

Reply

Response to Bonfiglio, L. 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 the following discussion, the author replies to the critical notes by Bonfiglio and demonstrates that they did not discredit the reliability and the accuracy of her paper [1].

2. Discussion

In discussion notes, Bonfiglio claims that “*important data from the recent literature are lacking in the paper of A.C. Marra*” [2], but the reported remarks are mainly based on unpublished data or on personal opinions and interpretations. The remarks are discussed here following Bonfiglio’s discussion.

1. Bonfiglio [2] reports data on elephants sourcing from Herridge’s PhD thesis [3], still unpublished, so they have to be treated with caution. Marra [1] did not report that large (“normal”) sized elephants are in the same lineage of *Palaeoloxodon falconeri*, as Bonfiglio asserts, but proposed that some occurrences of elephants having a size comparable to mainland ones might be related to several dispersal events through the Strait of Messina during late Middle Pleistocene. This hypothesis has also been considered by Palombo, with particular attention to the samples from Contrada Fusco, dated MIS 5 [4]. The proposal of a new species by Herridge [3] is interesting and, if verified, supports the hypothesis formulated by Marra. According to Herridge [3], *Palaeoloxodon* sp. nov. does not belong to the lineages of other Sicilian species and its origin can be found in newcomers probably spread after MIS 5. As a matter of fact, the caves where the specimens occur (Puntali, San Teodoro and Zà Minica) have been dated with different methods. Deposits yielding the proposed new species have been dated $32,000 \pm 4000$ yr by radiometric dating at San Teodoro cave [5] while at Puntali and

Zà Minica have been dated $200,000 \pm 40$ by aminoacid racemization [6]. However, the faunal assemblages of Puntali and Zà Minica, as well as San Teodoro, include *Bison priscus siciliae*, a species tentatively considered a new comer of the San Teodoro Faunal Complex [7]. The attribution of Puntali and Zà Minica assemblages to the San Teodoro Faunal Complex cannot be confirmed only by the occurrences of *Paleoloxodon* sp. nov. (still under study) and *Bison priscus siciliae* (present also in other sites still attributed to the Maccagnone Faunal Complex). Moreover, *Hippopotamus pentlandi*, considered extinct in the San Teodoro Faunal Complex, is recorded at Zà Minica, while *Equus hydruntinus*, found at San Teodoro, does not occur at Puntali and Zà Minica [8]. The publication of data from the Herridge's doctoral thesis [3] and a re-considerations of local faunal assemblages is needed. At the state of knowledge, the caution suggested by Ferretti [9] must be adopted.

2. Bonfiglio reports that “Burgio already suggested the possibility that hippopotamuses of different sizes inhabited Sicily in Pleistocene times” [2], but the hypothesis by Burgio [10] is not supported by biometrical data in his paper, which is a review published on an exhibition guide (not peer-reviewed). Findings of few postcranial remains of hippopotamuses from a site of unclear stratigraphy and taphonomy [11] are proposed by Bonfiglio as evidence of the presence of a new species smaller than *Hippopotamus pentlandi* [2]. The sample studied by Petruso and Traschetta is very poor and bones are badly preserved, as clearly wrote in the paper: “the taxonomic determination was possible only for the 33% of the bone material since the rest was badly damaged [...] only the 4% of the fossil material have been measured due to its bad conservation status” [11]. The few measurements on abraded postcranial bones and the shortage of comparisons are not sufficient to claim the existence of a new species of hippopotamus in Sicily. Moreover, the presence of a species smaller than *Hippopotamus pentlandi* is not documented in the abundant biometrical and morphological dataset known for hippopotamus remains recorded in Sicily [12,13]. Remains from Acquedolci and from the main sites of Sicily have been studied in Marra's doctoral thesis (supervisor Professor Ficcarelli, University of Florence; assistant supervisor Professor Bonfiglio, University of Messina) and no small bones have been found so hitherto there is no evidence to support a new species [14].

3. The attribution of tortoise remains of the genus *Geochelone* to “a subfamily rank as *Testudininei* indet., probably to the African genus *Centrochelys* or to the European genus *Cheirogaster*” reported by Bonfiglio [2] is based on a short abstract without biometrical and morphological data and discussion [15]. Although the study is interesting, the source of information cannot be considered before the publication of all data, possibly on a referred paper.

4. Bonfiglio emphasizes that “wrong identification of the taxa renders the proposal by Marra ill-timed and insignificant” [2], announcing new data on *Crocota crocota spelaea* and *Equus hydruntinus* from San Teodoro cave still unpublished, citing personal opinions and references on abstract books where morphological and biometrical data are not available [16,17]. These works in progress will certainly improve the knowledge about the San Teodoro Faunal Complex (FC) but cannot be considered in this form. Furthermore, Marra [1] reported the determinations of species from S. Teodoro published by the Bonfiglio's research team on referred journals from 2000 to 2012 [5,18–22], and it appears amazing that Bonfiglio considers the specific determinations wrong.

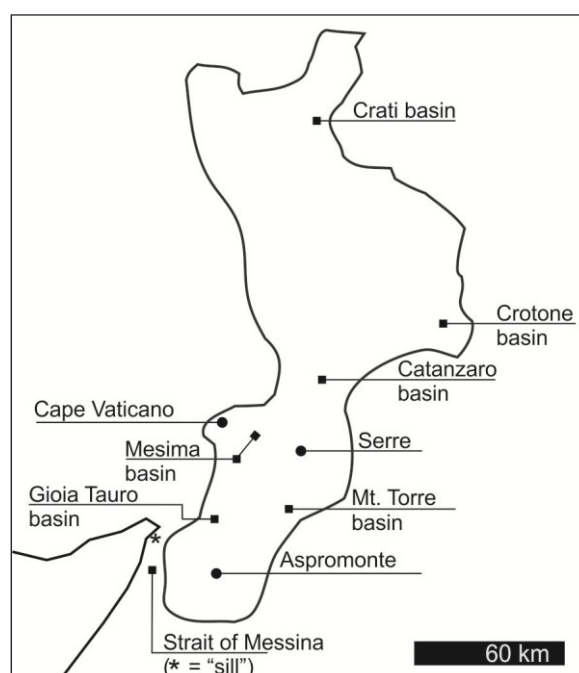
The data suggested by Bonfiglio [2] and the discussion represent details included in the references cited by Marra [1]. In particular:

1. Dispersals before MIS 6 have been considered (pages 124–125);
2. Amino acid racemization (AAR) dating might be considered not reliable, but it has to be reported;
3. Discussion on single sites is not pertinent to the review proposed by Marra [1]. However, data on the most relevant sites and their stratigraphy have been considered, and related papers, including wide discussions and rich bibliography, have been cited [19–24];
4. Bonfiglio claims that “*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 (Esu, Masini, Pavia, Petruso)*” [2]. This is to be hoped, but the work is still unpublished. The paper by Marra [1] is a step in this direction.

In the section “Critical Observations” [2], Bonfiglio reports palaeogeographical reconstructions by Bonfiglio and Mangano [25] and Rosso *et al.* [26], published respectively on a local symposium volume and on an excursion guide, both without referees. The source of palaeogeographic maps is reported in Marra [1] as Marra 2009 [27]. Bonfiglio suggests to update Figure 5 in Marra [1] using Figure 1 of her note [2], but Figure 5 by Marra is the palaeogeographic reconstruction of early Middle Pleistocene, while Figure 1 by Bonfiglio is related to lower Pleistocene. Moreover, Figure 5 by Marra is based on the evidence that in the early Middle Pleistocene, Mount Torre sea-strait was closing, and a lagoon was in, in connection with the marine basin of Locri; a portion of Cape Vaticano tilted under the sea-level [28] (sites are quoted in Figure 1, this paper). At that time, the sea strait of Catanzaro was very narrow and definitely closed in the Middle Pleistocene [29], while the Messina Strait was wider than today [30] (sites are quoted in Figure 1, this paper). Figure 1 by Bonfiglio is more pertinent to the early Pleistocene (comparable to Figure 4 in Marra [1]), with some considerations: in the Late Pliocene–Early Pleistocene, Calabria consisted of three islands (Serre, Aspromonte, and Capo Vaticano) by sea straits. In the Crati basin, a very thick Pliocene–Pleistocene sedimentary succession was depositing [31]. The marine basins of Mount Torre and Catanzaro were connecting the Tyrrhenian and Ionian seas, while the marine basins of Mesima and Gioia Tauro were isolating Cape Vaticano [28,29,32,33] (sites are quoted in Figure 1, this paper). Southernmost, the Messina Strait persisted as a sea strait for all the Quaternary, between Calabria and Sicily [34,35] (sites are quoted in Figure 1, this paper).

The detail showed in Bonfiglio’s Figure 2 [2] is reported in Figure 7 by Marra [1], in a different scale. The map of Figure 7 cannot be modified as requested by Bonfiglio, just on the basis of the spreading of *Equus hydruntinus* [2]. Marra pointed out that coastal lines might have changed locally and reported that the “*arrival in Sicily of a new stock of small mammals and some large mammals has been related by Bonfiglio et al. 2002 [20] to the opening of a land bridge as a consequence of an eustatic low stand, and by Marra 2009 [27] to a ‘stepping stones’ dispersal way*” (p. 129 in [1]; references are updated to this paper). Moreover, dispersals of *Equus hydruntinus* and possibly of *Bison priscus siciliae* are discussed also by a paleocological point of view by Marra (p. 130 in [1]).

Bonfiglio criticizes the sentence about *Palaeoloxodon falconeri*’s precursors: “Once they reached the island, they underwent evolutionary changes related to insular conditions” [1]. Bonfiglio claims that “*the first elephants occurring in Sicily in the Comiso limnic deposits are already very reduced in size*” [2]. It is obvious that the sentence by Marra was addressed to the precursors of endemic elephants, evolved on island from continental forms spread to Sicily, and it was not related to fossil evidence.

Figure 1. Sites quoted in the text.

Bonfiglio [2] asks references for the “good ichthyofauna” indicated by Marra (p. 127 in [1]), but the complete sentence is “*It is likely that a good ichthyofauna was present in the freshwaters, sufficient to sustain the rich avifauna*” and it is clear this assumption is inferred by the palaeoecology of birds in the Sicilian fossil record [36].

Bonfiglio reports wet conditions at San Teodoro cave, but they are referred to older levels of the cave, not to the whole Faunal Complex [2]. Marra [1] reports the general dry climate conditions of the San Teodoro FC resulting from faunal association and pollen data [37].

Bonfiglio indicates misprints, that are useful “*errata corrige*” to Marra’s article. In particular:

- Page 116 (line 23): errata “[10]”—corrigé “[52]”;
- Page 117: in the *Elephas falconeri* FC (line 15): errata: “undetermined bats”—corrigé: “bats”;
- Pages 123 (last line), 124 (lines 1 and 26), 125 (line 5), 126 (line 4), 128 (line 7): Errata “[47]”—corrigé “[48]”;
- Page 124 (line 2): errata “[48]”—corrigé “[47]”;
- Page 128, Table 1: errata “[5]”—corrigé “[34]”.

3. Conclusions

The reply to notes and discussions by Bonfiglio demonstrates that:

- The author did not overlook “*recent important data concerning the species contained in the different faunal assemblages of Sicily*” [2], the data mentioned by Bonfiglio being still unavailable in scientific papers but only reported without any biometric data in abstracts [15–17] or in unpublished doctoral thesis [3], or problematic sites [11], or unsupported researchers’ hypothesis [2,10];

- The author considered all the available and reliable data previously published concerning stratigraphy and dating of the faunal deposits, thus not considering unsupported or unpublished data.

The reliability and accuracy of the paper by Marra [1] can thus be upheld.

Acknowledgments

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Conflicts of Interest

The author declares no conflict of interest.

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