

Comment

Notes and Discussions on Marra, A.C. Evolution of Endemic Species, Ecological Interactions and Geographical Changes in an Insular Environment: A Case Study of Quaternary Mammals of Sicily (Italy, EU). *Geosciences* 2013, 3, 114–139.

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1. Introduction

In her paper, A.C. Marra intends to review the current knowledge on Quaternary mammals of Sicily. As a review, the paper should have presented a clear, updated and rigorous picture of the chosen topic. Actually, most of the paper's contents come from previous review papers (quoted with the numbers 1–6, 18, 19 and 50), most of which are dated. Above all, A.C. Marra overlooked recent important data concerning the species contained in the different faunal assemblages of Sicily, as well as previous data concerning the stratigraphy and datings of the faunal deposits.

2. Discussion Notes

Important data from the recent literature are lacking in the paper of A.C. Marra. In particular, the following remarks can be made:

1. Herridge [1] provides the first pan-Mediterranean study that incorporates taxonomic and allometric approaches to the evolution of dwarf elephants. At the species level, taxa denominations were shown to be valid, but the taxonomic integrity of the *Palaeoloxodon mnaidriensis* hypodigm was rejected and a new species of “large sized” dwarf elephant on Sicily and Malta was identified. As a consequence, Herridge [1] groups the dwarf elephant species of Sicily and Malta into three broad size-classes: “small sized” (*Palaeoloxodon falconeri*), “medium sized” (*Palaeoloxodon mnaidriensis*), and “large sized” (*Palaeoloxodon* sp. nov). Elephant remains from the Puntali, San Teodoro, and Za Minica caves are referred by Herridge [1] to *Palaeoloxodon* sp. nov., which cannot be considered part of the same lineage (*i.e.*, not ancestral) of the Sicilian *P. falconeri* [1,2]. Also according to Ferretti [3], it cannot be excluded that, actually, the Sicilian and Maltese medium-sized elephants are

the results of separate dwarfing processes in the two islands; the same author suggests keeping the name *P. mnaidriensis* for the Puntali Cave elephant remains, according to the current usage, even if this treatment is uncertain and needs further investigation. The question of what Marra calls “normal sized” elephants just cannot be limited to the elephants coming and going in the Strait of Messina area.

2. As concerns the Sicilian hippos, Burgio [4] already suggested the possibility that hippopotamuses of different sizes inhabited Sicily in Pleistocene times. Petruso and Taschetta [5] studied the hippo remains coming from the fossil site named “K22”, which is located in the San Vito Lo Capo Peninsula (TP), in North-Western Sicily. Biometrical data have been compared with those coming from the literature or unpublished thesis on other Sicilian hippo remains; in particular, two samples from the sites of Acquedolci [6–8] and Capo Tindari [9], in Eastern Sicily, and two samples from the sites of La Cannita [10,11] and San Ciro (unpublished data, see [6]), in North-Western Sicily, have been considered.

According to Petruso and Taschetta [5], *Hippopotamus pentlandi* from the K22 site shows important biometric differences, particularly in the postcranial skeleton, with respect to the other Sicilian hippos. It is well differentiated from the Acquedolci and Capo Tindari populations, which show the largest size, while it seems to be closer to La Cannita populations, even if smaller. As a matter of fact, a rigorous paper dealing with the thousands of remains from Acquedolci deposits [12] has not been published yet, and the question as to how many species of hippos inhabited Sicily during the Pleistocene remains open.

3. As to the faunal assemblages of the *P. falconeri* Faunal Complex (FC), the remains of the giant tortoises recovered from some Middle Pleistocene Sicilian deposits (Alcamo area in the Western Sicily, and Ragusa area in the South-Eastern Sicily), which were traditionally attributed to the genus *Geochelone*, are provisionally to be referred to a subfamily rank as Testudininei indet., probably to the African genus *Centrochelys* or to the European genus *Cheirogaster* [13].

4. Remains of *Equus hydruntinus* from the San Teodoro Cave show some similarities as well as some differences, in respect to the specimens from some Italian peninsular sites [14].

In addition, morphometric data on *Crocota crocuta spelaea* remains from the rich deposit of San Teodoro Cave have not been published yet, but the study of remains is still in progress, as those researchers who actually are dealing with Pleistocene mammals of Sicily well know [15]. A greater caution should be used on this topic, as the wrong identification of the taxa renders the proposal by Marra ill-timed and insignificant.

Other data from previous literature are to be taken in consideration, also regarding reliable stratigraphic information, which is still lacking for most of the cave deposits in Western Sicily, as they were emptied without stratigraphic methods during the 19th century [16], with a few exceptions concerning San Teodoro and San Ciro caves [17,18]. The following remarks can be made:

1. According to Abbazzi *et al.* [19], *Dama carburangelensis*, a species which has been attributed to the *Elephas* (= *Palaeoloxodon*) *mnaidriensis* FC, descends from the Calabrian species *Dama dama tiberina*, a subspecies of fallow deer described on fossil materials from Central Italy sites [20], referred to the upper part of the Middle Pleistocene (MIS 7 of the $\delta^{18}\text{O}$ stratigraphy), which was already present in Italy during MIS 9 [21]. *Dama carburangelensis* is certainly found in Sicily in the fissure filling deposits of Contrada Cimillà (South Eastern Sicily) [22], as well as in the continental deposits of

Carburangeli Cave and Cape Tindari, younger than the MIS 5e [23]. This datum calls in question the belonging of this taxon to a pre-MIS 6 dispersion phase through the Messina Strait.

2. Since 2008, amino acid racemization (AAR) dating of Sicilian Pleistocene mammals by Bada *et al.* [24] has been discredited. The age of the Puntali Cave fauna was calibrated using remains of *P. antiquus* from Isernia La Pineta (Southern Italy) for calculation of the isoleucine epimerization rate. According to Ferretti [3], an age slightly younger than 180 kya is to be attributed to the Puntali Cave fauna owing to new radiometric dates on the Isernia La Pineta fauna [25]. According to Herridge [1], the AAR dating of Sicilian Pleistocene mammals by Bada *et al.* [24] should be treated with caution, because AAR method, unlike radiometric techniques, is based on a chemical reaction as racemisation rate is a function of temperature, as well as time; the depositional environment (e.g., pH, water circulation, temperature) can impact on amino acids diagenesis and leaching, violating closed system assumptions. Burgio [4] already observed that new radiometric data from Contrada Fusco [26] bring into question previous AAR datings. In any case, AAR dating cannot be named as an absolute age, as Marra does at page 118.

3. The two sedimentary units recognized by Vaufrey [27] (red soils containing lithic tools and remains of vertebrates including *Equus hydruntinus*, and underlying deposits containing large mammal remains) only concern the cave deposits of Sicily, and the scheme suggested by Kotsakis [28] was based on the previous literature which was only applied to the cave deposits. Since 1985, stratigraphical researches and systematic excavations in Eastern and Western Sicily (Acquedolci, Coste di Gigia, Alcamo, Contrada Fusco, San Vito Lo Capo peninsula) yielded new data regarding the distribution of the bone deposits, their taphonomical characters and the correlation of the vertebrate-bearing deposits with the Pleistocene terraced deposits which in turn may be correlated with the $\delta^{18}\text{O}$ isotopic record and the main palaeogeographic events in Sicily ([16] and references therein). The new stratigraphic data have been added to the data previously recognized (see [27,29–31]). The remains of Pleistocene land vertebrates in Sicily, although traditionally associated with caves, in fact occur in a variety of different environments, which reflect the different palaeogeographic conditions of the Early, Middle and Late Pleistocene. Pleistocene terrestrial vertebrates are contained in limnic deposits frequently associated with a lagoon or swamp, in small freshwater basins or in deposits of transitional and marine littoral environments [32,33]. In the Hyblean carbonatic Plateau (South Eastern Sicily), numerous fissure filling deposits were recognized [34]. Systematic excavations at Contrada Fusco (Syracuse, South Eastern Sicily) [33] are of basic importance for modern research, because they illustrated a coastal plain environment characterized by fluvial deposits and by swamps, where a rich faunal assemblage composed of birds, large and small mammals is preserved. Continental basins deposits (Comiso, Contrada Fusco) better represent the assemblages belonging to the different FC, as they are free of taphonomic constraints typical of the cave environments. The definition of “Faunal Unit” by Gliozzi *et al.* [35] is based on all the species from local faunas selected as typical associations, which all belong to continental basins environments.

4. Finally, biochronology from Gliozzi *et al.* [35] is based on mammals, molluscs and ostracods. In Sicily, data from large and small mammals, birds and terrestrial molluscs, should be used with the aim to construct an integrated biochronology by all those specialists working on this topic (such as Esu, Masini, Pavia, Petruso).

3. Critical Observations

In the paper by A.C. Marra, the sources of palaeogeographical maps are lacking. Figure 5 by Marra is slightly modified from Bonfiglio *et al.* [36]; this map has been recently updated by Bonfiglio and Mangano [37] on the basis of numerous data (see [38–41]) and it has been also published in Rosso *et al.* [42] (see Figure 1). The area of the Messina “Strait” had a width of more than 60 km. Also, the palaeogeographic map in Figure 6 by Marra should be updated, according to Barrier [43] and Lentini *et al.* [44] geological maps (see Figure 2). In fact, a unique Pliocene–Lower Pleistocene transgressive sequence has been recognized in Sicily and Southern Calabria which has been controlled by tectonic activity and which ends with early Middle Pleistocene bathyal deposits [38,40,41,45–51]. In a second stage, probably since the early Middle Pleistocene, the region was strongly uplifted. Deltaic marine gravels and sandy deposits (“Messina Formation”) overlie the older bathyal ones in the area of the Strait of Messina. The extension of littoral deposits of the Messina Formation is shown in Barrier [43] and Lentini *et al.* [44] geological maps (see Figure 2). Disarticulated, fragmented, worn and mechanically selected fossil remains of elephant, hippopotamus, red deer, bear and tortoise are contained in the “Messina Formation” deltaic marine deposits [52].

Figure 1. Lower Pleistocene palaeogeography of North-Eastern Sicily and Southern Calabria. Dark gray: deposits of bathyal environment. Light gray: lands. Modified after Bonfiglio and Mangano [37].

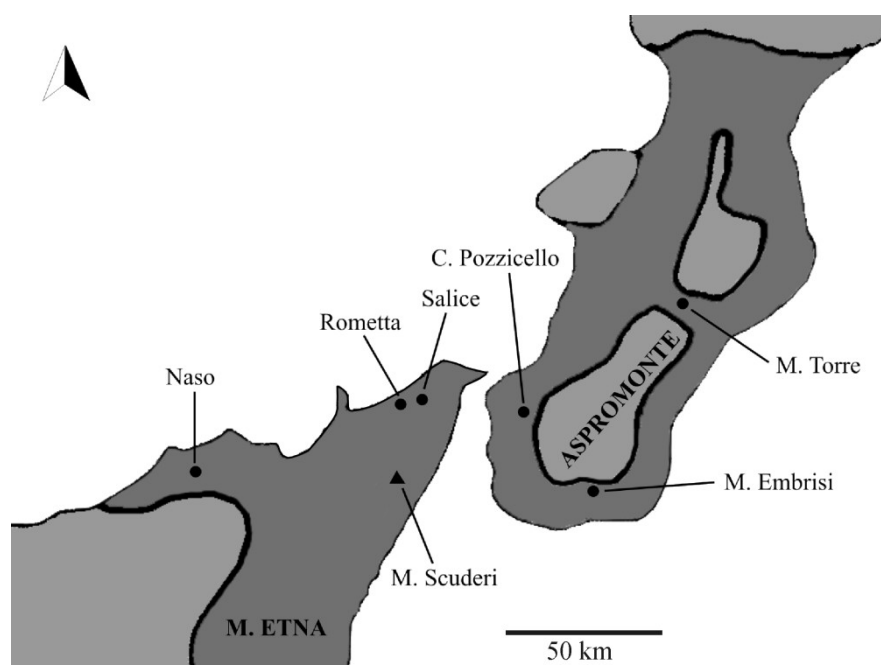
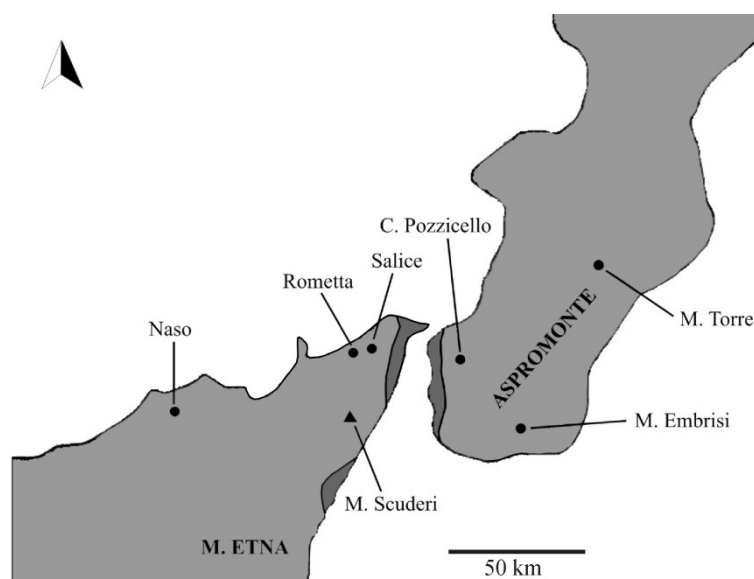


Figure 2. Late Middle Pleistocene palaeogeography of the Messina Strait area. Dark gray: littoral environment deposits of the “Messina Formation”. Light gray: lands. Modified after Barrier [43] and Lentini *et al.* [44].



The map in Figure 7 by Marra is not consistent with the arrival of *Equus hydruntinus*, as the presence of this horse in Sicily necessarily implies the existence of a stable land bridge at the time when it entered the island. The map in Figure 8 probably comes from Lambeck *et al.* ([53], Figure 12).

Finally, referring to the *Palaeoloxodon falconeri* Faunal Complex (FC) taxa, Marra writes: “Once they reached the island they underwent evolutionary changes related to insular conditions”. As a matter of fact, the first elephants occurring in Sicily in the Comiso limnic deposits are already very reduced in size [54].

In addition, some misprints are to be signaled:

- Page 116: the Barrier paper (quoted as No. 10) does not deal with the width of the Messina Strait, as it concerns the reconstruction of the diachronic marine Pliocene and Pleistocene sedimentary bodies, not their extension;
- Page 117: bats from Spinagallo cave have been studied and published by Kotsakis and Petronio [55];
- Pages 121 and 134, Figures 3 and 9 by Marra: references about the Marine Isotopic Signal $\delta^{18}\text{O}$, stratigraphy and Mammal Ages of peninsular Italy are lacking; since from 1997 [35] numerous biochronological settings of Italian Mammal Ages have been published;
- Pages 123–125 and 128: the paper quoted as No. 47 does not deal with the size reduction of *P. falconeri* or with “the stadial oscillations of the sea level in late Middle Pleistocene”; the correct number is probably 48;
- Page 124: the reference concerning *Lutra trinacriae* (quoted as No. 48) is not correct, as the correct number is 47;
- Page 126: the paper quoted as No. 47 does not deal with Contrada Fusco deposit; not one paper by Chilardi on Contrada Fusco is quoted;
- Page 127: references about the “good ichthyofauna” present in the freshwaters are lacking;

- Page 128, Table 1 by Marra: the paper quoted as No. 5 is not a paper by Palombo and does not deal with feeding behavior and body mass of endemic large mammals of Sicily; in fact, the references to the methods used for estimating the body mass are lacking;
- Page 130: taxa from faunal assemblages of Calabria considered as precursors of the species of San Teodoro Cave–Pianetti FC come from two well known post MIS 5e deposits from the following sites: the hill of S. Francesco d’Archi [56,57], and Contrada Ianni di S. Calogero [58]; Mallegni and Trinkaus [59] reported a Th–U determination of older than 40.000 years BP on marine mollusks from the San Francesco d’Archi level P, overlying the layer C-3 containing an immature Neanderthal mandible and vertebrate fauna;
- Page 133: at San Teodoro Cave, evidence of wet climatic conditions in the older levels of the excavated trenches have been described by Bonfiglio *et al.* [60] and Mangano [61].

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Conflicts of Interest

The author declares no conflict of interest.

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