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A new mawsoniid coelacanth (Actinistia) from the Upper Cretaceous of Southern France

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ABSTRACT

Axelrodichthys megadromos sp. nov. is a coelacanth described based on a single specimen collected in the lower Campanian site of Ventabren motorway, Southern France. The new species is referred to the mawsoniids because of the ornamentation of the skull roof and of the proportionally wide supraorbital series. The specimen belongs to the *Mawsonia-Axelrodichthys* complex based on features present on the lower jaw and on the basisphenoid. The new species is referred to the genus *Axelrodichthys* because of proportions of its parietonasal shield and because of the arrangement of the posterior parietals relative to the supraorbitals. Autapomorphic characters, in particular on the parasphenoid, justify the inclusion of the specimen in a new species. The occurrence of a mawsoniid in the Ibero-Amorican Island that formed part of the European Archipelago in the terminal Cretaceous is an evidence of a dispersal event from the southern land masses. The occurrence of *A. megadromos* in the Campanian-Maastrichtian represents the last occurrence of mawsoniids worldwide, after a gap in the fossil record of about 30 million years. This belated occurrence of *Axelrodichthys* extends the time range of this genus to approximately 40 myr and suggests that this genus, together with its sister genus *Mawsonia*, were organisms with a slow morphologic evolution.

1. Introduction

The coelacanths (Actinistia) are represented by a single living genus, *Latimeria*, with two species, *L. chalumnae* and *L. menadoensis*. The fossil record of the lineage starts in the Early Devonian and ends in the Late Cretaceous, with a ca. 70 myr-long gap in the Cenozoic. In the Cretaceous, two families of actinistans are recorded: the Latimeriidae and the Mawsoniidae. The Latimeriidae are represented by two genera, *Macropoma* from the Upper Jurassic (Lambers, 1996) to the lower Upper Cretaceous of Europe (Forey, 1998) and *Megalocoelacanthus*, from the Santonian to the Campanian of the United States (Dutel et al., 2012). Both are from marine deposits. Mawsoniidae are represented in the Cretaceous by three genera. *Lualabaea*, known by the single species *L. lerichei* Saint-Seine, 1955 from the Lualabaea Series, Zaire, a series initially dated to the Late Jurassic but regarded now as an equivalent to the Brazilian Areado Group from Brazil, which is dated to the Berriasian (Sgarbi, 2000; Carvalho and Maisey, 2008). Although related to other mawsoniids, the status of this taxon is still debated (Forey, 1998; Carvalho and Maisey, 2008). *Mawsonia gigas* Woodward, 1907 (in Mawson and Woodward [1907]), which includes '*M. minor*' Woodward, 1908 (see Forey, [1998]) was described from the Lower Cretaceous of Bahia in Brazil. Subsequently, other occurrences of *Mawsonia* have been recorded from South America: *M. brasiliensis* Yabumoto, 2002, from the Aptian Santana Formation in Brazil, which includes *M.* cf *gigas* described by Maisey (1986) from the same Formation according to Yabumoto (2002), and *Mawsonia* sp. from the Upper Jurassic – Lower Cretaceous Tacuarembó Formation in Uruguay (Soto et al., 2012). In Africa, *M. libyca* Weiler, 1935 was recorded in the Cenomanian of Egypt, *M. ubangiensis* Casier, 1961 in the Berriasian-Hauterivian of Zaire, *M. lavocati* Tabaste, 1963 in the Cenomanian of Morocco, with subsequent material referred to the latter species by Wenz (1980, 1981), Cavin and Forey (2004) and Yabumoto and Uyeno (2005), and eventually *M. tegamensis* Wenz, 1975 in the Aptian of Gadoufaoua, Niger. In a study of abundant fragmentary material from the Lower Cretaceous of the Sanfranciscana Basin, Brazil, referred to a population of *M. gigas*, Carvalho & Maisey (2008) pointed out the great intraspecific

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morphological variability of the type species of *Mawsonia*. As a consequence, they regarded all the Brazilian species of *Mawsonia* (*M. brasiliensis*, *M. minor* and *M.* cf. *gigas* from Maisey [1986]), and two of the African species, *M. ubangiensis* and *M. libyca* as junior synonyms of *M. gigas*. They also consider *Mawsonia lavocati* as a *nomen vanum* because the holotype, an angular, does not show diagnostic characters.

Axelrodichthys was originally recognized in the Santana Formation with *A. araripensis* Maisey, 1986, then a second species, *A. maiseyi* Carvalho, Gallo & Santos 2013 was described from coeval beds in the upper part of the Codó Formation (middle – Late Albian) (De Carvalho et al., 2013). In Africa, isolated elements from the Cenomanian of Morocco (Cavin and Forey, 2004; Cavin et al., 2015), as well as an isolated extracapsular from the ?Santonian/Coniacan of Madagascar and a partial skull roof from the Aptian of Niger (Gottfried et al., 2004) have been referred to the genus *Axelrodichthys*. So far, all Cretaceous mawsoniids have been found exclusively in Gondwanian land masses (Miguel et al., 2014), except an isolated lower jaw bone discovered in the upper Campanian – lower Maastrichtian of Cruzy, France (Cavin et al., 2005).

Here we report skull remains referred to a new mawsoniid species from the Campanian locality of Ventabren motorway (southern France, Aix-en-Provence Basin), situated at approximately 250 km in straight line from the site of Cruzy (Herault Department) where the first angular of mawsoniid was found. The new specimen represents a new species of *Axelrodichthys*. The holotype and only known specimen was discovered and prepared by one of us (XV) and donated to the Musée des Dinosaures d'Espéraza, France, in 1997.

2. Geological setting

The specimen was collected near the motorway A8 area service close to the village of Ventabren (Bouches-du-Rhône Department, Southeastern France, Fig. 1) in a lower Campanian deposit (="Valdo-Fuvelian" local French stages). The outcrop corresponds to a sequence with a 45 °dip of lignitic marls interbedded with lacustrine limestones in the western part of the Aix-en-Provence basin. The fossiliferous level is a fine limestone located at the base of the section of the Fuvelian (Fig. 1C) which contains a vertebrate assemblage including fish remains referred to the Phyllodontidae and to a gar (Lepisosteidae) identified as *Atractosteus* cf. *africanus* (specimen MDE-F1 housed in the collection of the Musée des Dinosaures d'Espéraza, France, Cavin et al., 1996), and also turtle remains (*Polysternon provinciale* and *Solemys* sp., aff. *gaudryi* or aff. *vermiculata* [Lapparent de Broin & Murelaga, 1999]). The upper levels, rich in carbonates and paleosols have yielded at the place known as the "Puit du saule" some dinosaur eggs

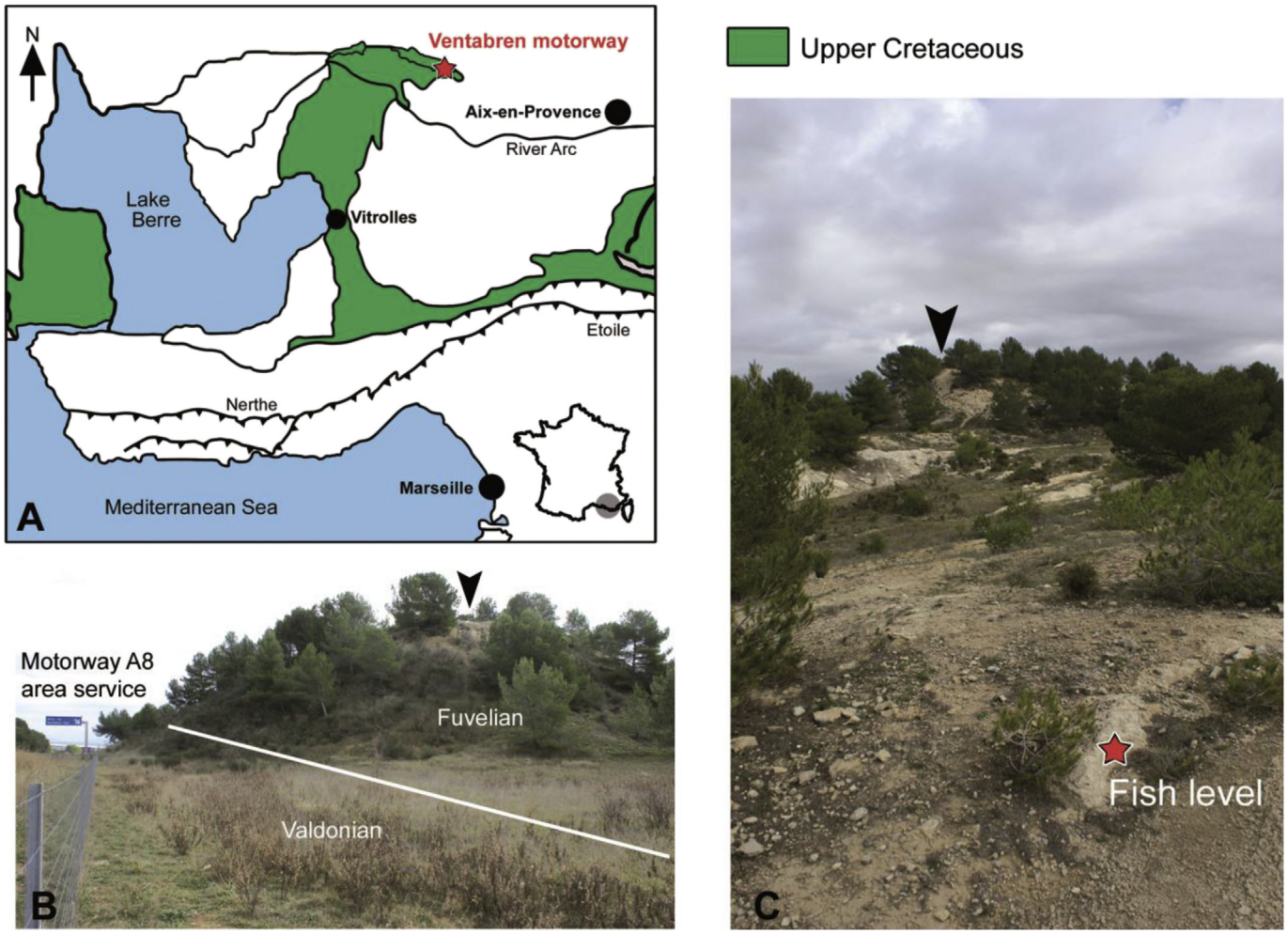

Fig. 1. A, Geographical location of the Ventabren motorway locality (indicated by a star) with the distribution of the Cretaceous deposits (in green). B, view of the site with indication of the limit between the Valdonian-Fuvelian local stages (lower Campanian); C, view of the fossiliferous level. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article).