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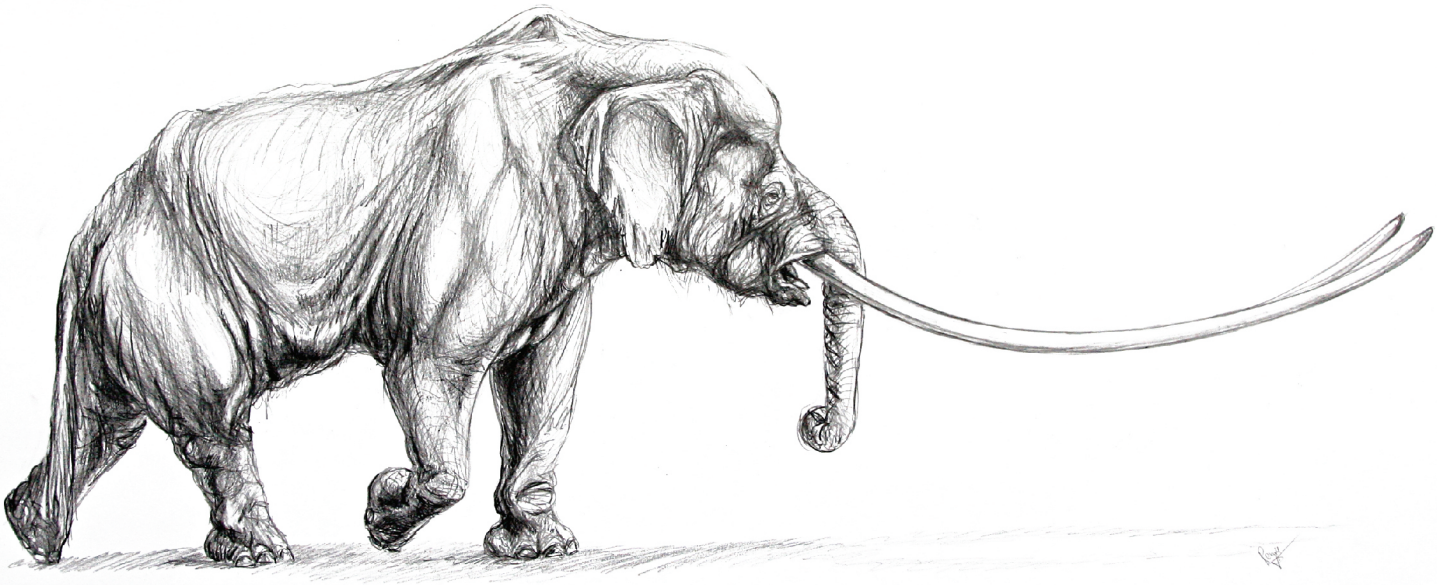

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ABSTRACT BOOK

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The Yukagir Bison: initial analysis of a complete frozen mummy of *Bison priscus* from the Early Holocene of Northern Eurasia

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A frozen mummy of bison (the so-called "Yukagir Bison") was discovered in 2011, thawing out from the northern slope of Chukchalakh Lake (Fig. 1) in the Yana-Indigirka Lowland of northern Yakutia, Eastern Siberia, Russia. The find represents the second complete (or almost complete) mummy of an adult steppe bison with preserved inner organs, recovered from the permafrost of Siberia. The AMS radiocarbon dates fall within 9,295 +/-45 yr BP (hair, GrA-53292) – 9,310 +/- 45 yr BP (horn core, GrA-53290) (Boeskorov et al., 2013).

Mitochondrial DNA analysis confirmed that the specimen belongs to the steppe bison, *Bison priscus*. The wear stage of the Yukagir Bison dentition correspond to 4-4.5 year-old animal, based on the comparisons with the modern prairie bison, B. bison (Boeskorov et al., 2013). The height in withers of the animal was about 170 cm with an estimated weight of 500-600 kg.

The body size of the Yukagir Bison was compared with that of the modern European and American bison. The results showed that its body was shorter than that of same-aged American bison, and closer to the average European bison size. The withers height of the studied specimen is closer to the grown bulls than to a 4-years old animal of the modern species. In addition, the Yukagir Bison appeared to be larger in hip height and chest girth than a 4 year-old European and American bison, but its hind foot length falls within the lower limits of both modern species. The hoofs appeared to be relatively large, with bearing surface of about 665 cm^2, which might indicate adaptation to support weight on softer (marshy) substrate. With its estimated weight of 500-600 kg, the hoof weight load would be 752-902 g/cm^2, which is considerably lower than in European bison (1,000-1,300 g/cm^2; Flerov, 1932). The Yukagir Bison tail is relatively short, which is also typical for the Canadian Wood bison, *B. bison athabascae*.

The young Yukagir Bison width in horn core tips is close to the maximum size of the fully grown modern bison, and falls within the range of *B. priscus occidentalis* (67–80 мм) recorded from the late Pleistocene of Eastern Siberia (Flerov, 1977). Having reached already a relatively large size for the 4 year-old animal, the Yukagir Bison would have reached withers height of about 200 cm and a weight of 1,000 kg in adulthood.

The mummy's digestive tract content along with palynological spectra of the sediments at the Yukagir bison site, were analyzed as well. The spore-pollen spectrum of the sediments reflects dominance of the sparse deciduous woodlands (birch, alder, willow, spruce) over steppe-grass vegetation. In contrast, the bison rumen

Fig. 1. The Yukagir bison *in situ*. Chukchalakh Lake bank slope, northern Yakutia, Russia.

and stomach samples mostly contained the pollen of herbs and grasses. The rumen contained 86.2% of grass and herb palynomorphs, while trees accounted only to 8.9%, with relatively high percentage (4.9%) of spores. The herbaceous vegetation was dominated by grasses (72%), accompanied by 6.5% of sedges. Low percentages of dwarf birch, Apiacea, and legumes (Fabaceae) were also present. Few other taxa comprising a fraction of percent were also identified. Non-pollen palynomorphs (except single spores of peat-moss) were absent in the analyzed rich organic material. Scarce fern spores were most likely consumed by the animal with water.

The 50 ml sample of the macro-remains collected from the stomach consisted of shredded vegetative plant parts: stems and leaves of grasses and herbs, free from bark crushed and split bush branches, along with rare remains of mosses (Bryales) grass seeds. Recovered single finds of bison hair, bird feather fragment, planktonic crustacean Daphina (Cladocera) and quartz grains were probably accidently swallowed by the animal while grazing and drinking.

The grass seeds from the stomach were well preserved and included Poaceae, Cyperaceae (*Carex* sp.), *Eriophorum* sp., Rosaceae (*Comarum palustre*); Menyanthaceae (*Menyanthes trifoliata*), and Apiaceae. All the plants identified from the seeds sampled from the bison stomach belong to typical grass-herbaceous species and genera found in the modern tundra zone of Yakutia.

Similar data on the gastric content were obtained from the analysis of the plant remains, biomorphs and pollen from the partial mummy of the steppe bison (*B. priscus*) discovered in the Holocene deposits of Rauchua River in vicinity of Bilibino, western Chukotka (Kirillova et al., 2013). Slightly younger in geological age (about 8,3 kyr BP) than the Yukagir Bison, the "Chukotka" bison also preferred feeding mostly on grasses, particularly Graminoids (Poacea), with significant ratios of sedges and forbs.

The beginning of the Holocene or Preboreal chronozone in Eastern Siberia was manifested by the climate warming about 10,300 years ago (Khotinsky, 1977). As a result, the favorable conditions that existed about 9,5 – 8,0 kyr BP, led to the expansion of tree and bush vegetation that reached their northernmost boundary ever recorded in Siberia since the last (Eemian) interglacial, with birch species reaching the New Siberian Islands (Kaplina et al., 1979; Sher, 1997; Wetterich et al., 2009).

Similarly to the Yukagir Bison site, the shrub- and forest-tundra landscapes with the lowest representation of steppe-grass vegetation were reconstructed for the Taymyr Peninsula around 10,000 yr BP (Klimanov et al., 2002), the Laptev Sea shelf about 9,300 yr BP (core samples PZ-2 and PZ-3; Naidina, 2006), the Oyagosskii Yar on the Laptev Sea arctic coast, which was particularly dominated by Alnaster fruticosa, Betula nana, and Salix about 11,500 – 8,400 yr BP (Wetterich et al., 2009; Andreev et al., 2011), and the northern Eastern Siberia (El'gygytgyn Lake) about 10,500 – 8,000 yr BP (Tarasov et al., 2013).

The comparison of pollen data from the bison digestive tract with those of sediment data directly confirmed that the steppe bison was a selective grazer species. Between 11,500 – 8,000 yr BP the species persisted in habitats that were dominated by vegetation largely unfavorable to the bison. Our data may indicate that the dramatic decrease of the suitable habitats and pastures in the high Arctic of Eastern Siberia during the early Holocene climatic optimum was a major factor of irreversible population fragmentation and decline leading to the species' extinction.

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