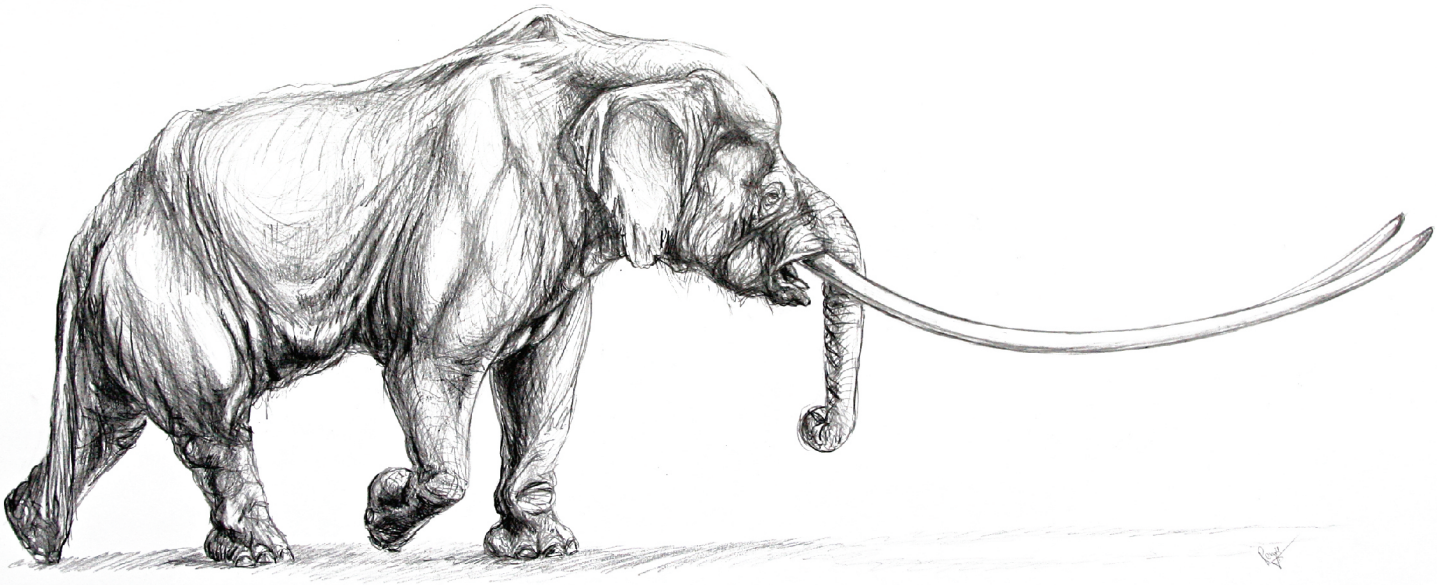
SCIENTIFIC ANNALS of the School of Geology,
Aristotle University of Thessaloniki

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

Diet of Late Pleistocene mammoths of northeastern Russia

Irina KIRILLOVA ✉, Jacqueline ARGANT, Olga KORONA, Alexei TIUNOV, Oksana ZANINA, Evgeniy ZINOVIEV, and Fedor K. SHIDLOVSKIY

Coprolites are an independent source of information on extinct animals' diet and habitat. Strictly speaking, samples of ancient animal dung found frozen in permafrost soils are not coprolites, since the material is not mineralized. Nevertheless, it is remarkably well preserved due to the permafrost.

End products of a large mammal's digestive process were found in the Terekhtyakh River Basin, right tributary of the Indigirka River (Northern Yakutia, Russia). By their size and shape they most closely correspond to those of a modern elephant.

The specimen F-552 from the Terekhtyakh River represented two undamaged well preserved dung heaps (100-115 mm high, 160 mm of maximum diameter, 426 and 439 grams of weight) and crumbled feces fragments that consisted of half-digested plant remains. ^{14}C-age of the sample is 25300 ± 1000 BP (SPb-490), calBC: 28113 ± 1099.

Carbon isotope composition (δ^{13}C) of two fragments analyzed ranged from -28.0 to -27.2‰ which corresponds fully to the carbon isotope composition of vascular plants in the boreal zone. Two fragments differed strongly in the isotope composition of nitrogen (δ^{15}N 1.6-1.8‰ in the first specimen, 7.6-7.8‰ in the second). Nevertheless, the observed range of δ^{15}N values does not exceed the scope of values typical for the manure of large herbivores.

A sample weighing 11 grams was taken from the very middle of the undamaged specimen for the pollen analysis. Pollen grains found in the coprolite were mainly from herbs typical for an open landscape. They were largely dominated by pollen grains of grass with several species of Poaceae which could not be identified to species. The second most abundant group was *Artemisia* (15,8%) represented by at least two species. Caryophyllaceae (5.0%), Rosaceae (*Potentilla* and *Dryas*, 2,8% and 0,33%, respectively), Fabaceae (2,3%), Cyperaceae (1%) were also found. Pollen of other herbaceous plants had a low occurrence (<1%). A single spore of fern was found.

A few taxa found suggest the presence of wet habitats: Polygonum amphibium type, *Ranunculus aquatilis* type, *Thalictrum*, and two Rosaceae, *Sanguisorba officinalis* and *Filipendula*, the former growing on grassy banks, the latter in damp meadows. Cyperaceae were probably also associated with wetlands. The pollen spectrum of the Mammoth coprolite was overwhelmingly dominated by light-demanding taxa, without any pollen of trees.

The presence of spores of coprophilous fungi inside the core of the coprolite may confirm the assertion (Van Geel et al., 2008) about Mammoth coprophagy as a purposeful behavior.

The specimen of feces weighing 332 grams with a volume of one liter included 2608 macro-remains of herbaceous plants belonging to 38 taxa, 14 of which were identified to species, 19 – to genus and 4 – to family level. A few fragments of woody plants (twigs of deciduous shrubs) were found, but monocotyledons – Cyperaceae and Poaceae were strongly dominating. Seeds of the following plants were abundant: goosefoot (*Chenopodium prostratum*), cinquefoil (*Potentilla cf. stipularis*), different Polygonaceae (*Polygonum humifusum* Merk. ex C. Koch, *Rumex lapponicus* (Hiitonen) Czernov, *Rumex sibiricus* Hult., *Rumex* spp.) and Caryophyllaceae (*Cerastium* spp., *Dianthus* sp., cf. *Minuartia* sp., *Silene* spp., *Stellaria* cf. *crassifolia* Ehrh., Caryophyllaceae gen. indet.). The majority of these plants are currently abundant in habitats along the Terekhtyakh River. Mesophytes were dominant; xeromesophytes, hygro- and hydrophytes were also present. This suggests that mammoth used for grazing areas of different wetness. Fruits and seeds were fully ripe and well preserved, which suggests that the sample was formed at the end of the growing season.

For the phytolith analysis a specimen of 1.46 grams was taken. In total, 14 morphotypes were identified. The size of the majority of phytoliths was 50 -100 microns. Poaceae prevailed in the spectrum (more than 70%, with a dominance of meadow grass *Poa* sp., reed grass *Calamagrostis* sp. and wild rye *Elymus* sp.), along with other wild grasses, mostly dicotyledons. Lignified tissues of shrubs were also found.

In total, 22 insect remains were found, 14 of them were identified to genus or species. These included Coleoptera: *Harpalus* sp. - 1 (Carabidae); *Aphodius* spp. - 6 (Scarabaeidae); Lathridiidae - 2; *Stephanocleonus* sp. - 1 and *Notaris aethiops* - 1 (Curculionidae), and 2 fragments of puparia (Diptera). This association is typical for Northeast Russia in the present time as well as in the Pleistocene. Fragile remains of *Aphodius* and flies' puparia suggest that the insects were attracted by (fresh) feces, while others could have been eaten by the mammoth together with plants. The manure was likely frozen relatively soon after it was populated by coprophages and was not unfrozen until the river eroded the shore.

Apart from plants and insects remains the following components were found in the feces: reindeer's and mammoth's fur, fragments of the intestinal tissues, daphnia ephippia.

According to the data obtained in this study, the landscape where the mammoth was grazing can be reconstructed as a treeless steppe or a meadow with mesophytic vegetation. The main plant species were *Artemisia*, Poaceae and Cyperaceae. Remains of Chenopodiaceae, Polygonaceae, Caryophyllaceae imply the presence of areas with weakly developed soil (gravel, stony and sand slopes). Dwarf birches and willows were growing nearby. Overall, this description corresponds well to the so-called "Mammoth Steppe".

References

van Geel B., Aptroot A., Baittinger C., Birks H. H., Bull I. D., Cross H. B., Evershed R. P., Gravendeel B., Kompanje E. J.O., Kuperus P., Mol D., Nierop K.G.J. , Pals J.P., Tikhonov A.N., van Reenen G., van Tienderen P.H., 2008. The ecological implications of a Yakutian mammoth's last meal. Quaternary Research 69, 361-376.

ikirillova@yandex.ru

Citation:
Kirillova, I., Argant, J., Korona, O., Tiunov, A., Zanina, O., Zinoviev, E. Shidlovskiy, F., 2014. Diet of Late Pleistocene mammoths of northeastern Russia. Abstract Book of the VIth International Conference on Mammoths and their Relatives. S.A.S.G., Special Volume 102: 82.