

Two new Pediculariidae from Hyères Seamount, eastern central Atlantic (Gastropoda: Cypraeoidea)

By FELIX LORENZ, Buseck-Beuern (Germany)

Figs 1-19

Keywords

New genus and species, Pediculariidae, Hyères Seamount

Abstract

Two new species and a new genus of the family Pediculariidae (Gastropoda: Cypraeoidea) from the Hyères Seamount in the eastern central Atlantic are described and discussed. *Pedicypraedia atlantica* n. gen., n. sp. is described and compared to the subfamilies of Pediculariidae to which it has an intermediate position. *Pedicularia splendida* n. sp. is described, differing from the other species in the genus by a nearly smooth, glossy shell.

Zusammenfassung

Zwei neue Arten und eine neue Gattung der Familie Pediculariidae (Gastropoda: Cypraeoidea) vom Hyères Seamount im östlichen Zentralatlantik werden beschrieben und dis-

kutiert. *Pedicypraedia atlantica* n. gen., n. sp. wird mit Vertretern der Unterfamilien der Pediculariidae verglichen, zwischen denen sie eine intermediäre Position einnimmt. *Pedicularia splendida* n. sp. unterscheidet sich durch das Merkmal eines glänzenden, völlig glatten Rückens von allen anderen Arten der Gattung.

Introduction

The expedition SEAMOUNT 2 on board the „Suroît“ in 1993 obtained a rich fauna of benthic organisms from the central Atlantic seamounts, including „Atlantis“ and „Hyères“, situated respectively 500 and 1000 km south-southwest of the Azores. In samples taken from depths of 800 to 1500 m, two new Pediculariids were discovered.

One of them is represented by an inconspicuous tiny fresh dead shell, whose conchological characteristics are most astonishing and deserve utmost attention. It is described as *Pedicypraedia atlantica* n. gen., n. sp.

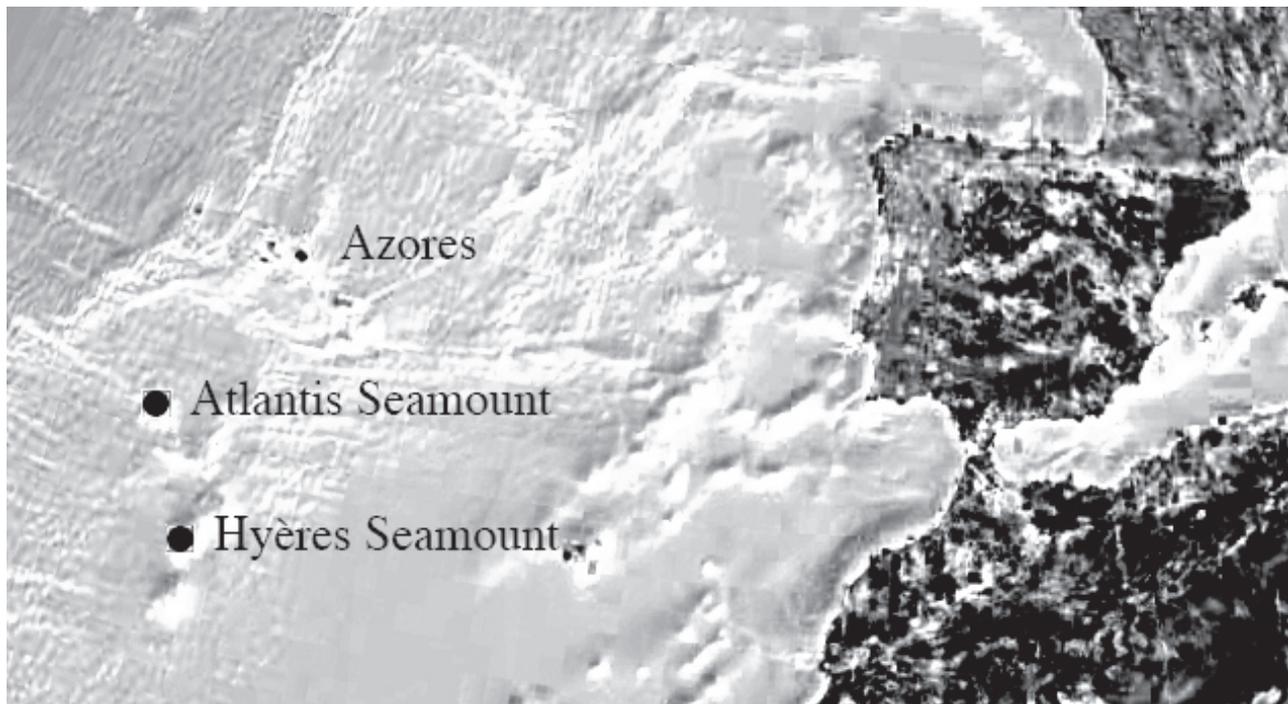


Fig. 1: Position of the Seamounts „Hyères“ and „Atlantis“ in the central eastern Atlantic.

Abbreviations

MNHN: Museum national d'Histoire naturelle Paris, France
RGM:

Pedicypraedia atlantica n. gen., n. sp. (Fig. 2, Fig. 5)

Material: A single, fresh dead specimen. **Holotype:** 5.3 mm, Hyères Seamount, eastern Atlantic (31°19'N 28°36'W), from 1060 m, campaign SEAMOUNT 2 (Le Suroît), Station DW 200, 18. Jan. 1993, coll. MNHN 21234.

Description: Shell elongate pyriform, slightly depressed. Dorsum coarsely ribbed with approximately 30 transverse ridges alternating in strength, and numerous finer longitudinal ones, forming a regular reticulated structure. Where transverse and longitudinal ridges meet there is a weak nodule. The protoconch is exposed and pointed, consisting of four whorls which show two rows of coarsely nodulose transverse ridges. The posterior canal is bordered with a denticulate ridge on the left side. There are weak columellar teeth anteriorly, but no parietal lip. The labrum is sharply angular along its edge, which is very slightly inflected midways, with a row of denticles along the aperture and a second row of approximately 30 indistinct denticles bordering the aperture. These denticles correspond with the ridges on the outer shell's surface, as of the lip was sharply folded and attached to the interior of the shell. Further to the inside of the shell, there is a second row of weak denticles whose position corresponds with a longitudinal growth-line approximately one mm above the labral edge on dorsum (Fig. 2, Fig. 5). The shell is dead taken so characteristics

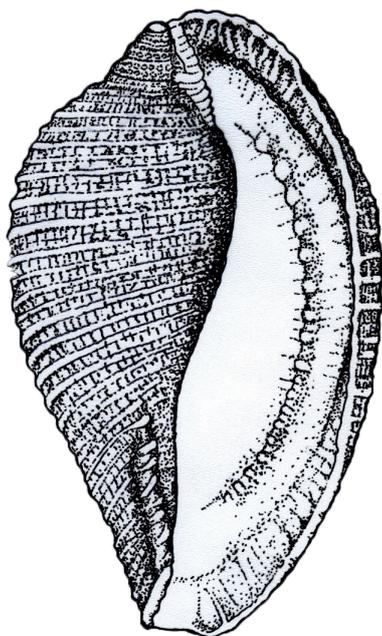


Fig. 2: *Pedicypraedia atlantica* n. gen., n. sp., 5.3 mm, Holotype.

of the colour cannot be traced. *Pedicypraedia* refers to the intermediate character of the genus between the ancient *Cypraedia* and the derived *Pedicularia*.

Discussion: The higher systematics of the Cypraeoidea is not fully clarified. FEHSE (2001) treats the Pediculariidae as a separate family opposed to the Cypraeidae, Eocypraeidae, and Ovulidae, which is an approach supported by the molecular findings of SCHIAPARELLI & al. 2005. The Pediculariidae are split in several subfamilies, all of which comprise members with distinct dorsal sculpturing. Three of these subfamilies need to be considered in evaluating the systematic position of *Pedicypraedia*.

The Pediculariinae (genus *Pedicularia*) have strongly modified, derived morphological features and appear modern in this regard. The fossil history is short, diversity is greatest now. For a discussion of this subfamily refer to the description of *Pedicularia splendida* n. sp. below.

The Cypraegemmulini are less extreme morphologically, their shells suggest that the female is not sessile as in *Pedicularia*, the few living members of the genus *Lunovula* are widespread in deep waters of the Indo-Pacific. Their shells share transverse and longitudinal sculpturing but that is not forming a regular network (Fig. 6, 7). The labrum is not inflected and the presence of a parietal shield along the columella makes them similar to the male phase of *Pedicularia* sp., to which they may as well belong (FEHSE, pers. comm.).

The Cypraeidae are an extinct group with a sculpturing of alternating transverse and crossing longitudinal ridges, but the labrum is inflected and the spire is sunken (see *Cypraedia* cf. *elegans* Fig. 8), except in the monotypic *Protocypraedia* (Fig. 9).

Pedicypraedia n. gen. appears to represent a living fossil whose systematic position is at the root between the subfamilies of ancient and modern Pediculariidae. The cup-shaped shell whose labrum is not inflected is interpreted as a modern, derived feature. It resembles that of *Pedicularia* in which the cavity formed by the shell acts as a marsupium. The dorsal sculpture and the position of the protoconch resemble the more ancient Cypraeidae: *Cypraedia* (Eocene) has an identical dorsal sculpture, a projecting protoconch and a comparable formation of the posterior canal is found in *Protocypraedia*. However, the labrum in all these is cypraeid-like, and not sharply angular as in *Pedicypraedia*. The combination of conchological features leaves *Pedicypraedia* in an uncertain position within these subfamilies, but certainly within the family Pediculariidae. The second row of labral denticles in the interior of the shell is unique in the family, and possibly a malformation. More likely, it is an indication for a hermaphroditic life cycle, just not as far derived as in *Pedicularia* - a fascinating speculation.

At the locus typicus of the unique specimen of *Pedicypraedia atlantica* n. gen., n. sp., a spectacular and unmistakable species of the genus *Pedicularia* was collected, which is described in the following.

***Pedicularia splendida* n. sp.**
(Fig. 3; Fig. 4a,b; Figs 10-19)

Material: Shells of *Pedicularia splendida* n. sp. were collected at five sites during the SEAMOUNT 2 expedition of the MNHN: Hyères Seamount, eastern Atlantic (31°25,50'N 28°51,80'W) at 1250 m, Station DW185: 1 specimen, male phase; Hyères Seamount (31°26,10'N 28°51,80'W) at 1520 m, Station DW186: 3 dead specimens; Hyères Seamount (31°09,50'N 28°43,50'W) at 845 m, Station DW203: 30 specimens of different phases of development including several larval stages; Hyères Seamount (31°19'N 28°36'W) at 1060 m, Station DW200: approx. 300 specimens of all phases of development. Several specimens with animals preserved in ethanol; Atlantis Seamount, eastern Atlantic (34°22,40'N 30°27,80'W) at 1340 m, Station DW 261: 5 male phase shells plus numerous larval shells.

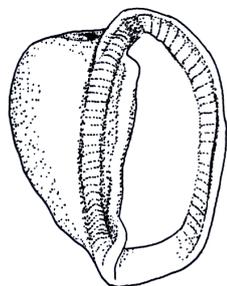


Fig. 3: *Pedicularia splendida* n. sp., male phase with fully formed, slightly ribbed parietal shield and faintly denticulate labrum, approx. 5 mm.

Holotype: 10.5 mm, female phase, Hyères Seamount (31°19'N 28°36'W) at 1060 m, Station DW 200 coll. MHHN 21233 (Fig. 19).

Paratype 1: 6.9 mm, male phase, Hyères Seamount (31°19'N 28°36'W) at 1060 m, Station DW 200 coll. MHHN (Fig. 18).

Paratype 2: 7.4 mm, female phase, Hyères Seamount (31°19'N 28°36'W) at 1060 m, Station DW 200 coll. MHHN (Fig. 17).

Paratype 3: 5.8 mm, transitional phase, Hyères Seamount (31°19'N 28°36'W) at 1060 m, Station DW 200 coll. MHHN (Fig. 16).

Paratype 4: 5.4 mm, male phase, Hyères Seamount (31°19'N 28°36'W) at 1060 m, Station DW 200 coll. MHHN (Fig. 15).

Paratype 5: 3.9 mm, juvenile, Hyères Seamount (31°19'N 28°36'W) at 1060 m, Station DW 200 coll. MHHN (Fig. 14).

All other specimens from the DW200 series are designated as paratypes.

The conchological features change considerably during the development of the animal. Therefore, the description given here is based on comparing the various growth stages. The external morphology of an animal of the female phase was examined. The specimen was taken from a branch of the host coral preserved in isopropyl alcohol. The animal was removed from the shell after soaking in distilled water for 48 hours. The external organs seemed well preserved and not shrunken due to the conservation procedure.

Shell: The protoconch shell consists of 5 whorls of which the first one is smooth, the following ones bear 12-15 rows of transverse pustules which are connected to the diagonally neighbouring ones by narrow striae, giving the protoconch a diagonally reticulated surface (Fig. 10). There is a distinct, angular beak on the aperture of the larval shell which remains discernible after the teleoconch-growth has started. Interestingly, the axis of the protoconch-shell is tilted outwards by 8-10° against the axis of the teleoconch on basal view by the time three third of the first teleoconch whorl is formed. The first half of that teleoconch whorl shows irregular, indistinct and shallow wavy transverse ridges which may be slightly granulose (Fig. 11). These ridges are dissolving in the second half of the first teleoconch whorl, which reaches to the top of the protoconch which is then tilted inwards. The second teleoconch whorl is smooth and glossy, covering one side of the protoconch (Fig. 12, 13).

The male phase of the shell is reached by the completion of the third teleoconch whorl, which covers the protoconch completely, except for the very tip which remains visible as a tiny brown dot throughout the later shell-development - a very constant feature (Fig 14, 16).

The male shell is pyriform, inflated and glossy. It varies little in shape and the length ranges from 5.2 to 6.9 mm, the ratio of width to length varies between 67 and 74% and the ratio between height and length between 55 and 64%. The labrum is slightly flaring, forming a rounded posterior and anterior extremity. On the columellar side a parietal shield is formed. The outer edge is a defined longitudinal callused ridge. Along the aperture, there is an angular carinal ridge which is indented posteriorly. The labral lip is slightly thickened, sloping inwards, angular along the edge. In shells that have just formed these structures, there are no obvious ridges or denticles, but in more callused shells with a more developed columellar ridge and labral edge there are fine transverse ridges all around the aperture. As growth proceeds, these ridges vanish around the aperture but become visible externally on the callused, solid girdle that forms the marsupium (Fig. 3).

The transition from the male phase to the female phase is defined by a growth-line that encircles the shell precisely in the area where inside the shell traces of the labrum are visible as a callus-ridge. No resorption of shell-material seems to occur. The outline of the now hat-shaped shell is rather irregularly oval to slit-shaped and corresponds with the area on the sylasterine host the shell attaches itself to while the spawn matures inside the brood-pouch. The length

Fig. 4a

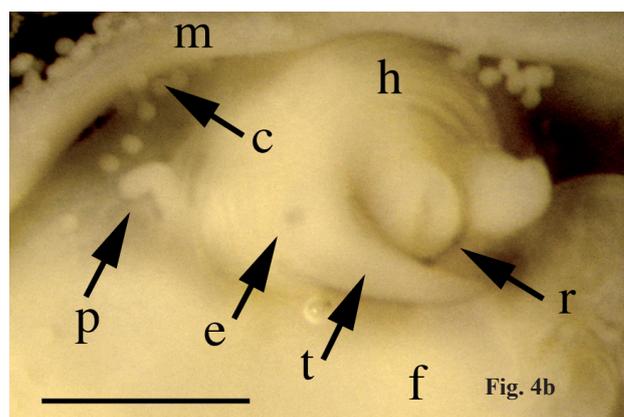
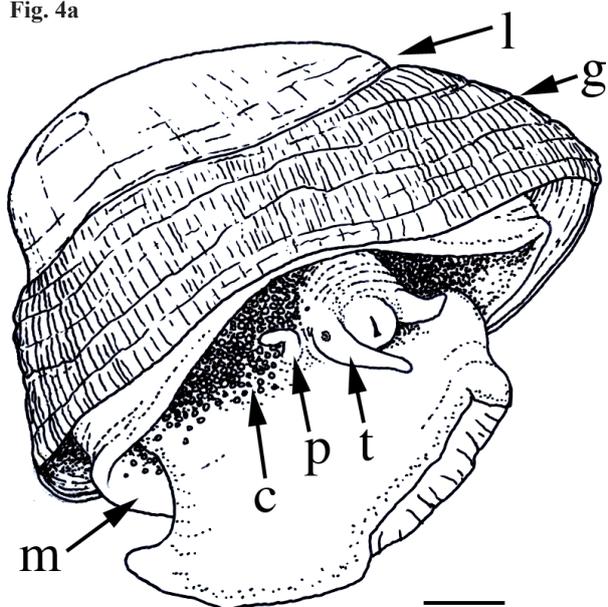


Fig. 4a, b: *Pedicularia splendida* n. sp., living animal of the female phase. The transition from male to female phase is characterized by a distinct growth line (l) above the ribbed girdle (g) of the shell. The mantle (m) and foot (f) form a cavity within the shell that serves as marsupium for the egg capsules (c). The penis is small, probably as a result of resorption (p). Head (h) and tentacles (t) with reduced eye (e) and proboscis (r). Scale: 1 mm.

of a female shell averages from 8 to 10 mm. At this stage, the width to length ratio varies between 44 and 56% and the height to length ratio between 55 and 70 %. The holotype is the largest specimen known.

The surface of the entire shell is glossy. The dome of the shell which represents the male growth-phase is almost completely smooth. In some specimens there are very indistinct transverse ridges causing a slightly wavy surface. The female growth stage is characterized by the irregular girdle which shows fine transverse (vertical) ribs. The part of the shell assignable to the male phase varies from brilliant white to rich orange, the girdle is always brilliant white.

Animal: The foot is moderately well developed, with an oval crawling surface. The tentacles and the proboscis of the animal are moderately short. The eyes are reduced and sunken in the base of the tentacle, visible only as faint greyish dots. The penis is well visible on the right side of the head. It is comparatively short and possibly underwent a resorption process during the female phase of the animal. Several hundred spherical eggs of 0,08 mm diameter filled the cavity between the mantle and the foot on either side of the animal (Fig. 4a, b).

Habitat, distribution and host: *Pedicularia splendida* n. sp. was found at the neighbouring Hyères Seamount (locus typicus) and Atlantis Seamount in the eastern central Atlantic at depths ranging from approximately 850 to 1550 m. In the sample from Station DW200 several specimens were found attached to its sylasterine host coral *Errina*

atlantica HICKSON, 1912 on which they leave a shallow depression encircled with a groove of 0.2 mm width and depth, surrounded by a slightly elevated ridge around the outside, deposited by the host coral.

Discussion: *Pedicularia splendida* n. sp. is the only species of the genus lacking a distinct dorsal sculpture in the adult shell. Along with its high gloss, this feature distinguishes it at once from all other members worldwide, which have a specific dorsal sculpturing also in the adult shell. Also, it is the second largest species, after *Pedicularia californica* (NEWCOMB, 1864), which may exceed 15 mm.

The genus *Pedicularia* comprises a large number of taxa of uncertain status. Taxonomists are facing the problem that most features of the shells are highly variable and depending on ecological factors such as the shape of the host to which the female phase attaches. GOUD & HOEKSEMA (2001) gave a comprehensive review of the Pacific species and discussed many of the taxonomical problems and approaches. According to their work, the sexes of Pediculariids are separate e. g. in *Pedicularia vanderlandi* GOUD & HOEKSEMA 2001, as no morphologically transitional stages were found. This is not the case in *Pedicularia splendida* n. sp., which is a protandric hermaphrodite according to the external anatomy of the animal and the existence of conchologically intermediate stages between a male and a female phase, which always bears traces of having gone through a male phase. Also other species show conchologically transitional stages, e. g. *Pedicularia californica*, but anatomical studies

are scarce in this group of molluscs. It is possible that both strategies of development occur in the genus depending on the adaptive strategies of the respective species.

Seamounts are submerged peaks in the ocean floor rising above their surrounding, often by 1000 m and more, without reaching the water surface. They provide unique ecosystems such as the “white coral” communities, have influence on coastal currents and facilitate the dispersal of coastal species into the open ocean and across the continents. The richness in endemic species varies with the isolation and size of the seamounts. The fauna usually consists of a mix of coastal forms and endemisms (GILLET & DAUVIN 2000, OLIVERIO & GOFAS 2006). This is also the case in the samples of Pediculariid species from the Hyères Seamount. Among the samples that contained *Pedicularia splendida* n. sp., no other adult shells of other *Pedicularia* species were found. Other samples from the Hyères Seamount and adjacent seamounts (Atlantis Seamount, Josephine Seamount), contain numerous *Pedicularia* cf. *sicula* SWAINSON, 1840, *Pedicularia* cf. *decurvata* LOCARD, 1897, which differ from each other in the structure of the dorsal sculpturing: in *Pedicularia sicula* SWAINSON, 1840, the ribs are alternating, in *Pedicularia decurvata* they are weaker and of equal strength.

Pedicypraedia atlantica n. gen., n. sp. obviously represents a rather archaic member of the group whose occurrence at Hyères Seamount is a relict population. *Pedicularia splendida* n. sp. on the other hand seems to be derived from ribbed coastal forms which can be assumed from the presence of weak ribs on the first teleoconch whorl.

Acknowledgements

Many thanks to Prof. Dr. PHILIPPE BOUCHET and VIRGINIE HÉROS of the MNHN, Paris for loan of material. DIRK FEHSE, Berlin, for useful suggestions, and Dr. HELMUT ZIBROWIUS for valuable suggestions, and for identifying the host coral of *Pedicularia splendida* n. sp. and to the editors of Acta Conchyliorum, HANS-JÖRG NIEDERHÖFER and KLAUS GROH for careful editing.

Last but not least many thanks to JANA for encouragement and support during the difficult phase of getting a book on Ovulidae ready, writing this paper, and running a shell-business.

Literature

FEHSE, D. (2001): Beiträge zur Kenntnis der Ovulidae (Mollusca: Cypraeoidea) VIII. Einleitung zur Familie sowie Katalog, Taxonomie und Bibliographie und Bemerkungen zu verwandten Gruppen. — Acta Conchyliorum, **5**: 51 pp.

GILLET, P. & DAUVIN, J. C. (2000): Polychaetes from the Atlantic seamounts of the southern Azores: biogeographical distribution and reproductive patterns. — Journal of the Marine Biological Association of the UK, **80**: 1019-1029.

GOUD, J. & HOEKSEMA, B. W. (2001): *Pedicularia vanderlandi* spec. nov., a symbiotic snail (Caenogastropoda: Ovulidae) on *Distichopora vervoorti* CAIRNS & HOEKSEMA, 1998 (Hydrozoa: Stylanderidae), from Bali, Indonesia. — Zoologische Verhandlungen Leiden, **334** (29): 77-97.

OLIVERIO, M., GOFAS, S. (2006): Coralliophiline diversity at mid-Atlantic seamounts (Neogastropoda, Muricidae, Coralliophilinae). — Bulletin of Marine Science, **79** (1): 205-230.

SCHIAPARELLI, S., BARUCCA, M., OLMO, E., BOYER, M. & CANAPA, A. (2005): Phylogenetic relationships within Ovulidae (Gastropoda: Cypraeoidea) based on molecular data from 16S rRNA gene. — Marine Biology, **147**: 411-420 + Supplement (published via internet): 22 pp.

SCHILDER, F. A. in WENZ, W. (1941): Superfamilia Cypraeacea. In: Schindewolf, O. H. (ed.), Handbuch der Paläozoologie, Band 6, Prosobranchia, Teil 5. Gebrüder BORNTAEGER, Berlin, p. 949-1014, figs. 2765-2910.

A more comprehensive list of references to the Cypraeoidea will soon be given in a revision of the Ovulidae (LORENZ & FEHSE, in print).

Address of the author:

Dr. FELIX LORENZ
Friedrich-Ebert-Str. 12
D-35418 Buseck-Beuern
Germany
E-Mail: Felix.Lorenz@t-online.de

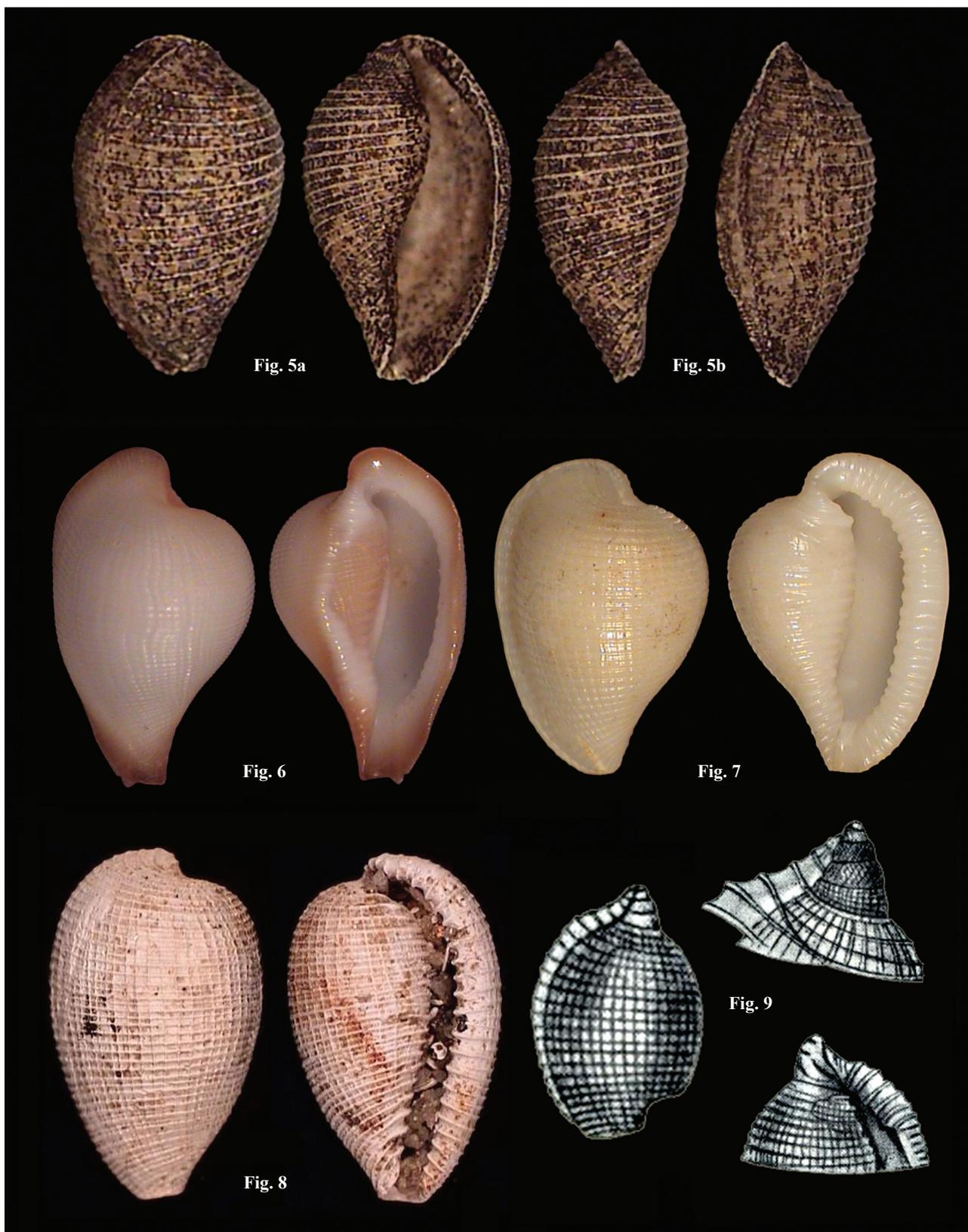


Fig. 5: *Pedicypraedia atlantica* n. gen. n. sp., 5.3 mm, Hyères Seamount, eastern central Atlantic, at 1060 m. Holotype coll. MNHN.
Fig. 6: *Lunovula superstes* (DOLIN, 1991) 10 mm, southern New Caledonia, at 400 m.
Fig. 7: *Lunovula finleyi* ROSENBERG, 1990, 16 mm, Tonga, at 350 m, coll. MNHN.
Fig. 8: *Cypraedia* cf. *elegans* (SOWERBY, 1823), 19 mm, Loire Atlantique, France, Eocene.
Fig. 9: *Protocypraedia conigera* (MARTIN, 1914), broken shell, full adult size approx. 10 mm (drawing after SCHILDER in WENZ 1941), Kali Puru, Indonesia Middle Eocene, coll. RGM 10138.
Scaled differently to allow direct comparison



Figs 10-13: *Pedicularia splendida* n. sp., Hyères Seamount, eastern central Atlantic, at 1060 m, shell development.

Fig. 10: Larval shell with distinct sculpturing and labral beak.

Fig. 11: near completion of the first teleoconch whorl, transverse striae still distinct

Fig. 12: beginning of second teleoconch whorl covering most of the protoconch. Transverse striae dissolving.

Fig. 13: completion of the second teleoconch whorl, transverse striae vanishing.

Scale: 1 mm.



Figs 14-19: *Pedicularia splendida* n. sp., Hyères Seamount, eastern central Atlantic, at 1060 m; **Fig. 14**, Paratype 5, subadult shell; **Fig. 15**, Paratype 4, male phase; **Fig. 16**, Paratype 3, transitional phase; **Fig. 17**, Paratype 2, female phase; **Fig. 18**, Paratype 1, male phase; **Fig. 19**, Holotype, female phase; All figured specimen coll. MNHN, scale: 5 mm.