doi: 10.3304/JMES.2018.010

Journal of Mediterranean Earth Sciences 10 (2018), xx-xx

J M E S

Journal of Mediterranean Earth Sciences

New evidences of mammal tracks from the Pleistocene of Gonnesa area (southwestern Sardinia, Italy)

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ABSTRACT - In this work, we report the occurrence of proboscidean and canid footprints in the Sardinian fossil record. The ichnofossils are assigned to *Proboscipeda panfamilia* McNeil, Hills, Tolman and Kooyman, 2007, and *Canipeda* isp. The studied footprints are preserved in highly consolidated aeolian deposits from the Pleistocene of Funtana Morimenta and Porto Paglia areas (Gonnesa, southwestern Sardinia, Italy). The recovered mammoth ichnofossils are represented by isolated manus-pes couples preserved as hyporeliefs and/or epireliefs. Furthermore, other footprints were observed *in situ*.

Keywords: Palaeoichnology; Pleistocene; Mammals; Sardinia.

1. INTRODUCTION

Fossil tetrapod tracks represent a source for palaeoenvironmental reconstructions. Tracks of large mammals were reported in different localities and in various environments: lagoon, lacustrine and beach deposits (Fornos et al., 2002; Lucas et al., 2007; Carvalho, 2009). Previously, the only macromammal tracks known in Sardinia were those left by Plio-Pleistocene endemic ruminants. These footprints are assigned to the ichnogenus *Bifidipes* Dematheuet al. (2004) and were discovered in several localities of the western coast of Sardinia (Fanelli et al., 2007). The ruminant tracks from Sardinia were mainly left by the Pleistocene deer *Praemegaceros cazioti* (Depéret, 1897) and, occasionally, by the Plio-Pleistocene bovids of the *Nesogoral* group (Fanelli et al., 2008; Kotsakis et al., 2008). Usually, these tracks were produced into sandy substrates of eolianites, coastal deposits and temporary shallow ponds.

2. THE ICHNOASSOCIATION

A new evidence of macromammal tracks from the Quaternary deposits of Gonnesa (southwestern Sardinia, Italy, Fig. 1) is here reported. The ichnofossils are represented by canid, cervid and proboscidean footprints. An isolated dog footprint preserved as concave epirelief (Fig. 2B-a) was discovered in the Porto Paglia area. Furthermore, in the same sandstone-block some deer footprints referable to *Bifidipes* isp. are present (Fig. 2B-b). As regard the dog footprint, it is digitigrade and symmetrical with four well-developed toe pads and relative claw marks, its central pad is not clearly visible. In the Pleistocene of Sardinia, only two dog species belonging to the endemic genus *Cynotherium* are reported: *C. sardous* Studiati, 1857, from the Middle - Upper Pleistocene and *C. malatestai* Madurell-Malapeira et al. (2015), from the ?late Early Pleistocene and/or Early Middle Pleistocene. The dog footprint from Porto Paglia is likely referable to *Cynotherium*, and it is here assigned to the ichnogenus *Canipeda* Vialov, 1983.

In addition, several proboscidean footprints are recently reported (Pillola and Zoboli, 2017) (Fig. 2A). These footprints have been discovered in the Funtana

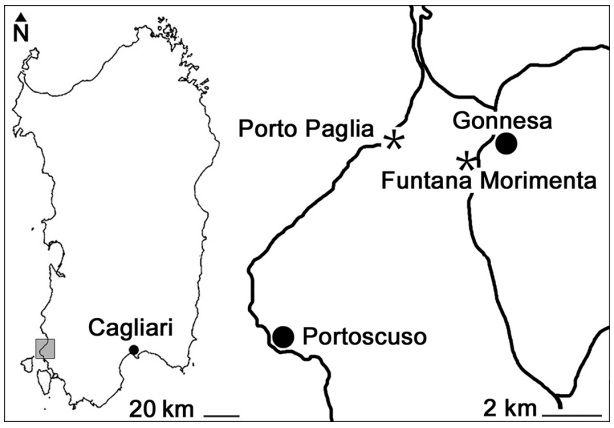

Fig. 1 - Map of the Gonnesa area (Sardinia, Italy), the asterisks indicates the ichnofossil sites.

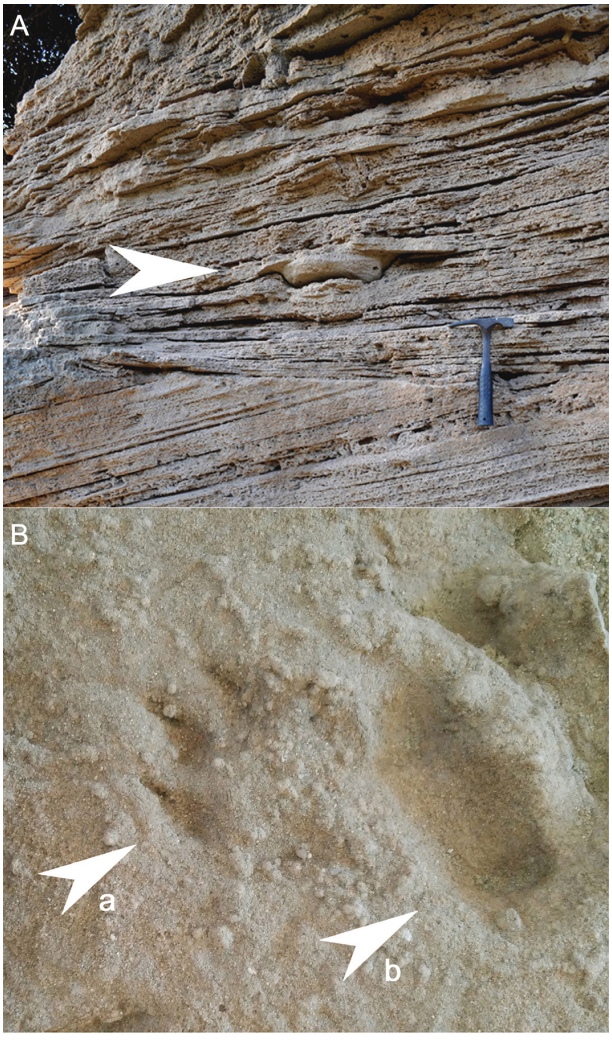

Fig. 2 - A) Cross-section of sandstone showing mammoth footprint impression and relative deformation of the underlying strata, Funtana Morimenta area. B) a: isolated dog footprint (*Canipeda* isp.); b: deer footprint (*Bifidipes* isp.), Porto Paglia area. Scale bar = 5 cm.

Morimenta aeolianites (l.s.) outcropping near the village of Gonnesa (Fig. 1). These ichnofossils are represented by single and double overlapping footprints, preserved as hyporeliefs and epireliefs.

The circular shapes and the size of the footprints (approximately 20 cm in diameter) indicate that the track-maker is probably the endemic dwarf mammoth *Mammuthus lamarmorai* (Major, 1883). The holotype of this species was found in the same locality at the end of the 19th century (Acconci, 1881). The mammoth footprints of Gonnesa are really small in comparison to the adult continental mammoth tracks, however, the state of preservation does not allow other considerations and these were assigned to the ichnospecies *Proboscipeda panfamilia* McNeil et al., 2007; Pillola and Zoboli, 2017) (Fig. 3).

3. CONCLUSIONS

The new data here reported allow to improve the knowledge of the vertebrate palaeoichnology record of Sardinia. The widespread ruminant footprint *Bifidipes* isp. is reported in the Funtana Morimenta area and *Canipeda* isp. is signaled in Sardinia for the first time. As regard the mammoth ichnofossils (*Proboscipeda panfamilia*), the Sardinian record may represent a unique example of dwarf mammoth footprints in the western Mediterranean Basin.

ACKNOWLEDGEMENTS - We gratefully acknowledge Sardinia Regional Government for the financial support of the PhD scholarship (P.O.R. Sardegna F.S.E. Operational Programme of the Autonomous Region of Sardinia, European Social Fund 2007-2013 - Axis IV Human Resources, Objective l.3, Line of Activity l.3.1.) and the Cagliari University CAR Project G.L. Pillola "Paleobiodiversità: strumento di base in biostratigrafia, in paleoecologia e nella valorizzazione dei beni culturali Geo-Paleontologici".

Fig. 3 - Picture of the dune landscape during the Middle-Upper Pleistocene at the Gonnesa area and vertebrate community interpreted from the track fossil record, from left to right: *Mammuthus lamarmorai*, *Cynotherium* sp. and *Praemegaceros cazioti*.

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