

SHORT NOTE – NOTA BREVE

A MIOCENE ACERATHERIINE RHINOCEROTID (MAMMALIA, PERISSODACTYLA) FROM EARLY PLEISTOCENE MARINE DEPOSITS AT MONTE DELLE PICHE (ROME, CENTRAL ITALY)

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Abstract. A fragmentary hemi-mandible of a rhinocerotid was collected during the end of the 19th century at Monte delle Picche (Rome). Morphological features, such as a short paralophid in the molar, the presence of a mesio-lingual cingulid in the teeth and a well-developed upturned I/2, indicate that the specimen belongs to Aceratheriini. In addition to other taxa (e.g. *Chilotherium*, *Aceratherium* and *Hoploaceratherium*), the hemi-mandible shows morphological traits suggestive of the genus *Acerorhinus*. The latter is well-documented in fossiliferous localities of Southeastern Europe, Turkey and China, chronologically related with the Land Mammal Zones MN 9-12. Unfortunately, the specimen is reworked in Early Pleistocene marine deposits. Hence, it cannot indicate the time at which the genus reached Italy.

Riassunto. Una emi-mandibola frammentaria di un rinocerotide fu rinvenuta alla fine del 19° secolo a Monte delle Picche (Roma). Caratteristiche morfologiche quali il paralofide corto nel molare, la presenza di un cingulum mesio-linguale nei denti e un incisivo ben sviluppato permettono di ascrivere il reperto alla Tribù Aceratheriini. Considerando i taxa appartenenti a questo gruppo (fra cui i generi *Chilotherium*, *Aceratherium* e *Hoploaceratherium*), il reperto in esame mostra affinità morfologiche con esemplari ascritti al genere *Acerorhinus*. Quest'ultimo è ben documentato in depositi fossiliferi dell'Europa sud-orientale, Turchia e Cina, cronologicamente correlabili con le *Land Mammal Zones* MN9-12. Sfortunatamente il rinocerotide di Monte delle Picche è un elemento rimaneggiato in depositi marini del Pleistocene Inferiore e non è quindi possibile definire l'età, anche approssimativa, della presenza del genere in Italia.

Introduction

During the construction of the Rome-Civitavecchia railway between 1856 and 1858 large mammal remains were collected from deposits at the foot of Monte delle Picche (Rome, Central Italy) (Ponzi 1858) (Fig. 1). These remains have been stored and preserved at the Museum of Paleontology at “Sapienza”, University of Rome (MPUR). A fragmentary hemi-mandible with a well-developed tusk-like I/2 (MPUR138), typical of Miocene rhinocerotid, was found associated with several other specimens. This specimen is the subject of the present analysis. It bears a label reading “Monte delle Picche”.

In the present paper, we use the nomenclature proposed by Antoine et al. (2003, 2010). The mandible is morphologically compared with several Miocene specimens from a number of Eurasian localities. The comparisons are based on the fossil material stored at the Natural History Museum Basel (NMB), Natural History Museum Wien (NHMW), Institute of Paleobiology of the Polish Academy of Sciences Warsaw (ZPAL), Institute of Vertebrate Paleontology and Paleoanthropology Beijing (IVPP), Museo Nacional de Ciencias Naturales Madrid (MNCN) as well as on the specimens published by Weber (1905), Borissiak (1914), Ringström (1924), Borsuk-Białynicka (1969), Guérin (1980), Ger-

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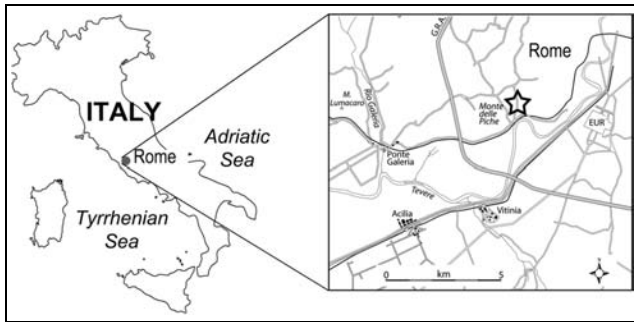


Fig. 1 - Location map of the Monte delle Piche (Rome).

aads & Koufus (1990), Cerdeño & Sánchez (2000), Deng (2001), Kaya & Heissig (2001), Becker (2003), Fortelius et al. (2003), Geraads & Spassov (2009) and Heissig (2012).

Finally, samples of sediment collected from the specimen MPUR138 were analysed from a micropalaeontological perspective in order to add palaeoenvi-

ronmental and biostratigraphic information or to corroborate existing data.

Description and comparison of the fragmentary hemi-mandible MPUR138

The hemi-mandible MPUR138 is moderately damaged and shows several fractures. In buccal view, a vertical fracture dissects the bone between P/4 and P/3, and the lower border of the horizontal ramus is anomalously concave (Fig. 2.1b). The portion of the symphysis appears quite robust and the incisor corpus bears a well-developed right tusk-like I/2 and part of the alveolus of the left one (Fig. 2.1b). In dorsal view, the two alveoli appear closely spaced. The specimen shows no evidence of an alveolus for I/1. In buccal view, the right I/2 curves strongly upwards. The I/2 has a sub-triangular transversal section. The ventro-lateral border is rounded (Fig. 2.1a). In lingual view, the horizontal

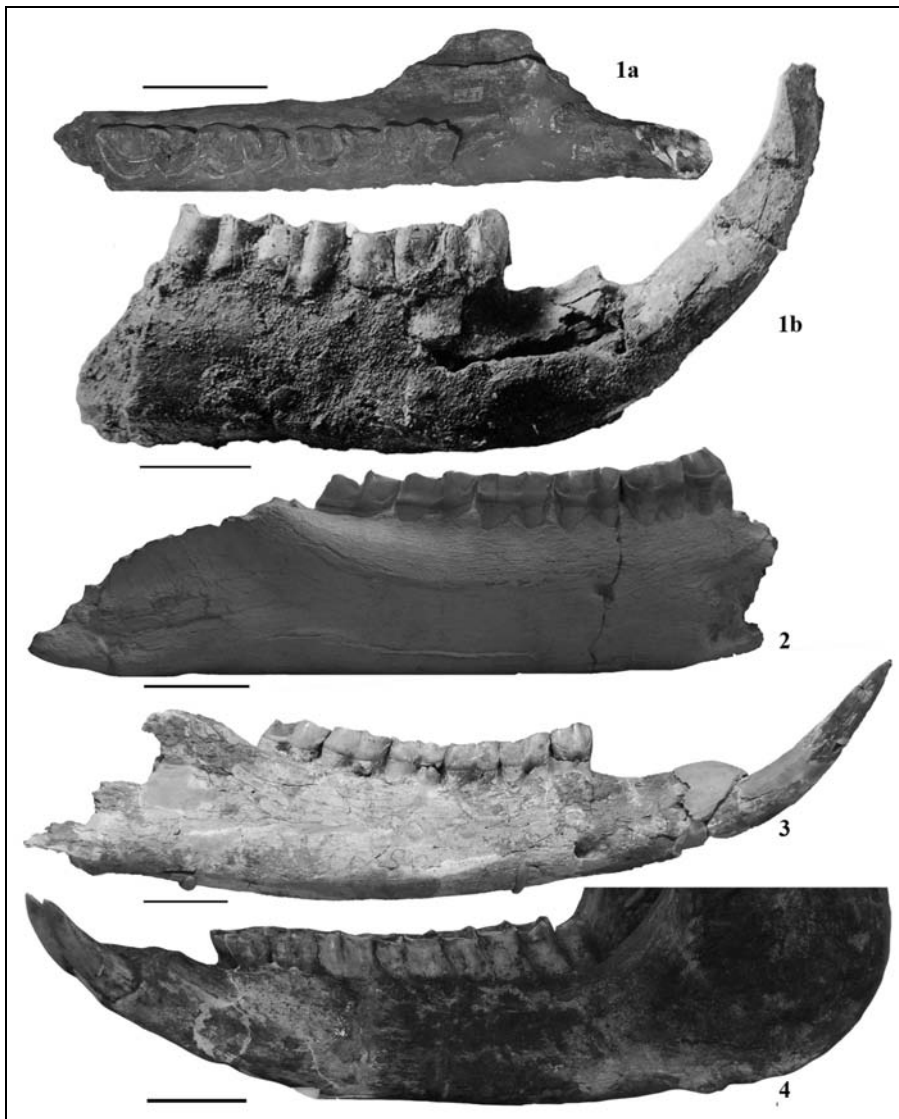
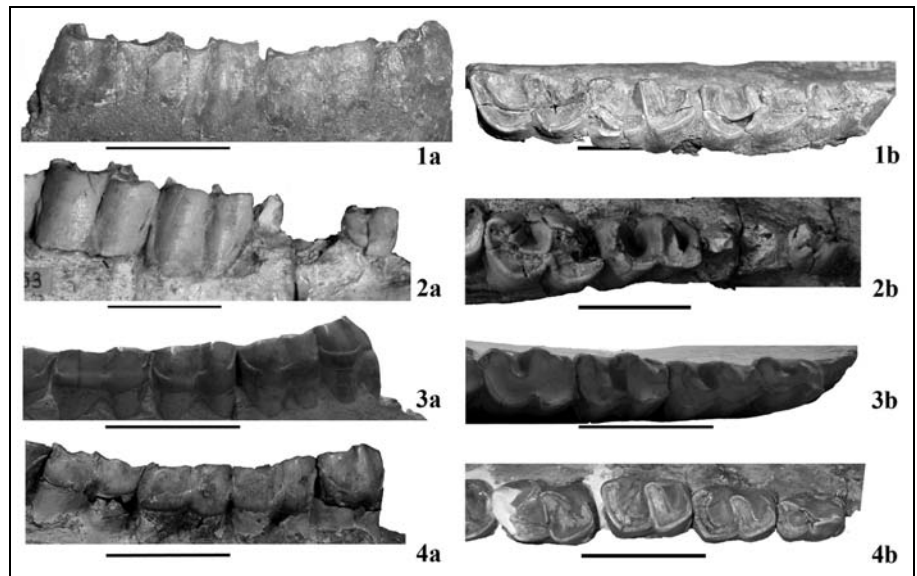


Fig. 2 - Fragmentary hemi-mandible MPUR138 from Monte delle Piche, 1a) in dorsal view, 1b) in buccal view (from Portis 1899); 2) fragmentary hemi-mandible of *Hoploaceratherium tetradactylum* from Sansan (France) (NMB S.s.131) in buccal view; 3) fragmentary hemi-mandible of *Aceratherium incisivum* from Charmoille (Switzerland) (NMB Cm191) in buccal view; 4) mandible of *Chiloterium wimani* from Laogochuan (China) (IVPP V12505) in buccal view. Scale bar = 5 cm. In 1b the scale bar is estimated.

Fig. 3 - Lower tooth row: 1) MPUR138; 2) *Chilotherium wimani* from Altai Teli (Mongolia) (ZPAL MgM-V/40); 3) *Hoploaceratherium tetradactylum* from Sansan (France) (NMB S.s.131); 4) *Aceratherium incisivum* from Charmoille (Switzerland) (NMB Cm191, on the left, and Cm504, on the right). a, buccal view; b, occlusal view. Scale bar = 5 cm.



ramus maintains its height unvaried. In the original photograph reported by Portis (1899), a significant fracture can be noticed on the buccal side of the specimen, between P/2 and the I/2. This area was filled with gypsum during the second half of the 20th century, and the I/2 was re-arranged differently than it appears in Portis' (1899) picture.

P/2 has a V-shaped posterior lingual valley (the anterior one is not visible). The tooth is worn obliquely (Fig. 3.1a). P/3 has V-shaped posterior and anterior lingual valleys. P/4 has a V-shaped anterior lingual valley, and a broad V-shaped posterior one. In M/1 the posterior valley is V-shaped, while the anterior one is partially covered by sediment; a distal cingulid occurs in this tooth. A mesio-lingual cingulid occurs in P/3, P/4 and M/1. In all the teeth the valley bottoms lie high above the collar. In occlusal view, the vestibular syncline is weak but it reaches the collar in P/4 and M/1 (Fig. 3.1b). The paralophid is short in M/1 (Fig. 3.1b). The diastema appears relatively short (approximately 59 mm).

The studied specimen differs from Teleoceratina (e.g. *Prosantorhinus* and *Brachypotherium*) which show the trigonid with obtuse or right angle, a constricted metaconid and lower premolars with U-shaped posterior lingual valleys (see Antoine et al. 2003, 2010). MPUR138 also differs from Elasmotheriina (e.g. *Hispanotherium*) in having a more massive symphysis, posterior border of the symphysis at the level of P/2-P/3, less marked vestibular syncline and mesio-lingual cingulids (see Antoine 2002; Antoine et al. 2003, 2010).

The studied specimen shows morphological characteristics suggestive of Aceratheriini such as a short paralophid in the lower molars, the presence of a mesio-lingual cingulid, the well-developed (in particular in males) I/2. Based on these characteristics the specimen

is not a horned rhinoceros (e.g. *Diboplos schleiermacheri*, cfr. Guérin 1980; Heissig 2012). MPUR138 differs from the mandibles of *Chilotherium*. The latter show a deeper vestibular syncline, horizontal wear in P/2, more convex ventral border of the horizontal ramus, broader symphysis, and more divergent I/2s (Fig. 2.4 and 3.2) [based on specimens from Samos (stored at the NHMW), from Altai Teli (stored at the ZPAL), and from Laogaochuan (stored at the IVPP), cfr. Weber 1905; Ringström 1924, pl. 2 fig. 2, pl. 3 figs. 2, 5, pl. 4 fig. 4, pl. 5 fig. 4, pl. 6 fig. 3, pl. 8 figs. 1-2; Borsuk-Białynicka 1969, pl. 25 figs. 2-5; Geraads & Koufos 1990, pl. 2 figs. 3-5; Deng 2001, pl. 2 figs. 1, 3; Fortelius et al. 2003, fig. 12.8]. Finally, in the species of the genus *Chilotherium* I/1 can also be present (Ringström 1924). Compared to MPUR138, the mandibles of *Aceratherium incisivum* have straighter I/2s, usually two small alveoli for I/1, vestibular cingulids on the lower premolars, gently convex lower border of the mandible, and a less high horizontal ramus under the premolars (Fig. 2.3 and 3.3) (based on the specimens from Charmoille stored at the NMB, from Prottes and Inzersdorf stored at the NHMW and data published by Guérin 1980). Moreover, in contrast to MPUR138 the mandibles of *Hoploaceratherium* from Sansan have two small alveoli for I/1 and, in buccal view, a marked vestibular cingulid in particular in M/1, P/4 and P/3 (Fig. 2.2 and 3.3) (based on the specimen stored at the NMB and on data published by Guérin 1980; Heissig 2012, figs. 16, 30-34). Furthermore, in *Hoploaceratherium* from Belvedere-Wien (stored at the NHMW) small cingulids occur at the base of the vestibular syncline in M/1, P/4 and P/3. In *Hoploaceratherium* the vestibular syncline appears deeper in M/1 and P/4, the I/2s are more divergent and the premolars are shorter (LP/2-P/4 = 87-103 mm, data from Heissig 2012) than in MPUR138

(LP/2-P/4 = approx. 113 mm) (cfr. Guérin 1980; Heissig 2012). In addition, the mandibles of *Alicornops simorreense* differ from MPUR138 in having a slightly convex lower border, the I/2 with a rounded section, lower premolars with vestibular cingulid, small cingular rim at the base of the posterior lingual valley, and the vestibular syncline deep in P/4 and M/1 (based on the specimen stored at the MNCN; cfr. Guérin 1980; Cerdeño & Sánchez 2000, figs. 3c, 4c-d). Furthermore, the length of the P/2-P/4 row in *A. simorreense* (LP/2-P/4 = 78-88.5 mm; data from Guérin 1980) is smaller than in MPUR138. The mandible of *Acerorhinus zernowi* from Sebastopol differs from MPUR138 in particular in having marked vestibular cingulids (Borissiak 1914, pl. 7 fig. 2a-b). The I/2 appears straighter in *A. zernowi* than in MPUR138. In contrast to *A. zernowi*, the I/2 of MPUR138 has a flat dorsal surface with a sharp medial edge and a rounded ventro-lateral border, the symphysis is not broad, the vestibular syncline is weak, and the two I/2s are not widely spaced (Borissiak 1914). *A. zernowi* from Yulafli (Kaya & Heissig 2001), however, shows a number of traits in common with MPUR138: the I/2s are slightly divergent and the distance between the two alveoli of I/2 is reduced, P/2 is obliquely worn, a mesio-lingual cingulid occurs in the teeth, the lingual valleys of the premolars are V-shaped (e.g. in CY/5), and they do not reach collar (Kaya & Heissig 2001, figs. 4, 5). Moreover, the axis of the I/2 in MPUR138 is oriented obliquely as in CY/3 from Yulafli (Kaya & Heissig 2001, fig. 4). MPUR138 is similar to a mandible of *Acerorhinus* sp. from Pentalophos-1 (Geraads & Koufos 1990, pl. 3 figs. 2-3, 5; Heissig 1999) in many features. The two mandible share the obliquely worn P/2, the profile of the lower border of the mandible which rises under P/2, the slightly divergent I/2s in contrast to the very closely spaced alveoli, the absence of I/1, the short diastema, and the weak vestibular syncline in the teeth (Geraads & Koufos 1990). They differ in the height of the horizontal ramus which is slightly smaller in MPUR138 (height of the horizontal ramus between P/4-M/1 = approx. 78 mm) than in the specimens from Pentalophos-1 (95 mm; data from Geraads & Koufos 1990), as well as in the length of the premolars, which are shorter in MPUR138 (LP/2-P/4 in the specimen from Pentalophos-1 = 120 mm; data from Geraads & Koufos 1990). Finally, MPUR138 shares common morphological features with the mandible of *Acerorhinus* sp. from Kalimantsi (Geraads & Spassov 2009, pl. 2 figs. D, E). The latter specimen has a shorter diastema (length of diastema = 35 mm; data from Geraads & Spassov 2009) than MPUR138 (length of diastema = approx. 59 mm). Moreover, the two mandibles show a similar ventral border of the horizontal ramus, the symphysis is relatively narrow, and the I/2s are not too divergent; finally, the I/2s are characterised by a flat

dorsal surface, with a rounded ventro-lateral border (Geraads & Spassov 2009). However, vestibular cingulids are present in all the teeth of the Kalimantsi specimen (Geraads & Spassov 2009).

Discussion and conclusion

The rhinocerotid hemi-mandible MPUR138 was originally identified as *Dihoplus schleiermachersi* by Portis (1899), and *Chilotherium* by Guérin (1980). In contrast, the specimen shows morphological affinities with the genus *Acerorhinus*.

The genus *Acerorhinus* has been recorded in several Turkish sites, at Pentalophos-1 (Greece), in sites of Bulgaria, Crimea (Ukraine), at Tung-Gur (Mongolia), as well as in Chinese localities (Borissiak 1914; Geraads & Koufos 1990; Cerdeño 1996; Heissig 1999; Deng 2000; Kaya & Heissig 2001; Fortelius et al. 2003; Antoine & Saraç 2005; Geraads & Spassov 2009). However, according to Geraads & Spassov (2009) the specimens from Tung-Gur are “only distantly related to *Acerorhinus*”. All the above-mentioned records are chronologically related with the Land Mammal Zones MN 9-12 (Vallesian-middle Turolian, which are approximately correlated with the Tortonian-earliest Messinian stages). At present, *Acerorhinus* is not recorded in Northern and Central Europe (Heissig 1999).

The micropalaeontological analysis of the sediment that covers MPUR138 indicated the presence of benthic (e.g. *Ammonia parkinsoniana*, *Ammonia tepida* and *Buccella granulata*) and planktonic foraminifera (e.g. *Globoturbotalita rubescens* and *Neogloboquadrina pachyderma*), as well as ostracods (*Parakrithe* sp., *Cytherella* sp. and *Eopajenborchiella* sp.). The assemblage contains also badly preserved shells of foraminifera older than the Gelasian age (*Cibicides dutemplei*, *Globoturbotalita woodi* and *Globotalia miozea*). The same assemblage was also found in the sediment associated with other fossil mammal remains from Monte delle Piche (MPUR1516 and MPUR1515). The presence of *N. pachyderma* with sinistral coiling suggests an Early Pleistocene age. The ostracod association suggests a marine circalittoral environment of sedimentation. Consequently, the reworked (Miocene) elements (the hemi-mandible of *Acerorhinus* and the shells of *G. miozea* and *G. woodi*) found at Monte delle Piche were redeposited during the first half of the Early Pleistocene. Based on all these lines of evidence, at present, the age at which *Acerorhinus* spread in Italy is impossible to establish.

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