107). On the European side, it reaches as far south as the northern Rockall Trough in bathyal depths; on the American side, it occurs in similar depths down to New England.

Remarks. Characteristic features of the species are the flexuous axial sculpture, well-marked sinus and smooth, obtuse protoconch (on very well preserved specimens only, fine spiral threads can be seen under the microscope).

The name *tenuicostata* has been used here because it is in general use for the present species, but it has two older synonyms: *P. willei* was published the year before, but Friele himself never illustrated the type specimen (originating from Norwegian North-Atlantic expedition st 18 or 40). We have examined these samples and they are conspecific with *tenuicostata.* Later Friele restricted his own use of *willei* to a form with stronger axial sculpture and the illustrated specimen of 1879 and 1886 comes from st 312, West of Spitzbergen, 1203 m. See also under *O. violacea* for the nomenclatorial discussion regarding that name.

Oenopota violacea (Mighels & Adams, 1842) Figs 145,261.

Pleurotoma bicarinata Couthouy, 1838: 104, pl. 1, fig. 11. Not *Pleurotoma bicarinata* W. Wood,1828.
Pleurotoma violacea Mighels & Adams, 1842: 51, pl. 4, fig. 21.
Bela minuscularia Locard, 1897: 259, pl. 12, figs 28-30.
Type material: P. bicarinata: lost (Johnson, 1946); *P. violacea:* see below under remarks; *B. minuscularia:* holotype in MNHN.
Type locality: P. violacea: east of Nahant, Massachusetts, USA; *B. minuscularia:* TRAVAILLEUR 1881, drag. 1, 43°01N, 09°38W, 2018 m.
Material examined: the type of Locard and about 70 samples with 400 spms and shs from southern Scandinavia, 80-350 m, coll. AW; THOR st 166, 62°57N, 19°58W, 957 m, 2 shs; st 167, 63°05N, 20°07W, 557 m, 1 sh; INGOLF st 85, 63°21N, 25°21W, 975 m, 2 shs; st 124, 67°40N, 15°40W, 932 m, 1 spm; THALASSA st X348, 44°07N, 04°43W, 600-900 m, 1 sh; st Z414, 48°05N, 08°30W, 650 m, 1 sh; st Z 415, 48°07N, 08°26W, 380 m, 1 sh; INCAL st DS03, 57°25N, 11°03W, 609 m, 1 spm, 1 sh; TRAVAILLEUR 1881, drag. 1, 18 shs; drag. 4, 38°09N, 09°44W, 2505 m, 3 shs.

Distribution. Panarctic-circumpolar (Thorson 1941: 107); the species had already been recorded from W. of Ireland in 990 m (Massy, 1930: 323).

Remarks. O. violacea is quite variable both in sculpture and colour, from glassy white to ochraceous fawn. It is the only true *Oenopota* of the area with dominant spiral sculpture. It has a distinctly shouldered sinus without spiral lines, evenly curved inner lip and obtuse protoconch.

The nomenclature of the present species is most unfortunate. The first available name, *bicarinata* Couthouy, cannot be used because it is preoccupied by *Murex bicarinatus* W. Wood, 1828, transferred by Wood himself to *Pleurotoma;* it is a synonym of *Turris cryptorraphe* Sowerby (Powell 1964: 335), and therefore a true *Turris* = *Pleurotoma* s.s. The next available name is *Pleurotoma violacea* Mighels & Adams. Johnson (1946: 230) selected as lectotype a shell in MCZ 165994, illustrated pl.27 fig. 5. That specimen, however, is a typical *Oenopota tenuicostata.* Strictly speaking the name *violacea* cannot be used for the species also known as *bicarinata* Couthouy, but should instead be used for the species *O. tenuicostata.* It would then be necessary to use the next available name, *Defrancia becki* Möller, 1842, which has merged long ago into the synonymy of *bicarinata* Couthouy and has not been used for a very long time. We understand that this would only increase the confusion in the genus and change the names of two of the better known species of

Oenopota. We have therefore decided to use the name *violacea* in the original sense of Mighels & Adams and to disregard the lectotype designation by Johnson. In any case, the systematics of *Oenopota* are in much too chaotic a condition for the question to be brought now to the International Commission on Zoological Nomenclature.

Oenopota trevelliana (Turton, 1834) Figs 155-156,264.

Pleurotoma reticulata Brown, 1827: pl. 48, figs 29-30; 1844: 8, pl.5, figs 29-30.
Pleurotoma trevelliana Turton, 1834: 351.
Type material: 5 syntypes, USNM 190860.
Type locality: P. trevelliana: Scarborough, Great Britain.
Material examined: about 40 samples with 180 spms and shs from southern Scandinavia (Öresund to Bergen), 20-350 m, coll. AW; INGOLF st 86, 65°03N, 23°48W, 143 m, 1 sh; st 115, 70°50N, 08°29W, 162 m, 1 spm, 2 shs; MICHAEL-SARS st 48, 61°00N, 02°53E, 270 m, 1 sh; THALASSA st Y374, 41°31N, 09°20W, 1250 m, 1 sh (fossil?) and the type material.

Distribution. According to Thorson (1941: 105), all over the lusitanian, boreal and arctic parts of the N. Atlantic, but we have not been able to check on actual material the records of the species from the Bay of Biscay.

Remarks. O. trevelliana has its main distribution on the shelf at depths above 300 m but has been included here because it can be confused with some other species of *Oenopota.* Its sculpture is close to that of *O. bergensis,* less so to that of *scalaris* and *turricula,* which have considerably stronger axial sculpture. It will be most easily recognized by its protoconch, intermediate in size (640-720 μm) between *bergensis* and *turricula,* sculptured with spiral lines (not keels) visible even at low magnification.

This is another case where strict application of priority would lead to the change of the name of a well-known species, and we have preferred to use the younger but commonly used name *trevelliana* until the taxonomy of the shallow-water species of the genus is better known.

Genus *NEPOTILLA* Hedley, 1918

Type species: *Daphnella bathentoma* Verco, 1909.

The genus is tentatatively used here for the first time in the N. Atlantic. It comprises a dozen Recent species from Australasia, the radulae of which are not known.

Nepotilla amoena (G.O. Sars, 1878) Figs 36,157.

Raphitoma amoena Sars, 1878: 220, pl. 17, fig. 10a-b.
Type material: syntypes in ZMO.
Type locality: Hasvig, West Finmark, N. Norway, 110-180 m.
Material examined: INGOLF st 126, 67°19N, 15°52W, 552m, 1 sh; st 115, 70°50N, 08°29W, 162 m, 1 spm juv.

Distribution. West and East Greenland, Iceland, Jan Mayen and N. Norway; upper bathyal.

Remarks. N. amoena can hardly be confused with any other species known from the Atlantic.

Powell (1966: 126) refers a number of species from New Zealand and Australia to the genus *Nepotilla,* but places *amoena* in *Teretia.* The radula seems to be unknown for all the species, so that our arrangements of *amoena* might be uncertain, but the similarity of the shell makes placement in *Nepotilla* more probable than in *Teretia,* from which it differs by having a radula and very different shell characters.

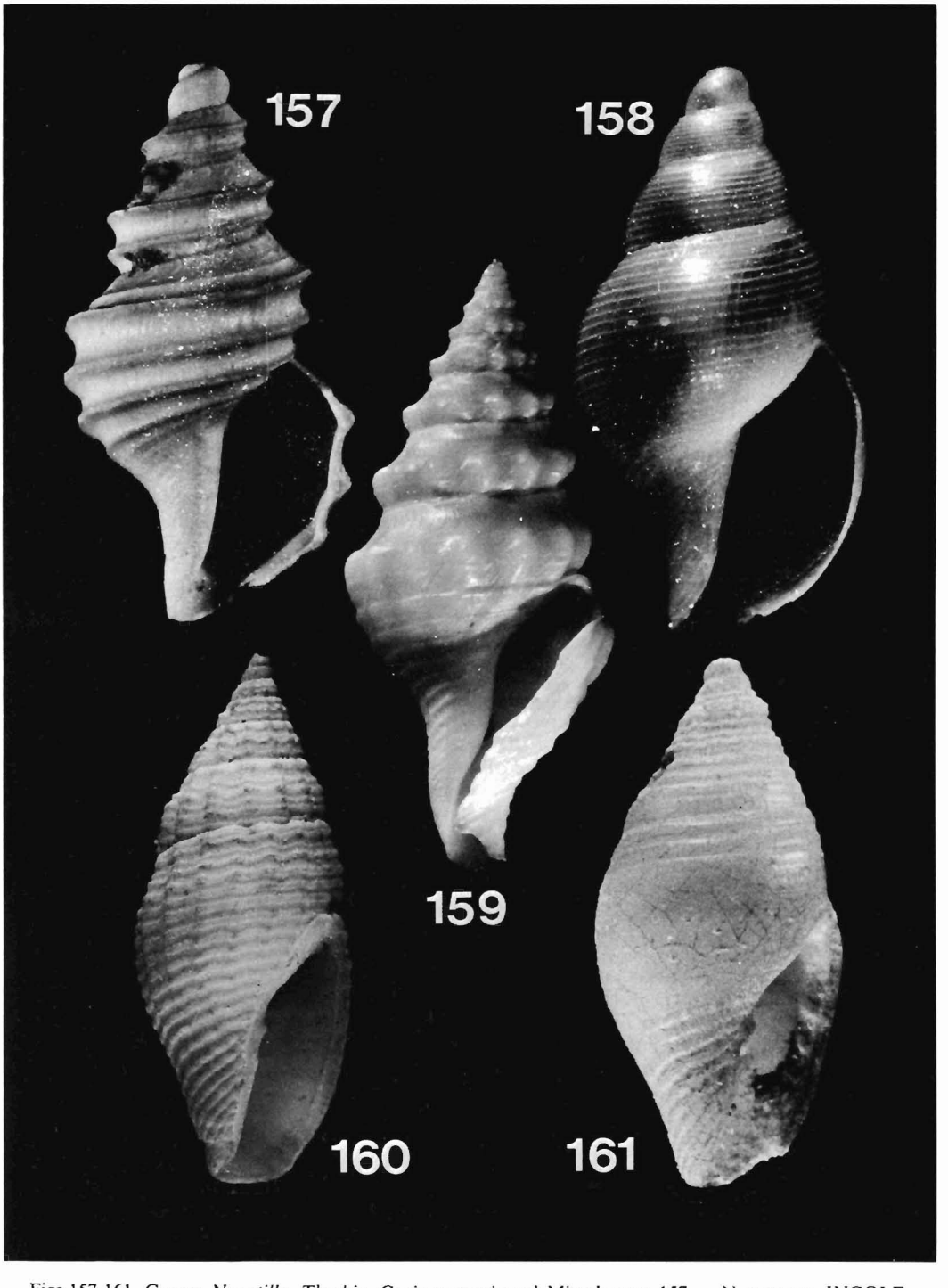
The animal lacks an operculum and has distinct eyes.

Genus *THESBIA* Jeffreys, 1867

Type species: *Tritonium nanum* Lovén, 1846.

Thesbia nana (Lovén, 1846) Figs 35,158,199.

Tritonium (?) *nanum* Lovén, 1846: 144.
Thesbia nana Lovén, G.O. Sars, 1878: p. 221, pl. 16, fig 2, pl. VIII, fig 3.
Type material: syntypes in SMNH.



Figs 157-161. Genera *Nepotilla, Thesbia, Corinnaeturris* and *Mitrolumna*. 157 — *N. amoena,* INGOLF st 115, 5.45 mm. 158 — *T. nana,* Bergen area 300-330 m, 4.3 mm. 159 — *C. leucomata,* TRAVAILLEUR (no loc.), 17.2 mm. 160 — *M. dalli,* holotype. 161 — *M. smithi,* holotype.

Type locality: Finmark, Norway.
Material examined: about 600 spms and shs from Southern Scandinavia, 80-500 m, coll. AW.

Distribution. Norway, Shetland, the Orkneys and Iceland (Thorson, 1941: 109).
Remarks. T. nana can hardly be confused with any other species; from juveniles of the genus *Lusitanops* it can be separated by the larger number of whorls at similar size and the spiral sculpture consisting of closely punctured, impressed lines; in *L. bullioides* the spiral sculpture in similar but there are only a few spaced lines and the protoconch is brown, whereas it is white in *T. nana* (direct development).

The animal has no operculum and two distinct eyes.

Genus *CORINNAETURRIS* **gen.nov.**

Type species: *Pleurotoma leucomata* Dall, 1881.

This new genus seems to differ from everything we know. The apex is multispiral, smooth with a single spiral keel; the surface of the shell is distinctly granular; the labial sinus is very deep and evenly curved at the substural zone; the shell is very solid and strongly sculptured. The animal lacks an operculum. The radular teeth are very long and slender.

The fossil genera *Pleurotomoides* Bronn, 1831 and *Etremopsis* Powell, 1942 have apparently similar protoconchs but a thickened outer lip.

Corinnaeturris leucomata (Dall, 1881) Figs 37,159,228.

Pleurotoma (Drillia?) leucomata Dall, 1881: 63; 1889: 120, pl. 11, fig. 13.
Pleurotoma dalli Bush, 1893: 208, pl. 2, fig. 2-2a.
Pleurotoma projecticium Locard, 1897: 197, pl. 9, figs 1-6.
Pleurotoma joubini Dautzenberg & Fischer, 1906: 11, pl. 1, figs 5-7.
Type material: P. leucomata: syntypes in USNM 87445; *P. projecticium:* lectotype and 5 paralectotypes in MNHN; *P. joubini:* holotype in MOM.
Type locality: P. leucomata: between Mississippi Delta and Cedar Key, 28°47N, 87°27W, 1310 m; *P. dalli:* off Cape Fear, S.E. United States, 1150 m; *P. projecticium:* TRAVAILLEUR 1882, st 67, 33°09N, 09°38W, 1900 m; *P. joubini:* MONACO st 1186, 15°15N, 23°04W, 660 m.

Material examined: the type material and TALISMAN st 31-33, 32°32N, 09°48W, 1350-1590 m, 5 spms; st 122, 18°37N, 25°10W, 3530 m, 1 spm; MONACO st 1116, 31°44N, 10°47W, 2165 m, 2 shs; MICHAEL-SARS 1910, st 41, 28°08N, 13°35W, 1365 m, 1 sh; JEAN-CHARCOT 1966, South of Madeira, 1520 m, 1 sh; METEOR st M36-103, 21°24N, 17°55W, 1125 m, 1 sh; 46°17N, 04°35W, 1340 m, Lagardère coll.; CINECA III, st B31, 29°36N, 11°04W, 1500 m, 1 sh.

Distribution. Only known from the material examined.

Remarks. The animal has no operculum. The shell has a granulated surface, rather uncommon among turrids, which in combination with the larval shell, makes it easily recognizable.

Genus *MITROLUMNA* Bucquoy, Dautzenberg & Dollfus, 1883

Type species: *Mitra olivoidea* Cantraine, 1835.

Orr (1959) has shown that *Mitromorpha* has a turrid radula. We figure here the radula of the type-species of *Mitrolumna,* which is also toxoglossate and of the same basic type. A lectotype of *M. olivoidea* is figured by Cernohorsky (1975:231). The two species from the bathyal of the Azores described by Dautzenberg & Fischer are referred to *Mitrolumna* on the basis of the shell morphology. We thank Dr. Cernohorsky for discussion about mitromorphid turrids.

Mitrolumna dalli (Dautzenberg & Fischer, 1896) Fig. 160.

Mitromorpha dalli Dautszenberg & H. Fischer, 1896: 431, pl. 15, fig. 18.
Type material: holotype in MOM.
Type locality: 38°33N, 28°08W, 1300 m.
Material examined: only known from the type material.

Remarks. The only mitromorphid turrid from the area with a strong axial sculpture, running from suture to suture on all the whorls.

Mitrolumna smithi (Dautzenberg & Fischer, 1896) Fig. 161.
Mitromorpha smithi Dautzenberg & H. Fischer 1896: 432, pl. 15, fig. 19.
Type material: holotype in MOM.
Type locality: 38°26N, 28°39W, 800 m.
Material examined: the holotype and BIACORES st 232, 36°55N, 25°11W, 390-620 m, 1 sh.

Remarks. The coloured spiral bands have faded considerably since the original illustration, and the reader is referred to it for a more accurate concept of the species. All the specimens of *M. olivoidea* we have examined have the spiral sculpture extending on the body whorl: this character and the colour pattern should make separation of the two species easy.

Genus *TARANIS* Jeffreys, 1870

Type species: *Trophon moerchi* Malm, 1863.

We have included in the genus not only the conventional species of the genus from the N. Atlantic *(moerchi, borealis, laevisculpta)* but also a species with planktotrophic larvae *(malmi)*. The absence of radula has been checked in *moerchi* and *borealis*.

Taranis borealis **n.sp.** Figs 162,270.
Pleurotoma parvulum (Jeffreys ms.) Locard, 1897: 200, pl. 11, figs 4-7 (pars), not *Pleurotoma parvula* Reeve, 1845.
Type material: holotype and 13 paratypes in the Naturhistoriska Museet, Göteborg; 5 paratypes in MNHN.
Type locality: SW of the Koster Is., Swedish west coast, 150-500 m.
Material examined: beside the types mentioned above, 3 additional shs from Koster area, 180-230 m, coll. AW; Bergen area, Norway, 150-680 m, 24 spms and shs, coll. AW; TRITON st 11, 59°20N, 07°13W, 1000 m, 1 sh; PORCUPINE st 17, 39°42N, 09°43W, 1980 m, 2 shs; MICHAEL-SARS, 60°57N, 03°42E, 190 m, 1 sh.

Distribution. Beside the material examined, *T. borealis* is known only from off Newport, Rhode Island, USA in 660 m (Verrill 1882: 486, pl. 57, fig. 18 as *Taranis moerchi*).

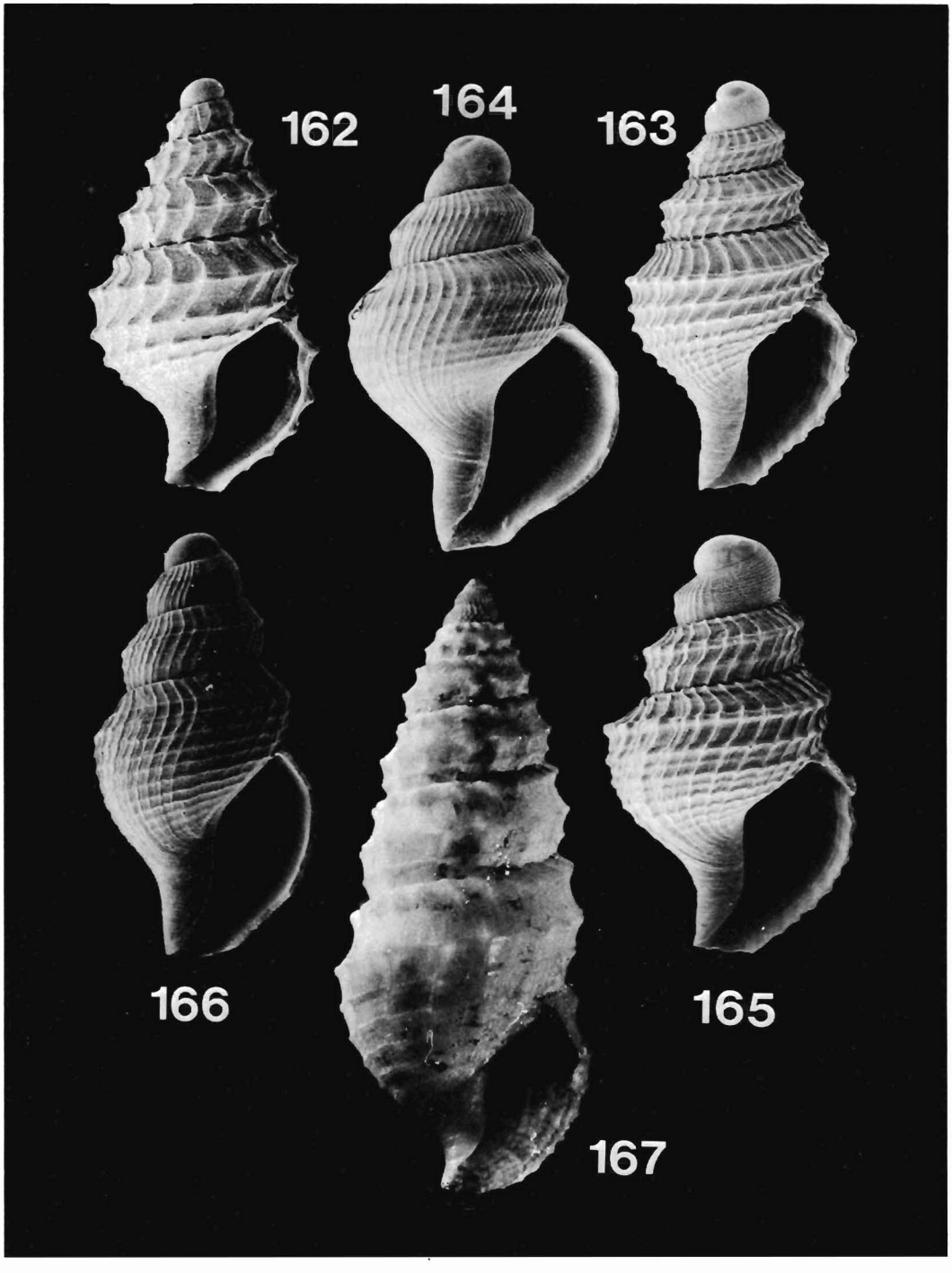
Description. Shell solid, glassy white, composed of 3 postlarval whorls. The outline of the shell is somewhat spiny, due to the strong sculpture of the penultimate and body whorl. The suture is shallow. The larval shell is brown, and consists of a single whorl, with a diameter of 500 μm, covered with spiral rows of granules giving a reticulate appearance. Very fresh adult shells have a microsculpture of very minute granules. The spiral macrosculpture of the postlarval whorls consists of one subsutural line, one strong keel at the periphery of the whorl and three more strong lines below it on the body whorl. These lines do not occur on the siphonal canal. The axial sculpture consists of bent lines which form nodulous projections when they cross the spiral sculpture. The siphonal canal is short and slightly curved to the columella, which together with the body whorl form a regular curve where they meet.
Dimensions: height of the shell 2.7 mm, breadth 1.45 mm; height of the aperture 0.9 mm, breadth 0.4 mm.

The animal has no operculum and no radula.

Remarks. T. borealis can be distinguished from *moerchi* by its stronger sculpture, smaller number of spiral lines below the peripheral keel and the colour of the larval shell which is white in *T. moerchi*. *T. malmi* has similarly a prickly sculpture but the protoconch is multispiral; *T. malmi* has planktotrophic larvae, whereas *borealis* has direct or lecithotrophic larval development.

Under the name *Pleurotoma parvulum* (Jeffreys, 1880: 318 nom.nud.) Locard (1897:200) has described a turrid which cannot be identified from the poor figure which is drawn from two specimens: we have examined the type material and found one shell of *Taranis malmi* with broken protoconch from which the lower part of the drawing of *P. parvulum* was prepared and one worn shell of *Taranis borealis* from which the upper part was drawn. However the name *parvulum* cannot be used for the *Taranis* described here because it is preoccupied by *Pleurotoma parvula* Reeve 1845.

Taranis malmi (Dall, 1889) Figs 167,272-273.
Pleurotomella (Gymnobela?) tornata var. *malmii* Dall, 1889:127.
Pleurotoma pycnoides Dautzenberg & Fischer, 1896: 418, pl. 16, figs 3-4.



Figs 162-167. Genus *Taranis*. 162 — *T. borealis*, Bergen area 140-170 m, 3.68 mm. 163 — *T. moerchi*, Koester area, Sweden, 4.05 mm. 164 — *T. moerchi*, THALASSA st Z426, 2.04 mm. 165 — *T. moerchi*, Koester area, 2.76 mm. 166 — *T. laevisculpta*, THALASSA st Y378, 2.80 mm. 167 — *T. malmi*, off Fowey Light, Florida 225 m, 5.35 mm.

Pleurotoma parvulum (Jeffreys ms.) Locard, 1897: 200, pl. 11, fig. 4-7 (pars), not *Pleurotoma parvula* Reeve, 1845: see remarks under *Taranis borealis.*
Type material: P. tornata var. *malmii:* holotype in USNM 87433; *P. pycnoides:* 2 syntypes in MOM.

Type locality: P.t. var *malmii:* 23°14N, 82°25W, 1450 m, (north of Cuba); *P. pycnoides:* MONACO st 553, 37°43N, 25°05W, 1385 m.
Material examined: the types mentioned above and MONACO st 198, 36°26N, 28°39W, 800 m, 4 shs; st 233, 38°33N, 28°09W, 1300 m, 2 spms; st 234, 39°02N, 27°55W, 454 m, 1 sh; st 553 (see above), 32 shs; off Fowey Light, Florida, 225 m, 11 spms and shs, USNM 318933.

Distribution. Only known from the material examined.

Remarks. This is the only *Taranis* of our area with planktotrophic larvae. It is also more slender than any other species, resembling only *borealis* in its spiny sculpture.

Taranis laevisculpta Monterosato, 1880, Figs 166,271.
Pleurotoma morchii var. *laevisculpta* Monterosato, 1875: 42 (nomen nudum).
Taranis laevisculpta Monterosato, 1880: 75; 1890: 27. Not *T. laevisculpta* of Locard 1897: 375.
Type material: 2 syntypes in the Monterosato coll., Rome.
Type locality: Palermo, Sicily ("abissicola").
Material examined: THALASSA st Y378, 41°31N, 09°16W, 1000 m, 3 spms; st Y393, 41°21N, 09°11W, 820 m, 1 sh; NORATLANTE st B15, 44°07N, 04°08W, 1885-1910 m, 1 sh; PORCUPINE st 17, 39°42N, 09°43W, 1800 m, 1 sh; and the type material.

Remarks. T. laevisculpta can be separated from *moerchi* by its more slender outlines, slightly bigger larval shell and fainter sculpture of more numerous spiral lines. It is also much smaller; none of our specimens which look adult is more than 2.8 mm high.

It is doubtful whether the species now lives in the Mediterranean: the types represent the only known record in this sea; they are well preserved but were dead when collected, and probably represent a fossil occurrence from a glacial period of the Quaternary.

Taranis moerchi (Malm, 1861) Figs 163-165,274-275.
Trophon mörchii Malm, 1861: 623; 1863: 130, pl. 2, fig. 15.
Pleurotoma cirratum Brugnone, 1862: 17, fig. 9 (non *P. cirrata* Bellardi, 1848).
Bela demersa Tiberi, 1868: 179.
Taranis morchii var. *tornatus* Verrill, 1884: 251.
Taranis alexandrina Sturany, 1896: 11, pl. 1, figs 8-9.
Taranis cirrata var. *minor,* var. *curta,* var. *spinulosa,* var. *simplex,* var. *tenuis* Locard, 1897:374.
not *Taranis mörchii* (Malm) of Verrill 1882: 486, pl. 57, fig. 18; not *T. moerchi* of Hubendick & Warén 1973, figs 180-181 (= *T. borealis* n.sp.).
Type material: P. cirratum supposedly in Museo de Zoologia del Comune di Roma. *T. alexandrina:* holotype in NHMW. *T. morchii* var. *tornatus:* USNM 37807; *B. demersa:* one syntype USNM 189755; *T. moerchi:* lost.
Type locality: (of *moerchi*) Hågärdskären, Bohuslän, Swedish west coast, 90 m.
Material examined: the types of Sturany, Tiberi and Verrill and about 400 spms and shs from southern Scandinavia, 80-700 m, coll. AW; THALASSA st Y401, 40°37N, 09°21W, 1040 m, 1 sh; st Y378, 41°31N, 09°16W, 1000 m, 4 spms; st Z399, 47°35N, 07°18W, 825 m, 1 sh; st Z400, 47°33N, 07°19W, 1175 m, 2 shs; st Z417, 48°12N, 09°09W, 865 m, 2 shs; st Z424, 48°28N, 09°44W, 475 m, 1 sh; Z426, 48°28N, 09°39W, 860 m, 1 spm; st Z434, 48°41N, 09°54W, 720 m, 1 spm;, st Z438, 48°34N, 10°25W, 1400 m, 1 spm; st Z440, 48°41N, 10°21W, 860 m, 1 sh; BIOGAS st DS81, 46°28N, 10°25W, 4715 m, 3 shs; st DS87, 44°05N, 04°19W, 1913 m, 2 shs; st DS51, 44°11N, 04°15W, 2430 m, 1 spm; NORATLANTE st B15, 44°07N, 04°08W, 1885-1910 m, 4 spms and shs; SARSIA st 7614, 43°43N, 03°38W, 1100 m, 1 sh; st 7616, 43°43N, 03°42W, 590-640 m, 2 shs; st 7627, 43°47N, 03°46W, 1925-1990 m, 1 sh; TRAVAILLEUR 1880, dr29, 43°40N, 04°38W, 232 m, 2 shs; TRAVAILLEUR 1881, dr26, 35°45N, 05°42E, 900 m, 1 sh; TRAVAILLEUR 1882, dr28, 35°21N, 09°05W, 420 m, 1 sh; dr 30, 35°25N, 07°58W, 1205 m, 2 shs; THOR 46°37N, 02°08W, 480-1500 m, 5 spms and shs; INGOLF st 32, 66°35N, 56°38W, 599 m, 1 spm; MICHAEL-SARS st 70, 42°59N, 51°15W, 1100 m, 1 sh; 60°57N, 03°42E, 350 m, 1 sh; PORCUPINE st 17, 39°42N, 09°43W, 2970 m, 7 shs; off Cadiz, 700 m, 1 sh; Adventure Bank, 170 m, 12 shs; MONACO St 1190, 15°14N, 23°04W, 628 m, 1 sh; st 2717, 36°42N, 08°40W, 750 m, 1 sh; St Raphaël, France, 30 shs, coll. Claudon, MOM; Palermo, Italy, 4 shs, BMNH; off Caesars Creek, Florida,

165 m, 10 spms and shs, USNM; INCAL st CP08, 50°15N, 13°13W, 2644 m, 1 spm; off NE Sardinia, 200-300 m, 9 shs, coll. Carrozza; INCAL st DS02, 57°59N, 10°49W, 2081 m, 8 spms.

Distribution. The bathyal zone on both sides of the North Atlantic and the Mediterranean; shallower occurrence in the northern part of its distribution.

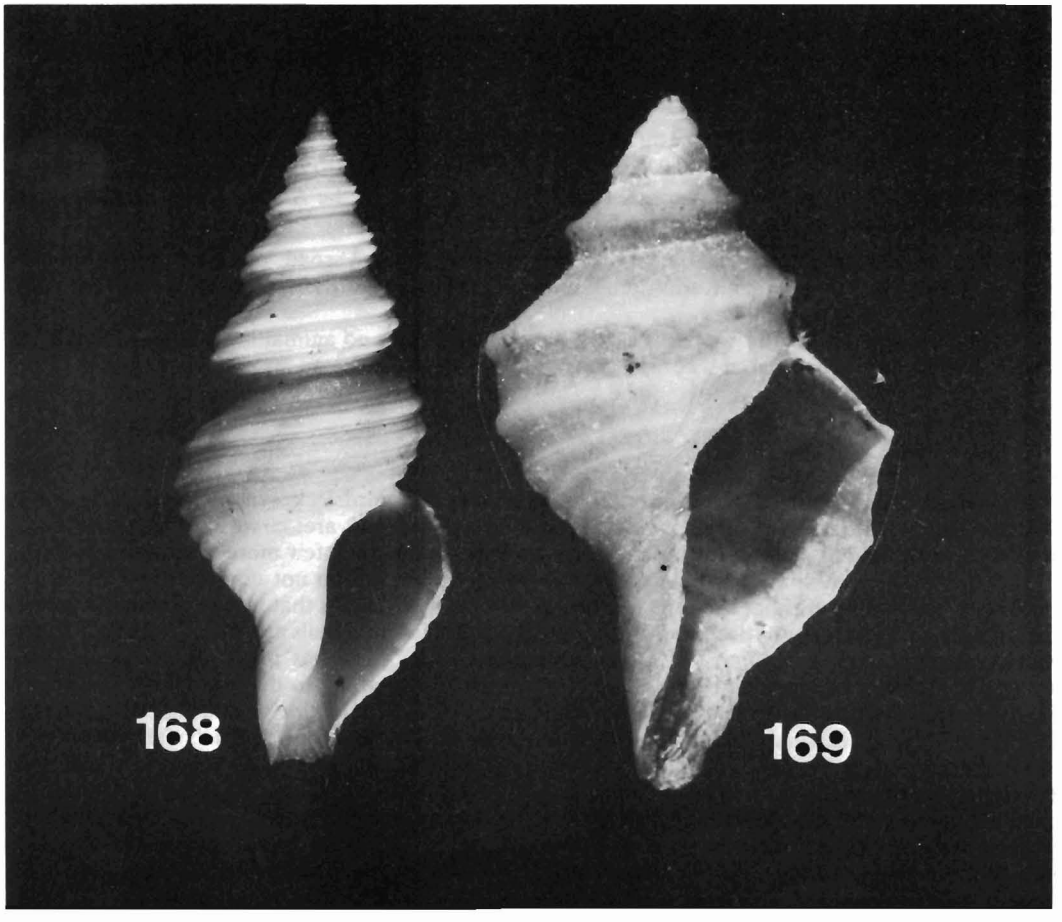
Remarks. The sculpture of *T. moerchi* is rather variable and specimens even smoother than *laevisculpta* can be found; they have however the same broad outlines as normally sculptured *moerchi.* For separation from *borealis,* see under that species.

Genus *TERETIA* Norman, 1888

Type species: see remarks under *T. teres.*

Teretia teres (Forbes, 1844) Figs 168,229.

Pleurotoma teres Forbes, 1844: 190 (nomen nudum); 1844 (in Reeve): *Pleurotoma* n° 161.
Pleurotoma boreale Lovén, 1846: 14 (in reprint).
Type material: P. teres: lost?; *P. boreale:* syntypes in SMNH.
Type locality: P. teres: Aegean sea; *P. boreale:* Bergen, Norway.
Material examined: about 150 spms and shs from southern Scandinavia, 30-600 m, coll. AW; THOR st 78, 61°07N, 09°30W, 835 m, 2 shs; st 99, 61°15N, 09°35W, 900 m, 1 sh; MONACO st 553, 37°43N, 25°05W, 1385



Figs 168-169. Genus *Teretia.* 168 — *T. teres,* Bergen area 460-540 m, 14.3 mm. 169 — *T. thaumastopsis,* MONACO st 233, 9.8 mm.

m, 1 sh; TRAVAILLEUR 1881 drag.7, 36°38N, 07°04W, 532 m, 2 shs; 1882 drag.40, 43°24N, 11°41W, 400 m, 1 sh; POLA st 213, 36°47N, 26°29E, 597 m, 2 shs; West of Brittany 47°30 to 48°42N, 07°13 to 10°34W, 330-1050 m, 50 shs; 44°54N, 02°11W, 150 m, 1 sh; INCAL st DS03, 57°25N, 11°03W, 609 m, 50 spms + shs; off Tromsö, 350 m, 2 spms; 44°00N, 02°10W. 270 m, 3 shs, Lagardère coll.

Distribution. The lower shelf and upper bathyal of the NE Atlantic and the Mediterranean.

Remarks. Teretia teres can hardly be confused with any other species; only *Pleurotomella megalembryon* and *Nepotilla amoena* have a more or less similar spiral sculpture. *T. teres* has no operculum and no radula; the animal has distinct eyes.

We have preferred to use the name of Forbes, instead of *Pleurotoma anceps* Eichwald, 1830, based on a Miocene fossil. We also suppose that the type of *Teretia* Norman, 1888 (not Monterosato, 1890 as supposed by Powell, 1966: 126), must be the Recent form, if (as we believe) the Miocene and Recent form are different. This will simplify the classification and it must have been the intention of Bucquoy, Dautzenberg & Dollfus when they introduced the generic name *Teres* (1883:87) for the species they described and figured under the name *Pleurotoma (Teres) anceps* Eichwald, 1830 (not *Teres* Boettger, 1878). Even if Eichwald's species is close to the Recent one, it is more convenient to have a Recent species as type of the genus.

Teretia thaumastopsis (Dautzenberg & Fischer, 1896) Figs 169,231.

Pleurotoma (?) *thaumastopsis* Dautzenberg & Fischer, 1896: 424, pl. 16, fig 14.
Pleurotomella ? *(Eucyclotoma) aperta,* Dall, 1927: 3, 30.
Type material: P. thaumastopsis: holotype in MOM; *P. aperta:* holotype in USNM 108306.
Type locality: P. thaumastopsis: MONACO st 233, 38°33N, 28°09W, 1300 m: *P. aperta:* off Georgia.
Material examined: the type material and MONACO st 233, 1 sh; st 703, 39°21N, 31°06W, 1360 m, 1 sh; st 719, 39°11N, 29°06W, 1600 m, 1 sh; CINECA III st B31, 29°36N, 11°04W, 1500 m, 1 sh.

Distribution. Only known from two other MONACO stations in the Azores and a PORCUPINE station off Portugal, which we have not been able to check.

Remarks. T. thaumastopsis can easily be recognized by its broad outline, keeled whorls, planktotrophic larval shell, and additional spiral lines below the keel. The main keel is slightly serrate.

The generic position of the species is extremely doubtful since no animal is available. *Teretia* can be considered only a provisional storage genus.

Genus *LUSITANOPS* Nordsieck, 1968

Type species: *Pleurotomella lusitanica* Sykes, 1906.
Published as a subgenus of *Pleurotomoides* Bronn, which Nordsieck synonymized with *Theta* Clarke. Characteristics for *Pleurotomoides,* according to Nordsieck are: larval shell with axial ribs, not reticulated, animal without operculum and eye. He enumerated a few more characters, but they are not valid for more than singular species, for which reason we do not discuss them. Evidently Nordsieck was not aware that the type of *Pleurotomoides* is fossil, so that nothing is known about the animal and he had not noticed that the larval shells of Miocene fossils attributed to the genus are paucispiral and smooth (Glibert, 1954). In *Pleurotomoides* s.s. he has placed three species, viz. *diastropha, lyronuclea* and *callembryon,* none of which has anything to do with *Pleurotomoides.*

Lusitanops is said to differ from *Pleurotomoides* by having finer sculpture and shorter columella and by lacking a siphonal canal. It is right that the sculpture of *lusitanica* is fainter than in *Pleurotomoides:* it has only spiral sculpture. But the columella is proportionally longer and there is a distinct siphonal canal.

It thus happens that it is only by accident that *Lusitanops* is considered by us a valid genus, because not one of the characters used to define it is valid. We have used *Lusitanops* for Turridae with no distinct sinus zone, discrete sculpture, comparatively large body whorl and short siphonal canal.

Synonym: *Pseudazorita* Nordsieck, 1977:31 has been erected to include *dalmasi* D.&F. and *blanchardi* D.&F. Neither was a type species designated, nor a diagnosis of the new taxon given. Of *P. dalmasi,* Nordsieck has given two drawings: one copied from Kobelt, who himself copied it from

Dautzenberg & Fischer; one from an actual shell dredged in the Ionian Sea: we have examined this material and it proved to be *Gymnobela subaraneosa* (D.&F.). In order to clear up the case and get rid of the name, we here designate *blanchardi* D.&F. as type of *Pseudazorita* Nordsieck, which then becomes a synonym of *Lusitanops.*

Lusitanops blanchardi (Dautzenberg & Fischer, 1896) Figs 174,179.

Pleurotoma blanchardi Dautzenberg & H. Fischer, 1896: 430, pl. 15, fig. 16.
Type material: holotype in MOM.
Type locality: MONACO st 233, 38°33N, 30°29W, 1300 m.
Material examined: the holotype and MONACO st 553, 37°43N, 25°05W, 1385 m, 1 sh; st 575, 38°27N, 26°29W, 1165 m, 1 sh; st 683, 38°20N, 28°05W, 1550 m, 1 sh; st 698, 39°11N, 30°45W, 1846 m, 2 shs; st 703, 39°21N, 31°06W, 1360 m, 1 sh; st 719, 39°11N, 30°24W, 1600 m, 1 sh; st 1349, 38°35N, 28°05W, 1250 m, 1 sh; PORCUPINE st 17, 39°42N, 09°43W, 1980 m, 3 shs.

Distribution. Only known from the material examined.

Remarks. L. blanchardi is the only species of the genus with strong spiral sculpture and a pointed protoconch. In *L. bullioides,* the protoconch has the same outline but has nearly one more whorl and the adult shell has only a few faint spiral grooves.

Lusitanops bullioides (Sykes, 1906), Figs 177,185.

Pleurotomella (?) *bullioides* Sykes, 1906: 178, pl. 16, fig. 1-1a.
Type material: holotype in BMNH.
Type locality: PORCUPINE st 17, 39°42N, 09°43W, 1980 m.
Material examined: the holotype and 16 shs from the type locality and the nearby PORCUPINE st 16, 1800 m; MONACO st 1349, 38°35N, 28°06W, 1250 m, 2 shs.

Distribution. Only known from the material examined.

Remarks. The species can be identified by its nearly smooth adult shell with only a few impressed spiral lines. Most other species have a heavier sculpture of the adult shell, except *L. hyaloides* which has a very obtuse protoconch whereas that of *bullioides* is pointed.

Lusitanops cingulata **n.sp.** Figs 175,182.

Type material: holotype in MNHN.
Type locality: INCAL st WS02, 50°19N, 12°56W, 2505 m.
Material examined: the holotype and INCAL st DS05, 56°28N, 11°12W, 2500 m, 1 sh.

Distribution. Only known from material examined.

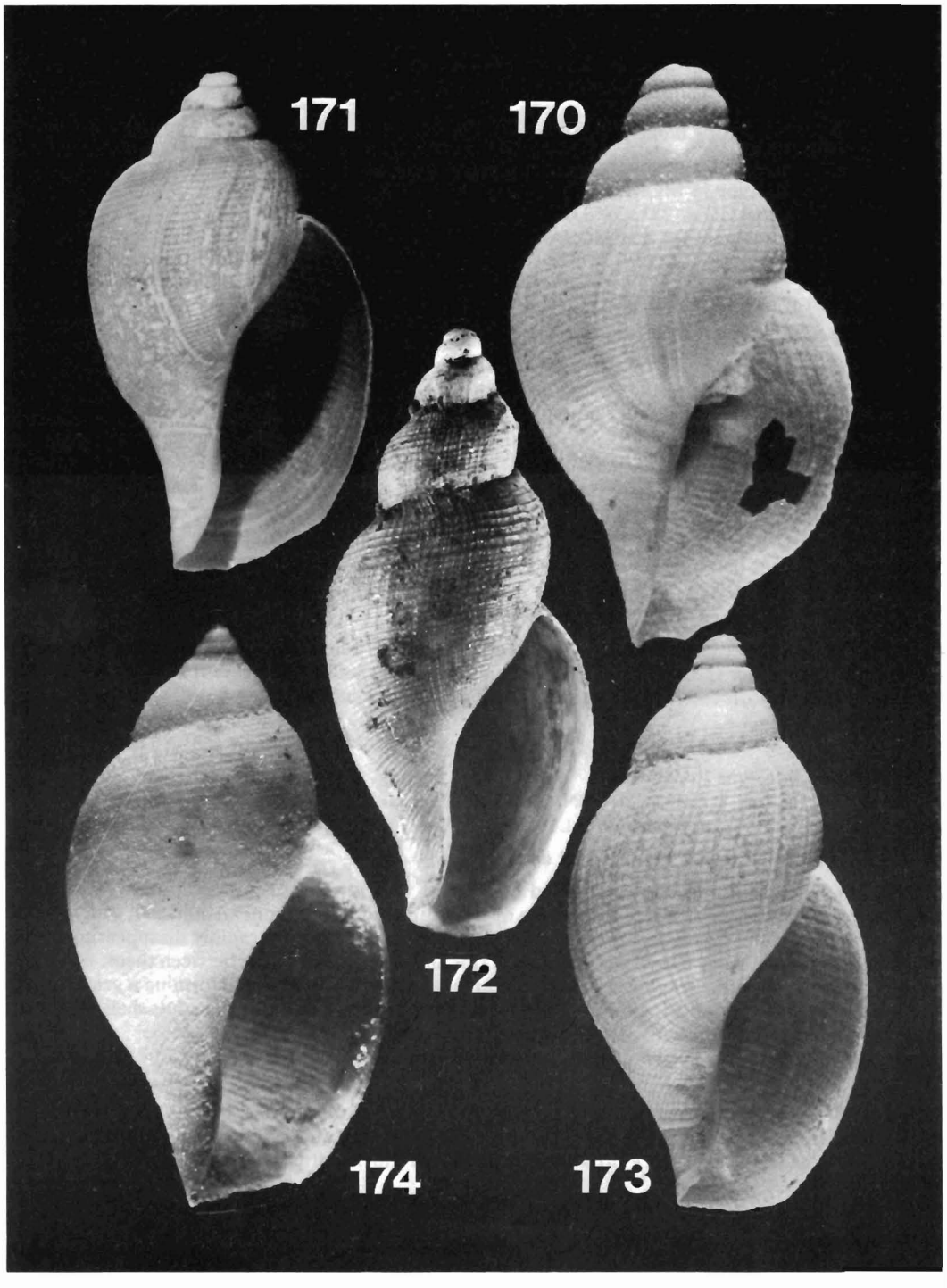
Description. Shell thin, vitreous, composed of 4 larval whorls and 2⅓ inflated postlarval whorls, very convex in outlines with a deep suture. No distinct subsutural sinus zone. Adult shell with regular spiral furrows. On the first whorl there is a faint sinuous axial sculpture, rapidly disappearing when the shell grows older. Larval shell with bent axial ribs and short spiral riblets between them. Outer lip regularly convex. Siphonal canal very short. Columellar side slightly sinuous, forming a gentle angle where it meets the body whorl. Colour of the larval shell brown. Colour of the adult shell yellowish white turning into light brown when the animal grows older.
Dimensions: height of the shell 6.52 mm, breadth 4.12 mm; height of the aperture 3.67 mm, breadth 2.02 mm.

Remarks. This species is easily recognizable by the colour and sculpture of the adult shell. The general appearance is a little like that of *Pleurotomella lottae,* but among othe characters that species has a subsutural sinus zone, very broad protoconch and much flatter whorls.

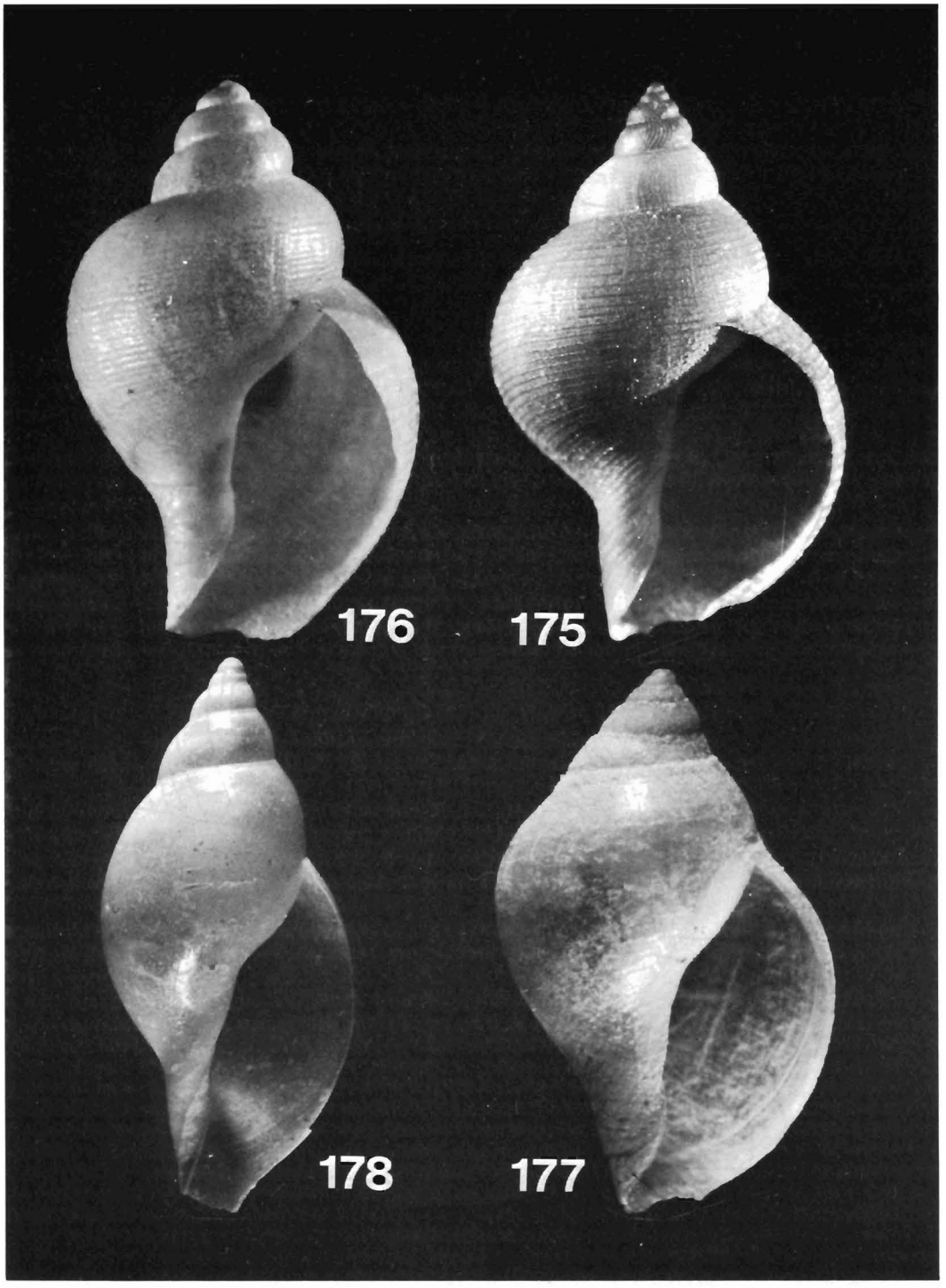
Lusitanops expansa (G.O. Sars, 1878) Figs 172,184.

Bela? *expansa* G.O. Sars, 1878: 240, pl. 17, fig. 7.
Type material: holotype in ZMO.
Type locality: Vadsö, Norway, 220 m.
Material examined: the holotype and 60°08N, 04°58E, 240-280 m, 1 sh (broken), coll. AW.

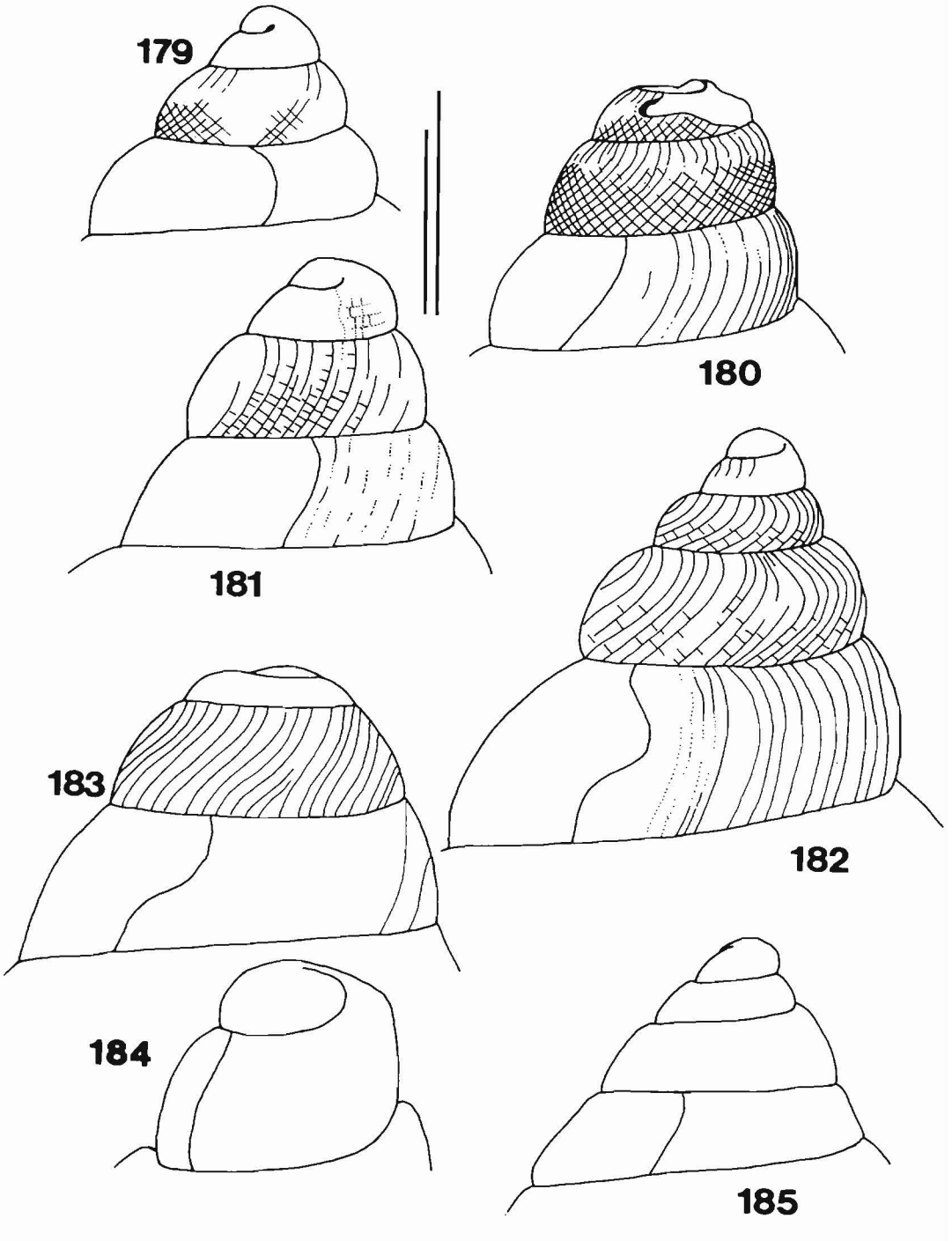
Distribution. Only known from the material examined.



Figs 170-174. Genus *Lusitanops*. 170 — *L. sigmoidea*, holotype. 171 — *L. sigmoidea*, BIOGAS (no loc.), 7.25 mm. 172 — *L. expansa*, holotype 8.6 mm. 173 — *L. lusitanica*, holotype 5.5 mm. 174 — *L. blanchardi*, holotype 6.8 mm.



Figs 175-178. Genus *Lusitanops*. 175 — *L. cingulata*, holotype. 176 — *L. macrapex*, holotype. 177 — *L. bullioides*, MONACO st 1349, 4.9 mm. 178 — *L. hyaloides*, MONACO st 1349, 17.3 mm.



Figs 179-185. Protoconchs of *Lusitanops*. 179 — *L. blanchardi*. 180 — *L. sigmoidea*. 181 — *L. lusitanica*. 182 — *L. cingulata*. 183 — *L. hyaloides*. 184 — *L. expansa*. 185 — *L. bullioides* (shape only, sculpture corroded). Left scale line for all figures (except 181): 0.5 mm. Right scale line (Fig. 181 only): 0.5 mm.

Remarks. Despite intensive dredging in the Bergen area, *L. expansa* has been found only once. It is the only species of the genus with direct development, as evidenced by the protoconch.

Lusitanops hyaloides (Dautzenberg, 1925) Figs 178,183.

Pleurotoma (Pleurotomella) hyaloides Dautzenberg, 1925: 4, fig. 8; 1927: 62, pl. 3, figs 20-21
Type material: holotype in MOM.
Type locality: MONACO st 1349, 38°35N, 28°05W, 1250 m.
Material examined: the holotype and 2 shs from the type locality; MONACO st 683, 38°20N, 28°04W, 1550 m, 1 sh; st 719, 39°11N, 30°24W, 1600 m, 2 shs; INGOLF st 78, 60°37N, 27°52W, 1505 m, 1 sh; THALASSA st Z447, 48°47N, 11°12W, 1500 m, 1 sh; PORCUPINE st 17, 39°42N, 09°43W, 1980 m, 6 shs.

Distribution. Only known from the material examined.

Remarks. L. hyaloides is distinguished from other species of the genus by its very blunt protoconch and the apparently polished shell, which in fact proves to be covered by numerous fine spiral grooves.

Lusitanops lusitanica (Sykes, 1906) Figs 173,181.

Pleurotomella (?) *lusitanica* Sykes, 1906: 181, pl. 16, fig 3-3a.
Type material: holotype in BMNH. Sykes mentions six paratypes; of these one is missing, three are juveniles of *L. blanchardi* and one is so damaged that it is impossible to say which species it was.
Type locality: PORCUPINE st 17, 39°42N, 09°43W, 1980 m.
Material examined: the type material and one additional shell from PORCUPINE st 17 or 16 (confused labelling), 1800 or 1980 m.

Distribution. Only known from the material examined.

Remarks. This species comes very close to *L. blanchardi* and *L. sigmoidea,* in having basically the same adult sculpture, but *blanchardi* is broader even if it has a very similar protoconch. *L. sigmoidea* has a more sinuous axial sculpture and a bigger protoconch. The adult shells of *"Pleurotoma" dyscrita* Watson, from Sombrero I., and *Lusitanops* sp.A are also extremely similar, the main differences between the species lying in the protoconchs. It seems therefore virtually impossible to identify at species level a shell of this group with a missing protoconch.

Lusitanops macrapex **n.sp.** Figs 176,256-257.

Type material: holotype in MNHN.
Type locality: MONACO st 749, 38°54N, 21°06W, 5005 m.
Material examined: the holotype and PORCUPINE st 17, 39°42N, 09°43W, 1980 m, 1 sh.

Distribution. Only known from the material examined.

Description. Shell thin, semitransparent, composed of 3 larval whorls (the embryonic shell is missing) and 1½ very convex postlarval whorls, with a deep suture. There is no subsutural zone. The adult sculpture consists of evenly spaced shallow grooves. The axial sculpture consists only of growth lines, occasionally a little stronger. The larval shell is *c.* 2 mm high and sculptured with bent axial ribs and numerous very fine spiral lines. The adult outer lip is a little broken but it has evidently been evenly convex. The siphonal canal is short, broad, curved towards the columella. The columella and body whorl form a regular curve where they meet. The colour is light yellowish white; the larval shell has about the same colour.
Dimensions: height of the shell 6.6 mm, breadth 4.0 mm; height of the aperture 3.9 mm, breadth 2.0 mm.

Remarks. The unusually big size of the larval shell, which is evidence of planktotrophic larval development, and the very convex postlarval whorls are the best identification characters.

Lusitanops sigmoidea **n.sp.** Figs 170-171,180.

Type material: holotype in MNHN.
Type locality: BIOGAS st DS76, 47°35N, 09°33W, 4228 m.
Material examined: the holotype and BIOGAS st CP08, 47°33N, 08°38W, 2177 m, 1 sh; INCAL st WS03, 48°19N, 15°23W, 4830 m, 1 spm; PORCUPINE st 17, 39°42N, 09°43W, 1980 m, 1 sh; unknown locality (label missing), 1 sh.

Distribution. Only known from the material examined.

Description. The shell is fragile and inflated, consisting of 2 postlarval whorls of evenly convex outlines and a deep suture. The protoconch has at least 2.5 whorls (earlier part corroded). The adult whorls have no subsutural zone. Their sculpture consists of very regular spiral and sinuous axial lines. These are of equal strength on the first and second whorls; on older specimens however (4 whorls in the BIOGAS shell) the spirals become more and more dominant. The larval shell is brown with an obliquely reticulate sculpture in the lower 2/3 of each whorl and bent axial ribs in the upper third. In the older parts of the protoconch the axial ribs extend to the lower part of the whorl. The outer lip is broken in the type, but evenly convex in older specimens. The siphonal canal is very short. The columella and body whorl form a regular curve where they meet. The adult shell is light yellowish white.
Dimensions: height of the shell 3.84 mm, breadth 2.20 mm; height of the aperture 2.40 mm, breadth 1.16 mm.

Remarks. We have selected as holotype a juvenile which had the best (although partly corroded) larval shell because of the importance of this character in the genus. A larger specimen with eroded larval shell, and therefore referable to the present species only with a little doubt, is 14.7 mm high and 7.5 mm broad (BIOGAS). The larval shell of *sigmoidea* has a bigger basal diameter than in *L. blanchardi* and *lusitanica.* The adult sculpture, although basically similar, has the axial ribs more sinuous in *sigmoidea* than in the two above mentioned species.

Lusitanops sp.A.

Material examined: BIOGAS st CP01, 47°35N, 08°39W, 2245 m, 1 sh; Gulf of Tarento, Sicily, 1 sh (coll. DiGeronimo).

Remarks. This is apparently another undescribed species of the *sigmoidea* group, with a smaller and blunt protoconch. It is mentioned here only to make the genus *Lusitanops* known in the Mediterranean.

Genus *FAMELICA* **gen.nov.**

Type species of the genus: *Pleurotomella catharinae* Verrill & Smith, 1884.

This genus is characterized by a very slender, spirally sculptured shell of small to moderate size. The larval shell indicates planktotrophic development; it is monocingulate with axial ribs below the keel and consists of about five whorls, of which three show the carination. Fresh shells are transparent and colourless and seem to be very fragile.

Besides the species enumerated below, the genus also includes *Mangilia scipio* Dall, 1889 and *Daphnella* (?) *bitrudis* Barnard, 1963, both from deep water.

We have felt forced to make this new genus for some species which seem to be related and for which we have not been able to find a genus that, even in a very broad sense, could be strained to include them.

Famelica catharinae (Verrill & Smith, 1884) Figs 186,278.

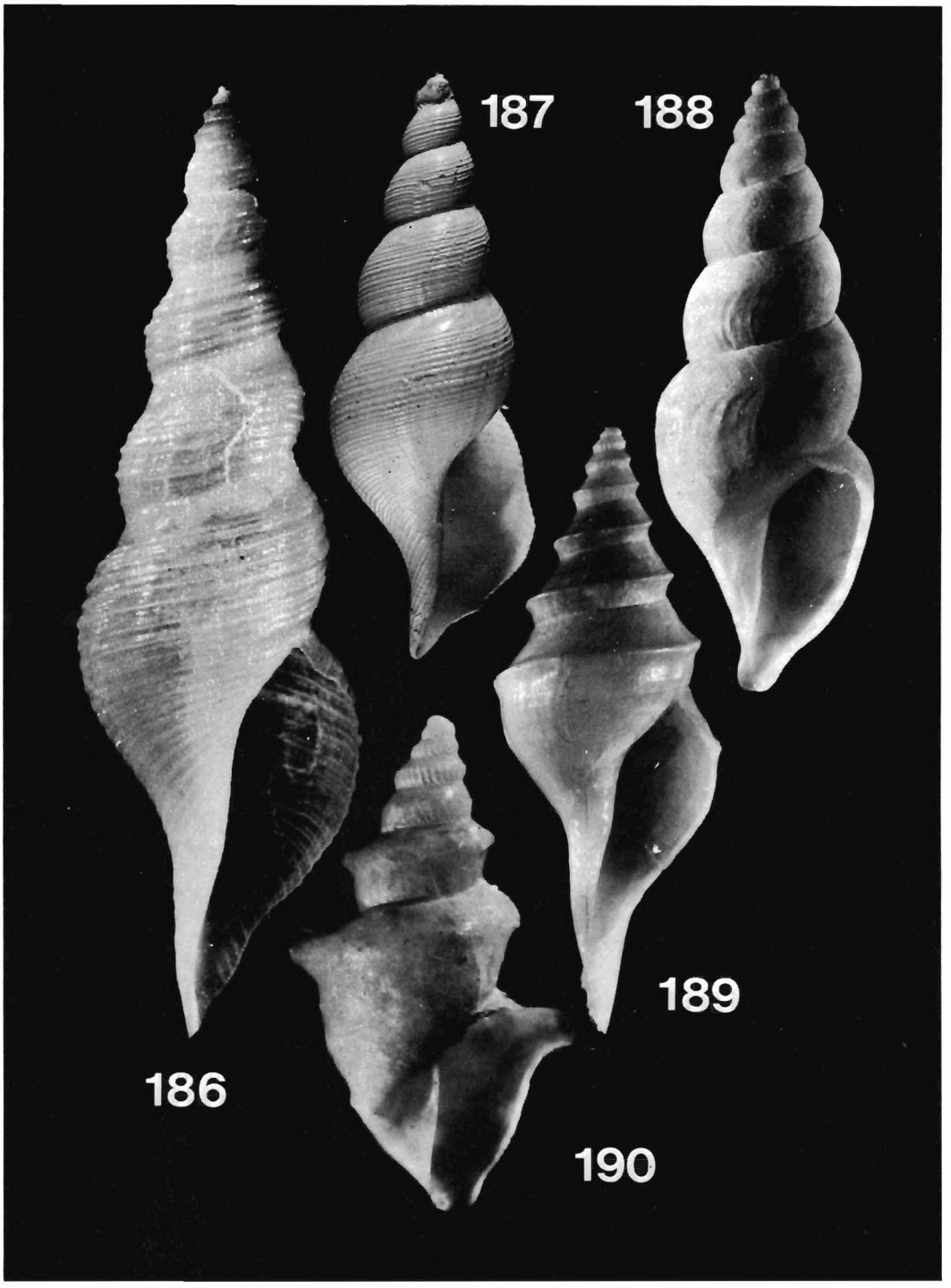
Pleurotomella catharinae Verrill & Smith, 1884: 155, pl. 31, fig. 9-9a.
Type material: holotype in USNM 37891.
Type locality: USFC st 2041, 39°23N, 68°25W, 2900 m.
Material examined: the holotype and BIACORES st 36, 38°11N, 29°39W, 2670 m, and the material mentioned by Verrill (1884: 156).

Distribution. Only known from 35° to 40°N, 1500-3200 m, in the Western Atlantic beside the specimen recorded above.

Remarks. F. catharinae is characterized by the larval shell, its very slender outlines and comparatively strong spiral sculpture. *F. mirmidina* has more convex whorls, no spiral sculpture and a very characteristically curved columella. *F. monoceros* differs by having less distant axial ribs on the larval shell and much fainter sculpture.

Famelica monoceros (Watson, 1881) Figs 187,276-277.

Pleurotoma (Thesbia) monoceros Watson, 1881: 449.
Clathurella (Daphnella) monoceros Watson 1886: 365, pl. 20, fig. 1.



Figs 186-190. Genera *Famelica* and *Aliceia*. 186 — *F. catharinea*, BIACORES st 36, 14.5 mm. 187 — *F. monoceros*, holotype. 188 — *F. mirmidina*, holotype. 189 — *F. monotropis*, MONACO st 553, 9.4 mm. 190 — *A. aenigmatica*, holotype.

Mangilia ischna Dall, 1927: 31.
Type material: P. monoceros: holotype BMNH 1887.2.9.1118; *M. ischna:* holotype USNM 107950.
Type locality: P. monoceros: CHALLENGER st 104, 02°25N, 20°01W, 4000 m; *M. ischna:* off Fernandina, Florida.
Material examined: the type material and MONACO st 1713, 28°04N, 16°50W, 1340-1530 m, 1 sh; st ?, 3 shs; BIACORES st 126, 39°20N, 33°47N, 3360 m, 1 sh; CINECA III st B31, 29°36N, 11°04W, 1500 m, 1 sh.

Distribution. Only known from the material examined.

Remarks. The holotype is probably full grown, while the other specimens seen are young. The type also lacks the larval shell, and we are therefore not completely certain about the identity of our material. The similarities in sculpture and form, however, are so great that we do not hesitate to use Watson's name.

This species resembles *F. catharinae* considerably but that species has stronger spiral sculpture and more distant axial ribs on the larval shell.

Famelica mirmidina (Dautzenberg & Fischer, 1896) Figs 188,280-281.

Pleurotoma mirmidina Dautzenberg & Fischer, 1896: 413, pl. 17, fig. 13.
Type material: holotype in MOM.
Type locality: MONACO st 553, 37°43N, 25°06W, 1385 m.
Material examined: the holotype and PORCUPINE 1870 st 17, 39°39N, 09°39W, 1350 m, 1 sh; BIACORES st 126, 39°20N, 33°47W, 3360 m, 1 sh; MONACO st 719, 39°11N, 30°24W, 1600 m, 3 shs.

Distribution. Only known from another MONACO station in the Azores.

Remarks. This species can be recognized among all E. Atlantic Turridae known to us by the columella which is concave and has a distinctly folded inner lip, the fold of which runs parallel to the columella and forms a narrow fissure or chink on it.

Famelica monotropis (Dautzenberg & Fischer, 1896) Figs 189,279.

Pleurotoma monotropis Dautzenberg & H. Fischer, 1896: 423, pl. 16, fig. 5.
Type material: holotype in MOM.
Type locality: MONACO st 553, 37°43N, 25°06W, 1385 m.
Material examined: the holotype and 1 sh from the type locality; MONACO st 703, 39°21N, 31°06W, 1360 m, 1 sh; st 719, 39°11N, 32°45W, 1600 m, 1 sh.

Distribution. Only known from another MONACO station in the Azores.

Remarks. This species deviates rather much from the other species here included in *Famelica,* but the characters of the protoconch fit well. Also the columellar area reminds one a little of that of *F. mirmidina.*

Only *Ancistrosyrinx clytotropis* has a similarly keeled adult shell, but it has direct development and comparatively strong spiral sculpture.

Famelica **sp.n.**

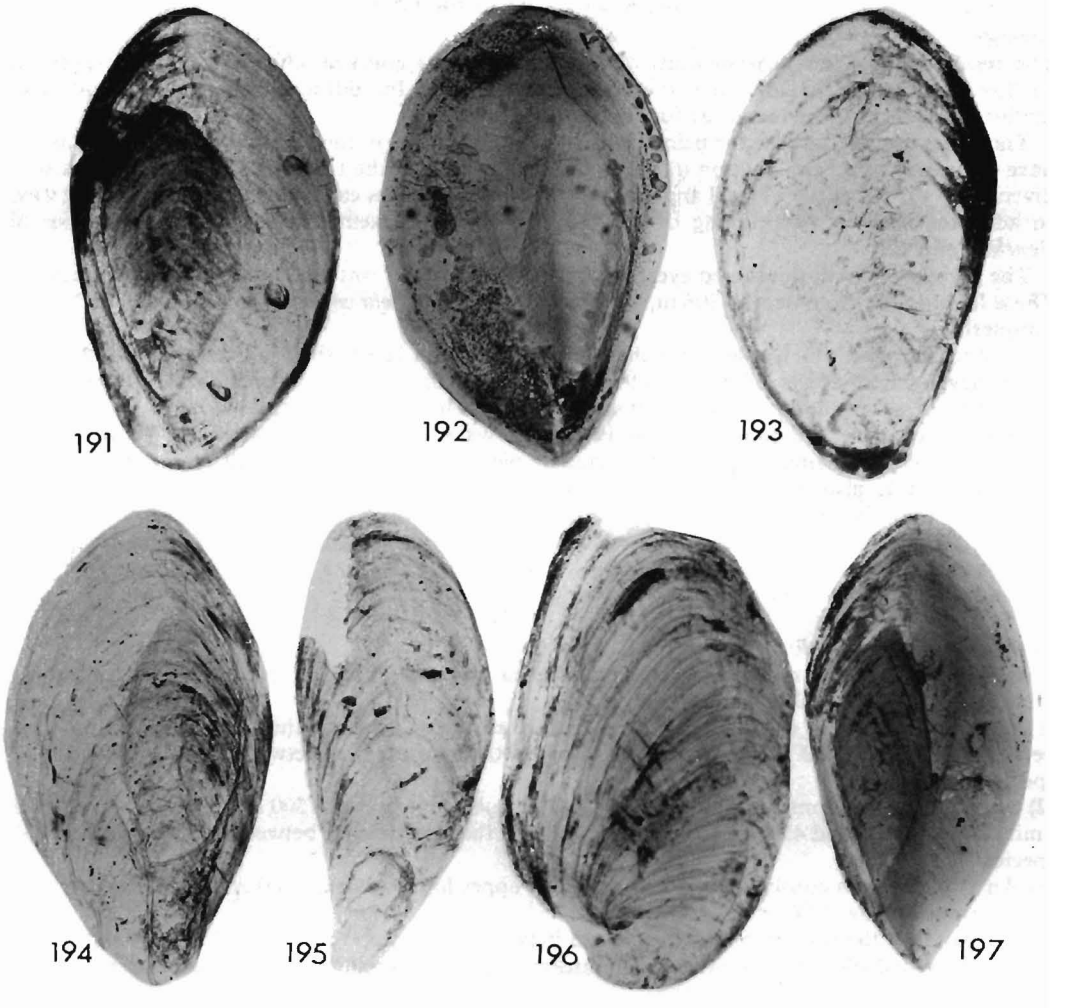
We have a fragment of an evidently undescribed species from MONACO st 1116, 31°44N, 10°47W, 2165 m. The outline is rather close to that of *F. mirmidina* except for the columella, which is normal. The sculpture consists of about five indistinct, but rather broad spiral ribs and deeply sinuated incremental lines instead of being almost lacking as in *mirmidina.* As we only have a single slightly broken shell, without apex, we have preferred not to describe it.

Genus *ALICEIA* Dautzenberg & Fischer, 1897

Type species: *A. aenigmatica* Dautzenberg & Fischer, 1897.

The genus is considered by Powell (1966:70) a probable synonym of *Clavus* Montfort 1810. This is very unlikely although no material is presently availble for anatomical study and we do not have a large experience of species in *Clavus* s.s.

Kay (1979:364) has figured a species as "*Thatcheriasyrinx* sp". This is probably a second species of *Aliceia.*



Figs 191-197. Opercula. 191 — *Spirotropis centimata,* 4.8 mm. 192 — *S. azorica,* 2.0 mm. 193 — *S. monterosatoi,* 3.2 mm. 194 — *Drilliola pruina,* 2.1 mm. 195 — *Borsonia hirondelleaea,* 5.0 mm. 196 — *Irenosyrinx hypomela,* 12.6 mm. 197 — *Leucosyrinx verrilli,* 7.2 mm.

Aliceia aenigmatica Dautzenberg & Fischer, 1897, Figs 190,230.

Aliceia aenigmatica Dautzenberg & H. Fischer, 1897: 182, pl. 4, figs 15-18.

Type material: Syntypes in MOM.

Type locality: not designated, but in the bathyal of the Azores.

Material examined: the type material and MONACO st 698, 39°11N, 30°44W, 1846 m, 3 shs; PORCUPINE st 16, 39°55N, 09°56W, 1800 m, 2 shs; st 17, 39°42N, 09°43W, 1980 m, 4 shs.

Distribution. Known only from a few other MONACO stations in the bathyal of the Azores (material now seriously damaged by acidic glass tubes).

Remarks. The general shape, with processes from the outer lip, makes this species easily recognizable among the known species of the family.

CONCLUDING REMARKS

Biology

The results of our few examinations of stomach contents confirm what was known earlier for shallow water turrids, namely that they feed on polychetes. In addition we have found that other molluscs are also on the menu, as for the family Conidae.

The cones are well known for being rather highly specialized in their diet and their narrow niches have been used as an explanation of the richness of species in the tropical area. Probably the high diversity of turrids in the abyssal and especially the bathyal zones can be explained in the same way. In addition, there is partitioning of habitat with depth as exemplified by the three species of *Benthomangelia.*

The presence of well-developed eyes in purely abyssal species was a surprise to us: for instance in *Theta lyronuclea* (mean depth 4306 m, 17 samples) or *Gymnobela emertoni* (mean depth 3852 m, 21 samples).

Another surprise was the high number of species with a larval shell indicating planktotrophic larval development, 69% of all the species. This tendency, that planktotrophic development is dominant, is increased for greater depths: for species below 3000 m, 78%.

The egg-capsules are constructed as in shallow-water Turridae (Figs 46-47). They are rather frequent in deep-sea samples and are deposited on pieces of hard material: shell debris, small stones, pieces of coal... also ahermatypic corals (Arnaud & Zibrowius 1973). In our present state of knowledge they are impossible to identify even to generic level.

It is also interesting to note that some species like *Gymnobela subaraneosa* or several *Lusitanops* spp. have a larval shell consisting of 3.5—4.5 whorls and only 2—3 postlarval whorls, even if all evidence suggests that they are adults.

Bathymetrical distribution

Tables 2 and 3 summarize the horizontal and vertical distribution of the species. We have classified them into the classical deep faunal categories.

(1) A deep-shelf fauna consisting of species with an upper limit on the shelf and a lower limit between 1000 and 2000 m, and a distinct peak in their occurrence between 300 and 1000 m: 17 species.

(2) A bathyal fauna consisting of species with an upper limit between 500 and 1500 m and a lower limit between 2500 and 4500 m. They have a peak in their occurrence between 1500 and 3000 m: 61 species.

(3) An abyssal fauna consisting of species with an upper limit between 2500 and 3500 m and a peak in occurrence below 4000 m: 24 species.

This parallels the topographical distinction between shelf, slope and abyssal plain. Locally it is modified by hydrological conditions, for instance in the Mauretanian upwelling, where typically bathyal species occur in the deep shelf.

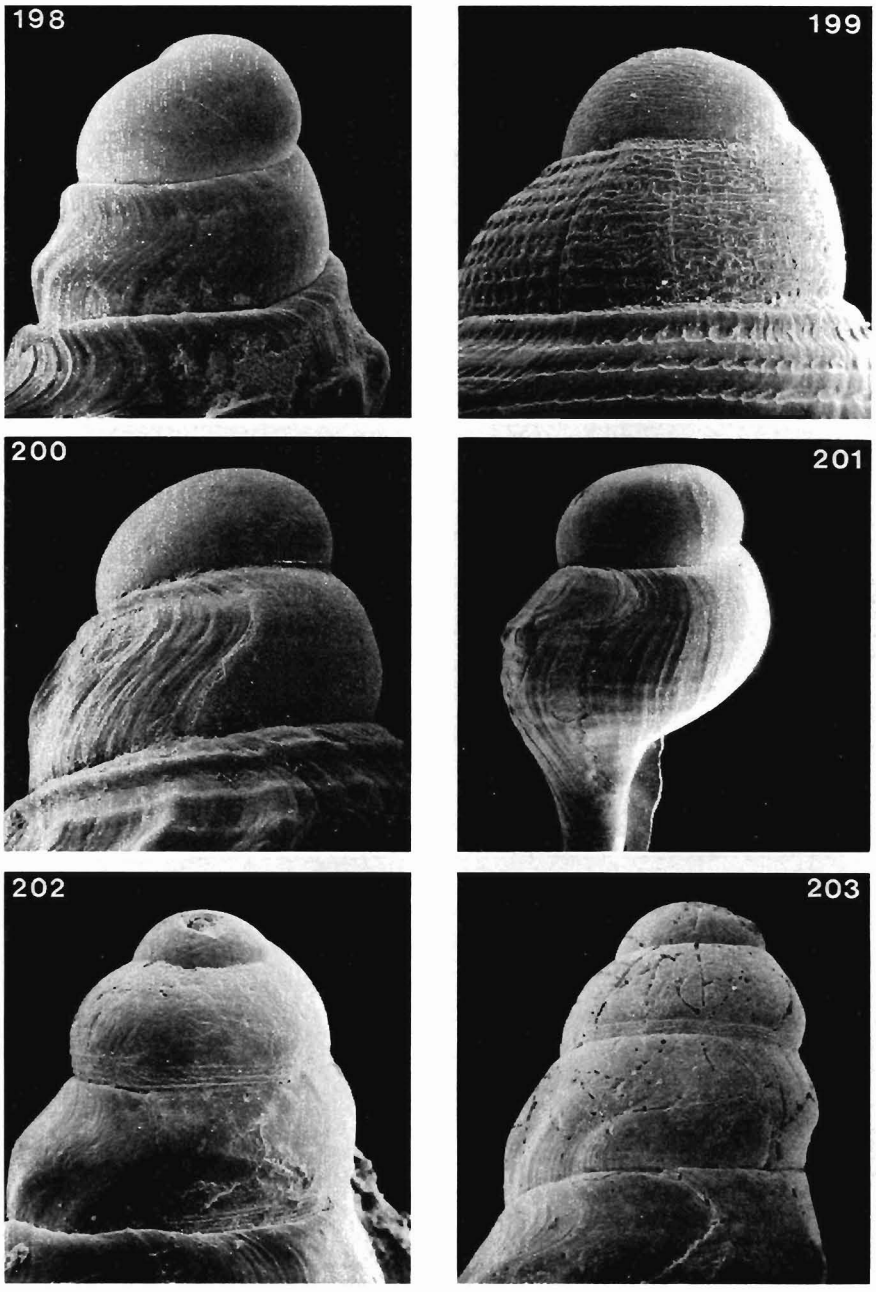
Maximum diversity is on the slope which offers more diversified habitats, with rocks, mud and ahermatypic coral reefs, while the abyssal, at least as sampled in our material, consists of uniform ooze plains, with lower availability of food.

Table 3
Species number within depth intervals

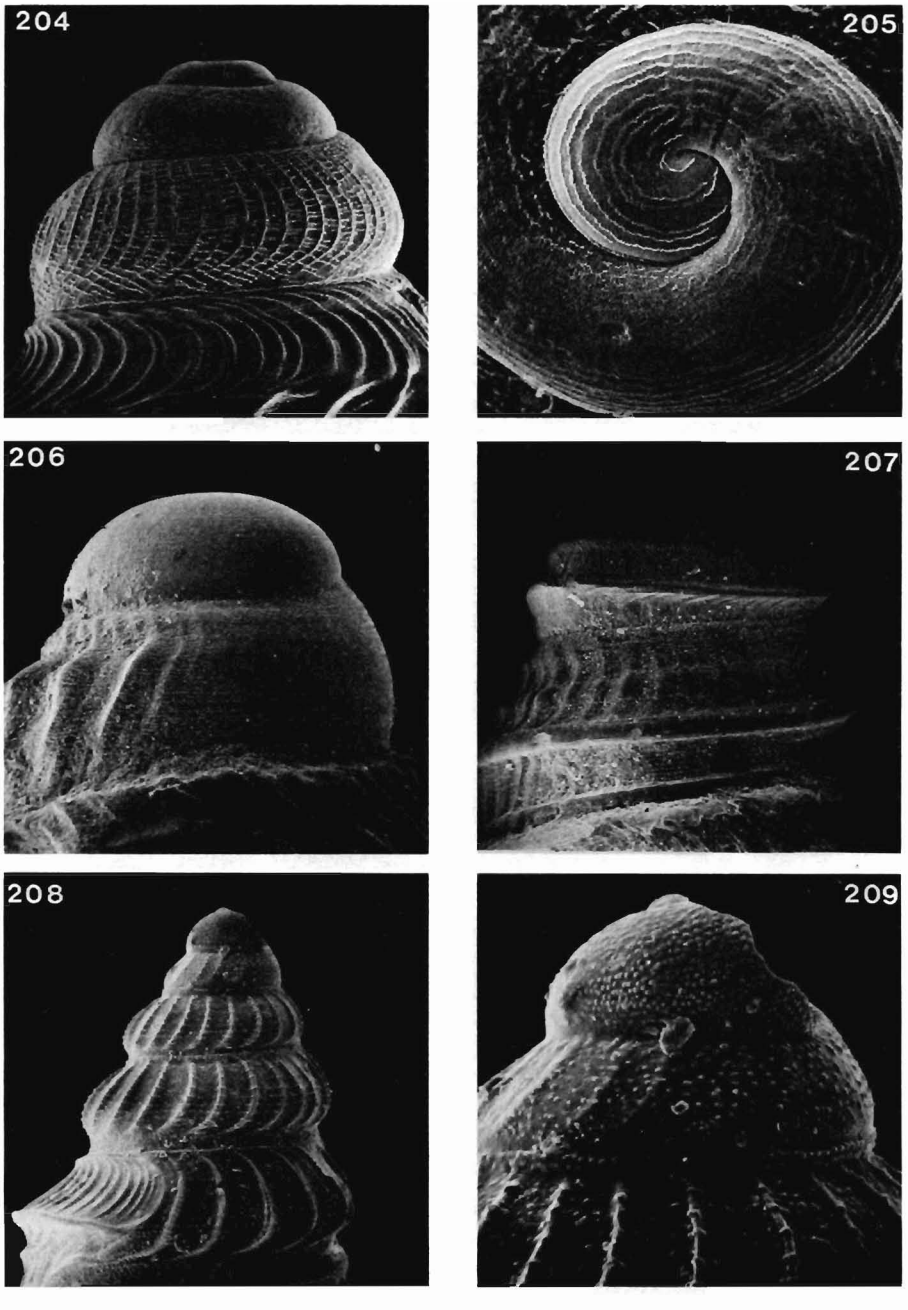
depths (m)	300 — 500	500 — 1000	1000 — 1500	1500 — 2000	2000 — 2500	2500 — 3000	3000 — 3500	3500 — 4000	4000 — 4500	4500 — 5000
species	25	38	59	62	36	28	26	15	25	17	5
total no. of dredgehauls	176	371	218	102	146	96	45	28	75	52	9

Geographical distribution

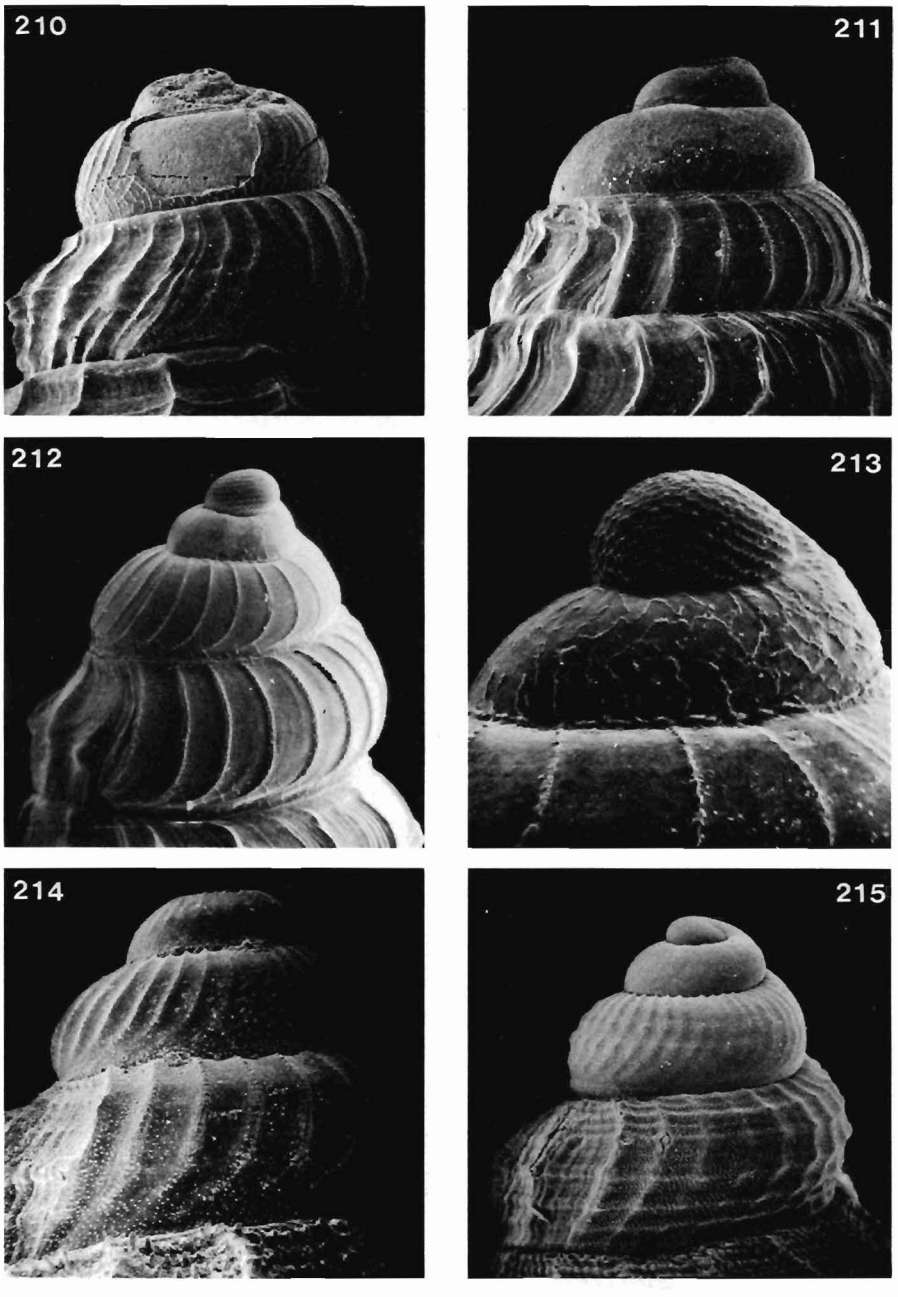
It is difficult to give detailed accounts of the biogeography within the area treated here because the majority of the dredge hauls on which our revision is based is concentrated around the Azores, the Bay of Biscay and the Rockall Trough. We have very little material from west of Spain, the Mid-Atlantic and the area east of Reykjanes ridge. However on a larger scale, some patterns become apparent and will be more so when the other families have been monographed.



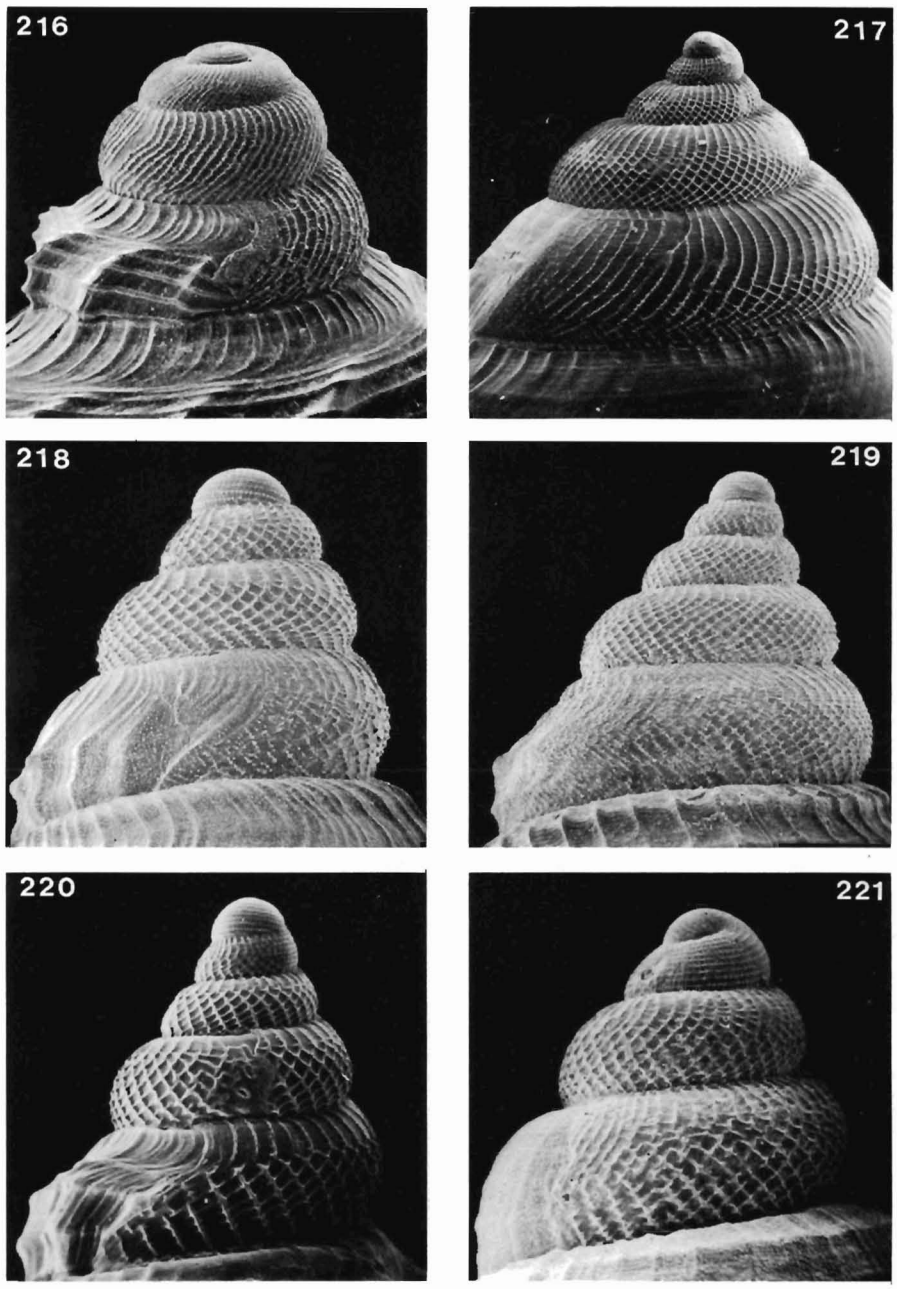
Figs 198-203. Protoconchs. 198 — *Borsonia hirondelleae* (×40). 199 — *Thesbia nana* (×78). 200 — *Typhlomangelia nivalis* (×55). 201 — *Irenosyrinx hypomela* (×18.5). 202 — *Leucosyrinx verrilli* (×42.5). 203 — *Spirotropis centimata* (×40). (For all the plates of protoconchs, the magnification mentioned is ± 10%).



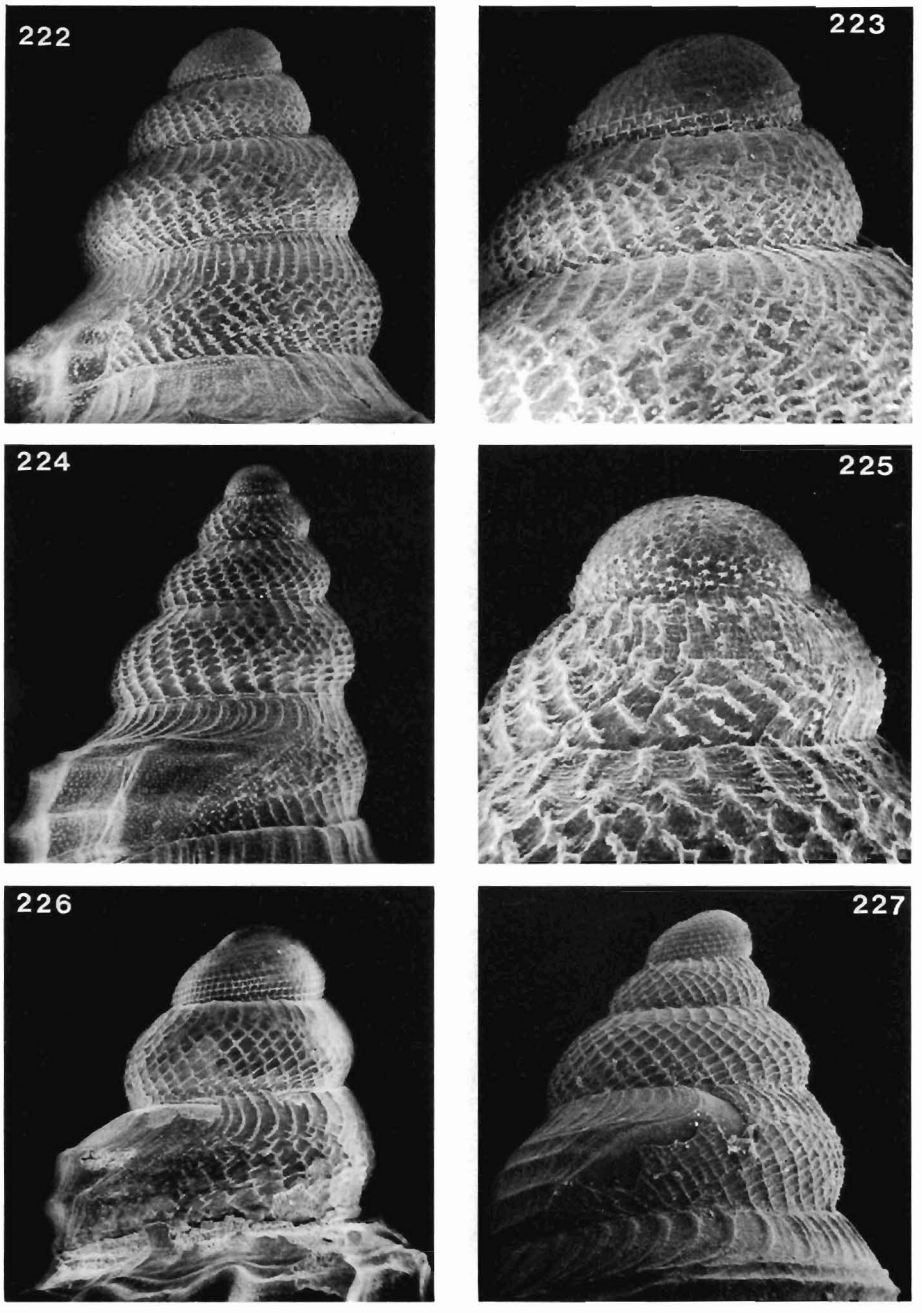
Figs 204-209. Protoconchs of *Drilliola*. 204,205 — *D. pruina* (×50.5, ×137). 206 — *D. megalacme* (×55). 207 — *D. emendata* (×55). 208,209 — *D. loprestiana* (apex broken) (×43.5, ×170).



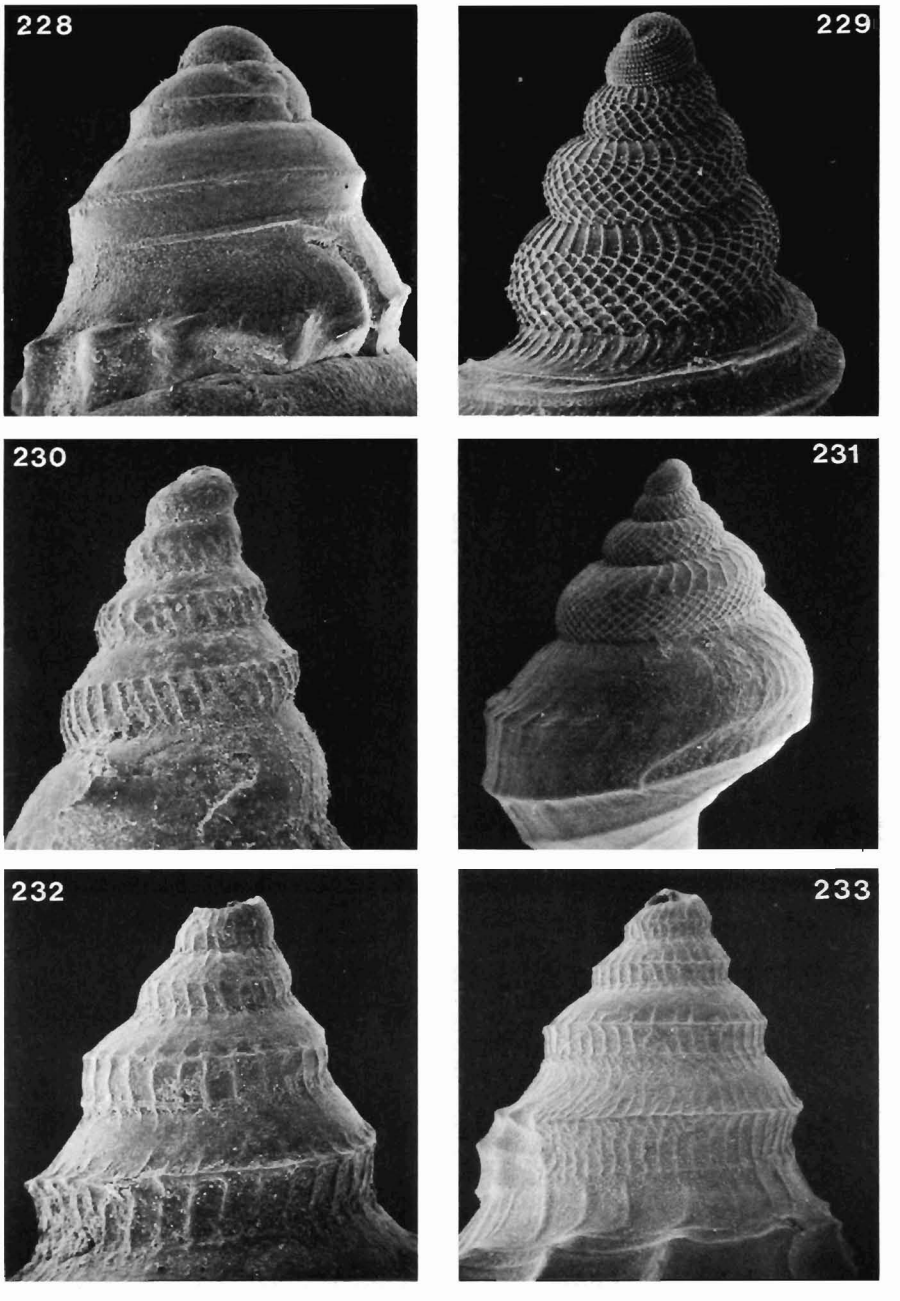
Figs 210-215. Protoconchs. 210 — *Benthomangelia decapitata* (×35). 211 — *Benthomangelia antonia* (×40). 212, 213 — *Benthomangelia macra* (×40, ×160). 214 — *Mangelia serga* (×66.5). 215 — *Mangelia nuperrima* (×41).



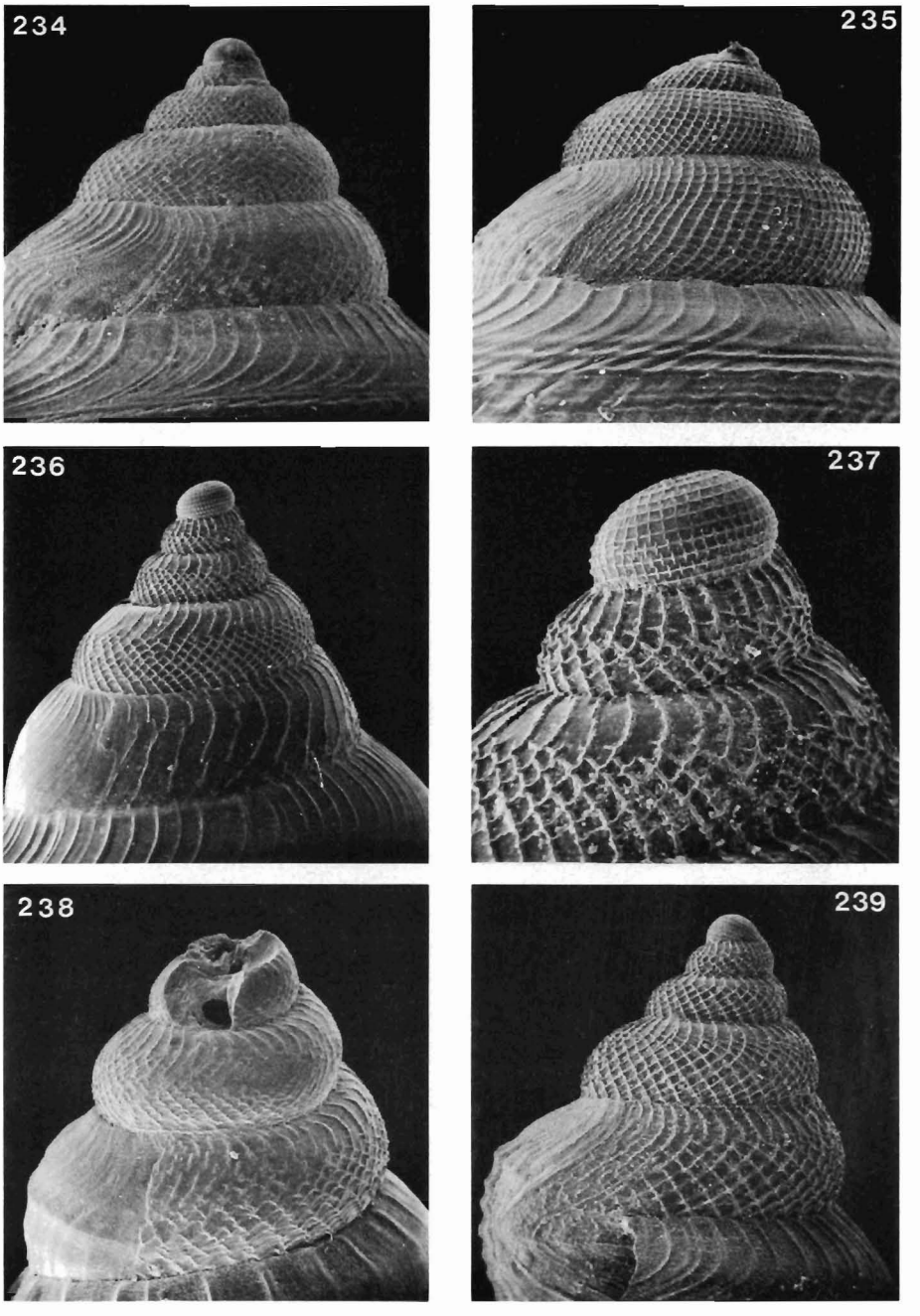
Figs 216-221. Protoconchs of *Pleurotomella*. 216 — *P. packardi* (×41). 217 — *P. lottae* (×40). 218 — *P. bureaui* (×55). 219 — *P. sandersoni* (×41). 220 — *P. gibbera* (×68.5). 221 — *P. obesa* (×75.5).



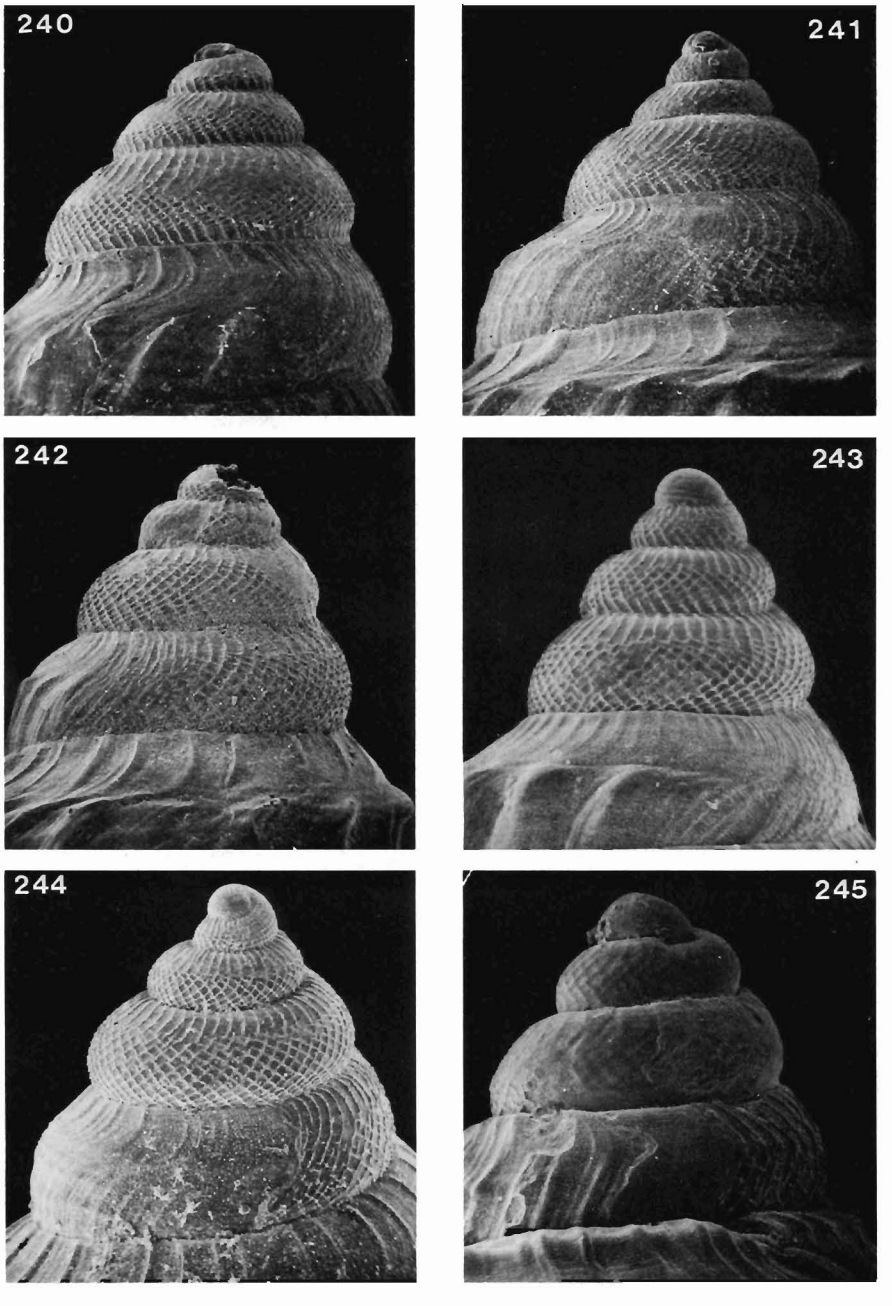
Figs 222-227. Protoconchs of *Pleurotomella*. 222, 223 — *P. coeloraphe* (×55, ×110). 224, 225 — *P. eurybrocha* (×55, ×174). 226 — *P. demosia* (×55). 227 — *P. megalembryon* (×46.5).



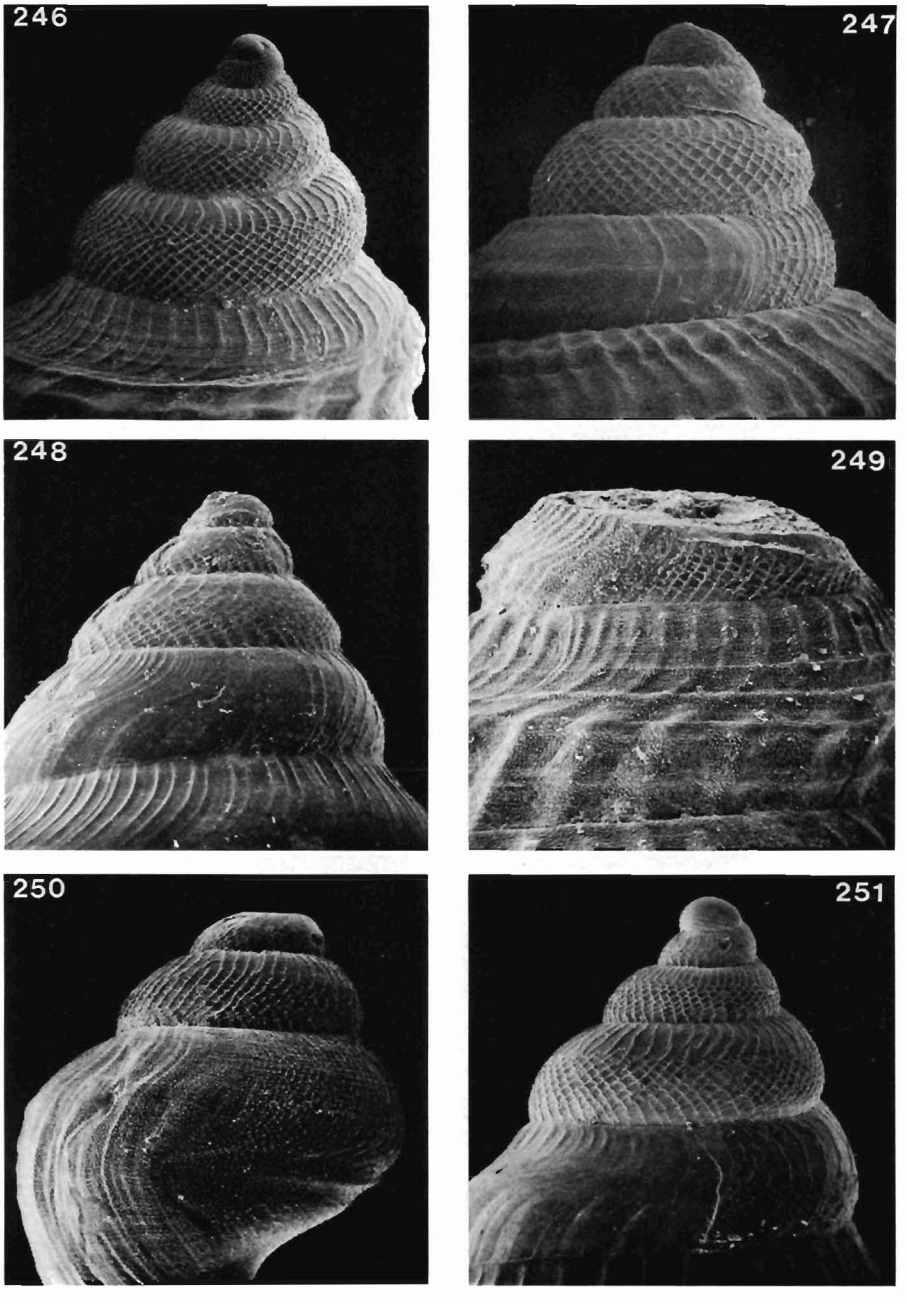
Figs 228-233. Protoconchs. 228 — *Corinnaeturris leucomata* (×55). 229 — *Teretia teres* (×46). 230 — *Aliceia aenigmatica* (×55). 231 — *Teretia thaumastopsis* (×27.5). 232 — *Neopleurotomoides callembryon* (×55). 233 — *Neopleurotomoides distincta* (×37.5).



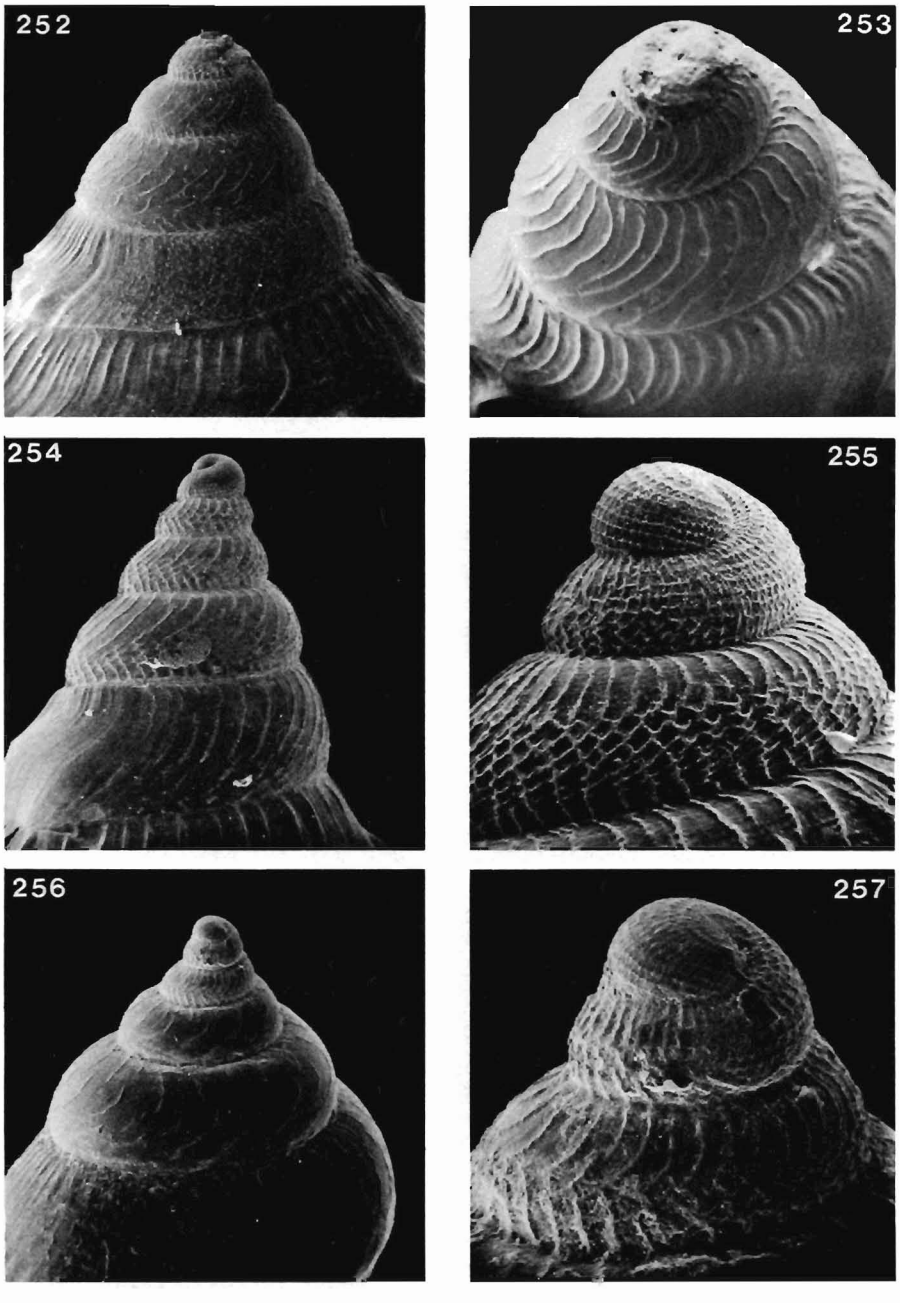
Figs 234-239. Protoconchs. 234 — *Xanthodaphne bruneri* (×39). 235 — *Xanthodaphne* n.sp. (×35.5). 236, 237 — *Xanthodaphne dalmasi* (×35.5, ×114). 238 — *Phymorhynchus sulcifera* (×41). 239 — *Phymorhynchus alberti* (identification not 100% certain) (×41).



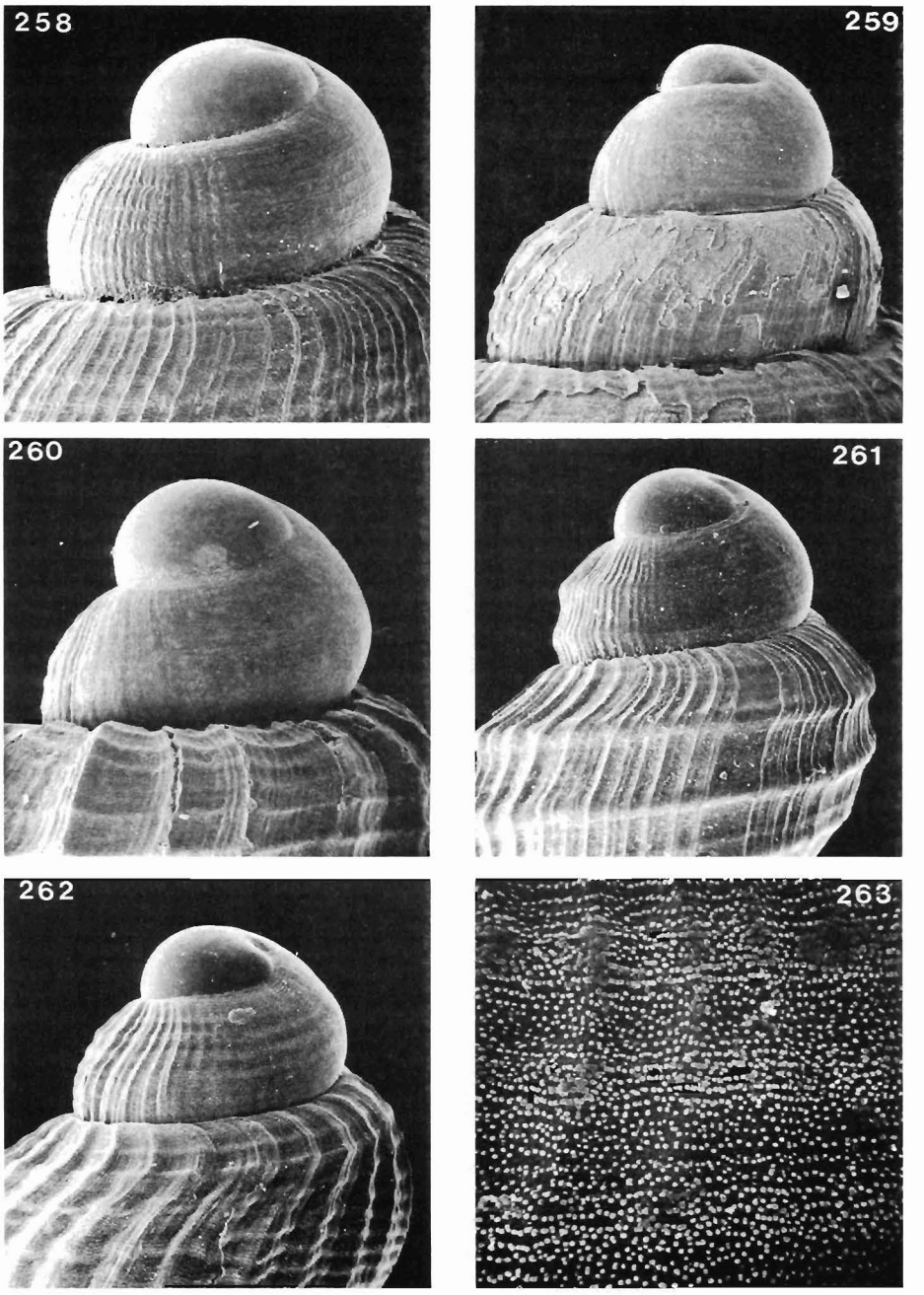
Figs 240-245. Protoconchs of *Gymnobela*. 240 — *G. homeotata* (×39). 241 — *G. lamyi* (×39). 242 — *G. leptoglypta* (×41). 243 — *G. pyrrhogramma* (×46). 244 — *G. subaraneosa* (×41). 245 — *G. watsoni* (×66.5).



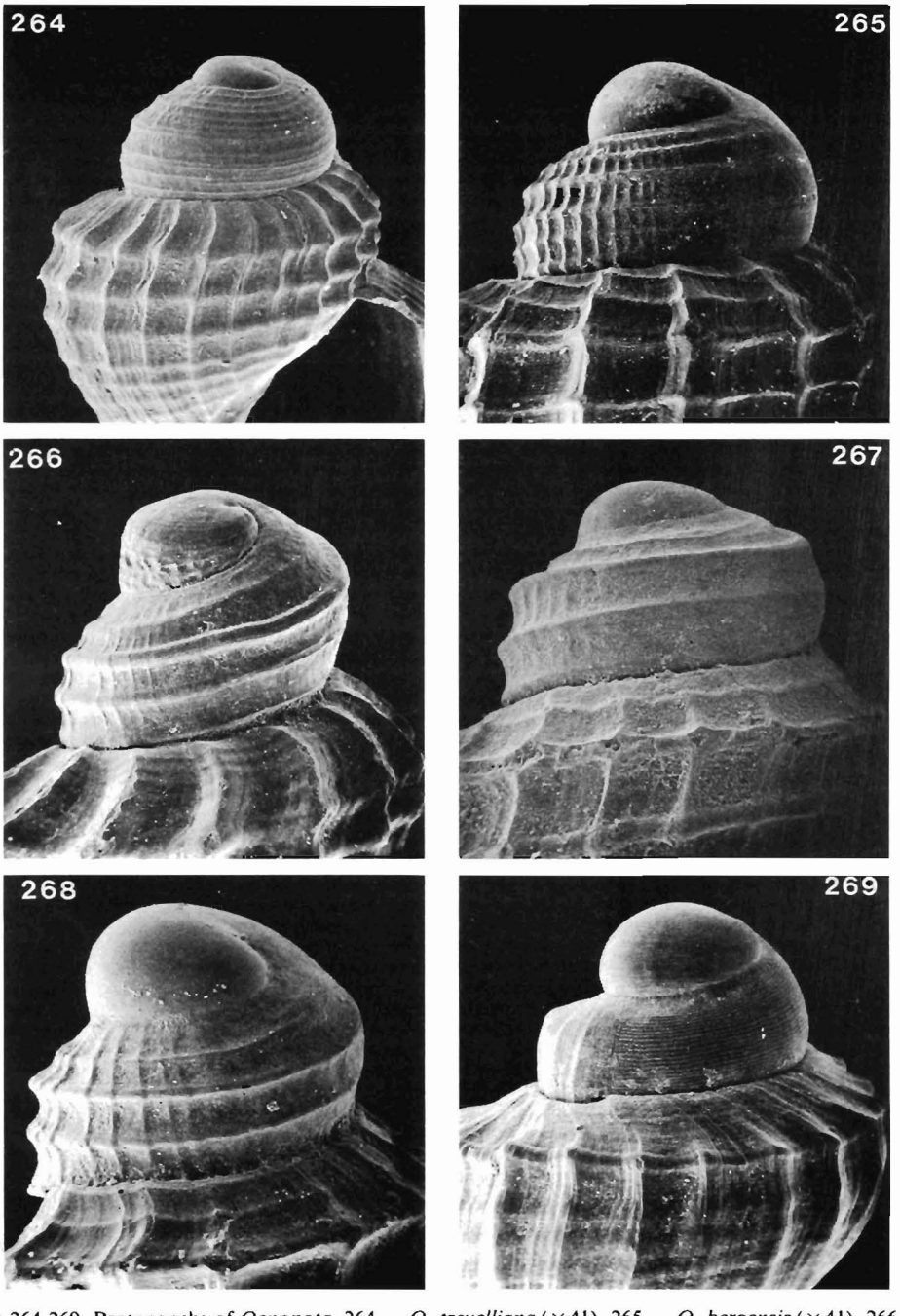
Figs 246—251. Protoconchs of *Gymnobela*. 246 — *G. abyssorum* (×36.5). 247 — *G. aquilarum* (×55). 248 — *G. emertoni* (×36). 249 — *G. engonia* (×41). 250 — *G. frielei* (×41). 251 — *G. fulvotincta* (×40).



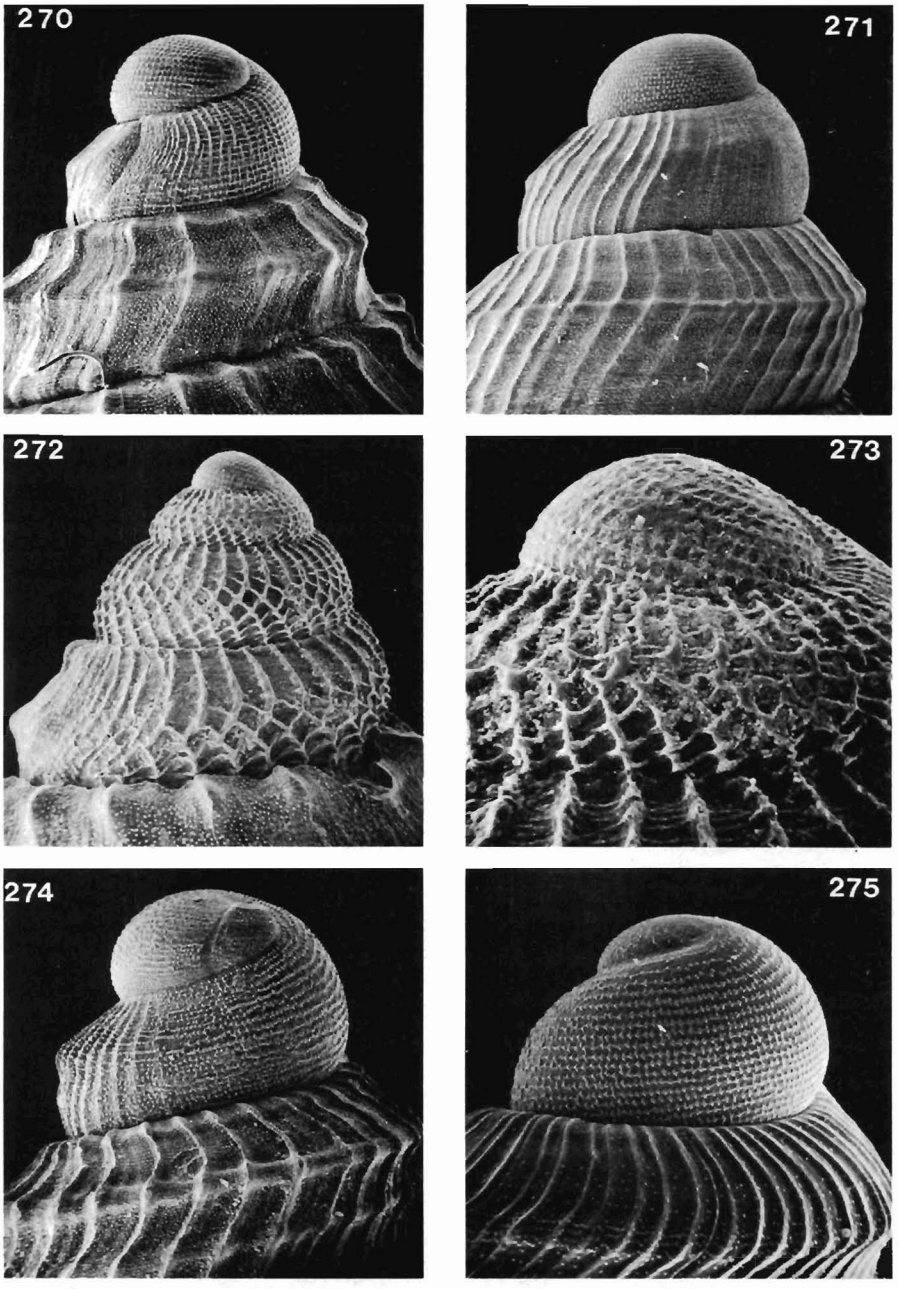
Figs 252-257. Protoconchs. 252 — *Theta lyronuclea* (×18.5). 253 — *Theta vayssierei* (×20). 254, 255 — *Theta chariessa* (×35.5, ×114). 256, 257 — *Lusitanops macrapex,* part of the larval shell (×29.5, ×114).



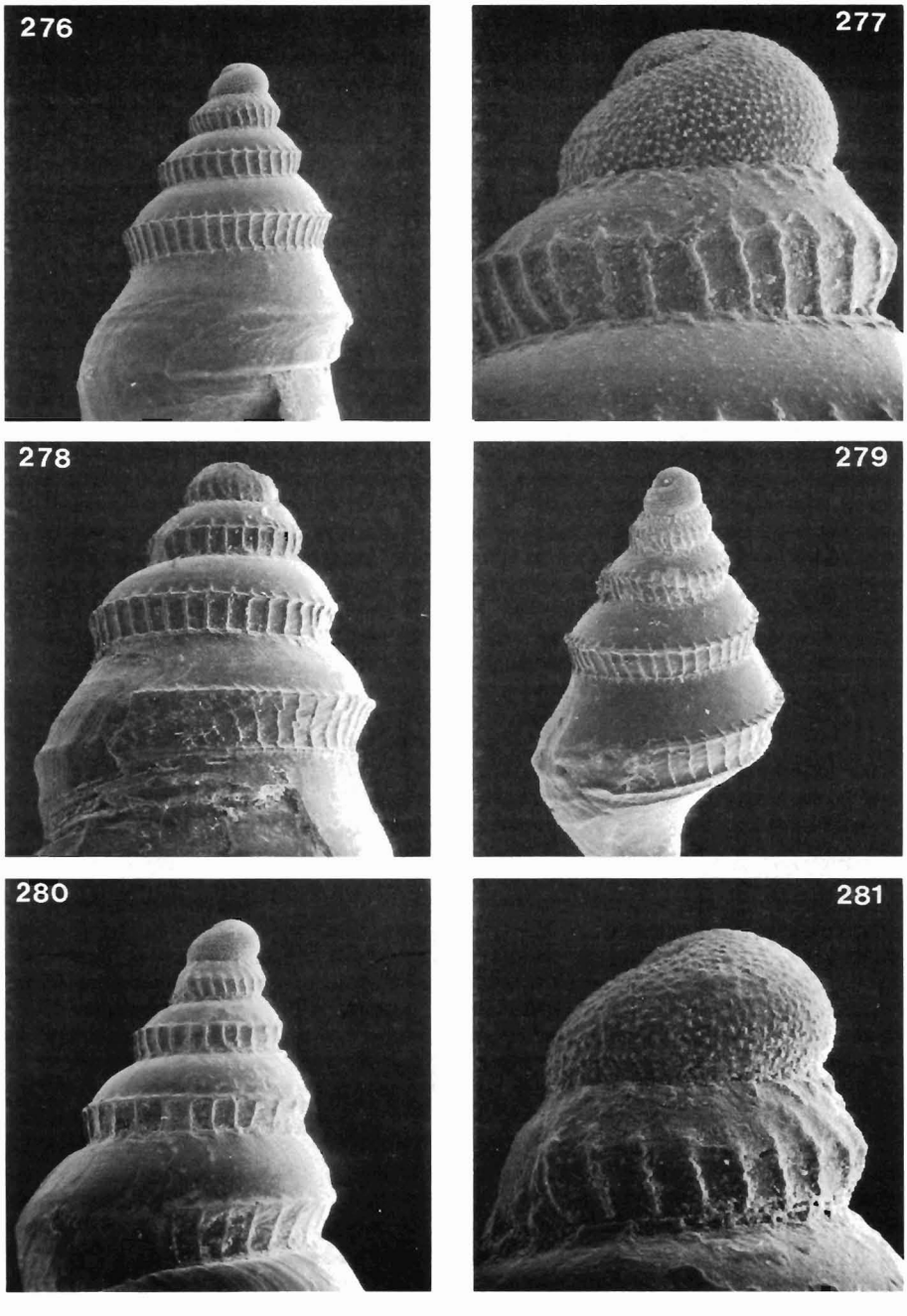
Figs 258-263. Protoconchs of *Oenopota*. 258 — *O. ovalis*, INGOLF st 113 (×41). 259 — *O. ovalis*, THALASSA st Z407 (×41). 260 — *O. dictyophora* (×41). 261 — *O. violacea* (×41). 262, 263 — *O. tenuicostata* (×41, ×275).



Figs 264-269. Protoconchs of *Oenopota*. 264 — *O. trevelliana* (×41). 265 — *O. bergensis* (×41). 266 — *O. elegans* (×41). 267 — *O. turricula* (×55). 268 — *O. scalaris* (×41). 269 — *O. graphica* (×41).



Figs 270-275. Protoconchs of *Taranis*. 270 — *T. borealis* (×55). 271 — *T. laevisculpta* (×55). 272, 273 — *T. malmi* (×82.5, ×275). 274, 275 — *T. moerchi* (×55, ×105).



Figs 276-281. Protoconchs of *Famelica*. 276, 277 — *F. monoceros* (×33, ×160). 278 — *F. catharinae* (×41). 279 — *F. monotropis* (×35.5). 280, 281 — *F. mirmidina* (×41, ×172). All the SEM pictures have been taken by Mrs Guillaumin on the Cameca microscope of the Centre de Microscopie, Université Paris VI.

A. *The Mediterranean*

Fifteen of the species treated here occur in the Mediterranean: this is a small portion.

Most species of the nearby Atlantic shelf fauna also occur in the Mediterranean, except the genus *Oenopota,* which is a typical boreal and cold-water genus. Only the following species can be considered deep elements:

Spirotropis monterosatoi, Pleurotomella eurybrocha, Micropleurotoma spirotropoides, Typhlomangelia nivalis, Gymnobela abyssorum, G. subaraneosa, Benthomangelia macra, Taranis moerchi, Lusitanops sp. A.

All these species are known also from the bathyal of the Atlantic: there is no endemic deep-water element in the Mediterranean; there are no abyssal Mediterranean species.

This is explained by the present and past hydrographical conditions of this sea:

1. The bottom temperature is very warm, 13°C, compared to the cooler temperatures of the nearby Atlantic. Temperature, more likely than pressure, regulates the vertical distribution of deep benthic organisms, which means that a species able to live at 4000 m in the Mediterranean will also be able to live there at 500 m, hence no purely abyssal species.
2. In the upper Tertiary, the Mediterranean has been evaporated during the Messinian phase (upper Miocene), as evidenced by thick gypsum deposits. This means that the Mediterranean had to be recolonized from the Atlantic, at least as far as the deep-water fauna is concerned. This occurred relatively recently and only by species which: (1) either have planktonic larvae and were thus able to enter the Mediterranean via the inflowing Gibraltar surface current *(Gymnobela, Benthomangelia, Lusitanops, Pleurotomella);* or (2) have direct development but a rather broad bathymetric distribution and are thus able to cross the Gibraltar sill (350 m) at the benthic stage *(Spirotropis, Micropleurotoma, Taranis).*

Among the many Atlantic species which come into the first category (70 species), probably a great number enter as larvae but, due to the warm bottom temperatures, are unable to perform a normal metamorphosis. All these reasons probably account for the low diversity of the deep Mediterranean fauna.

B. *The Norwegian Sea*

The Norwegian Sea has no endemic abyssal and few endemic bathyal species. For a full discussion on the evolution of the abyssal Norwegian mollusc fauna, see Bouchet & Warén (1979). In short, it can be said that this fauna is not a derivative from the N. Atlantic one, but from the Polar basin one. This sea is separated from the N. Atlantic by the Shetland-Faeroe Ridge and can be colonized only by species having planktonic larvae or direct development plus broad vertical distribution.

On the northern side of the ridge they find cooler bottom temperatures (—1°C to —2°C), which explains in part the very limited success of these candidates to immigration.

But the Shetland-Faeroe Ridge is probably not the only limiting factor to species diversity in the northern N. Atlantic because the area west of Ireland (Rockall Trough) already has a reduced diversity compared to the Bay of Biscay or the Azores, with only 27 species (*c.* 26%) occurring north of 55° N. Twelve of these are typical shelf species, and the bathyal/abyssal fauna there has only 15% of the species of the total area.

C. *Relations with the Western Atlantic turrid fauna*

Thirty-two species occur also in the Western Atlantic basin, which makes 34% of the species described before this revision. But if we calculate the same figure for species known from more than 20 records, we get 60%. This derives from the fact that the fauna of the western side is less well described and only the more common species are known; so we can expect that the percentage of species in common will rise when the vast amounts of material from recent American sampling programmes are worked out.

In any case the mid Atlantic ridge cannot be regarded as a geographical barrier and it was only a convenient limit to the area we intended to cover.

D. *Southern limits*

We cannot at present say very much because we have not examined much material from south of the area treated here and the few records in the literaturee are unreliable. Study of existing collections will probably give an answer but our impression is that the bathyal of West Africa or the Caribbean

has very little in common with the bathyal of northern areas; on the contrary the abyssal fauna seems to be more uniform, at least on the eastern side of the Atlantic.

ACKNOWLEDGMENTS

In the first place we thank Drs L. Cabioch, J. Forest and L. Laubier, leaders of the expeditions which on *Thalassa* and *Jean-Charcot* collected most of the material on which the revision is based. The material was made available through the Centre de Tri d'Océanographie Biologique, under the direction of M. Segonzac.

For additional material from other expeditions we thank Drs J. Gage and D. Heppell *(Challenger II),* R. Fechter and F. Talavera *(Meteor),* B. Aldred and A. Rice *(Discovery),* J. Knudsen *(Ingolf, Thor, Bartlett),* E. Southward *(Sarsia),* M. Glémarec *(Cineca III),* P. Arnaud, Lagardère, Carrozza and DiGeronimo.

For help in museum work, especially in the location of type specimens, we are indebted to Drs J. Rosewater and R. Houbrick (USNM), K. Way and A. Blake (BMNH), J. Kjennerud (ZMB), K. Boss (MCZ), Testa (MOM), J. van Goethem (IRSN), R. Kilias (ZMHU), Wawra and Paget (NHMW), K. Nicolay (Rome), B. Hubendick (Göteborg) and L. Orrhage (SMNH).

For technical assistance during various phases of the work, we thank Ms C. Chérel.

For help in the photographical part, we thank Mrs Guillaumin (Univ.Paris VI) and Mr Foubert (MNHN).

Working visits to MOM were made possible through a grant to P. Bouchet by the Comité de Perfectionnement de l'Institut Océanographique. We also thank the Centre National de la Recherche Scientifique for grants to A. Warén which permitted working visits to Paris.

REFERENCES

ABBOTT, R.T. 1974. *American Seashells.* 2nd edition. Van Nostrand Reinhold Co., New York. 663pp.

ARNAUD, P.M. & H. ZIBROWIUS 1973. Capsules ovigères de Gastéropodes Turridae et corrosion du squelette des Scléractiniaires bathyaux des Açores. *Revista de la Faculdade de Ciencias Lisboa,* (2) **17C**(2): 581-98.

BARTSCH, P. 1934. Reports on the collections obtained by the first Johnson-Smithsonian Deep-sea Expedition to the Puerto Rican deep: New Mollusks of the family Turritidae. *Smithsonian Miscellaneous Collections,* **91**(2): 1-29.

BARTSCH, P. 1941. The nomenclatorial status of certain northern Turritid mollusks. *Proceedings of the biological Society of Washington,* **54:** 1-14.

BARTSCH, P. 1941a. *Turritomella,* new subgeneric name for *Turritoma* Bartsch, 1941. *Nautilus,* 54: 143.

BELLARDI, L. 1839. Une coquille des sables tertiaires des collines subapennines, nommée Borsonia prima. *Bulletin de la Société géologique de France,* **10:** 30-31.

BOSS, K.J.J., ROSEWATER, J. & RUHOFF, F. 1968. The zoological taxa of William Healey Dall. *United States National Museum Bulletin,* **287:** 1-427.

BOUCHET, P. 1977. Mise en évidence de stades larvaires planctoniques chez des Gastéropodes Prosobranches des étages bathyal et abyssal. *Bulletin du Muséum national d'Histoire naturelle, Paris,* (3), **400**:947-72.

BOUCHET, P. & WAREN, A. 1979. The abyssal molluscan fauna of the Norwegian Sea and its relation to other faunas. *Sarsia,* **64:** 211-43.

BROWN, T. 1844. *Illustrations of the Recent Conchology of Great Britain and Ireland.* 2nd edition. Smith, Elder & Co., London. 144pp.

BROWN, T. 1827. *Ibid.,* 1st edition.

BRUGNONE, G.A. 1862. *Memoria sopra alcuni Pleurotomi fossili dei dintorni di Palermo.* F. Lao, Palermo. 41pp.

BRUSINA, S. 1866. Contribuzione della fauna dei Molluschi dalmati. *Verhandlungen der Kaiserlich-königlichen zoologisch-botanischen Gesellschaft in Wien,* **16:** 1-134.

BUCQUOY, E., DAUTZENBERG P. & DOLLFUS, G. 1883. *Les Mollusques marins du Roussillon,* **I,** Gastéropodes. Fascicule 3. Baillère, Paris. pp. 85-135.

BUSH, K. 1893. Report on the Mollusca dredged by the "Blake" in 1880, including descriptions of several new species. *Bulletin of the Museum of Comparative Zoology,* **23**(6): 197-244.

CALCARA, P. 1841. Monografia dei generi *Spirorbis* e *Succinea* seguita da alcune nuove specie di conchiglie siciliane. *Giornale Letterario,* **226:** 1-11 (Not seen).

CARROZZA, F. 1975. Microdoride di Malacologia mediterranea. *Conchiglie,* **11** (9-10): 185-92.

CASEY, T.L. 1903. Notes on the Conrad collection of Vicksburg fossils, with descriptions of new species. *Proceedings of the Academy of Natural Science of Philadelphia,* **55:** 261-83.

CERNOHORSKY, W.O. 1975. The taxonomy of some Indo-Pacific Mollusca, Part 3. *Records of the Auckland Institute and Museum,* **12:** 213-34.

CLARKE, A.H. 1959. New abyssal Molluscs from off Bermuda collected by the Lamont Geological Observatory. *Proceedings of the Malacological Society of London,* **33:** 231-8.

COSSMANN, M. 1896. *Essais de Paléoconchologie comparée.* 2ème livraison. Published by the author, Paris. 179pp.
COUTHOUY, J.P. 1838. Descriptions of new species of Mollusca and shells and remarks on several polypi found in Massachusetts Bay. *Boston Journal of Natural History,* **2**(1): 53-111.
CRISTOFORI, G. de & JAN, G. 1833. *Catalogus in IV Sectiones divisus rerum naturalium in Museo exstantium ...Sectio II. Pars 1. Conchylia fossilia ex formatione telluris tertiaria in collectione nostra exstantia.* Typ. Carmignani, Parmae. 16pp.
DALL, W.H. 1881. Reports on the results of dredging... in the gulf of Mexico and in the Caribbean sea... XV. Preliminary Report on the Mollusca. *Bulletin of the Museum of Comparative Zoology,* **9**(2): 33-144.
DALL, W.H. 1886. *Ibid.* XXIX. Report on the Mollusca, part 1. *Bulletin of the Museum of Comparative Zoology,* **12**(6): 171-318.
DALL, W.H. 1889. *Ibid.* XXIX. Report on the Mollusca, part 2. Gastropoda and Scaphopoda. *Bulletin of the Museum of Comparative Zoology,* **18:** 1-492.
DALL, W.H. 1890. Scientific results of explorations by the U.S. Fish Commission steamer "Albatross". VII. Preliminary report on the collection of Mollusca and Brachiopoda. *Proceedings of the United States National Museum,* **12:** 219-362.
DALL, W.H. 1895. Diagnoses of new species of mollusks from the West coast of America. *Proceedings of the United States National Museum,* **18:** 7-20.
DALL, W.H. 1908. Reports on the dredging operations off the west coast of Central America to the Galapagos, to the West coast of Mexico, and in the gulf of California..XIV. the Mollusca and Brachiopoda. *Bulletin of the Museum of Comparative Zoology,* **43**:(6) 205-487.
DALL, W. H. 1918. Notes on the nomenclature of the mollusks of the family Turritidae. *Proceedings of the United States National Museum,* **54:** 313-33.
DALL, W.H. 1924. Notes on molluscan nomenclature. *Proceedings of the Biological Society of Washington,* **37:** 87-90.
DALL, W.H. 1927. Small shells from dredgings off the southeast coast of the U.S. *Proceedings of the United States National Museum,* **70**(18): 1-134.
DAUTZENBERG, P. 1889. Contribution à la faune malacologique des iles Açores. *Résultats des Campagnes Scientifiques... Albert Ier,* **1:** 1-112.
DAUTZENBERG, P. 1891. Contribution à la faune malacologique du golfe de Gascogne. *Mémoires de la Société Zoologique de France,* **4:** 604-19.
DAUTZENBERG, P. 1925. Mollusques nouveaux provenant des croisières du Prince Albert Ier de Monaco. *Bulletin de l'Institut Océanographique de Monaco,* **457:** 1-12.
DAUTZENBERG, P. 1927. Mollusques provenant des campagnes scientifiques du Prince Albert Ier de Monaco dans l'océan Atlantique et dans le golfe de Gascogne. *Résultats des Campagnes Scientifiques... Albert Ier,* **72:** 1-401.
DAUTZENBERG, P. & FISCHER, H. 1896. Dragages effectués par l'*Hirondelle* et par la *Princesse-Alice:* 1. Mollusques Gastéropodes. *Mémoires de la Société Zoologique de France,* **9:** 395-498.
DAUTZENBERG, P. & FISCHER, H. 1897. Dragages effectués par l'*Hirondelle* et par la *Princesse-Alice,* 1888-1896. *Mémoires de la Société Zoologique de France,* **10,** 139-234.
DAUTZENBERG, P. & FISCHER, H. 1906. Mollusques provenant des dragages effectués à l'ouest de l'Afrique. *Résultats des Campagnes Scientifiques... Albert Ier,* **32:** 1-125.
FECHTER, R. 1976. *Pleurotomella (Theta) bathyiberica* sp.nov. und Neufunde von *Pleurotomella (Theta) lyronuclea* Clarke, 1959 aus dem Iberischen Tiefseebecken. *Meteor Forschung-Ergebniss,* D, **22:** 70-6.
FECHTER, R. 1979. Abyssale Turriden von der Horseshoe-Tiefsee-Ebene. *Spixiana,* **2**(1): 63-8.
FECHTER R. 1979. Gastropoden aus der Iberischen Tiefsee. *Meteor Forschung-Ergebnisse,* D, **30:** 23-40.
FISCHER, P. 1882. Diagnoses d'espèces nouvelles de Mollusques recueillis dans le cours des expéditions scientifiques de l'aviso le Travailleur (1882), pars II. *Journal de Conchyliologie,* **30:** 273-7.
FORBES, E. 1844. Report on the Mollusca and Radiata of the Aegean sea, and on their distribution, considered as bearing on geology. *Reports of the British Association for the Advancement of Science for 1843:* 130-93.
FRETTER, V. & GRAHAM, A. 1962. *British Prosobranch Mollusc.* Ray Society, London. 755 pp.
FRIELE, H. 1874. Oversigt over de i Bergens omegn forekommende skaldaekte Mollusker. *Forhandlinger i Videnskabsselskabet i Kristiania* (1873): 289-312.
FRIELE, H. 1877. Preliminary report on the Mollusca. *Nyt Magazin for Naturvidenskaberne,* **23,** 1-10.
FRIELE, H. 1879. Catalog der auf der norwegischen Nordmeer-expedition bei Spitzbergen gefunden Mollusken. *Jahrbücher der Deutschen Malakozoologischen Gesellschaft,* **1:** 264-86.
FRIELE, H. 1886. Mollusca II. *The Norwegian North-Atlantic Expedition 1876-78,* **16,** 1-44.
GERONIMO, I. di 1972. Contributo alla conoscenza della malacofauna batiale al largo di Siracusa. *Conchiglie,* **8**(1-2): 1-7.
GERONIMO, I. di & PANETTA, P. 1973. La malacofauna batiale del golfo di Taranto. *Conchiglie,* **9**(5-6): 69-122.
GIANNINI, F. 1975. Conchiglie rare raccolte nel Tirreno (Nota seconda). *Conchiglie,* 11:87-92.
GLIBERT, M. 1954. Pleurotomes du miocène de la Belgique et du bassin de la Loire. *Mémoires de l'Institut Royal des Sciences naturelles de Belgique,* **129:** 1-75.
GRIEG, J. A. 1920. Brachiopoda, Scaphopoda, Gastropoda and Lamellibranchiata. *Reports on the Scientific results of the Michael-Sars Expedition,* **3**(2): 1-20.
GRIEG, J.A. 1931. Supplement to the Brachiopoda, Scaphopoda, Gastropoda and Lamellibranchiata. *Reports on the Scientific results of the Michael-Sars Expedition,* **5**(4): 3-5.
HUBENDICK, B. & WAREN, A. 1973. Småsnäckor från svenska Västkusten, 5. *Göteborgs Naturhistoriska Museum Årstryck 1973:* 41-48.

IREDALE, T. 1918. Molluscan nomenclatural problems and solutions — No.1. *Proceedings of the Malacological Society of London,* **13:** 28-40.
JEFFREYS, G. 1867. *British Conchology,* **4.** Van Voorst, London. 486pp.
JEFFREYS, J.G. 1877. New and peculiar Mollusca of the Eulimidae and other families of Gastropoda, as well as of the Pteropoda, procured in the 'Valorous' expedition. *Annals and Magazine of Natural History,* (4): **20:** 317-39.
JEFFREYS, J.G. 1880. The deep-sea Mollusca of the Bay of Biscay. *Annals and Magazine of Natural History,* (5), **6:** 315-9.
JEFFREYS, J.G. 1882. Notes on the Mollusca procured by the Italian Exploration of the Mediterranean in 1881. *Annals and Magazine of Natural History,* (5), **10:** 27-35.
JEFFREYS, J.G. 1883. On the Mollusca procured during the Cruise of H.M.S. 'Triton' between the Hebrides and Faroes in 1882. *Proceedings of the Zoological Society of London 1883:* 389-99.
JOHNSON, R.I. 1946. Joseph Pitty Couthouy — a bibliography and catalogue of his species. *Occasional Papers on Molluscs,* **1**(5): 33-40.
JOHNSON, R.I. 1949. Jesse Wedgwood Mighels with a bibliography and a catalogue of his species. *Occasional Papers on Molluscs,* **1**(14): 213-231.
KAY, E.A. 1979. *Hawaiian Marine Shells.* Bernice P. Bishop Museum Special Publication 64(4). Bishop Museum Press, Honolulu. 655 pp.
KNUDSEN, J. 1970. The systematics and biology of abyssal and hadal Bivalvia. *Galathea Report,* **11:** 1-241.
KOBELT, W. 1905. *Iconographie der schalentragenden europäischen Meeresconchylien,* **3.** C.W. Kreidel, Wiesbaden. 406pp.
KOSUGE, S. 1967. On the transfer of *"Phymorhynchus?" tenuis* Okutani, 1966 to the family Buccinidae. *Venus,* **25**(2): 59-64.
KURODA, T. & HABE, T. in HABE, T. 1962. *Coloured Illustrations of the Shells of Japan,* **2.** Hoikusha, Osaka. 182pp.
LOCARD, A. 1892. *Les Coquilles marines des Côtes de France.* Baillère, Paris. 384pp.
LOCARD, A. 1896. Mollusques testacés et Brachiopodes, *in:* Résultats scientifiques de la campagne du "Caudan", I. *Annales de l'Université de Lyon:* 129-242.
LOCARD, A. 1897. *Mollusques testacés, I. Expéditions Scientifiques du Travailleur et du Talisman.* Masson, Paris. 516pp.
LOVEN, S. 1846. Index Molluscorum litora Scandinaviae occidentalia habitantium. *Kongelige Vetenskaps-Akademiens Förhandlingar,* **3:** 135-204.
MALM, A.W. 1861. Nye Krebs och blöddyr. *Forhandlinger vid de skandinaviske Naturforskeres 8. Möde i Köbenhavn 1860:* 616-624.
MALM, A. W. 1863. Nya fiskar, kräft och blötdjur för Skandinaviens fauna. *Göteborgs Vetenskaps och Vitterhetssamhälles Förhandlingar,* **8,** 97-132.
MARTENS, E. von 1903. Die beschalten Gastropoden der deutschen Tiefsee-Expedition 1898-1899. A. Systematisch-geographischer Teil. *Deutsche Tiefsee Expedition,* **7:** 1-146.
MASSY, A.L. 1930. Mollusca (Pelecypoda, Scaphopoda, Gastropoda, Opisthobranchia) of the Irish Atlantic slope, 50-1500 fathoms. *Proceedings of the Royal Irish Academy,* **39B**(13): 232-342.
McLEAN, J. 1971. A revised classification of the Family Turridae, with the Proposal of new subfamilies, genera, and subgenera from the Eastern Pacific. *Veliger,* **14**(1): 114-30.
MIGHELS, J.W. & ADAMS, C.B. 1842. Descriptions of twenty-four species of the shells of New England. *Boston Journal of Natural History,* **4:** 37-54.
MÖLLER, H. 1842. *Index Molluscorum Groenlandiae.* Copenhagen. 25pp.
MONTAGU, G. 1803. *Testacea Britannica,* **1.** J. White, London. 291pp.
MONTEROSATO, A. di 1872. *Notizie intorno alle Conchiglie fossili di Monte Pellegrino e Ficarazzi.* Tip. M. Amenta, Palermo. 44pp.
MONTEROSATO, A.di 1875. Nuova rivista delle conchiglie Mediterranee. *Atti dell'Academia Palermitana di Scienze, Lettere ed Arti,* (2) **5:** 1-50.
MONTEROSATO, A.di 1880. Conchiglie della zona degli abissi. *Bulletino della Societa Malacologica Italiana,* **6:** 50-82.
MONTEROSATO, A.di 1881. Conchiglie del Mediterraneo. *Naturalista Siciliano,* **1**(1): 2-4.
MONTEROSATO, A.di 1890. Conchiglie delle profondita del mare di Palermo. *Naturalista Siciliano,* **6-8:** 1-31.
MONTEROSATO, A. di 1872. *Notizie intorno alle Conchiglie fossili di Monte Pellegrino e Ficarazzi.* Tip. M. Amenta, Palermo. 44 pp.
NORDSIECK, F. 1968. *Die europäischen Meeres-Gehäuse schnecken.* G. Fischer, Stuttgart. 273pp.
NORDSIECK, F. 1971. Kontinentale und abyssische Meeresmollusken des Jonischen Meeres. *Archiv für Molluskenkunde,* **101:** 187-90.
NORDSIECK, F. 1973. Molluschi abissali dello Jonio. *La Conchiglia,* **57-58:** 4-7.
NORDSIECK, F. 1977. *The Turridae of the European seas.* La Piramide, Roma. 131pp.
NORMAN, A.M. 1888. *Museum Normanianum. IV. Mollusca Marina.* T. Caldcleugh, Durham. 29pp.
ODHNER, N.H. 1960. Mollusca. *Reports of the Swedish deep-sea Expedition, Zoology,* **2**(22): 365-400.
OLSSON, A. 1971. Mollusks from the gulf of Panama collected by R/V John Elliott Pillsbury, 1967; *in: Studies in tropical American Mollusks:* 35-92. University of Miami Press.
ORR, V. 1959. Classification and radula of *Mitromorpha atramentosa. Nautilus,* **72**(3): 75-8.
PETUCH, E. J. 1974. Two new Pacific cone shells and a new *Pleurotomella* from the Hatteras Abyssal Plain. *Veliger,* **17**(1): 40-43.
PHILIPPI, R.A. 1844. *Enumeratio Molluscorum Siciliae...,* **2.** E. Anton, Halle. 303pp.

PINNA, G. 1971. I tipi delle specie di Gasteropodi terziari istituite da Giuseppe de Cristofori e Giorgio Jan nel 1832 censervati nelle collezioni del museo civico di Storia Naturale di Milano. *Atti della Societa Italiana de Scienze naturale e del Museo Civico di Storia Naturale de Milano,* **12**(4): 421-40.
POWELL, A.W.B. 1942. The New Zealand Recent and fossil Mollusca of the family Turridae. *Bulletin of the Auckland Institute and Museum,* **2,** 1-188.
POWELL, A.W.B. 1951. Antarctic and subantarctic Mollusca: Pelecypoda and Gastropoda. *Discovery Reports,* **26:** 47-196.
POWELL, A.W.B. 1964. The family Turridae in the Indo-Pacific. Part 1. The subfamily Turrinae. *Indo-Pacific Mollusca,* **1**(5): 227-345.
POWELL, A.W.B. 1966. The Molluscan families Speightiidae and Turridae. *Bulletin of the Auckland Institute and Museum,* **5:** 1-184.
REEVE, L.A. 1844. *Conchologia Iconica,* **I.** *Pleurotoma,* pl. 19. Reeve Bros. London.
RICHARD, J. 1934. Liste générale des stations des Campagnes scientifiques du Prince Albert de Monaco avec notes et observations. *Résulats des Campagnes scientifiques...Albert Ier,* **89:** 1-348.
RICHTER, G. & THORSON, G. 1975. Pelagische Prosobranchier-Larven des Golfes von Neapel. *Ophelia,* **13,** 108-85.
SARS, M. 1859. Bidrag til en skildring av den arktiske Molluskfauna ved Norges nordlige Kyst. *Forhandlinger i Videnskabsselskabet i Kristiania* (1858): 34-87.
SARS, M. 1869. Fortsatte bemerkninger over det dyriske livs udbredning i havets dybder. *Forhandlinger i Videnskabsselskabet i Kristiania* (1868): 246-75.
SARS, G.O. 1873. Bidrag til kundskaben om dyrelivet. *Forhandlinger i Videnskabsselskabet i Kristiania* (1872): 73-119.
SARS, G.O. 1878. *Mollusca regionis arcticae Norvegiae.* Brögger, Christiania. 466 pp.
SCACCHI, A. 1835. Notizie intorno alle conchiglie ed a' zoofiti fossili che si trovano nelle vicinanze di Gravina in Puglia. *Annali Civili del Regno delle Due Sicile,* **7**(13): 5-18.
SHUTO, T. 1971. Taxonomical notes on the turrids of the Siboga-Collection originally described by M.M. Schepman, 1931 (part III). *Venus,* **30**(1): 5-22.
SMITH, E.A. 1895. Report upon Mollusca dredged in the Bay of Bengal and the Arabian sea during the season 1893-94. *Annals and Magazine of Natural History,* (6) **16:** 1-19.
SORGENFREI, T. 1958. Molluscan assemblages from the marine Middle Miocene of South Jutland and their environments. *Geological Survey of Denmark,* (2) **79:** 1-503.
STRAUSZ, L. 1966. *Die Miozän-Mediterranen Gastropoden Ungarns.* Akadémiai Kiado, Budapest. 693pp.
STURANY, R. 1896. Mollusken I (Prosobranchier und Opisthobranchier; Scaphopoden; Lamellibranchier) gesammelt von S.M. Schiff Pola 1890-1894. *Denkschriften der Mathematisch-Naturwissenschaflichen Classe der Kaiserlichen Akademie der Wissenschaften,* **63:** 1-36.
SYKES, E.R. 1906. On the Mollusca procured during the "Porcupine" expeditions, 1869-1870. Supplemental notes, part III. *Proceedings of the Malacological Society of London,* **7:** 173-90.
TESTA, D. 1842. *Due nove specie di Conchiglie rinvenute nei dintorni di Palermo.* Palermo. 4pp.
THIELE, J. 1925. Gastropoda der Deutschen Tiefsee-Expedition. II Teil. *Deutsche Tiefsee-Expedition 1898-1899,* **17**(2): 35-382.
THIELE, J. 1931. *Handbuch der systematischen Weichtierkunde,* **I.** G. Fischer, Stuttgart. 778pp.
THIELE, J. 1935. *Ibid.,* **2.** pp. 779-1154.
THORSON, G. 1941. Marine Gastropoda Prosobranchiata. *Zoology of Iceland,* **4**(60): 1-150.
TIBERI, N. 1855. *Descrizione di alcuni nuovi Testacei viventi nel Mediterraneo.* G. Nobile, Napoli. 16pp.
TIBERI, N. 1868. Nova Mediterranei testacea. *Journal de Conchyliologie,* **16:** 179-80.
TURTON, W. 1834. Description of some nondescript and rare British species of shells. *Magazine of Natural History,* **7:** 350-3.
VAYSSIERE, A. 1930. Etude zoologique et anatomique sur quelques Gastéropodes Prosobranches...*Résultats des Campagnes scientifiques...Albert Ier,* **80:** 1-26.
VERRILL, A.E. 1872. Results of recent dredging expeditions on the coast of New England. *American Journal of Science,* **3**(5): 1-16.
VERRILL, A.E. 1880. Notice of recent additions to the marine invertebrata of the northeastern coast of America, with descriptions of new genera and species and critical remarks on others, part 2. *Proceedings of the United States National Museum,* **3:** 356-405.
VERRILL, A.E. 1882. Catalogue of marine molluscs added to the fauna of New England during the past ten years. *Transactions of the Connecticut Academy,* **5**(2): 447-587.
VERRILL, A.E. 1884. Second catalogue of Mollusca, recently added to the fauna of the New-England coast and the adjacent parts of the Atlantic, consisting mostly of deep-sea species, with notes on others previously recorded. *Transactions of the Connecticut Academy,* **6**(1): 139-294.
VERRILL, A.E. 1885. Third catalogue of Mollusca...consisting mostly of deep-sea species...*Transactions of the Connecticut Academy,* **6:** 395-452.
WAREN, A. 1975. *Spirotropis sarsi,* new name for *Spirotropis carinata* Sars 1878. *Sarsia,* **59:** 49-52.
WAREN, A. 1980. Marine Mollusca described by John Gwyn Jeffreys, with the location of the type material. *Conchological Society of Great Britain and Ireland, Special Publications,* **1,** 1-60.
WATSON, R.B. 1881. Mollusca of H.M.S. 'Challenger' expedition — part 8. *Journal of the Linnean Society,* **15:** 388-412; part 9. *Ibid.*:413-455; part 10. *Ibid.*: 457-475.
WATSON, R.B. 1886. Report on the Scaphopoda and Gasteropoda collected by H.M.S. Challenger during the years 1873-76. *Reports on the Scientific Results of the Challenger Expedition, Zoology,* **42:** 1-756.

INDEX

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 2. Bathymetrical Distribution of the Deep Sea Turridae

Species	Medit.	Europe	Azores	W.Atl.	Max °S	Max °N	3	5	10	15	20	25	30	35	40	45	50		Mean depth (m)	σ	Faunal assemblage
Spirotropis azorica			X		37°02 N	39°02 N	1	5	4									10	518	210	shelf
Spirotropis monterosatoi	X	X			21°23 N	65°41 N	9	6	15	7	1	2						40	712	485	bathyal
Spirotropis centimata		X	X	X	29°52 N	39°30 N				4	9	8						21	1840	308	bathyal
Micropleurotoma spirotropoides	X	X			35°00 S	44°10 N	1	1	2	1	2	2						9	1157	644	bathyal
Micropleurotoma melvilli		X			02°00 N	42°48 N	1		2	1	1	1		1				7	1540	958	bathyal
Micropleurotoma travailleuri		X			29°35 N	37°19 N			4	1	1							6	996	544	bathyal
Irenosyrinx hypomela		X		X	19°45 N	58°51 N					1		7	7	1	9	5	30	3627	790	abyssal
Ancistrosyrinx clytotropis		X			39°39 N	44°07 N			1	1	1							3	1270	302	bathyal
Leucosyrinx verrilli		X	X	X	03°10 N	43°46 N		1	3	17	12	10	4	1				48	1692	597	bathyal
Phymorhynchus sulcifera		X	X	X	29°58 N	44°10 N				4	7	5						16	1739	341	bathyal
Phymorhynchus alberti		X			16°12 N	47°35 N					1				2	9	6	18	4233	644	abyssal
Phymorhynchus chevreuxi			X		39°11 N	39°11 N					1							1	1600	—	bathyal
Typhlogmangelia nivalis	X	X	X		15°17 N	64°45 N	2	2	11	12	1	11	4	1				44	1500	820	bathyal
Borsonia hirondelleae		X	X		15°48 N	45°48 N	1	1	2	9	4	1			1			19	1368	705	bathyal
Mangelia serga	X	X	X	X	18°38 N	43°43 N	2	2	13	6	4							27	938	463	shelf
Mangelia nuperrima	X	X			21°23 N	48°26 N	9	3	2		1							15	395	416	shelf
Drilliola loprestiana	X	X	X	X	25°30 N	44°35 N	5	5	7	9	3							29	850	491	shelf
Drilliola emendata	X	X			21°23 N	39°55 N	4	2	1	1	2							10	683	664	shelf
Drilliola megalacme		X			39°42 N	39°42 N					1							1	1551	—	bathyal
Drilliola pruina		X	X		37°26 N	50°19 N				1	2	5	4	2		1		15	2464	706	bathyal
Pleurotomella anceyi			X		39°21 N	39°21 N				1								1	1361	—	bathyal
Pleurotomella benedicti		X		X	40°17 N	47°36 N						4						4	2274	73	bathyal
Pleurotomella bureaui		X	X		29°35 N	39°27 N				3	2							5	1478	96	bathyal
Pleurotomella lottae		X		X	21°27 N	47°35 N					1	3	1					5	2238	272	bathyal
Pleurotomella sandersoni		X	X	X	36°49 N	55°44 N					1	2	1		2	7	1	1	15	3776	982	abyssal
Pleurotomella packardi		X	X	X	32°39 N	76°54 N			4	11	3	18	7	5	1	10			59	2442	1080	bathyal
Pleurotomella megalembryon		X	X	X	37°43 N	47°33 N				3	2								5	1414	151	bathyal
Pleurotomella demosia		X	X		32°34 N	39°42 N		1	1	5	2								9	1223	422	bathyal
Pleurotomella coeloraphe		X	X		37°43N	39°42 N				5	1								6	1441	245	bathyal
Pleurotomella eurybrocha	X	X	X		29°35 N	48°47 N				7	5	1							13	1625	323	bathyal
Pleurotomella gibbera	X	X			25°30 N	39°00 N	4	1	1										6	308	204	shelf
Pleurotomella obesa		X	X		38°35 N	39°42 N				1	1								2	1615	365	bathyal
Neopleurotomoides distincta		X	X		38°33 N	39°55 N				1	1			1					3	2153	877	bathyal
Neopleurotomoides callembryon		X	X		37°43N	47°33 N				5	3								8	1482	272	bathyal
Neopleurotomoides sp.A		X			42°27 N	42°27 N										1			1	4354	—	abyssal
Neopleurotomoides sp.B		X			47°32 N	47°32 N										1			1	4249	—	abyssal
Benthomangelia antonia		X	X	X	18°34 S	55°43 N			1	1	4	8	5	5	5	14	2		45	3229	1050	abyssal

Species	Medit.	Europe	Azores	W.Atl.	Max °S	Max °N	3	5	10	15	20	25	30	35	40	45	50			Mean depth (m)	σ	Faunal assemblage
Benthomangelia decapitata		X	X		39°20 N	55°45 N						1		2	1	24	14	2	44	4383	511	abyssal
Benthomangelia macra		X	X		04°04 N	50°19 N			2	9	9	2		2					24	1607	612	bathyal
Gymnobela abyssorum	X	X	X		17°17 N	48°40 N	6	5	18	14	1				1				45	859	604	bathyal
Gymnobela agassizi		X	X	X	18°40 S	47°35 N			1	4	3	8	2	2					20	2109	619	bathyal
Gymnobela fulvotincta		X	X		37°36 N	48°40 N			2	13	2		1						18	1381	454	bathyal
Gymnobela lamyi			X		38°35 N	38°35 N				1									1	1250	—	bathyal
Gymnobela leptoglypta		X	X		38°33 N	39°42 N				2	2								4	1532	291	bathyal
Gymnobela pyrrhogramma		X	X		29°35 N	44°12 N	1	4	12	5									28	749	359	bathyal
Gymnobela emertoni		X	X	X	30°17 N	52°06 N					1		2	4	3	6	5		21	3852	771	abyssal
Gymnobela watsoni		X	X		37°43 N	47°35 N				5	3	1							9	1527	318	bathyal
Gymnobela aquilarum		X	X	X	10°31 S	50°19 N			1	1	5	7	3	3	1	8			29	2841	1843	abyssal
Gymnobela frielei		X	X	X	20°47N	57°59N					1	12	5	2	2	5	1		28	2925	910	abyssal
Gymnobela engonia		X		X	18°34 S	68°25 N							3	2	5	19	8		37	4149	533	abyssal
Gymnobela homeotata		X			01°47 N	46°27 N				1				2		1	1		5	3304	1260	abyssal
Gymnobela subaraneosa	X	X	X		37°43 N	57°58 N			1	5	6	18	10		1	1			42	2241	656	bathyal
Gymnobela phyxanor		X			10°31 S	47°34 N					1			1		2			4	3351	958	abyssal
Gymnobela chyta		X	X		38°30N	47°32 N				1	2								3	2086	215	bathyal
Theta vayssierei		X	X		20°47 N	47°34 N								1		3	1	2	7	4425	754	abyssal
Theta lyronuclea		X		X	20°47 N	47°38 N								3		7	6	1	17	4306	577	abyssal
Theta chariessa		X	X	X	0°45 N	50°15 N		1	1	19	14	24	10		1	3			73	2032	757	bathyal
Xanthodaphne heterogramma		X		X	2°26 N	37°26 N										1			2	4452	—	abyssal
Xanthodaphne bruneri		X	X	X	21°38 N	47°26 N							2	1		1	5		9	4154	772	abyssal
Xanthodaphne leptalea		X	X	X	30°03 N	43°21 N						2	1						3	2447	241	bathyal
Xanthodaphne dalmasi		X	X		28°04 N	40°05 N				7	6	1	1						15	1663	436	bathyal
Xanthodaphne charcotiana		X			47°30 N	48°19 N										2	1		3	4469	254	abyssal
Xanthodaphne sp.		X			43°43 N	50°14 N				1			1						2	1867	767	bathyal
Bathybela nudator		X			42°19 N	52°06 N								1		2	1		4	4146	511	abyssal
Bathybela tenellunum		X		X	31°45 N	38°20 N							2	3					5	3064	237	abyssal
Oenopota ovalis		X		X	46°26 N	63°22 N			2	3	1	7	2				1		16	1991	986	bathyal
Oenopota dictyophora		X			44°06 N	64°45 N				3	1	5							9	1831	452	bathyal
Oenopota convexigyra			X		39°19 N	39°19 N								1					1	3360	–	abyssal
Oenopota bergensis		X			33°09 N	63°56 N	24	3	4		1								33	359	310	shelf
Oenopota elegans		X			40°34 N	67°19 N		27	2	4	1								34	523	361	shelf
Oenopota violacea		X		X	38°09N	67°40 N	70	2	6			1	1						80	200	—	shelf
Oenopota turricula		X			56°00 N	60°30 N	20												20	75	—	shelf

Species	Medit.	Europe	Azores	W.Atl.	Max °S	Max °N	3	5	10	15	20	25	30	35	40	45	50		Mean depth (m)	σ	Faunal assemblage
Oenopota graphica		X			33°09 N	58°00 N			1	1	3	5						10	1805	424	bathyal
Oenopota tenuicostata		X		X	42°59N	67°19 N		51	6	2		3	1	1				64	400	–	bathyal
Oenopota scalaris		X			61°07N	70°05 N	30	1	10	1								42	373	271	shelf
Oenopota trevelliana		X			30°14 N	70°50 N	43			1		1		1				45	254	–	shelf
Nepotilla amoena		X			67°19 N	70°50 N	2		1									3	286	188	shelf
Thesbia nana		X			59°00 N	67°00 N	40											40	200	–	shelf
Corinnaeturris leucomata		X		X	15°15 N	46°17 N			1	6	3	1			1			12	1588	688	bathyal
Mitrolumna dalli			X		38°33 N	38°33 N				1								1	1300	–	bathyal
Mitrolumna smithi			X		38°26 N	38°26 N			2									2	652	148	shelf
Taranis borealis		X		X	39°42 N	60°57 N	2	2		1			1					6	843	990	bathyal
Taranis malmi			X	X	23°14 N	39°02 N	1	1	1	3								6	936	475	bathyal
Taranis laevisculpta	X	X			39°42 N	44°07 N			1	1	2							4	1380	476	bathyal
Taranis moerchi	X	X		X	15°14 N	66°35 N	5	3	11	8	3	2	2				1	35	1146	939	bathyal
Teretia teres	X	X	X		2°10 N	61°15 N	4	9	17	2								32	588	270	shelf
Teretia thaumastopsis			X	X	29°35 N	39°21 N				3	1							4	1440	117	bathyal
Lusitanops blanchardi		X	X		37°43 N	39°42 N				5	4							9	1495	263	bathyal
Lusitanops bullioides		X	X		38°35 N	39°42 N				1	2							3	1677	311	bathyal
Lusitanops cingulata		X			50°19 N	56°28 N							2					2	2502	2.5	bathyal
Lusitanops hyaloides		X	X		38°20 N	60°37 N				1	5							6	1493	113	bathyal
Lusitanops expansa		X			60°08 N	70°05 N	2											2	240	20	shelf
Lusitanops lusitanica		X			39°42 N	39°42 N					2							2	1980	–	bathyal
Lusitanops macrapex			X		38°54 N	38°54 N											1	1	5005	–	abyssal
Lusitanops sigmoidea		X			39°42 N	48°19 N					1	1					1	1	4	3303	7245	abyssal
Lusitanops sp.	X	X			47°35 N	47°35 N						1						1	2245	–	bathyal
Famelica catharinae			X	X	38°11 N	39°23 N							2					2	2785	115	abyssal
Famelica mirmidina		X	X		37°43 N	39°39 N			2	1				1				4	1924	835	bathyal
Famelica monoceros		X	X		02°25 N	39°20 N			2					1	1			4	2577	1125	bathyal
Famelica monotropis		X	X		37°43 N	39°21 N			2	1								3	1448	108	bathyal
Famelica **n.sp.**			X		31°44 N	31°44 N						1						1	2165	–	bathyal
Aliceia aenigmatica		X	X		39°11 N	39°55 N				3								3	1825	75	bathyal