

The continental Late Cretaceous of Europe: toward a better understanding

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The Late Cretaceous, more precisely the Latest Cretaceous (Campanian and Maastrichtian), appears to be a key period in the history of terrestrial biotas. At that time, several groups that make up a substantial component in the recent biotas underwent a marked diversification (therian mammals, i.e. modern mammals, birds, squamate reptiles, and lissamphibians). Moreover, fossiliferous beds from that period have produced the last dinosaurs and pterosaurs.

Until the last few decades, terrestrial faunas from that time interval were known mainly from North America and Asia (Gobi desert). In Europe, only sparse localities yielded poor and non-diverse faunas lacking small forms. However, intensive prospection led by several teams, new excavations and the use of chemical-preparation and screenwashing have largely corrected this state of affairs as shown by a recent article by Codrea et al. [7]. Totești-baraj, the locality they discovered in the Hațeg basin (Transylvania, Romania) has yielded a rich and diverse Maastrichtian fauna; moreover, it has produced one mammal tooth per 100 kg of matrix in average, which is an exceptional output as far as the European Cretaceous is concerned. The Latest Cretaceous of the Hațeg basin appears to be potentially rich as previously heralded by a few other sites [8,12].

Initiated in the 1960s [13], systematic prospection and excavations have led to the discovery (or rediscovery) of several fossiliferous sites, mainly during the late 1980s [2, 11] and 1990s [5,6,10,17]. These sites are all located in southern Europe: Iberian Peninsula, southern France, Slovenia, Romania, the northernmost locality being Muthmannsdorf in Austria [4,14]. It should be noted that, apart from Muthmannsdorf and a locality recently discovered in Slovenia (see below), all the fossiliferous sites are located on the Iberian–Armorican

and Transylvanian islands that made up a part of the European archipelago at that time. Thus far, only Laño (Basque Country) has been the subject of an exhaustive study [1]. But despite the fact that the European faunas remain incompletely known, recent works have considerably extended our knowledge. Previously, the picture that emerged was of a homogeneous Latest Cretaceous fauna of vertebrates in Europe, but recent studies have shown that the composition and palaeobiogeographic origin of the vertebrate assemblages are rather complex.

At least as far as dinosaurs are concerned, a turnover affected faunas of southern France during the Maastrichtian [15]. Moreover, faunas from different European regions are not identical [4]. Although southern Europe was separated from North America and Asia during the Latest Cretaceous [14], the fauna of the Iberian–Armorican island resulted from the addition of Gondwanan and ‘Asiamerican’ forms to Laurasian taxa [5]. Gondwanan forms probably came from Africa owing to the Mediterranean Sill [3,16], a discontinuous route that stretched between Africa and Eurasia [18]. But, Transylvanian localities do not include taxa with unquestionable African affinities.

Apart from the first results, there is plenty of potential for further assessments and reassessments. An example of this is the intra-Maastrichtian turnover. It was evidenced in southern France [15], but did it take place elsewhere, more specifically out of the Iberian–Armorican island? Another question is relevant to the relationships with Gondwana. Whereas Gondwanan (i.e. African) forms entered the Iberian–Armorican island, such forms are probably unknown in the Transylvanian region. Is this a bias resulting from an incomplete knowledge of Romanian faunas or was the

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Transylvanian island really cut off from the Mediterranean Sill? Moreover, what were the interrelationships between the islands that made up Europe during the Late Cretaceous?

Up to a recent date, Muthmannsdorf (the fauna of which is still poorly known) was the only Late Cretaceous locality between the Iberian-Armorican and Transylvanian islands. But Delbeljak et al. [9] have reported on a new Campanian or Maastrichtian site in Slovenia,

which represents an important and promising palaeogeographical landmark; its study will likely greatly increase our understanding of the European palaeogeography of the latest Cretaceous. However, whatever the progress in the study of the European Latest Cretaceous may be, it should be kept in mind that the biotas of that time interval remain incompletely known. Palaeobotanical aspects have been poorly developed and continental invertebrates are practically unknown.

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