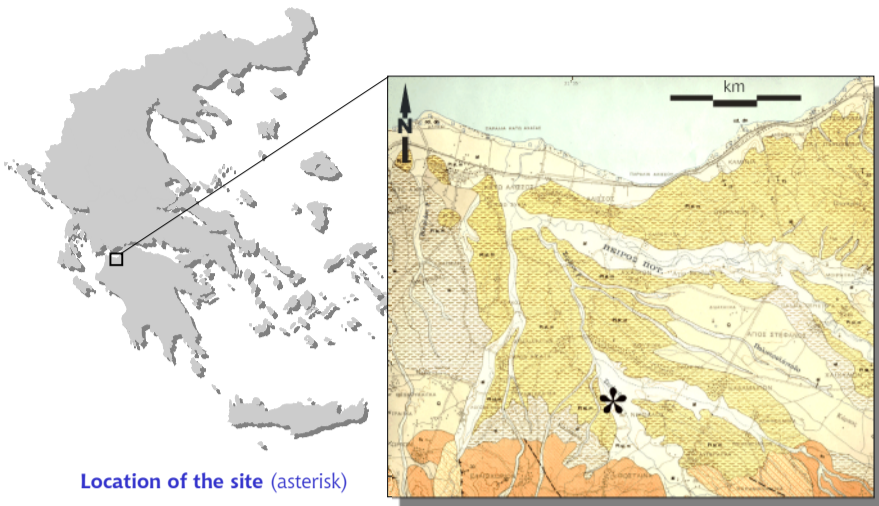
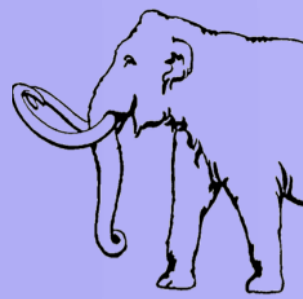


An elephant skeleton from NW Peloponnese, Greece

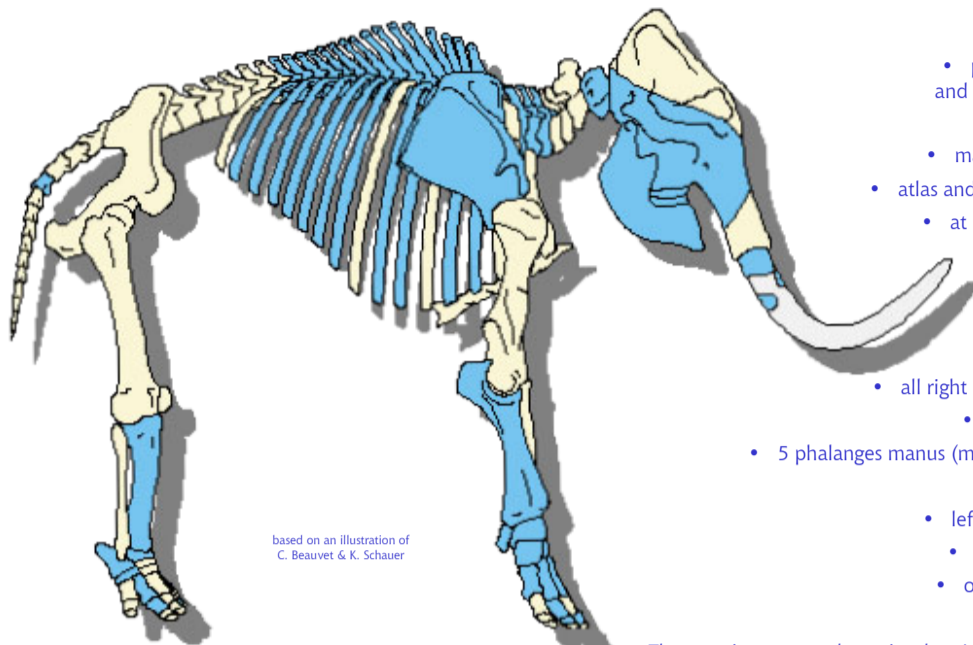
Athanasios ATHANASSIOU

Hellenic Ministry of Culture, Department of Palaeoanthropology–Speleology, Ardittou 34B, 11636 Athens, Greece



Location of the site (asterisk)

The finding was discovered in 1988 by the archaeologist Andreas Darlas, while prospecting the area of Loussiká (Achaia, NW Peloponnese) for prehistoric artefacts. He noticed the presence of tusk fragments in a bulldozer backfill. The bulldozer trench had cut across the proximal part of the skull, breaking the preserved right tusk in pieces. The site was excavated in 2001 and 2003 under the direction of A. Darlas, revealing a partial elephant skeleton, including the skull, the mandible, and part of the axial and appendicular skeleton.



Preserved anatomical parts (shown in blue)

- partial skull with both M3s and fragments of the right tusk
 - stylohyoid
- mandible with m2s and m3s
- atlas and 3 other cervical vertebrae
- at least 13 thoracic vertebrae
 - one caudal (?) vertebra
 - 15 costae
 - both scapulae
 - left ulna
- all right and most left carpal bones
 - most metacarpals (II–IV)
- 5 phalanges manus (media III, prox. & media IV)
 - right tibia
- left calcaneus and astragalus,
- right navicular and cuboid
- one or two phalanges pedis
 - a sesamoid

The specimens are kept in the Archaeological Museum of Patras, except for the skull, which still remains under preparation at the Dpt. of Palaeoanthropology–Speleology of the Ministry of Culture in Athens.

A straight-tusked elephant OR a mammoth ?

The elephant skeleton from Loussiká was preliminarily attributed to the straight-tusked elephant *Elephas (Palaeoloxodon) antiquus* (see abstract of this Conference), based on the lower m3 morphology (high hypsodonty, folded enamel, medium lamellar frequency) and despite the virtual absence of a loxodont sinus and the rather broad appearance of the occlusal surface (though not outside the metrical range of the species — Maglio 1973). *E. antiquus* was —so far— the only known elephant species exhibiting similar dental characters in Southern Greece. Also when partially exposed during the excavation, the skull was misinterpreted as having a partially preserved two-domed frontal crest, a typical character of the latter species. However, during a recent partial uncovering of the skull (which is still under preparation), it was observed that the part above the nasal cavity was destroyed before burial (as usual in fossil elephant skulls), so a crest or vertex is not available. Moreover, the tusk sheaths were found to run almost parallel to each other and are situated very close together. This morphology, in spite of the absence of the vertex and tusks, points towards the genus *Mammuthus* (Osborn 1942, Maglio 1973).

Two tusk fragments —quite possibly belonging to the same individual— were also found to exhibit acute Schreger angles of about 80° in natural break surfaces, perpendicular to the tusk axis and close to the cement/dentine junction. This is outside the outer angle range measured in *Elephas (Palaeoloxodon)* and corresponds well to the angles measured in *Mammuthus* (e.g. Palombo & Villa 2001).

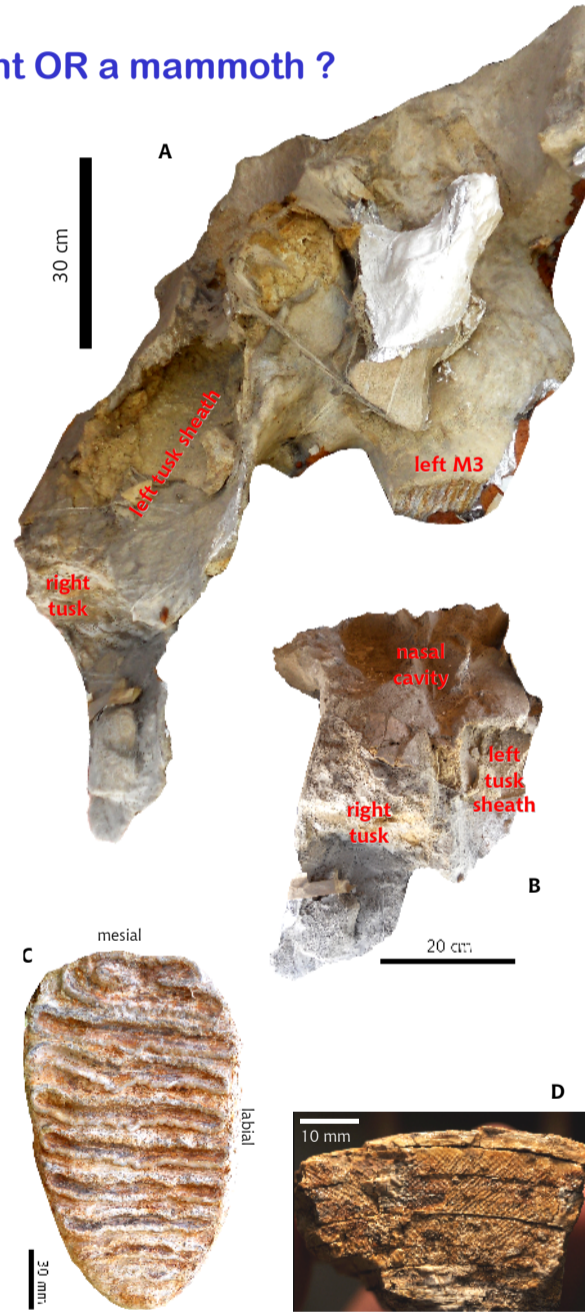
The skull seems to have one molar at each side (the ventral side of the skull is still not well visible due to the presence of supportive polyurethane), which is interpreted as the M3. The left M3, figured on the right, is little worn (9 plates in use), estimated about 300 mm long, 92 mm wide (at 3rd plate) and more than 200 mm high. Its lamellar frequency is estimated at 6.5. Its enamel is moderately thick (2.6–2.9 mm) and moderately folded. These molar features characterize the mammoth *M. trogontherii* (Guenther 1969, Maglio 1973), a well-known species in Central Europe but uncommon in Mediterranean Europe and Greece in particular (van der Made & Mazo 2001, Doukas & Athanassiou 2003, Palombo & Ferretti 2005).

The mandible is preserved in two parts, the symphyseal area being broken and distorted. The hemimandible length (measured parallel to its labial wall) is 680 mm, the ramus DAP is 320 mm, the corpus max. DT is 185–205 mm and the corpus depth below m3 is 210 mm. Each hemimandible retains the distal part of the almost totally worn m2 and the erupting and little worn m3 (9–10 plates in use, at least 16 in total). m3 dimensions in mm: DAP >300, DT = 99 (at 5th plate), H estimated > 200.

Only two long limb bones are preserved, the left ulna and the right tibia, the former being not fully fused at its distal epiphysis. The carpal and tarsal bone morphology corresponds best with the respective *Mammuthus primigenius* figures in Andrews & Forster Cooper (1928), less with those of *Loxodonta* and *Elephas*. This is another indication for the assignment of the find to the genus *Mammuthus*, although the great morphological diversity of elephant skeletal elements should be acknowledged.

The dental and osteological characters of the Loussiká skeleton allows some inferences on the ontogenetic age and the gender of the individual. The presence of a worn m2 and a m3 already in use indicates a XXII age group, according to the age criteria for *Loxodonta africana* established by Laws (1966), which may correspond to about 40 years of age for the Loussiká individual.

The diameter of the right tusk basal part, which is preserved in the alveolus, is 170–180 mm, pointing to a male individual. Also the presence of not fully fused bones (thoracic vertebrae, ulna) in a mature individual also indicates a male, as

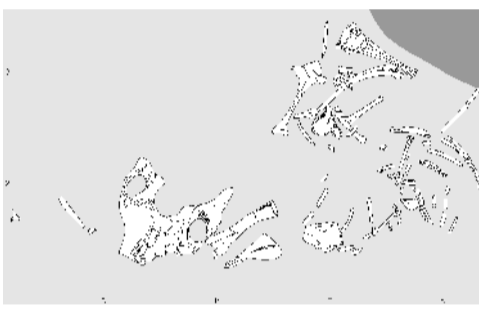


A: Lateral view of the skull (left side); B: Anterior view of the skull (note the close distance between the tusk sheaths); C: Left M3, occlusal surface; D: Natural tusk cross section, close to the periphery of the tusk, exhibiting the Schreger pattern.

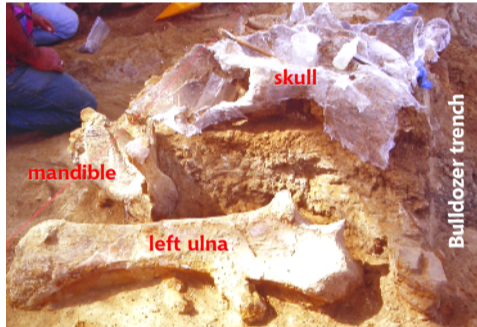
the male elephants are known to grow till a late age (Lister 1999). Ulna's distal epiphysis is among the last to fuse. Moreover, the large size of the Loussiká mammoth (slightly smaller than the West Runton individual, attributed to a male by Lister & Stuart in press) is another indication of male gender.

Conclusion: The Loussiká skeleton is an important find referred to *Mammuthus trogontherii*, a species previously unknown in Southern Greece. Its presence extends considerably the species' known geographical distribution towards the south of the Balkan peninsula and dates the continental deposits of the area in the Middle Pleistocene. If we consider that *M. trogontherii* (commonly named the 'steppe mammoth') is usually palaeoecologically associated with cold environments, it is possible to assume that this species lived in Southern Greece during a cold stage, such as the particularly cold MIS 12.

The findings are not in anatomical position; they are scattered mainly in a NE–SW direction, in a layer of fine clayey cross-bedded sand of fluvial origin. The elephant-bearing layer overlies a sequence of Pliocene marine sediments, rich in mollusc fossils, deposited in a shallow sea. The alpine basement of NW Peloponnese area consists of flysch of the Gávrovo geotectonic zone.



Part of the excavated skeletal parts *in situ* (early stage of the 2001 excavation)



left hemimandible

REFERENCES

Andrews C.W., Forster Cooper C. (1928): On a specimen of *Elephas antiquus* from Upnor. British Museum (Natural History). London.

Doukas C.S., Athanassiou A. (2003): Review of the Pliocene and Pleistocene Proboscidea (Mammalia) from Greece. *Deinsea*, 9: 97–110.

Guenther E.W. (1969): Die Elefantenmolaren aus den Kiesen von Süßenborn bei Weimar. *Paläontologische Abhandlungen*, 3 (3/4): 711–734.

Laws R.M. (1966): Age criteria for the African elephant, *Loxodonta a. africana*. *East African Wildlife Journal*, 4: 1–37.

Lister A.M. (1999): Epiphyseal fusion and postcranial age determination in the woolly mammoth *Mammuthus primigenius*. *Deinsea*, 6: 79–88.

Lister A.M., Stuart A.J. (in press): The West Runton mammoth (*Mammuthus trogontherii*) and its evolutionary significance. *Quaternary International* (2010), doi: 10.1016/j.quaint.2010.07.032.

Maglio V.J. (1973): Origin and evolution of the Elephantidae. *Transactions of the American Philosophical Society*, 63 (3): 1–149.

Osborn H.F. (1942): Proboscidea – a monograph of the discovery, evolution, migration and extinction of the mastodonts and elephants of the world, II: Stegodontoidea and Elephantidae. American Museum Press, New York.

Palombo M.R., Ferretti M.P. (2005): Elephant fossil record from Italy: knowledge, problems, and perspectives. *Quaternary International*, 126–128: 107–136.

Palombo M.-R., Villa P. (2001): Schreger lines as support in the Elephantinae identification. *Proceedings of the 1st International Congress "The World of Elephants"* (Rome, 2001): 656–660.

van der Made J., Mazo A.V. (2001): Spanish Pleistocene Proboscidean diversity as a function of climate. *Proceedings of the 1st International Congress "The World of Elephants"* (Rome 2001): 214–218.