

## Eocene mammalian fossil record and biodiversity from Iberia: New primate and sirenian discoveries and palaeobiogeographic implications

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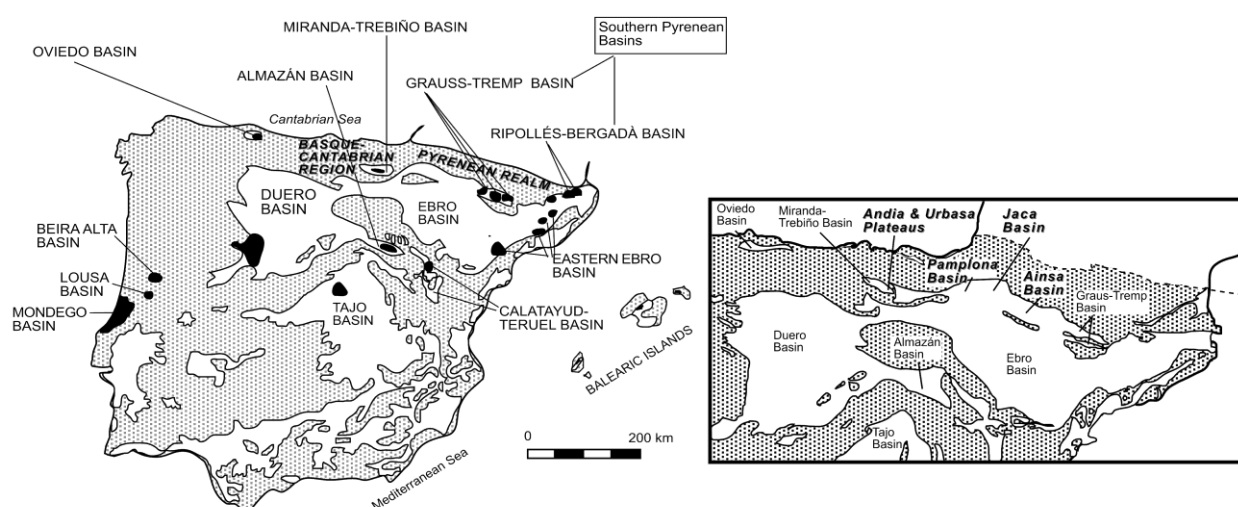
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New finds of mammals from the Eocene of the Iberian Peninsula, including rodents, primates, artiodactyls, perissodactyls, and sirenians, are crucial to investigating the evolutionary and palaeobiogeographic history of the Eocene mammalian faunas across Europe. The fossils come from the Pyrenean Realm and from adjacent Cenozoic basins of the Basque-Cantabrian region and central Iberia (Fig. 1). Many of the remains are already published (Astibia *et al.*, 2010; Badiola *et al.*, 2009 and references therein; Cuesta and Badiola, 2009; Marigó *et al.*, 2010, 2011a; Minwer-Barakat *et al.*, 2010; Quer and Agustí, 2010), whereas others are unpublished or their study is still ongoing.

Middle and late Eocene perissodactyl faunas of the western and central Iberian basins (Duero, Almazán, Oviedo and Miranda-Trebiño basins) are clearly different from those of the southern Pyrenean basins (Fig. 1). In contrast, the Eocene mammalian faunas of the southern Pyrenees are similar to those of the southern part of the Central European Island (southern France, Switzerland), where the typical western Iberian endemic taxa are absent. On the basis of this faunal differentiation the existence of the Western Iberian Bioprovince is hypothesized (Badiola *et al.*, 2009). Five genera and 16 species of equoids and five taxa of lophiodonts, which are unknown elsewhere in Europe, have been identified

so far in this bioprovince. In the context of Iberian biochronology, rodent, primate and artiodactyl fossils have been less well known than perissodactyls. However, various middle and late Eocene taxa of artiodactyls, rodents and primates found in this bioprovince may also support the endemism of these faunas (Badiola *et al.*, 2009). The endemic nature of the primates is supported mainly by adapoid taxa, such as the new genus and species *Mazateronodon endemicus* found in the Almazán Basin (Marigó *et al.*, 2010). The study of the first fossil record of microchoerine omomyids from the Western Iberian Bioprovince is in progress in collaboration with the aforementioned authors from the Institut Català de Paleontologia (ICP) of Barcelona. These fossils will extend what is known in this matter. Further and more detailed information about Eocene primate fossils from Iberia can be found in Marigó *et al.* (2011b).

Recent discoveries and investigations of new sirenian material from the Pyrenean Realm illustrate the high palaeontological potential of the Iberian Peninsula for marine mammals too. The best-known sirenian fossils, consisting of various cranial and postcranial remains, come from the Bartonian deposits of the eastern margin of the Pyrenean Realm. The fossils were initially described as *Prototherium*



**Figure 1.** Map showing Cenozoic basins of the Iberian Peninsula and the Balearic Islands. The areas with Eocene terrestrial mammalian fossils are indicated by black (Further details in Badiola *et al.*, 2009). Inset: the enlarged area of the Pyrenean Realm and adjacent regions showing the areas in which sirenian fossils have been recovered in bold type.

*solei* and *P. montserratense* (Pilleri *et al.*, 1989), but were later assigned to *P. intermedium*, which is also found in the late Eocene of northern Italy (Bizzotto, 2005). Much more scarcely documented is the sirenian fossil record of the western Pyrenees. The fossils consist of vertebrae and ribs found in the Bartonian beds of the Pamplona and Jaca basins (Fig. 1). The caudal vertebrae from the Jaca Basin are described as Dugongidae indet. (Pilleri *et al.*, 1989; Astibia *et al.*, 1999). A large number of disarticulated vertebrae and ribs are described from the Uztarrotz and Ardanatz sites in the Pamplona Basin. According to their morphology as well as the biogeographical and stratigraphic data, they seem to be closely related to a basal dugongid such as *Prototherium* (Astibia *et al.*, 2005). Our recent field and research activities have extended the distribution of the sirenian fossil record to most of the western Pyrenees. The earliest sirenian fossils from Western Europe have been found in the Urbasa and Andia Mountains (Navarre), and in the Ainsa Basin (Huesca) (Fig. 1). Two partial atlases, one humerus fragment, and several dorsal ribs found in two beds in Navarre are dated as late Lutetian and referred to ?Dugongidae indet. (Astibia *et al.*, 2010). More complete and diverse fossil remains have been found in the Ainsa Basin, consisting of a skull with teeth, numerous vertebrae and ribs, scapula, humerus, ulna, and a possible pelvic bone, possibly belonging

to the same individual. The fossil-bearing bed is located in the deltaic deposits of the Sobrarbe Formation, which is dated as late Lutetian (De Federico, 1981; Bentham, 1992). The morphology of the fossils is consistent with referral to basal forms of Dugongidae, the only sirenian clade known so far in the middle Eocene of Europe, sharing some cranial morphological features with *Prototherium* and *Eotheroides*. These fossils, as well as those found at other Lutetian sites of the Sobrarbe Fm., the study of which is in progress, will be essential in investigating the palaeobiogeography and evolution of the first clades that appeared in the Tethys Seaway during the rapid early middle Eocene diversification of the group.

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