



ISSN 0375 - 7633

Bollettino

della

**Società Paleontologica
Italiana**

Publicato sotto gli auspici
del Consiglio Nazionale delle Ricerche

Volume 42, n. 1-2, 2003

MUCCHI - MODENA

<i>Bollettino della Società Paleontologica Italiana</i>	42 (1-2), 2003	ISSN 0375-7633	59-63	1 pl.	Modena, Giugno 2003
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New records of *Metaxytherium* (Mammalia: Sirenia) from the late Miocene of Cisterna quarry (Apulia, southern Italy)

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KEYWORDS – *Sirenia*, *Metaxytherium*, *Systematics*, *Geographical and stratigraphical distribution*, *Miocene*, *South Italy*, *Mediterranean*.

ABSTRACT – New records of *Metaxytherium* (Mammalia: Sirenia) from Tortonian (late Miocene) sediments of Cisterna quarry, Apulia (southern Italy) are described. They are two fragmentary specimens consisting of a skull roof with one associated rib and one isolated rib.

On the basis of this datum and other published and unpublished records, *Metaxytherium* occurred relatively frequently and with a wide geographical distribution in the Mediterranean during the Miocene. In particular, high frequency and wide distribution have been observed in the late Miocene for the species *M. medium*, the only recorded in the Mediterranean during this time interval.

RIASSUNTO – [Nuovi ritrovamenti di *Metaxytherium* (Mammalia: Sirenia) del Miocene superiore dell'Italia meridionale] – Vengono descritti nuovi ritrovamenti di *Metaxytherium* (Mammalia: Sirenia) provenienti dai sedimenti tortoniani (Miocene superiore) della cava Cisterna, Puglia (Italia meridionale). Questo dato, insieme ad altri pubblicati e impubblicati, ci indicano che *Metaxytherium* era relativamente frequente e con un'ampia distribuzione geografica durante il Miocene nel Mediterraneo. In particolare, nel Miocene superiore fu largamente diffusa la specie *M. medium*, l'unica che risulta presente, nel Mediterraneo, in questo intervallo di tempo.

INTRODUCTION

The Cisterna quarry at Cavallino near Lecce (Apulia, southern Italy) has yielded an exceptional assemblage of Late Miocene fossil marine vertebrates in the "Pietra leccese" formation. In the decade of 1980-1990, when the quarry was active, several fossils belonging to cetaceans (both Mysticeti and Odontoceti), sirenians, fishes and turtles were collected. All materials are kept at the Museo dell'Ambiente of Lecce University (MA). Part of this material comprises cetaceans and fishes which have already been the subject of various publications (Varola *et al.*, 1989; Bianucci *et al.*, 1992, 1994; Carnevale *et al.*, 2002), although many other specimens still await examination. The purpose of the present study is to describe the sirenian specimens collected in this quarry.

SYSTEMATIC PALEONTOLOGY

Class MAMMALIA Linnaeus, 1758
Order SIRENIA Illiger, 1811
Family DUGONGIDAE Gray, 1821
Subfamily HALITHERIINAE (Carus, 1868) Abel, 1913
Genus METAXYTHERIUM de Christol, 1840
METAXYTHERIUM MEDIUM (Desmarest, 1822)
Pl. 1; Text-fig. 2

Referred specimen – Skull roof (MA 969/1) and right rib (MA 970/1), probably belonging to the same animal; isolated incomplete right rib (MA 971/A).

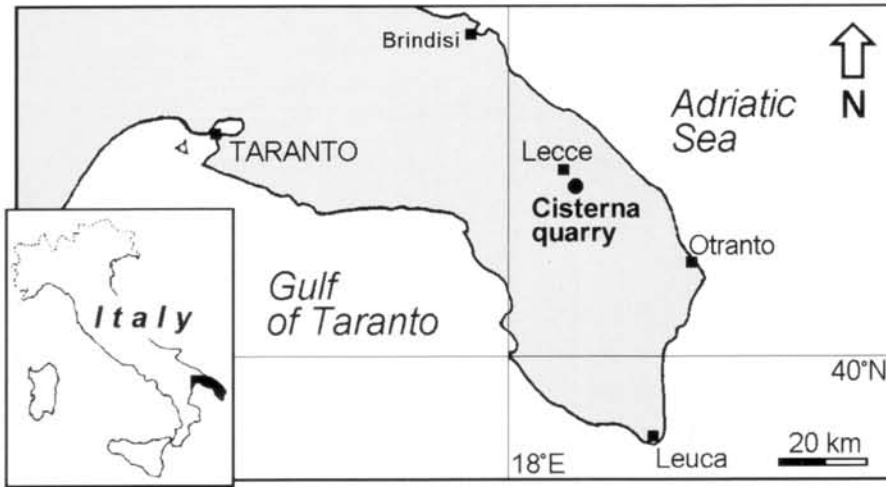
Locality – Cisterna quarry near the village of Cavallino (Province of Lecce, southern Italy) (Text-fig. 1).

Age and stratigraphic occurrence – Late Miocene, early Tortonian: *Globorotalia acostaensis* Zone of Iaccarino and Salvatorini (1982).

Description

Skull – Parietals, incomplete supraoccipital and a portion of frontals are preserved in the skull roof MA 969/1. On the whole the skull fragment shows a nearly rectangular cranial vault with an almost flat roof and low temporal crests (type "A" of Domning, 1988). The minimum distance between the temporal crests is about 40 mm. The anteroposterior length of the parietal is 102 mm. Nuchal crest, external occipital protuberance, and median ridge are evident. Marked rugose sutural surfaces for the squamosals (lost in the specimen) show that these bones extended posterodorsally to the posterolateral corner of the roof. A feeble median concavity is observed dorsally at the level of the parietal-frontal suture. The interfrontal suture is interdigitated. The endocranial surface is medially divided by a strong bony falx cerebri.

Ribs – The right rib MA 970/1, associated with the skull MA 969/1, is relatively slender and probably it has been reduced in thickness by erosion. It exhibits a uniform curvature along its entire length. The proximal portion is poorly preserved and does



Text-fig. 1 - Geographic location of Cisterna quarry, where the sirenian specimens reported here were collected.

not show distinct tuberculum and capitulum. The distal end is flat. Its total length (straight line) is 285 mm and its mid-shaft diameters are 27.5 x 13.3 mm.

The isolated right rib MA 971/1 lacks its proximal portion. It is robust, consists almost completely of compact bone and exhibits a feeble curvature and a flat distal portion. The total length of the fragment is 255 mm and its greatest diameters are 42.0 x 28.7 mm.

Comparison – The skull roof and the two ribs exhibit morphology that is in the range of variability of *Metaxytherium* spp. (Domning & Thomas, 1987; Domning, 1988; Domning & Pervesler, 2001). They are referred to *Metaxytherium medium* since this is the only known sirenian species in the Late Miocene of the Mediterranean and eastern North Atlantic.

DISCUSSION AND CONCLUSIONS

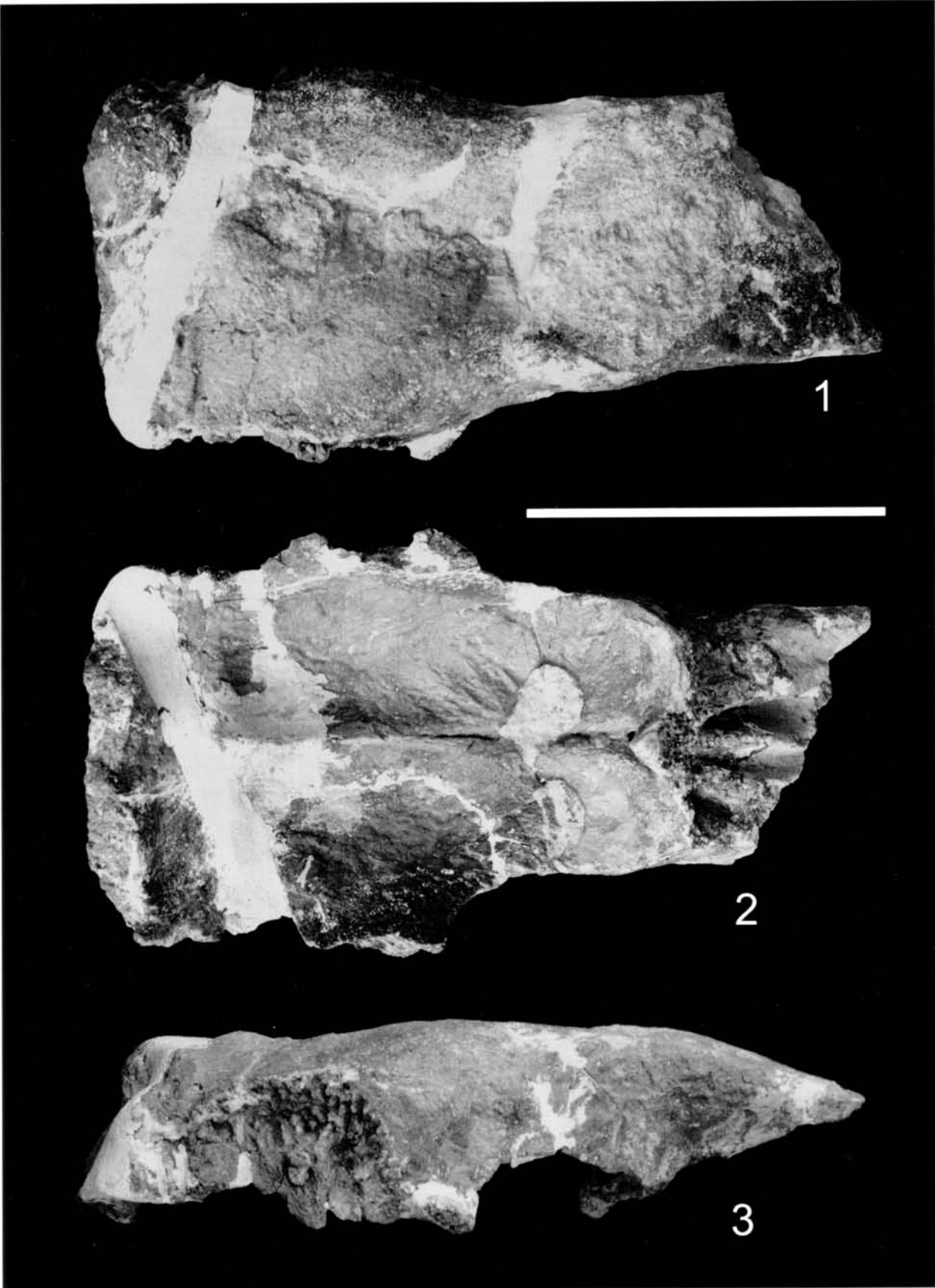
A detailed analysis of the origin and distribution of *Metaxytherium* was made by Domning & Thomas (1987) and Domning & Pervesler (2001). In these works the authors speculated that the oldest securely dated *Metaxytherium* remains, apart from one unpublished Late Oligocene occurrence in the USA, are those referred to *M. krahuletzki* from the Burdigalian sediments of Austria and Switzerland. Records that may be closely related to *M. krahuletzki* are also known from the Burdigalian of Slovakia, France and Libya (Domning & Pervesler, 2001). In this early Miocene

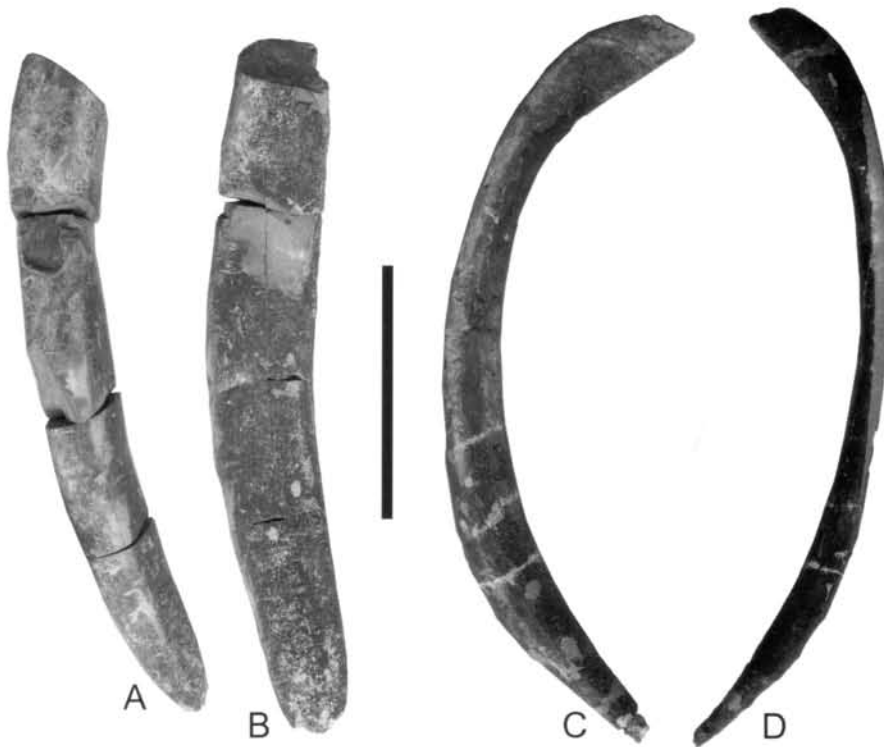
interval, *Metaxytherium* specimens are relatively common in the Mediterranean area, while apparently in the Langhian-Serravallian (middle Miocene) sediments they are relatively scarce (Tab. 1). They were recorded only from the late Burdigalian-Langhian sediments of Catalonia (Spain) (Pilleri *et al.*, 1989) with the species *Metaxytherium catalaunicum* (considered as probably synonymous with *M. medium* by Domning & Pervesler, 2001), and from the latest Langhian-early Serravallian sediments of Sardinia (Italy) with *Metaxytherium* sp. (Capellini, 1886; Carboni & Kotsakis, 1983). Nevertheless some fragmentary *Metaxytherium* specimens were also collected from Late Burdigalian-Langhian levels of the Pietra leccese (pers. observ.). This material, still partially enclosed in stone slabs, is kept in the Museo dell'Ambiente of Lecce University.

The most numerous recorded remains of Italian Miocene *Metaxytherium* are from Tortonian (late Miocene) sediments. *Metaxytherium* remains have been collected from Calabria, Sardinia and Apulia regions (Capellini, 1878; Neviani, 1886; Del Campana, 1924; Comaschi Caria, 1957; Moncharmont Zei & Moncharmont, 1986; Borgia *et al.*, 1981; Pilleri & Cigala Fulgosi, 1989; Carone, 1997). From Calabria there are also three unpublished records consisting of two skulls and one postcranial skeleton (Carone, pers. comm.). New specimens of *M. medium* are also recorded from Tortonian sediments of Tuscany (pers. observ.).

EXPLANATION OF PLATE 1

Figs. 1-3 - Skull roof (MA 969/1) of *Metaxytherium medium* from Cisterna quarry.
1) Dorsal view. 2) Ventral view. 3) Right lateral view.
Scale bar = 10 cm.





Text-fig. 2 - Right ribs of *Metaxytherium medium* from Cisterna quarry in anterior and lateral views. A = MA 971/1 in anterior view; B = the same in lateral view; C = MA 970/1 in anterior view; D = the same in lateral view. Scale bar = 10 cm.

The above analysis of published and unpublished data suggests that *Metaxytherium* was relatively common and had a wide geographical distribution in the Mediterranean during the Miocene. In particular in

the late Miocene the statement above applies to *Metaxytherium medium*, the only species known for this time interval. This species had a very wide geographical distribution considering that it was also

Age	Species	Locality	References
Burdigalian	<i>Metaxytherium krahuletzii</i> and <i>Metaxytherium</i> sp.	Austria Switzerland	Domning & Pervesler, 2001
	<i>Metaxytherium krahuletzii?</i>	Slovakia, Libya, France	Domning & Pervesler, 2001
Late Burdigalian-Langhian	<i>Metaxytherium "catalaunicum"</i>	Spain	Pilleri <i>et al.</i> , 1989
	<i>Metaxytherium</i> sp.	Apulia (Italy)	Unpublished data
Latest Langhian-early Serravallian	<i>Metaxytherium</i> sp.	Sardinia (Italy)	Capellini, 1886; Carboni & Kotsakis, 1983
Tortonian	<i>Metaxytherium medium</i> and <i>Metaxytherium</i> sp.	Calabria (Italy)	Carone, 1999; Moncharmont Zei & Moncharmont, 1986; Neviani, 1886; Del Campana, 1924
		Tuscany (Italy)	Unpublished data
		Apulia (Italy)	Capellini, 1878; Borgia <i>et al.</i> , 1981; this paper.
	<i>Metaxytherium</i> sp.	Sardinia (Italy)	Comaschi Caria, 1957
	? <i>Metaxytherium</i> sp.	Emilia Romagna (Italy)	Pilleri & Cigala Fulgosi, 1989

Tab. 1 - Age, systematics and bibliographical references of *Metaxytherium* records from the Miocene of the Mediterranean basin.

found in the Serravallian-Tortonian of northern France and of the Netherlands (Domning & Thomas, 1987).

ACKNOWLEDGEMENTS

We thank D.P. Domning (Laboratory of Paleobiology, Department of Anatomy, Howard University, Washington, DC) for very useful suggestions.

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(manuscript received December 9, 2002
accepted February 6, 2003)

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