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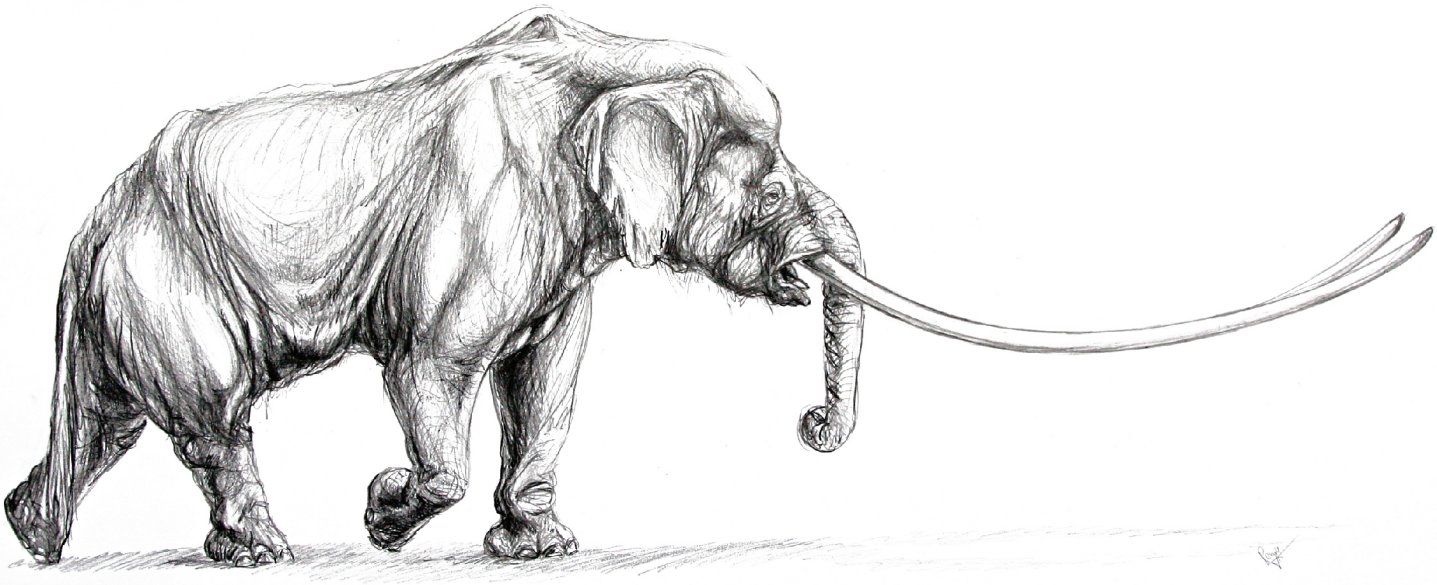

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ABSTRACT BOOK

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Locomotory adaptations in the astralagus-calcaneus of Siculo-Maltese dwarf elephants

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Insular endemic proboscideans, due to the range in body mass changes and diverse insular environments which they became adapted to, represent a unique taxon for investigating the evolutionary processes and mechanisms which large mammals undergo in response to the biotic/abiotic characteristics of island ecosystems. Of particular interest are the Pleistocene insular elephants from the Siculo-Maltese (palaeo)archipelago which evolved highly derived morphologies with respect to their putative mainland ancestor *Palaeoloxodon antiquus* (Palombo, 1996; 2007; van der Geer et al., 2010; Herridge, 2010), and also display a very diverse range in body mass.

Here we examine locomotory adaptations in Siculo-Maltese dwarf elephants, with a particular emphasis on the smallest elephant *Palaeoloxodon 'falconeri'*, from Spinagallo Cave (Hyblean Plateau, southeastern Sicily) (Ambrosetti, 1968) as inferred from the morphology of the astralagus and calcaneus (51 and 52 specimens respectively, representing all ontogenetic stages). We investigate the relative significance of the different factors which likely contributed (whether directly or indirectly) to the evolution of the hind-foot's locomotor function, including steeper topography in a more confined and resource-limited area, a reduction in body mass and rockier substrate, and the combined effects of the absence of both predators and competitors (ecological release, see Palombo, 2007; Lomolino et al. 2012).

Of particular interest in *P. 'falconeri'* is the presence of a large, continuous articular facet for the tibia-fibula on the calcaneus, which likely evolved in concert with the synostosis of the tibia and fibula, present in nearly all specimens including young individuals. The functional significance of the articular facet for the tibia-fibula likely included i) an increased range of plantar/dorsiflexion of the hind-foot, possibly beneficial for climbing steep gradients by providing more upslope leverage, ii) a more secure braking mechanism for walking downslope, iii) a shift in body mass towards the lateral side of the hind-foot, iv) a shift in body mass posteriorly, and v) synostosis between the tibia and fibula, resulting in a combined articular facet for both.

Furthermore, if the suggestion that *P. 'falconeri'* is more cursorial than its putative ancestor is correct (see Palombo, 2003), it would be consistent with the medio-laterally constrained and more sagitally-oriented locomotion observed in *P. 'falconeri'*, which is typical for cursorial quadrupeds (Biewener, 2003); as well as the observation that quadrupeds with a mass of ~300 kg or more are required to sacrifice much of their cursorial performance to the demands of support (Biewener, 1989; 1990). Since *P. 'falconeri'* from Spinagallo Cave did not exceed 150 kg in adult males (Palombo and Giovinazzo, 2005), a reduction in body mass was likely a significant factor in the evolution of its locomotion. All considered, morphological evidence from the astragalus-calcaneus suggest several highly derived adaptations to the hilly landscape of Sicily. Ongoing research into the appendicular anatomy of Siculo-Maltese dwarf elephants will also help to address the question as to what extent differences observed in foot bones might support a new taxonomic assessment (Scarborough, in prep.).

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