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Original article

Vertebrate microremains from the Early Cretaceous of southern Tunisia☆

Microrestes de vertébrés du Crétacé inférieur du Sud tunisien

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Abstract

Microremains of various sharks, actinopterygians and crocodiles have been recovered from two sites in the Douiret Formation and three sites in the Aïn el Guettar Formation in southern Tunisia. The presence of an actinistian is also suggested based on histological study of hemisegments of lepidotrichia. Convergence in dental enameloid microstructure between neoselachian sharks and actinopterygians sharing a tearing dentition is also documented. The vertebrate assemblage of the Douiret Formation suggests a pre-Aptian age for this formation and the presence of *Bernissartia* in the Aïn el Guettar Formation confirms faunal exchange between Africa and Europa during the Early Cretaceous.

Keywords: Continental Intercalaire; Sharks; Actinopterygians; Actinistians; Crocodiles

Résumé

Des microrestes de plusieurs requins, actinoptérygiens et crocodiles ont été recueillis dans deux sites de la Formation Douiret et trois sites de la Formation Aïn el Guettar dans le Sud tunisien. La présence d'un actinistien est également suggérée d'après des études paléohistologiques d'hémisegments de lépidotriches. Une convergence dans la microstructure de l'émailloïde dentaire des requins néosélaciens et des actinoptérygiens partageant une denture de type arracheur est également illustrée. La faune de vertébrés de la Formation Douiret indique un âge pré-Aptien pour cette formation et la présence de *Bernissartia* dans la Formation Aïn el Guettar confirme que des échanges faunistiques ont eu lieu entre l'Afrique du Nord et l'Europe durant le Crétacé inférieur.

Mots clés : Continental Intercalaire ; Requins ; Actinoptérygiens ; Actinistiens ; Crocodiles

1. Introduction

Fossil vertebrate remains have long been reported from the Mid-Cretaceous "continental intercalaire" of the Tataouine region, southern Tunisia (Pervinquière, 1912; de Lapparent, 1951, 1960; Tabaste, 1963; Schlüter and Schwarzhans, 1978; Bouaziz et al., 1988). These layers were usually considered as continental deposits, but recent fieldwork in this area from 1995–2005 has yielded a wealth of new data concerning both fossil vertebrates and plants, which indicate a greater marine influence on the deposits than previously suspected (Barale, 1999, 2007; Benton et al., 2000; Barale and Ouaja, 2001; Buffetaut and Ouaja, 2002; Cuny et al., 2004; Srarfi et al., 2004; Anderson et al., 2007). However, most of the above-mentioned publications focused on rather large, at least centimetric, fossils, and very few studies have been conducted on vertebrate microremains, the size of which lies between 10 and 0.5 mm, except for the study of the shark faunas (Cuny et al., 2004) and taphonomic and geochemical studies (Anderson et al., 2007). Anderson et al. (2007) provided a taxonomic diversity analysis of four localities (Jebel Boulouha North side, Oued el Khil, Touil el Mra and Oum

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ed Diab), but without description of the fossils. They reported the presence of teeth of *Priohybodus* sp., *Hybodus* sp., *Onchopristis* sp. as well as indeterminate dermal denticles. Concerning actinopterygians, they reported teeth of *Lepidotes* and Caturidae, as well as indeterminate vertebrae, scales and lepidotrichia. They also mentioned reptilian teeth and claws, as well as crocodile teeth and scutes. Taphonomic and geochemical studies of these faunas allowed Anderson et al. (2007) to reach the following conclusions: the Jebel Boulouha North side assemblage (Douiret Formation) was interpreted as a terrestrial carbonate-rich environment with relatively little mixing. The Touil el Mra assemblage (Aïn el Guettar Formation) suggested a marginal marine environment with some mixing of previously interred bones. The Oued el Khil and Oum ed Diab assemblages (Aïn el Guettar Formation) are more equivocal, suggesting mixed freshwater and marine influences.

The present paper aims to describe in detail the most significant vertebrate microremains from these four sites, as well as fossils from Oued Zefrat, a site that was not included in the previous studies by Cuny et al. (2004) and Anderson et al. (2007), and to discuss their importance for a better understanding of the evolution of the Tunisian Lower Cretaceous faunas. Description of the chondrichthyan component of the faunas is not repeated here, and we refer instead to Cuny et al. (2004), except for new records not previously reported.

2. Geological setting

The main vertebrate-bearing units within the ''continental intercalaire'' are of Early Cretaceous age and the localities in the Tataouine Basin are exposed along the Dahar Cliff, which runs for about 300 km in a roughly N-S direction along the northeastern margin of the basin (Fig. 1). The five localities included in this study belong to two different formations: the Douiret Formation, which belongs to the Merbah el Asfer Group and is considered Aptian in age, although it is likely to be a little older (Barremo-Aptian, Le Lœuff et al., 2010), and the Aïn el Guettar Formation, which is early Albian in age and divided into two members, the Chenini Member below and the Oum ed Diab Member above (Ouaja, 2003 in Barale, 2007).

The Douiret Formation is 90 m-thick and consists mainly of sandstone in its lower part and of mudstone in its upper part

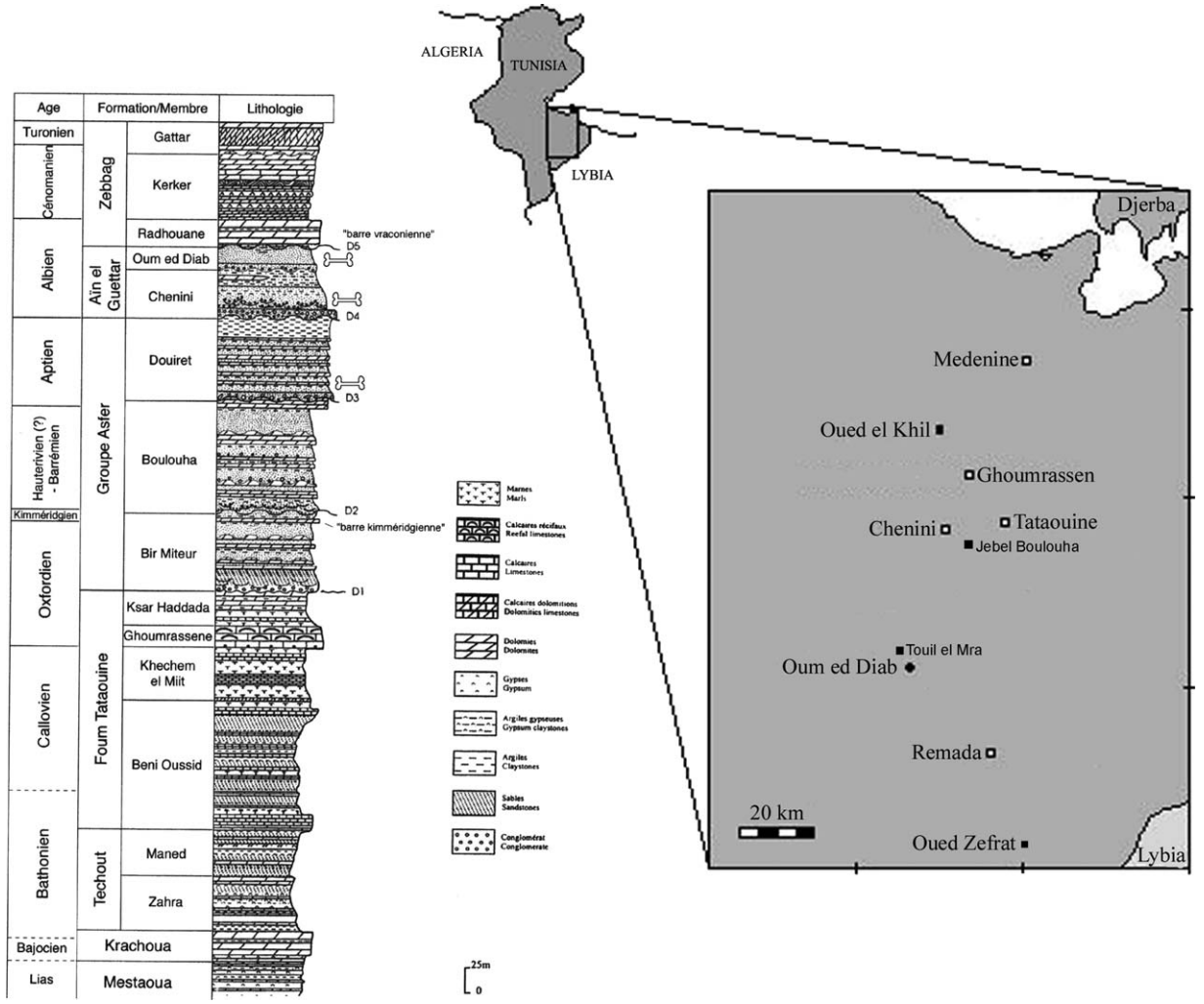

Fig. 1. Stratigraphy and location. Left: simplified stratigraphy of the Jurassic-Cretaceous succession on the Dahar plateau in southern Tunisia (modified from Srarfi, 2006). Right: location (black squares) of the localities mentioned in the text (modified from Buffetaut and Ouaja, 2002).