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Large-sized and middle-sized elephants from the Pleistocene of Sicily: the case of Contrada Fusco (Siracusa, Southeastern Sicily)

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SUMMARY: In Sicily, large-sized elephants have been found in association with the medium-sized species *Palaeoloxodon (=Elephas) mnaidriensis* in the so-called "stadio di Maccagnone" dating to the late Middle Pleistocene. The possibility that they represent a different species than *P. mnaidriensis* (for instance a subspecies of *P. antiquus*) is not unanimously accepted by scholars and an alternative hypothesis must be considered. The aim of this study is to explore new aspects of this subject starting from the excavation of Contrada Fusco. At this site large-sized and middle-sized elephants were found in the same stratigraphic levels dating to isotope stage 5. The large number of recovered remains provide us with a good basis from a statistical point of view. Preliminary biometric data seem to suggest that sexual dimorphism could be invoked to explain size differences for elephants in the faunal assemblage.

1. The Excavation of Contrada Fusco

The excavation of Contrada Fusco, close to the western periphery of Siracusa, took place from 1991 to the end of 1995. It uncovered a complex stratigraphic series which has furnished an enormous quantity of palaeontological and palaeoenvironmental data. The faunal assemblage includes 55 species of vertebrates, of which the following have been identified so far: fishes, reptiles. amphibians, birds, micromammals (insectivores and rodents), otters, hyenas, bears, and large sized mammals as hippopotamus and elephants.

The stratigraphic sequence starts with marine clays which date to the end of the Sicilian (Caruso 1996) and contain *Globorotalia truncatulinoides excelsa, Hyalinea baltica*, and *Gephyrocapsa* sp3. They are overlain by continental silts which contain no vertebrate remains (level L1). The top of this unit is incised by channels filled with alluvial sediments (related to a braided system) which are mainly gravels (level All) and contain abundant vertebrate remains. The faunal assemblage is dominated by a "medium sized" elephant, formerly called *Palaeoloxodon (=Elephas) mnaidriensis*, and a second kind of elephant of larger dimensions which has been provisionally classified as *Elephas* sp.

Pollen analyses (Arobba 1996) demonstrated the presence of a shrub vegetation while the few trees formed patches of woodland or grew in those places where it was possible to reach the uppermost water-table. Among the birds there is a prevalence of species typical of open environments, confirming that the climate must have been rather dry and substantially warm (Cassoli & Tagliacozzo 1996) with probable seasonal rainfall.

In the following phase a limited marine transgression deposited biogenic limestones (level C3) eastwards, while westwards there are sandy limestones and sands typical of a transitional beach environment (level C4). These latter sediments contain numerous vertebrate remains among which the hippopotamus becomes more and more frequent.

A subsequent regression led to the formation of a vast coastal plain characterised by ponds and

marshes populated by a great variety of vertebrates. Dominated by the presence of the hippopotamus, this level (L2) shows a very low percentage of elephant remains. It is possible that the herds were disturbed by the large hippopotamus population and preferred to exploit other water resources rather than competing with them.

This phase ends with a new marine transgression which caused the formation of a huge salt water lagoon. The sediments (level L3) contain a few remains of hippopotamus and mark the end of the Middle Pleistocene deposits in the area.

The average age obtained using Electron Spin Resonance for the three levels (All, C4 and L2) which are rich in fauna is 146,800 ± 28,700 years BP, so within one standard deviation, and in view of the likely interglacial age of the deposits, the stratigraphic sequence can be referred to isotope stage 5 (Rhodes 1996). The faunal assemblage could be referred to the so called "stadio di Maccagnone" (Burgio 1997) characterised by a well balanced fauna with few endemic features.

The presence of large-sized elephants in the faunal assemblage is one of the most interesting features. Large sized elephants have previously been found in Sicily, for instance during the excavations in Viale Libertà in Palermo. These have been referred to *Palaeoloxodon (=Elephas) antiquus leonardii*, a subspecies of the continental *P. antiquus*. The faunal assemblage of Contrada Fusco is probably the largest sample available so far, thus it could furnish us a starting point for unravelling the significance of these larger individuals.

2. Large-Sized vs. Middle-Sized Individuals

If large- and medium-sized individuals represent two distinct species, the Contrada Fusco evidence shows that they were sympatric, but is this the only model that could explain their co-occurrence?

It is possible that the elephant population of Contrada Fusco represents a time averaged assemblage in which size differences could be explained as intraspecific patterns. For example genetic drift has been invoked by some scholars to explain the presence of large sized individuals – in this case ancestor-like features occasionally reappear in a population which shows a low degree of genetic modifications due to insularity (Malatesta 1985).

On the other hand it is possible that in a large faunal assemblage such as Contrada Fusco we could have only one sexually dimorphic species, with social patterns that are similar to those shown by living elephants, where adult males and females are segregated. The presence of some larger elephants in the faunal assemblage could indicate mixed herds involved in die-off events or even animals that did not live together but visited the area at different times. In fact, like modern male and female elephants, they could have lived apart most of the time, but with overlapping home ranges, using the same water resources so that they occasionally died in the same area. In this case, size differences in the Contrada Fusco assemblage would not be so dramatic in relation to modern populations. In Hwange National Park, Zimbabwe (Tab. 1) males are

Tab.1 - Humerus length for *Loxodonta africana* in Hwange National Park, Zimbabwe. Source: Haynes (1991).

Specimen	Sex	Humerus length (cm)
Makololo 2	M	111.0
Guvalala	M	108.0
Shabi Shabi (a)	F	85.0
Shabi Shabi (b)	F	88.0
Shabi Shabi (c)	F	83.0

Tab.2 - Humerus length for "large-sized" and "medium-sized" elephants in Contrada Fusco. Bone lengths indicated as incomplete are likely to only slightly underestimate the true value.

Specimen	Humerus length (cm)	Remarks
SR FSC B 4 – 1	103,15	
SR FSC O 21 – 1	>69	Lateral tuberosity missing
SR FSC ICL 16 – 1	>68,5	Lateral tuberosity missing
SR FSC ICO 26 – 1	65,8	Distal epiphysis fusion line still visible
SR FSC INW 25 – 1	>70	Lateral tuberosity damaged, distal epiphysis fusion line still visible

20-40% taller than females, humeri and femora being about 17-25% longer (in individuals over fifteen years old) (Haynes 1991). while differences in limb bones over 40% for *Loxodonta africana* were occasionally observed (Haynes pers. comm.),

Conversely in Contrada Fusco (Tab. 2) the "large-sized" humerus B4–1 is less than 35 % longer than "medium-sized" humeri with complete or almost complete epiphyseal fusion (stage 4 and 5, see Haynes 1991).

Even though the study of the Contrada Fusco assemblage is still in progress, the "large sized" vs. "medium-sized" ratio is consistent with data obtained from modern populations, if the large bones represent males at the upper end of their normal size distribution; in fact "large sized bones" represent less than 5% of the elephant bones recovered from Contrada Fusco.

3. Conclusions

The possibility that the large sized elephants of the "stadio di Maccagnone" did not represent a different species from medium-sized elephants must be considered. Biometric and morphologic data concerning large sized individuals are scarce and not statistically significant. Whether they represent ancestor-like individuals according to a genetic drift model, or just big adult males in the sexual dimorphism model, a revision of the available data is needed. The Contrada Fusco assemblage could be a good starting point to compare distinctive features of large and middle sized insular elephants and their continental and modern relatives.

4. References

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