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A new vertebrate-, ostracod-, and charophyte-bearing locality in the Middle Jurassic of the Grands Causses (southern France)

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ABSTRACT

A new fossiliferous locality from the Middle Jurassic (Bathonian) of the Grands Causses (Gard, France) is described. The layer is rich in gyrogonites of *Porochara douzensis*. The only ostracod carapace found is identified as *Darwinula magna*. As for vertebrates, teeth of Hybodontiformes, teeth and scales of Semionotiformes, and one fragmentary tooth of Crocodyliformes have been collected and are determined as *Hybodus* sp., *Lepidotes* sp., and Atoposauridae indet., respectively. The assemblage is representative of a Jurassic coastal environment with freshwater ponds and lagoons.

1. Introduction

The Grands Causses are a group of high and extensive Jurassic carbonate plateaus situated in the South of the Massif Central (France). Lignitic deposits in the Grands Causses have been known and exploited since prehistoric time (Théry et al., 1995). The first mention of vertebrate remains in the lignites and associated clayey deposits of the Grands Causses are due to Bleicher (1871, 1872a,b), but it was not until 1966 that systematic prospecting for vertebrates was conducted in several localities by a team from the Freie Universität Berlin. The results of these efforts were, unfortunately, only partially published (Seiffert, 1969a,b; Kriwet et al., 1997).

Such field work was resumed by three of us (FK, RLA and DH) in 2007 and, especially, 2010, which permitted the collecting of vertebrate remains from a number of sites. The aim of this paper is to present the data obtained from a new locality.

Institutional abbreviations. MNCN, Museo nacional de Ciencias naturales-CSIC, Madrid, Spain; MHNG, Muséum d'Histoire naturelle de Genève, Geneva, Switzerland.

2. Materials and methods

The site is situated on the territory of the municipality of Revens (Gard, France), near the place named St.-Martin. It is a lignite exposure (N 44°04′16″; E 03°17′53″) visible in the pathway running alongside the river Dourbie and leading to abandoned mines (Fig. 1). It lies near the base of the Calcaire à Stipites Formation and is, therefore, Middle Bathonian in age (Early Bathonian *sensu lato*; ~167 Ma; Ciszak et al., 1999). A test sample of lignite was collected, screen-washed in fresh water in the field and dried. The resulting concentrated fraction (1.9 kg) was soaked in a solution of H_2O_2, dried again, and screen-washed in the laboratory. The remaining portion was then sorted manually under a binocular microscope. Despite the small size of the sample, a number of identifiable vertebrate specimens (teeth and scales) were found together with indeterminate bony fragments, a single ostracod carapace, a few gastropods, woody plant remains, and charophyte gyrogonites. This suggests that it is a remarkably rich site, which is reinforced by the fact that a more than eight times larger sample from a similar exposure in the same pathway, 160 m further north, yielded no vertebrate but a tiny bony fragment (scale?). The gyrogonites and the ostracod are housed in the MHNG (collection P.-O. Mojon, MHNG 60692-60693), whereas the microvertebrates are kept in the MNCN (provisional accession numbers MNCN KSM 1-21).

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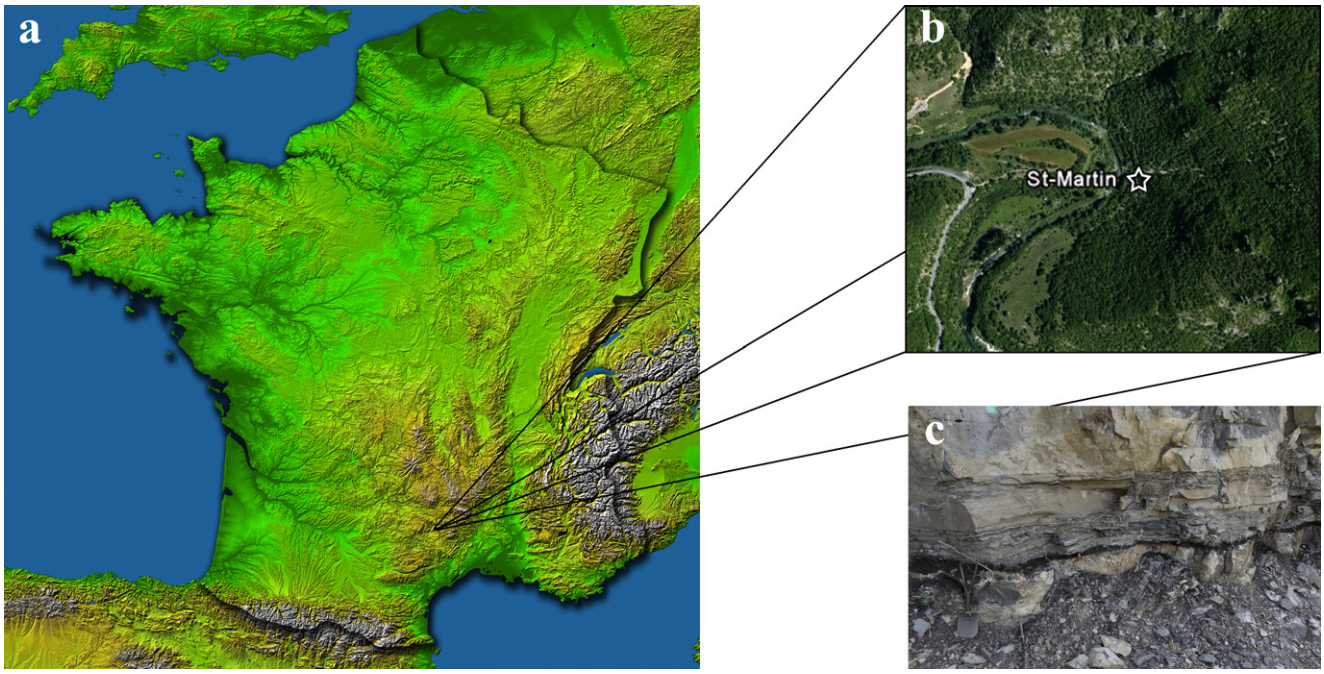

Fig. 1. Fossil locality: (a) location of the St.-Martin (Revens) area in France; (b) aerial photograph (850 m wide) with the location of the site (star) and (c) excavation point showing the blackish lignite layer (the shovel is 60 cm long).

3. Description and comparison

3.1. Charophytes

About 30 gyrogonites were retrieved. They are of middle size with five sinistrally spiraled, concave cells, ten whorls, a rose-shaped apical pore, and basal plate in two parts (Fig. 2a–d). They are easily recognized as belonging to the family Porocharaceae. Although the sample from St.-Martin is about 20% smaller than the type-specimens from Les Douzes (situated 15 km north), it can be identified as *Porochara douzensis* (Feist and Grambast-Fessard, 1984) Schudack, 1986 based in particular on the number of convolutions. Mojon (2002) interpreted the polymorphism observed in the gyrogonites of Porocharaceae as resulting mainly from environmental variations.

3.2. Ostracod

A single, well-preserved, particularly large-sized specimen of ostracod has been recovered. It has an elongate, oblong carapace and the external surface of the valves is smooth (Fig. 2e). These are characters found in *Darwinula magna* Rohr, 1976 (uncannily, this species appears to have been named independently but identically by a different author; cf. Ye et al., 1977, p. 258). The specimen is, therefore, identified as such even though we agree with Schudack (2006) that the systematics of this speciose genus is presently in a confused state.

3.3. Chondrichthyans

Eleven fragmentary crowns were found (Fig. 3). The largest specimen consists of a main (?) cusp and a lateral cusplet and measures about 2.5 mm mesio-distally and 1.7 mm baso-apically. The highest isolated cusps in the sample reach 2.2 mm in height. The best preserved crowns consist only of two cusps, which might represent two lateral cusplets or a main cusp and a lateral cusplet. These cusps are triangular in outline in labial or lingual views and quite broad at their base. Some isolated cusps, which are also the highest in the sample, can be more narrowly based. They are

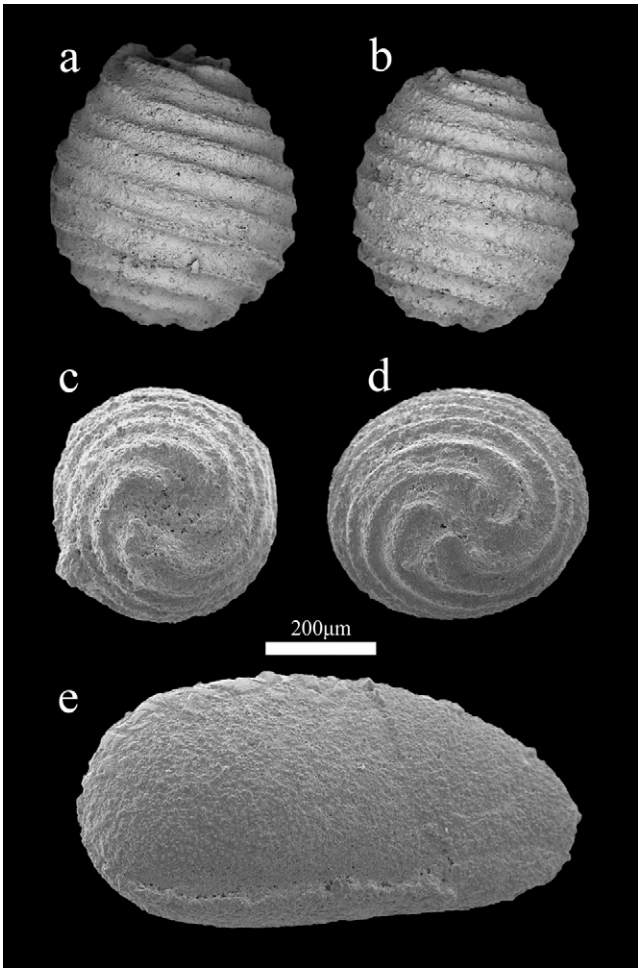

Fig. 2. Charophytes and ostracod from the Bathonian of St.-Martin (Revens, France): (a and b) gyrogonites of *Porochara douzensis* in lateral view; (c) gyrogonite of *P. douzensis* in apical view; (d) gyrogonite of *P. douzensis* in basal view and (e) carapace of *Darwinula magna* in lateral view.