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Original article

Discovery of a Charophyte locality and Biostratigraphy of the continental Eocene deposits of Oued Méridja (southwestern Algeria)

Découverte d'un gisement de Charophytes et Biostratigraphie de l'Éocène continental d'Oued Méridja (sud-ouest algérien)

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Abstract

The continental deposits of Oued Méridja area (west of Bechar, southwestern Algeria) have been assigned by previous authors to the early Eocene on the basis of lacustrine gastropod fauna (*Pseudoceratodes*). This study reports new paleontological and biostratigraphic data from the Oued Méridja section. Recent field investigations resulted in the discovery of an important charophyte assemblage, composed of five species belonging to four genera: *Maedleriella cristellata*, *Maedleriella* aff. *cristellata*, *Harrisichara* aff. *leptocera*, *Peckichara disermas* and? *Gyrogona* sp. This association allows to suggest a late Thanetian to early Ypresian age for this locality.

Keywords: Charophytes; Lacustrine gastropods; Early Eocene; Biostratigraphy; Oued Méridja; Bechar; Southwestern Algeria

Résumé

Les dépôts continentaux de la région de l'Oued Méridja (ouest de Bechar, sud-ouest Algérien) ont été rapportés par les anciens auteurs à l'Éocène inférieur grâce à une faune de gastéropodes lacustres (*Pseudoceratodes*). Il s'agit ici de présenter de nouvelles données paléontologiques et biostratigraphiques issues de la coupe de l'Oued Méridja. L'étude détaillée de ces niveaux a permis la découverte d'une importante flore de charophytes, composée de cinq espèces appartenant à quatre genres : *Maedleriella cristellata*, *Maedleriella* aff. *cristellata*, *Harrisichara* aff. *leptocera*, *Peckichara disermas* et ? *Gyrogona* sp. Cette association a permis de proposer à ce gisement un intervalle stratigraphique allant du Thanétien supérieur à l'Yprésien inférieur.

Mots clés : Charophytes ; Gastéropodes lacustres ; Eocène inférieur ; Biostratigraphie ; Oued Méridja ; Bechar ; Sud-ouest Algérien

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1. Introduction

The present work reports the paleontological and stratigraphical study of newly discovered charophyte-bearing layers from the Cenozoic hamadian deposits of the Oued Meridja area, in the northwestern Sahara (southwest Algeria). It also provides, for the first time in this site, an interesting association of fauna and charophyte flora.

Earlier studies carried out east of the Méridja region have yielded only very few paleontological data, based on the continental gastropod *Pseudoceratodes* and encrusting algae. The *Pseudoceratodes*-bearing lacustrine limestones allowed Jodot (1953a) to describe species *Pseudoceratodes clariondi* and to suggest an early Eocene age for these deposits.

As part of his doctoral research on Paleocene and Eocene continental formations of Algeria, Mahboubi (1995) conducted a geological and stratigraphical study of these continental Eocene deposits, near the village of Méridja, describing a sedimentary succession divided in a transitional, lower and upper member. This section was re-studied by Adaci (2012) who reported stromatolites and some unidentified gastropods in lacustrine limestones from the lower units.

A second fossiliferous locality was discovered further to the west, in fluvial deposits belonging to the Hamada de Méridja and overlying the strata studied by Mahboubi (1995), which was assigned a middle or late Eocene age, on the basis of a sparse flora of charophytes [*Peckichara* sp., *Nitellopsis* (*T.*) *thaleri* and *Raskyella* sp.; identified by F. Mebrouk] and an assemblage of terrestrial gastropods, composed of Bulimes and Helicids (Adaci, 2001; Adaci et al., 2005). Recent paleontological study of Bulimes fauna from both the Hamada de Méridja and Djebel Mékaïdou (Oran High Plains) based on statistical methods, has allowed Gaouar (2009) to review the age of these localities, particularly that of Djebel Mékaïdou. More recently, The Bulimes from the Hamada de Méridja Formation have been taxonomically revised with the description of a new genus and species (Hammouda et al., accepted). Also, Hammouda et al. (2015) dated this formation as early–middle Eocene in age based on the fossil Boraginaceae nutlets (*Boraginocarpus algeriensis*) and charophyte gyrogonite assemblage (*Peckichara* and *Harrisichara*) present in this formation.

With the aim to refine the continental Eocene section, near the eastern extremity of the Hamada de Méridja, we have carried out various field campaigns in the Oued Méridja area. Charophytes, ostracods, gastropods and fish teeth were identified. The discovery of these new fossiliferous layers led to the enrichment of the paleontological inventory of this area and also allows consequently a more precise stratigraphic attribution of these deposits.

2. Geographical and geological setting

2.1. Geographical Setting

A large proportion of the desert area situated in the northwestern corner of the Algerian Sahara is constituted by stony plateaus largely devoid of sand, called "Hamadas". The Hamadas west of Bechar include the large Hamada de Guir, and two other Hamadas, known as the Hamada de Oum es Sbaa and the Hamada de Méridja.

The Hamada de Oum es Sbaa corresponds to a vast plateau that runs almost east-northeast to west-southwest, stretching from Bechar to the eastern bank of Oued Guir, where a continuous cliff on its southern edge forms a "second barga" (Hamada alongside the Bechar–Kenadsa–Méridja road). This tabular formation is dominated by the Gours (flat-topped hills with steep sides) of Ziar, Gola and Oum es Sebaa.

The Hamada de Méridja covers a large area between Oued Guir east of Méridja and the Hamada de Boudenib in Morocco. It includes two quite distinct stony plateaus, the plateau of Méridja to the East and that of Dermchane to the West, the latter of which is the lateral continuation of the Hamada de Boudenib in Morocco.

Our study was carried out in the Oued Méridja area, at the eastern extremity of the Hamada de Méridja, about seventy kilometers west of Bechar (see Fig. 1).

2.2. Geological setting

The hamadian deposits of the northwestern Sahara range in age from Eocene to Pliocene. West of Bechar, Neogene deposits are present in the large Neogene Hamada de Guir which is slightly tilted from north to south. The Paleogene Hamadas include Hamada de Oum es Sbaa (*Ceratodes* Hamada) and Hamada de Méridja (*Clavator* Hamada) (see Fig. 2).

These mainly detrital formations, have a long and controversial chronostratigraphic history, as paleontological arguments are sparse. A variety of ages was suggested for these deposits, including the Senonian (Menchikoff, 1946; Lavocat, 1954), Eocene–Oligocene or Miocene–Pliocene (Deleau, 1952).

To the east of the Méridja locality, north of the Bechar–Kenadsa–Méridja axis, outcrops of lacustrine limestones contain the gastropod *Pseudoceratodes* (Clariond, 1939); these deposits were informally named "*Ceratodes* Hamada" and the limestones were assigned an early Eocene age by Jodot (1953a).

Originally suggested as Oligocene in age [geological survey sheets "Hamada de Guir" (Choubert, 1950) and "Morocco-west Algeria" (Anonymous, 1952)], the Hamada de Méridja and nearby Moroccan Hamada de Boudenib deposits, contain terrestrial gastropods identified as *Clavator* at the time, were informally referred to as "*Clavator* Hamada" by Jodot (1953b), who hypothesized an early Miocene (Aquitanian) age of deposition. However, the Hamada de Boudenib, was assigned to the middle–upper Eocene after a taxonomic revision of the Bulimes gastropod fauna it was found to contain (Truc et al., 1987; Truc, 1988, 1989; El Youssi et al., 1989; El Youssi, 1993).

The Paleogene continental deposits of both the Méridja and Oum es Sebaa Hamadas unconformably overlie the marine Cretaceous deposits (Adaci et al., 2005).

The detailed litho- and biostratigraphical study conducted in the Oued Méridja area, eastern extremity of the Hamada de Méridja, covers a part of the deposits referred as "*Ceratodes* Hamada" deposits (Jodot, 1953a). This section is essentially

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