The first fossil ribbonfish (Teleostei, Lampridiformes, Trachipteridae)

GIORGIO CARNEVALE*

CNR – Istituto di Geoscienze e Georisorse, c/o Dipartimento di Scienze della Terra, via S. Maria, 53, I-56126 Pisa, Italy

Abstract – The first fossil ribbonfish, *Trachipterus mauritanicus* sp. nov., based on a single specimen, is described from Sidi-Brahim, an Upper Miocene (Messinian) locality situated in the central sector of the Chelif Basin, northwestern Algeria. *Trachipterus mauritanicus* sp. nov. is characterized by a flattened neurocranium and an advanced insertion of the dorsal fin. Based on skeletal morphology, *T. mauritanicus* sp. nov. appears to be related to *T. arawatae* and *T. trachypterus*. *Trachipterus mauritanicus* sp. nov. represents the eighth taxon described up to now from Sidi-Brahim. The occurrence of the first fossil member of the family Trachipteridae from the Upper Miocene sediments of northwestern Algeria emphasizes the crucial importance of the Messinian ichthyofaunas from Algeria to our knowledge of the fossil record of the Teleostei.

Keywords: Teleostei, Lampridiformes, *Trachipterus mauritanicus* sp. nov., Miocene, Algeria.

1. Introduction

The Lampridiformes are a group of exclusively marine fishes with a poor fossil record dating from to Late Cretaceous. They consist 12 living genera included in seven families. All living lampridiforms are coastal or pelagic in temperate and tropical seas. This group is characterized by an extreme morphological disparity, and it includes some of the most bizarre vertebrate species. One of the most peculiar representative of the order is the oarfish, *Regalecus glesne*, which can reach more than 15 meters in length, and was considered in ancient times as the legendary sea serpent (Fitch & Lavenberg, 1968). Because of their wide morphological differences, lampridiforms were not recognized as a natural group until the pioneering work of C. Tate Regan (1907), who provided the first comprehensive taxonomic analysis of this group and named these fishes Allotriognathi. Regan (1907) divided the lampridiforms into two groups: the Bathysomi, which included the families Lamprididae (= Selenichthyes) and Veliferidae (= Histichthyes), and the Taeniosomi, the elongate lampridiforms, which consisted of the Lophotidae and the Trachipteridae. Later, Regan (1924) added the Stylephoridae to the group. The term Lampridiformes was introduced by Greenwood *et al*. (1966). The monophyly of this group has been corroborated by a cladistic analysis of morphological (Olney, Johnson & Baldwin, 1993) and molecular (Wiley, Johnson & Dimmick, 1998) data. Several hypotheses have been presented on the phylogenetic position of lampridiforms within teleosts. Stiassny & Moore

(1992) proposed two alternative scenarios, placing Lampridiformes as either basal acanthomorphs or basal percomorphs. The first hypothesis was supported by Olney, Johnson & Baldwin (1993) and Johnson & Patterson (1993), who considered them as the sister group of the Euacanthomorpha. In contrast, recent studies of evolutionary genomics (Miya, Kawaguchi & Nishida, 2001; Miya *et al*., 2003) concluded that the Lampridiformes are not acanthomorphs but ctenosquamates, and placed this group as the sister taxon of Ateleopodiformes.

Regan's Trachipteridae comprised two genera, *Trachipterus* and *Regalecus*. A revision of this family by Walters & Fitch (1960) placed *Regalecus* in the separate family Regalecidae, and erected two new trachipterid genera: *Desmodema* and *Zu*. These fishes are characterized by unique morphological features, such as ribbon-like body form (Oelschläger, 1976), specialized integument (Walters, 1963), and rotating eye (Haedrich, 1974). The systematics of trachipterids at the specific level are somewhat confused (see, e.g., Rosenblatt & Butler, 1977; Heemstra & Kannemeyer, 1984; Olney, 1984). To date, ten living species are recognized, and no fossil taxa have been known. The purpose of this paper is to describe the first fossil representative of the family Trachipteridae. The fossil was recently found among the undescribed material of the paleoichthyological collection of the Muséum National d'Histoire Naturelle in Paris.

2. Locality and stratigraphy

The material was collected in the 1920's from a sedimentary succession croppingout near Sidi-Brahim,

* E-mail: carnevale@dst.unipi.it

Figure 1. Type locality of *Trachipterus mauritanicus* nov. sp. The asterisk indicates the location of Sidi-Brahim.

in the central sector of the Chelif Basin, northwestern Algeria (Fig. 1). The outcrop is located near the Ouadi Bechela, several kilometres from the town of Mostaganem. The succession is affected by a moderate tectonization. Arambourg (1927) provided a schematic representation of the stratigraphy of the section. Unfortunately, he did not indicate the exact thickness of the different lithologies. A stratigraphic section is here restored based on the description of Arambourg (1927). The base of the section is represented by a great thickness of the so-called *Globigerina* marls. The marls are overlained by several meters of marly limestone, siliceous marls, and at least three tripolaceous intervals. Gypsum strata lie over the Tripoli. Pliocene sediments represent the upper part of the section.

The material comes from the Tripoli intervals. From a lithological point of view, the Tripoli consists of diatomites and diatomitic marls that are present in most of the Mediterranean domains. Nearly all of the stratigraphic section dates back to the Upper Miocene, Messinian (Arambourg, 1927). In Algeria, diatomitic deposits appear in coincidence with the occurrence of the Messinian biostratigraphic markers *Globorotalia mediterranea*/*Globorotalia conomiozea* (Poignant & Moisette, 1992; Mansour *et al.*, 1994), which was dated 7.12 Ma by Krijgsman *et al.* (1995). Moreover, the onset of evaporite sedimentation in the Mediterranean was fixed at 5.96 Ma by Krijgsman *et al.* (1999; 2001). Thus, because of the stratigraphic position of the fossiliferous layers, which are located below the gypsum strata, the fossil fishes of Sidi-Brahim are approximatively 6 million years old.

3. Methods

The type and only known specimen is deposited in the Laboratoire de Paléontologie of the Muséum National d'Histoire Naturelle (MNHN), Paris (MNHN ORA1221). The specimen was examined using a stereomicroscope equipped with a *camera lucida*. Measurements were taken with a dial caliper, to the nearest 0.1 mm. Comparative data were derived mainly from the literature.

4. Systematic palaeontology

Subdivision TELEOSTEI *sensu* Patterson & Rosen, 1977
Order LAMPRIDIFORMES *sensu* Olney, Johnson & Baldwin, 1993
Family TRACHIPTERIDAE *sensu* Walters & Fitch, 1960
Genus *Trachipterus* Goüan, 1770

Trachipterus mauritanicus sp. nov.

Diagnosis. A *Trachipterus* that differs from all other species of the genus by a more advanced insertion of the dorsal fin and by a more flattened dorsal portion of the neurocranium.
Holotype. MNHN ORA1221, a completely articulated skull and the anterior part of the dorsal fin, preserved on diatomite.
Horizon and locality. Upper Miocene (Messinian) of Sidi-Brahim, central portion of the Chelif Basin, northwestern Algeria.
Derivation of name. From Mauritania Caesariensis (Latin), the ancient name of the North Africa region that includes the type locality.

4.a. Description (Figs 2–6; 8a)

Laterally compressed teleost. Head length 34.3 mm. Other measurements as percentage of head length: head depth (66.7 %), snout length (32.9 %), orbit (21.5 %), eyeball (based on preserved pigment) (17.7 %).

The neurocranium is moderately deep posteriorly, and becomes deeper in the posterior part of the frontal region and shallower anteriorly. The orbit is large, about equal to half the length of the neurocranium. The eyeball is large and preserved as a thin carbon film. The bones are delicate, feebly ossified. The frontals are the largest bones on the neurocranium. The anterior portion of these bones represents the lateral wall of a cradle-like chamber. The two contralateral frontals probably do not meet at the midline anteriorly, as in other trachipterids. The frontal cradle walls end dorsally forming a prominent process. A well-developed crest is visible along the entire base of the frontal cradle. Two additional frontal ridges are clearly recognizable on the lateral surface of the frontal cradle. All these ridges arise from a prominent
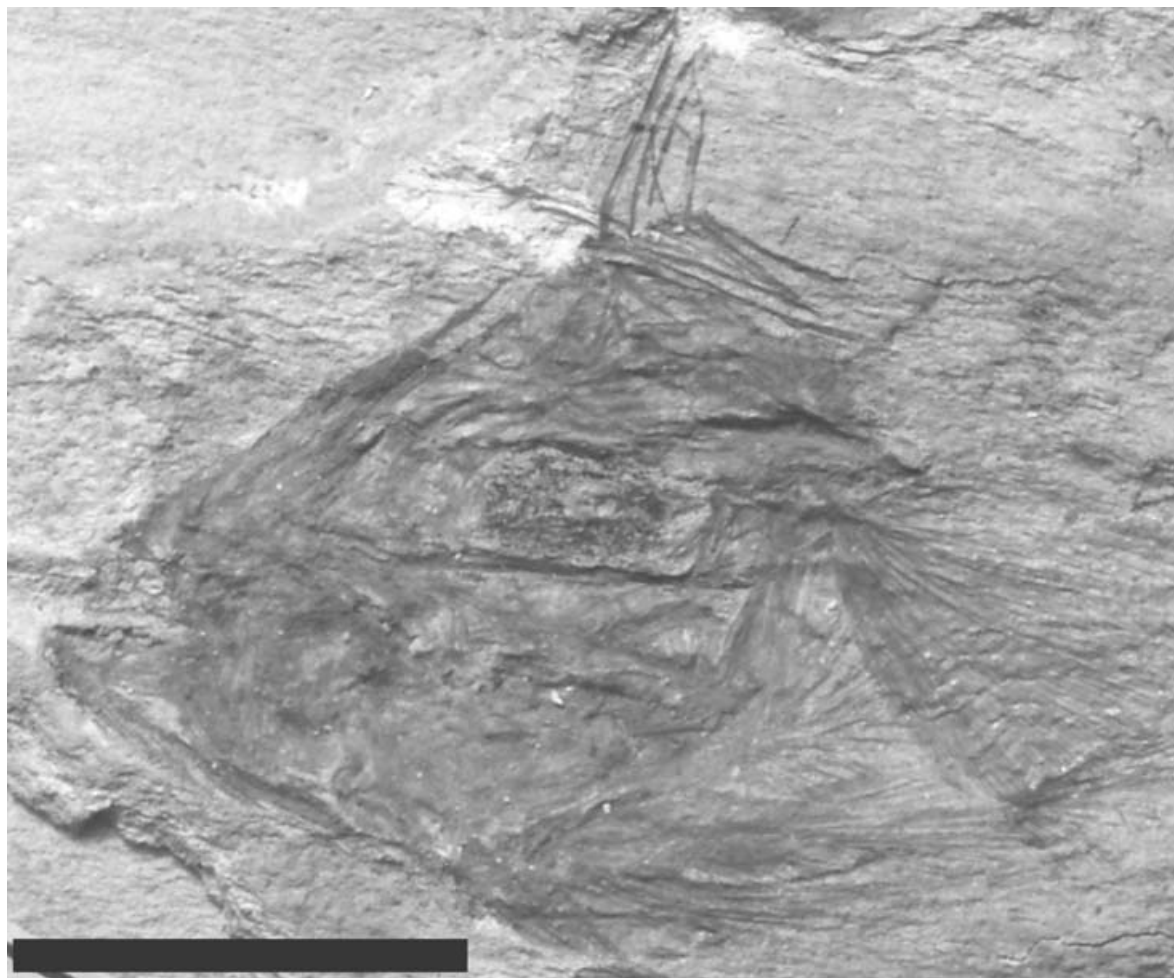
Figure 2. *Trachipterus mauritanicus* nov. sp. from the Miocene of Algeria. Holotype, MNHN ORA1221, left side, lateral view. Scale bar 20 mm. Photograph courtesy of Daniel Goujet.

central frontal ridge, which continues posteriorly on the sphenotic and the pterotic. The frontals are posteriorly sutured to the supraoccipital, the parietal and the sphenotic. The parietals are separated at the midline by the supraoccipital and the epioccipitals. The suture between the supraoccipital and the epioccipitals is difficult to interpret. The anteriormost part of the neurocranium is obscured by the overlying maxilla, and the morphology of the vomer cannot be observed. The lateral ethmoids are anterior to the mesethmoid and are sutured dorsally to it and to the frontals. The mesethmoid, orbitosphenoid and pterosphenoid form the dorsal margin of the orbit. The basisphenoid is well preserved, but partially displaced. The sphenotic, prootic, and basioccipital are recognizable in the posterior part of the neurocranium. The parasphenoid is long and slender. Posteriorly it attaches to the ventral part of the basioccipitals. The nasal is preserved in life position, immediately anterior to the frontal. Of the infraorbital bones, the lachrymal is preserved. This bone is laminar, subrectangular and bears a thin process ventrally. The mouth is small. The upper jaw presumably is highly protrusible. The premaxilla is a large bone with an extremely elongate ascending process. A large rostral cartilage inserting into the frontal cradle was probably located distally on the posterior margin of the ascending process of the premaxilla. Two recurved pointed premaxillary teeth are preserved. The alveolar process of the maxilla is globose, nearly ovoid in outline. It is ornamented with light radial grooves and ridges. There is a small ascending maxillary process. The mandible consists of the dentary and the angulo-articular. A single pointed tooth is visible anteriorly, along the dorsal margin of the dentary.

The suspensorium consists of the ectopterygoid, endopterygoid, hyomandibula, metapterygoid, quadrate, palatine and symplectic. The metapterygoid has a highly convex anterior margin. The endopterygoid is rather large. This bone bears a median ridge which passes anteriorly on the palatine and on ectopterygoid. The palatine prong is absent. The quadrate is subtriangular, fan-shaped. The symplectic is a cylindrical slender bone. The hyomandibula is elongate. It appears to articulate with the basioccipital, but this position could be due to the fossilization processes that caused
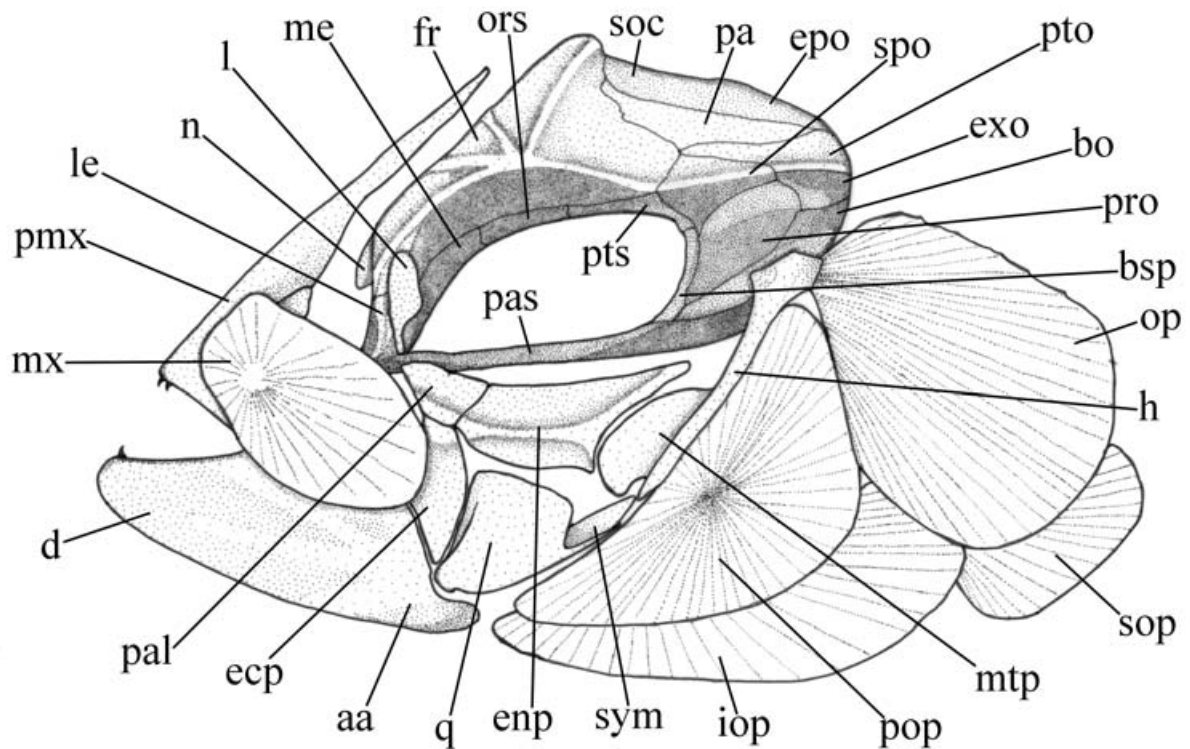
Figure 3. *Trachipterus mauritanicus* nov. sp., reconstruction of the skull, left side, lateral view. Abbreviations: aa, angulo-articular; bo, basioccipital; bsp, basisphenoid; d, dentary; ecp, ectopterygoid; enp, endopterygoid; epo, epioccipital; exo, exoccipital; fr, frontal; h, hyomandibula; iop, interopercle; l, lachrymal; le, lateral ethmoid; me, mesethmoid; mtp, metapterygoid; mx, maxilla; n, nasal; op, opercle; ors, orbitosphenoid; pa, parietal; pal, palatine; pas, parasphenoid; pmx, premaxilla; pop, preopercle; pro, prootic; pto, pterotic; pts, pterosphenoid; q, quadrate; soc, supraoccipital; sop, subopercle; spo, sphenotic; sym, symplectic.
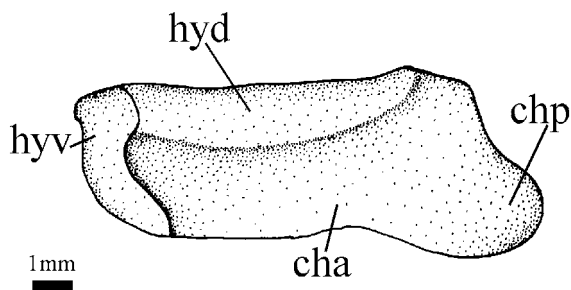

Figure 4. *Trachipterus mauritanicus* nov. sp., reconstruction of the hyoid bar, left side, lateral view. Abbreviations: cha, anterior ceratohyal; chp, posterior ceratohyal; hyd, dorsal hypohyal; hyv, ventral hypohyal.

Figure 5. *Trachipterus mauritanicus* nov. sp., dorsal fin (pennant), left side, lateral view.

partial displacement of the suspensorium. In fact, an original articulation with the prootic is more probable.

The opercular bones are well preserved. They are characterized by robust radial ridges, alternated with thin laminae of bone. The dorsal margin of the opercle appears to be slightly scalloped. The preopercle and interopercle are very large. The hyoid bar is massive and subrectangular in outline (Fig. 4). There are no apparent sutures between the dorsal hypohyal, anterior ceratohyal and posterior ceratohyal, but this is pro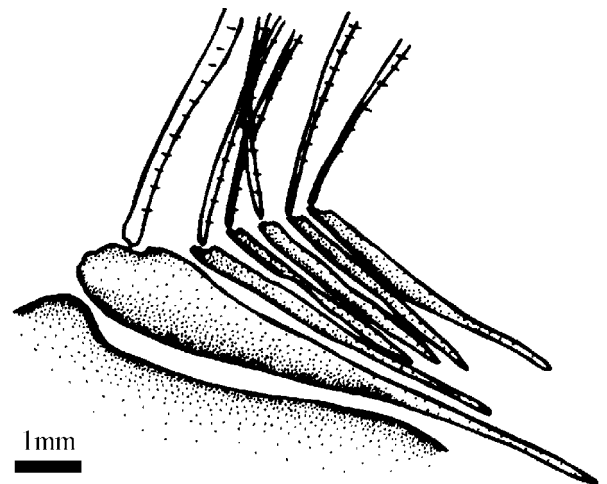bably the result of lack of preservation. There are six branchiostegal rays. Fragments of the gill arch series, probably of ceratobranchials and epibranchials, are visible. These fragments bear slender pointed teeth.

The dorsal fin (Fig. 5) inserts at the level of the vertical through the midpoint of the orbit. Six rays of the fin pennant are preserved, with the pennant crest formed by the anteriormost dorsal rays.
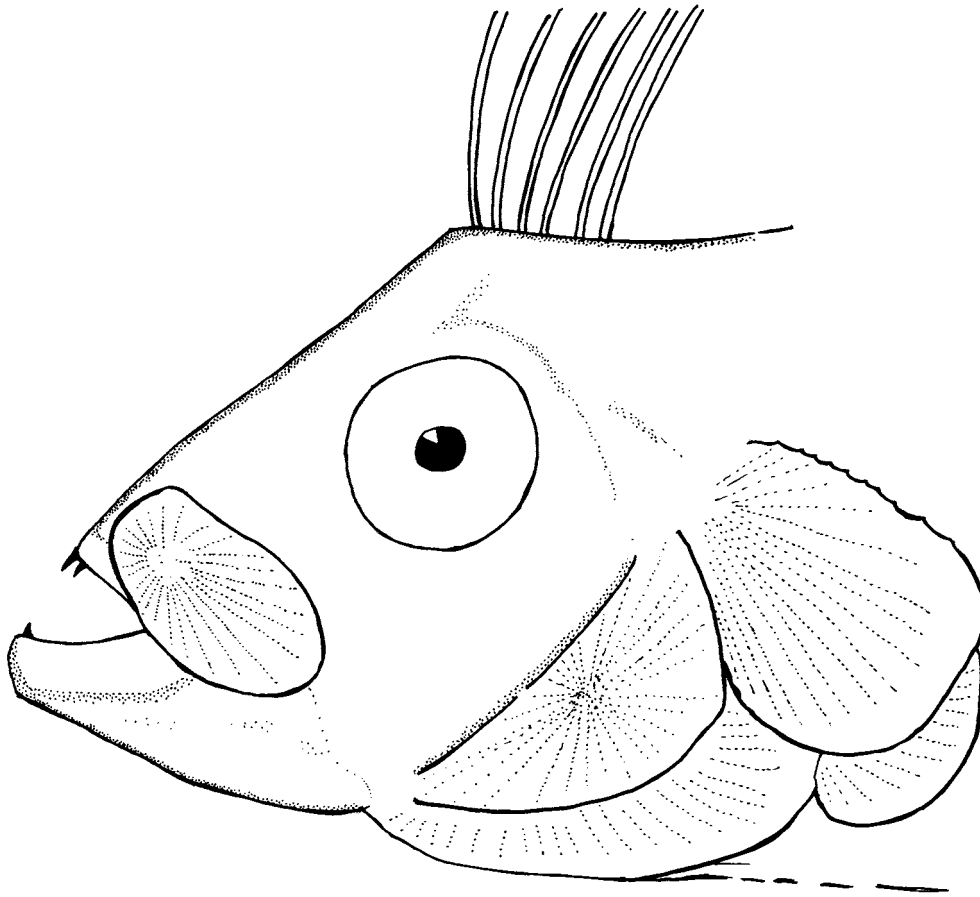
Figure 6. Reconstruction of *Trachipterus mauritanicus* nov. sp.

Each of these rays bears small lateral spinules. The distal parts of the dorsal-fin rays are not preserved, but they were probably well developed originally. The rays are supported by six pterygiophores. The anteriormost pterygiophore is greatly enlarged. The second pterygiophore is better developed relative to pterygiophores 3 to 6. The pterygiophores are inclined forward over the neurocranium. Although there are no preserved vertebrae, it is probable that the first pterygiophore inserted anterior to the first neural spine. Very little of the series of lateral line scales is preserved. A small stout pointed spine is visible on the slab. This spine is evidently displaced from its original position. Because of its morphology, this spine can be interpreted as the remnant of a lateral line scale (see, e.g. fig. 19 in Olney, Johnson & Baldwin, 1993).

4.b. Remarks

This new Miocene fossil can be unequivocally assigned to the Lampridiformes based on four synapomorphies (see Olney, Johnson & Baldwin, 1993): mesethmoid posterior to lateral ethmoids, elongate ascending process of the premaxilla that probably inserted into the frontal cradle, absence of palatine prong, and (presumed) insertion of the first dorsal-fin pterygiophore anterior to the first neural spine. The presence of the supraoccipital which separates the parietals, the orbitosphenoid which anteriorly contacts the mesethmoid, the (presumed) protrusibility of the mouth, and the presence of six branchiostegal rays also suggest its inclusion in the Lampridiformes (Regan, 1907). Several characters strongly support the assignment to the Trachipteridae, including (Olney, Johnson & Baldwin, 1993): absence of the supraoccipital crest, presence of first two dorsal-fin pterygiophores enlarged and inclined forward over the neurocranium, presence of a basisphenoid (Walters & Fitch, 1960), presence of lateral spinules on dorsal-fin rays (Olney, 1984), and presence of spines on lateral line scales. Also, the presence of stout pointed teeth in both jaws further confirm the species with the Trachipteridae (Palmer, 1986).

The family Trachipteridae consists of three genera (Fig. 7), *Desmodema*, *Trachipterus* and *Zu*, which clearly differ in general physiognomy (see, e.g. Fitch, 1964; Heemstra & Kannemeyer, 1984). Fishes of the genera *Desmodema* and *Zu* are characterized by the presence of abundant body scales (Walters & Fitch, 1960; Palmer, 1961), and the genus *Zu* can be distinguished by the presence of a small orbitosphenoid process (Oelschläger, 1983). The absence of an orbitosphenoid process and body scales therefore supports the inclusion of the new species in the
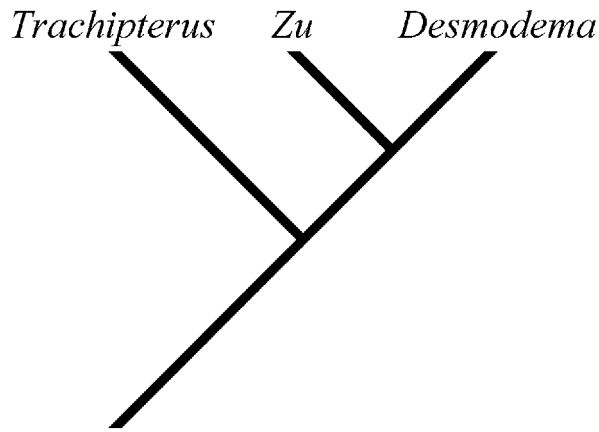
Figure 7. Cladogram summarizing Rosenblatt & Butler's (1977) proposal of interrelationships among Trachipteridae.
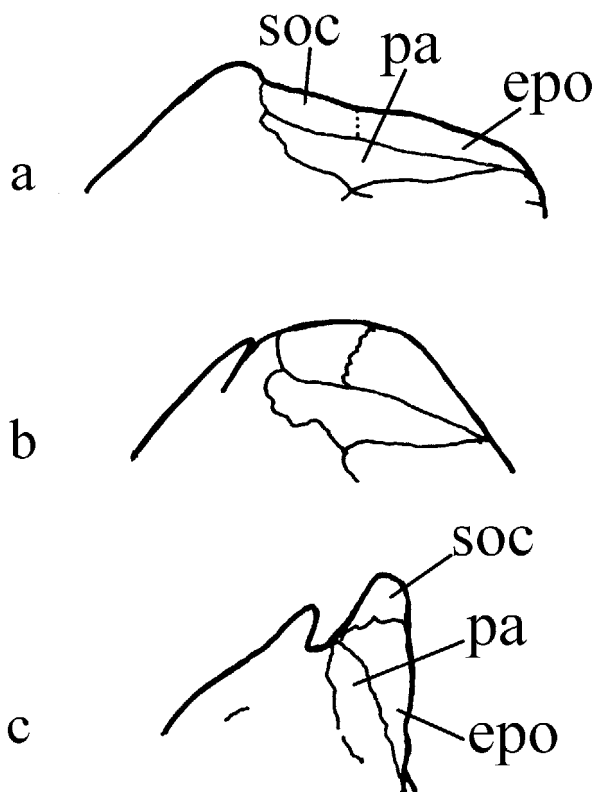

Figure 8. Comparison of the dorsal neurocranium bone arrangement in *Trachipterus mauritanicus* nov. sp. (a), *Trachipterus trachypterus* (b), and *Trachipterus articus* (c). (b) and (c) redrawn from Oelschläger (1983). Abbreviations: epo, epioccipital; pa, parietal; soc, supraoccipital.

genus *Trachipterus*. Although largely incomplete, the specimen can be easily assigned to a new species, especially by its neurocranial shape. The neurocranium of *Trachipterus mauritanicus* sp. nov. is more elongate and dorsally flattened with respect to that of its other congenerics (Regan, 1907; Oelschläger, 1983), and the dorsal portion of it has a characteristic arrangement of the bones (Fig. 8). As can be observed in Figure 8, the neurocranium of the other *Trachipterus* species, such

as *Trachipterus articus* and *Trachipterus trachypterus*, is deeper and shorter than that of *Trachipterus mauritanicus* sp. nov. The new species also differs from congenerics by the position of insertion of the dorsal fin. As described above, the dorsal fin of *Trachipterus mauritanicus* sp. nov. inserts at the level of the vertical through the midpoint of the orbit. The insertion of the dorsal fin is always situated well posterior to the orbit, at least behind the vertical through the posterior margin of the orbit in *Trachipterus altivelis*, *Trachipterus arawatae* and *Trachipterus trachypterus* (see, e.g. Walters & Fitch, 1960; Palmer, 1961; Nishimura, 1963; Fitch, 1964; Tortonese, 1970; Heemstra & Kannemeyer, 1986). A further character may be of relevance for evaluating the systematic placement of the new species: the presence of an endopterygoid ridge that extends onto the ectopterygoid and palatine. Such an endopterygoid ridge also is present in *Radiicephalus elongatus* (see fig. 11 in Olney, Johnson & Baldwin, 1993). Although additional more complete specimens are needed to improve our understanding of the relationships of *Trachipterus mauritanicus* sp. nov., it is interesting to note an high degree of resemblance, at least in its jaws and opercular bones morphology, to the extant *Trachipterus arawatae* (see May & Maxwell, 1986), a species that commonly occurs off South Africa (Heemstra & Kannemeyer, 1986), Australia (May & Maxwell, 1986), and New Zealand (Paulin *et al.*, 1989).

5. Discussion

In his review of the fossil record of teleostean fishes, Patterson (1993) provided a scheme of the stratigraphic range of the Lampridiformes. The Trachipteridae were excluded in this scheme, as well as the Radiicephalidae, Regalecidae and Stylephoridae. Similar results were later discussed by Bannikov (1999), who listed fossil taxa belonging to this order. Although reported by neither of these authors, fossil remains assigned to the Trachipteridae were described by Bassani (1905) from the Pleistocene clay of Taranto, Apulia, southern Italy. This author described two largely incomplete specimens assigned to the species *Trachipterus iris* (= *Trachipterus trachypterus*). Unfortunately, these specimens were not figured and their description does not allow a precise taxonomic assessment. Bassani was dubious about the placement of the specimens, suggesting some affinities with the Regalecidae. The putative trachipterid material was lost and not re-examined in the later studies of the Taranto ichthyofauna (D'Erasmo, 1922; Montcharmont-Zei, 1957). However, the description of the two Pleistocene specimens from Taranto by Bassani (1905) contains no mention of features that could be interpreted as lampridiform and trachipterid synapomorphies as listed by Olney, Johnson & Baldwin (1993). For these reasons, *Trachipterus mauritanicus* sp. nov. should be

considered as the first confirmed representative of the family Trachipteridae in the fossil record.

Taeniosomus lampridiforms are poorly represented in the fossil record. Members of the Radiicephalidae, Regalecidae and Stylephoridae are not known as fossils, whereas the Lophotidae are represented by at least three fossil genera. The earliest Lophotidae, *Eolophotes lenis*, was described by Daniltschenko (1962) from the Middle Eocene of Georgia. Arambourg (1943) described *Lophotes elami* based on two specimens, which are housed at the Laboratoire de Paléontologie of the MNHN in Paris, from the Oligocene deposits of Elam, Iran. This species was later reanalysed (Walters, 1957) and referred to the new genus *Protolophotus* (see also Arambourg, 1967). Oelschläger (1979) discussed the systematic status of the Iranian specimens and concluded that they belonged to separate taxa. He erected the new genus *Protomecichthys* for one of the specimens (the paratype MNHN EIP11), because of its resemblance to the extant lophotid genus *Eumecichthys*. However, he did not provide a formal diagnosis and description of the new taxon, thereby not fulfilling the requirements of the International Code of Zoological Nomenclature. Thus, as suggested by Bannikov (1999), the genus *Protomecichthys* is not valid. Examination of the Iranian specimens (MNHN EIP10; MNHN EIP11) revealed a clear taxonomic separation for the two fossil specimens. In agreement with the observations of Oelschläger (1979), one of the specimens (MNHN EIP11) shows strong similarities with the extant lophotid *Eumecichthys*. However, a more detailed morphological study of these fossils to elucidate their status is strongly recommended. An additional lophotid, *Oligolophotes fragosus*, was recently reported by Bannikov (1999) from the Lower Oligocene sediments of the Pshekha Formation, northern Caucasus.

Although rather rare, fossil bathysomous lampridiforms are characterized by an amazing disparity. The two living families, Lamprididae and Veliferidae, plus two exclusively extinct families, Palaeocentrotidae and Turkmenidae, and several taxa of difficult phylogenetic placement, are currently known as fossils. The Veliferidae are known from the Late Cretaceous (Campanian) from Nardò, Apulia, southern Italy (Sorbini & Sorbini, 1999), and another taxon, *Veronavelifer sorbinii*, was described by Bannikov (1990) from the Eocene of Monte Bolca, Italy. The only fossil Lamprididae, *Lampris zatima*, was described by various authors (Jordan & Gilbert, 1920; Jordan, 1925, 1927; David, 1943) from the Upper Miocene diatomites of Lompoc, California. The family Palaeocentrotidae was established by Bonde (1966) to accommodate *Palaeocentrotus boeggildi* from the Lower Eocene of the Fur Formation, Denmark (Kühne, 1941), originally described as a zeomorph. A brief description of an additional *Palaeocentrotus* specimen from the Lower Paleocene (Danian) of Denmark was provided by Bonde (1992). The probably related genus *Bathysoma* was described by Davis (1890) from the Lower Paleocene (Danian) of Scania, southern Sweden. This genus has been assigned over many years to several perciform families (Woodward, 1901; Jordan, 1923; Romer, 1945; Bertin & Arambourg, 1958; Patterson, 1964), and later to the Lampridiformes (Patterson, 1968). Patterson (1968) considered it to be a member of the Veliferidae but he also noted its similarities to *Palaeocentrotus*. Slightly younger fragmentary *Bathysoma* specimens were recently collected in Sealand, Denmark, from erratic boulders of Late Paleocene age (Bonde, 1992). The family Turkmenidae comprises three genera, *Analectis* from the Upper Eocene and Lower Oligocene of the northern Caucasus (Daniltshenko, 1980; Bannikov & Parin, 1997), and *Danatinia* and *Turkmene* from the Upper Paleocene of Turkmenistan (Daniltshenko, 1968). Bannikov (1999) provided a detailed diagnosis of the family and genera. A further undescribed turkmenid taxon (aff. *Analectis*) was reported by Bonde (1987, 1997) from the Lower Eocene of Denmark. Bonde (1995) also reported a probable juvenile lampridiform from the same strata. An additional unusual fossil lampridiform, *Bajaichthys elegans*, was described by Sorbini & Bottura (1988) from the Eocene of Monte Bolca, Italy. This fish is known from a single juvenile individual, and it is probably a member of a new family. Finally, according to Bonde (1995), the genera *Goniocranion* and *Whitephippus* from the Eocene London Clay Formation (Casier, 1966) must be considered typical lampridiforms.

The origin of the Lampridiformes is not clear. Some Cretaceous fossils (*Aipichthys*, *Araripichthys* and *Pharmacichthys*) previously considered as related to this order (Rosen & Patterson, 1969; Silva Santos, 1985), are now placed within other euteleostean groups (see, e.g. Gayet, 1981; Maisey & Blum, 1991; Olney, Johnson & Baldwin, 1993; Otero & Gayet, 1995; Arratia & Chorn, 1998; Cavin, 2001; Maisey & Moody, 2001). The basal position of the Veliferidae is supported by the fossil record (see Sorbini & Sorbini, 1999). The Eocene occurrence of the Lophotidae implies that its sister taxa, Lamprididae, Stylephoridae, and Radiicephalidae, should have been present as well, suggesting a probable divergence of the two lampridiform lineages (Bathysomi and Taeniosomi) at least in the Paleocene. Also, the Miocene occurrence of trachipterids consequently suggests that their sister group, the Regalecidae, were already present at that time.

6. Conclusion

Trachipterus mauritanicus sp. nov. is the eighth member of the Messinian ichthyofauna from Sidi-Brahim. This ichthyofauna was described by Arambourg (1927), together with those from other localities of

northwestern Algeria (Raz-el-Aïn, Les Planteurs, Gambetta, Saint Denis du Sig). Arambourg (1927, 1929) reported the presence of clupeids (*Alosa elongata*), sternoptychids (*Argyopelecus logearti*, *Maurolicus muelleri*), paralepidids (*Paralepis albyi*), myctophids (*Hygophum probenoiti*, *Myctophum columnae*) and bregmacerotids (*Bregmaceros albyi*) at Sidi-Brahim. Bregmacerotid skeletons were by far the most common elements of the fauna. The composition of the fauna clearly reflects the palaeoecological conditions of the depositional environment during diatomitic sedimentation. Arambourg (1927) interpreted the Sidi-Brahim ichthyofauna as a midwater assemblage. The occurrence of clupeids is restricted to a few scales found in the upper fossiliferous layers. The occurrence of a trachipterid in the diatomites of Sidi-Brahim is consistent with the ecological information furnished by other taxa (except *Alosa elongata*). Thus, like its other congenerics, *Trachipterus mauritanicus* sp. nov. was probably a mesopelagic fish.

After a cursory survey of the teleost fossil record, it is interesting to observe that to date, two families, Labrisomidae (*Labrisomus pronuchipinnis*) and Tripterygidae (*Tripterygion pronasus*), were known as fossils only from the Messinian deposits of the Oran region. In addition, these Algerian localities also provided the only fossil skeletal remains of the families Batrachoididae (*Halobatrachus didactylus*), Cepolidae (*Cepola cuneata*) and Pinguipedidae (*Parapercis mesogea*). The occurrence of the first fossil trachipterid in this area greatly reinforces the idea that the Miocene ichthyofaunas from the Oran region are of crucial importance for the fossil record of the Teleostei.

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