

**OTOLITH MORPHOLOGY OF *NEZUMIA SCLERORHYNCHUS*
AND *NEZUMIA AEQUALIS* (MACROURIDAE):
A USEFUL TOOL TO SPECIES IDENTIFICATION
AND ECOLOGICAL STUDIES**

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With 2 figures, 2 tables and 1 plate

ABSTRACT. Otoliths of *Nezumia sclerorhynchus* and *N. aequalis* are described and compared. When studying the marine trophic relationships, its general shape and morphometry allows one to separated these two sympatric species.

KEY WORDS: Otoliths, Macrouridae, *Nezumia sclerorhynchus*, *Nezumia aequalis*.

RESUMO. São descritos e comparados os otólitos *sagitta* de *Nezumia sclerorhynchus* e de *N. aequalis*. No estudo das relações tróficas marinhas a sua forma e morfometria permitem distinguir qual destas duas espécies simpátricas foi predada.

PALAVRAS-CHAVE: Otólitos, Macrouridae, *Nezumia sclerorhynchus*, *Nezumia aequalis*.

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INTRODUCTION

Teleost saccular otoliths have the potential for being among the most important available tools to researchers in ichthyology, fisheries biology, palaeontology, archaeology, and related disciplines.

From the ichthyologist point of view, the descriptive study of otoliths is important to estimate age and growth pattern of teleosts. The otoliths are the only structures that consistently record daily events in the early life stages and annual events throughout life (JONES, 1992). They can also be useful regarding the trophic relationships among aquatic communities, as the presence of these structures in the digestive tract is an important clue to prey identification. They can be also of great help to establish relationships within gadiforms (NOLF & STEURBAUT, 1989) to which the species studied herein belongs.

Nezumia sclerorhynchus (Valenciennes, 1838) and *Nezumia aequalis* (Günther, 1878) are sympatric species on the Portuguese slope and quite abundant (SALDANHA *et al.*, 1995) below 500 m (MARQUES & ALMEIDA, 1998). To determine which species is present in a predator stomach content, the general shape of the otolith can be used to identify these two species.

Otoliths of *Nezumia aequalis*, collected off Iceland, were described by SCHMIDT (1968).

In this work we describe *Nezumia sclerorhynchus* otoliths and compare its shape with that of *Nezumia aequalis*.

MATERIAL AND METHODS

Specimens were collected in December 1995 off the Portuguese west coast during the IPIMAR Cruise "Recursos de Profundidade", at a depth of 870 m off Arrifana (37° 15' N; 09° 15' W). The material studied consisted of one hundred *Nezumia sclerorhynchus* and fifteen *N. aequalis* captured on the same haul.

Otoliths were extracted from all the *Nezumia aequalis* (ranging from 33.6 mm to 54.2 mm head length) and from the sixteen larger *Nezumia sclerorhynchus* (ranging from 31.4 mm to 47.8 mm head length). They were cleaned from *sacculus* remains and observed under a stereomicroscope and a JEOL Scanning Electron Microscope LV-5200 (SEM).

The following measurements in millimetres, were taken using a calibrated stereomicroscope eyepiece: HL = head length of the fish; OL = otolith length; OW = otolith width and OT = otolith thickness (SCHMIDT, 1968).

Ratios of selected measurements were calculated as follows: head length / otolith length; otolith length / otolith width and otolith length / otolith thickness, and their differences between *Nezumia sclerorhynchus* and *N. aequalis* were tested using *t*-test.

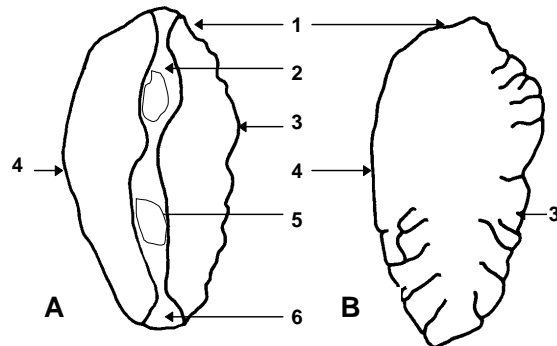


Fig. 1 - Saccular otoliths of *Nezumia sclerorhynchus* (A - inner face view of left sagitta; B - outer face view of right sagitta): 1 - rostrum; 2 - ostium; 3 - ventral margin; 4 - dorsal margin; 5 - sulcus; 6 - cauda.

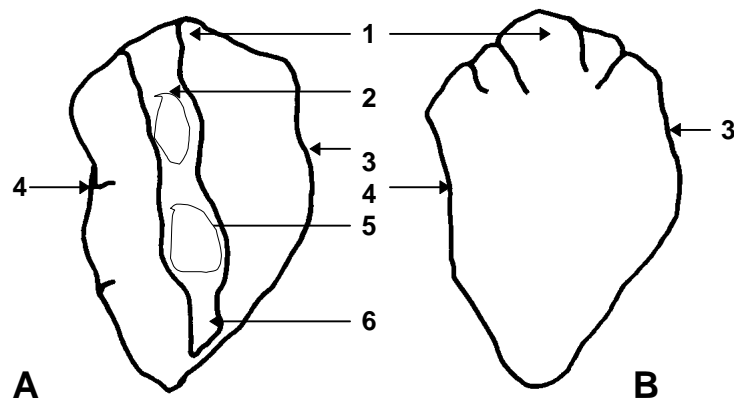


Fig. 2 - Saccular otoliths of *Nezumia aequalis* (A - inner face view of left sagitta; B - outer face view of right sagitta): 1 - rostrum; 2 - ostium; 3 - ventral margin; 4 - dorsal margin; 5 - sulcus; 6 - cauda.

RESULTS

Description of *Nezumia sclerorhynchus* saccular otolith:

This species has large otoliths (Fig. 1) as indicated by the mean HL/OL ratio 4.67. The outline is oval. Rostrum and antirostrum short and round. No excisura (deep sinus in the marginal outline where the sulcus ends anteriorly). The outer face is irregular and convex and the inner face is slightly convex. The dorsal margin is crenulated and less curved than the ventral margin. The highest point of the dorsal margin is the

anterodorsal dome. Outer face smooth. Ostium and cauda open. Sulcus extending full length of the otolith. Crista superior elevated and crista inferior slope shaped. Caudal colliculum plane (Plate I - A).

Otolith measurements (Table 1) are: Length (OL): 6.7 to 8.9 mm; Weight: 74.4 to 131.8 mg; Mean of HL/OL = 4.7 (ranging from 4.4 to 5.8); Mean of OL/OW = 1.8 (ranging from 1.6 to 2.0); Mean of OL/OT = 4.8 (ranging from 4.3 to 5.5).

Description of *Nezumia aequalis* saccular otolith:

This species has larger otoliths (Fig. 2) with a mean HL/OL ratio of 5.0. The outline is trapezoidal, the cranial end broad, with a short slightly rounded tip. Caudal end is thinner and ends up rounded. Antirostrum short and round having a slight excisura. The outer face is convex and the inner face flat. The highest point of the dorsal margin is the anterodorsal dome. Ostium open and cauda closed. Sulcus flat, extending full length. The ventral margin is almost even, but the caudal part can bear 1 to 3 little teeth. The dorsal margin is toothed strongly and more irregular (Plate I - B).

TABLE 1 - Meristic data, in millimetres, from *Nezumia sclerorhynchus* otoliths: HL - Fish head length; OL - Otolith length; OW - Otolith width; OT - Otolith thickness.

<i>Nezumia sclerorhynchus</i>				
N.º	HL (mm)	OL (mm)	OW (mm)	OT (mm)
1	31.9	7.1	3.7	1.6
2	34.9	7.4	4.5	1.6
3	35.8	7.9	4.2	1.6
4	36.3	8.2	4.2	1.6
5	36.3	7.7	4.0	1.6
6	41.0	8.9	4.8	1.6
7	42.1	8.7	4.5	1.8
8	47.8	8.2	4.7	1.6
9	36.2	7.4	4.0	1.6
10	40.1	8.4	4.5	1.8
11	36.9	7.6	4.2	1.6
12	34.7	7.4	4.0	1.4
13	31.4	6.7	3.9	1.5
14	32.0	6.9	3.7	1.6
15	38.7	8.4	4.7	1.8
16	39.7	8.4	4.7	1.6

TABLE 2 - Meristic data, in millimetres, from *Nezumia aequalis* otoliths: HL - Fish head length; OL - Otolith length; OW - Otolith width; OT - Otolith thickness.

<i>Nezumia aequalis</i>				
N.º	HL (mm)	OL (mm)	OW (mm)	OT (mm)
1	48.6	9.7	6.1	1.9
2	43.6	8.4	5.5	1.8
3	45.4	9.2	5.8	2.1
4	54.2	10.5	6.0	2.3
5	45.8	9.7	6.4	2.1
6	48.8	9.0	5.0	1.9
7	37.7	7.9	5.2	1.8
8	36.4	8.4	5.0	1.8
9	38.8	7.4	4.5	1.5
10	43.0	8.9	5.6	1.9
11	43.8	8.1	5.2	1.8
12	33.6	7.3	4.2	1.5
13	34.2	7.1	5.2	1.5
14	44.2	7.9	5.0	1.8
15	40.9	8.1	5.0	1.8

Otolith measurements (Table 2) are: Length (OL): 7.1 to 10.5 mm; Weight: 95.6 to 309.5 mg; Mean of HL/OL = 5.0 (ranging from 4.3 to 5.6); Mean of OL/OW = 1.6 (ranging from 1.5 to 1.8); Mean of OL/OT = 4.7 (ranging from 4.4 to 5.1).

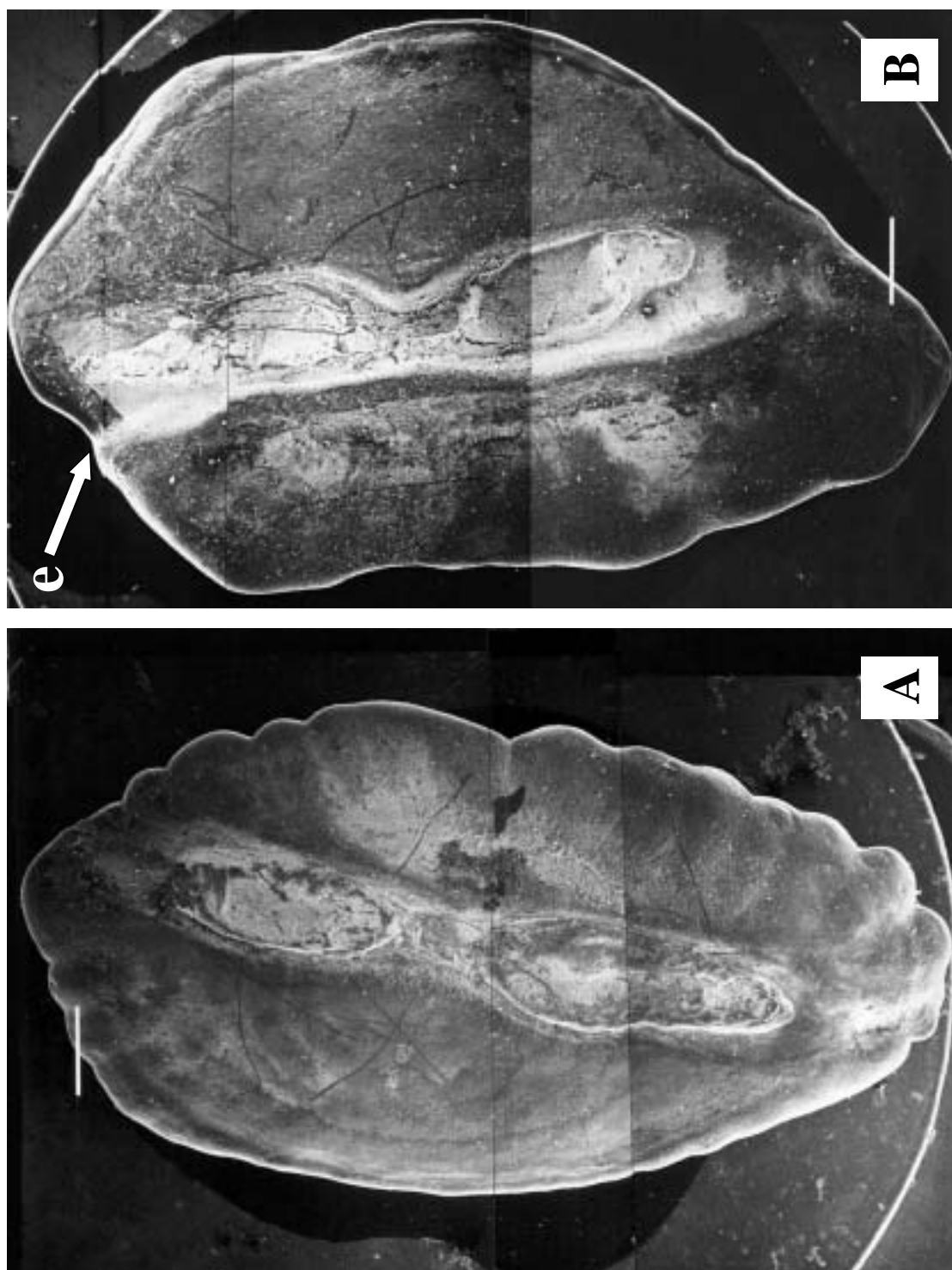
CONCLUSION

Morphologically, sagitta of both species can be easily distinguished by their general shape, as those of *Nezumia sclerorhynchus* are much more oblong, have no excisura and the ventral margin is serrated. However, the latter feature is age-related, observed in juveniles of many macrourids (D. NOLF, pers. comm.).

The identification of these two species using the morphological shape of their otoliths is validated by the significant differences (*t*-test, $P = 0.05$) found for the OL/OW and HL/OL relationships.

This method allows one to identify the otoliths eventually present in a predator stomach content, and to conclude which *Nezumia* species was preyed and even estimate its size.

Plate I - Scanning Electron Micrography of the left otoliths of *Nezumia sclerorhynchus* (A) and *Nezumia aequalis* (B) (x 1.500) (e = excisura). Scale bar = 1 mm.



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