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Prominatherium dalmatinum from the late Eocene of Grancona (Vicenza, NE Italy). The oldest terrestrial mammal of the Italian peninsula

Prominatherium dalmatinum *de l'Éocène supérieur de Grancona (province de Vicence, Nord-Est de l'Italie). Le plus ancien mammifère terrestre de la péninsule Italienne*

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ABSTRACT

So far, the oldest terrestrial mammal associations in Italy dates to the beginning of the Oligocene, with Anthracotheriidae being the most represented taxon. Sites from northern Italy yielded remains of the genus *Anthracotherium* that spread from Asia to western Europe after the Grande Coupure. A finding at Grancona, which is Priabonian in age, implies that Anthracotheriidae family reached the Italian Peninsula before the Eocene–Oligocene boundary. Thus, the dispersal of this family in northern Italy is anterior than previously believed. The fossil consists of a poorly preserved right hemi-maxilla with well-preserved P4 and M3. The shape and the size of the teeth are not compatible with the genus *Anthracotherium*. On the contrary, the closer affinities with the Croatian species *Prominatherium dalmatinum* suggest a connection between the Balkan area and the Italian peninsula and a possible new way of dispersal for this family.

RÉSUMÉ

Jusqu'à présent, les associations de mammifères terrestres les plus anciennes d'Italie dataient du début de l'Oligocène, les Anthracotheriidae étant le taxon le mieux représenté. Les sites du Nord de l'Italie fournissent des restes du genre *Anthracotherium*, qui s'est répandu depuis l'Asie jusqu'à l'Europe de l'Ouest, après la Grande Coupure. Une découverte à Grancona, d'âge Priabonien, implique que la famille des Anthracotheriidae a atteint la péninsule Italienne à la limite Éocène–Oligocène. Donc la dispersion de cette famille dans le Nord de l'Italie est antérieure à ce que l'on pensait jusqu'alors. Le fossile consiste en un hémi-maxillaire droit mal conservé, avec une P4 et une M3 bien conservées. La forme et

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la taille de ces dents ne sont pas compatibles avec le genre *Anthracotherium*. Au contraire, de proches affinités avec l'espèce croate *Prominatherium dalmatinum* suggèrent une connexion entre la zone des Balkans et la péninsule Italienne, ainsi qu'un nouvel itinéraire de dispersion pour cette famille.

1. Introduction

The aim of this paper is to describe a new finding related to Anthracotheriidae and to discuss its palaeogeographic value in the context of the European late Eocene. Although the material is poor and very badly preserved, we are sure that its discovery provides interesting new data to understand the mammalian dispersal in Europe during the Paleogene.

The subject of this paper is a fossil donated to the Archaeological and Natural Science Museum "G. Zannato" in Montecchio Maggiore (VI) thirty years after its the discovery. At the time of the recovery, there were maintenance works on a road between Corrubbio di Grancona and San Gaudenzio di Grancona (Fig. 1B). An amateur palaeontologist was looking for fossils when he found what was later identified as the remains of a member of the family Anthracotheriidae Leidy, 1869.

Anthracotheres have often been early members of large-scale mammalian dispersal events, suggesting phases of connection between landmasses. This taxon probably originated in Asia during the late middle Eocene and spreading later into Europe and North America (Lihoreau and Ducrocq, 2007; Tsubamoto et al., 2002).

The genus *Anthracotherium* was first identified in Italy at Cadibona (Savona) by Cuvier (1822). This early Oligocene lignitic site (MP 21–24) is one of the most important deposit in which anthracotheres were studied (Fig. 1A). Cadibona yielded mainly fossils of *Anthracotherium magnum* (Cuvier, 1822; Kotsakis, 1984, 1986; Palazzi, 1922; Squinabol, 1890).

Another important site is located at Monteviale (Vicenza), where Beggiato (1865) described an intermediate species between *A. magnum* and *A. minus* (Fig. 1A). Later Dal Piaz (1926, 1932) attributed the remains of Monteviale to *Anthracotherium monsvialense*, previously described by De Zigno (1888). This site is early Oligocene in age (MP 21) and all the remains were found in a lignitic layer (Ghezzo and Giusberti, 2016; Kocsis et al., 2014; Mietto, 1997; Pandolfi et al., 2016).

The province of Vicenza yielded also two other lignite deposits in which *A. magnum* and *A. monsvialense* were discovered during the twentieth century: Zovencedo and Chiuppano (Accordi, 1951), both Oligocene in age (Kotsakis, 1984, 1986; Mietto, 1997) (Fig. 1A). Others isolated anthracotherid findings are reported in Kotsakis et al. (2005).

The taxa discovered in Italy until now belong to the genus *Anthracotherium* that appeared in the European continent after the Eocene–Oligocene boundary (MP 20–21), when the Grande Coupure, a big faunal turnover, happened (Costa et al., 2011; Stehlin, 1910).

The specimen from Grancona dates from the end of the Eocene, at the Priabonian age (MP 17–20), before any other anthracothere discovery in Italian sites until now. Thus, the recovery of these remains led to a series of questions: Is it possible that Anthracotheriidae reached the Italian peninsula before the Grande Coupure? Which way did they used? Were there several phases for the anthracothere dispersal?

The anthracotheriid dental terminology and the taxonomy follows Lihoreau and Ducrocq (2007) and Boisserie et al. (2010).

2. Geological context

Grancona is a small town located in the Berici Hills, South-West of the Veneto region (Fig. 1A). These hills are situated in the Pianura Padana and pre-Alps context, which is mainly characterized by deposition of shallow-marine carbonates with lower-middle Eocene and Oligocene volcanic activity (Rasser et al., 2008).

Thin and discontinuous upper Paleocene to lower Eocene red marly limestones — called Scaglia Rossa — are widely distributed in the whole area, which encompasses Lessini Shelf, Berici Hills and Euganei Hills. At the beginning of the Eocene, this area was submerged by the sea and the presence of Scaglia Rossa as basal facies is an evidence of a marine environment. Scaglia Rossa is overlaid by turbiditic tuffs, marls and tuffaceous marls, moving upward into marly calcarenites named Pietra di Nanto (Fabiani, 1915), Lutetian in age (Rasser et al., 2008).

In the subsequent several million years, volcanic activity led to the rise of marine platforms in some areas of Berici Hills. This caused the sedimentation of calcarenites associated with nummulites named Calcari Nummulitici (Fabiani, 1915) that testifies a change in water depth. In the western Colli Berici, shallow-marine carbonate sedimentation was interrupted by extrusion of basalt flows. Hence, during the late Eocene, some areas of Berici Hills emerged creating a new configuration characterized by low-level waters, lagoons and islands (Rasser et al., 2008).

It is only during the Oligocene epoch that some areas of Berici hills were partially emerged, as shown by the presence of lignitic deposits in which abundant fossils of anthracotheres were found (e.g., Kotsakis, 1984, 1986; Rasser et al., 2008).

2.1. Age of the fossil

Specimen MCZ 3422 was found along a road right outside Grancona (Fig. 1B), where the section was exposed during maintenance works thirty years ago and then