



New dwarf elephant material from the Pleistocene of Cyprus

George ILIOPOULOS^{1,2}, Athanassios ATHANASSIOU³, George KONSTANTINOOU⁴

¹Department of Geology, University of Patras, 26504 Rio Patra, Greece, iliopoulos@upatras.gr

²Natural History Museum of Crete, University of Crete, P.O. Box 2208, 71409, Heraklion Crete, Greece

³Hellenic Ministry of Culture, Ephorate of Palaeoanthropology-Speleology, Ardittou 34B, 11636 Athens, Greece

⁴Kerynias 6, 2200 Geri, Nicosia, Cyprus



Satellite photograph of Cyprus where the collection site Ormideia is shown.

Recently, fossil specimens of elephants and hippos were collected by one of the authors (GK) from an open air locality, a roadcut section southeast of the town Ormideia in the area of Xylophagou (Eastern Cyprus). The broader area has already yielded fossil mammal remains (Bate, 1904; Boekschoten & Sondaar, 1972; Poole & Robertson, 1998; Reese, 1995; Theodorou *et al.*, 2005): five localities have been found on Cape Pyla, one in Achna and one near Xylophagou. The bone-bearing bed consists of a well-cemented green sandstone. The fossils were found scattered in a distance of more than 500 m. The sandstone is located in the middle of a sequence with alternations of marls and thin marly limestones with *Cerastoderma* shells, overlain by coarse and poorly sorted conglomerates. The marls and marly limestones indicate deposition in a lagoonal environment. According to Poole and Robertson (1998), these sediments belong to the Fanglomerate Group, can be correlated with their Unit 3 and thus the age of the sediments is early Late Pleistocene.

The presence of scattered bones in the sandstone implies the presence of a transportation mechanism that spread the bones in a fairly wide area.



View of the Ormideia section. The fossiliferous layer is indicated by the arrow.



The left D3(?) of the dwarf elephant as it was found in the sediment.

Cyprus is a typical large Mediterranean Island that during the Late Pleistocene was inhabited by an endemic island fauna, consisting of pigmy hippopotamuses (*Phanourios minor*), dwarf elephants (*Elephas (Palaeoloxodon) cypriotes*), a small carnivore (*Genetta plesictoides*), micromammals (such as *Mus cypriacus*), birds, reptiles and amphibians.

Until now more than 40 fossiliferous localities have been found on the island (van der Geer *et al.*, 2010), the majority of which are caves, collapsed caves and rockshelters (Hadjisterkotis & Reese, 2008). In all these localities the remains of *Ph. minor* are by far the dominant elements in the bone accumulations, with elephant findings—when found in a locality—practically scarce (Simmons, 2000; Hadjisterkotis & Reese, 2008). Moreover, the condition of the recovered material, especially of the long bones, is rather poor, as most of them are fragmented or incomplete.

The material recovered at Ormideia comprises mainly cranial and postcranial elements of dwarf elephants and pigmy hippos. In addition to mammalian specimens, a small number of bird bones that belong to a large raptor have been also collected. Unlike all other Cypriot localities, the collected *P. minor* specimens are outnumbered by the elephant ones, making the latter the dominant taxon of the assemblage. The elephant material consists of a mandible, four complete molars, one complete tusk, a complete tibia, fragments of long bones, vertebrae and several carpal, tarsal and metapodial bones.

According to a number of authors (Boekschoten & Sondaar, 1972; Simmons, 2000; Davies & Lister, 2001; Herridge, 2010) there is an indication that possibly a second ancestral species of a larger and older dwarf elephant existed on Cyprus during the Late Pleistocene. However, the number of elephant specimens that are referable to this large form is very small (locality Achna and four other sites). The size of the newly collected specimens from Ormideia is also larger than the respective known specimens of *E. cypriotes* (Bate, 1904; Herridge, 2010). Thus, it is quite possible that these specimens are taxonomically related to the larger elephant from Achna. The size of the tibia (length 272 mm) is within the range of specimens from Tilos Island and Puntali Cave on Sicily, indicating a similar size with the two taxa (*E. tiliensis* and *E. mnaidriensis* respectively).

The new collected material has not yet been studied in detail, so that its taxonomic affinities with the other samples of Cypriot elephants are still unresolved. For the time being and until we have the chance to study the other large elephant material or proceed with excavations in the locality we preliminarily refer this material to *E. cf. cypriotes*.

Left and right upper D3(?), possibly from the same individual (the molars are 54.4 and 53.8 mm long). Scale bar 3cm.



Left: Right lower m2 (95.2 mm long, 35.2 mm wide)



Right: Left upper M2 (79.9 mm long, 38.8 mm wide)



Mandible with both m1 or m2 *in situ*



Left tusk with maximum external perimeter of 820mm, and maximum diameter of 570 mm. It presents rather strong curving and torsion. It is significantly larger than the tusks of *E. cypriotes* that have been found until now (133–400 mm; Bate, 1904; Simmons, 2000) and much more curved. Scale bar 3cm.



A complete fused right radius and ulna of *Phanourios minor*. Scale bar 3 cm.



Left dwarf elephant tibia (272 mm long). Scale bar 3cm.



Left femur and last digit of a bird, possibly a raptor. Scale bar 3 cm.



REFERENCES

- Bate, D.M.A. 1904. Further note on the remains of *Elephas cypriotes* from a cave-deposit in Cyprus. *Phil. Transactions of the Royal Society of London B*, 197: 347-360.
- Boekschoten, G.J. & Sondaar, P.Y. 1972. On the fossil Mammalia of Cyprus. *Proceedings of the Koninklijke Nederlandse Akademie van Wetenschappen*, 75: 306-338.
- Davies, P. & Lister, A.L. 2001. *Palaeoloxodon cypriotes*, the dwarf elephant of Cyprus: size and scaling comparisons with *P. falconeri* (Sicily-Malta) and mainland *P. antiquus*. International Congress "The World of Elephants", Rome, *Proceedings*: 479-480.
- Hadjisterkotis, E. & Reese, D.S. 2008. Considerations on the potential use of cliffs and

caves by the extinct endemic Late Pleistocene hippopotami and elephants of Cyprus. *European Journal of Wildlife Research*, 54: 122-133.

Herridge, V.L. 2010. Dwarf elephants on Mediterranean islands: A natural experiment in parallel evolution. PhD thesis, University College London.

Poole, A.J. & Robertson, A.H.F. 1998. Pleistocene fanglomerate deposition related to uplift of the Troodos ophiolite. *Proc. ODP, Sci. Results*, 160: 545-560.

Reese, D.S. 1995. The Pleistocene vertebrate sites and fauna of Cyprus. *Bulletin of the Geological Survey Department of Cyprus*, 9: 1-203.

Simmons, A.H. 2000. Faunal extinction in an island society: pigmy hippopotamus hunters of Cyprus. Kluwer, New York: 381pp.

Theodorou, G., Panayides, J., Tsiolakis, E., & Filippidi, A. 2005. Preliminary observations on new dwarf elephant remains from the Pleistocene of Xylophagou area, Cyprus. 2nd International Congress "The World of Elephants" Sept. 22-25, 2005 Mammoth Site, Hot Springs, South Dakota, USA.

Van der Geer, A., Lyras, G., Dermizakis, M. & de Vos, J. 2010. Evolution of island mammals: adaptation and extinction of placental mammals on islands. Wiley-Blackwell, Oxford: 479pp.