

LAMPADENA IONICA: A NEW TELEOST FROM THE MEDITERRANEAN PLEISTOCENE.

ANGELA GIRONE* & DIRK NOLF**

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Riassunto. Viene descritta la nuova specie *Lampadena ionica* (Myctophidae, teleostei) riscontrata in depositi del Pleistocene inferiore-medio dell'Italia meridionale. In particolare *L. ionica* è stata riconosciuta dalla biozona a "large *Gephyrocapsa*" a quella a *Pseudoemiliania lacunosa* ed apparentemente sembra estinguersi prima della fine del Pleistocene. Sebbene il genere *Lampadena* sia tuttora vivente solo negli oceani Atlantico e Indo-Pacifico, esso è noto nel Mediterraneo sin dal Miocene inferiore. *L. ionica* sembra essere l'unica specie di questo genere esistente nel Pleistocene del Mediterraneo. Sino ad ora è stata rinvenuta associata a fauna bentonica (invertebrati e vertebrati) caratteristica di ambienti batiali indicante una profondità maggiore di 500 metri.

Abstract. The new species *Lampadena ionica* (Myctophidae, Teleostei) is described from lower and middle Pleistocene deposits of southern Italy. In particular, *L. ionica* is known from the "large *Gephyrocapsa*" up to the *Pseudoemiliania lacunosa* biozone. Apparently, the species became extinct before the end of the Pleistocene. Although the genus *Lampadena* lives only outside the Mediterranean today, it is known from the Mediterranean realm since the early Miocene. *L. ionica* seems to be the only species of the genus *Lampadena* existing in the Pleistocene deposits of the Mediterranean area.

The new species has been found only associated with benthic faunas (invertebrate and vertebrate) indicating an bathyal environment deeper than 500m.

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. dea* 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 Foredeep (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 volcanoclastic 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* nannofossil biozone (Ciaranfi et al. 2001; Marino 1996).

Palaeological, taphonomical, and sedimentological analyses suggest a general regressive trend from upper slope to shoreface 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 associa-

*Dipartimento di Geologia e Geofisica, Università di Bari, via E. Orabona 4, 70125 Bari : email girone@geo.uniba.it

**Institut royal des Sciences naturelles de Belgique, rue Vautier 29, B-1000 Bruxelles: email Dirk.Nolf@natuurwetenschappen.be

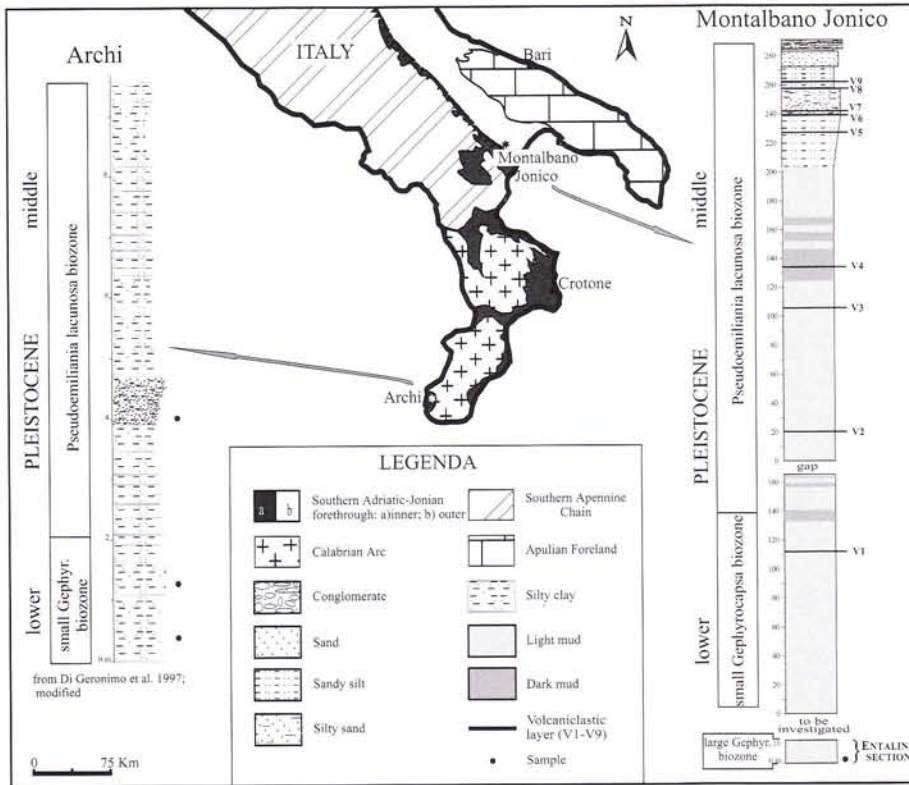


Fig. 1 - Location of Montalbano Jonico and Archi sections.

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 shown 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 Myctophidae 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. anomala* 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-

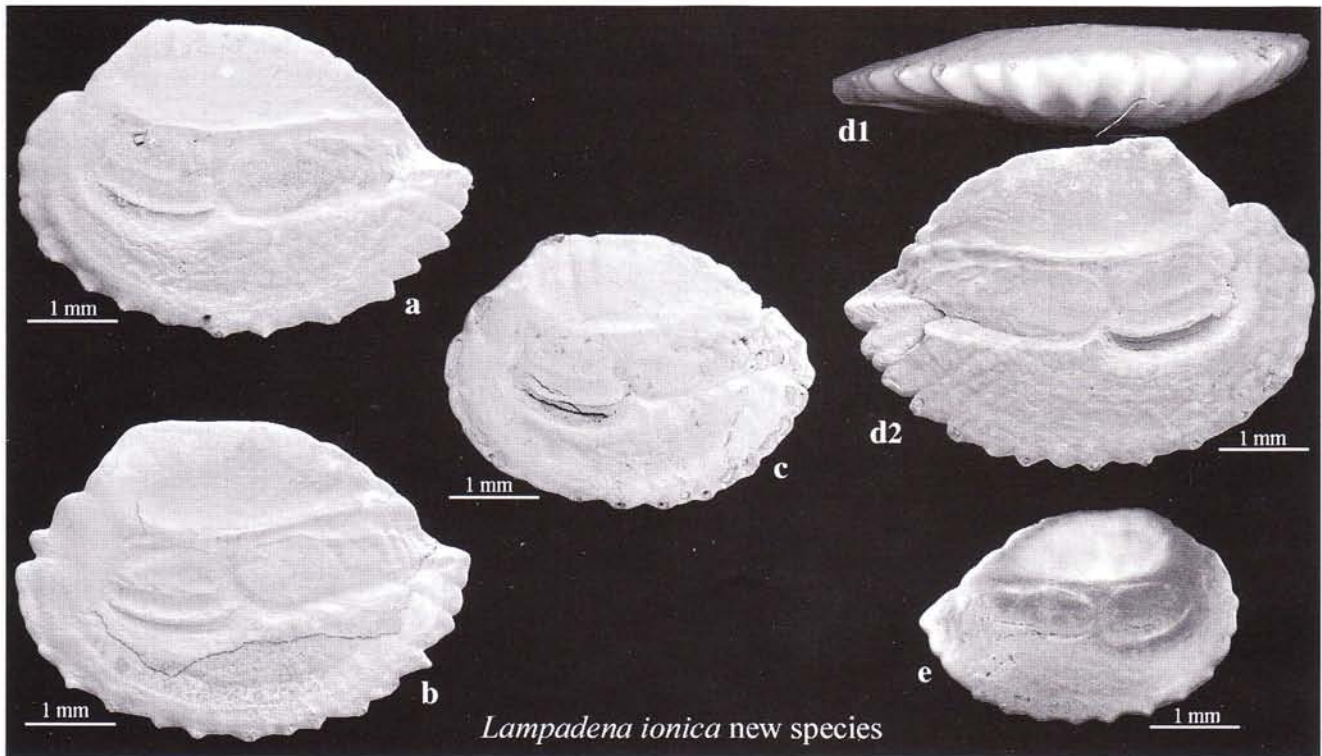


Fig. 2 - *Lampadena ionica*, Montalbano Jonico, lower Pleistocene (large *Gephyrocapsa* biozone): a) holotype; left otolith; b-c) paratypes, left otoliths; d2-e) paratypes; right otoliths; d1) ventral view.

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 posterodorsal 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 pos-

terior 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. urophaos* 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. urophaos* are much

NOMINAL SPECIES	FIGURED OTOLITHS	DISTRIBUTION
<i>Lampadena anomala</i> Parr, 1928	Pl. 1, Fig. 9-10 COLEMAN & NAFFAKTITIS, 1972, fig. 4C, p. 7 NAFFAKTITIS & PAXTON, 1968, fig. 10.8, p. 24	Atlantic, Indian Ocean, east and central Pacific
<i>Lampadena chavesi</i> Collet, 1905	Pl. 1, Fig. 5-8 NAFFAKTITIS & PAXTON, 1968, fig. 10.7, p. 24 SMALE et al., 1995, pl. 21, fig. E1-3	N and S Atlantic, antitropical; southern Indian and Pacific oceans
<i>Lampadena dea</i> Fraser-Brunner, 1949	Pl. 1, Fig. 18 NAFFAKTITIS & PAXTON, 1968, fig. 10.6, p. 24 RADWANSKA, 1992, fig. 36, p. 186	Southern parts of all three oceans, between 20 and 50°S
<i>Lampadena luminosa</i> (Garman, 1899)	Pl. 1, Fig. 1-4 NAFFAKTITIS & PAXTON, 1968, fig. 10.1, p. 24 RIVATON & BOURRET, 1999, pl. 119, figs. 1-13 SMALE et al., 1995, pl. 21, fig. F1-2	Atlantic, eastern Pacific
<i>Lampadena notialis</i> Nafpaktitis & Paxton, 1968	Pl. 1, Fig. 11-12 NAFFAKTITIS & PAXTON, 1968, fig. 10.5, p. 24 SMALE et al., 1995, pl. 21, fig. G2, not G1(=? <i>Bolinichthys</i>)	Southern Ocean
<i>Lampadena pontifex</i> Krefft, 1970	Pl. 1, Fig. 20-21 KREFFT, 1970, fig. 3, p. 280	Atlantic, mainly Mauritanian upwelling
<i>Lampadena speculigera</i> Goode & Bean, 1896	Pl. 1, Fig. 13-15 NAFFAKTITIS & PAXTON, 1968, fig. 4, p. 12, fig. 10.1, p. 24 SMALE et al., 1995, pl. 21, fig. A1-3	N Atlantic, S Atlantic, S Indian ocean, SE Pacific
<i>Lampadena urophaos urophaos</i> Paxton, 1963	Pl. 1, Fig. 16-17 KOTLYAR & PARIN, 1990, fig. 2, p. 101 NAFFAKTITIS & PAXTON, 1968, fig. 10.2, p. 24 RIVATON & BOURRET, 1999, pl. 119, figs. 14-19	Eastern Pacific
<i>Lampadena urophaos atlantica</i> Maul, 1969	Pl. 1, Fig. 19	N Atlantic
<i>Lampadena</i> sp. A	Pl. 1, Fig. 22 NAFFAKTITIS & PAXTON, 1968, fig. 10.3, p. 24	Off Japan, otoliths from stomach content of sperm whale <i>Kogia simus</i> ; fish unknown

Table 1 - List of Recent species of the genus *Lampadena*. The references on iconography and the geographic distribution are also reported.

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 obtuse 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 obtuse 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

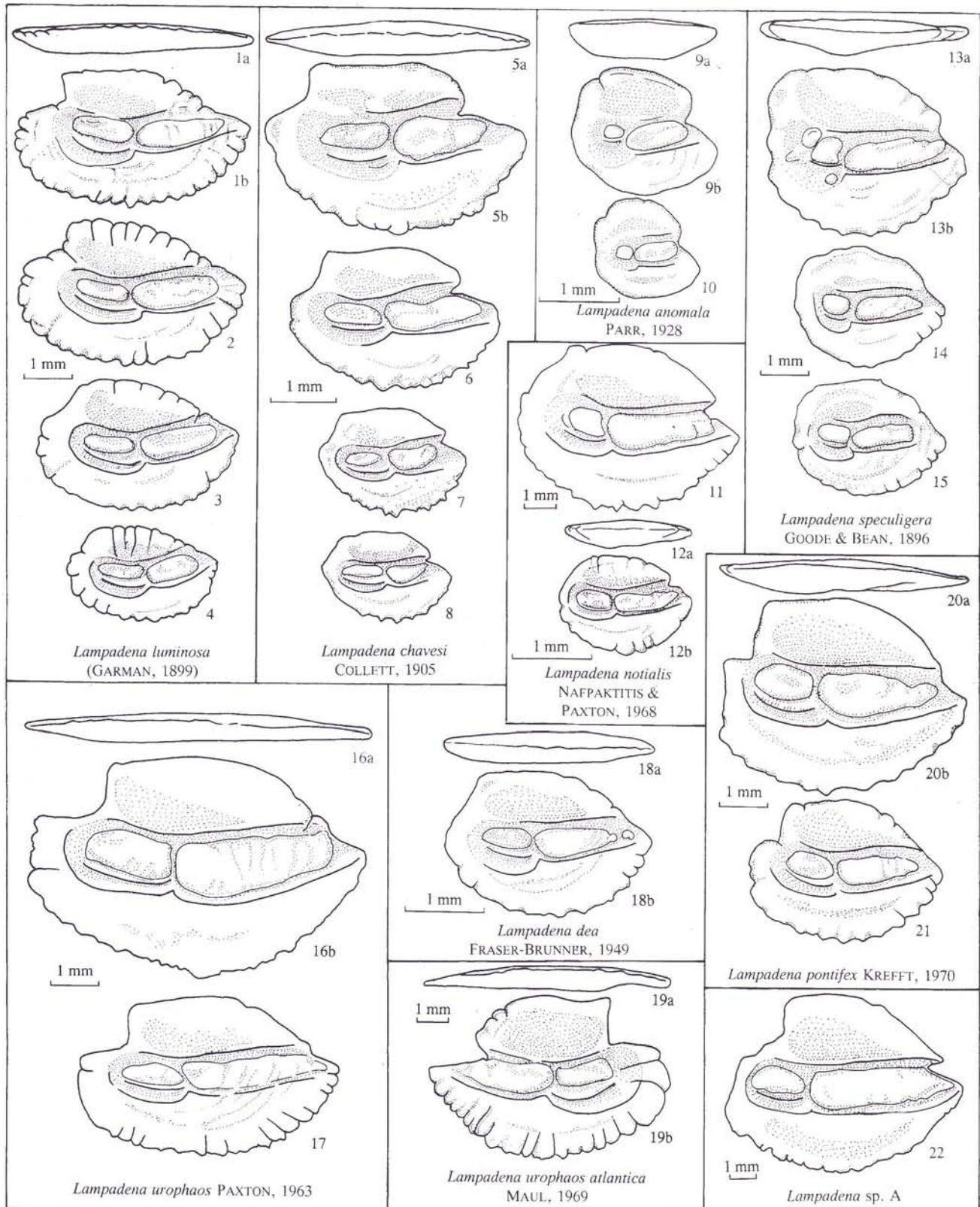


PLATE 1

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 Biscaye. Fig. 16-17) *Lampadena urophaos* Paxton, 1963, 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 urophaos atlantica* Maul, 1969, right otoliths. Recent: off Portugal, Atlantic. Fig. 20-21) *Lampadena pontifex* Krefft, 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. Redraw, after Nafpaktitis & Paxton (1968, fig. 10.3).

Lampadena sp. A (Pl. 1, fig. 22).

In the Recent *L. speculigera* and *L. anomala*, 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 Nafpaktitis & Paxton (1968) and Coleman & Nafpaktitis (1972), the otoliths of *L. anomala* 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 *Taaningichthys* (Myctophidae). Otoliths of *L. ionica* clearly belong to the *Lampadena* group with elongate otoliths and are quite different from the high-shaped *L. anomala* 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 *Pseudoemiliana 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 (Nafpaktitis 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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