Rivista Italiana di Paleontologia e Stratigrafia	volume 119	no. 1	pp. 125-129	March 2013

SHORT NOTE – NOTA BREVE

EARLIEST OCCURRENCE OF WOOLLY RHINO (*COELODONTA ANTIQUITATIS*) IN ITALY (LATE PLEISTOCENE, GROTTA ROMANELLI SITE)

LUCA PANDOLFI [1*] & ANTONIO TAGLIACOZZO [2]

Received: June 21st, 2012; accepted: September 11th, 2012

Key words: *Coelodonta antiquitatis*, Late Pleistocene, Grotta Romanelli, Southern Italy.

Abstract. We describe the proximal epiphysis of a rhinoceros third metacarpus collected from the level XI of Grotta Romanelli. This level is chronologically referred to a time span between approximately 80 and 69 ka. Morphological and morphometric characters of the third metacarpus suggest that it belongs to *Coelodonta antiquitatis*. This is the earliest record of woolly rhino in Italy.

Riassunto. Viene descritta un'epifisi prossimale di un terzo metacarpo di rinoceronte, rinvenuta nel livello XI della Grotta Romanelli, e riferibile ad un intervallo cronologico compreso fra circa 80 e 69 mila anni. La particolare morfologia e le dimensioni consentono di attribuire il reperto a *Coelodonta antiquitatis*, specie relativamente rara in Italia, e segnalata finora con certezza solo a partire da circa 40 ma.

Introduction

A proximal epiphysis of a rhinoceros third metacarpus has been discovered in the level XI (level I in Blanc 1920) of Grotta Romanelli (Castro, Lecce) (Fig. 1) during the Archaeological Excavations in the 50-60s of the past century (Cardini & Biddittu 1967; Tagliacozzo 2003). This specimen, stored in the Museo Nazionale Preistorico Etnografico Luigi Pigorini (MNPELP), has been identified during a general revision of the Grotta Romanelli mammal remains.

Grotta Romanelli, the most famous and studied cave of the Salento area, opens at the inner margin of a narrow shore platform at about 7 m above sea level (Blanc 1920, 1928; Mastronuzzi et al. 2007). According to Blanc (1920) the platform is marked by potholes (referable to the last interglacial; see Mastronuzzi et al. 2007), partially filled by thin beach deposits with pebbles and rare marine fossils. Several mammal remains have been recovered from the beach deposits (level XII). Furthermore, thick slope deposits, represented by red breccia and relatively scarce bones (level XI), cover the level XII (Fig. 1b). Two U/Th radiometric ages have been obtained from the stalagmites H and F, yielding an age of <69 ka for the first speleothem and of 40±3,250 ka for the second one (Fornaca Rinaldi & Radmilli 1968) (Fig. 1). Fine breccia deposits, that developed diffusely along the coastal area during the last glacial period, seal the sequence of Grotta Romanelli. A number of radiocarbon ages ranging approximately 11 to 9 ka have been obtained from these upper levels (Bella et al. 1958; Vogel & Waterbolk 1963; Alessio et al. 1964, 1965).

According to general accepted Pleistocene large-mammal biochronologic schemes (Gliozzi et al. 1997; Torre et al. 2001; Palombo et al. 2003 and references therein), and in contrast with the above-mentioned radiometric ages, the occurrence of *Canis* sp. aff. *C. mosbachensis* would make the lower levels (XII-IX) of Grotta Romanelli better referable to the Middle Pleistocene. Actually, this carnivore is even recorded in late Middle and Late Pleistocene deposits and has been considered as a persistence of a Galerian taxon (Di Stefano

1 *Corresponding author. Dipartimento di Scienze Geologiche, Università degli Studi Roma Tre, Largo S. L. Murialdo, 1, I-00146 Roma, Italy. E-mail: lpandolfi@uniroma3.it

2 Sezione di Paleontologia del Quaternario e Archeozoologia, Soprintendenza al Museo Nazionale Preistorico Etnografico "L. Pigorini", P.le G. Marconi 14, I-00144 Roma, Italy. E-mail: antonio.tagliacozzo@beniculturali.it

et al. 1992; Capasso Barbato & Gliozzi 1995; Petronio & Sardella 1998). Nonetheless the systematic position of this small-sized Italian dog is still unclear, and a careful revision of the specimens is needed. At Romanelli it has been found in the level IX (chronologically comprised between <69 ka and 40±3,250 ka), represented by well-preserved bones and a complete skull, in association with remains of an evolved form of the genus *Dama* typical of the Late Pleistocene (Di Stefano & Petronio 2003).

The systematic and taxonomy of the fossil rhinoceroses is still debated. We follow here the view recently published by Deng et al. (2011), considering the species *etruscus*, *hundsheimensis* and *hemitoechus* as belonging to the *Stephanorhinus* genus, but referring the species *kirchbergensis* to the genus "*Dihoplus*", together with the Miocene species *ringstroemi* and *pikermiensis* and the Pliocene *megarhinus*.

Description of the rhinoceros third metacarpus from Grotta Romanelli

The studied specimen (MNPELP s.n.) is represented by the proximal epiphysis and part of the diaphysis (Fig. 2) of a rhinoceros third metacarpus. In lateral view, the proximal epiphysis shows two articular surfaces for the fourth metacarpus. The anterior one is well developed and its lower margin is at the same level as that of the posterior one. These characters seem to be distinctive of *Coelodonta antiquitatis* (Guérin 1973, 1980). In *Stephanorhinus hundsheimensis* (=*Dicerorhinus etruscus brachycephalus* in Guérin 1980), *Stephanorhinus hemitoechus* and "*Dihoplus*" *kirchbergensis* (=*Dicerorhinus mercki* in Guérin 1980), the anterior articular surface for the fourth metacarpus is less developed and lower than that of the posterior one (Fig. 2). In the Romanelli specimen, as generally recognized in *C. antiquitatis*, a very strong saliency separates the articular surfaces for the uncinate and for the magnum; this saliency appears less marked in other late Middle and Late Pleistocene species. Furthermore, in proximal view, the antero-lateral surface of the proximal epiphysis appears more developed and marked in the Romanelli specimen, and generally in *Coelodonta*, than in other species (Fig. 2).

The dimensional characters of the proximal epiphysis (Proximal Transverse Diameter = 66,5; Proximal Anteroposterior Diameter = 52,01) of the Romanelli specimen are larger than those of *S. hundsheimensis* (PTD = 51-63; PAPD = 42-51,5; data from Guérin 1980) and approach to the maximal values of *S. hemitoechus* (PTD = 53,5-65; PAPD = 42,5-57; data from Guérin 1980) and the medial ones of "*D.*" *kirchbergensis* (PTD = 58-71; PAPD = 50-59; data from Guérin 1980) and *C. antiquitatis* (PTD = 59,5-79; PAPD = 42,5-61,5; data from Guérin 1980).

Conclusions

According to Kahlke & Lacombat (2008) the first occurrence of the genus *Coelodonta* in Europe is from deposits of a glacial meltwater delta of MIS 12 (about 460 ka BP in age) at Bad Frankenhausen (albeit this record has been questioned by Guérin 2010). The woolly rhino is a common element in all the European cold stages until the Late Pleistocene even under moderate temperatures, when general climatic conditions are sufficiently dry (Kahlke & Lacombat 2008; Guérin

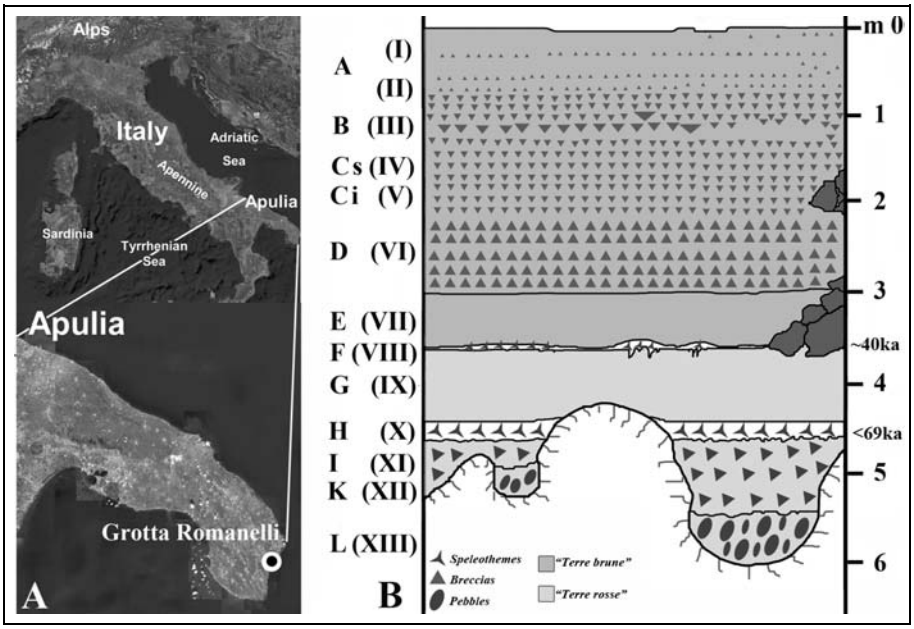

Fig. 1 - A) Location map of the Grotta Romanelli; B) Stratigraphy of Grotta Romanelli (modified from Blanc 1920). On the left, letters indicate stratigraphic levels according to Blanc (1920), while roman numbers indicate stratigraphy according to other authors. On the right is reported the depth (in meters) of the stratigraphic sequence and speleothemes radiometric ages.

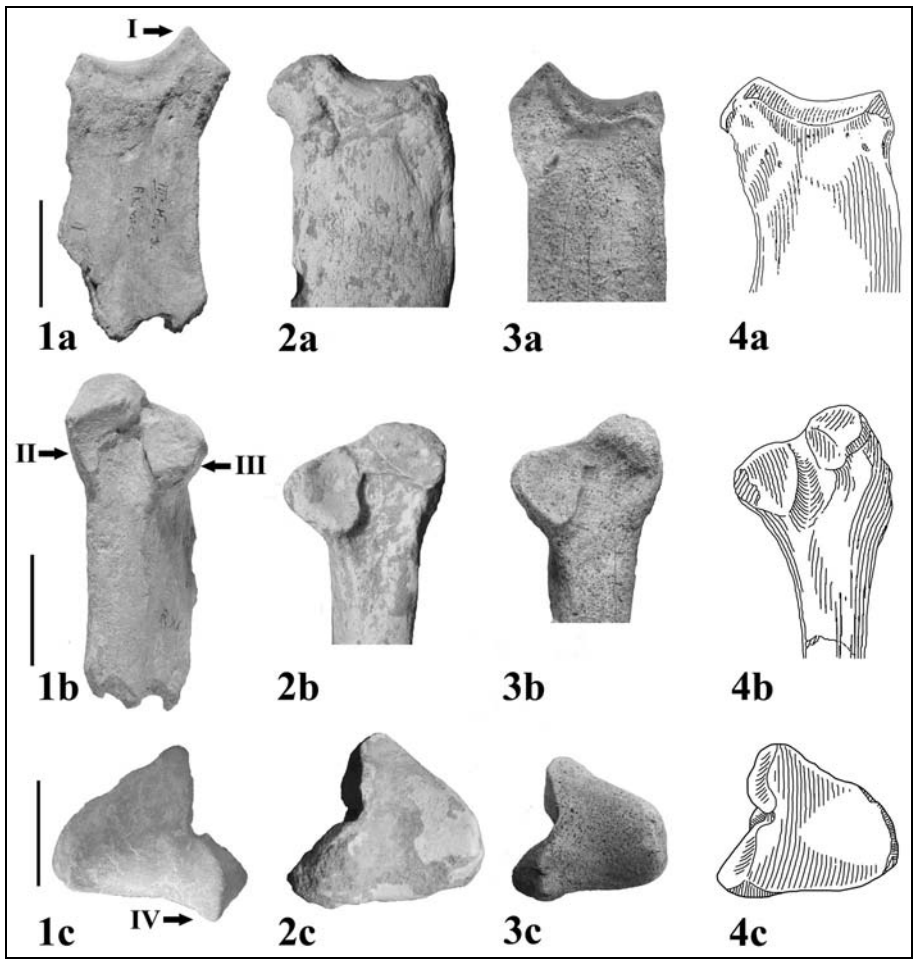

Fig. 2 - Third metacarpus of: 1) *Coelodonta antiquitatis* (left) from Grotta Romanelli (MNPELP s.n.); 2) *S. hemitoechus* (right) from Grotta Lina, Maratea, (MPUR GL206); 3) *S. hundsheimensis* (right) from the lower levels of Vitinia, Rome (MPUR9/3); and 4) "*D.*" *kirchbergensis* (right), taken from Kahlke (1977); a) frontal view; b) lateral view; c) proximal view. Scale bar (for 1, 2 and 3) is 3 cm (specimen 4 is not in scale).
I = saliency between the articular surfaces for the uncinate and for the magnum; II = anterior articular surface for MCIV; III = posterior articular surface for MCIV; IV = antero-lateral surface of the proximal epiphysis.

1980). During the last glacial maximum, the woolly rhino was present across Europe, from the Iberian Peninsula to Siberia and from Scotland to Greece (Melentis 1966; Borsuk-Bialynicka 1973; Guérin 1980; Kahlke 1999; Orlova et al. 2004).

In Italy, woolly rhino is recorded only in a few localities, often without adequate stratigraphic or chronological data. The species is represented by some teeth remains at Opcina, Fadalto nel Veneto, and Polesine (Leonardi 1947, 1948), and Riparo Fumane (Cremaschi et al. 2005), by a fragmentary skull at Monte Circeo (Palmarelli & Palombo 1981) and by several remains at Settepolesini di Bondeno (Gallini & Sala 2001), Ingarano (Petronio & Sardella 1998) and Cardamone (Vaufrey 1927).

The earliest record of woolly rhino in Italy is chronologically enclosed between 37-29 ka at the sites of Riparo Fumane and Settepolesini di Bondeno (Cremaschi et al. 2005; Gallini & Sala 2001). Basing on faunal assemblage, Petronio & Sardella (1998) refer the deposit of Ingarano to the MIS4/3 but, according to the same authors, occurrence of woolly rhino remains at Ingarano is from a sandy-clay level in unclear stratigraphic relationships with the main succession of the site.

The discovery of *Coelodonta* at Grotta Romanelli represents the southern-most occurrence of the species in Western Europe and extends the known temporal range in Italy. Basing on stratigraphic and radiometric data, the level XI of the cave – from which the woolly rhino has been recovered – can be chronologically correlated with the so-called "Ancient Würm" and/or the first phase of the Early Pleniglacial (approximately with a time span between 80 and 69 ka). The occurrence of *Coelodonta* at Romanelli is an important datum for the studies of the paleobiogeography of the species and of the cold faunas in Italy. This record suggests that the fluctuations of the Adriatic sea level probably allowed cold faunas from the Balcans – where the woolly rhino is recorded in several Late Pleistocene sites, including Romania (Codrea 2005) and former Yugoslavia (in particular Serbia-Montenegro and Croatia; Malez 1986; Markovic 1998; Nedeljkovic 2006) – to reach the Italian Peninsula and spread into the Salento earlier than 40 ka. Indeed, during the MIS4, the sea level was approximately 100 meters lower than it is today (Shackleton 2000; Waelbroeck et al. 2002) and the Adriatic seabed was partially emerged as a "land bridge".

New discoveries and additional material will be useful to furter investigate and better understand the relationship between cold faunas of Italy and the Balcans during the last glacial period.

Acknowledgements. The authors thank Prof. R.D. Kahlke and an anonymous reviewer for useful comments and constructive criticism, and are grateful to the Associate Editor, Prof. L. Rook, for insightful suggestions that improved the manuscript.

REFERENCES

Alessio M., Bella F. & Cortesi C. (1964) - University of Rome carbon-14 dates. *Radiocarbon*, 6: 77-90.

Alessio M., Bella F., Bachechi F. & Cortesi C. (1965) - University of Rome carbon-14 dates III. *Radiocarbon*, 7: 213-222.

Bella F., Blanc A.C., Blanc G.A. & Cortesi C. (1958) - La prima datazione con il ^{14}C della formazione pleistocenica di Grotta Romanelli (Terra d'Otranto). *Quaternaria*, 5: 1-8.

Blanc G.A. (1920) - Grotta Romanelli. *Archivio Antropol. Etnol.*, 50: 1-39.

Blanc G.A. (1928) - Grotta Romanelli. *Archivio Antropol. Etnol.*, 58: 1-49.

Borsuk-Bialynicka M. (1973) - Studies on the Pleistocene rhinoceros *Coelodonta antiquitatis* (Blumenbach) - *Palaeontol. Pol.*, 29: 1-97.

Capasso Barbato L. & Gliozzi E. (1995) - Biostratigraphical and palaeogeographical implications of the late Middle Pleistocene well balanced fauna from Quisana-Certosa (Capri, Southern Italy). *Boll. Soc. Paleontol. It.*, 34(2): 235-261.

Cardini L. & Biddittu I. (1967) - Attività scientifica dell'Istituto Italiano di Paleontologia Umana dalla sua fondazione, Liguria-Puglia. *Quaternaria*, 9: 385-408.

Codrea V. (2005) - The extinct *Coelodonta antiquitatis* (Perissodactyla, Mammalia) from Romania – Repertory of sites. *Studii si cercetari, Geologie-Geografie*, 10: 13-32.

Cremaschi M., Ferraro F., Peresani M. & Tagliacozzo A. (2005) - Il sito: nuovi contributi sulla stratigrafia, la cronologia, le faune a macromammiferi e le industrie del paleolitico antico. In: Broglio A. & Dalmeri G. (Eds) - Pitture paleolitiche nelle Prealpi Venete: Grotta di Fumane e Riparo Dalmeri, *Atti del Simposio, Mem. Museo Civ. Storia Nat. Verona*, 2° serie (Sezione Scienze dell'Uomo 9), Preistoria Alpina, nr. speciale: 12-22.

Deng T., Wang X., Fortelius F., Li Q., Wang Y., Tseng Z.J., Takeuchi G.T., Saylor J.E., Säilä L.K. & Xie G. (2011) - Out of Tibet: Pliocene woolly rhino suggests high-plateau origin of ice age megaherbivores. *Science*, 333: 1285-1288.

Di Stefano G., Petronio C., Sardella R., Savelloni V. & Squazzini E. (1992) - Nuove segnalazioni di brecce ossifere nella costa fra Castro Marina e Otranto (Lecce). *Il Quaternario*, 5(1): 3-10.

Di Stefano G. & Petronio C. (2003) - Systematics and evolution of the eurasian Plio-Pleistocene cervini (Artiodactyla, Mammalia). *Geologica Romana*, 36(2000-2002): 1-24.

Fornaca-Rinaldi G. & Radmilli A.M. (1968) - Datazione con il metodo Th230/U238 di stalagmiti contenute in depositi mousteriani. *Atti Soc. Toscana Sci. Nat.*, 75(2): 639-646.

Gallini V. & Sala B. (2001) - Settepolesini di Bondeno (Ferrara - Eastern Po Valley): the first example of mammoth steppe in Italy. In: Cavarretta G., Gioia P., Mussi M. & Palombo M.R. (Eds) - Proceedings of the 1st International Congress «The World of Elephants», Rome October 16-20, 2001: 247-254. CNR (Consiglio Nazionale delle Ricerche) Publishing House, Roma.

Gliozzi E., Abbazzi L., Argenti P., Azzaroli A., Caloi L., Capasso Barbato L., Di Stefano G., Esu D., Ficcarelli G., Girotti O., Kotsakis T., Masini F., Mazza P., Mezzabotta C., Palombo M.R., Petronio C., Rook L., Sala B., Sardella R., Zanalda E. & Torre D. (1997) - Biochronology of selected mammals, molluscs and ostracods from the middle Pliocene to the late Pleistocene in Italy. The state of the art. *Riv. It. Paleontol. Strat.*, 103: 369-388.

Guérin C. (1973) - Les trois espèces de rhinocéros (Mammalia, Perissodactyla) du gisement Pléistocène Moyen des Abimes de La Fage a Noailles (Corrèze). *Nouv. Arch. Mus. Hist. Natur. Lyon*, 11: 55-84.

Guérin C. (1980) - Les rhinocéros (Mammalia, Perissodactyla) du Miocène terminal au Pléistocène supérieur en Europe occidentale. Comparaison avec les espèces actuelles. *Doc. Lab. Géol. Lyon*, 79(1-3): 1-1185.

Guérin C. (2010) - *Coelodonta antiquitatis* praecursor (Rhinocerotidae) du Pléistocène moyen final de l'aven de Romain-la-Roche (Doubs, France). *Rev. Paléobiol.*, 29(2): 697-746.

Kahlke H.D. (1977) - Die Rhinocerotidenreste aus den Travertinen von Taubach. *Quartärpaläontologie,* 2: 305-359.

Kahlke R.D. (1999) - The History of the Origin, Evolution and Dispersal of the Late Pleistocene *Mammuthus-Coelodonta* Faunal Complex in Eurasia (Large Mammals). Fenske Companies, Rapid City.

Kahlke R.D. & Lacombat F. (2008) - The earliest immigration of woolly rhinoceros (*Coelodonta tologoijensis,* Rhinocerotidae, Mammalia) into Europe and its adaptative evolution in Palaearctic cold stage mammal faunas. *Quaternary Sci. Rev.*, 27: 1951-1961.

Leonardi P. (1947) - Resti fossili di rinoceronti del Museo di Storia Naturale di Trieste. *Atti Mus. Civ. Storia Nat.-Trieste*, 16(12): 145-164.

Leonardi P. (1948) - Resti fossili inediti di rinoceronti conservati nelle collezioni dell'Istituto Geologico

dell'Università di Padova. *Mem. Ist. Geol. Univ. Padova,* 15(1947): 1-30.

Malez M. (1986) - Die quartären Vertebraten-faunen in der SFR Jugoslawien. *Quartärpaläontologie*, 6: 101-117.

Markovic A. (1998) - Woolly rhinoceros *Coelodonta antiquitatis* (Blumenbach, 1803) from Pleistocene of Serbia. *Bull. Nat. Hist. Mus. Belgrade*, 47-50(A): 217-237.

Mastronuzzi G., Quinif Y., Sansò P. & Selleri G. (2007) - Middle-Late Pleistocene polycyclic evolution of a stable coastal area (souther Abulia, Italy). *Geomorphology*, 86: 393-408.

Melentis J.K. (1966) - Studien über fossile Vertebraten Griechenlands. 4. Die pleistozänen Nashörner des Beckens von Megalopolis in Peloponnes (Griechenland). *Ann. Géol. Pays Hell.*, 16: 363-435.

Nedeljkovic D. (2006) - *Coelodonta antiquitatis* (Blumenbach, 1799) iz nanosa reke Save kod Ravnja [*Coelodonta antiquitatis* (Blumenbach, 1799) from the drift of the river Sava near Ravanj] [in Serbian, English abstract]. *Rad Muzeja Vojvodine, Muzej Vojvodine, Novi Sad*, 47-48: 67-76.

Orlova L.A., Kuzmin Y.V. & Dementiev V.N. (2004) - A review of the evidence for extinction chronologies for five species of upper Pleistocene megafauna in Siberia. *Radiocarbon*, 46(1): 301-314.

Palmarelli A. & Palombo M.R. (1981) - Un cranio di *Coelodonta antiquitatis* (Blumenbach) (Rhinocerotidae) del Pleistocene superiore del Monte Circeo (Lazio meridionale). *Boll. Servizio Geol. Italia*, 102: 281-312.

Palombo M.R., Azanza B. & Alberdi M.T. (2003) - Italian mammal biochronology from the la test Miocene to the Middle Pleistocene: a multivariate approach. *Geologica Romana*, 36: 335-368.

Petronio C. & Sardella R. (1998) - Remarks on the stratigraphy and biochronology of the Late Pleistocene deposit of Ingarano (Apulia, Southern Italy). *Riv. It. Paleontol. Strat.*, 104(2): 287-294.

Shackleton N.J. (2000) - The 100.000-year Ice-Age cycle identified and found to lag temperature, carbon dioxide and orbital eccentricity. *Science*, 289: 1897-1902.

Tagliacozzo A. (2003) - Archeozoologia dei livelli dell'Epigravettiano finale di Grotta Romanelli (Castro, Lecce) strategie di caccia ed economia di sussistenza. In: Fabbri P.F., Ingravallo E. & Mangia A. (Eds) - La Grotta Romanelli nel centenario della sua scoperta (1900-2000), Atti del Convegno, Castro 6-7 ottobre 2000: 169-216.

Torre D., Abbazzi L., Bertini A., Fanfani F., Ficcarelli G., Masini F., Mazza P. & Rook L. (2001) - Structural changes in Italian Late Pliocene - Pleistocene large mammal assemblages. *Boll. Soc. Paleontol. It.*, 40: 303-306.

Vaufrey R. (1927) - Le mammouth et le rhinocéros à narines cloisonnées en Italie méridionale. *Bull. Soc. Géol. Franç.*, 27(4): 163-171.

Vogel J.C. & Waterbolk H.T. (1963) - Groningen radiocarbon dates IV. *Radiocarbon*, 5: 163-202.

Waelbroeck C., Labeyrie L., Michel E., Duplessy J.C., McManus J.F., Lambeck K., Balbon E. & Labracherie M. (2002) - Sea level and deep water temperature changes derived from benthic foraminifera isotopic records. *Quaternary Sci. Rev.*, 21: 295-305.