

Pyramidellidae (Mollusca, Gastropoda, Heterobranchia) collected during the Dutch CANCAP and MAURITANIA expeditions in the south-eastern part of the North Atlantic Ocean (part 1)

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Key words: Pyramidellidae; new species; North Atlantic Ocean.

The species of the Pyramidellidae collected during several expeditions in the south-eastern part of the North Atlantic Ocean are listed, with locality data, depth ranges, and notes on nomenclature, systematics and distribution. The samples classified with the genera *Pyramidella*, *Tiberia*, *Adelactaeon*, *Odetta*, *Folinella*, *Ondina*, *Odostomia*, *Puposyrnola* and *Eulimella* (partly) are dealt with in this paper. In total 64 species are reported from the research area, 32 of which are described as new to science; one nomen novum is introduced. Lectotypes of *Aclis tricarinata* Watson, 1897, *Monoptygma puncturata* Smith, 1872, *Odetta sulcata* de Folin, 1870, and *Odostomia sulcifera* Smith, 1872, are designated and figured. In an appendix, the complete locality data of the Mauritania I & II expeditions are published for the first time.

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Introduction

The seven CANCAP expeditions to the CANarian and the CAPE-Verdian archipelagos, during the period 1976-1986, aiming at a better knowledge of the marine biodiversity in that area, were organized by staff members of the Nationaal Natuurhistorisch Museum (= NNM), Leiden. Research material was collected in various ways, from the coastal zone down to 4000 m depth. For additional information and detailed locality data concerning the CANCAP expeditions, see the extensive report by van der Land (1987). Additionally, the NNM participated in the Dutch Mauritania I & II expeditions to the NW African coast.

The locality data of the Mauritania I & II expeditions had not yet been published completely and are provided now in an appendix.

The group of genera dealt with in this paper is not considered a monophyletic entity. The genera are combined here for pragmatic reasons only. The species are arranged according to similarity and partly alphabetically.

Material and methods

The CANCAP material has been deposited in the NNM collections. The material collected during the Mauritania-I expedition is in the Zoological Museum in Amsterdam (= ZMA), whereas that of the Mauritania-II expedition is in the NNM. Only the samples not collected during the expeditions mentioned here, are cited under the heading 'Material' with a reference to the collection where that material is kept.

In the following species descriptions much emphasis is placed on the type of embryonic whorls or protoconch, which is known to be indicative of the kind of embryonic development of the snails (Thorson, 1946, 1950; Maleikovskiy, 1976). The course of the growthlines, which are mostly orthocline or prosocline and rarely opisthocline, is also indicated. One of the characteristics of the Pyramidellidae is a more or less prominent tooth on the columella. We distinguished between a tooth (or teeth) properly speaking, a fold, e.g. a slight thickening on the columella, and no thickening at all. Some species have "teeth" or "riblets" at the inside of the outer lip, which are formed at a growth-stop; these cannot be seen if they are too far inside the shell. The dimensions of the shells are given on the basis of full-grown specimens; because it may be uncertain whether a shell should be considered full-grown, the minimum sizes indicated are based on a more or less subjective judgement.

In the Pyramidellidae there are over 300 nominal genera. We agree with several workers such as Schander (1994), Wise (1996), and others, that most of these taxa, which are based on shell characters only, are ill-defined and probably do not represent phylogenetically valid groups. We have therefore used genera and subgenera in a fairly broad sense, mainly to denote morphologically well-defined groups of species.

The terminology used for the protoconch, or embryonic whorls, follows van Aartsen (1981, 1987) and Schander (1994).

- Type A: angle of the protoconch with the shell axis ranging from 90° to c. 110°. A-I is planispiral or planorbid, with all protoconch whorls mainly in one plane (fig. 68). A-II is helicoid, with a clearly protruding nucleus (fig. 57). In some cases the first

teleoconch whorl overlaps the protoconch, but even in those cases the topwhorl can still be seen.

- Type B: angle of the protoconch with the axis of the shell ranging from 120° to c. 160°. Here the topwhorl usually cannot be seen because it is hidden within the first teleoconch whorl (fig. 66); the rest of the embryonic whorls is visible, however.

- Type C: angle almost 180°. Here the topwhorls have almost disappeared into the first teleoconch whorl (fig. 61).

The types B and C are usually referred to as 'intorted'. It should be emphasized that there is very little intraspecific variation in the structure of the protoconch, which is often diagnostic.

The following abbreviations are used for collections with pyramidellids used in the present paper: AD, J.J. van Aartsen, Dieren; BMNH, The Natural History Museum, London; HJ, Hebrew University, Jerusalem; MNHN, Muséum National d'Histoire Naturelle, Paris; NMW, National Museum of Wales, Cardiff; RMNH, National Museum of Natural History, Leiden; USNM, U.S. National Museum of Natural History, Washington; ZMA, Zoological Museum, Amsterdam.

The abbreviation MWH is used for the former Malacological Working-group, the Hague. This group was active in the sixties, when the first author was a member. Many new species in this paper are named after fellow-members of that time, in remembrance of the many pleasant hours spent together.

Systematic part

Genus *Pyramidella* Lamarck, 1799

Type species (by monotypy): *Trochus dolabratus* Linné, 1758.

The generic name *Pyramidella* Lamarck, 1799, has been validated under the Plenary Powers of the ICZN, Opinion 386 (1955). The name *Obeliscus* Anonymus, 1797 [= *Obeliscus* Gray, 1847] has also been used for this genus, whereas the name *Pyramidella* was used for the genus now known as *Otopleura* Fischer, 1885.

Pyramidella (*Pyramidella*) *dolabrata* (Linné, 1758)

Trochus dolabratus Linné, 1758: 760, spec. 522.

Pyramidella terebelloides; Kira, 1962: 203, pl. 69 fig. 22.

Pyramidella terebella; Habe, 1962: 86, pl. 41 fig. 40.

Pyramidella terebellum; Cernohorsky, 1972: 199, pl. 56 fig. 12, 12a; Lindner, 1982: 212, pl. 51 fig. 3.

Pyramidella dolabrata; Kay, 1979: 412, 413, fig. 133A; Abbott & Dance, 1982: 277, figure.

Material.— Cape Verde Islands: 6.058/2, 6.064/2, 7.076/2, 7.077/1.

Nomenclature.— We agree with Cernohorsky (1972), Kay (1979), and others, that *P. dolabrata* (Linné, 1758) is a somewhat variable species and that *Helix terebellum* Müller, 1774, *Obeliscus terebelloides* A. Adams, 1854, and several additional nominal taxa described as separate species by Laseron (1959) should be considered synonyms.

Distribution.— In the East Atlantic *P. dolabrata* has been recorded from Luanda,

West Africa, by Sowerby in Reeve (1865: spec. 13) and Dautzenberg (1912: 55), from St. Helena by Smith (1890: 275), from S. Thomé by Tomlin et al. (1914: 256), from the Gulf of Guinée by Talavera (1981: 166), and from the Cape Verde Islands by Dautzenberg (1912: 55), Saunders (1977: 7) and von Cosel (1982: 21). This implies that the type locality of this species, viz. "in Africa" (Linné, 1767: 1231, no. 601) may be right after all, and not erroneous as suggested by Dodge (1958: 204).

Depth range.— 29–44 m.

Pyramidella (Longchaeus) schanderi nom. nov.
(fig. 1)

Obeliscus suturalis von Maltzan, 1885: 26. Schander, 1994: 49, 66, fig. 7d.

Not *Pyramidella suturalis* Lea, 1846: 258, pl. 36 fig. 63.

Material.— Cape Verde Islands: 6.014/1, 6.025/1, 6.027/1, 6.054/1, 6.056/2, 6.059/>25, 6.064/14, 6.082/3, 6.083/2, 6.084/4, 6.107/14, 6.128/2, 6.130/7, 6.132/2, 6.141/4, 6.156/5, 6.159/1, 6.160/6, 6.164/3, 6.171/1, 7.031/1, 7.042/3, 7.043/9, 7.064/1, 7.065/17, 7.067/1, 7.068/4, 7.075/>25, 7.079/>25, 7.080/>25, 7.088/1, 7.089/6, 7.090/1, 7.093/1, 7.097/3, 7.106/1, 7.115/1, 7.128/4, 7.160/4, 7.161/2. West Africa (Mauritania): 3.133/1.

Distribution.— This species which was originally described from Gorée, West Africa, turns out to be one of the most common pyramidellid species of the Cape Verde Islands. In our material it is represented by numerous specimens.

Nomenclature.— At first we were not sure about the differences between this species and *Pharcidella (?) inopinata* (Schander, 1994). Schander (1994: 48, 66, fig. 7c) describes and figures a specimen of a rather different form, but this could have been an aberrant specimen. Schander himself (in litt., 1997) considers our shells to belong to *Pyramidella suturalis* (von Maltzan, 1885). We agree with this opinion.

Unfortunately, the well-known name *Pyramidella suturalis* (von Maltzan, 1885) is preoccupied by *Pyramidella suturalis* Lea, 1846. Therefore, we here propose *Pyramidella schanderi* nom. nov. for the former taxon (6.2 × 2.4 mm; fig. 1).

We do not classify this species with *Pharcidella* Dall, 1889, as this (sub)genus is characterized by prominent axial ribs, which *P. schanderi* nom. nov. does not possess. A tentative placement into the subgenus *Longchaeus* Mörch, 1875, seems more appropriate in view of the clear peripheral sulcus.

Differentiation.— *Pyramidella schanderi* nom. nov. is very similar to the West Atlantic *P. (Longchaeus) candida* Mörch, 1875, but shells of the latter species are somewhat larger and less slender, while the sutures are even more horizontal (see Warmke & Abbott, 1962: pl. 28, fig. d). Moreover, the growthlines in our shells are orthocline to slightly opisthocline, whereas they are prosocline in *P. candida*. The same character distinguishes the West Atlantic *P. crenulata* Holmes, 1859 (see Wise, 1996: 475, fig. 23). The figure published by Abbott (1974: 291, 290, fig. 3461) does not represent *P. candida*.

Depth range.— 18–95 m.

Etymology.— This species is renamed after Dr. C. Schander, friend of the first author and well-known for his contributions to the knowledge of the West African Pyramidellidae.

Genus *Tiberia* Monterosato, 1875

Type species (by subsequent designation [ICZN Art. 69(a)(i)(1)]): *Pyramidella minuscula* Monterosato, 1880.

Pyramidella minuscula Monterosato, 1874, is a nomen nudum. This species was formally described by Monterosato only in 1880, as *Pyramidella (Tiberia) minuscula*. As discussed by van Aartsen & Corgan (1996: 180), the genus group names *Tiberia* Jeffreys, 1884, and *Tiberiola* Cossmann, 1900 (= *Tiberia* Jeffreys, 1884, not Monterosato, 1875) are synonyms. The genus *Tiberiella* Coen, 1933, with the type species *Tiberia pretiosa* Coen, 1933, is not closely related because the holotype of *T. pretiosa* (HJ 7301) is a form of the well-known *Chrysallida obtusa* (Brown, 1827) (van Aartsen, unpublished results). *Tiberiella* is a junior synonym of *Parthenina* Bucquoy, Dautzenberg & Dollfus, 1883, because both taxa have the same type species.

Tiberia minusculoides spec. nov.
(fig. 2)

Material.— Holotype (NNM 57270): 7.049, Cape Verde Islands, SW of Maio, Ponta Inglez/ Ponta Preta; 15°06'N 23°24'W; depth 273 m, yellow-grey sandy clay; van Veen grab; 25.viii.1986. Paratypes (NNM 57271-57278). Canary Islands: 2.065/1, 2.066/1, 2.074/1, 4.060/6, 4.082/1. Cape Verde Islands: 6.124/1, 7.038/1, 7.061/5 fragments.

Description.— Shell solid; the spire forming a slender cone with straight sides and the periphery only weakly angled. Colour yellowish-white with a yellow-brown spiral band along the periphery; on the adapical part of the lower whorls, bordering the suture, another band of the same colour. Embryonic whorls planorbid, type B to C. Teleoconch formed by five to six strongly flattened whorls. Suture simple and straight. Growthlines changing from somewhat prosocline on the topwhorls to somewhat opisthocline and flexuous on the lower whorls. Only microscopic spiral striae can be detected. Outer lip gently curved. There are no teeth on the inside of the outer lip. Umbilicus round and deep. There is one tooth-like fold at the adapical side of the columella; more basally there are two much weaker folds.

Dimensions: H. 5.0-6.2 mm, W. 2.5-2.75 mm; holotype: 5.2 × 2.7 mm.

Differentiation.— This species is rather similar to the well-known *Tiberia minuscula* (Monterosato, 1880) and has most probably been confused with that species in the past. Shells of *T. minuscula*, however, are smaller, viz. about 4 mm high with the same number of whorls, usually more cylindrical and not provided with a yellow-brown spiral band below the upper suture of the lower whorls.

Depth range.— 273–886 m.

Etymology.— The epithet *minusculoides* refers to the similarity with *minuscula*.

Tiberia apicifusca spec. nov.
(figs 3, 52)

Material.— Holotype (NNM 57279): 6.012, Cape Verde Islands, S of São Tiago; 14°53'N 23°30'W; depth c. 500 m, grey brown mud; van Veen grab; 5.vi.1981. Paratypes (NNM 57280-57291). Cape Verde Islands: 6.010/2, 6.011/3, 6.012/7, 6.013/1, 6.017/5,

6.027/1, 7.003/3, 7.006/1, 7.014/1, 7.049/1, 7.100/2, 7.129/2 fragments.

Description.— Shell rather thin; the spire forms a slender cone with rather straight sides. The regular, conical, general shape may be disturbed somewhat when the lower part of the whorls is relatively broad. Colour cream to white, without spiral colourbands but with a yellowish-brown top. Embryonic whorls intorted, of type C, and coloured light brown. Teleoconch formed by five to six whorls; the initial ones are nearly flat, whereas the following ones are increasingly more convex. Suture simple and clearly marked. Growthlines markedly opisthoclinal; shell without additional sculpture. Outer lip gently curved, without teeth. Umbilicus wide, open and deep. Only a single tooth-like fold is clearly visible; two additional, very weak folds, below the adapical one, may also be discernible.

Dimensions: H. 4.5-5.0 mm, W. 2.3-2.5 mm; holotype 4.5 × 2.3 mm.

Differentiation.— *Tiberia apicifusca* spec. nov. can be recognized easily because of its light brown protoconch, thus differing from both *T. minuscula* and *T. minusculoides* spec. nov. The protoconch is also more strongly intorted than in these two species. None of the 28 specimens that could be studied had a colour band.

Depth range.— 273–970 m.

Etymology.— This species is named *apicifusca* because of the brown colour of the apex.

Tiberia micalii (Peñas & Rolan, 1997)
(fig. 4)

Sayella micalii Peñas & Rolan, 1997: 36, figs 1-5.

Material.— Cape Verde Islands: 7.065/1, 7.067/1 (fig. 4).

Description.— Only two fragmentary specimens were found, but these are quite characteristic. The complete shell probably had an elongated oblong shape, with a relatively high last whorl. Colour cream, with a narrow yellow-brown spiral band just above the periphery. Embryonic whorls planorbic, of type B, diameter about 450 µm. Only a few weakly convex teleoconch whorls are known. Suture impressed. Growthlines orthoclinal to slightly prosoclinal. There is no particular microsculpture. Outer lip rather straight. Umbilicus narrow but deep. On the columella two teeth can be seen, but both fragments are broken at the lower columellar part.

Nomenclature.— Although Peñas & Rolan (1997: 37) describe two columellar teeth (their figure even shows three), they place their species in *Sayella* Dall, 1885. However, in species of that genus, hitherto known only from eastern North America, there is only one moderately prominent fold on the columella.

Because of the three columellar teeth, the smooth, banded whorls, and the form of the umbilicus, we place this species in *Tiberia*. It differs from *T. minuscula* and related forms by its prominent teeth and the much more slender and oval form.

Depth range.— 39-42 m.

Genus *Pseudoscilla* Boettger, 1901

Type species (by monotypy): *Oscilla* (*Pseudoscilla*) *miocaenica* Boettger, 1901.

Oscilla (*Pseudoscilla*) *miocaenica* Boettger, 1901, is figured by Zilch (1935: 227, fig. 2). This species is surprisingly similar to *Odostomia* (*Parthenia*) *exarata* Carpenter, 1857, as figured by Dall & Bartsch (1909: pl. 19 fig. 2). Because *O. exarata* is the type species (by original designation) of *Miraldiella* Cossmann, 1921, the latter nominal taxon is a junior synonym of *Pseudoscilla*.

Pseudoscilla babylonica (C.B. Adams, 1845)

(figs 5, 53)

Chemnitzia babylonica C. B. Adams, 1845: 6.

Aclis tricarinata Watson, 1897: 255, pl. 20 fig. 23.

Cingulina babylonica; Warmke & Abbott, 1961: 148; de Jong & Coomans, 1988: 120, pl. 19 fig. 637.

Material.— Canary Islands: 4.001/1, 4.020/1, 4.027/1, 4.036/1, 4.073/1, 4.K04/1; Gran Canaria, AD4888/3; Lanzarote, AD24813/1 and AD27559/2; La Graciosa, AD27510/1; Fuertaventura, AD27665/3. Cape Verde Islands: 6.004/1, 6.005/2, 6.006/2, 6.010/3, 6.015/1, 6.024/2, 6.040/7, 6.103/1, 6.105/2, 6.132/2, 6.134/3, 6.149/3, 7.007/2, 7.008/2, 7.028/2, 7.030/2, 7.031/1, 7.050/1, 7.064/1, 7.079/6, 7.080/25, 7.100/3, 7.101/1, 7.102/1, 7.119/1, 7.121/2.

Differentiation.— *Pseudoscilla babylonica* is one of the relatively few species of Pyramidellidae in which the embryonic whorls are not smooth but decorated (with spiral ribs). The sculpture of the protoconch can only be seen in well preserved specimens, however (fig. 53).

Nomenclature.— According to Faber (1988: 81), who placed this species in *Liamorpha* Pilsbry, 1898, *Pyramidelloides judithae* Usticke, 1959, is a synonym. See hereafter with *Liamorpha elegans* (de Folin, 1870).

A study of the three syntypes of *Aclis tricarinata* Watson, 1897 (NMW 1955.158.00655), as well as twenty conspecific other specimens in the same collection (NMW 1955.158), all originating from Madeira, proved conclusively that *Aclis tricarinata* Watson, 1897, is a junior synonym of *Pseudoscilla babylonica* (C. B. Adams, 1845). One of the syntypes mentioned has been selected as lectotype (2.2 × 1.0 mm; fig.5).

Distribution.— This well-known Caribbean species turns out to be widely distributed throughout the Canary Islands and the Cape Verde Islands.

Depth range.— 23-354 m.

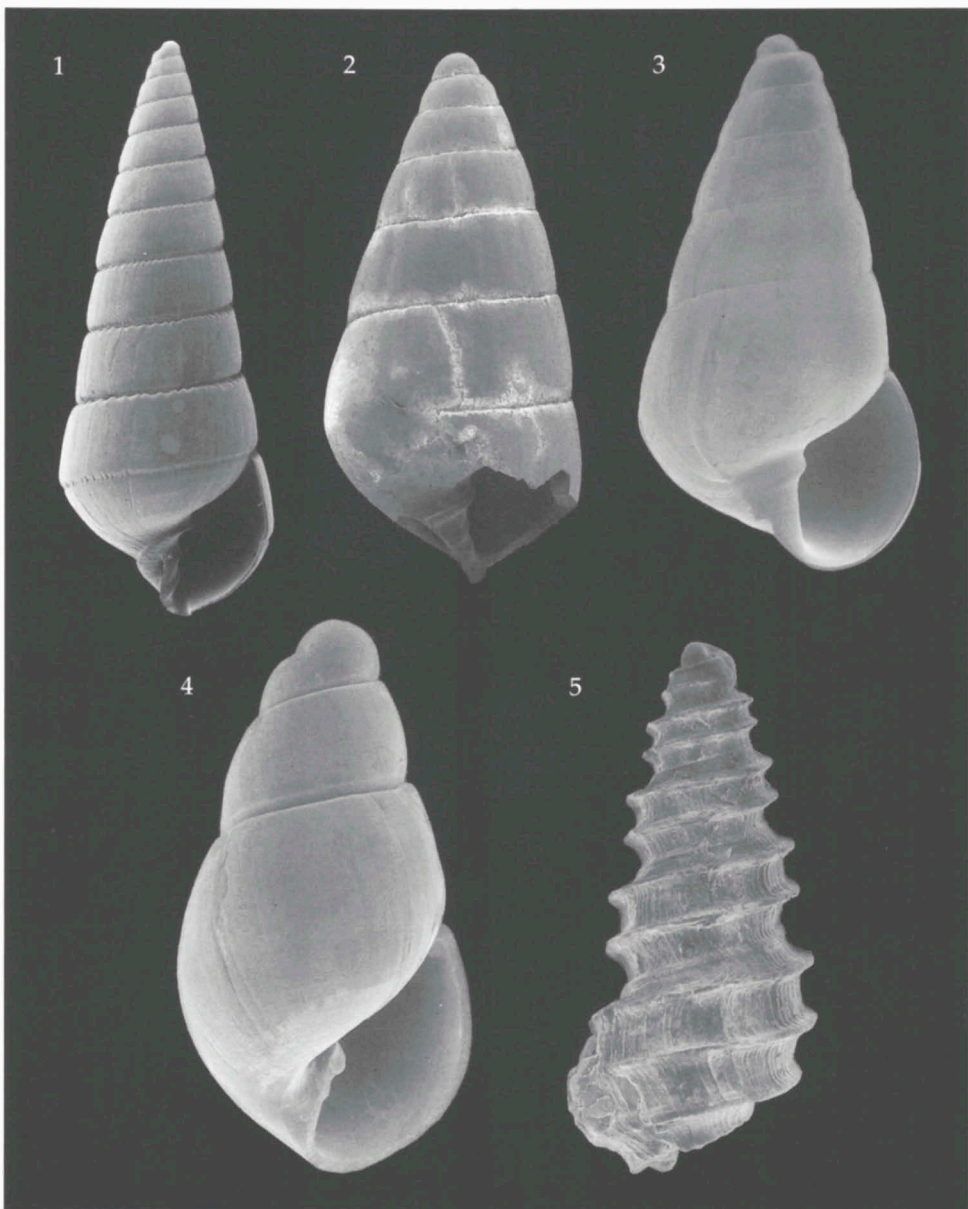
Genus *Liamorpha* Pilsbry, 1898

Type species (by monotypy): *Lia decorata* de Folin, 1873.

Originally described as *Lia* (de Folin, 1873), this name turned out to be preoccupied by both *Lia* Eschscholtz, 1829, and *Lia* Mörch, 1852. For that reason Pilsbry (1898: 323) introduced the replacement name *Liamorpha*.

Liamorpha elegans (de Folin, 1870)

Mathilda elegans de Folin, 1870: 212, pl. 26 fig. 11 [not pl. 28 fig. 15].



Figs 1-5. *Pyramidella*, *Tiberia* and *Pseudoscilla* species. 1, *Pyramidella schanderi* nom. nov., 6.2 mm, sta. 7.079, Cape Verde Islands, W of Ilhéu de Sal Rei, 16°10'N 23°00'W, depth 60 m, 28-viii-1986; 2, *Tiberia minusculoïdes* spec. nov., holotype (NNM 57270), 5.2 mm, sta. 7.049, Cape Verde Islands, SW of Maio, Ponta Inglez/Ponta Preta, 15°06'N 23°14'W, depth 273 m, 25-viii-1986; 3, *Tiberia apicifusca* spec. nov., holotype (NNM 57280), 4.5 mm, sta. 6.012, Cape Verde Islands, S of São Tiago, 14°53'N 23°30'W, depth about 500 m, 5-vi-1981; 4, *Tiberia micalii* (Peñas & Rolán, 1997), 2.2 mm, sta. 7.067, Cape Verde Islands, W of Boa Vista, SW of Ilhéu Calheta do Velho, 16°11'N 22°59'W, depth 42 m, 27-viii-1986; 5, *Pseudoscilla babylonia* (C.B. Adams) (lectotype of *Aclis tricarinata* Watson), 2.2 mm, Madeira, coll NMW 1955.158.00655.

Miralda elegans; Hoenselaar & Moolenbeek 1990: 65, figs 1-4; Rolan & Fernandes, 1993: 6, pl. 11 figs 1-3; Nofroni & Schander, 1994: 9, fig. e.

Material.— West Africa (Mauritania): 3.109/10, 3.128/1, 3.172/>25, 3.178/5, 3.179/4, 3.189/2; M.011/1, M.030/2, M.032/2, M.033/2, M.043/8, M.044/1, M.045/2, M.106/6, M.113/3, M.115/4, M.118/7, M.121/3, M.122/1.

Distribution.— A very characteristic and relatively common West African species, originally described from Senegal. Hoenselaar & Moolenbeek (1990: 65, 66) reported the finding of a specimen from the Mediterranean, Balearic island Formentera (Spain).

Nomenclature.— The generic placement in *Liamorpha* Pilsbry, 1898, is based on the helicoid protoconch of both *L. elegans* and *L. decorata*, the type species. Van Aartsen (1984:137) already mentioned the possibility that *Liamorpha* Pilsbry, 1898, is synonymous with *Miralda* A. Adams, 1863, as suggested by Dall & Bartsch (1906: 356). The type species of *Miralda*, *Parthenia diadema* A. Adams, 1860, is problematic, however. The (possible) type specimen [BMNH 1878.1.28.348, ex H. Adams coll.] has an intorted top and teeth at the inside of the outer lip. As this is quite different from the description by Dall & Bartsch (1906: 356, pl. 17 fig. 2) of a specimen that they also considered to belong to *Miralda diadema*, we prefer to use *Liamorpha* Pilsbry, 1898.

Depth range.— 14-114 m.

Genus *Adelactaeon* Cossmann, 1895

Type species (by original designation): *Tornatella papyraceus* Basterot, 1825.

The genus *Adelactaeon*, with the type species *A. papyraceus* (Basterot, 1825) from the Miocene of France, has been considered synonymous with *Myonia* A. Adams, 1860, not Dana, 1847, by Cossmann (1895: 54) himself, as well as by several later authors. This view is accepted here as well. Both A. Adams (1860: 406) and Cossmann (1895: 55) classify their genus with the Acteonidae. Glibert (1952: 387, 388, pl. 14 fig. 8) discusses and figures the type species, which he considers identical with *Tornatella elata* von Koenen, 1882 (3.0 × 1.6 mm; fig. 6), known from the north-west European Miocene. We consider *Phasianema* Wood, 1842, and *Leucotina* A. Adams, 1860, different genera. *Leucotina* has recently been shown by Hori et al. (1995) to belong to the Amathinidae. Whether this is also true for *Adelactaeon*, we do not know.

The genus *Phasianema* is based on *Phasianema sulcata* Wood, 1842, its type species by monotypy. This species is similar to *Adelactaeon* in general shape, but it differs by the narrow spiral ribs, separated by much broader interstices, which are not crossed by thickened lamellar growthlines as in *Adelactaeon*. *Phasianema sulcata* is figured by Glibert (1958: pl. 2 fig. 12).

Nerita costata Brocchi, 1814, not Gmelin, 1791, is indicated as type species of *Phasianema* by Thiele (1929: 233) and Wenz (1940: 849), but this is an error. Brocchi's species, the correct name of which is *Fossarus clathratus* Philippi, 1844 (see Mienis, 1973: 87), is the type species of *Clathrella* Récluz, 1864 (by monotypy: see van Aartsen et al., 1984: 50, pl. 123 fig. 241). Recently it has been suggested by Campbell et al. (1995: 168) that *Carinorbis* Conrad, 1862, is an senior synonym of *Clathrella* Récluz, 1864.

Adelactaeon puncturata (Smith, 1872)
(fig. 7)

Monoptygma (*Myonia*) *puncturata* Smith, 1872: 734, pl. 75 fig. 16.

Nomenclature.—The type lot [BMNH 1870.1.14.11] consists of five shells with an intorted top of type C, a prominent fold on the columella, and a spiral sculpture consisting of seven to eight spirals, which are broader than the interstices. In these interstices, the lamellar growthlines are thickened and very conspicuous, whence the name. We have selected the largest specimen (4.4 × 2.2 mm) as lectotype (fig. 7).

Distribution.—Originally described from Whydah, West Africa, this species has never been found again as far as we know. In our material we found a number of fragments or topwhorls which might belong to it. Additionally we discovered two other *Adelactaeon* species, which clearly differ from *A. puncturata* and are described below.

Adelactaeon elongata spec. nov.
(fig. 8)

Material.— Holotype (NNM 57294): M.002, Mauritania, Baie de Cansado; 20°53'N 17°02'W; depth 8 m, anoxic fine mud; van Veen grab; 5.vi.1988.

Paratypes. Mauritania: M.002/1 (NNM 57263); III/2 (ZMA 3.97.005).

Description.— Shell slender conical to slightly oval. Colour whitish-transparent. Embryonic whorls intorted, of type C. Teleoconch of four to five moderately convex whorls, which rapidly increase in size. The height of the whorls is 60% of their width. Suture indented. Growthlines thickened, rib-like, and clearly prosocline. Sculpture formed by spiral ribs and interstices which are about equal in width. About eight interstices, crossed by the thickened growthlines, are present on each whorl. On the base of the last whorl, six to eight additional spirals are seen. Outer lip gently curved and sharp, columella nearly straight. Umbilicus narrow but conspicuous. Tooth well-developed, very high on the columella.

Dimensions: H. 7.6 mm, W. 3.1 mm; holotype: 7.6 × 3.1 mm.

Differentiation.— Although evidently congeneric with *A. puncturata* (Smith, 1872), this new species clearly differs by the more slender shells, with spirals and interstices which are about equally broad. In *A. puncturata* the interstices are narrower than the spirals.

Depth range.— 0-8 m.

Etymology.— The epithet *elongata* refers to the shape of the shell.

Adelactaeon lilyae spec. nov.
(fig. 9)

Material.— Holotype (ZMA 3.97.006): B3, Mauritania, Banc d'Arguin; 19°37.4'N 16°52.1'W; depth 21-34 m; 17.v.1988.

Paratypes (NNM 57295-57296). Mauritania: M.065/1, 3.109/3.

Description.— Shell oval to egg-shaped, with pupoidal top. Colour whitish. Embryonic whorls intorted, of type C. Teleoconch of three to four whorls which are moderately convex, the height measuring slightly more than half the width. Suture indented. Growthlines prosocline, thickened to thin lamellae. Sculpture consisting of spiral ribs and equally broad interstices; on the initial teleoconch whorls there are about eight ribs and on the last whorl there are eight additional ones. Outer lip gently curved; the columella nearly straight. Umbilicus small but conspicuous. Tooth prominent but situated very deeply inside the shell, so that it cannot easily be detected.

Dimensions: H. 3.5-5.0 mm, W. 1.9-2.5 mm; holotype: 3.5 × 1.9 mm.

Differentiation.— Shells of this species differ from those of *Adelactaeon elongata* spec. nov. by their more egg-shaped form, the somewhat lower whorls as compared to their width, and the more pupoidal apical part, with smaller embryonic whorls. The holotype is a relatively slender specimen; some of the paratypes are comparatively broader.

Depth range.— 14-25 m.

Etymology.— This species is named after Mrs. Lily de Klein-Steenbergen, who always supports the first author by collecting shells and shellgrit wherever she goes.

Genus *Odetta* de Folin, 1870

Type species (by subsequent designation [ICZN Art. 69 (a)(i)(1); see van Aartsen, 1984]): *Odetta sulcata* de Folin, 1870 .

This generic name has been discussed by van Aartsen (1984: 135). The status of the type species could be ascertained. See also the notes on *O. sulcata*.

Odetta dekleini spec. nov. (fig. 11)

Material.— Holotype (NNM 57297): 7.007, Cape Verde Islands, SW of São Tiago; 14°54'N 23°38'W; depth 420 m, muddy sand; van Veen grab; 20.viii.1986.

Paratypes (NNM 57298-57313). Cape Verde Islands: 6.005/2, 6.006/2, 6.009/1, 6.015/4, 6.040/1, 7.004/1, 7.007/6, 7.050/3, 7.066/1, 7.067/1, 7.119/2, 7.121/2, 7.128/5, 7.129/6, 7.161/1.

Description.— Shell very small, egg-shaped with a somewhat pupoidal top. Colour whitish transparent. Embryonic whorls intorted, of type B. Teleoconch consisting of three to three and a half only slightly convex whorls. Suture not well-marked, mostly coinciding with one of the spiral grooves. Growthlines thickened, prosocline, especially pronounced within the spiral grooves. With three to four spiral grooves, which measure about half the width of the spiral bands. On the last whorl there are about five additional grooves below the periphery. In all these grooves the thickened growthlines can easily be seen. Outer lip thin and smooth inside. There is no umbilicus. Only an inconspicuous tooth is discernible, situated deeply within the aperture.

Dimensions: H. 1.1-1.3 mm, W. 0.6 mm; holotype 1.1 × 0.6 mm.

Differentiation.— This *Odetta* species differs from both *O. sulcata* and *O. marci* spec. nov. by the fact that the grooves between the spiral ribs are not smooth and narrow but relatively broad, with the thickened growthlines prominently present.

Depth range.— 42-420 m.

Etymology.— This species is named after Dr W. J. de Klein, a friend and former colleague of the first author, who always shows a keen interest in natural history.

Odetta marci spec. nov.
(fig. 12)

Material.— Holotype (NNM 57314): M.078, Mauritania, off Banc d'Arguin; 20°00'N 17°21'W; depth 41 m, dark-grey muddy fine sand; van Veen grab; 14.vi.1988.

Paratypes (NNM 57315). Mauritania: M.064/2.

Description.— Shell forming a slender cone, slightly narrowed and somewhat pupoidal at the top. Colour whitish. Embryonic whorls intorted, of type B. Teleoconch consisting of five and a half only slightly convex whorls. Suture clearly marked, channelled. Growthlines difficult to detect, most probably about orthocline. With one or two incised spiral grooves at the upper part of the initial teleoconch whorls; the lower whorls with four to five such grooves, which cover the total height of the whorl. Shell base with additionally eight to ten grooves, which are increasingly more narrowly spaced towards the umbilicus. Outer lip thin, smooth inside. There is a well-marked umbilical chink. Columellar tooth conspicuous.

Dimensions: H. 3.8 mm, W. 1.5 mm; holotype 3.8 × 1.5 mm.

Differentiation.— *Odetta marci* spec. nov. is known with only one fullgrown and two immature specimens. Still this species is so much different from the well-known *O. sulcata* that we do not hesitate to describe it as new to science. In *O. marci* spec. nov. the first groove appears just below the upper suture and the lower whorls carry four to five grooves, whereas *O. sulcata* has the first spiral groove at or below the middle of the whorl and the final whorls carry only two to three grooves. The embryonic whorls are also quite different, indicating a different mode of development.

Depth range.— 24-41 m.

Etymology.— This species is named after Marc S. S. Lavaleye, participant in the Mauritania expeditions and keen collector of Pyramidellidae.

Odetta sulcata (de Folin, 1870)
(figs 10, 13, 54)

Ondina sulcata de Folin, 1870: 214.

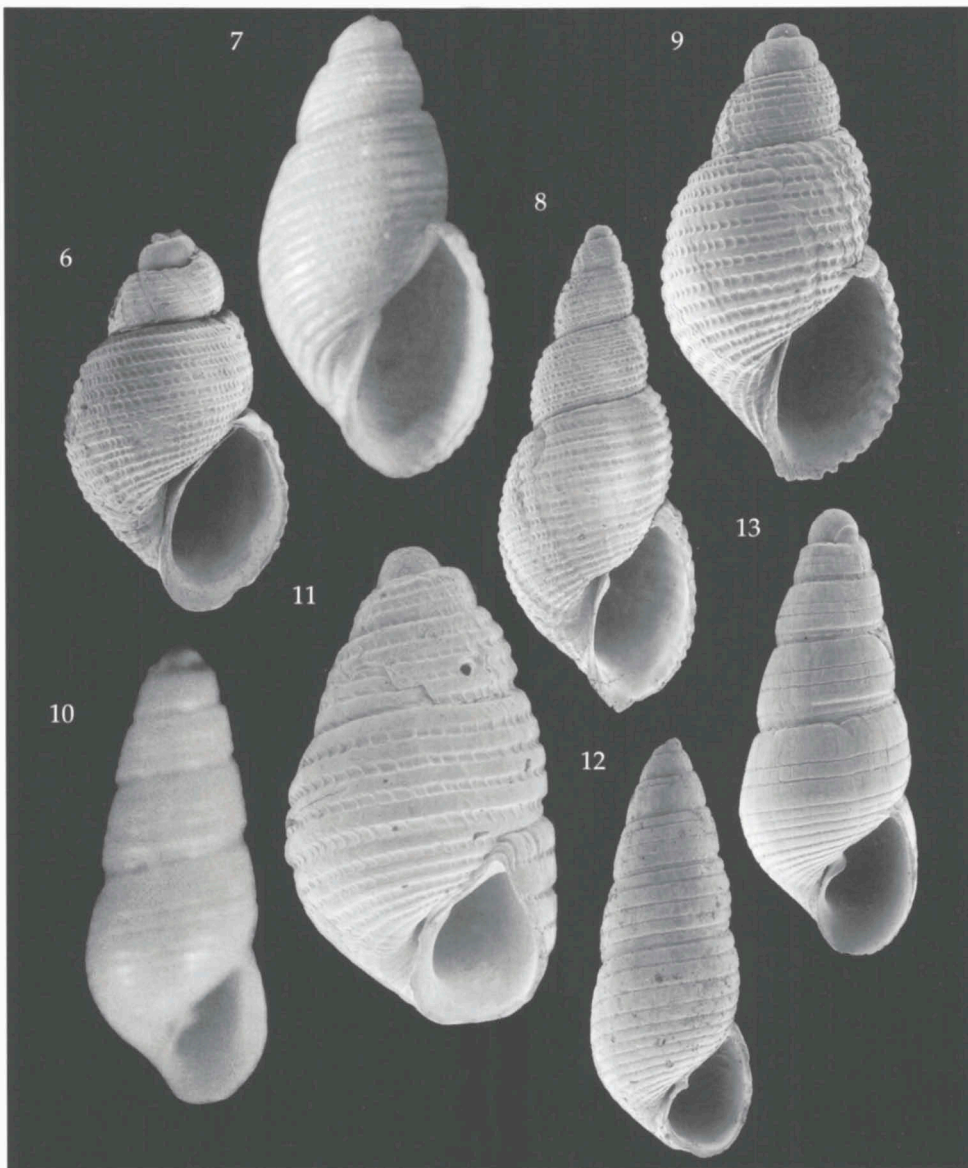
Odetta sulcata; de Folin, 1873: pl. 29 fig. 1.

Pyrgulina infrasulcata Dautzenberg, 1912: 68, pl. 3 figs 17, 18; Schander, 1994: 45, pl. 6 fig. e [citing Dautzenberg, 1913].

Material.— Mauritania: M.031/2, M.032/1, M.043/1, M.064/1, M.065/2; V/14 (figured specimen: 2.1 × 0.8 mm), VII/26; B1/4, B8/1.

Depth range.— 0-70 m.

Nomenclature.— As shown by van Aartsen (1984: 135), *Ondina sulcata* de Folin, 1870, should be considered the type species of *Odetta* de Folin, 1870. This species was



Figs 6-13. *Adelactaeon* and *Odetta* species. 6, *Tornatella elata* von Koenen, 3.0 mm, Miste, Winterswijk, the Netherlands, coll. van Aartsen; 7, *Adelactaeon puncturata* (Smith), lectotype, 4.4 mm, Whydah, West Africa, coll. BMNH 1870.1.14.11; 8, *Adelactaeon elongata* spec. nov., holotype (NNM 57294), 7.6 mm, sta. MAU.002, Mauritania, Baie de Cansado, 20°53'N 17°02'W, 5-vi-1988; 9, *Adelactaeon lilyae* spec. nov., holotype (ZMA 3.97.006), 3.5 mm, sta. B3, Mauritania, Banc d'Arguin, 19°37,4'N 16°52.1'W, 21-34 m, 17-v-1988; 10, *Odetta sulcata* de Folin, lectotype (coll. de Folin-MNH), 1.7 mm, Ile Cagnabac, Senegal; 11, *Odetta dekleini* spec. nov., holotype (NNM 57297), 1.1 mm, sta. 7.007, Cape Verde Islands, SW of São Tiago, 14°54'N 23°38'W, depth 420 m, 20-viii-1986; 12, *Odetta marci* spec. nov., holotype (NNM 57314), 3.8 mm, Sta. MAU.078, Mauritania, off Banc d'Arguin, 20°00'N 17°21'W, depth 41 m, 14-vi-1988; 13, *Odetta sulcata* (de Folin), 2.1 mm, Sta. R V, Mauritania, Banc d'Arguin, 19°47'30"N 17°32'30"W, 23-v-1988.

originally described from Cagnabac and Cap Verga, West Africa.

The two type specimens in MNHN correspond perfectly well with the specimen figured as *Pyrgulina infrasulcata* by Schander (1994: pl. 6 fig. e) and with our specimens. The lectotype of *O. sulcata* is designated and figured here (1.7 × 0.6 mm; fig. 10). The type specimen of Dautzenberg's *P. infrasulcata*, also in MNHN, is fully destroyed. Still, on the basis of the original data, we are convinced that *P. infrasulcata* is a junior synonym of *O. sulcata*.

Several of our specimens are larger than the type specimens and some show a less pronounced spiral sculpture, but this clearly concerns intraspecific variation only.

Genus *Folinella* Dall & Bartsch, 1904

Type species: *Amoura anguliferens* de Folin, 1873.

The generic name *Folinella* was introduced to replace *Amoura* de Folin, 1873, not Gray, 1847, and, consequently, both nominal taxa have the same type species, viz. *Amoura anguliferens* de Folin, 1873. *Ividella* Dall & Bartsch, 1907 [a nomen novum for *Funicularia* Monterosato, 1884, not Forbes, 1845] is a junior synonym of *Folinella*. *Rissoa excavata* Philippi, 1836, is the type species of *Funicularia* Monterosato and thus also of *Ividella*. See van Aartsen (1984).

Folinella holthuisi spec. nov. (fig. 14)

Material.— Holotype (NNM 57316): M.087, Mauritania, off Banc d'Arguin; 19°32'N 16°54'W; depth 65 m, sticky grey mud with shells, ophiuroids, small bivalves; van Veen grab; 15.vi.1988. Paratypes. Mauritania: M.031/3 (NNM 57317); B1/6 (ZMA 3.97007).

Description.— Shell slender ovoid, strongly sculptured. Colour whitish. Embryonic whorls intorted, of type B. Teleoconch consisting of three to three and a half whorls. Suture deeply channelled. Growthlines slightly prosocline. On the initial teleoconch whorls, the upper three quarters of the whorl show axial ribs only. These ribs are crossed by a spiral rib at the lower end, followed further down by another prominent spiral rib, bordering the sutural channel. On the lower whorls, the axial ribs split up into beads which extend laterally, forming spiral ribs that way. There are three plus one spiral ribs, crossing equally strong axials which end at about the periphery; on the last whorl, on the shell base, there are about four additional, smooth, spiral ribs. Outer lip thin and smooth inside. Umbilicus lacking. There is a moderately strong tooth on the columella.

Dimensions: H. 2.0-2.2 mm, W. 1.0-1.2 mm; holotype 2.2 × 1.1 mm.

Differentiation.— This species is most similar to *Folinella ghisottii* van Aartsen, 1984, but that species has a different spiral sculpture. On the older whorls there are two widely spaced spiral ribs, as in *Folinella excavata* (Philippi, 1836). On the lower whorls, a third spiral develops in between these two, so that on the penultimate whorl there are three nearly equally prominent spiral ribs. We figure a specimen from Isola di Giglio (Italy) for comparison (fig. 15). See also van Aartsen (1977: pl. 60 fig. 4) and Peñas et al. (1996: pl. 29 fig. 62)

Depth range.— 53-70 m.

Etymology.— This species is named after Prof. Dr L.B. Holthuis, in acknowledgement of his valuable advices in nomenclatural questions .

Folinella moolenbeeki spec. nov.
(figs 16, 55)

Material.— Holotype (ZMA 3.97.008): II, Mauritania, Banc d'Arguin; 19°46'N 17°30'W; littoral; 23.v.1988.

Paratypes (ZMA 3.97.009-013). Mauritania: I/1, II/2, V/2, VII/4, IX/10.

Description.— Shell compact, somewhat egg-shaped with rather straight sides, with a pupoid top. Colour white. Embryonic whorls intorted, of type B to C. Teleoconch consisting of about four whorls that look concave because of the sculpture. Suture incised, not channelled. Growthlines and axial ribs prosocline. With 15 to 20 prosocline, axial ribs which continue to the base of the shell. There are two widely spaced, very prominent spiral ribs, i.e. one on each half of the whorl. On the last whorl there are three additional spirals below the periphery. Outer lip as thick as the bordering shell wall, forming a continuous peristome with the inner lip. Umbilicus lacking. Tooth weak, situated deeply inside the aperture.

Dimensions: H. 2.0-2.5 mm, W. 1.0-1.1 mm; holotype 2.0 × 1.0 mm.

Differentiation.— In general shape and especially in sculpture this species is very similar to the well-known *Folinella excavata* (Philippi, 1836), but its apical whorls are much more compact and more pupoid as compared to the slender, regularly conical topwhorls of *F. excavata* (compare figs 55 and 56). The axial ribs are usually more prosocline too, but this is variable in *F. excavata*.

Depth range.— littoral.

Etymology.— This species is named after R.G.M. Moolenbeek, friend and colleague of the authors and curator of the department of Mollusca at ZMA.

Folinella excavata (Philippi, 1836)
(figs 17, 56)

Rissoa excavata Philippi, 1836: 154, pl. 10 fig. 6.

Chrysallida excavata; van Aartsen, 1977: 50, pl. 60 fig. 3; Peñas et al., 1996: 18, pl. 29 figs 60, 61.

Chrysallida (Ividella) excavata; Savona & Ciccone, 1981: 41-49, pl. 49.

Material.—Only one specimen, dredged at 645 m depth in the Selvagens archipelago (St. 3.070).

Distribution.— This well-known species is widespread along the Atlantic and Mediterranean coasts of Europe. It was reported previously from the Atlantic coast of Morocco, from Tanger to Es-Saouira (Mogador) by Pallary (1920: 60) and Bellon-Humbert (1974: 42).

Variation.— The variety *harveyi* Thompson, 1840, as discussed and figured by Savona & Ciccone (1981: 49) is a form with much more numerous axial ribs which is found every now and then together with the usual form. We did not find this form in our material.

Genus *Ondina* de Folin, 1870

Type species (by subsequent designation [ICZN Art. 69 (a)(i)(1); see van Aartsen, 1984]): *Ondina semiornata* de Folin, 1872 [= *Ondina warreni* (Thompson, 1845)].

The genus *Ondina* de Folin, 1870 and its type species have been discussed by van Aartsen (1984: 136). The European species have been monographed by the same author (1987).

Ondina mosti spec. nov.
(fig. 18)

Material.— Holotype (NNM 57318): 7.129, Cape Verde Islands, S of São Nicolau, S. Jorge Bay; 16°33'N 24°16'W; depth 405 m, muddy bottom; rectangular dredge; 2.ix.1986.
Paratypes (NNM 57319-57323). Cape Verde Islands: 7.049/1, 7.050/7, 7.120/1, 7.121/1, 7.129/2.

Description.— Shell elongated ovoid with a flat top. Colour hyaline, transparent. Embryonic whorls intorted, of type C. Teleoconch consisting of about three to three and a half moderately convex whorls. Suture well-marked but not deep. Growthlines nearly orthocline and sinuous near the upper suture. With four to five incised spirals on the upper whorls; last whorl with about ten additional incised lines below the periphery. Outer lip thin and flexuous, smooth inside. Umbilicus forming a slight chink. There is a slight fold on the columella, as in all *Ondina* species.

Dimensions: H. 2.0-2.4 mm, W. 1.0-1.2 mm; holotype 2.4 × 1.1 mm.

Differentiation.— This species belongs to the *Ondina* s.s. species group, with a.o. *O. obliqua* (Alder, 1844), *O. warreni* (Thompson, 1845) and *O. divisa* (J. Adams, 1797) [= *O. insculpta* (Montagu, 1808)], known from Atlantic-Mediterranean Europe. These species are figured by van Aartsen (1987: figs 46, 49, 48) and Warén (1991: figs 34C, D, E). They all differ from *O. mosti* spec. nov. by a proportionally smaller aperture and last whorl, and a more slender general shape, with telescope-like upper whorls. The incised spirals remind of those in *O. divisa*, but shells of that species are also more slender conical (see Warén, 1991: fig. 39D).

Depth range.— 200-400 m.

Etymology.— This species is named after B. van der Most, former member of the MWH.

Ondina cf. *obliqua* (Alder, 1844)

Odostomia obliqua Alder, 1844: 327, pl. 7 fig. 12.

Ondina obliqua; van Aartsen, 1987: 17, 19, pl. 33 fig. 46; Warén, 1991: 104, 105, fig. 34D; Peñas et al., 1996: 53, 56, fig. 143.

Material.— Canary Islands: 4.116/1, 420 m.

Note.— *Ondina obliqua* can be recognized by its tilted protoconch which is intorted of type B, instead of type C as in all other *Ondina* species. It is a well-known all be it rare species of the Atlantic-Mediterranean coasts of Europe, not reported before from our study area.

We found a single specimen which has a number of its characteristics. That shell is much more slender than usual in *O. obliqua*, however, and its whorls do not increase in size so rapidly. We therefore doubt its identification.

Ondina warreni (Thompson, 1845)

Rissoa warreni Thompson, 1845: 315, pl. 19 fig. 4.

Ondina warreni; van Aartsen, 1987: 17, 19, pl. 33 fig. 49; Warén, 1991: 104, 105, fig. 34E; Peñas, 1996: 53, 57, 61, figs 146, 147.

Material.— Madeira Archipelago: 4.K27/7, beached.

Note.— Only mentioned from our study area by Nordsieck & Talavera (1979: 186) from Porto Santo, Madeira archipelago. The shell figured by Warén (1991: fig. 34E) is exceptionally slender and not representative of this well-known species of Atlantic European coasts.

Ondina dilucida (Monterosato, 1884)
(fig. 19)

Auriculina dilucida Monterosato, 1884: 97.

Ondina spec.; van Aartsen et al., 1984: 53, pl.125 fig.257.

Ondina diaphana dilucida; van Aartsen, 1987: 18, pl.33 fig. 54.

Material.— Canary Islands: 2.011/1 (fig. 19), 2.085/2.

Note.— The smooth, transparent *Ondina* species, for which the subgenus *Glabrondina* Sacco, 1892, was introduced, are very difficult to distinguish. There are three shells in our material that we identify with *O. dilucida* with some doubt. One of these specimens is figured (2.4 × 1.2 mm; fig. 19). The species had not been reported from our study area before.

Depth range.— 125-500 m.

Genus *Odostomia* Fleming, 1813

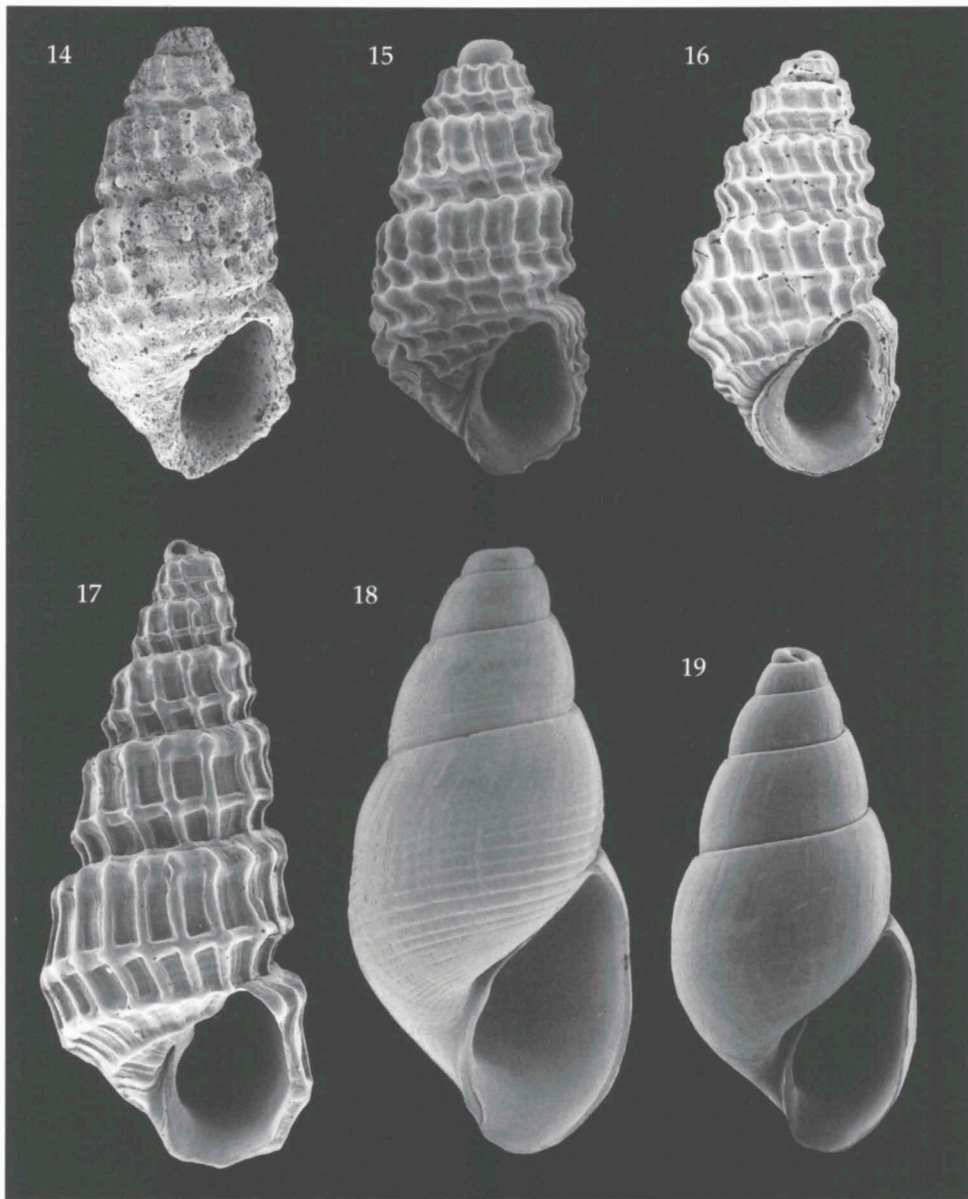
Type species (designated by Gray, 1847): *Turbo plicatus* Montagu, 1803.

The type species of this "classic" pyramidellid genus is also the type species of the nominal genus *Turritodostomia* Sacco, 1892. Therefore, *Turritodostomia* is a junior synonym of *Odostomia*, as already indicated by Bucquoy et al. (1898: 767) and Dall & Bartsch (1909: 131).

The European species have been monographed by van Aartsen (1987) and are also partly discussed by Peñas et al. (1996).

Odostomia (Odostomia) acuta Jeffreys, 1848
(figs 20, 57)

Odostomia acuta Jeffreys, 1848: 338; Warén, 1980: 37, pl. 6 figs 23, 24; van Aartsen et al., 1984: 51, pl. 125 fig. 246; 1987: 8, 11, pl. 29 fig. 15; Peñas et al., 1996: 39, 41, figs 108, 109.



Figs 14-19. *Folinella* and *Ondina* species. 14, *Folinella holthuisi* spec. nov., holotype (NNM 57316), 2.2 mm, sta. MAU.087, Mauritania, off Banc d'Arguin, 19°32'N 16°54'W, depth 65 m, 15-vi-1988; 15, *Folinella ghisottii* van Aartsen, 1984, 2.0 mm, Italy, Isola di Giglio, coll. van Aartsen; 16, *Folinella moolenbeeki* spec. nov., holotype (ZMA 3.97.008), 2.0 mm, Sta. R II, Mauritania, Banc d'Arguin, 19°46'N 17°30'W, 23-v-1988; 17, *Folinella excavata* (Philippi), 3.0 mm, Porto Pollo, Corse, France, littoral, 13-vii-1978, coll. van Aartsen; 18, *Ondina mosti* spec. nov., holotype (NNM 57318), 2.4 mm, sta. 7.129, Cape Verde Islands, S of São Nicolau, S. Jorge Bay, 16°33'N 24°16'W, depth 405 m, 2-ix-1986; 19, *Ondina dilucida* (Monterosato), 2.4 mm, sta. 2.011, Canary Islands, S of Fuerteventura, Punta de Jandia, 28°02'N 14°29'W, depth 125 m, 24-viii-1977.

Material.— Mauritania: M.002/4, M.014/1, M.031/6, M.033/1, M.044/1, M.045/2, M.065/2, M.097/7, M.099/2, M.111/2, M.113/2, M.121/1, 3.109/4, 3.133/1, 3.172/1; I/3, II/1, V/1, St. VII/6; B7/6, B8/7. Canary Islands: 2.012/1, 2.021/1, 2.034/2, 2.043/2, 2.080/1, 4.041/1, 4.088/4, 4.138/2, 4.159/1. Madeira Archipelago: 1.017/5, 4K27/5; Bay of Funchal, -40 m / >25 [in ZMA]. Cape Verde Islands: 6.014/5, 6.084/1, 6.101/3, 6.103/6, 6.105/10, 7.085/1, 7.086/4, 7.088/2, 7.093/25, 7.094/3, 7.095/3, 7.102/6, 7.106/4.

Nomenclature.— We figure a specimen from the Ria de Arosa (Spain) for comparison (figs 20, 57).

Distribution.— This species was reported already from the Canary Islands by Jeffreys (1884: 347), from Madeira by Watson (1897: 296) and from the Azores by Nord-sieck & Talavera (1979: 187).

Depth range.— 0-200 m.

Odostomia (Odostomia) duureni spec. nov.
(fig. 21)

Material.— Holotype (NNM 57324): 5.053, Azores, S of São Miguel; 37°42'N 25°27'W; depth 50 m, coarse, mainly volcanic sand; van Veen grab; 31.v.1981.
Paratypes (NNM 57325-57334): Azores: 5.037/2, 5.053/1, 5.077/6, 5.078/2, 5.079/2, 5.092/2, 5.102/1, 5.130/5, 5.131/2, 5.138/1.

Description.— Shell forming a slender cone with flat sides. Colour rose-brown to yellowish brown. Embryonic whorls planorbic, of type B. Teleoconch consisting of three to four flat whorls, angled at the periphery. Suture clear, but not deeply incised. Growthlines clearly prosocline; without additional sculpture. Outer lip almost straight adapically, abruptly curved at the periphery and gently rounded basally. The columellar part of the inner lip is straight. Umbilicus lacking. Tooth clearly developed at the adapical side of the columella.

Dimensions: H. 1.8-2.5 mm, W. 0.9-1.4 mm; holotype 1.8 × 0.9 mm.

Differentiation.— With its prosocline growthlines, the flat and peripherally angled whorls, and a straight columellar border of the aperture, the present species is similar to *Odostomia unidentata* (Montagu, 1803). However, the latter species has a helicoid protoconch of type A-II, indicative of a different embryonic development.

Depth range.— 50-125 m.

Etymology.— This species is named after L. van Duuren, former member of the MWH.

Odostomia (Odostomia) omphaloessa Watson, 1897
(figs 22, 58)

Odostomia omphaloessa Watson, 1897: 261, pl. 20 fig. 30.

Material.— Canary Islands: 2.022/9, 2.033/5, 2.044/1, 2.073/3, 2.075/1, 4.013/1, 4.014/1, 4.048/2, 4.067/5, 4.073/5, 4.080/1, 4.088/20, 4.089/1, 4.090/10, 4.091/1, 4.092/5. Selvagens Archipelago: 3.065/2, 3.080/1, 3.081/1, 3.087/4, 3.099/2, 4.103/1. Madeira: North coast littoral/17[AD28150] and Bay of Funchal, -40 m. / >25 in ZMA.

Notes.— Originally described from Madeira, where it has still been found recently in shell grit from the north coast littoral, this is one of the very few coloured *Odostomia* species.

Whereas Watson (1897: 261) indicates the colour as "with a slight ruddy tinge, so that the general appearance is a little horny", several of our specimens are rosa coloured, others whitish. As noted already by Watson, this species is very similar to *O. acuta* Jeffreys, 1848, but the shells are much smaller and differ also in the structure of the embryonic whorls, which are intorted of type B, instead of helicoid of type A II.

Depth range.— 0-215 m.

Odostomia (Odostomia) romburghi spec. nov.
(fig. 23)

Material.— Holotype (NNM 57335): 6.107, Cape Verde Islands, SW of Santa Luzia; 16°44'N 24°46'W; depth 50 m, sand; van Veen grab; 16.vi.1982.

Paratypes (NNM 57336-57401). Cape Verde Islands: 6.001/3, 6.003/1, 6.004/7, 6.005/8, 6.006/3, 6.007/7, 6.008/10, 6.009/6, 6.010/2, 6.014/7, 6.015/12, 6.024/>25, 6.040/6, 6.054/25, 6.056/5, 6.057/8, 6.066/1, 6.077/10, 6.082/7, 6.083/8, 6.085/3, 6.101/5, 6.103/>25, 6.105/>25, 6.107/18, 6.128/4, 6.130/13, 6.132/5, 6.134/8, 6.138/5, 6.143/6, 6.147/3, 6.149/14, 6.156/1, 6.160/3, 6.162/2, 7.028/17, 7.030/17, 7.031/6, 7.032/1, 7.037/7, 7.042/5, 7.043/12, 7.049/4, 7.050/15, 7.068/2, 7.080/5, 7.085/2, 7.088/1, 7.089/1, 7.091/5, 7.093/6, 7.094/2, 7.100/14, 7.101/5, 7.102/7, 7.109/8, 7.110/2, 7.115/13, 7.116/>25, 7.119/24, 7.120/5, 7.121/12, 7.122/3, 7.128/>25, 7.129/8, 7.141/15, 7.142/4, 7.143/4, 7.160/3.

Description.— Shell forming a slender cone with straight sides. Colour blueish-white. Embryonic whorls helicoid, of type A II. Teleoconch consisting of six to seven whorls, which are almost flat. The periphery of the last whorl is prominently carinated. Suture clearly marked and accentuated by the carina of the whorl above it. Growthlines prosocline; with only a (very) faint additional spiral striation. Outer lip straight adapically, strongly angled at the peripheral carina and then gently curved to the columella, which is rather straight. Usually there is a narrow umbilical chink. Tooth clearly marked, situated rather high on the columella..

Dimensions: H. 3.2-4.0 mm, W. 1.4-1.6 mm; holotype 3.2 × 1.4 mm.

Differentiation.— This species is very similar to *O. unidentata* (Montagu, 1803), but differs in the much more slender shape of the shell and the quite different dimensions. At the stage of six whorls, an average *O. unidentata* measures 5.0 mm in height, whereas *O. romburghi* spec. nov. reaches only 3.0 mm. For the protoconchs the sizes are more than 350 µm versus c. 200 µm. See also the notes on *O. unidentata* var. *elata* Jeffreys, 1867, with *O. verhoeveni* spec. nov.

Depth range.— 18-400 m.

Etymology.— This species is named after D. van Romburgh, former member of the MWH.

Odostomia (Odostomia) suboblonga Jeffreys, 1884

Odostomia suboblonga Jeffreys, 1884: 345, pl. 26 fig. 3; Warén, 1980: 39, pl. 6 fig. 29; van Aartsen, 1987: 12, pl. 30 fig. 21.

Material.— Canary Islands: 4.049/4, 313 m.

Differentiation.— This is a very rare species which is most similar to *O. conoidea* (Brocchi, 1814). Both species share the general shape of the shell, with a smooth and shiny surface and orthocline growthlines. However, *O. suboblonga* has an intorted protoconch, of type B, and inside the outer lip there are no teeth.

Distribution.— *Odostomia suboblonga* has been mentioned from off the Cape Verde Islands by Jeffreys (1884: 345), and from Porto Santo and the Azores by Nordsieck & Talavera (1979: 188).

Odostomia (Odostomia) unidentata (Montagu, 1803)
(fig. 24)

Turbo unidentata Montagu, 1803: 324.

Odostomia unidentata; van Aartsen, 1987: 8, 11, pl. 29 fig. 17; Peñas et al., 1996: 54, 47, figs 114, 115.

Material.— Mauritania: 3.172/2, 3.178/7; M.030/7, M.031/9, M.043/1, M.046/2, M.077/3, M.078/2, M.079/3, M.084/2, M.097/6, M.111/1, M.113/6, M.115/4, M.121/2, M.135/4; I/5, II/6, III/1, V/25; B7/6, B8/6. Canary Islands: 2.003/3, 2.034/2, 2.048/1, 2.103/1, 2.120/2, 4.024/2, 4.038/7, 4.041/3, 4.044/3, 4.048/4, 4.068/1, 4.088/4, 4.090/7, 4.092/3, 4.112/1, 4.137/1, 4.138/5, 4.139/6, 4.159/1; Tenerife, -98 m/12 in ZMA. Selvagens Archipelago: 3.063/4. Madeira Archipelago: 1.017/2; Bay of Funchal, -40 m/2 in ZMA. Cape Verde Islands: 6.004/1.

Differentiation.— See the notes on *O. unidentata* var. *elata* Jeffreys, 1867, with the next species.

Distribution.— A well-known species, previously reported from the "western coasts of Africa" by Jeffreys (1884: 346), from the Canaries and Madeira by Jeffreys (1884: 346) and Watson (1885: 481), and from the Azores by Dautzenberg (1889: 59).

Depth range.— 0-200 m.

Odostomia (Odostomia) verhoeveni spec. nov.
(figs 25, 59)

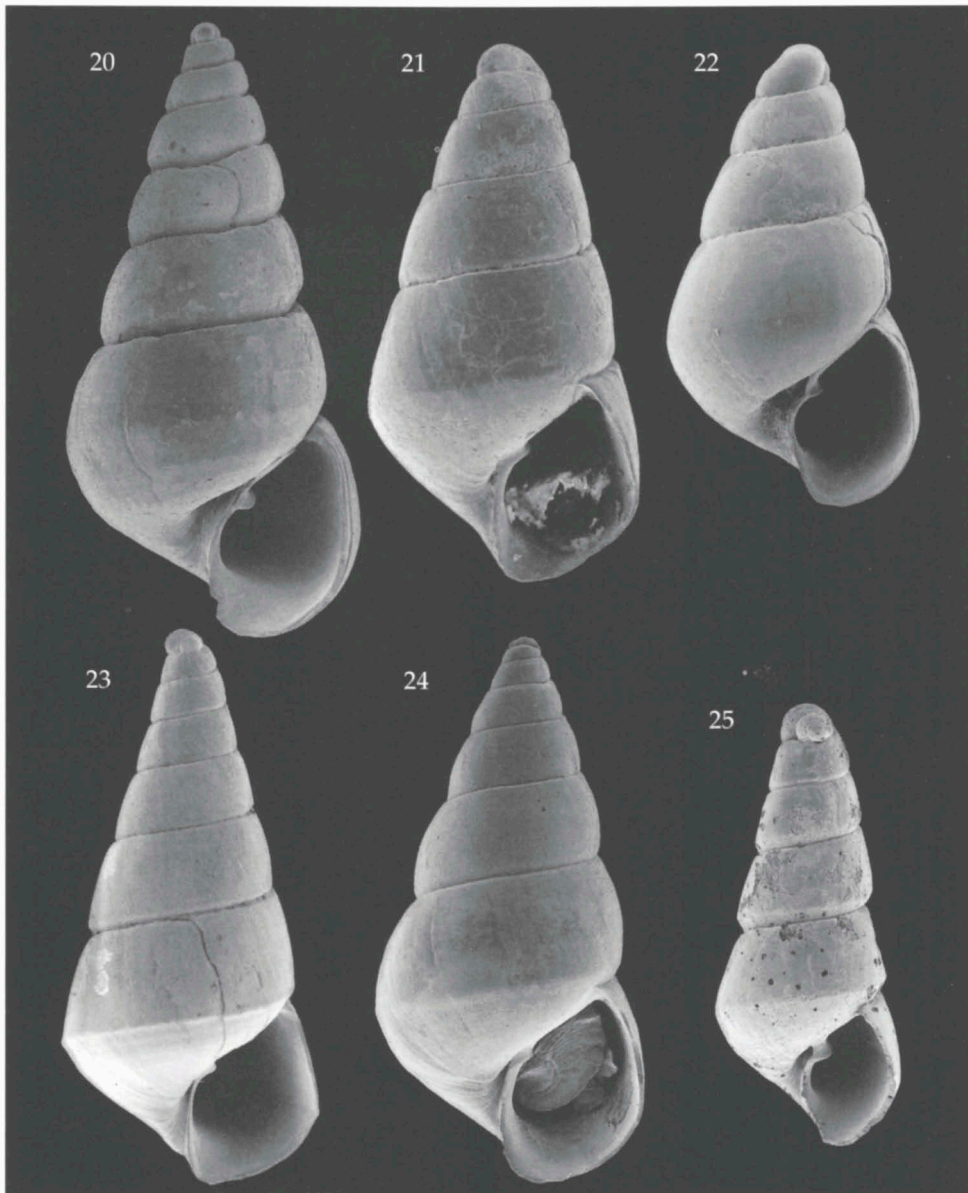
Material.— Holotype (NNM 57402): St. M.097, Mauritania, off Banc d'Arguin; 19°24'N 16°48'W; depth 26 m muddy sand with some shellgravel, ophiuroids; van Veen grab; 16.vi.1988.

Paratypes (NNM 57403-57405). Mauritania: M.078/1, M.097/5, M.099/1.

Description.— Shell forming a slender, somewhat pagoda-like cone. Colour white and shiny. Embryonic whorls helicoid, of type A II. Teleoconch consisting of four and a half to five flat whorls. Suture impressed, nearly horizontal. Growthlines slightly opisthocline and sinuous. There is hardly any sculpture; a faint spiral striation can be detected under the microscope. Outer lip thin, smooth inside. Umbilicus obsolete, only a slight chink is sometimes present. Tooth well-developed, situated very high on the columella.

Dimensions: H. 1.6-1.8 mm, W. 0.6-0.7 mm; holotype 1.7 × 0.7 mm.

Differentiation.— This species looks like a miniature of a very slender *O. unidentata* (Montagu, 1803). It is not only much smaller than that species, but it also shows opisthocline growthlines instead of the prominent prosocline ones of *O. unidentata*.



Figs 20-25. *Odostomia* species. 20, *Odostomia acuta* Jeffreys, 4.5 mm, Ria de Arosa, Spain, coll. van Aartsen; 21, *Odostomia duareni* spec. nov., holotype (NNM 57324), 1.8 mm, sta.5.053, Azores, S of São Miguel, 37°42'N 25°27'W, depth 50 m, 31-v-1981; 22, *Odostomia omphaloessa* Watson, 1.5 mm, sta. 4.088, Canary Islands, E of Lanzarote, 29°08'N 13°26'W, depth 51 m, 22-v-1980; 23, *Odostomia romburghi* spec. nov., holotype (NNM 57335), 3.2 mm, sta. 6.107, Cape Verde Islands, SW of Santa Luzia, 16°44'N 24°46'W, depth 50 m, 16-vi-1982; 24, *Odostomia unidentata* (Montagu), 4.8 mm, Loch Creran (Scotland), off Rubla Mor, 56°31.2'N 05°23.5'W, 23-viii-1993, coll. van Aartsen; 25, *Odostomia verhoeveni* spec. nov., holotype (NNM 57402), 1.7 mm, sta. MAU.097, Mauritania, off Banc d'Arguin, 19°24'N 16°48'W, depth 26 m, 16-vi-1988.

Our material also contains two specimens of a somewhat larger form (2.2 × 1.0 mm) with clearly prosocline growthlines. These two shells may belong to *O. unidentata* var. *elata* Jeffreys, 1867, which is originally described as "Spire more elongated, and base narrower" (Jeffreys, 1867: 134). Unfortunately, according to Warén (1980: 38), there are no type specimens known of this taxon. Moreover, Jeffreys' name is preoccupied by *O. elata* A. Adams, 1860. For the moment being these two specimens cannot be identified.

Depth range.— 26-42 m.

Etymology.— This species is named after M. Verhoeven, former member of the MWH.

Odostomia (Odostomia) brandhorsti spec. nov.
(fig. 26)

Material.— Holotype (NNM 57406): 7.119, Cape Verde Islands, S of Razo; 16°36'N 24°36'W; depth 140-160 m, coarse calcareous sand, gravel and stones with Foraminifera; van Veen grab; 1.ix.1986. Paratypes (NNM 57407-57429). Cape Verde Islands: 6.004/3, 6.005/4, 6.006/1, 6.008/2, 6.015/7, 6.024/1, 6.040/2, 6.052/1, 6.061/2, 6.068/18, 6.105/7, 6.134/5, 7.004/1, 7.005/1, 7.007/1, 7.042/2, 7.050/2, 7.080/8, 7.106/2, 7.119/11, 7.121/7, 7.122/1, 7.128/5.

Description.— Shell forming a short cone with straight sides and a flat top. Colour white-transparent. Embryonic whorls intorted, of type C. Teleoconch consisting of about four, slightly convex whorls. Suture clearly marked. Growthlines strongly prosocline. On the initial whorls a few spirally incised lines are sometimes discernible; apart from that the surface is smooth. Outer lip thin. Only a slight umbilical chink is sometimes present. There is a small but distinct columellar tooth.

Dimensions: H. 1.4-1.5 mm, W. 0.6-0.7 mm; holotype: 1.4 × 0.7 mm.

Differentiation.— This rather common species looks somewhat like some forms of *O. turrita* Hanley, 1844, but it has an intorted protoconch instead of the helicoid protoconch of that species. *O. striolata* Forbes & Hanley, 1850, is also somewhat similar, but much larger and less slender.

Depth range.— 60-400 m.

Etymology.— This species is named after A. L. Brandhorst, former member of the MWH.

Odostomia (Odostomia) dijkhuizeni spec. nov.
(fig. 27)

Material.— Holotype (NNM 57430): M.065, Mauritania, off Banc d'Arguin; 20°00'N 17°11'W; depth 25 m, muddy sand with *Cardium* and *Lanice*; van Veen grab; 13.vi.1988.

Paratypes (NNM 57431- 57445; ZMA 3.97.027-3.97.032). Mauritania: 3.133/1, M.011/2, M.013/1, M.030/3, M.031/3, M.033/1, M.043/3, M.044/1, M.045/2, M.046/1, M.065/3, M.078/1, M.079/1, M.084/1, M.085/3; I/12, II/4, III/9, V/>25, VII/24; B1/>25, B8/4.

Description.— Shell forming a slender cone with straight sides. Colour white, shiny. Embryonic whorls intorted, of type C. Teleoconch of four to five almost flat whorls. Suture clearly incised but not at all channelled. Growthlines orthocline to

very slight prosocline. The surface is smooth and shiny. Outer lip thin, straight over most of its length. Only a slight umbilical chink can sometimes be detected. Tooth conspicuous, situated at the upper part of the columella.

Dimensions: H. 2.3-2.5 mm, W. 1.0-1.2 mm; holotype: 2.3 × 1.0 mm.

Differentiation.— This species is similar to *O. turriculata* Monterosato, 1869, but it has nearly orthocline growthlines, whereas the last whorl is relatively much larger. There is a certain resemblance to *O. paardekooperi* spec. nov. too, but shells of that species are more slender and have a relatively shorter last whorl, whereas the growthlines are clearly prosocline.

Depth range.— 0-75 m.

Etymology.— This species is named after T. Dijkhuizen, former member of the MWH.

Odostomia (Odostomia) paardekooperi spec. nov.
(fig. 28)

Material.— Holotype (NNM 57446): 6.101, Cape Verde Islands, SW of Santa Luzia; 16°45'N 24°46'W; depth 20 m, coarse sand; van Veen grab; 16.vi.1982.

Paratypes (NNM 57447-57489). Cape Verde Islands: 6.004/3, 6.005/1, 6.007/3, 6.009/2, 6.015/3, 6.019/1, 6.024/2, 6.056/3, 6.061/10, 6.066/7, 6.068/2, 6.077/5, 6.082/7, 6.083/5, 6.101/20, 6.103/22, 6.105/13, 6.107/4, 6.130/7, 6.134/4, 6.147/2, 6.156/5, 6.158/4, 6.159/13, 6.160/6, 6.164/5, 6.171/3, 7.032/1, 7.049/2, 7.050/6, 7.093/6, 7.100/1, 7.106/3, 7.115/1, 7.116/3, 7.119/24, 7.120/4, 7.121/5, 7.128/7, 7.141/22, 7.142/9, 7.143/5.

Description.— Shell forming a slender cone with straight sides. Colour whitish. Embryonic whorls intorted, of type C. Teleoconch of about six flat whorls, somewhat angled at the periphery of the last whorl. Suture clearly impressed. Growthlines markedly prosocline. No sculpture, except for the growthlines. Outer lip straight adapically, strongly curved at the peripheral angle and evenly rounded abapically. Umbilicus small but distinct. Tooth very prominent.

Dimensions: H. 2.7-3.1 mm, W. 1.1-1.3 mm; holotype: 2.8 × 1.1 mm.

Differentiation.— This fairly common species is most similar to *O. turriculata* Monterosato, 1869, as described and figured by van Aartsen (1987: 5, 28, fig. 3). Shells of that species, however, have flexuous and opisthocline growthlines and similar but larger embryonic whorls.

Depth range.— 20-400 m.

Etymology.— This species is named after L. S. Paardekooper, former member of the MWH.

Odostomia (Odostomia) schrami spec. nov.
(figs 29, 60)

Material.— Holotype (NNM 57490): 3.172, off Mauritania; 20°21'N 17°17'W; depth 34 m, sand with shell gravel; triangular dredge; 1.xi.1978.

Paratypes (NNM 57491-57502; ZMA 3.97.033). Mauritania: 3.110/2, 3.133/1, 3.172/37, 3.178/2, M.097/1, M.106/5, M.109/2, M.111/4, M.113/6, M.115/7, M.121/5, M.122/2; B4/4.

Description.— Shell slender oval, with the last whorl occupying nearly two thirds of the total length. Colour white to transparent, glossy. Embryonic whorls intorted, of type B. Teleoconch consisting of four and a half to five and a half whorls, which are only slightly convex. Suture clearly incised and markedly inclined. Growthlines orthocone, becoming flexuous or sinuous on the lower whorls. The surface is smooth and glossy. Outer lip sharp, smooth inside. Mouth narrowly oval, occupying just over one third of the total height. Umbilicus lacking. Tooth conspicuous, placed high on the columella.

Dimensions: H. 2.9-3.0 mm, W. 0.8-1.1 mm; holotype: 2.9 × 0.9 mm.

Differentiation.— *O. schrami* spec. nov. is similar to *O. kromi* van Aartsen et al., 1984. Compared with that species, it is larger, with a relatively higher body-whorl and a larger aperture. The topwhorls are similar (in both species type B), but the growthlines are more orthocone and become more or less flexuous on the lower whorls, in contrast to the straight, somewhat prosocline growthlines in *O. kromi* (see also van Aartsen et al., 1984: 52, pl. 124 fig. 249).

Depth range.— 15-75 m.

Etymology.— This species is named after A. A. W. Schram, former member of the MWH.

Odostomia (Odostomia) striolata Forbes & Hanley, 1850

Odostomia striolata Forbes & Hanley, 1850: 267, pl. 95 fig. 5; van Aartsen et al., 1984: 51, pl. 124 fig. 247; 1987: 9, 13, pl. 30 fig. 25; Peñas et al., 1996: 49, 52, figs 127, 128.

Material.— Canary Islands: 2.003/3, 2.010/1, 2.032/2, 2.033/13, 2.043/3, 2.044/1, 2.075/2, 2.147/3; 4.001/3, 4.013/3, 4.014/19, 4.016/8, 4.020/>25, 4.022/>25, 4.024/11, 4.027/19, 4.029/10, 4.034/1, 4.038/7, 4.088/4, 4.090/2, 4.110/7, 4.112/21; Fuertaventura/>25, Tenerife, -100m/>25, El Hierro/2, Isla de La Palma/>25 [in ZMA]. Selvagens Archipelago: 3.062/4, 3.063/10, 3.099/9, 4.103/1. Madeira, Bay of Funchal, -6-20 m/>25 [in ZMA]. Azores: AZO 020/1, AZO 021/4, AZO 022/2; 5.006/7, 5.008/6, 5.017/8, 5.036/2, 5.050/8, 5.051/9, 5.054/6, 5.077/1, 5.078/16, 5.079/>25, 5.080/4, 5.083/6, 5.084/8, 5.092/7, 5.093/8, 5.094/4, 5.102/2, 5.112/16, 5.113/7, 5.116/2, 5.119/4, 5.121/16, 5.126/4, 5.128/6, 5.129/1, 5.132/>25, 5.135/17, 5.138/15, 5.139/6, 5.140/5, 5.146/3, 5.150/6, 5.159/5, 5.162/1, 5.176/5; São Miguel, Ponta Delgada, -8 m/5, São Miguel, Praia do Populo, beach/10; São Miguel, Ponta Delgada, reef edge/3, Pico, lagoon/5, Graciosa, beach/6, Terceira, beach/11 [in ZMA]. Cape Verde Islands: 6.093/3, 7.028/12, 7.030/3, 7.031/2, 7.037/2, 7.038/6, 7.100/2, 7.110/1, 7.115/2, 7.119/8, 7.120/1, 7.121/3, 7.129/3.

Distribution.— *O. striolata* has only been reported once from Tenerife, Canary Islands (Nordsieck & Talavera, 1979: 189). From the present study the species appears to be much more widely distributed.

Depth range.— 0-400 m.

Odostomia (Odostomia) turrita Hanley, 1844

Odostomia turrita Hanley, 1844: 18; van Aartsen et al., 1984: 51, pl. 124 fig. 248; 1987: 8, 12, pl. 29 fig. 18; Peñas et al., 1996: 47, 54, figs 116, 117.

Material.— Mauritania: M.011/2, M.013/2, M.032/2, M.033/1, M.084/2, M.106/13, M.118/12, M.121/4; 3.172/>25, 3.174/2, 3.178/17, 3.179/9. Canary Islands: 2.033/2, 2.043/1, 2.064/3, 2.075/4,

4.013/15, 4.014/21, 4.016/>25, 4.020/16, 4.022/>25, 4.024/>25, 4.027/19, 4.028/2, 4.029/11, 4.034/1, 4.036/>25, 4.038/25, 4.041/8, 4.048/5, 4.067/7, 4.073/2, 4.088/19, 4.090/4, 4.091/1, 4.110/2, 4.112/5; Fuertaventura/8, Tenerife/>25 [in ZMA]. Madeira, Bay of Funchal, -2 to -40 m./>25 [in ZMA]. Azores: 5.006/>25, 5.008/2, 5.009/2, 5.017/3, 5.026/6, 5.033/12, 5.036/7, 5.037/8, 5.039/4, 5.040/>25, 5.047/12, 5.050/19, 5.051/10, 5.064/6, 5.077/>25, 5.078/>25, 5.079/>25, 5.080/7, 5.083/5, 5.084/11, 5.091/>25, 5.093/24, 5.094/5, 5.096/19, 5.102/6, 5.111/4, 5.112/>25, 5.113/12, 5.116/5, 5.117/6, 5.118/3, 5.119/20, 5.121/13, 5.122/2, 5.126/1, 5.128/6, 5.129/5, 5.131/5, 5.132/6, 5.133/2, 5.135/4, 5.136/4, 5.138/7, 5.139/16, 5.140/17, 5.144/>25, 5.148/5, 5.150/6, 5.158/>25, 5.159/8, 5.162/14, 5.164/12, 5.190/6, 5K01/7; AZO 021/3, AZO 022/>25; São Miguel, Ponta Delgada -8 m/1, São Miguel, Ponta Delgada, reef edge/25; São Miguel, São Roque/10, São Miguel, Praia de Popula, beach/15, Pico, lagoon/7, Graciosa, beach/5 [in ZMA].

Distribution.— Reported already from the Canary Islands by Jeffreys (1884: 346), Watson (1885: 481) and Nordsieck & Talavera (1979: 188), from Madeira by Watson (1897: 298) and from Morocco (Casablanca and Rabat) by Pallary (1920: 60) and Bellon-Humbert (1974: 45). From our work this species appears to be widely distributed throughout our study area except for the Cape Verde Islands.

Depth range.— 0-250 m.

Odostomia (Odostomia) angusta Jeffreys, 1867

Odostomia pallida var. *angusta* Jeffreys, 1867: 125.

Odostomia angusta; Warén, 1980: 37, pl. 6 fig. 18 [not fig. 22 (Warén, in litt.)]; van Aartsen, 1987: 9, 13, pl. 30 fig. 23; Peñas et al., 1996: 40, 49, figs 123, 124.

Material.— Mauritania: M.106/>25, M.109/5, M.111/7, M.115/2, M.118/>25, M.121/4, 3.172/24, 3.174/>25, 3.178/>25, 3.179/21, 3.181/17; B6/>25. Canary Islands: 4.022/2, 4.088/1, 4.090/1. Cape Verde Islands: 6.105/1, 6.149/1, 7.115/1, 7.142/1.

Distribution.— This species had not been mentioned before from West Africa or the neighbouring islands

Depth range.— 13-80 m.

Odostomia (Odostomia) boermani spec. nov.
(figs 30, 61)

Material.— Holotype (NNM 57503): M.033, off Mauritania; 18°47'N 16°34'W; depth 114 m, muddy sand and fine shell gravel; van Veen grab; 9.vi.1988.

Paratypes (NNM 57504-57508; ZMA 3.97.034). Mauritania: 3.133/1, M.030/2, M.032/5, M.033/2, M.046/1; B5/1).

Description.— Shell strong, forming a slender, somewhat pagoda-like cone. Colour milky-white and shiny. Embryonic whorls intorted, type C. Teleoconch consisting of about five whorls which are only slightly curved in their upper two-thirds and markedly more convex in the lower third. Suture well-marked. Only growthlines can be detected, which are about orthocone. Outer lip thin, smooth inside. Umbilicus a small chink. There is a moderately prominent tooth on the columella.

Dimensions: H. 2.5-2.7 mm, W. 1.0-1.3 mm; holotype: 2.7 × 1.3 mm.

Differentiation.— *O. boermani* spec. nov. is similar to *O. lukisii* Jeffreys, 1859, as far

as its shiny, milky-white whorls and the flat, intorted topwhorls are concerned. However, the shape of the whorls is quite different and the shells are clearly larger than those of *O. lukisii*.

Depth range.— 25-114 m.

Etymology.— This species is named after D.J. Boerman, former member of the MWH.

Odostomia (Odostomia) carrozzai van Aartsen, 1987

Odostomia carrozzai van Aartsen, 1987: 10, 13, pl. 31 fig. 30 [nomen novum for *Odostomia albella* auct., non Lovén, 1846].

Material.— Canary Islands: 4.073/1, 4.088/4, 4.091/1, 4.092/1. Selvagens Archipelago: 3.070 (fragments).

Distribution.— This species is cited from Madeira by Jeffreys (1884: 348) on the authority of Watson, who cited this species too (Watson, 1897: 296) as very abundant at Madeira. We found only a few specimens, none of which from Madeira.

Depth range.— 48-92 m.

Odostomia (Odostomia) eulimoides Hanley, 1844

Odostomia eulimoides Hanley, 1844: 18; van Aartsen et al., 1984: 53, pl. 125 fig. 252; 1987: 10, 14, pl. 31 figs 31, 32; Peñas et al., 1996: 44, 51, figs 132, 133.

Material.— Mauritania: M.078/5, M.084/1; B7/1, B8/1. Azores: 5.051/12; São Miguel, Ponta Delgada, -8 m/1, São Miguel, São Roque/1, Graciosa, beach/2, Terceira, beach/>25 [in ZMA].

Distribution.— *Odostomia eulimoides* has been reported from Tanger Bay (Morocco) by Jeffreys (1884: 348 '*Odostomia pallida*') as its most southern locality. In our material there are six specimens from the West African coast and many from the Azores, which extends the area of this species to the Southwest.

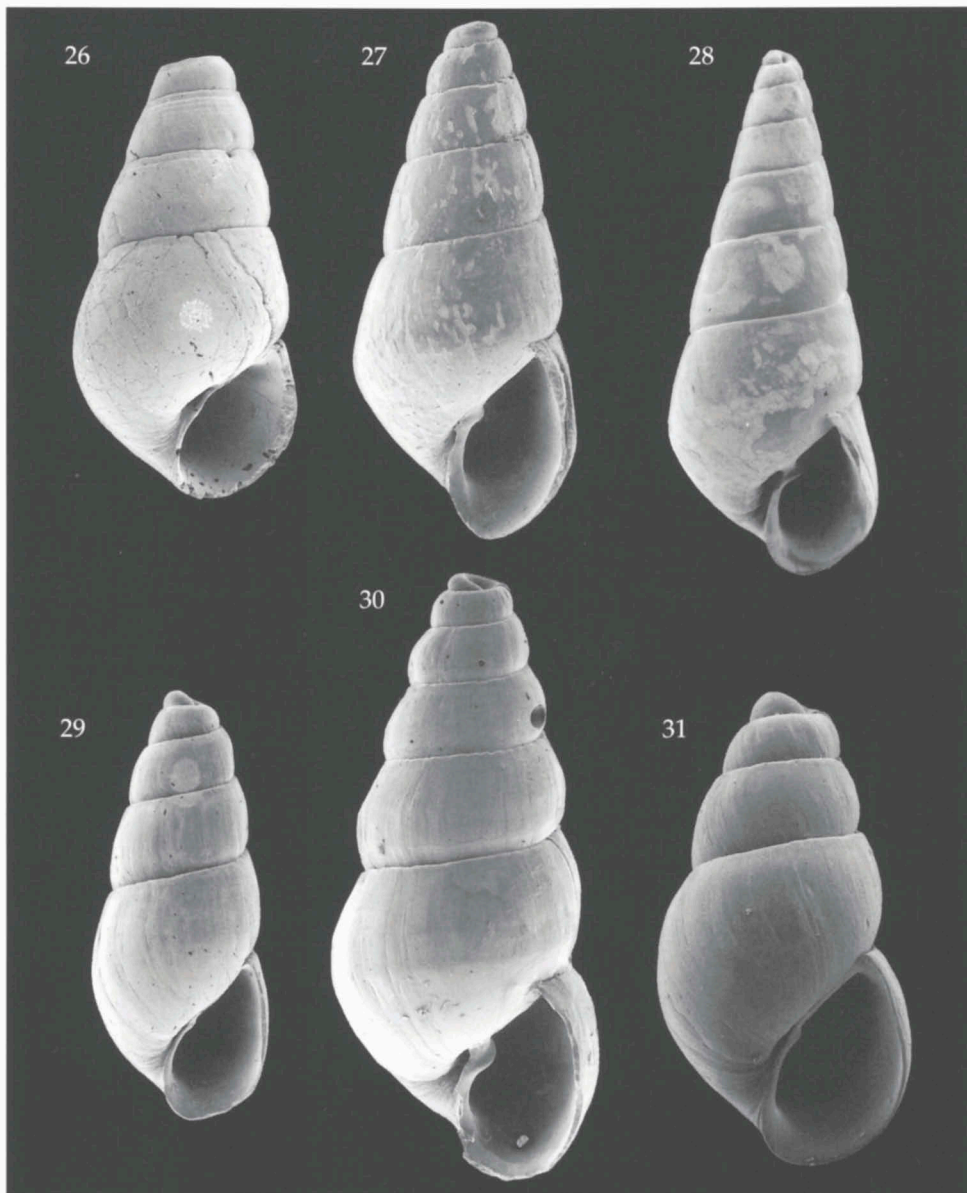
Depth range.— 0-41 m.

Odostomia (Odostomia) kuiperi spec. nov.
(fig. 31)

Material.— Holotype (ZMA 3.97.014): 6, Azores, NE of Terceiro, São Sebastiao, Os Salgueiros, 29.iii.1989 (leg. T. Piersma).

Paratypes (NNM 57509-57511, 58051; ZMA 3.97.015-016). Azores: 5.130/2, 5.138/5, 5.176/4, AZO.22/1; 6, NE of Terceira, São Sebastião/21, St. 9 Pico, lagoon, E. of Lajes do Pico/4.

Description.— Shell slender egg-shaped, rather small. Colour white. Embryonic whorls intorted, of type B. Teleoconch of three and a half to four, moderately convex whorls; the last whorl measures more than half the total height of the shell. Suture clearly defined. Growthlines slightly prosocline, with a tendency to become orthocline on the lower whorls; no further sculpture. Outer lip thin, smooth inside. Only a



Figs 26-31. *Odostomia* species. 26, *Odostomia brandhorsti* spec. nov., 1.4 mm, holotype (NNM 57406), sta. 7.119, Cape Verde Islands, S of Razo, 16°36'N 24°36'W, depth 140-160 m, 1-ix-1986; 27, *Odostomia dijkhuizeni* spec. nov., holotype (NNM 57430), 2.3 mm, sta. MAU.065, Mauritania, off Banc d'Arguin, 20°00'N 17°11'W, depth 25 m, 13-vi-1988; 28, *Odostomia paardekooperi* spec. nov., holotype (NNM 57446), 2.8 mm, sta. 6.101, Cape Verde Islands, SW of Santa Luzia, 16°45'N 24°46'W, depth 20 m, 16-vi-1982; 29, *Odostomia schrami* spec. nov., holotype (NNM 57490), 1.9 mm, sta. 3.172, off Mauritania, 20°21'N 17°17'W, depth 34 m, 1-xi-1978; 30, *Odostomia boermani* spec. nov., holotype (NNM 57503), 2.7 mm, sta. MAU.033, off Mauritania, 18°47'N 16°34'W, depth 114 m, 9-vi-1988; 31, *Odostomia kuiperi* spec. nov., holotype (ZMA 3.97.014), 1.4 mm, sta. 6, Azores, Pico, NE of Terceira, São Sebastião, 29.iii.1989.

slight umbilical chink. Tooth small but conspicuous.

Dimensions: H. 1.4-1.8 mm, W. 0.7-0.9; holotype: 1.4 × 0.8 mm.

Differentiation.— This species looks like a slender miniature of *O. angusta* Jeffreys, 1867, but with the same number of whorls it measures about half the size of that species.

Depth range.— 0-142 m.

Etymology.— This species is named after J.G.J. Kuiper, former member of the MWH.

Odostomia (Odostomia) lukisii Jeffreys, 1859

Odostomia lukisii Jeffreys, 1859: 112, pl. 3 figs 19a, b; Warén, 1980: 38, pl. 6 figs 25, 26; van Aartsen et al., 1984: 53, pl. 124 fig. 253; 1987: 8, 12, pl. 30 fig. 19; Peñas et al., 1996: 46, 53, figs 138, 139.

Material.— Mauritania: 3.172/2; B1/1, B2/2. Canary Islands: 2.032/1, 2.033/4, 2.043/1, 4.013/2, 4.014/2, 4.038/1, 4.073/4, 3K08/1, 4K06/1; Gran Canaria/1, Tenerife/42, El Hierro/>25, Isla de La Palma/10, Fuerteventura/21, Gomera/2 [in ZMA]. Madeira Archipelago: 4K27/1; Bay of Funchal/18 [in ZMA]. Azores: 5.006/1, 5.010/1, 5.036/2, 5.037/3, 5.039/3, 5.040/2, 5.082/1, 5.102/1, 5.158/1, AZO 005/2, AZO 020/1, AZO 033/4, 5K01/1; São Miguel, Ponta Delgada, -8 m/4, Pico, lagoon/13, Terceira, beach/9 [in ZMA].

Distribution.— This species has not been mentioned from our study area before.

Depth range.— 0-150 m.

Odostomia (Odostomia) scalaris Macgillivray, 1843

Odostomia scalaris 1843 Macgillivray, 1843: 154; van Aartsen et al., 1984: 53, pl. 125 fig. 254; 1987: 9, 12, pl. 30 fig. 22; Peñas et al., 1996: 51, 52, fig. 136 (not 137).

Material.— Mauritania: M.033/1, M.078/1; 3.172/>25.

Distribution.— This widely distributed species has been reported before from "off the West of Africa" by Jeffreys (1884: 348), from Madeira by Watson (1897: 298), from the Selvagens archipelago by Nordsieck & Talavera (1979: 187) and from the Azores by Dautzenberg (1889: 59).

Nomenclature.— Many authors use the name *O. rissoides* Hanley, 1844, for this species, but we follow van Aartsen (1987a: 149, 150) in the use of the senior name *O. scalaris*.

Depth range.— 34-114 m.

Odostomia (Odostomia) verduini van Aartsen, 1987

Odostomia verduini van Aartsen, 1987: 5, 9, 13, pl. 30 fig. 24; Peñas et al., 1996: 49, 54, figs 125, 126.

Material.— Canary Islands: 4.069/2, 4.092/1; Mauritania: M.033/1, M.064/2, M.118/3; 3.172/3, 3.174/2, 3.178/5, 3.181/11; Cape Verde Islands: 6.059/1, 6.064/1, 7.068/1.

Differentiation.— Shells of this species have flat whorls with an adapical spiral

groove, a prominent columellar tooth, and prosocline growthlines.

Among our material we found two specimens [M.065 and 3.172] which correspond in nearly all details with *O. verduini*, except for their helicoid protoconch of type A II instead of the intorted type B of *O. verduini*. As there are only two specimens available for study, we refrain from describing these specimens as representing a species new to science.

Depth range.— 12-100 m.

Odostomia (Odostomia) meijeri spec. nov.
(fig. 32)

Material.— Holotype (NNM 57512): M.043, off Mauritania; 19°04'N 16°25'W; depth 15 m, greyish sand with some shell gravel; van Veen grab; 11.vi.1988.

Paratypes (NNM 57513-57519; ZMA 3.97.035-3.97.042): Mauritania: 3.109/9, 3.128/1, 3.172/7, M.013/3, M.043/11, M.044/6, M.111/2; I/11, II/16, III/8, St. V/1, VII/9, IX/4, B4/3, B7/3.

A few specimens are not considered paratypes: Mauritania: M.011/1, M.030/2, M.113/1; 3.172/1. These shells are larger, viz. up to two mm high at the same width, and thus more slender too. The growthlines become flexuous near the aperture on the last whorl and the tooth seems to be somewhat more prominent. Still we consider it possible that these specimens belong to the same species and give a photograph (fig. 33) for future recognition.

Description.— Shell compact, short ovoid-conical, with an obtuse top. Colour white to hyalin-transparent. Embryonic whorls intorted, of type C. Teleoconch consisting of three to three and a half slightly convex whorls, which are somewhat shouldered. Suture conspicuous but not very deep. Growthlines straight and nearly orthocline. With a few spirally incised lines around the periphery, not always easily discernible. Outer lip thin, evenly rounded and smooth inside. Only a slight umbilical chink. Tooth very small, situated deep within the aperture and hardly visible therefore.

Dimensions: H. 1.5-1.6 mm, W. 0.8-1.0 mm; holotype: 1.6 × 0.9 mm.

Differentiation.— Because of the spirally incised lines around the periphery, this small species is similar to *O. nivosa* (Montagu, 1803) as figured by van Aartsen et al. (1984: 53, pl. 123 fig. 255). However, that species has much more slender shells, with a sculpture consisting of a few spiral ribs.

According to the original description, *Ondina hemisculpta* de Folin, 1887, does not correspond with *O. meijeri* spec. nov., but the figure is somewhat similar. According to Kisch (1959: 108) the type specimen is lost.

Depth range.— 0-34 m.

Etyymology.— This species is named after A.W.J. Meijer, former member of the MWH.

Odostomia (Odostomia) truncatula Jeffreys, 1850
(fig. 34)

Odostomia truncatula Jeffreys, 1850: 109; Warén, 1980: 39, pl. 6 fig. 21; Fretter et al., 1986: 595-597, figs 409-411.

Material.— Cape Verde Islands: 7.102/1, 7.119/1, 7.121/1 (fig. 34).

Distribution.— Three specimens of an *Odostomia* species from the Cape Verde Islands are so similar to *O. truncatula* (type locality: Plymouth) that we identify them with that rare species, although it is not known from the Canary Islands, Madeira or the Azores. There are also no published records from Morocco or the more southern West African coasts.

Depth range.— 140-200 m.

Odostomia (Odostomia) vanurki spec. nov.

(fig. 35)

Material.— Holotype (NNM 57520): St. 7.065, Cape Verde Islands, W of Boa Vista, SW of Ilhéu Calheta do Velho; 16°10'N 22°58'W; depth 39 m, very fine, yellow calcareous sand; van Veen grab; 27.viii.1986.

Paratypes (NNM 57521-57523): Cape Verde Islands: 6.059/2, 7.042/1, 7.065/5.

Description.— Shell rather slender, nearly cylindrical with an obtuse top. Colour whitish to transparent. Embryonic whorls intorted. Teleoconch consisting of three and half, evenly rounded whorls. Suture well-marked. Growthlines slightly prosocline, not very pronounced; apart from these, the shell surface is smooth and shiny. Outer lip thin. Umbilicus lacking. There is a weak tooth on the columella, situated deeply inside the aperture.

Dimensions: H. 1.7 mm, W. 0.6 mm; holotype: 1.7 × 0.6 mm.

Differentiation.— *Odostomia vanurki* spec. nov. differs from *O. nivosa* (Montagu, 1803) and *O. truncatula* Jeffreys, 1850, as figured by van Aartsen (1987: pl. 28 figs 8 and 9, respectively) by the more slender general shape of the shell and its smooth, shiny surface without a spiral sculpture. *Odostomia vanurki* is also very similar to *Lios-tomia wareni* Schander, 1994, but it can be distinguished from that species by the weak tooth on the columella, the sutures which are less steep, the relatively larger aperture and the more convex whorls.

Depth range.— 39-76 m.

Etymology.— This species is named after R.M. van Urk, former member of the MWH.

Odostomia (Megastomia) conoidea (Brocchi, 1814)

(fig. 36)

Turbo conoideus Brocchi, 1814: 660, pl.16 fig. 2; Pinna & Spezia, 1978: 162, pl. 53 fig. 4 [type].

Odostomia conoidea; van Aartsen, 1987: 7, 10, pl. 29 fig. 12; Peñas et al., 1996: 42, 45, figs 106, 107.

Material.— Mauritania: M.011/9, M.013/4, M.014/2, M.030/12, M.031/>25, M.032/18, M.033/14, M.034/8, M.035/3, M.046/6, M.064/5, M.065/15, M.077/>25, M.078/12, M.079/17, M.084/7, M.087/1, M.097/7, M.099/14, M.106/1, M.111/2, M.113/9, M.118/2, M.121/5, M.135/>25; 3.109/13, 3.113/25, 3.123/3, 3.128/4, 3.133/>25, 3.159/1, 3.172/6, 3.192/3, 3.194/>25. Canary Islands: 2.010/1, 2.075/2, 4.044/2. Cape Verde Islands: 6.010/2, 6.057/4, 6.059/10, 6.061/4, 6.066/2, 6.103/1, 6.107/1, 6.128/2, 6.130/12, 6.156/1, 6.160/2, 6.164/2, 7.042/7, 7.065/4, 7.066/5, 7.068/3, 7.079/>25, 7.080/25, 7.097/1, 7.143/1, 7.160/3, 7.161/3.

Nomenclature.— This rather common species shows a broad intraspecific variation. We therefore consider *O. boteroi* Schander, 1994, *O. corimbensis* Schander, 1994, *O. gilsoni* Dautzenberg, 1912, and *O. sulcifera* Smith, 1872, conspecific. We have selected the specimen marked "Fig'd spec." in sample BMNH 1870.1.1229 as lectotype of *O. sulcifera*, described from Whydah (West Africa) (4.6 × 1.9 mm; fig. 36).

Distribution.— This widely distributed species has been reported from Madeira by Watson (1897: 297), from Morocco (Casablanca, Mogador and Rabat) by Pallary (1920: 59) and Bellon-Humbert (1974: 44), and from the Canary Islands by Nordsieck & Talavera (1979: 186).

Depth range.— 15-150 m.

Odostomia (Megastomia) conoidea (Brocchi, 1814) var.
(fig. 37)

Material.— Mauritania: M.029/1, M.033/7, M.064/3, M.097/11 (fig. 37), 3.159/1 and Banc d'Arguin, St. B8/>25 in ZMA.

Notes.— The present specimens are much more slender than any we have seen from Atlantic-Mediterranean origin. The length is 2.7-3.1 mm and the width is no more than 1.1-1.4 mm. Still they show the same protoconch as *Odostomia (Megastomia) conoidea*, the same orthocline growthlines and the same very smooth and shiny surface. A weak carinal spiral rib is also present. Knowing the great variability of the Pyramidellidae, we refrain from describing these specimens as a new species but point out their different shape (2.7 × 1.1 mm; fig. 37).

Odostomia (Megastomia) conspicua Alder, 1850

Odostomia conspicua Alder, 1850: 359; van Aartsen, 1987: 7, 8, pl. 28 figs 10, 11.

Material.— Canary Islands: 4.013/2, 4.014/4, 4.038/5, 4.041/1, 4.088/7, 4.099/1, 4.137/1, 4.138/4, 4D02/3; Tenerife, -98 m/15 [in ZMA]. Madeira Archipelago: 3.002/1; Bay of Funchal, -35 m/8 [in ZMA].

Notes.— *Odostomia conspicua*, one of the largest European *Odostomia* species, has already been mentioned from Madeira by Watson (1897: 297) and Nordsieck & Talavera (1979: 186). It is a rather rare species. The shells are rosa-brown in colour.

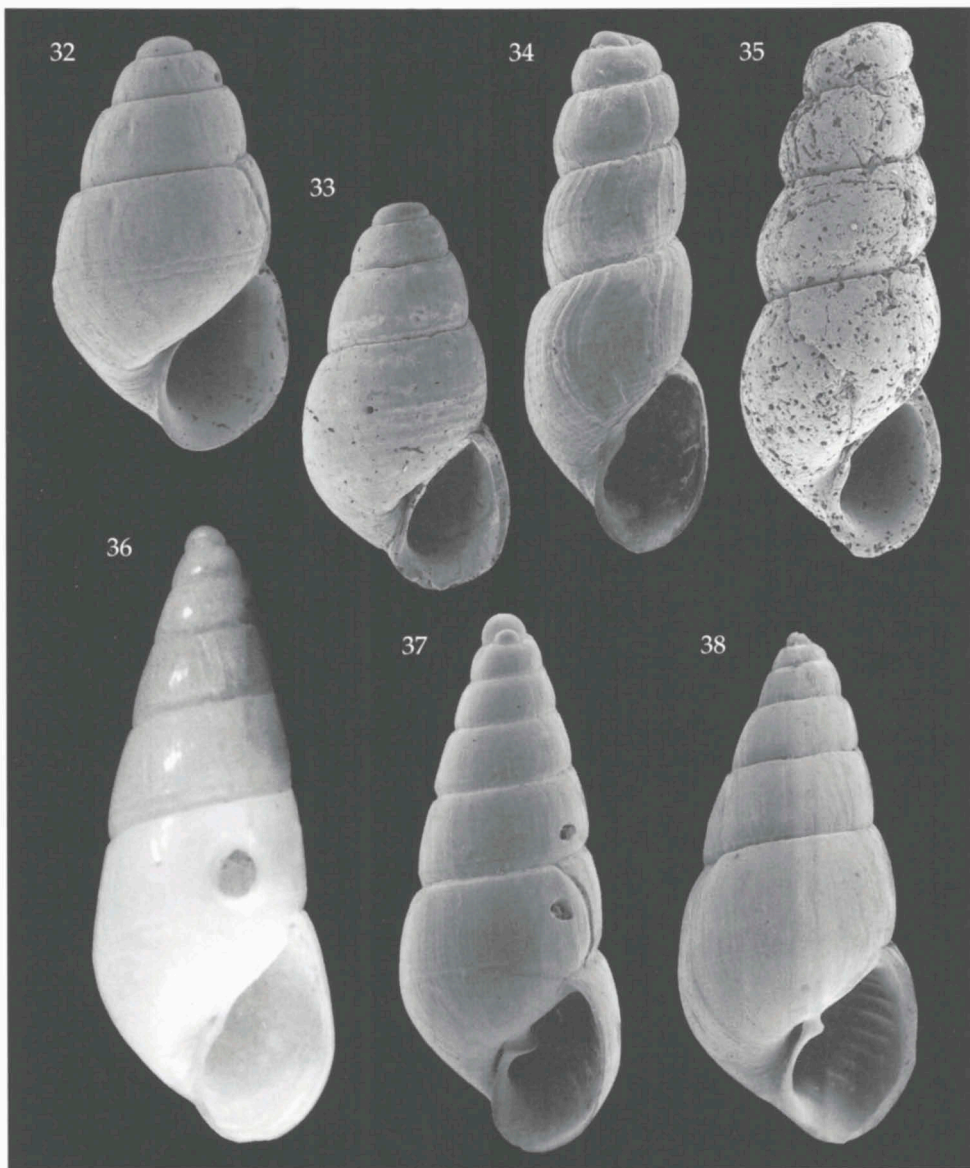
Depth range.— 0-120 m.

Odostomia (Megastomia) desmiti spec. nov.
(figs 38, 62)

Material.— Holotype (NNM 57524): M.065, Mauritania, off Banc d'Arguin; 20°00'N 17°11'W; depth 25 m, muddy sand with *Cardium* and *Lanice*; van Veen grab; 13.vi.1988.

Paratypes (NNM 57525-57532; ZMA 3.97.043). Mauritania: M.030/4, M.035/6, M.064/6, M.065/5, M.097/1, M.113/3; 4.112/1, 4.159/1; B8/5.

Description.— Shell forming a slender cone with straight sides. Colour whitish in



Figs 32-38. *Odostomia* species. 32, *Odostomia meijeri* spec. nov., holotype (NNM 57512), 1.6 mm, sta. MAU.043, off Mauritania, 19°04'N 16°25'W, depth 15 m, 11-vi-1988; 33, *Odostomia meijeri* spec. nov. var., 1.8 mm, sta. 3.172, Mauritania, 20°21'N 17°17'W, depth 34 m, 1-xi-1978. ; 34, *Odostomia truncatula* Jeffreys, 2.3 mm, sta. 7.121, Cape Verde Islands, S of Razo, 16°36'N 24°37'W, depth 200-230 m, 1-ix-1986; 35, *Odostomia vanurki* spec. nov., holotype (NNM 57520), 1.7 mm, sta. 7.065, Cape Verde Islands, W of Boa Vista, SW of Ilhéu Calheta do Velho, 16°10'N 22°58'W, depth 39 m, 27-viii-1986; 36, *Odostomia conoidea* (Brocchi) (lectotype of *O. sulcifera* Smith, BMNH 1870.1.1229), 4.6 mm, West Africa, Whydah; 37, *Odostomia conoidea* var., 2.7 mm, sta. MAU.097, Mauritania, off Banc d'Arguin, 19°24'N 16°48'W, depth 26 m, 16-vi-1988; 38, *Odostomia desmiti* spec. nov., holotype (NNM 57524), 3.7 mm, sta. MAU.065, Mauritania, off Banc d'Arguin, 20°00'N 17°11'W, depth 25 m, 13-vi-1988.

dead material. Embryonic whorls intorted, of type B. Teleoconch of about five whorls, which are slightly convex. Suture well-marked, but not very deeply incised. Growthlines orthocone to slightly prosocline. Apart from the growthlines, the sculpture consists of a single spiral line around the periphery. Outer lip evenly rounded, with a number of spiral riblets inside. Umbilicus moderately prominent. Tooth clearly marked.

Dimensions: H. 2.7-3.7 mm, W. 1.5-1.8 mm; holotype: 3.7 × 1.7 mm.

Differentiation.— This species differs from the well-known *O. conoidea* (Brocchi, 1814) and related forms by its type B (instead of type A) protoconch, indicative of a non-pelagic embryonic development.

Depth range.— 24-200 m.

Etymology.— This species is named after H.G. de Smit, former member of the MWH.

Odostomia (Megastomia) zijpi spec. nov.
(fig. 39)

Material.— Holotype (NNM 57533): St. M.065, Mauritania, off Banc d'Arguin; 20°00'N 17°11'W; depth 25 m, muddy sand with *Cardium* and *Lanice*; van Veen grab; 13.vi.1988.

Paratypes (NNM 57534): Mauritania: M.065/3.

Description.— Shell forming a very broad cone with straight sides. Colour chalky-white. Embryonic whorls intorted, of type B. Teleoconch consisting of about three to three and a quarter, rather flat whorls. Suture impressed but not deep. Growthlines slightly prosocline. No sculpture except for the growthlines. Outer lip sharp, inside with about seven spiral riblets. Without an umbilicus or with only a very small umbilical chink. Tooth rather prominent.

Dimensions: H. 1.8-2.1 mm, W. 1.2-1.4 mm; holotype: 2.1 × 1.4 mm.

Differentiation.— A remarkable species. The shell is much broader than in *O. (M.) desmiti* spec. nov., with which it can be compared. We found only four specimens, so it is possible that full-grown shells reach larger dimensions. Its stumpy shape differentiates this species clearly from *O. (M.) conoidea* (Brocchi, 1814), *O. (M.) desmiti* and similar species.

Depth.— 25 m.

Etymology.— This species is named after J.C.M. van Zijp, former member of the MWH.

Odostomia (Liostomia) clavula (Lovén, 1846)

Turbonilla clavula Lovén, 1846: 18.

Odostomia clavula; van Aartsen, 1987: 6, pl. 28 figs 6, 7; Peñas et al., 1996: 42, 43, figs 96, 97.

Liostomia clavula; Warén, 1991: 106, 107, fig. 35C, D, G.

Material.— Mauritania: M.030/1, M.031/7, M.032/1, M.034/1, M.077/3, M.078/4, M.084/1, M.085/4, M.087/1, M.097/3, M.099/4, M.135/1, 3.113/1, 3.133/2, 3.172/1, 3.194/>25; B1/4, B2/1, B5/4, B7/6, St. B8/4.

Nomenclature.— For the time being we do not follow Warén (1991: 106) in the use of *Liostomia* Monterosato, 1884, as a full genus but prefer to use it with the majority of the authors as a subgenus of *Odostomia* Fleming, 1813.

Distribution.— *O. clavula* has not been reported before from our research area.

Depth range.— 19-100 m.

Odostomia (Pyramistomia) fehrae spec. nov.
(fig. 40)

Material.— Holotype (NNM 57535): St. 5.140, Azores, W of Pico; 38°34'N 28°33'W; depth 88 m; van Veen grab; 7.vi.1981.

Paratypes (NNM 57536-57543). Azores: 5.051/6, 5.058/2, 5.093/1, 5.111/1, 5.122/1, 5.131/2, 5.135/2, 5.140/10.

Description.— Shell strong, forming a slender cone with straight sides, interrupted by broad channels. Colour whitish. Embryonic whorls planorbic, of type B. Teleoconch of four shouldered whorls, forming a right angle near the upper suture, continuing with a slightly concave part towards the lower periphery, which is accentuated by a prominent spiral rib, and reaches the lower suture nearly vertically. Suture only slightly impressed, but broadly channelled because of the sculpture. Growthlines clearly prosocline. Except for the growthlines, the sculpture consists of the strong, spiral rib at the abapical side of the whorls, and a less prominent one delimiting the shell base. The form of the outer lip reflects the shape of the whorls. Umbilicus lacking. Tooth well-marked.

Dimensions: H. 1.7-1.9 mm, W. 0.7-0.9 mm; holotype: 1.7 × 0.9 mm.

Differentiation.— This species is unlike any other recent European pyramidellid. It has some analogy with the fossil *O. deubeli* Boettger, 1901, as figured by Cossmann (1921: pl. 6 figs 34, 35) and Zilch (1934: 238, pl.12 fig.14). However, that species has a definite spiral rib at the adapical side of the whorls, which splits into two ribs on the lower whorls; in our species there is only a conspicuously angular part below the suture but no upper spiral rib. Still, the general morphology of the two species suggests a close relationship and because *O. deubeli* is the type species of *Pyramistomia* Cossmann, 1921, we classify our species with that taxon, which is given a subgeneric status here.

Depth range.— 92-400 m.

Etymology.— This species is named after Mrs. M. C. Fehr-de Wal, former member of the MWH.

Pending further research on the generic subdivision of the genus *Odostomia*, the following species are not classified in a subgenus.

Odostomia bernardi spec. nov.
(figs 41, 63)

Material.— Holotype (NNM 57544): 5.091, Azores, E of Faial; 38°51'N 28°36'W; depth 33 m, fine volcanic sand with shell gravel; van Veen grab; 2.vi.1981.

Paratypes (NNM 57545-57577; ZMA 3.97.018-025). Azores: AZO 20/12, AZO 24a/1, 5.006/1, 5.008/3,

5.026/1, 5.039/1, 5.050/7, 5.051/22, 5.053/1, 5.054/21, 5.055/1, 5.064/1, 5.077/2, 5.084/15, 5.091/>25, 5.092/>25, 5.094/1, 5.096/13, 5.100/4, 5.112/16, 5.113/11, 5.121/1, 5.122/3, 5.126/1, 5.128/7, 5.130/6, 5.132/13, 5.135/10, 5.138/4, 5.139/1, 5.140/4, 5.160/1, 5.190/1; São Miguel, Caloura littoral/3, Terceira, Angra de Heroísmo harbour/>25, São Miguel, São Roque/1, Faial, Porto Pin near Horta, beach/3, São Miguel, Praia do Populo/14, São Miguel, Praia do Populo/>25, Terceira/3, São Miguel, Ponta Delgada (-8 m)/4 [in ZMA].

Description.— Shell egg-shaped. Colour whitish in dead material. Embryonic whorls of type C. Teleoconch consisting of two and a half to three slightly convex whorls, the last one relatively very large. Suture well-marked, moderately incised. Growthlines orthocline to very slightly prosocline. Except for the well-marked growthlines there is no clear sculpture. Outer lip rather straight adapically, basally more strongly curved. Umbilicus lacking. There is a clear tooth, situated deeply inside the aperture.

Dimensions: H. 1.4-1.6 mm, W. 0.7-0.8 mm; holotype: 1.4 × 0.7 mm.

Differentiation.— This relatively common species is similar to the European *Odostomia glabrata* Forbes & Hanley, 1850, as figured by van Aartsen (1987: 30, fig. 26). The latter species, however, has more slender shells, which are not egg-shaped and provided with clearly prosocline growthlines. The embryonic whorls of *O. glabrata* are also of type C, but much larger.

Depth range.— 0-300 m.

Etymology.— This species is named after J.J. Bernard, former member of the MWH.

Odostomia dalsumi spec. nov.
(figs 42, 64)

Material.— Holotype (NNM 57578): 7.028, Cape Verde Islands, SE of Cima; 14°57'N 24°39'W; depth 225 m, yellow sand with shell gravel; van Veen grab; 23.viii.1986.

Paratypes (NNM 57579): Cape Verde Islands: 7.028/6.

Description.— Shell short, egg-shaped. Colour white. Embryonic whorls intorted, of type C. Teleoconch of little more than two shouldered whorls. Suture clearly marked, moderately incised. Growthlines prosocline and very clearly marked. Only the prominent growthlines form a kind of sculpture. Outer lip thin. Umbilicus small but conspicuous. Tooth weak, situated deeply inside the aperture.

Dimensions: H. 0.9-1.0 mm, W. 0.7 mm; holotype: 0.9 × 0.7 mm.

Differentiation.— For differences of this very small species with *O. mamoi* Mifsud, 1993, and *O. prinsi* spec. nov., see the notes on the latter species.

Depth.— 225 m.

Etymology.— This species is named after J. van Dalsum, former member of the MWH.

Odostomia mamoi Mifsud, 1993
(fig. 43)

Odostomia mamoi Mifsud, 1993: 16-18, figs; Nofroni & Tringali, 1995: 36, 37, pl. 7 figs 29-33.

Material.— Canary Islands: 2.022/2 (fig. 43), 2.085/1.

Description.— Shell broadly egg-shaped. Colour whitish transparent. Embryonic whorls intorted, of type C. Teleoconch of two to two and a half whorls. Suture clearly marked, moderately incised. Growthlines prosocline and well-marked; there is no other sculpture. Outer lip thin, regularly curved. Umbilicus rather small but well-marked. No tooth on the columella.

Dimensions: H. 1.5 mm, W. 1.0 mm; figured specimen (fig. 43): 1.5 × 1.0 mm.

Distribution.— Originally described from the Mediterranean, this species has recently been mentioned from Tenerife, Canary Islands, by Nofroni & Tringali (1995). Our shells also originate from the Canary Islands. This species is not known from the Cape Verde Islands, but two more or less similar taxa, viz. *O. dalsumi* spec. nov. and *O. prinsii* spec. nov. are reported from that region.

Depth range.— 83-500 m.

Odostomia prinsii spec. nov.
(figs 44, 65)

Material.— Holotype (NNM 57580): 6.093, Cape Verde Islands, SW of Razo; 16°36'N 24°37'W; depth 400-430 m, sand and shell gravel; van Veen grab; 15.vi.1982.

Paratypes (NNM 57581-57582): Cape Verde Islands: 6.093/4, 7.128/3.

Description.— Shell rissoid, rather small. Colour white. Embryonic whorls intorted, of type C. Teleoconch consisting of two to two and a half whorls. Suture clearly defined, but not incised. Growthlines very pronounced, rib-like, and clearly prosocline; no additional sculpture present. Outer lip thin, regularly curved. Umbilicus small, but clearly present. Tooth small but well-developed, situated deeply inside the aperture.

Dimensions: H. 1.2-1.3 mm, W. 0.8 mm; holotype: 1.2 × 0.8 mm.

Differentiation.— With *O. mamoi* and *O. dalsumi* spec. nov., *O. prinsii* spec. nov. belongs to a group of three species with small shells with rather prominent, prosocline growthlines. In *O. mamoi* and *O. prinsii* the whorls are regularly rounded, whereas they are clearly shouldered in *O. dalsumi*. In *O. dalsumi* the smallest of the three, the tooth is less clearly developed than in *O. prinsii*. In *O. mamoi*, the largest species, there is no tooth on the columella.

Depth range.— 400 m.

Etyymology.— This species is named after B. Prins, former member of the MWH.

Odostomia nitens Jeffreys, 1870

Odostomia nitens Jeffreys, 1870: 79; van Aartsen, 1987: 6, pl. 28 fig. 4.

Material.— Canary Islands: 2.011/1, 2.085/1, 4.058/3, 4.060/11, 4.087/1. Azores: 5.012/>25, 5.051/>25, 5.122/2. Cape Verde Islands: 6.093/1, 7.039/3, 7.052/1.

Nomenclature.— This well-known species is the type species (by monotypy) of *Doliella* Monterosato, 1880.

Distribution.— *Odostomia nitens* is known from rather deep water and has been reported from the Azores by Jeffreys (1884: 349), Watson (1885: 480) and Dautzenberg (1889: 59).

Depth range.— 125-700 m.

Odostomia marthinae (Nofroni & Schander, 1994)
(fig. 45)

Chrysallida marthinae Nofroni & Schander, 1994: 2, 8, 9, figs 1a, b, 2f.

Material.— Mauritania: M.013/5, M.030/19, M.031/>25, M.032/4, M.033/4, M.043/16, M.044/18, M.045/1, M.046/2, M.077/>25, M.078/>25, M.079/>25, M.084/19, M.085/6, M.097/>25, M.099/4, M.111/>25, M.113/>25, M.114/1, M.115/9, M.121/21, M.135/8; 3.109/4, 3.113/7, 3.123/1, 3.128/1, 3.133/5, 3.172/>25, 3.194/>25; B1/5, B2/15, B3/2, B5/5, B7/>25, B8/>25.

Nomenclature.— This recently described species is very characteristic but difficult to classify with one of the many morphologically defined (sub)genera in the family. We do not consider it a *Chrysallida* species, and tentatively classify it with *Odostomia*. The figured specimen (fig. 45) measures 2.5 × 1.2 mm.

Distribution.— This is one of the more common West African pyramidellids.

While studying the Mollusca of the bay of Algeciras, the first author discovered a perfectly well preserved shell of this species, but as this was the only specimen found, it was not mentioned in the published report by van Aartsen et al. (1984).

Depth range.— 14-100 m.

Genus *Puposyrnola* Cossmann, 1921

Type species (by original designation): *Auricula acicula* Lamarck, 1804 .

The type species of this genus is the eocene fossil *Auricula acicula* Lamarck, 1804. This species is figured by Cossmann (1921: 229, pl. 5 figs 60-64), who based the 'subgenus' *Puposyrnola* on the pupoidal outline of the shell, in contrast to *Syrnola* A. Adams, 1860.

Usually, both *Syrnola* and *Puposyrnola* species are supposed to have a well-developed tooth on the columella. This tooth is missing in the two species that are described below. Their classification is based on the general shape of the shells, which is clearly pupoid. *Syrnola minuta* H. Adams, 1869, has previously been placed in *Puposyrnola* by van Aartsen (1994: 93) and Peñas et al. (1996: 38).

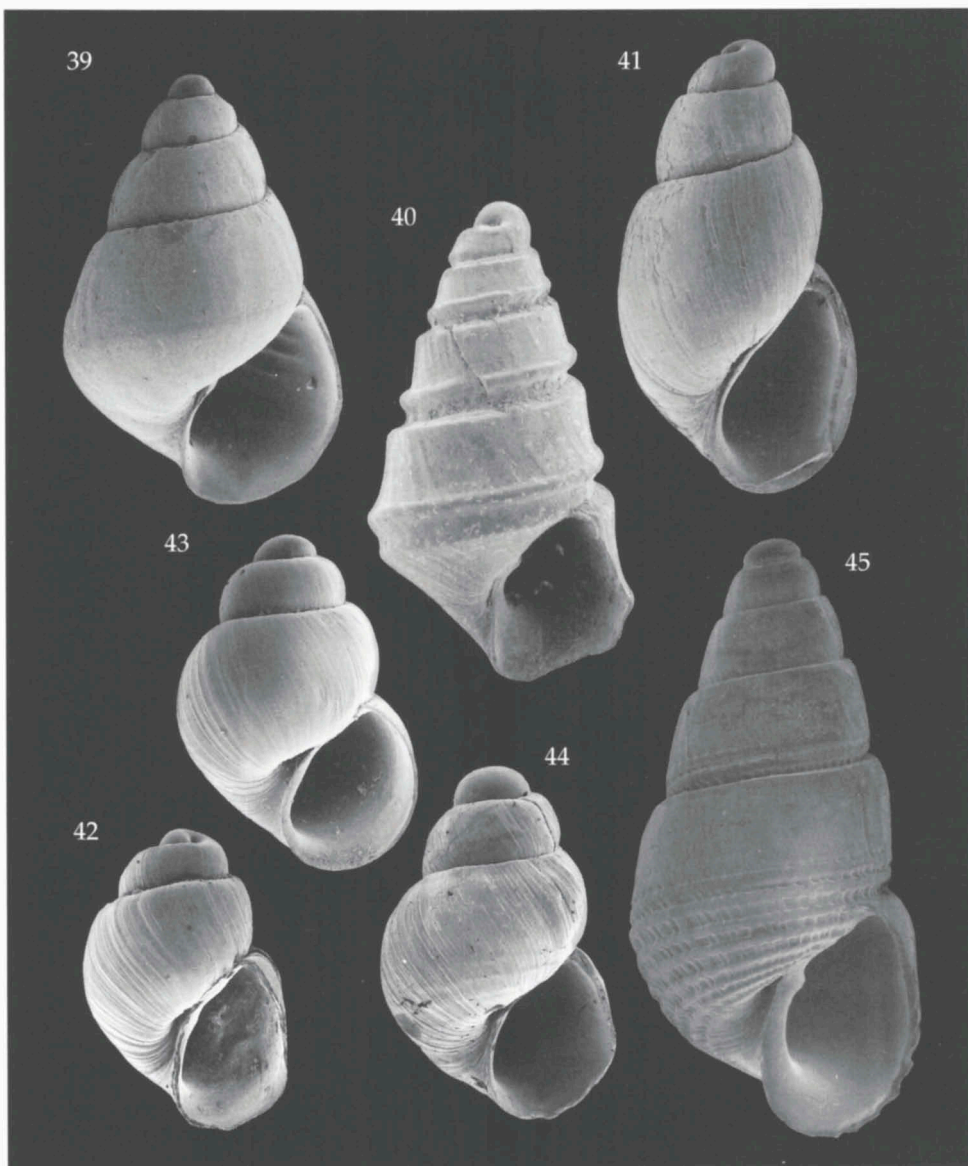
Puposyrnola minuta (H. Adams, 1869)

Syrnola minuta H. Adams, 1869: 274, pl. 19 fig. 10.

Puposyrnola minuta; van Aartsen, 1994: 93, pl. 107 fig. 10; Peñas et al., 1996: 38, 41, figs 89, 90, 93.

Material.— Canary Islands: 4.060/1. Mauritania: M.035/2, 2.036/4, 3.194/1.

Notes.— This well-known Atlantic-Mediterranean species, once reported from our research area, from Orotava, Canary Islands (H. Adams, 1869) is present in our



Figs 39-45. *Odostomia* species. 39, *Odostomia zijpi* spec. nov., holotype (NNM 57533), 2.1 mm, sta. MAU.065, Mauritania, off Banc d'Arguin, 20°00'N 17°11'W, depth 25 m, 13-vi-1988; 40, *Odostomia feh-rae* spec. nov., holotype (NNM 57535), 1.7 mm, sta 5.140, Azores, W of Pico, 38°34'N 28°33'W, depth 88 m, 7-vi-1981; 41, *Odostomia bernardi* spec. nov., holotype (NNM 57544), 1.4 mm, sta. 5.091, Azores, E of Faial, 38°51'N 28°36'W, depth 33 m, 2-vi-1981; 42, *Odostomia dalsumi* spec. nov., holotype (NNM 57578), 0.9 mm, sta. 7.028, Cape Verde Islands, SE of Cima, 14°57'N 24°39'W, depth 225 m, 23-viii-1986; 43, *Odostomia mamoi* Mifsud, 1.5 mm, sta. 2.022, Canary Islands, S of Fuerteventura, Punta de Jandia, 28°03'N 14°30'W, depth 83-97 m, 25-viii-1977; 44, *Odostomia prinsii* spec. nov., holotype (NNM 57580), 1.2 mm, sta. 6.093, Cape Verde Islands, SW of Razo, 16°36'N 24°37'W, depth 400-430 m, 15-vi-1982; 45, *Odostomia* (?) *marthinae* (Nofroni & Schander), 2.5 mm, sta. MAU.114, Mauritania, off Banc d'Arguin, 20°29'N 17°14'W, depth 36 m, 18-vi-1988.

material too. The shells vary in slenderness, but are always characteristic. The golden-yellow band mentioned in the original description is rarely present in empty shells. Our largest specimen measures 4.0 mm in height.

Depth range.— 78-580 m.

Puposyrnola kaasi spec. nov.
(figs 46, 66)

Material.— Holotype (NNM 57583): 7.100, Cape Verde Islands, W of Sal, off Palmeira; 16°46'N 23°01'W; depth 354 m, volcanic and calcareous mud, sand and gravel; van Veen grab; 30.viii.1986. Paratype (NNM 57584): Cape Verde Islands: 6.079/1.

Description.— Shell subcylindrical with a pupoidal top. Colour milky white. Embryonic whorls planorbid, intorted, of type B. Teleoconch of six to seven slightly concave whorls. Suture clearly incised, but not channelled. Growthlines prosocline; with an additional, microscopic spiral striation. Outer lip straight. Umbilicus lacking. Neither a columellar tooth nor a fold are present.

Dimensions: H. 4.4 mm, W. 1.4 mm; holotype: 4.4 × 1.4 mm.

Differentiation.— Compared with the only other European *Puposyrnola* species, viz. *P. minuta* (H. Adams, 1869), shells of this species are larger, more cylindrical, and provided with a less clearly pupoidal top.

Depth range.— 270-354 m.

Etymology.— This species is named after P. Kaas, former member of the MWH.

Genus *Eulimella* Forbes & MacAndrew, 1846

Type species (by original designation [see van Aartsen, 1988: 173]): *Eulima macandrei* Forbes, 1844 [= *E. scillae* (Scacchi, 1835)].

This genus comprises species with slender, smooth shells with many whorls, and without a columellar tooth. We follow the majority of the authors in considering the fossil *Eulimella scillae* (Scacchi, 1835) and *Eulimella macandrei* (Forbes, 1844) one and the same species.

The subgenus name *Ptycheulimella* Sacco, 1892, is sometimes used for species with shells with a weak fold on the columella and frequently a brownish spiral colour-band. As long as the identification of the type species of the subgenus, viz. *Tornatella pyramidata* Deshayes, 1835, is most uncertain, we prefer not to subdivide *Eulimella* s.l.

Eulimella unifasciata (Forbes, 1844)

Eulima unifasciata Forbes, 1844: 188.

Syrnola unifasciata; Carrozza, 1977: 178, pl. 2 fig. 1; Terreni, 1981: 46, pl.7 fig.10.

Eulimella unifasciata; van Aartsen, 1994: 99, pl. 109 fig. 19.

Material.— Canary Islands: 2.114/3, 2.155/1, 4.080/1, 4.082/1, 4.115/2.

Nomenclature.— Several authors placed this species in the genus *Syrnola* A. Adams, 1860. We do not agree with this classification, because *Syrnola* is supposed to

be characterized by the presence of a prominent tooth, which is lacking in this species.

Distribution.—*Eulimella unifasciata* is known from rather deep water and has previously been reported from "off the Sahara" and from the Azores by Jeffreys (1884: 351) and Dautzenberg (1889: 60), and from Mauritania by Altimira (1978: 182).

Depth range.— 200-700 m.

Eulimella verduini spec. nov.
(fig. 47)

Material.— Holotype (NNM 57585): 2.010, Canary Islands, S of Fuerteventura, Punta de Jandia; 28°03'N 14°29'W; depth 100-300 m, sand and shell gravel; van Veen grab; 24.viii.1977.

Paratypes (NNM 57586-56590). Canary Islands: 2.010/1, 2.034/1, 4.044/2, 4.048/3, 4.067/1. Three specimens from Station 4.080 are tentatively classified with this species.

Description.— Shell forming a very slender, elongated cone, with a rather obtuse top. Colour whitish, with a well-delimited, narrow, supraperipheral, brown band. Between this band and the abapical suture there is always a narrow whitish zone. Embryonic whorls planorbid, of type A I; rather large, viz. 400 μ m in width. Teleoconch formed by six to seven whorls which are slightly concave. Suture well-marked below the periphery of the preceding whorl. Growthlines orthocline and rather prominent, simulating axial ribs. Except for the clearly marked growthlines, there is only a vague supraperipheral angle, just above the abapical suture of each whorl. Outer lip straight adapically and gently curved below. Umbilicus lacking. On the columella there is no tooth, but usually an indistinct fold.

Dimensions: H. 3.1-4.0 mm, W. 0.9-1.0 mm; holotype: 3.1 \times 1.0 mm.

Differentiation.— In this species there is a narrow, brownish, spiral band on the lower part of each whorl, just as in *E. unifasciata* (Forbes, 1844), *E. neoattenuata* Gagliani, 1992, and *E. vanhareni* spec. nov., but it differs from all of these by the clearly concave whorls and the much more accentuated growthlines.

Depth range.— 47-300 m.

Etymology.— This species is named after the late A. Verduin, well-known malacologist and good friend of the authors.

Eulimella robusta spec. nov.
(figs 48, 67)

Material.— Holotype (NNM 57591): M.034, off Mauritania; 18°46'N 16°40'W; depth 167 m, muddy fine sand, some shell gravel; van Veen grab; 9.vi.1988.

Paratypes (NNM 57592-57593): Mauritania: M.034/1, M.035/1.

Description.— Shell strong, conical with straight sides and a rather obtuse top. Colour whitish, no colour-bands could be seen. Embryonic whorls planorbid, of type A I, with a width of about 450 μ m. Teleoconch of five to six flat or slightly concave whorls with a somewhat angled periphery. Suture well-marked. Growthlines somewhat prosocline; additionally there is only a fine microscopic spiral striation. Outer lip straight adapically and gently curved towards the columella, which is nearly

straight. Umbilicus lacking. On the columella there is no tooth, but only an indistinct fold.

Dimensions: H. 4-5 mm, W. 1.7-2.0 mm; holotype: 4.7 × 1.8 mm.

Differentiation.— This species is most similar to the recently described *Eulimella telum* Schander, 1994, but the shells are larger, have a larger protoconch and also a different shape (see Schander, 1994: 62, fig. 3e).

Depth range.— 167-200 m.

Etymology.— The epithet *robusta* refers to the strong appearance of the shells.

Eulimella sinuata spec. nov.

(fig. 49)

Material.— Holotype (NNM 57594): 7.039, Cape Verde Islands, SE of Cima; 14°56'N 24°38'W; depth 590-610 m, volcanic and calcareous sand; van Veen grab; 24.viii.1986.

Paratypes (NNM 57595-57598). Cape Verde Islands: 6.095/1, 7.015/2, 7.029/1, 7.039/3.

Description.— Shell rather stout, forming a very slender, elongated cone. Colour whitish, sometimes with a very faint yellowish-brown, spiral colourband around the periphery. Embryonic whorls somewhat helicoid, of type A. Teleoconch of six to seven nearly flat whorls which are slightly angled at the periphery. Suture very clearly marked. Growthlines prosocline; without further sculpture. Outer lip straight adapically, gently curved below. Umbilicus lacking. There is no columellar tooth but only an indistinct fold.

Dimensions: H. 3.3-4.5 mm, W. 1.1-1.4 mm; holotype: 3.3 × 1.1 mm.

Differentiation.— From the other *Eulimella* species with a golden brown spiral band, this species differs mainly by its prosocline growthlines; these are opisthocline in *E. unifasciata* and *E. vanhareni* spec. nov. The whorls are neither flat as in *E. unifasciata* nor concave as in *E. verduini* spec. nov.

Depth range.— 225-930 m.

Etymology.— The epithet *sinuata* refers to the slightly sinuate outline of the whorls.

Eulimella vanhareni spec. nov.

(figs 50, 68)

Material.— Holotype (NNM 57599): 4.116, Canary Islands, S of Palma; 28°26'N 17°51'W; depth 420 m, gravel, sand and shells; van Veen grab; 28.v.1980.

Paratypes (NNM 57600-57607). Canary Islands: 2.014/2, 2.075/1, 2.084/1, 2.103/1, 2.120/1, 4.048/5, 4.116/5, 4.156/2. Selvagens Archipelago: 3.099/1.

Description.— Shell forming a very much elongated cone with straight sides. Colour whitish, with a golden-yellow spiral band just above the periphery. Embryonic whorls planorbic, of type A I to B. Teleoconch consisting of seven to eight whorls which are flat to very slightly convex. Suture vaguely incised. Growthlines opisthocline in the lower whorls; without additional sculpture. Outer lip gently curved, with several tooth-like riblets inside. Umbilicus lacking. There is no columellar tooth, but a clear fold is usually present.

Dimensions: H. 4 - 6 mm, W. 1.1 - 1.5 mm; holotype: 4.6 × 1.3 mm.

Differentiation.— Because of its coloured spiral band, this species is clearly similar to the well-known *E. unifasciata* (Forbes, 1844). That species has the same type of protoconch as well as opisthocline growthlines (van Aartsen, 1994: 99, 109, fig.19). However the coloured band is broader and not clearly delimited in *E. unifasciata* and there are no riblets on the inside of the outer lip.

Eulimella vanhareni spec. nov. is somewhat similar to "*Syrnola*" *wenzi* Nordsieck, 1972 [= *Odostomia crassa* Jeffreys, 1884, not *Odostomia crassa* (Thompson, 1845)], but that species (only fragments are known) has orthocline to slightly prosocline growthlines and a well-developed tooth on the columella (van Aartsen, 1994: 94).

Eulimella species are supposed to have shells without teeth on the inside of the outer lip. Nevertheless, this species is classified here. The present lack of knowledge about the more than 300 nominal genera of the Pyramidellidae leaves us no more acceptable alternative than considering this an aberrant *Eulimella* species.

Depth range.— 200-585 m.

Etymology.— This species is named after H. van Haren, former member of the MWH.

Eulimella tydemani spec. nov.
(fig. 51)

Material.— Holotype (NNM 57608): 7.068, Cape Verde Islands, W of Boa Vista, SW of Ilhéu Calheta do Velho; 16°11'N 22°59'W; depth 40 m, fine yellow-grey sand, foramin.; van Veen grab; 27.viii.1986. Paratypes (NNM 57609-57610). Cape Verde Islands: 7.042/1, 7.079/10, 7.080/2.

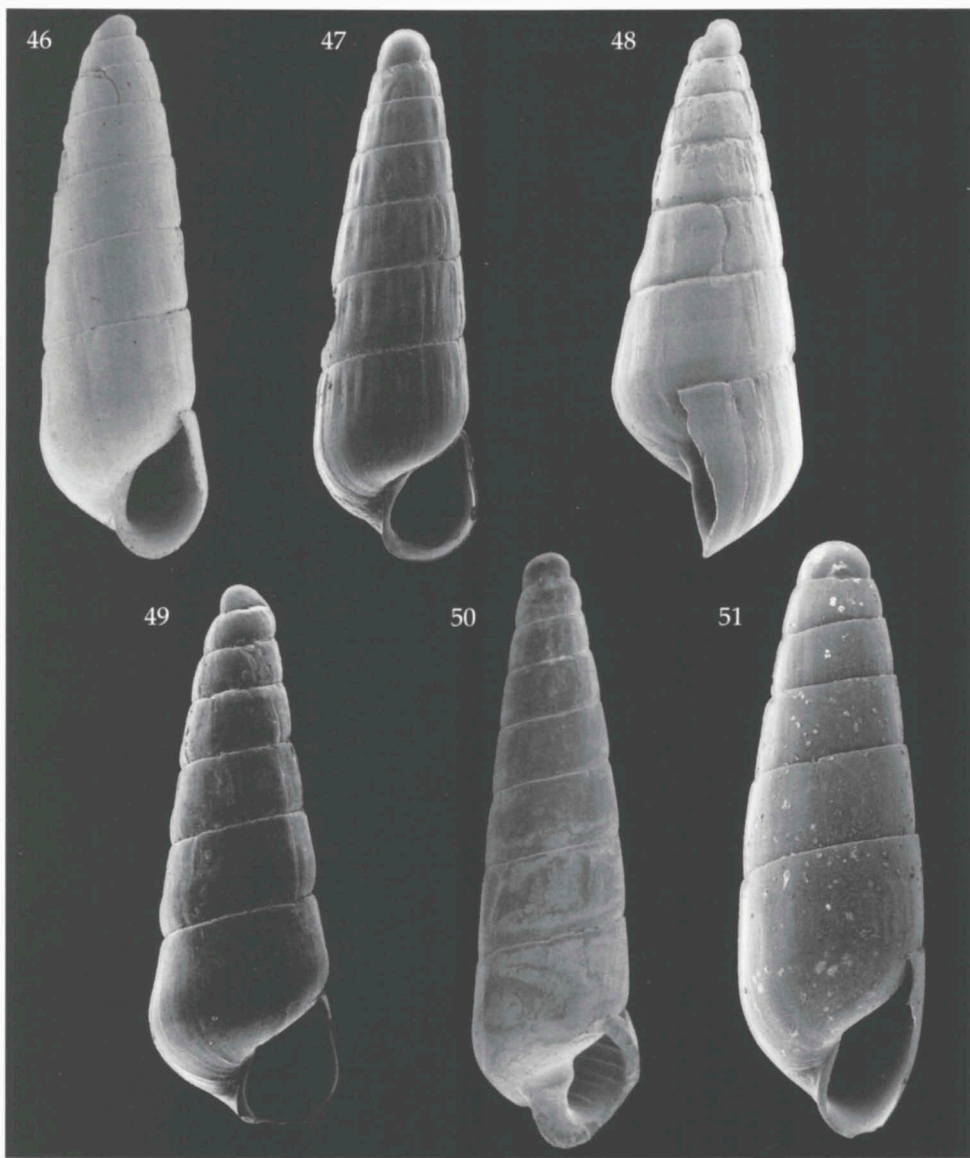
Description.— Shell subcylindrical, with a rather obtuse top. A narrow light brown spiral band runs around the periphery and just above the lower suture at the older whorls. Embryonic whorls planorbic, of type A I, rather large, viz. about 500 µm in diameter and, characteristically, coloured light brown. Teleoconch of six to seven relatively high flat whorls. Suture incised, not channeled as in the other *Eulimella* species here described. Growthlines very slightly prosocline to orthocline. Only an indistinct microscopic spiral striation is discernible. Palatal part of the outer lip nearly straight, then abruptly curved upwards to reach the columella. Umbilicus lacking. On the columella there is no tooth but only an indistinct fold.

Dimensions: H. 3.5 - 4.0 mm, W. 1.0 - 1.15 mm; holotype: 3.7 × 1.1 mm.

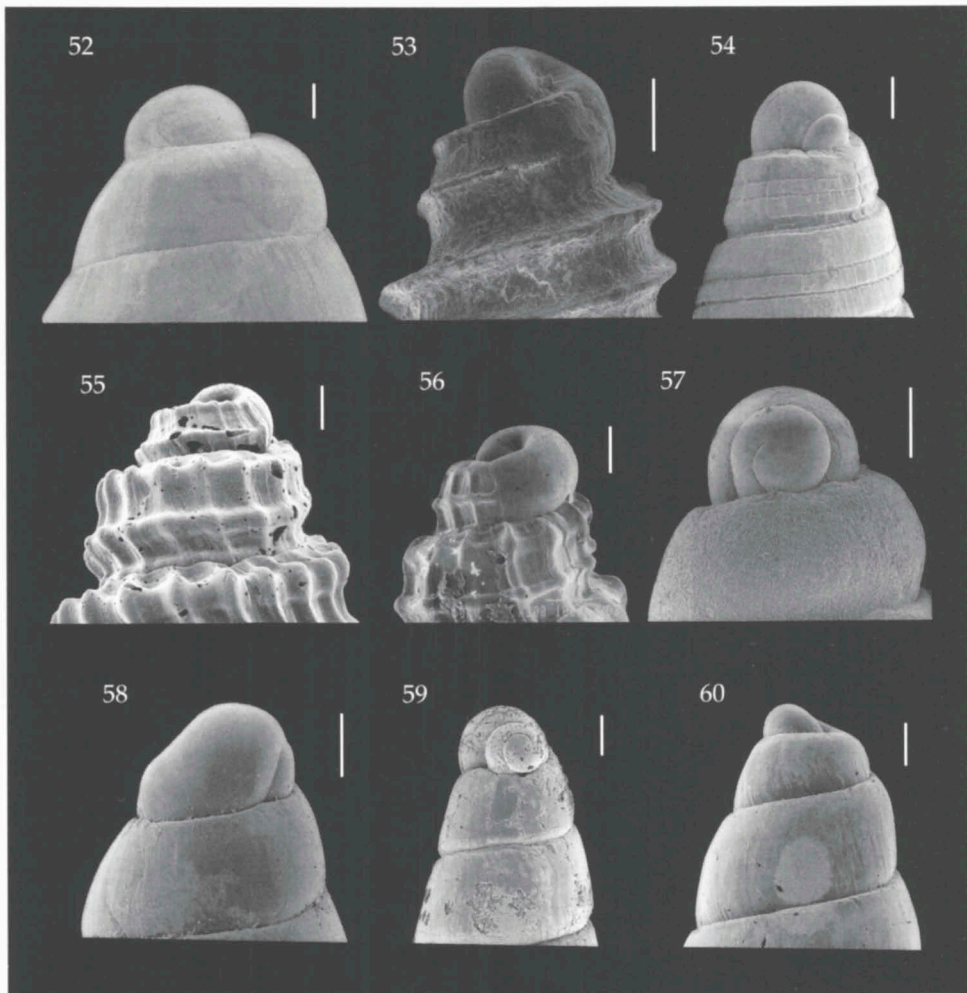
Differentiation.— Although the present species is somewhat similar to *Puposyrnola minuta* (H. Adams, 1869) in general shape (see: van Aartsen, 1994: 107, fig. 10; Peñas et al., 1996: 41, fig. 89) that species has a clearly different form and a totally different apertural structure. Moreover, the topwhorl of *P. minuta* is not coloured light brown, as it is in *E. tydemani* spec. nov. Because of its non-pupoidal outline we do not place *Eulimella tydemani* in *Puposyrnola*.

Depth range.— 40-76 m.

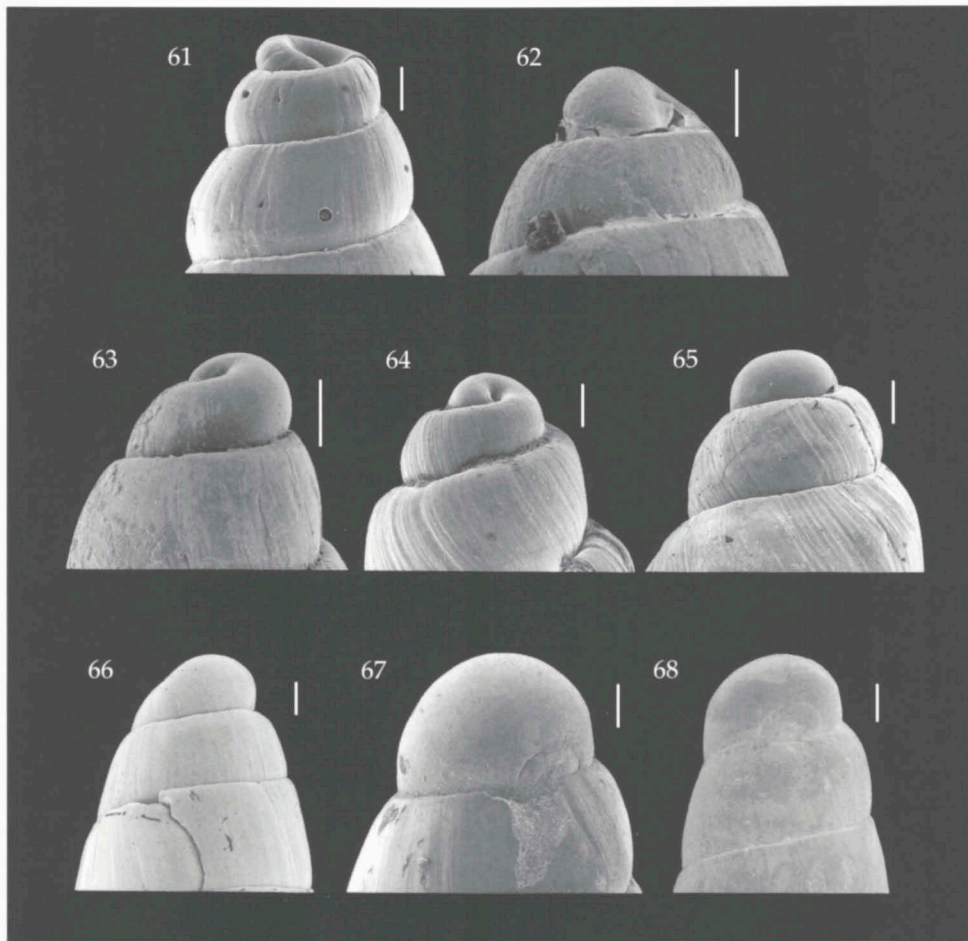
Etymology.— The epithet *tydemani* refers to the research vessel Tydeman, used during the CANCAP II-VII expeditions.



Figs 46-51. *Puposyrnola* and *Eulimella* species. 46, *Puposyrnola kaasi* spec. nov., holotype (NNM 57583), 4.4 mm, sta 7.100, Cape Verde Islands, W of Sal, off Palmeira, 16°46'N 23°01'W, depth 354 m, 30-viii-1986; 47, *Eulimella verduini* spec. nov., holotype (NNM 57585), 3.1 mm, sta. 2.010, Canary Islands, S of Fuerteventura, Punta de Jandia, 28°03'N 14°29'W, depth 100-300 m, 24-viii-1977; 48, *Eulimella robusta* spec. nov., holotype (NNM 57591), 4.7 mm, sta. MAU.034, off Mauritania, 18°46'N 16°40'W, depth 167 m, 9-vi-1988; 49, *Eulimella sinuata* spec. nov., holotype (NNM 57594), 3.3 mm, sta. 7.039, Cape Verde Islands, SE of Cima, 14°56'N 24°38'W, depth 590-610 m, 24-viii-1986; 50, *Eulimella vanhareni* spec. nov., holotype (NNM 57599), 4.6 mm, sta. 4.116, Canary Islands, S of Palma, 28°26'N 17°51'W, depth 420 m, 28-v-1980; 51, *Eulimella tydemani* spec. nov., holotype (NNM 57608), 3.7 mm, sta. 7.068, Cape Verde Islands, W of Boa Vista, SW of Ilhéu Calheta do Velho, 16°11'N 22°59'W, depth 40 m, 27-viii-1986.



Figs 52-60. Protoconchs. 52, *Tiberia apicifusca* spec. nov., holotype (NNM 57279), sta. 6.012; 53, *Pseudoscilla babylonica* (C.B. Adams) (lectotype of *Aclis tricarinata* Watson), coll. NMW 1955.158.00655; 54, *Odetta sulcata* (de Folin), sta. R V, Mauritania (ZMA); 55, *Folinella moolenbeeki* spec. nov., holotype (ZMA 3.97.008); 56, *Folinella excavata* (Philippi), Porto Pollo, Corse, France; 57, *Odostomia acuta* Jeffreys, Ria de Arosa, Spain; 58, *Odostomia omphaloessa* Watson, sta. 4.088; 59, *Odostomia verhoeveni* spec. nov., holotype (NNM 57402), sta. MAU.097; 60, *Odostomia schrami* spec. nov., holotype (NNM 57490), sta. 3.172. All scale-bars indicate 0.1 mm.



Figs 61-68. Protoconchs. 61, *Odostomia boermani* spec. nov., holotype (NNM 57503), sta. MAU.033; 62, *Odostomia desmiti* spec. nov., holotype (NNM 57524), sta. MAU.065; 63, *Odostomia bernardi* spec. nov., holotype (NNM 57544), sta. 5.091; 64, *Odostomia dalsumi* spec. nov., holotype (NNM 57578), sta. 7.028; 65, *Odostomia prinsii* spec. nov., holotype (NNM 57580), sta. 6.093; 66, *Puposyrnola kaasi* spec. nov., holotype (NNM 57583), sta 7.100; 67, *Eulimella robusta* spec. nov., holotype (NNM 57591), sta. MAU.034; 68, *Eulimella vanhareni* spec. nov., holotype (NNM 57599), sta. 4.116. All scale-bars indicate 0.1 mm.

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Appendix

The locality data of the Mauritania I & II expeditions

Tyro Mauritania-I Expedition 1988 (material in ZMA)

B1: Banc d'Arguin; 19°33.8'N 17°54.5'W; depth 53-64 m; 13.v.1988.

B2: Banc d'Arguin; 19°32.7'N 16°59.9'W; depth 99-152 m; 15.v.1988.

B3: Banc d'Arguin; 19°37.4'N 16°52.1'W; depth 21-34 m; 17.v.1988.

B4: Banc d'Arguin; 19°40'N 16°56'W; depth 37-62 m; 19.v.1988.

B5: Banc d'Arguin; 19°56.7'N 17°28.2'W; depth 85-154 m; 22.v.1988.

B6: Banc d'Arguin; 20°15'N 17°08'W; depth 18-20 m; 24.v.1988.

B7: Banc d'Arguin; 20°00'N 17°26'W; depth 50-62 m; 24.v.1988.

B8: Banc d'Arguin; 20°05.4'N 17°21.6'W; depth 33 m; 28.v.1988.

I: Banc d'Arguin, Baie d'Awatil; 19°46'N 17°29'W; littoral; 23.v.1988.

II: Banc d'Arguin; 19°46'N 17°30'W; littoral; 23.v.1988.

III: Banc d'Arguin; 19°46'30"N 17°31'W; littoral; 23.v.1988.

IV: Banc d'Arguin; 19°47'N 17°32'W; littoral; 23.v.1988.

IX: Banc d'Arguin; 19°50'30"N 17°34'30"W; littoral; 23.v.1988.

V: Banc d'Arguin; 19°47'30"N 17°32'30"W; littoral; 23.v.1988.

VI: Banc d'Arguin; 19°48'N 17°33'W; littoral; 23.v.1988.

VII: Banc d'Arguin; 19°49'N 17°33'30"W; littoral; 23.v.1988.

VIII: Banc d'Arguin; 19°49'50"N 17°34'W; littoral; 23.v.1988.

Tyro Mauritania-II Expedition 1988 (material in NNM)

M.001: Baie de Cansado; 20°53'N 17°02'W; depth 8 m; fishing lines; 5.vi.1988.

M.002: Baie de Cansado; 20°53'N 17°02'W; depth 8 m, anoxic fine mud; Van Veen grab; 5.vi.1988.

M.003: Baie de Cansado; 20°54'N 17°02'W; depth 0-6 m, on shipwreck (partly above water); scuba

diving, snorkelling; 6.vi.1988.

M.004: Passe du Levrier, E of Cap Blanc; 20°47'N 17°02'W; depth 15 m, sandy mud; Van Veen grab; 6.vi.1988.

M.005: Passe du Levrier, E of Cap Blanc; 20°47'N 17°02'W; dept 15 m, sandy mud; Van Veen grab; 6.vi.1988.

M.006: Passe du Levrier, E of Cap Blanc; 20°49'N 17°01'W; dept 15 m, fine sandy mud with tube-worms, hermit-crabs, bivalves; 1.2 m Agassiz trawl; 7.vi.1988.

M.007: E coast of Cap Blanc; 20°47'N 17°03'W; littoral zone; hand-collecting, snorkelling; 7.vi.1988.

M.008: E coast of Cap Blanc; 20°47'N 17°03'W; sublittoral zone, depth 0-2 m; scuba diving, snorkelling, snorkelling; 7.vi.1988.

M.009: Passe du Levrier, E of Cap Blanc; 20°48'N 17°02'W; depth 17 m, sandy mud and shell gravel; 1.2 m Agassiz trawl; 7.vi.1988.

M.010: Passe du Levrier, E of Cap Blanc; 20°49'N 17°01'W; depth 17 m, muddy sand; 1.2 m Agassiz trawl; 7.vi.1988.

M.011: Off coast; 18°50'N 16°18'W; depth 15 m, hard bottom with brownish yellow sand; Van Veen grab; 8.vi.1988.

M.012: Off coast; 18°50'N 16°19'W; depth 18 m, brownish yellow sand, hermit crabs, polychaetes; Van Veen grab; 8.vi.1988.

M.013: Off coast; 18°50'N 16°20'W; depth 20 m, coarse yellow sand with shell gravel; Van Veen grab; 8.vi.1988.

M.014: Off coast; 18°50'N 16°21'W; depth 21 m, brownish yellow, somewhat muddy sand; Van Veen grab; 8.vi.1988.

M.015: Off coast; 18°50'N 16°21'W; depth 21 m, sandy bottom with calcareous algae on shells, sponges; 1.2 m Agassiz trawl; 8.vi.1988.

M.016: Off Mauritania; 18°51'N 16°21'W; depth 21 m, sandy bottom; 1.2 m Agassiz trawl; 8.vi.1988.

M.017: Off coast; 18°50'N 16°19'W; depth 18 m, sandy bottom with folioid bryozoans, sponges; 1.2 m Agassiz trawl; 8.vi.1988.

M.018: Off coast; 18°50'N 16°22'W; depth 26 m, sandy bottom with shells, hermit-crabs, bryozoans, sponges; 1.2 m Agassiz trawl; 8.vi.1988.

M.019: Off coast; 18°50'N 16°23'W; depth 30 m, sandy bottom with sponges; 1.2 m Agassiz trawl; 8.vi.1988.

- M.020: Off coast; 18°50'N 16°24'W; depth 37 m, sandy bottom; 1.2 m Agassiz trawl; 8.vi.1988.
- M.021: Off coast; 18°50'N 16°25'W; depth 37 m, muddy sand with Foraminifers, crabs, opithobranchs, hermit-crabs; 1.2 m Agassiz trawl; 8.vi.1988.
- M.022: Off coast; 18°50'N 16°28'W; depth 60-66 m, muddy sand, crabs, echinoids, opithobranchs, hermit-crabs, sponges, flatfish (soleids); 1.2 m Agassiz trawl; 8.vi.1988.
- M.023: Off coast; 18°50'N 16°30'W; depth 71 m, small catch; 1.2 m Agassiz trawl; 8.vi.1988.
- M.024: Off coast; 18°50'N 16°18'W; depth 14 m; 3 baited shrimp-traps, overnight; 8/9.vi.1988.
- M.025: Off coast; 18°50'N 16°18'W; depth 14 m; deep-sea camera plus video-camera (ship at anchor); 8.vi.1988.
- M.026: Off coast; 18°50'N 16°18'W; depth 14 m; line fishing; 8.vi.1988.
- M.027: Off coast; 18°50'N 16°18'W; depth 16 m, hard bottom with sand, hydroids and soft corals; 1.2 m Agassiz trawl; 9.vi.1988.
- M.028: Off coast; 18°50'N 16°20'W; depth 20 m, sandy bottom, soft corals, bryozoans, crabs; 1.2 m Agassiz trawl; 9.vi.1988.
- M.029: Off coast; 18°49'N 16°22'W; depth 23 m, greyish-yellow sand with few animals; Van Veen grab; 9.vi.1988.
- M.030: Off coast; 18°49'N 16°24'W; depth 36 m, muddy grey sand, tubeworms macro-foraminifers; Van Veen grab; 9.vi.1988.
- M.031: Off coast; 18°48'N 16°28'W; depth 70 m, muddy dark-grey sand with tubeworms foraminifer; Van Veen grab; 9.vi.1988.
- M.032: Off coast; 18°47'N 16°34'W; depth 113 m, greyish-yellow sand; Van Veen grab; 9.vi.1988.
- M.033: Off coast; 18°47'N 16°34'W; depth 114 m, muddy sand and fine shell gravel; Van Veen grab; 9.vi.1988.
- M.034: Off coast; 18°46'N 16°40'W; depth 167 m, muddy fine sand, some shell gravel; Van Veen grab; 9.vi.1988.
- M.026: Off coast; 18°50'N 16°18'W; depth 14 m; line fishing; 8.vi.1988.
- M.036: Off coast; 18°45'N 16°42'W; depth 203 m; 5 shrimp-traps, overnight; 9/10.vi.1988.
- M.037: Off coast; 18°45'N 16°42'W; bottom at 200 m; line fishing; 9.vi.1988.
- M.038: Off coast; 18°46'N 16°45'W; depth 260 m, muddy bottom; 3.5 m Agassiz trawl; 9.vi.1988.
- M.039: Off coast; 18°48'N 16°43'W; depth 260-280 m, muddy bottom, tubeworms; 3.5 m Agassiz trawl; 9.vi.1988.
- M.040: Off coast; 18°51'N 16°53'W; depth 500 m, fossil coral debris, tubeworms; 3.5 m Agassiz trawl; 9.vi.1988.
- M.041: Off coast; 18°51'N 16°56'W; depth 800-840 m, muddy bottom; 3.5 m Agassiz trawl; 10.vi.1988.
- M.042: Off coast; 18°03'N 16°58'W; depth 820-990 m, muddy bottom; 3.5 m Agassiz trawl; 10.vi.1988.
- M.043: Off coast; 19°04'N 16°25'W; depth 15 m, greyish sand with some shell gravel; Van Veen grab; 11.vi.1988.
- M.044: Off coast; 19°04'N 16°25'W; depth 18 m, muddy fine grey sand, some shell gravel; Van Veen grab; 11.vi.1988.
- M.045: Off coast; 19°04'N 16°26'W; depth 22 m, muddy fine grey sand, shell gravel; Van Veen grab; 11.vi.1988.
- M.046: Off coast; 19°04'N 16°27'W; depth 25 m, muddy fine sand and shell gravel; Van Veen grab; 11.vi.1988.
- M.047: Off coast; 19°04'N 16°27'W; depth 25 m, hermit-crabs with epizoans, octopods, gastropods; 2.4 m Agassiz trawl; 11.vi.1988.
- M.048: Off coast; 19°04'N 16°25'W; depth 24 m, flatfish, hermit-crabs, sponges; 2.4 m Agassiz trawl; 11.vi.1988.
- M.049: Off coast; 19°05'N 16°25'W; depth 12-18 m, sand and sandstone, red algae, gorgonians, etc; rectangular dredge; 11.vi.1988.
- M.050: Off coast; 19°05'N 16°25'W; depth 20 m, shells, gorgonians, hermit-crabs, some red algae; 2.4 m Agassiz trawl; 11.vi.1988.
- M.051: Off coast; 19°04'N 16°25'W; depth 15 m, sandy bottom and sandstone ridge; scuba diving, underwater photography; 11/12.vi.1988.
- M.052: Off coast; 19°04'N 16°25'W; depth 18 m; rectangular dredge; 11.vi.1988.
- M.053: Off coast; 19°05'N 16°28'W; depth 30 m, many small flatfish; 2.4 m Agassiz trawl; 11.vi.1988.
- M.054: Off coast; 19°05'N 16°29'W; depth 30 m, small flatfish (soleids), gastropods; 2.4 m Agassiz trawl; 11.vi.1988.
- M.055: Off coast; 19°05'N 16°25'W; depth 15 m; line fishing; 11.vi.1988.
- M.056: Off coast; 19°05'N 16°25'W; depth 15 m; 5 shrimp traps, overnight; 11/12.vi.1988.
- M.057: Off coast; 19°05'N 16°25'W; depth 15 m; deep-sea camera, underwater-video; 11.vi.1988.
- M.058: Off coast; 19°05'N 16°25'W; at surface; neuston net (30 minutes); 12.vi.1988.
- M.059: Off coast; 19°05'N 16°39'W; depth 110 m, small catch, hermit-crabs, flatfish; 2.4 m Agassiz trawl; 12.vi.1988.

- M.060: Off coast; 19°06'N 16°46'W; depth 280-350 m, rather steep continental slope, many irregular sea-urchins; 2.4 m Agassiz trawl; 12.vi.1988.
- M.061: Off coast; 19°09'N 16°52'W; depth 400-750 m, rather steep canyon slope, fishes, pennatulids, small gastropods; 2.4 m Agassiz trawl; 12.vi.1988.
- M.062: Off coast; 19°09'N 16°52'W; depth 800-1200 m, steep slope, only some pelagic fauna; failure (net did not touch bottom), 2.4 m Agassiz-trawl; 12.vi.1988.
- M.063: off Banc d'Arguin; 20°00'N 17°09'W; depth 20 m, hard bottom with some muddy sand, gorgonians; Van Veen grab; 13.vi.1988.
- M.064: off Banc d'Arguin; 20°00'N 17°11'W; depth 24 m, muddy sand with *Cardium* and *Lanice*; Van Veen grab; 13.vi.1988.
- M.065: off Banc d'Arguin; 20°00'N 17°11'W; depth 25 m, muddy sand with *Cardium* and *Lanice*; Van Veen grab; 13.vi.1988.
- M.066: off Banc d'Arguin; 20°00'N 17°11'W; depth 25 m, muddy sand with *Cardium* and *Lanice*; 3.5 m Agassiz trawl; 13.vi.1988.
- M.067: off Banc d'Arguin; 20°00'N 17°12'W; depth 28 m, muddy sand with *Cardium*, etc.; 3.5 m Agassiz trawl; 13.vi.1988.
- M.068: off Banc d'Arguin; 20°01'N 17°15'W; depth 30 m, muddy sand; 3.5 m Agassiz trawl; 13.vi.1988.
- M.069: off Banc d'Arguin; 20°00'N 17°17'W; depth 32 m, muddy sand with small bivalves; 3.5 m Agassiz trawl; 13.vi.1988.
- M.070: off Banc d'Arguin; 20°00'N 17°18'W; depth 38-41 m, muddy sand; 3.5 m Agassiz trawl; 13.vi.1988.
- M.071: off Banc d'Arguin; 20°00'N 17°21'W; depth 43 m, muddy sand with tubeworms, crabs, flatfish; 3.5 m Agassiz trawl; 13.vi.1988.
- M.072: off Banc d'Arguin; 20°00'N 17°24'W; depth 48-52 m, muddy sand; 3.5 m Agassiz trawl; 13.vi.1988.
- M.073: off Banc d'Arguin; 20°03'N 17°09'W; depth 19 m, hard calcareous bottom; 1.2 m Agassiz trawl; 13.vi.1988.
- M.074: off Banc d'Arguin; 20°02'N 17°09'W; depth 22 m, hermit-crabs with bryozoans; 2.4 m Agassiz trawl; 13.vi.1988.
- M.075: off Banc d'Arguin; 20°01'N 17°09'W; depth 22 m, *Luidia*, hermit-crabs with bryozoans, some crabs, small catch; rectangular dredge; 14.vi.1988.
- M.076: off Banc d'Arguin; 20°00'N 17°10'W; depth 24 m, tubeworms, hermit-crabs; rectangular dredge; 14.vi.1988.
- M.077: off Banc d'Arguin; 20°00'N 17°17'W; depth 35 m, dark-grey muddy sand; Van Veen grab; 14.vi.1988.
- M.078: off Banc d'Arguin; 20°00'N 17°21'W; depth 41 m, dark-grey muddy fine sand; Van Veen grab; 14.vi.1988.
- M.079: off Banc d'Arguin; 20°01'N 17°23'W; depth 53 m, dark-grey muddy fine sand, tube-worms, ophiurids, *Tellina*; Van Veen grab; 14.vi.1988.
- M.080: off Banc d'Arguin; 20°02'N 17°26'W; depth 60-70 m, gastropods, hermit-crabs, flatfish; 3.5 m Agassiz trawl; 14.vi.1988.
- M.081: off Banc d'Arguin; 19°59'N 17°27'W; depth 120 m, failure: gear lost; 3.5 m Agassiz trawl; 14.vi.1988.
- M.082: off Banc d'Arguin; 19°59'N 17°30'W; depth 100 m; 2.4 m Agassiz trawl; 14.vi.1988.
- M.083: off Banc d'Arguin; 20°00'N 17°42'W; depth 720-760 m, failure: gear lost; 2.4 m Agassiz trawl; 14.vi.1988.
- M.084: off Banc d'Arguin; 19°35'N 16°50'W; depth 19 m, light-grey sandy mud; Van Veen grab; 14.vi.1988.
- M.085: off Banc d'Arguin; 19°35'N 16°51'W; depth 35 m, light grey sandy mud with shells, ophiurids, small bivalves; Van Veen grab; 15.vi.1988.
- M.086: off Banc d'Arguin; 19°32'N 16°52'W; depth 52 m, sticky grey mud with shell gravel, ophiuroids, small bivalves; Van Veen grab; 15.vi.1988.
- M.087: off Banc d'Arguin; 19°32'N 16°54'W; depth 65 m, sticky grey mud with shells, ophiuroids, small bivalves; Van Veen grab; 15.vi.1988.
- M.088: off Banc d'Arguin; 19°33'N 16°55'W; depth 64 m, sticky grey mud with shells, ophiuroids, echinoids, bivalves, tubeworms; 1.2 m Agassiz trawl; 15.vi.1988.
- M.089: off Banc d'Arguin; 19°34'N 16°55'W; depth 62 m, ophiuroids, *Ebalia*, bivalves, tubeworms; 1.2 m Agassiz trawl; 15.vi.1988.
- M.090: off Banc d'Arguin; 19°35'N 16°51'W; depth 38 m, ophiuroids, echinoids, bivalves, fishes; 1.2 m Agassiz trawl; 15.vi.1988.
- M.091: off Banc d'Arguin; 19°35'N 16°50'W; depth 30 m, very small catch; 1.2 m Agassiz trawl; 15.vi.1988.
- M.092: off Banc d'Arguin; 19°35'N 16°50'W; depth 32 m, very small catch; 1.2 m Agassiz trawl; 15.vi.1988.
- M.093: off Banc d'Arguin; 19°35'N 16°57'W;

- depth 85-90 m, echinoids, small bivalves, gastropods, tubeworms; 1.2 m Agassiz trawl; 15.vi.1988.
- M.094: off Banc d'Arguin; 19°32'N 17°01'W; depth 110 m; 1.2 m Agassiz trawl; 15.vi.1988.
- M.095: off Banc d'Arguin; 19°31'N 17°01'W; depth 200-110 m, small catch, only hermit-crabs; rectangular dredge; 15.vi.1988.
- M.096: off Banc d'Arguin; 19°33'N 17°02'W; depth 200-110 m; 1.2 m Agassiz trawl; 16.vi.1988.
- M.097: off Banc d'Arguin; 19°24'N 16°48'W; depth 26 m muddy sand with some shell gravel, ophiuroids; Van Veen grab; 16.vi.1988.
- M.098: off Banc d'Arguin; 19°25'N 16°48'W; depth 26 m, muddy sand, gorgonians, hermit-crabs, tubeworms; 2.4 m Agassiz trawl; 16.vi.1988.
- M.099: off Banc d'Arguin; 19°25'N 16°49'W; depth 42 m, dark-grey sandy mud with shell gravel (Pinna), ophiuroids, tubeworms; Van Veen grab; 16.vi.1988.
- M.100: off Banc d'Arguin; 19°26'N 16°50'W; depth 45 m, muddy sand with macro-foraminifers, gastropods, etc.; 2.4 m Agassiz trawl; 16.vi.1988.
- M.101: off Banc d'Arguin; 19°43'N 16°59'W; depth 61-78 m, sticky mud with some sand and shell gravel; 2.4 m Agassiz trawl; 16.vi.1988.
- M.102: off Banc d'Arguin; 19°45'N 17°05'W; depth 24 m, muddy bottom with dense population; 2.4 m Agassiz trawl; 16.vi.1988.
- M.103: off Banc d'Arguin; 19°46'N 17°06'W; depth 400-100 m, steep slope of canyon, tubeworms, scleractinians, ophiuroids; rectangular dredge; 16.vi.1988.
- M.104: off Banc d'Arguin; 19°43'N 17°30'W; depth 1500 m, many fish etc.; 3.5 m Agassiz trawl; 17.vi.1988.
- M.105: off Banc d'Arguin; 19°43'N 17°44'W; depth 1600-1900 m, many holothurians and ophiuroids; 3.5 m Agassiz trawl; 17.vi.1988.
- M.106: off Banc d'Arguin; 20°31'N 17°02'W; depth 15 m, shell gravel; Van Veen grab (4x); 18.vi.1988.
- M.107: off Banc d'Arguin; 20°31'N 17°03'W; depth 18 m, very small catch (Pyura, crab); 2.4 m Agassiz trawl; 18.vi.1988.
- M.108: off Banc d'Arguin; 20°31'N 17°04'W; depth 20 m, small catch, shell gravel; 2.4 m Agassiz trawl; 18.vi.1988.
- M.109: off Banc d'Arguin; 20°31'N 17°05'W; depth 22 m, muddy sand with shell gravel; Van Veen grab; 18.vi.1988.
- M.110: off Banc d'Arguin; 20°30'N 17°05'W; depth 22 m, shell gravel; 2.4 m Agassiz trawl; 18.vi.1988.
- M.111: off Banc d'Arguin; 20°31'N 17°09'W; depth 29 m, coarse sand, somewhat muddy, and shell gravel; Van Veen grab; 18.vi.1988.
- M.112: off Banc d'Arguin; 20°31'N 17°10'W; depth 29 m, shell gravel, hermit-crabs, echinoids; 2.4 m Agassiz trawl; 18.vi.1988.
- M.113: off Banc d'Arguin; 20°30'N 17°13'W; depth 36 m, coarse sand and shell gravel; Van Veen grab; 18.vi.1988.
- M.114: off Banc d'Arguin; 20°29'N 17°14'W; depth 36 m, shell gravel; 2.4 m Agassiz trawl; 18.vi.1988.
- M.115: off Banc d'Arguin; 20°28'N 17°17'W; depth 38 m, muddy sand with fine shell gravel and tubeworms; Van Veen grab; 18.vi.1988.
- M.116: off Banc d'Arguin; 20°26'N 17°18'W; depth 38 m, shell gravel, tubeworms, hermit-crabs; 2.4 m Agassiz trawl; 18.vi.1988.
- M.117: off Banc d'Arguin; 20°24'N 17°19'W; depth 35-40 m, sandy bottom; 3.5 m Agassiz trawl; 18.vi.1988.
- M.118: off Banc d'Arguin; 28°25'N 17°04'W; depth 17 m, yellow sand and shell gravel; Van Veen grab; 19.vi.1988.
- M.119: off Banc d'Arguin; 20°25'N 17°06'W; depth 17 m, practically no catch; 2.4 m Agassiz trawl; 19.vi.1988.
- M.120: off Banc d'Arguin; 20°24'N 17°08'W; depth 22 m, shell gravel with many Venus shells, few small fish, echinoids; 3.5 m Agassiz trawl; 19.vi.1988.
- M.121: off Banc d'Arguin; 20°27'N 17°14'W; depth 31 m, fine sand with shell gravel, somewhat muddy; Van Veen grab; 19.vi.1988.
- M.122: off Banc d'Arguin; 20°27'N 17°15'W; depth 32 m, shell gravel; 3.5 m Agassiz trawl; 19.vi.1988.
- M.123: off Banc d'Arguin; 20°26'N 17°20'W; surface (bottom at 36 m); neuston net (during the day); 19.vi.1988.
- M.124: off Banc d'Arguin; 20°26'N 17°21'W; depth 37 m, muddy sand; 3.5 m Agassiz trawl; 19.vi.1988.
- M.125: off Banc d'Arguin; 20°25'N 17°26'W; depth 47 m, sandy bottom with some shell- and calcareous gravel; 3.5 m Agassiz trawl; 19.vi.1988.
- M.126: off Banc d'Arguin; 20°24'N 17°30'W; depth 55-60 m, fine sediment, flatfish, hermit-crabs, etc.; 3.5 m Agassiz trawl; 19.vi.1988.

- M.127: off Banc d'Arguin; 20°24'N 17°34'W; depth 62-75 m, fine sediment, many fishes, crabs, gastropods, etc; 3.5 m Agassiz trawl; 19.vi.1988.
- M.128: off Banc d'Arguin; 20°25'N 17°35'W; surface (bottom at 75 m); neuston net (during the night); 19.vi.1988.
- M.129: off Banc d'Arguin; 20°25'N 17°40'W; depth 140 m, failure; Van Veen grab (4x); 20.vi.1988.
- M.130: off Banc d'Arguin; 20°25'N 17°40'W; depth 95-100 m, muddy sand; 3.5 m Agassiz trawl; 20.vi.1988.
- M.131: off Banc d'Arguin; 20°29'N 17°41'W; depth 225-235 m; 3.5 m Agassiz trawl; 20.vi.1988.
- M.132: off Cap Blanc; 20°34'N 17°45'W; depth 305-325 m; 3.5 m Agassiz trawl; 20.vi.1988.
- M.133: off Cap Blanc; 20°39'N 17°48'W; depth 400-450 m; 3.5 m Agassiz trawl; 20.vi.1988.
- M.134: off Cap Blanc; 20°44'N 17°48'W; depth 530-700 m, mainly fish, shrimp, small asteroids, tubeworms; 3.5 m Agassiz trawl; 20.vi.1988.
- M.135: off Cap Blanc; 20°42'N 17°21'W; depth 50 m, muddy, dark-grey fine sand, little shell gravel; van Veen grab; 21.vi.1988.
- M.136: off Cap Blanc; 20°43'N 17°21'W; depth 50 m; deep-sea camera (10x); 21.vi.1988.
- M.137: off Cap Blanc; 20°43'N 17°23'W; depth 50 m, flatfish, hermit-crabs, octopus, etc.; 2.4 m Agassiz trawl; 21.vi.1988.
- M.138: off Cap Blanc; 20°44'N 17°25'W; depth 54-62 m; 3.5 m Agassiz trawl; 21.vi.1988.
- M.139: off Cap Blanc; 20°42'N 17°30'W; depth 63-71 m, Xenophora, flatfish, hermit-crabs, etc.; 3.5 m Agassiz trawl; 21.vi.1988.
- M.140: off Cap Blanc; 20°40'N 17°31'W; depth 73 m, muddy sand with some shell gravel; Hamon grab; 21.vi.1988.
- M.141: off Cap Blanc; 20°40'N 17°31'W; depth 72 m; deep-sea camera (10x); 21.vi.1988.
- M.142: off Cap Blanc; 20°39'N 17°36'W; depth 75-100 m, Xenophora, flatfish, octopus, etc.; 3.5 m Agassiz trawl; 21.vi.1988.
- M.143: off Cap Blanc; 20°40'N 17°31'W; depth 150-175 m, net torn, only small catch, mostly ctenoids; 3.5 m Agassiz trawl; 21.vi.1988.
- M.144: off Cap Blanc; 20°43'N 17°39'W; depth 200-210 m; 2.4 m Agassiz trawl; 21.vi.1988.