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A new chronology for Spinagallo Cave (Sicily): Implications for the evolution of the insular dwarf elephant *Palaeoloxodon falconeri*

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The mid-19th century to early-20th century saw the discovery of remarkable palaeontological specimens, such as 1m-tall dwarf elephants, in Pleistocene sediments of Mediterranean coastal caves (e.g. Spratt 1867; Falconer, 1868; Bate, 1907). However, after more than a century of study, spatial and temporal patterns and rates of mammalian evolution in island settings remain poorly constrained. Current chronology relies on (a) biostratigraphic correlations using the island endemic taxa themselves, raising the possibility of circular reasoning in our evolutionary interpretations; or (b) now discredited chronological techniques (e.g. amino acid racemisation of teeth and bones: Blackwell et al, 1990). With ever-increasing interest in Mediterranean island faunas, it is imperative that we find ways of building a robust chronology for the region and the ex situ fossil specimens housed in collections around the world. Here we present the first absolute-age chronology for one of the most important dwarf elephant sites: Spinagallo Cave, Sicily.

Located 116 - 130 m above present sea level in a Miocene limestone scarp, 15 km SW of Siracusa, Sicily, Spinagallo Cave (Grotta Spinagallo) was excavated in 1958 and 1960 (Accordi and Colacicchi, 1962). More than 2000 bones of the 1m-tall dwarf elephant *Paleoloxodon falconeri* were uncovered from the sandy 'red earth', and these are now housed in museum collections. No detailed excavation notes remain and the cave was much altered during the 1960 phase by breaking through the lower passage roof, but from published reports we do know: (i) that the cave was excavated in two phases, and the approximate extent of the excavations in each of these field season; and (ii) the approximate position of some key specimens, such as a well-preserved adult skull.

Following new field investigations, we have identified a few fossil specimens in situ within the 'red earth' sediments adhering to the cave walls. Intercalated within the red earth are sheets (> 5 cm) of flowstone, similar to those described in the scientific reports. At the base of the cave passage there is evidence of marine incursion and deposition of beach material ('panchina'), also in line with the published cave stratigraphy.

In this talk, we will present the first comprehensive overview of our 40 U-Th ages from speleothems above and below in situ fossil remains, and Optically Stimulated Luminescence (OSL) ages of the fossiliferous red earth. For most locations in the cave, we have obtained multiple age determinations, to demonstrate stratigraphic consistency within an individual layer. In addition, a comprehensive search of bone specimens from Spinagallo Cave housed at Catania University revealed 4 bones with calcite coatings >2 mm thickness, and these were also sampled to give a robust minimum age for *P. falconeri*. Our results provide a vital first step in establishing a robust chronology of Mediterranean island dwarfism to further our understanding of the causes and mechanisms of island evolution and body-size change in mammalian species.

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