

Monoplacophora
Bathyal
North Atlantic
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Atlantique Nord

Monoplacophorans in the North Atlantic

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ABSTRACT

Neopilina zografi, originally described as belonging to the Gastropoda by Dautzenberg and Fischer (1896), is shown to be the first named of all Recent Monoplacophora. It is known from four shells in the bathyal zone of the Azores (1385-1600 m) and represents the first record of the class in the Northern Atlantic.

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RÉSUMÉ

Présence de monoplacophores dans l'Atlantique Nord.

Neopilina zografi est le premier connu des monoplacophores actuels mais avait à l'origine été décrit par Dautzenberg et Fischer (1896) comme un gastéropode. Quatre coquilles sont connues du bathyal des Açores (1385-1600 m) : c'est la première fois que cette classe de mollusques est signalée dans l'Atlantique Nord.

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INTRODUCTION

During the last part of the 19th century and the beginning of this century Prince Albert 1^{er} of Monaco carried out extensive deep-sea dredging operations in the Northeastern Atlantic. Collections from his expeditions still constitute an important body of information on the deep-sea fauna of this area.

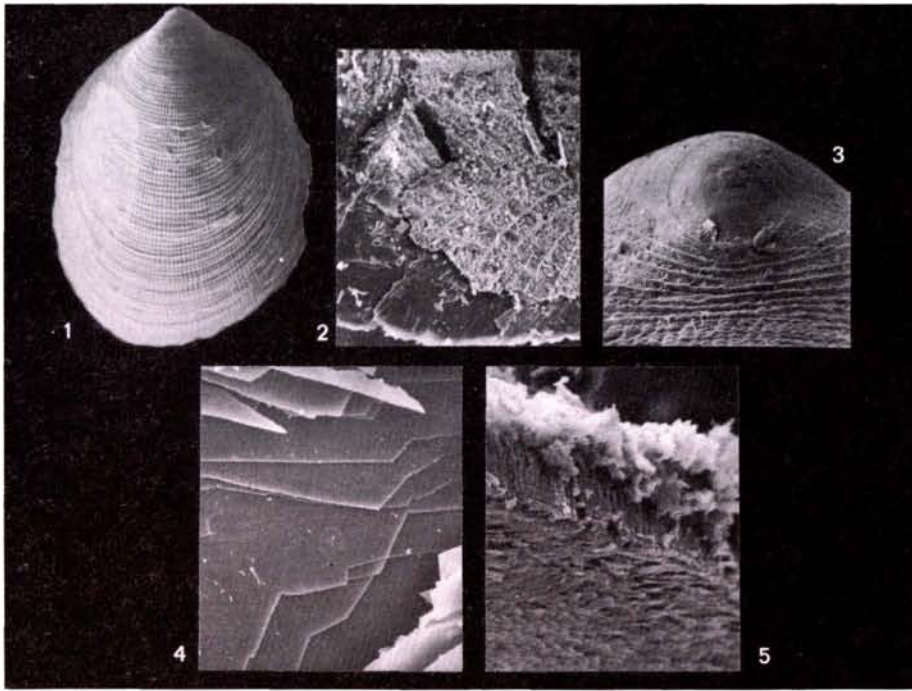
In connection with taxonomic work on deep-sea gastropods we have examined large parts of these collections, the molluscs of which were originally reported on by Dautzenberg and Fischer (1896; 1897) and Dautzenberg (1927). Two species proved to be especially interesting because of their resemblance to the Monoplacophora, a phylogenetically important class of molluscs previously known only from the Indo-Pacific and extreme SW Atlantic (McLean, 1979). Dautzenberg and Fischer described from the bathyal of the Azores two species that they assigned to the limpet genus *Acmaea*, *A. zografi* D. and F., 1896 and *A. euglypta* D. and F., 1897. However, close examination of the four known shells by the present authors revealed that specimens of *A. euglypta* are merely young individuals of *A. zografi*. A systematic paragraph and revision placing the species in *Neopilina* is presented at the end of the paper (Plate, Fig. 1).

The known specimens are all empty shells without preserved soft parts and a classification as monoplacophorans or gastropods is not possible from external shell characters alone. The crystalline structure of the shell however is different in the two classes: Monoplacophora have a layer of prisms and an internal nacreous layer (Schmidt, 1959; Meenakshi *et al.*, 1970), while the limpet-shaped gastropods lack a nacreous layer (Mac Clintock, 1967). Scanning electron microscopic examination of the shell structure of *A. zografi* revealed the specimens to be monoplacophorans because a nacreous layer is present (Plate, Fig. 4-5).

Three other neopilinid species have been considered mature at sizes of 3 mm or less (McLean, 1979). They are *N. oligotropa* Rokop, 1972, *N. veleronis* Menzies and Leighton, 1963 and *Vema hyalina* McLean, 1979. In these species, as well as in *Neopilina euglypta*, the shells have a mature look and do not have disproportionately large protoconchs, as would be the case were they juvenile specimens attaining larger sizes. Ripe gonads were observed initially in the description of *N. veleronis*; *Vema hyalina* has now been collected on a sufficient number of occasions (Lowenstam, 1978) to suggest that larger specimens will not be found. We therefore suggest that *Neopilina* is represented in the North Atlantic by an established breeding population and not just by a few rare juveniles which have settled in an inappropriate habitat.

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Plate

1) *Neopilina zografi*, shell, maximal diameter 3.9 mm. 2) Detail of the corroded shell surface of a broken fragment (M × 190). 3) Apex, showing the cup-shaped larval shell (M × 140). 4) Detail of nacreous layer (M × 1,900). 5) Edge of a fragment, showing nacreous layer (bottom), prismatic layer (center) and corroded surface layer (top, light) (M × 2,500).

1) *Neopilina zografi*, coquille, diamètre maximal 3,9 mm. 2) Détail de la surface corrodée d'un fragment de coquille (G × 190). 3) Apex, mettant en évidence la coquille larvaire cupuliforme (G × 140). 4) Détail de la couche nacréée (G × 1,900). 5) Bord d'un fragment, montrant la couche nacréée (en bas), la couche des prismes (au centre) et la couche externe corrodée (en haut, plus clair) (G × 2,500).
Photos : Centre de Microscopie du CNRS, Paris.

(1959) described a spirally coiled larval shell in *N. galathea*. No subsequent author has reported a coiled protoconch in Recent Monoplacophora; Figure 3 (Plate) shows that *N. zografi* has a simple semi-globular larval shell. We suppose that Lemche and Wingstrand's statement is erroneous.

Neopilina zografi is the first known monoplacophoran from the Atlantic, with the exception of two records from the Antarctic (Filatova *et al.*, 1975) and the Falkland islands (Rosewater, 1970). It is also the first one that originates from bathyal (1 385-1 600 m) depths: although another monoplacophoran, *Vema hyalina*, is known from depths of 174-388 m, all other species of *Neopilina* and *Vema* are truly abyssal in occurrence, the shallowest record being one for *N. galathea* at 2 781-2 809 m off Cape San Lucas, Baja California (Parker, 1962).

SYSTEMATICS

Neopilina zografi (Dautzenberg and Fischer, 1896)

Acmaea zografi Dautzenberg and Fischer, 1896 (p. 495, pl. 22, fig. 16-17) = *Acmaea euglypta* Dautzenberg and Fischer, 1897 (p. 181, pl. 4, fig. 25-26).

Type material

The holotypes of both species are in the Musée Océanographique, Monaco.

Type locality

A. zografi, Princesse-Alice, station 553, 37°42'40"N, 25°05'15"W, 1385 m (near Sao Miguel); *A. euglypta*, Princesse-Alice, station 719, 39°11'N, 30°24'15"W, 1 600 m (SE of Corvo).

Material examined.

The type material and two additional shells from the type locality of *euglypta* in the Museum National d'Histoire Naturelle (Paris) and the Institut Royal des Sciences Naturelles (Bruxelles).

The species was not collected during the Biaçores expedition of 1971 which sampled the deep-water fauna

around the Azores. These islands are a relatively young system in the Atlantic and it can be expected that neopilinids will be found in other bathyal environments.

The recent genera of Monoplacophora were summarized by McLean (1979) who distinguished between *Neopilina* Lemche, 1957 and *Vema* Menzies, 1959, characterized by 5 and 6 pairs of gills respectively. *Vema* was divided into two subgenera, *Vema* s. s. and *Laevipilina* McLean, 1979, the last group separated because of lack of sculpture, small size and a different shape of the prisms of the prismatic layer of the shell. *Acmaea zografi* does not have the large hexagonal prisms typical for *Laevipilina*, but whether it shall be placed in *Neopilina* or *Vema* can presently not be decided with certainty because of lack of soft parts. The fairly solid shell, however, indicates closer affinity with *Neopilina*.

REFERENCES

Dautzenberg P., 1927. Mollusques provenant des campagnes scientifiques du prince Albert 1^{er} de Monaco dans l'Océan Atlantique et dans le Golfe de Gascogne, *Res. Camp. Sci. Albert-1*, 72, 1-401.
 Dautzenberg P., Fischer H., 1896. Dragages effectués par l'Hirondelle et par la Princesse-Alice : 1. Mollusques gastéropodes, *Mém. Soc. Zool. Fr.*, 9, 395-498.
 Dautzenberg P., Fischer H., 1897. Dragages effectués par l'Hirondelle et par la Princesse-Alice, 1888-1896, *Mém. Soc. Zool. Fr.*, 10, 139-234.
 Filatova Z., Vinogradova N., Moskalev L., 1975. The mollusk *Neopilina* in the Antarctic, *Okeanologia*, 15, 101-102 (in Russian).
 Lemche H., Wingstrand K., 1959. The anatomy of *Neopilina galathea* Lemche, 1957, *Galathea Rep.*, 3, 9-71.
 Lowenstam H., 1978. Recovery, behavior and evolutionary implications of live Monoplacophora, *Nature*, 273, 231-232.
 Mac Clintock C., 1967. Shell structure of patelloid and bellerophontoid Gastropods, *Peabody Mus. Nat. Hist. Yale Univ.*, 22, 1-140.
 McLean J., 1979. A new Monoplacophoran limpet from the continental shelf off southern California, *Contrib. Sci. Nat. Hist. Mus. Los Angeles*, 307, 1-19.
 Meenakshi V., Hare P., Watabe N., Wilbur K., Menzies R., 1970. Ultrastructure, histochemistry, and amino acid composition of the shell of *Neopilina*, *Anton Bruun Rep.*, 2, 1-12.
 Parker R., 1962. Speculations on the origin of the invertebrate faunas of the lower continental slope, *Deep-Sea Res.*, 8, 286-293.
 Rosewater J., 1970. Monoplacophora in the South Atlantic Ocean, *Science*, 167, 1485-1486.
 Schmidt W., 1959. Bemerkungen zur schalenstruktur von *Neopilina galathea*, *Galathea Rep.*, 3, 73-78.