

A NEW SPECIES OF *CUSPIDARIA* (MOLLUSCA: BIVALVIA: ANOMALODESMATA) FROM THE MAURITANIAN DEEP CONTINENTAL MARGIN (NORTH-EASTERN ATLANTIC)

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Abstract *Cuspidaria voncoseli* new species, is described from Northern Mauritanian deep waters at a depth of 1588–1618m in soft bottoms. This new species is characterized by a white smooth shell with a globose disc well-separated from the rostrum, two pairs of lateral septal muscles and frilled tentacles. In addition, we describe a tentative new species but because of the lack of material have not named it.

Key words *Bivalvia*, *Cuspidaria*, *Mauritania*, *bathyal zone*, *carnivorous molluscs*, *new species*, *anatomy*

INTRODUCTION

The family Cuspidariidae includes highly specialised carnivorous mainly deep-water bivalves distributed worldwide (Knudsen, 1970; Poutiers & Bernard, 1995). Cuspidariids have a very well-developed septum instead of the gills found in 'ordinary' bivalves, and it has a principal role in the act of prey capture (Allen & Morgan, 1981). The siphonal apertures have sensory tentacles to detect their prey, which are mainly copepods and ostracods (Reid & Reid, 1974).

Allen (2011) listed all known Cuspidariidae species from the Atlantic, including their synonyms and bibliography. Eleven species that belong to the genus *Cuspidaria* are present in the Eastern Atlantic off West Africa; however, only two have been reported in Mauritanian waters: *Cuspidaria cuspidata* (Olivi, 1792) and *Cuspidaria rostrata* (Spengler, 1793); both with wide geographic distribution (Krylova, 2006).

Despite deep-water sampling during oceanographic expeditions (e.g. 'Meteor', 'CANCAP-III' and 'Tyro Mauritania-II') and several studies on the composition of bivalve assemblages on the Mauritanian shelf (Talavera, 1975; Duineveld *et al.*, 1993; Michel *et al.*, 2011), there is limited information on this family in Mauritanian waters.

In this paper, we described two specimens of Cuspidariidae obtained during surveys conducted in Mauritanian waters, from Cape Blanc to the Senegal River, by the Spanish Institute of

Oceanography (IEO) in collaboration with the University of Vigo (UVigo), Spain.

MATERIALS AND METHODS

The specimens were collected using a beam trawl during the 'Maurit-0911' survey conducted on board R/V 'Vizconde de Eza', on the continental margins of Mauritania. The specimens were sorted on board to the morpho-species level, and the bivalves were fixed and preserved in 70% ethanol.

The shell morphology was studied with a motorized Nikon SMZ25 stereomicroscope equipped with Nikon DS-Fi2 digital camera. The photographs were obtained using the NIS-Elements Microscope Imaging Software.

The holotype of *Cuspidaria voncoseli* new species, has been deposited in the 'Museo Nacional de Ciencias Naturales, Consejo Superior de Investigaciones Científicas (CSIC)', Madrid (MNCN). *Cuspidaria* sp. has been deposited in the collection of the University of Vigo (Faculty of Marine Sciences, Marine Zoology Laboratory).

SYSTEMATICS

Order ANOMALODESMATA Dall, 1889
Superfamily CUSPIDARIOIDEA Dall, 1886
Family CUSPIDARIIDAE Dall, 1886

Genus *Cuspidaria* Nardo, 1840

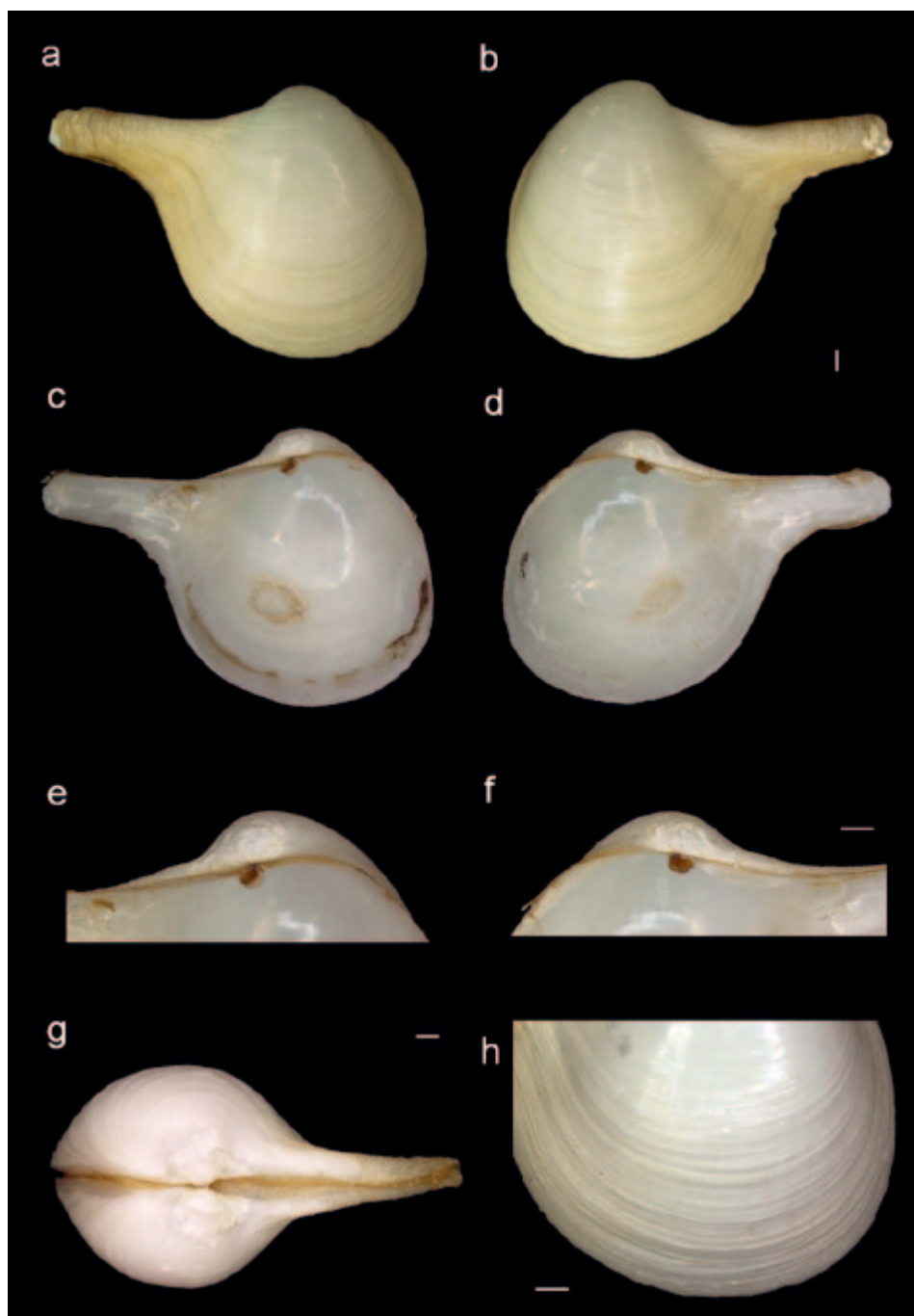


Figure 1 *Cuspidaria voncoseli* n. sp. Holotype. **a**, exterior of the right valve; **b**, exterior of the left valve; **c**, interior of the left valve; **d**, interior of the right valve; **e**, interior view of the left hinge plate; **f**, interior view of the right hinge plate; **g**, doârsal view; **h**, shell sculpture. Scale=1mm.

Cuspidaria voncoseli new species
(Figs 1–5)

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Holotype 1 specimen, off Cape Blanc, Mauritania, 20°45'N, 18°11'W, 1588–1618m, 25 xi 2009, MNCN15.07/15006.

Type locality Off Cape Blanc, Mauritania.

Material examined Holotype.

Measurements Length, 19.4mm; height, 13.1mm; width of conjoined valves, 10mm.

Description Shell thin, strongly inequilateral, posteriorly rostrate, disc globose (W/L=0.5).

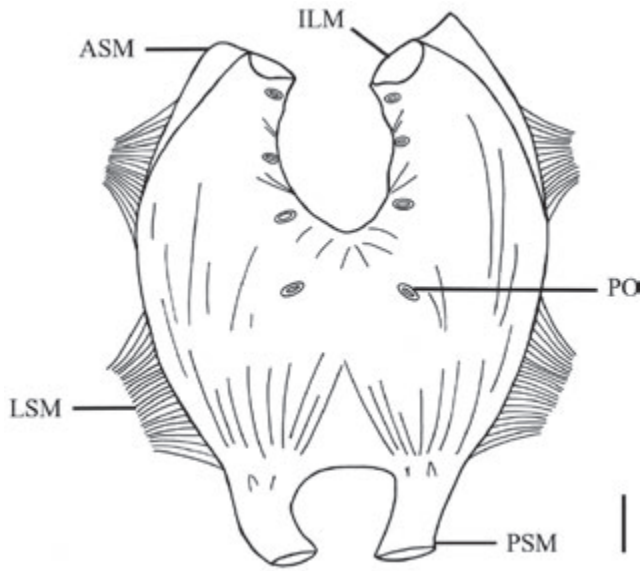


Figure 2 *Cuspidaria voncoseli* n. sp. Ventral view of the septum. Scale=1mm. ASM, anterior septal muscle; ILM, inner lateral muscle; LSM, lateral septal muscle; PO, septal pore; PSM, posterior septal muscle.

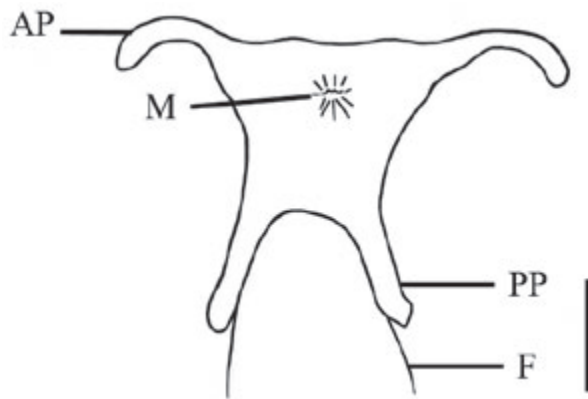


Figure 3 *Cuspidaria voncoseli* n. sp. Frontal view of the mouth and palps. Scale=1mm. AP, anterior palp; F, foot; M, mouth; PP, posterior palp.

Slightly inequivalve, the posterior ventral margin of the left valve slightly overlaps the right; posterior dorsal margin of the right valve slightly overlaps the left. Umbo strongly pronounced, anterior to midline of shell, with beaks facing inward. Anterior dorsal shell margin short and convex; anterior margin slightly curved to meet the ventral margin; ventral shell margin strongly convex with a deep rostral sinuation, sinuation of the left valve more marked than that of the right. Posterior dorsal margin slightly curved. Rostrum slightly longer than half the disc length (measured from the breaks to the rostral distal margin), with posterior margin convex; a

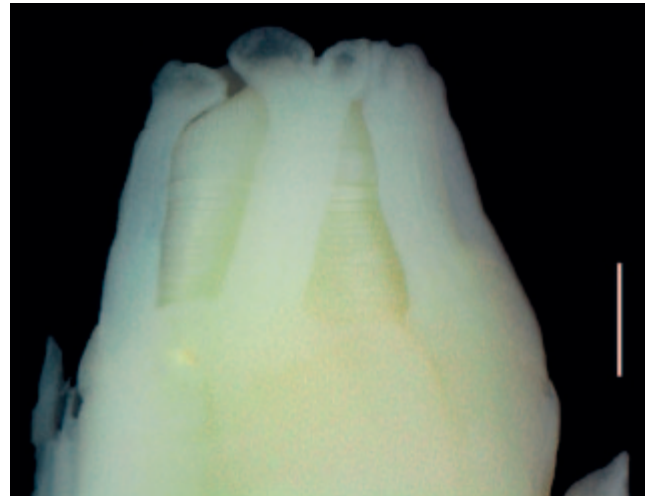


Figure 4 *Cuspidaria voncoseli* n. sp. Dorsal view of the exhalant siphon tentacles. Scale=0.5mm.

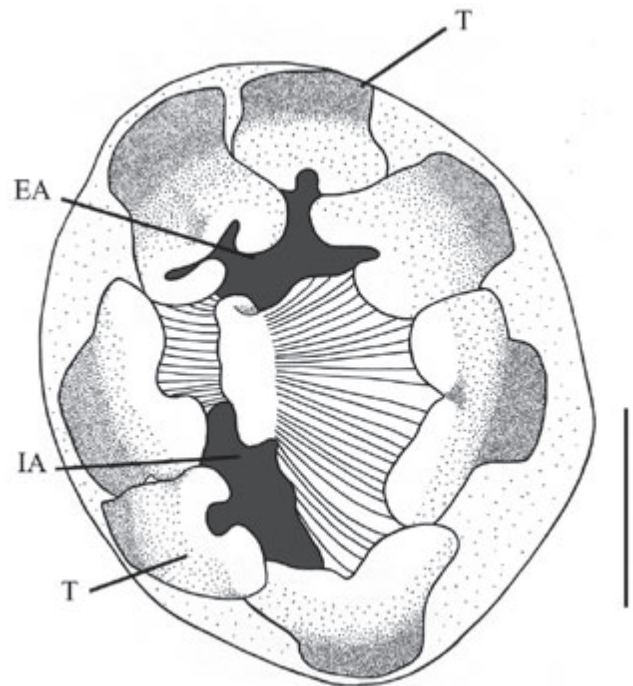


Figure 5 *Cuspidaria voncoseli* n. sp. Posterior view of the inhalant and exhalant siphons and tentacles. Scale=0.5mm. EA, exhalant aperture; IA, inhalant aperture; T, tentacle.

diagonal rostral ridge running from beaks to half the rostrum in left valve, ridge not visible in the right valve. Sculpture consists of fine and numerous concentric growth lines that continue to the rostrum. Periostracum thin, translucent, yellowish brown. Hinge consists of a relatively broad posterior lateral tooth in the right valve, which extends slightly beyond the middle of the posterior adductor muscle scar; the left valve is

edentate. Internal ligament, the resilifer directed posteriorly and obliquely ventral with its free edge curved, the resilium roughly circular in shape. Interior glossy.

Anatomy Similar to other *Cuspidaria* species described by Allen & Morgan (1981). Mantle thin and transparent. A wide and thick septum with four pairs of septal pores; lateral septal muscles divided into two groups. Palps type II (see Allen & Morgan, 1981); anterior palps long and finger-like; paired posterior palps long, narrow and similar to the anterior palps. Seven frilled tentacles around the inhalant and exhalant siphons; three in dorsal position and four in lateral and ventrolateral position. The ovary well-developed and surrounding the stomach.

Derivation of name This species is named after Dr. Rudo von Cosel (Muséum national d'Histoire naturelle, Paris) for his extensive and important contributions to the investigation of bivalves in West Africa.

Habitat On muddy sand bottoms, 1588–1618m.

Comparisons This species is distinguished by the great convexity of its ventral shell margin when compared with other species of *Cuspidaria* and by the separation of the rostrum with respect to the disc. Of the two species listed from Mauritania, the new species differs from *C. cuspidata* by the shell shape, which is subtriangular, and the width and angle of inclination of the rostrum. When compared with *C. rostrata*, the difference in the length of the rostrum is evident, being clearly shorter in *C. voncoseli* n. sp.

With respect to the internal anatomy, the new species falls within the group of a few species with the lateral septal muscles divided in two groups and frilled siphonal tentacles. Four *Cuspidaria* species reported from the East Atlantic have these features: *C. rostrata*, already compared, and the amphi-Atlantic *Cuspidaria barnardi* Knudsen, 1970, *Cuspidaria jeffreysi* (Dall, 1881) and *Cuspidaria ventricosa* Verrill & Bush, 1898. In contrast to the new species, *C. barnardi* has type I palps with small anterior palps. Although the palps of *C. jeffreysi* are type II, in the new species, there is no distal horned extension in the posterior palps, as illustrated Allen & Morgan (1981: fig. 20) for *C. jeffreysi*. The septum is thin

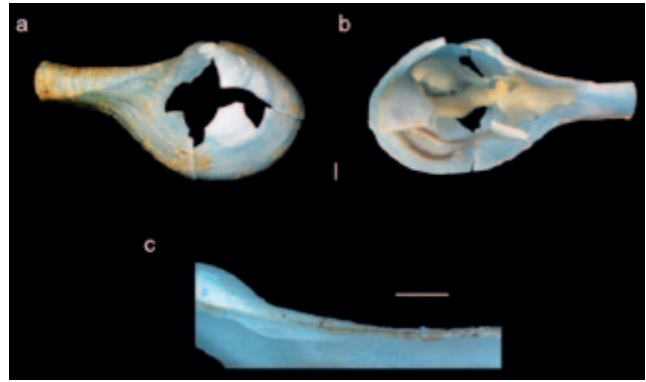


Figure 6 *Cuspidaria* sp. a, exterior of the right valve; b, interior of the right valve; c, interior view of the right hinge plate. Scale = 1mm.

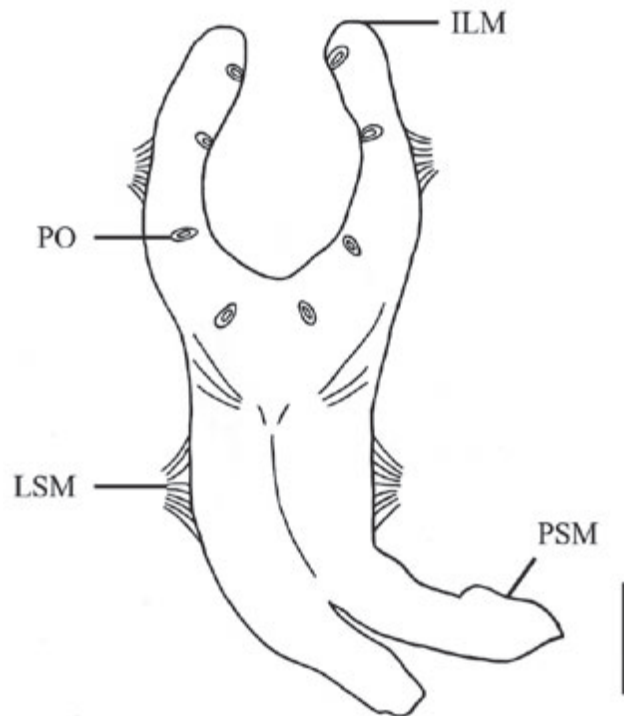


Figure 7 *Cuspidaria* sp. Ventral view of the septum. Scale = 1mm. ILM, inner lateral muscle; LSM, lateral septal muscle; PO, septal pore; PSM, posterior septal muscle.

in *C. ventricosa*, whereas it is wide and thick in the new species.

Cuspidaria sp.
(Figs 6, 7)

Material examined One fragment of the right valve and soft parts, off Cape Blanc, Mauritania, 20°44'N, 17°40'W, 332–344m, 27 xi 2009. UVigo Maurit-0911, Cod: 12389.

Measurements Length, 17.3mm; height, 9.0mm.

Description Shell thin, semi-transparent, strongly inequilateral, posteriorly rostrate, disc obliquely ovate. Umbo prominent, lightly anterior to the midline of the shell. Anterior dorsal shell margin slope down; anterior margin convex to meet the ventral margin; ventral margin rounded, being sinuous and oblique posteriorly. Postero-dorsal margin slightly concave. Rostrum relatively long, longer than half the disc length, with posterior margin curved; a diagonal ridge running from beaks to the postero-ventral margin. Sculpture consists of fine growth lines. Periostracum thin, translucent, yellowish brown. Colour white. Hinge weak, with a thin and long posterior lateral tooth in the right valve, anterior margin thin. Interior glossy.

Anatomy Septum narrow and elongate with four pairs of septal pores; two pairs of lateral septal muscles. Anterior palps short and leaf-shape; posterior palps long, narrow and finger-like. Inhalant and exhalant siphons surrounded by seven frilled tentacles.

Habitat On sand bottoms, between 332 and 344m.

Comparisons The shell shape is similar to that of *Cuspidaria meteoris* described by Krylova (2006) in the Northeast Atlantic; however, in the valve of our specimen, the posterior sinuation corresponding to the intersection of the rostrum and disc is more concave. In addition, *C. meteoris* has continuous lateral septal muscles on each side, whereas, in *Cuspidaria* sp., these muscles are divided in two groups. Therefore, this species can be included within the group of *C. voncoseli* n. sp. on the basis of its internal anatomy. *Cuspidaria* sp. can be distinguished from *C. voncoseli* n. sp. for having a less globose disc, convex anterior margin and the presence of a strong diagonal ridge on the rostrum of the right valve. Besides, *Cuspidaria* sp. shows similarities with *Cuspidaria gracilis* (Jeffreys, 1882) and *C. rostrata* with respect to the shell shape; from *C. gracilis* can be distinguished by a more concave ventral margin and from *C. rostrata* by having a shorter, broader and keeled rostrum.

DISCUSSION

The new data obtained in this study contribute to the knowledge of the biodiversity of carnivorous septibranchs on the continental slope of West Africa. Although we found only one specimen of the new species, we decided to name it. The low number of individuals of a particular species is a common feature in deep-water studies. Grassle & Maciolek (1992) indicated that, in the east coast of the United States, a high percentage of species are represented by only one specimen at all sampling scales, and Ramil & Ramos (2017) found that, on the Mauritanian continental slope, 40% of the species have been collected only once. In addition, Martínez Arbizu & Brix (2008) highlighted that many new species from deep waters have been described on the basis of a single individual.

Bivalves of the genus *Cuspidaria* usually do not form dense populations and are not very numerous in catches. There are some confusions in the taxonomy and distribution of some species because some descriptions are based on a small number of specimens (Zelaya & Ituarte, 2006) and many representatives of the genus can be considered as rare species. Understanding of the importance of rare species for the functioning of ecosystems and assessment of species richness is increasing (Cao *et al.*, 1998; McGill, 2003; Chapman *et al.*, 2018). Obviously, cuspidariids on the West African slope comprise more species than we currently know, and a record of a presumably new but un-named species is evidence of that. Further samplings are necessary for more information on rare septibranchs.

ACKNOWLEDGEMENTS

We want to thank the crew of the R/V Vizconde de Eza; the scientists involved in the sample processing; and Dr Ana Ramos, from the Instituto Español de Oceanografía, for enabling access to the material collected during the *Maurit* surveys. We also want to thank Professor Rudo von Cosel and an anonymous referee for their constructive comments and suggestions on the manuscript.

This study was undertaken within the framework of the ECOAFRIK project and was partially funded by the MAVA Fondation pour la Nature (MAVA contract 12/87 AO C4/2012). This is ECOAFRIK publication number 34.

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