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SOME CONSIDERATIONS ON THE NOMENCLATURAL AND TAXONOMIC STATUS OF THE UPPER MIOCENE OCEAN SUNFISH *ORTHAGORISCUS (MOLA) LATHANICUS* GAGNAISON & BOUILLY, 2009

Abstract - A. COLLARETA, G. CARNEVALE, *Some considerations on the nomenclatural and taxonomic status of the upper Miocene ocean sunfish Orthagoriscus (Mola) lathanicus Gagnaison & Bouilly, 2009.*

The family Molidae comprises one of the tetraodontiform lineages with the least known fossil record. Each new addition to the short list of extinct molid taxa significantly contributes to shed light on the patterns of diversity and distribution of ocean sunfishes through time. This is particularly true for the Miocene, which is regarded as an interval of increased abundance and diversity of ocean sunfishes worldwide. Here, we reconsider the nomenclatural status of the fossil ocean sunfish taxon *Orthagoriscus (Mola) lathanicus* Gagnaison & Bouilly, 2009 from the upper Miocene of central-western France and argue that it represents an unavailable species name in light of the ICZN Code's criteria. In addition, we briefly discuss the taxonomic significance of the specimens that have been assigned to *Orthagoriscus (Mola) lathanicus* in the broader framework of the upper Miocene fossil record of the family Molidae from the Northeastern Atlantic region. We conclude that these fossils are too fragmentary to comprise the hypodigm of a new species, and should rather be regarded as not diagnostic below the family-level.

Key words - Gymnodontes, International Code of Zoological Nomenclature, molas, Molidae, nomenclature, palaeoichthyology, vertebrate palaeontology, taxonomy, Tetraodontiformes, Tortonian-Messinian

Riassunto - A. COLLARETA, G. CARNEVALE, *Alcune considerazioni sullo status nomenclaturale e tassonomico del pesce luna tardo-miocenico Orthagoriscus (Mola) lathanicus Gagnaison & Bouilly, 2009.*

La famiglia Molidae costituisce una delle linee evolutive di tetraodontiformi il cui record fossile è più frammentario. Ogni nuova aggiunta alla breve lista dei taxa estinti di molidi contribuisce in modo significativo a far luce sui pattern di diversità e distribuzione dei pesci luna nel corso del tempo geologico. Ciò è particolarmente vero per il Miocene, che sembra rappresentare un intervallo temporale di grande abbondanza e diversità dei pesci luna in tutto il mondo. Nel presente lavoro si riconsidera lo status nomenclaturale del taxon fossile *Orthagoriscus (Mola) lathanicus* Gagnaison & Bouilly, 2009 dal Miocene superiore della Francia centro-occidentale e si sostiene che esso rappresenti un nome specifico non disponibile alla luce dei criteri del codice ICZN. Inoltre, si discute brevemente il significato tassonomico degli esemplari che sono stati assegnati a *Orthagoriscus (Mola) lathanicus* nel quadro più ampio della documentazione fossile tardo-miocenica della famiglia Molidae nell'Atlantico nord-orientale. Si conclude che tali fossili sono troppo frammentari per costituire l'ipodigma di una nuova specie e dovrebbero piuttosto venir considerati come non diagnostici a livelli tassonomici inferiori a quello di famiglia.

Parole chiave - Gymnodontes, Codice Internazionale di Nomenclatura Zoologica, pesci luna, Molidae, nomenclatura, paleoittologia, paleontologia dei vertebrati, tassonomia, Tetraodontiformes, Tortoniano-Messiniano

INTRODUCTION AND RATIONALE

Currently, ocean sunfishes (family Molidae) comprise five species in three genera (*Mola*, *Masturus* and *Ranzania*) of large-bodied, extremely autapomorphic gymnodont fishes. Members of the genera *Masturus* and *Mola* can grow to titanic dimensions, up to more than 3 metres in total length as well as approximately 2 tons in body mass (e.g., Gudger, 1928; Santini & Tyler, 2002). Molids are widely regarded as comprising some of the most fecund extant vertebrates, with a single female of *Mola mola* being capable of producing up to 300 000 000 eggs during a single spawn (e.g., Schmidt, 1921; Parenti, 2003). Similarly impressive is the body outline of the ocean sunfishes, which appear as 'half fish' with the posterior portion cut off (McCann, 1961).

As far as palaeontology is concerned, molids comprise one of the tetraodontiform lineages with the least known fossil record (Carnevale *et al.*, 2021, and references therein). Each new addition to the short list of extinct molid taxa is thus remarkable on its own and significantly contributes to shedding light on the patterns of diversity and distribution of ocean sunfishes through time. This is particularly true for the Miocene, which is regarded as an interval of increased abundance and diversity of ocean sunfishes worldwide (Carnevale & Godfrey, 2018; Carnevale *et al.*, 2021; Collareta *et al.*, 2021; Gouiric-Cavalli *et al.*, 2021).

Here, we reconsider the nomenclatural status of the fossil ocean sunfish taxon *Orthagoriscus (Mola) lathanicus* Gagnaison & Bouilly, 2009 from the upper Miocene of central-western France. In addition, we briefly discuss the taxonomic significance of the specimens that have been assigned by Gagnaison & Bouilly (2009) and Gagnaison *et al.* (2015) to *Orthagoriscus (Mola) lathanicus* in the Northeastern Atlantic region.

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RESULTS AND DISCUSSION

Gagnaison & Bouilly (2009) described and figured an isolated premaxillary beak from the Upper Miocene (Tortonian-Messinian) ‘faluns’ of Channay-sur-Lathan (Indre-et-Loire, France), which they correctly identified as belonging to the family Molidae. Representing the first fossil find of an ocean sunfish from central-western France, this remarkable specimen was contextually assigned to the then new species *Orthagoriscus (Mola) lathanicus* Gagnaison & Bouilly, 2009. However, this species-level name does not seem to match the minimum criteria for availability as set by Article 16.4 of the International Code of Zoological Nomenclature (ICZN, 1999) for the reasons that are detailed below.

Whereas Gagnaison & Bouilly (2009) based the creation of *Orthagoriscus (Mola) lathanicus* on the specimen depicted in their figures 4-9, the latter was not explicitly designated as a name-bearing type for this species. Since Article 16.4.1 of the ICZN Code indicates that species names published after 1999 must be accompanied by the explicit fixation of a holotype, *Orthagoriscus (Mola) lathanicus* is an unavailable species name in light of the ICZN Code’s criteria. It may be argued that Gagnaison & Bouilly (2009) clearly based their new species description on a single specimen, hence the fixation of the latter as holotype by monotypy (ICZN, 1999: Article 73.1.2). However, holotype fixation by monotypy may not represent a case of “explicit” fixation as required by Article 16.4.1, which instructively refers to Article 73.1.1 (dealing with holotype fixation by original designation) but not to Article 73.1.2, especially in the present case in which no unambiguous identifiers are provided for the studied specimen.

Further advocating against the availability of *Orthagoriscus (Mola) lathanicus* is the limited amount of information provided by Gagnaison & Bouilly (2009) about the repository of the specimen on which their species description relies (cf. ICZN, 1999: Article 16.4.2). In this respect, Gagnaison & Bouilly (2009) stated the following: “Actuellement, le fossile est toujours en cours d’étude au sein de l’Institut Polytechnique La Salle-Beauvais à Beauvais (Oise)” [=“Currently, the fossil is still being studied at the La Salle-Beauvais Polytechnic Institute in Beauvais (Oise)”]; authors’ own translation]. Such a sentence cannot be taken as “a statement of intent that they [i.e., the holotype or syntypes; authors’ note] will be (or are) deposited in a collection” (ICZN, 1999: Article 16.4.2), nor the subsequent sentence by Gagnaison & Bouilly (2009) about the eventual destination of a cast of the studied fossil is effective in satisfying the requirements set by Article 16.4.2 of the ICZN Code.

In addition to these considerations, we must also note here that the case for the availability of *Orthagoriscus (Mola) lathanicus* is further weakened by the lack of a species diagnosis in the original description (cf. ICZN, 1999: recommendation 13A; see also Cifelli & Kielan-Jaworowska, 2005).

While not directly affecting the availability of *Orthagoriscus (Mola) lathanicus*, the assignment of Gagnaison & Bouilly’s species to the genus *Orthagoriscus*, subgenus *Mola* is also problematic. Indeed, *Orthagoriscus* has been recognised as a junior synonym of *Mola* for most of the 20th century, and its usage has consequently been abandoned (e.g., Gregory & Raven, 1934; Fraser-Brunner, 1951; Tyler, 1980). There is no reason to resurrect the genus name *Orthagoriscus*, nor to regard *Mola* as a subgenus of *Orthagoriscus*.

The scope itself of Gagnaison & Bouilly’s species might also be discussed. Both the aforementioned specimen and the referred material (another premaxillary beak) reported on by Gagnaison *et al.* (2015) are incomplete and inadequately preserved. Gagnaison & Bouilly (2009) mentioned three characters as useful for distinguishing *Orthagoriscus (Mola) lathanicus* from other fossil molids, namely, i) a relatively small size, ii) a small number of lamellae (actually, “two series of – at least – five” lamellae, according to the authors) in the dentigerous zone of the premaxillary beak, and iii) the allegedly high (c. 85°) angle formed by the anterolateral margins of the beak. Of these three characters, the first appears to be poorly diagnostic, as it is likely related to ontogeny and smaller specimens are known from other palaeontological collections (e.g., Leriche, 1926: fig. 3; Weems, 1985: fig. 1). Similarly related to ontogeny might be the second character, as the number and extent of trituration teeth of living molas seemingly undergo extensive changes to their morphology with body size increase (e.g., Tyler, 1980; Porcasi & Andrews, 2001). Finally, a beak angle of 85° is consistent with similar measurements of several specimens assigned to *Ranzania grahami* Weems, 1985, *Ranzania tenneyorum* Weems, 1985 and *Mola pileata* (van Beneden, 1881) [= *Mola chelonopsis* (van Beneden, 1883)] from the Miocene of the Atlantic Coastal Plain, USA (average angle 84.5°, standard deviation $\pm 2^\circ$; Weems, 1985). Thus, none of the above morphological traits seem to provide consistent support for a species-level attribution of the specimens assigned to *Orthagoriscus (Mola) lathanicus* – that is, even if *Orthagoriscus (Mola) lathanicus* were an available name, it would still be a *nomen dubium*. More generally, the material studied by Gagnaison & Bouilly (2009) and Gagnaison *et al.* (2015) appears as too fragmentary to prove diagnostic below the family level; hence their best taxonomic identification as belonging to Molidae gen. et sp. indet.

CONCLUDING REMARKS

Summarizing, Gagnaison & Bouilly (2009) and Gagnaison *et al.* (2015) correctly identified and reported on two molid fossils from the Upper Miocene of central-western France. By adding to the fragmentary fossil record of ocean sunfishes, their studies are certainly useful and commendable. However, the species name *Orthagoriscus (Mola) lathanicus* is an unavailable name that should be abandoned. The molid specimens from the Savigné-sur-Lathan Basin are too fragmentary to comprise the hypodigm of a new species. A comprehensive reappraisal of the historical collections of fossil molids from the Netherlands (e.g., van Beneden, 1881, 1883; Leriche, 1926) and the study of new materials from the Tortonian of Belgium (Goolaerts *et al.*, 2020) informed by new observations on the intra- and interspecific skeletal variability of extant molids will hopefully shed new light on the alpha-diversity of ocean sunfishes in the Upper Miocene of the Northeastern Atlantic.

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