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Original article

A new small mammal assemblage from the M013 Terre Rosse fissure filling (Gargano, South-Eastern Italy)[☆]

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ABSTRACT

The taxonomic study of the small mammal assemblage from fissure M013, sampled by a team of the University of Torino during the 2005–2009 excavations in the Dell'Erba Quarry (Apricena, Foggia) is presented. The assemblage includes the Echinisoricinae *Apulogalerix* cf. *pusillus* and the Crocidosoricinae *Lartetium* cf. *dehmi*; the Myomiminae species *Sertomys simplex* and *Sertomys lyrifer*; a new genus and species of Cricetodontinae and a single specimen of *Hattomys* cf. *nazarii*. Muridae include *Mikrotia* cf. *parva*, *Mikrotia* sp. 1 and a new genus and species of Murinae, phylogenetically related to *Mikrotia*. The occurrence of the new Murinae, the new Cricetodontinae, the two species of glirids and the Crocidosoricinae, as well as the absence of *Apodemus* and *Prolagus*, indicates M013 as the oldest Gargano's faunal assemblage known to date, despite the occurrence of *Hattomys* cf. *nazarii*, *Mikrotia* cf. *parva* and *Mikrotia* sp. 1, which most probably results from infiltrations from younger fissure fillings. The M013 assemblage is an absolute novelty for the Abruzzo-Apulian Palaeobioprovince, opening new perspectives for the timing and mode of dispersal of the forerunners of the Gargano fauna.

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1. Introduction

A rich amount of fossil remains of a highly diversified vertebrate fauna, known as the “*Mikrotia* fauna” (nomen novum for *Microtia* Freudenthal, 1976; Freudenthal, 2006) has been retrieved over the last 40 years from the extensive palaeokarst network that affects the Mesozoic limestone along the north-western slopes of Mount Gargano (Fig. 1). The maze of fissures is filled-in with red soil deposits called Terre Rosse. The faunal assemblages reveal a rather complex history of faunal colonisations, which occurred when the area was isolated.

The fossiliferous deposits were extensively exposed by intensive quarrying in an area of some 20 square kilometres, between the towns of Apricena and Poggio Imperiale (Fig. 1). A similar fauna, however, was also found at San Nazzario (about 5 km N) and Monte Granata (25 km SE), as well as in an unspecified locality between Barletta and Andria (Freudenthal, 1971), about 100 km SE from the quarry area. The Terre Rosse fauna, together with those recovered in Scontrone and Palena-Capo di Fiume (Abruzzo, central Italy), documents the existence of a biogeographic domain called the

Abruzzo-Apulian Palaeobioprovince (Mazza and Rustioni, 1996, 2008; Rook et al., 2006).

The numerous fissure fillings document a succession of faunal immigrations in an archipelago (Freudenthal, 1976; De Giuli et al., 1986a, 1990). The colonizations occurred in at least four distinct phases (De Giuli et al., 1987a, 1990; Masini et al., 2008) which are reflected in the different degrees of diversity and endemism of the taxa (Masini et al., 2010).

The Terre Rosse deposits were first sampled from 1969 to 1974 by a team of the Rijksmuseum van Geologie en Mineralogie of Leiden, the Netherlands (now Netherlands Centre for Biodiversity, Naturalis) led by Matthijs Freudenthal. In the 1980s, a team of the Dipartimento di Scienze della Terra of the University of Florence (Italy), led by Claudio De Giuli and Danilo Torre, collected a large amount of specimens. More recently, a team of the University of Torino led by Giulio Pavia carried out extensive fieldworks in the area, focusing on the Villafranchian deposits of the Apricena karstic network (Pavia et al., 2011). The Torino team, however, sampled also several Terre Rosse fissure fillings to preserve this unique palaeontological record from the ongoing destructive quarry activity. The M013 fissure was discovered and sampled during the 2005–2009 excavations in the Dell'Erba Quarry. It is located at the southern border of the quarrying area, once known as the Pirro Quarry, close to the extensively investigated Pirro 10 site (Pavia et al., 2011).

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Fig. 1. Location map of the Abruzzo–Apulian Palaeobioprovince sites. Squares indicate localities with Terre Rosse fauna found in fissure deposits of the foreland domain. Triangles indicate localities with remains found in beach to marine deposits in the chain domain. After Masini et al. (2010), modified.

Forty years after the discovery of the Terre Rosse fauna, this newly-found M013 fissure filling is first described. Three new components are added to the established “*Mikrotia* fauna” list: a primitive *Deinogalerix* (Villier et al., 2013), a primitive Cricetodontinae (new genus and species) and a Murinae (new genus and species) related to *Mikrotia*. These three new entries indicate M013 as Gargano’s oldest fissure described to date.

2. Chronological and palaeontological setting

2.1. Foreword

All classes of tetrapods are represented in the “*Mikrotia* fauna”: Amphibia, Reptilia, Aves and Mammalia. In spite of this, however, the fauna is highly unbalanced and presents all the features of an insular assemblage. The bulk of the assemblage is composed of endemic micromammals (rodents, lagomorphs and insectivores = Eulipotyphla) and birds, some of which of very large size. Macromammals are less well represented. They include the highly endemic ruminant family Hoplitomericidae (Mazza, 2013), but also several species of the “giant” hedgehog *Deinogalerix* (Villier et al., 2013): despite being insectivores, they are commonly included among the large mammals of the Gargano fossil community because of their anomalous size. Carnivores are represented only by the marine otter *Paralutra garganensis*. Nevertheless, the fissure fillings gave rich amounts of remains of non-mammalian predators, such as crocodiles, snakes, but most of all birds of prey. Bats are under-represented in the Gargano Terre Rosse fauna. An updated faunal list of the mammalian taxa is reported in Masini et al. (2010).

Because the deposits from the different fissures are not physically superimposed in stratigraphical succession, they had to be arranged in biochronological order (sensu Lindsay, 1990) on the basis of the degree of evolution of their faunal content. This was possible because the faunal composition and the endemic features of the taxa from the different fissures vary fairly coherently. In his pioneering paper, Freudenthal (1976) elaborated a biochronological succession of the fissures sampled by Naturalis, based on the evolution of the teeth (size and morphotypes) of both *Mikrotia* and cricetids. The evolutionary succession of *Mikrotia* was actually the skeleton of the whole biochronological scheme.

Freudenthal’s (1976) chronology was De Giuli et al.’s (1987a) starting point. These authors based their reconstruction on eight samples collected by the Florence University team, chosen for their very rich fossiliferous content, that could be confidently assumed as appropriate to reconstruct the faunal succession in the

palaeoisland. The authors carried out detailed morphological analyses on *Prolagus* (Mazza, 1987a, 1987b, 1987c), but most decisively on *Mikrotia*. With the exception of the fissure San Giovannino, nobody had ever attempted to compare and possibly merge the two biochronological schemes. Rinaldi and Masini (2009), studying Myomiminae from the two collections kept at Leiden and Florence, were the first who tried to amalgamate the two systems into a single framework (Fig. 2). Nonetheless, by their own admission, Rinaldi and Masini’s (2009) effort was not flawless for a number of reasons. First, De Giuli et al. (1987a) and Freudenthal (1976) analyzed samples of different sizes – the former studied few larger ones, whereas the latter based his analysis on many small sub-samples. Moreover, different principles were used to organize the populations from the different fissures into an evolutionary succession. Freudenthal (1976) assumed a progressive linear increase in size of the individuals over time – a sort of equivalent of Foster’s (1964) island rule. De Giuli et al. (1987a) considered Freudenthal’s assumptions weak and regarded the appearance of new morphotypes (“apomorphies”) as a more effective proxy of the evolutionary advancement of a population. Additional difficulties come from the incomplete knowledge of the faunal composition of some fissures as well as from the non-equivalent taxonomic-evolutionary information on which the two orderings are based. Cricetids, for instance, were not analyzed by De Giuli et al. (1987a), whereas Freudenthal (1976) ignored *Prolagus*.

Phases	De Giuli et al., 1987a	Freudenthal, 1976
4	F32	
3	San Giovannino F9	San Giovannino Pirro 11A
2	F1	Fina D Cantatore 3A
1	F21a-b F15	Trefossi 1 Rinascita 1 Biancone 1

Fig. 2. Tentative correlation of the biochronological successions by De Giuli et al. (1987a) and by Freudenthal (1976), presented in Rinaldi and Masini (2009), modified.

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