LAMPADENA IONICA: A NEW TELEOST FROM THE MEDITERRANEAN PLEISTOCENE.

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Introduction

The genus Lampadena Goode & Bean, 1896 was known as a fossil in the Mediterranean realm from Miocene and Pliocene deposits but is not represented there in the Recent fauna. The Miocene species are the extinct L. gracile (Schubert 1912) and L. speculigeroides Brzobohaty & Nolf, 1996. In the Pliocene, the Recent L. depress Fraser-Brunner, 1949 is recorded from Zanclean (Lower Pliocene) deposits of the western Mediterranean (Nolf & Cappetta 1988; Nolf et al. 1998). In the Recent fauna, the latter species is restricted to the southern part of the Indian and Pacific Oceans, between the latitudes of approximately 20°S and 50°S (Nafpaktitis & Paxton 1968). Recent taxonomic studies on the Mediterranean Pleistocene otoliths revealed the presence of a new species, Lampadena ionica, from two sites in southern Italy. The otoliths of the species described here can easily be distinguished from the other Lampadena species of the Mediterranean Miocene and Pliocene as well as from the living species.

Otoliths of Lampadena ionica n. sp. were collected from silty Pleistocene deposits at two locations in southern Italy.

Montalbano Jonico - A composite succession of marine Pleistocene deposits, over 400 m thick, was reconstructed along the internal border of the southern Apennines Foredi (Montalbano Jonico area, Fig. 1) (Ciaranfi et al. 1997). It consists mainly of terrigenous clayey-silts and silty-clays in the basal and middle part, and of sandy-silts, silty-sands, and sand bodies in the upper part. Nine volcanlastic layers (V1-V9) are included at various heights, and a marine conglomerate tops the succession (Fig. 1).

Calcareous nannofossil assemblages indicates a lower to middle Pleistocene age, and the succession was proposed to locate the GSSP of the Lower-Middle Pleistocene (Ciaranfi et al. 1997). The basal part of the section belongs to the "large Gephyrocapsa" and "small Gephyrocapsa" nannofossil biozones, and the middle and upper part to the Pseudoemiliania lacunosa nannonossil biozone (Ciaranfi et al. 2001; Marino 1996).

Palaeocological, taphonomical, and sedimentological analyses suggest a general regressive trend from upper slope to shelf-edge environments.

The otoliths studied were collected from the first 12 m of the section, named Entalina section, which belongs to the Lower Pleistocene (large Gephyrocapsa nannofossil biozone). The benthic invertebrate associ-
tions and the otolith associations are dominated by bathyal species suggesting a palaeodepth of 500-600 m (Ciaranfi et al. 2001; Girone 2000).

**Archi** - This section, 9 m thick, is located near Reggio Calabria, southern Italy, (Fig. 1) at about 90 m above the sea level and is particularly well-exposed along a N-S abandoned quarry front. The section, lower-middle Pleistocene in age, mainly consists of well stratified pelitic sediments with a general slight westward sloping of the beds (Di Geronimo et al. 1997). The deposition occurred during a cold phase, as inferred from the planktonic foraminiferal assemblages. The invertebrate benthic faunas (foraminifers, molluscs, bryozoans, and serpulids) (Di Geronimo et al. op. cit.) as well as the fish otoliths (Girone 2000) testify a bathyal palaeoenvironment, 500 to 1000 m deep. The occurrence of *L. ionica* in the section is show in Fig. 1.

**Systematic palaeontology**

Terminology applied to otolith morphology follows Nolf (1985). The classification adopted is that of Rosen (1973)

Subsection **CTENOSQUAMATA** Rosen, 1973
Sept **SCOPELOMORPHA** Rosen, 1973
Order **Myctophiformes** Regan, 1911
Family **Myctophiidae** E Gill, 1893
Genus **Lampadena** Goode & Bean, 1896

**Type species.** *Lampadena speculigera* Goode & Bean, 1896.

The otoliths of the species of the genus *Lampadena* generally have large and oval-shaped otoliths; considerably longer than high. They can show a slight or absent posterodorsal notch. Only one Recent species *L. anomalua* has a small and more round-shaped otolith.

**Lampadena ionica** new species

Fig. 2 a-e

Etymology. - From the Montalbano Jonico Section (Basilicata, southern Italy), the type locality.

Type material. - Holotype: a left otolith (Fig. 2a) (DGGUB AG 1) from the Entalina section (Montalbano Jonico Composite Section) Lower Pleistocene in age; 10 paratypes, of which four are figured (Fig. 2b-e) (DGGUB AG 2-5).

Type locality. - Montalbano Jonico section, southern Italy.

Repository. - Dipartimento di Geologia e Geofisica, Università degli Studi di Bari, Italy (DGGUB AG1-5).

Diagnosis. A species characterised by moderately thin, oval shaped otoliths becoming more elongated with the growth. The rostrum is large and salient with no antirostrum. The posterodorsal angle is wide and moderately notched. The sulcus is wide.

Description

This species is characterized by oval-shaped otoliths with a wide sulcus. The ostium is somewhat longer than the cauda. The caudal colliculum is narrower than the ostial one, which becomes slender towards the anterior end. The cristae become obsolete in the posterior part of the otolith; the superior one is well marked and more linear than the inferior one. The col-
licular crest is elongated and separated from the crista inferior by a deep furrow. The dorsal and ventral areas are very similar in size; the former is characterized by a depression covering most of its surface. This depression is deeper just above the crista superior and becomes more smooth towards the dorsal rim. The ventral area is slightly convex and bears a shallow groove near to the ventral rim. In large specimens, the dorsal rim is truncated in its posterior part (behind the posterodorsal angle) where it reaches its maximum height. In small specimens the dorsal rim shows a regular curve. The ventral rim is curved but not semicircular and bears irregularly spaced obtuse spines. The anterior spines (3 or 4 in number) are more pointed and are closer to each other. They are separated by deep furrows on the inner face. The posterior rim is globally rounded, but the lobation shows a marked variability among the available specimens. In several larger ones, it bears two or three lobes near the postero dorsal angle. The outer face is irregularly convex with the maximal convexity located in the posterior part. The surface of this face shows a low elongate umbo in the central part and numerous radial lobes in the marginal zone.

Affinities. Otoliths of Lampadena ionica can be distinguished from those of the fossil species L. gracile (Schubert, 1912) and L. speculigeroides Brzobohaty & Nolf, 1996 from the Mediterranean Miocene by their notched and wide posterodorsal angle, their less pronounced rostrum and a more rounded and convex posterior margin. In the two Miocene species, this margin is linear and subvertical (Brzobohaty & Nolf 1996, pl. 4, figs. 1-6 and figs. 12-16).

In the Recent fauna, the genus Lampadena is represented by eight nominal species and one subspecies (Paxton 1979). Otoliths collected from the stomach content of a pigmy sperm whale (Kogia simus) caught off Taiji, Japan, are different from all other presently known Lampadena species and apparently represent a ninth species (Pl. 1, fig. 22), but the entire fishes have not been caught. Otoliths of all known taxa have been figured by various authors and those pictures are scattered through the literature. References to these sources are listed in Table 1, which also provides a survey of the geographic distribution of each taxon. Otoliths of all those Recent taxa are also figured on Pl. 1, which for several of species, provides growth series that never have been published before.

Otoliths of L. ionica differ from those of L. luminosa (Garman 1899) (Pl. 1, fig. 1-4) and L. urophao Paxton, 1963 (Pl. 1, fig. 16-17) by a wider sulcus, a posterodorsal angle which is conspicuously obtuse and, in adult specimens, a less notched superior part of the posterior rim. In the medium-sized otoliths of the present Pleistocene species and the Recent L. luminosa, the two latter features appear to be very similar, but the medium-sized as well as the large specimens of L. ionica are less oblongate and have a wider-shaped anterior part than L. luminosa. The features that distinguish the Pleistocene species from the Pacific L. urophao are much

Fig. 2 - Lampadena ionica, Montalbano Jonico, lower Pleistocene (large Gephyrocapsa biozone): a) holotype; left otolith; b-c) paratypes, left otoliths; d-e) paratypes; right otoliths; d1) ventral view.
more marked in the Atlantic subspecies *L. urophaos atlantica* Maul, 1969 (Pl. 1, fig. 19) that, in addition to other features, has a more elongated antirostrum and a more salient rostrum than *L. ionica*.

Although the general shape of otoliths of *L. ionica* shows some similarity to those of the Recent North Atlantic *L. notialis* Nafpaktitis & Paxton, 1968 (Pl. 1, fig. 11-12), the Pleistocene specimens differ from the latter by having a larger sulcus, a more salient posterodorsal angle and a more expanded anteroventral area. In *L. notialis* the antirostrum is well developed while in *L. ionica* it is almost absent. These differences can also be observed in the medium sized-otolith of *L. notialis* from the south Atlantic figured by Nafpaktitis & Paxton (1968, fig. 10) in which the anterior part of the dorsal area is wider than in *L. ionica*.

Otoliths of the *L. ionica* differs from those of *L. dea* Fraser-Brunner, 1949 (Pl. 1, fig. 18), known as fossil from the Lower Pliocene deposits of the Mediterranean realm, by their marked rostrum and their more obtrude posterodorsal angle which, in the recent species is nearly right. Moreover, *L. dea* generally shows a well distinct rostrum and antirostrum (Nafpaktitis & Paxton 1968).

The more obtrude posterodorsal angle is also the feature that distinguishes otoliths of *L. ionica* from those of the recent *L. pontifex* (Pl. 1, fig. 20-21) and

<table>
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<th>NOMINAL SPECIES</th>
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<tr>
<td><em>Lampadena anomala</em> Parr, 1928</td>
<td>Pl. 1, Fig. 9-10</td>
<td>Atlantic, Indian Ocean, east and central Pacific</td>
</tr>
<tr>
<td><em>Lampadena chavesi</em> Collet, 1905</td>
<td>Pl. 1, Fig. 5-8</td>
<td>N and S Atlantic, antitropical; southern Indian and Pacific oceans</td>
</tr>
<tr>
<td><em>Lampadena dea</em> Fraser-Brunner, 1949</td>
<td>Pl. 1, Fig. 18</td>
<td>Southern parts of all three oceans, between 20 and 50°S</td>
</tr>
<tr>
<td><em>Lampadena luminosa</em> (Garman, 1899)</td>
<td>Pl. 1, Fig. 1-4</td>
<td>Atlantic, eastern Pacific</td>
</tr>
<tr>
<td><em>Lampadena notialis</em> Nafpaktitis &amp; Paxton, 1968</td>
<td>Pl. 1, Fig. 11-12</td>
<td>Southern Ocean</td>
</tr>
<tr>
<td><em>Lampadena pontifex</em> Krefft, 1970</td>
<td>Pl. 1, Fig. 20-21</td>
<td>Atlantic, mainly Mauritanian upwelling</td>
</tr>
<tr>
<td><em>Lampadena speculigera</em> Goode &amp; Bean, 1896</td>
<td>Pl. 1, Fig. 13-15</td>
<td>N Atlantic, S Atlantic, S Indian ocean, SE Pacific</td>
</tr>
<tr>
<td><em>Lampadena urophaos urophaos</em> Paxton, 1963</td>
<td>Pl. 1, Fig. 16-17</td>
<td>Eastern Pacific</td>
</tr>
<tr>
<td><em>Lampadena urophaos atlantica</em> Maul, 1969</td>
<td>Pl. 1, Fig. 19</td>
<td>N Atlantic</td>
</tr>
<tr>
<td><em>Lampadena sp. A</em></td>
<td>Pl. 1, Fig. 22</td>
<td>Off Japan, otoliths from stomach content of sperm whale <em>Kogia simus</em>; fish unknown</td>
</tr>
</tbody>
</table>

Table 1 - List of Recent species of the genus *Lampadena*. The references on iconography and the geographic distribution are also reported.
The Recent specimens figured in this plate are from the collection IRSNB (Institut Royal des Sciences Naturelles de Belgique). Fig. 1-4) Lampadena luminosa, left otoliths. Recent: Gulf of Mexico. Fig. 5-8) Lampadena chavesi Collet, 1905, left otoliths. Recent: Atlantic, off the Azores. Fig. 9-10) Lampadena anomala Parr, 1928, left otoliths. Recent: Atlantic (Research vessel Knorr, station 65). Fig. 11-12) Lampadena notialis Nafpaktitis & Paxton, 1968, left otoliths. Recent: 11) South West Atlantic (Research vessel Walter Herwig station 367), coll. SCHWARZHANS; 12) off New South Wales, Australia. Fig. 13-15) Lampadena speculigera Goode & Bean, 1896, left otoliths. Recent: 13) Atlantic, off NW Ireland; 14-15) Gulf of Biscay. Fig. 16-17) Lampadena urophias Paxton, 1965, left otoliths; fig. 16) New Caledonia; fig. 17) California. Recent: 16) off New Caledonia; 17) off California. Fig. 18 Lampadena dea Fraser-Brunner, 1949, left otoliths. Recent: SE Pacific. Fig. 19) Lampadena urophias atlantica Maul, 1969, right otoliths. Recent: off Portugal, Atlantic. Fig. 20-21) Lampadena pontifex Kefit, 1970, left otoliths. Recent: Atlantic (Research vessel Atlantis II station 59). Fig. 22) Lampadena sp. A, left otolith. Recent: from the stomach content of a pigmy sperm whale (Kogia simus) caught off Taiji, Japan. Redrawn after Nafpaktitis & Paxton (1968, fig. 10.3).
Lampadena sp. A (Pl. 1, fig. 22).

In the Recent L. speculigera and L. anomalana, the general shape of the otoliths is quite different; the otoliths of L. speculigera have a nearly vertical posterior margin and a narrower sulcus with a very short cauda.

According to Naifaktitis & Paxton (1968) and Coleman & Naifaktitis (1972), the otoliths of L. anomalana can be considered as intermediate between the more elongated otoliths of all other Lampadena species and the almost round, smooth-edged otoliths of the genus Taeniaiceps (Myctophidae). Otoliths of L. ionica clearly belong to the Lampadena group with elongate otoliths and are quite different from the high-shaped L. anomalana morphology.

**Distribution**

*Lampadena ionica* first appears in the Lower Pleistocene beds ("large Gephyrocapsa" nannofossil biozone) in the basal part of the Montalbano Jonico section. The presence of *L. ionica* in the bathyal assemblages from the Archi Section (Calabria, Southern Italy), referable to the "small Gephyrocapsa" and the Pseudeomiliana lacunosa nannofossil biozones (Di Geronimo et al. 1997), suggests that this species survived in the Mediterranean basin up to the Middle Pleistocene.

Most Recent species of the genus Lampadena appear to be among the deepest-dwelling myctophids; they are merely captured below 600-700 m. *L. pontifex* and *L. luminosa* occur also at shallower depths between 275 and 450 m (Naifaktitis et al. 1977).

*L. ionica* was collected from beds which, according to their content of benthic invertebrates and benthic fish assemblages, indicate a bathyal environment of more than 500 m deep (Girone 2000). In the Montalbano sections, *L. ionica* is absent in the more shallow associations referable to the "small Gephyrocapsa" biozone.

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