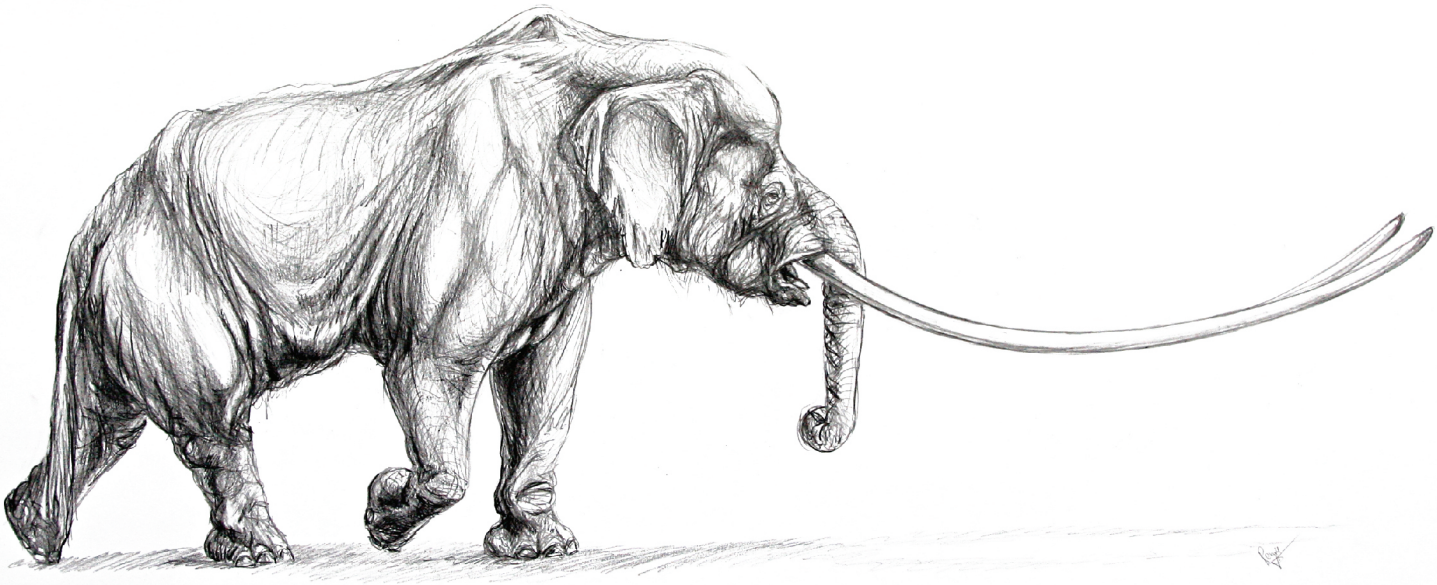
SCIENTIFIC ANNALS of the School of Geology,
Aristotle University of Thessaloniki

SPECIAL VOLUME 102



VIth International Conference on Mammoths and their Relatives

GREVENA
SIATISTA
GREECE 2014

ABSTRACT BOOK

Editors:
Dimitris S. KOSTOPOULOS, Evangelos VLACHOS, and Evangelia TSOUKALA

THESSALONIKI, MAY 2014

Scientific Annals, School of Geology, Aristotle University of Thessaloniki, Greece
VI[th] International Conference on Mammoths and their Relatives, Grevena - Siatista
Special Volume 102 150-151 Thessaloniki, 2014

On the dwarf elephant stylohyoid bones from Spinagallo Cave (Hyblean Plateau, south-eastern Sicily)

Maria Rita PALOMBO ✉

The peculiar hyoid apparatus of proboscideans, which likely evolved by the end of the Oligocene, is considered to be a key element in their evolution, as well as being a structure which helps to elucidate certain aspects of the physiology and herd behaviour of extinct proboscideans (Shoshani et al., 2007; Shoshani and Marchant, 2008 and references therein). The hyoid apparatus, which consists of only five bones (a pair of stylohyoidea, a pair of thyrohyoidea, and an unpaired basihyoideum) is situated deep within the throat. It connects to the cranium and the

Fig. 1. Stylohyoidea from Spinagallo Cave (Hyblean Plateau, south-eastern Sicily) in medial (above) and lateral (below) view.

base of the tongue, supporting the end of the trachea and larynx, and plays a role in the function of the pharyngeal pouch. This pouch is a structure which is unique to elephants, connected by means of the deep-gular musculature (digastricus, stylopharingeus, styloglossus and stylogastricus muscles) to the hyoid bones (Marchant and Shoshani, 2007; Shoshani and Marchant, 2008).

Although remains of the hyoid fragile apparatus are rare in the fossil record, in recent decades studies on stylohyoid bones have steadily increased in number, particularly with regard to the genera *Mammut*, *Mammuthus* and *Palaeoloxodon*. However, the stylohyoidea of dwarf elephants remain little-known, and thus far only a single dwarf elephant stylohyoid has been reported from Benghisa Gap (south-east Malta), described and figured as "*Elephas melitensis*" by Adams (Adams, 1874, page 45, plate15, fig. 10)

This study aims to provide new insights into dwarf elephant stylohyoidea by describing three stylohyoid bones (MPVR-Sp1, MPVR-Sp2 and MPVR-Sp3, Fig. 1) from the rich assemblage of dwarf elephant bones recovered in 1958/1960 from the Middle Pleistocene deposits infilling the lower chamber of Spinagallo Cave (Siracuse, Hyblean Plateau, Sicily) (Accordi and Colacicchi, 1962; Ambrosetti, 1968).The three stylohyoidea from Spinagallo display several morphological and dimensional differences amongst each other, the significance of which is difficult to ascertain. This uncertainty is in part due to the variation in shape and proportions displayed in the stylohyoidea of continental straight-tusked elephants (Palombo, 2012), and the limited number of specimens from Spinagallo.

The specimen MPVR-Sp1 (Fig. 1, a'-a''), the largest and best preserved from Spinagallo, is characterised by a robust superior ramus (SR), displaying conspicuous ribs and scars at the tip. The SR is flat on the lateral side and slightly expanded on the medial, where a groove first runs parallel to the SR posterior border and then extends along the origin of the posterior ramus (PR). The PR, which serves as the insertion of the digastricus muscle, is broken close to its origin, where it is sub-triangular in section, and its superior-lateral face is flattened. The inferior ramus (IR), broken at about two-thirds of its length, diverges from the PR with an angle of about 60°. The preserved portion of the IR, seen in anterior view, bends towards the lateral side, suggesting that the axis of the IR is somehow deflected from that of the PR. On the medial side, where the IR and PR meet and the stylopharyngeus muscle originates, both ribs and scars for the muscle attachment are evident.

In the specimen MPVR-Sp2 (Fig. 1, b'-b''), the IR is broken off, the SR is slender and has a deep and pronounced groove on its medial side, running from the posterior tip of the SR to the anterior-medial origin of the PR. The latter is definitely longer than the SR, flat and slightly rotated towards the medial side at its origin.

Specimen MPVR-Sp3 (Fig. 1, c'-c'') the smallest from Spinagallo Cave, has a somewhat slender SR, and a slender IR broken not far from its origin, with the preserved proximal portion strongly curved towards the lateral side. This specimen is characterized by a pronounced, deep groove running along the SR medial-posterior side, which extends into the proximal part of the PR. As a result, the PR appears folded medially on itself, with a superior-lateral face that appears to nearly extend to the top of the SR. This feature is much more pronounced than in the Maltese specimen, which, based on its dimensions, could be tentatively referred to *P. falconeri*.

Although the actual significance of the morphological and dimensional differences observed in stylohyoidea from Spinagallo Cave remain difficult to ascertain, it appears that all specimens were capable of supporting robust muscles, possibly affording increased support to the pharyngeal pouch. This structure, located at the base of the tongue stores water for drinking or dousing the body in time of stress, and facilitates the production and also resonance of low frequency sounds (e.g. Garstang, 2010). Accordingly, we may speculate that members of *P. falconeri* herds were capable of communicating among each other via infrasonic calls, over a distance of a few kilometers. However, whether or not the differences evidenced in styloihyoidea from Spinagallo Cave are merely related to intra-specific variation or also have dimorphic or taxonomic significance is a question which remains unanswered.

References

Accordi, B., Colacicchi, R., 1962. Excavations in the pigmy elephants cave of Spinagallo (Siracusa). Geologica Romana 1, 217-230.

Adams, A.L., 1874. I. On the Dentition and Osteology of the Maltese fossil Elephants, being a Description of Remains discovered by the Author in Malta, between the years 1860 and 1866.The Transactions of the Zoological Society of London 9(1), 1-124.

Ambrosetti, P., 1968. The Pleistocene dwarf elephants of Spinagallo (Siracusa, south-eastern Sicily). Geologica Romana 7, 277-398.

Garstang, M., 2010. Chapter 3.2. Elephant infrasounds: long-range communication. Handbook of Behavioral Neuroscience 19, 57-67.

Marchant, G.H., Shoshani, J., 2007. Head muscles of *Loxodonta africana* and *Elephas maximus* with comments on *Mammuthus primigenius* muscles. Quaternary International 169, 186-191

Palombo, M.R., 2012. Intra-specific variation of stylohyoid bones in *Palaeoloxodon*: A case study of Neumark-Nord 1 (Geiseltal, Sachsen-Anhalt, Germany) straight-tusked elephants. Quaternary International 276-277, 77-92

Shoshani, J., Ferretti, M.P., Lister, A.M., Agenbroad, L.D., Saegusa, H., Mol, D., Takahashi, K., 2007. Relationships within the Elephantinae using hyoid characters. Quaternary International 169, 174-185.

Shoshani, J., Marchant, G.H., 2008. Hyoid elements from Mammut and Mammuthus from three archaeological sites, New York, USA. Mastodon Paleobiology, Taphonomy, and Paleoenvironment in the Late Pleistocene of New York State: Studies on the Hyde Park, Chemung, and North Java Sites 61, 85-110.

mariarita.palombo@uniroma1.it

Citation:
Palombo, M., 2014. On the dwarf elephant stylohyoid bones from Spinagallo Cave (Hyblean Plateau, south-eastern Sicily). Abstract Book of the VIth International Conference on Mammoths and their Relatives. S.A.S.G., Special Volume 102: 150-151.