Quaternary Mammal Collections in the Museums of Yakutsk (Eastern Siberia, Yakutia, Russia)

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Summary

The presence of permafrost creates unique conditions for preservation not only of skeletal parts but also of parts of carcasses of extinct animals. A significant part of the permafrost fossils dating to the Quaternary has been found in the territory of the Sakha (Yakutia) Republic that occupies most of Eastern Siberia. The most interesting and spectacular collections of fossil mammals belonging to the Quaternary are kept in the museums of Yakutsk and are briefly reviewed here. The main parts of these collections are housed in the following museums: the Regional Museum of Nature, the Geological Museum of the Institute of Geology of Diamonds and Precious Metals, Siberian Division, Russian Academy of Sciences and the Mammoth Museum. In this paper we describe a right femur of a small woolly mammoth, *Mammuthus primigenius*, in the collection of the Mammoth Museum in Yakutsk, showing that small woolly mammoths already existed more than 48,000 BP on the continent of Eurasia.

Samenvatting

Collecties van Kwartaire Zoogdieren in de Musea van Jakutsk (Oost Siberië, Jakutië, Rusland).

De permafrost of eeuwig bevroren bodem draagt zorg voor een unieke conservering van skeletdelen, maar ook van de zachtere onderdelen van een dier zoals de huid, haar, kraakbeen, spieren en zelfs organen als maag, darmen en geslachtsdelen. Vondsten uit de permafrost van het oosten van Siberië en met name van het grondgebied van Jakutië, hebben veel belangrijke informatie verschaft over o.a. het uiterlijk van Pleistocene en Vroeg Holocene zoogdieren zoals bijvoorbeeld de wolharige neushoorn, de wolharige mammoet en de steppenwisent. Voedselresten die zijn aangetroffen in de inhoud van organen als de maag van de wolharige mammoet en holtes in gebitsorganen van de wolharige neushoorn hebben bijgedragen tot een beter beeld van de leefomgeving van deze dieren tijdens het Laat Pleistoceen. Belangrijke collecties van deze Siberische vondsten zijn te vinden in o.a. het Zoölogisch Museum van de Russische Akademie van Wetenschappen in Sint Petersburg (Vereshchagin & Tikhonov, 1999) maar ook in de hoofdstad van Jakutië, Jakutsk. De collecties daar zijn verdeeld over drie musea: het Regionaal Natuurmusem, het Geologisch Museum en het Mammoet Museum. In deze bijdrage geven wij een kort overzicht van belangrijke objecten in die musea. Sinds 2002 heeft het jongste museum in Jakutsk dat zich gespecialiseerd heeft op de wolharige mammoet en de Mammoet Fauna, zijn eigen tentoonstellingsruimte. Een aantal van de unieke tentoongestelde objecten worden in deze bijdrage afgebeeld. In dit artikel maken we tevens gebruik van de mogelijkheid om een zeer kleine rechter femur van een kleine, volwassen wolharige mammoet, *Mammuthus primigenius*, te beschrijven. Dit skeletelement toont aan dat zeer kleine wolharige mammoeten meer dan 48.000 jaar geleden ook voorkwamen op het vaste land van Eurazië.

Introduction

Most of the territory of Eastern Siberia is located on permafrost, which is a relict of the Pleistocene caused by an average annual air temperature less than 0° Celcius. Long and severe winters (up to 8 months) and short summers keep the upper layers of the surface of the ground frozen to a depth of hundreds of meters and in some places more than one kilometer. For example, in the summer in Central Yakutia the melting of the upper layers of the ground is not deeper than 1,5 – 2 meters. In the north of Eastern Siberia the melting during summer is even shallower. So, the permafrost serves as a natural refrigerator for preserving remains of animals and plants frozen in the ground. The wide distribution of perma-

Fig 1 Territory of Sakha (Yakutia) Republic

Grondgebied van Sakha (Jakutië) Republiek

frost in Siberia created really unique conditions for the preservation of bones and parts of complete carcasses of woolly mammoth (*Mammuthus primigenius*) and other mammals.

The major part of such mammal remains from the Pleistocene were recovered in Sakha (Yakutia) Republic (Fig. 1). Investigations of the Mammoth fauna and expeditions for collecting the remains of extinct animals have been conducted in Yakutia for more than 200 years. Most of the world famous mammoth remains come from this country and are kept in the Zoological Museum of Saint Petersburg, e.g. a complete mammoth skeleton with parts of the skin (the so-called Adam's Mammoth discovered in 1799), the famous Berezovka Mammoth found in 1900; a part of the body including the head and parts of two legs of a woolly rhinoceros from the river Vilyui (1771); and the head of a woolly rhinoceros of Verkhoyansk (1877).

The Regional Museum of Nature

In 1891 the Regional Museum of Nature was established in Yakutsk. From that time on many finds of Pleistocene and Holocene mammals were placed on display in this museum. It is worth mentioning here the following mammalian remains which are on display: a mammoth skeleton (*Mammuthus primigenius*), recovered on the bank of the river Tirekhtyakh (Indigirka River basin) in 1971, the cranium of the woolly rhinoceros (*Coelodonta antiquitatis*) with both frontal and nasal horns, several skulls of the steppe bison, (*Bison priscus*) and of the Lena horse (*Equus lenensis*). The sub-fossil skeleton of the Greenland Whale, *Balaena mysticetus*, radiocarbon dated 1500 yBP, found in 1973 on the East Siberian Sea shore near the mouth of the Bolshaya Kuropatochiya river is also of interest.

The Geological Museum of the Institute of Geology of Diamonds and Precious Metals, Siberian Division, Russian Academy of Sciences

In the second half of the 20th century the Institute of Geology, the Yakutian Branch of the Siberian Division of the USSR Academy of Sciences, started to built up a collection of Pleistocene mammals, especially of the Mammoth Fauna, originating from the permafrost. Step by step, the geological and paleontological collections in that institute were brought together in the Geological Museum. The largest collection of fossil mammals of the northeast of Russia which inhabited the territory of Yakutia during the end of the Pliocene and the entire Pleistocene can be found in this museum. Extensive collections of representatives of the Mammoth Fauna (120.000 – 10.000 yBP) are stored in this museum and there is a nice display of spectacular discoveries. There are more than 5000 skeletal parts of woolly mammoth (*Mammuthus primigenius*), woolly rhinoceros (*Coelodonta antiquitatis*), Lena horse (*Equus lenensis*), Steppe bison (*Bison priscus*), Pleistocene musk-ox (*Ovibos pallantis*), reindeer (*Rangifer tarandus*), red deer (*Cervus elaphus*), moose (*Alces spec.*), cave lion (*Panthera spelaea*), wolf (*Canis lupus*) etc. etc. Another collection of great importance is the one originating from the end of the Pliocene – Early Pleistocene belonging to the so-called Olyrian Fauna (which inhabited the basins of the northern rivers Kolyma, Indigirka and Yana) (Sher, 1971; Vangengeim, 1977) including the broad-fronted moose (*Cervalces latifrons*), Beringian musk-ox (*Praeovibos beringiensis*), steppe goat (*Soergelia spec.*) and the Vera horse (*Equus vera*) and others.

Fig 2 Complete hind leg of a woolly mammoth from the Berelekh mammoth 'cemetery'

Een complete achterpoot van een wolharige mammoet van het zg. mammoet-'kerkhof' van Berelekh

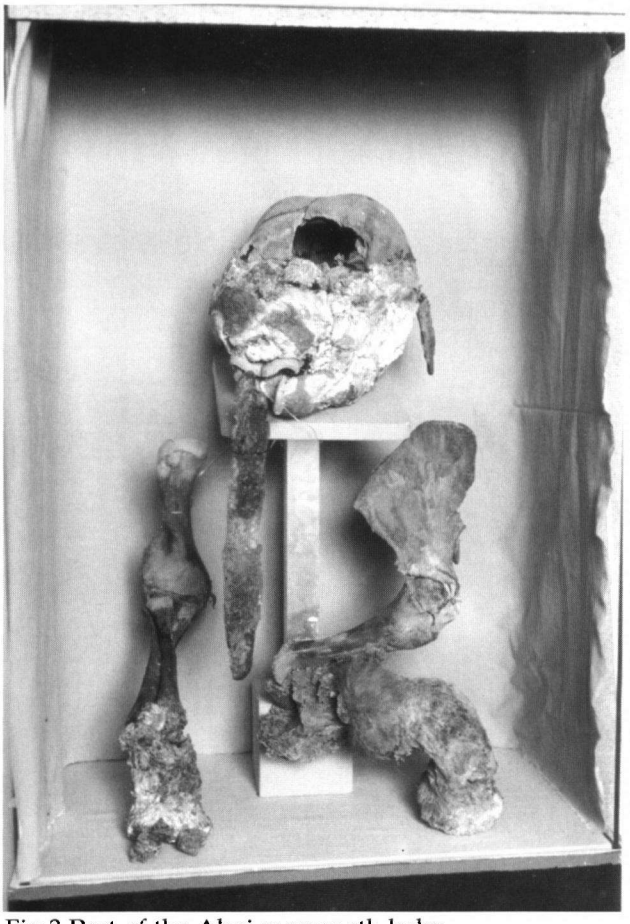
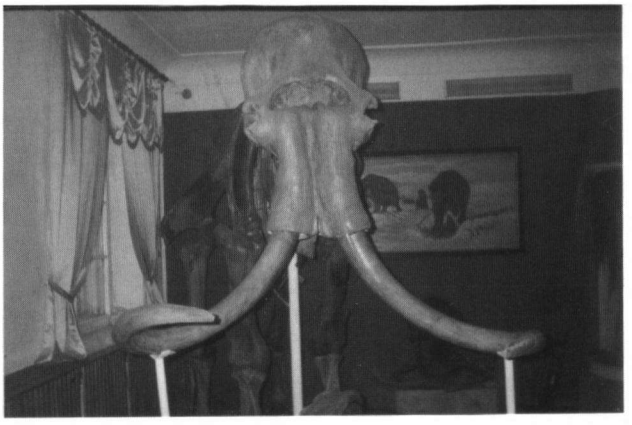


Fig 3 Part of the Abyi mammoth baby

Gedeelte van het Abyi mammoetkalf



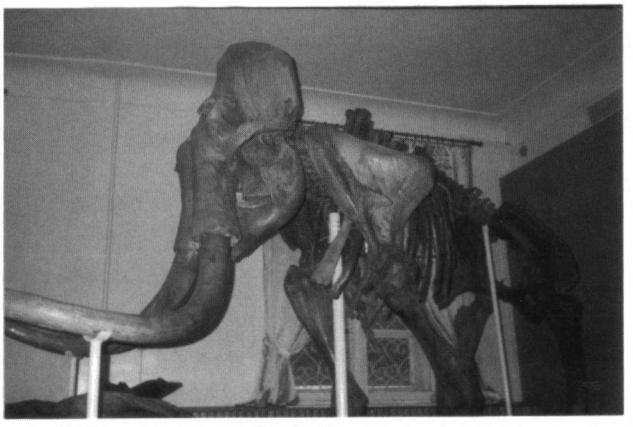


Fig 5 Akana mammoth skeleton

Mammoetskelet uit Akana

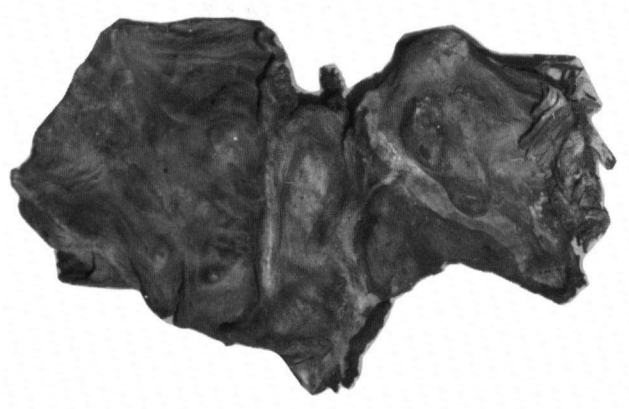


Fig 4 Part of the Kular mammoth skin

Gedeelte van de mammoethuid gevonden in Kular

There are some unique exhibits, including complete skeletons and carcasses of fossil mammals in the Geological Museum. These include:

- Complete hind leg of a woolly mammoth, *Mammuthus primigenius* (Fig. 2) measuring 175 cm. Discovered in 1970 on the Berelekh mammoth "cemetery" on the banks of the river Berelekh, (Indigirka River Basin). More than 8000 bones have been found here dating in a time-span between 14.000 and 12.000 yBP (Mol, 1995). The frozen leg was found separately at the site. The skin of this leg is covered with long red-brownish coloured hairs of which some reach a length of 105 cm. The foot size is 24 x 25 cm and four nails are preserved on it (Vereshchagin & Tikhonov, 1990 and 1999).

- Part of the so-called Abyi mammoth baby (Fig. 3). This is the fourth find of a woolly mammoth baby (the first was Effie, north of Fairbanks, Alaska, USA, the second was Dima, Magadan District, Russia and the third was Masha on the Yamal Peninsula, Russia). The Abyi mammoth

Fig 6 Mammoth skeleton from the River Khroma / Mammoetskelet uit de rivier Khroma

baby was discovered and excavated in 1990 on the bank of the Indigirka River, 50 km downstream the village Belaya Gora (Abyi District). The following parts are preserved: the head with milk dentition, including milk tusks, the trunk, 12 cm. long ears, the left front leg with skin and wool, parts of the other limbs, ribs and parts of the unfused vertebrae. The mammoth baby was approximately two months old at the time of death. According to Lazarev (1994) the geological age of the sediments which included the remains of this animal are dated in the Karginian Interglacial of the Late Pleistocene (approximately between 42.000 - 27.000 yBP). In 1971 in that locality in such sediments a bison mummy was found. Absolute age of that mummy is 29.500 +/- 1000 yBP (Flerov, 1977).

- Large part of the skin (maximum measurements 170 x 130 cm.) of the Kular woolly mammoth (Fig. 4). It was found during mining operations in 1980 at the Kular gold-mine (up stream the Omoloi River). Geological age: Late Pleistocene.

- Skeleton of an adult male woolly mammoth from Akana (Fig. 5). The skeleton was excavated from the river bank of the Bolshaya Chukochiya River near the locality "Akana" (Nizhne-Kolymsky District). Geological age of the sediments in which the skeleton was embeded: Late Pleistocene.

- An almost complete skeleton (Fig. 6) of a male woolly mammoth (not mounted). Found in 1988 up stream the River Khroma near Khromskaya Çuba (Gulf). Late Pleistocene.

- The Churapcha woolly rhinoceros, *Coelodonta antiquitatis* (Fig. 7). The carcass belongs to an adult female woolly rhinoceros and was found in the village Churapcha (Central Yakutia). It is the third find of a complete skeleton of the woolly rhinoceros in the world - the woolly rhinoceros was restricted to Eurasia, (Boeskorov, 2001a, Mol & de Vos, 2001). In this wonderful specimen both horns, frontal and nasal, are preserved, as well as the nails on the hind and front legs. The fragments of the skin with wool are preserved on the hind leg. The colour of the wool is yellow and the length of the hair is 15 cm. Also fragments of the gastro-intestinal contents have been preserved (Lazarev *et al.*, 1998). The length of the mounted skeleton, measured from the anterior end of the cranium to the first caudal vertebra, is 260 cm., the height at withers is 160 cm. Radiocarbon dates in Moscow on this specimen showed the animal

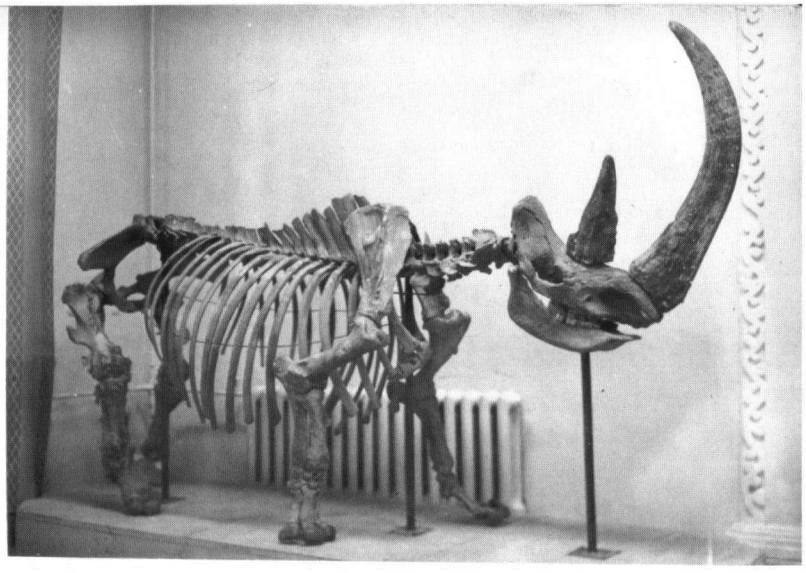


Fig 7 The Churapcha woolly rhinoceros skeleton

Het skelet van een wolharige neushoorn gevonden in Churapcha

died 19.500 +/- 120 yBP (GIN-0594; Boeskorov, 2001 a). The Churapcha rhinoceros was the base for the creation of a "life-size" model of the woolly rhinoceros for the museum "Ecomare" on the island of Texel, the Netherlands (Mol & De Vos, 2001).

- Holotype of the *Equus lenensis* Russanov, 1968 (a cranium N 33) (Fig. 8). The skull was found in the Lena River Delta region near American-Khaya Hill. Comparatively small horse with height at withers 125-140 cm. Basal length of this cranium is 490 mm. Late Pleistocene.

- Fragment of a foal of the Lena horse, *Equus lenensis* (Fig. 9). Found at the Kular gold-mine (up stream the Omoloi River). Hoof, muscles and skin

Fig 8 Skull (holotype) of *Equus lenensis* Russanov / De schedel (holotype) van *Equus lenensis* Russanov, 1968, gevonden in de delta van de Lena vlakbij American-Khaya heuvel

Fig 9 Fragment of a Lena horse foal leg

Deel van een been van een veulen uit de Lena

with hair are preserved. Geological age: Late Pleistocene.

- Fragments of the Siberian snow sheep *Ovis nivicola* skulls (Fig. 10). The left one is N 1430 found on the Vilyui River near Verkhnevilyuisk City, right one is N 4837 found on the Lena River near Kachikatsy village. These two localities are situated far from the modern area of distribution of this species. This circumstance demonstrates the wider distribution of *Ovis nivicola* during the Late Pleistocene than in the present time.
- Two well-preserved skulls of adult male cave lions, *Panthera spelaea* (Fig. 11). Discovered at the Duvanny outcrop (Lower stream of the Kolyma River) in 1987, and described recently (Boyeskorov & Lazarev, 1997; Baryshnikov & Boeskorov, 2000).

The Mammoth Museum of the Institute of Applied Ecology of the North, Academy of Sciences of the Sakha (Yakutia) Republic, ("The Mammoth Museum").

In 1991 the Mammoth Museum was founded and specialises on mammoths and the Mammoth Fauna. The aim of this museum is to study the Mammoth Fauna and its environment during the Pleistocene. The collection of the Mammoth Museum consists of more than 1000 remains of the larger mammals of the Mammoth Fauna. This collection needs further study to improve understanding of the Late Pleistocene and the extinction of many large mammals at the end of the Pleistocene and the beginning of the Holocene. The collection contains much material of woolly mammoth (isolated skeletal parts) from the mainland which indicates that the woolly mammoth was not as big as many people assume. As an example, a right femur of a very small but full grown female woolly mammoth, *Mammuthus*

Fig 10 Skulls of Siberian snow sheep / Schedels van Siberische sneeuwschapen (*Ovis nivicola*)

Fig 11 Skull of the cave lion N 6397 discovered at the Duvanny outcrop

Schedel van de grottenleeuw N 6397 die ontdekt werd in de ontsluiting bij Duvanny

Fig 12 Mammoth skin from the Bolshoy Lyakhovsky Island

Mammoethuid van Bolshoy Lyakhovsky eiland

primigenius, was studied by us. The results are presented in Table 1.

Table 1

***Mammuthus primigenius* (BLUMENBACH, 1799), Femur dexter**	**Mammoth Museum, Yakutsk. Catalog Number 7176**
Locality	Duvanny Yar, Lower Stream of the Kolyma River, Yakutia
Gender	Female
Individual age	50 AEY (=African Elephant Years) based on the fusion of the caput femoris and the shaft
Geological age, 14 C (AMS, Groningen University, the Netherlands)	48.000 yBP (GrA 20382)
Remarks	Caput femoris is completely fused with the diaphysis indicating an old individual

Measurements	
Maximum length	82 cm
Ø Caput femoris	11,9 cm
Maximum width shaft anterior-posterior	6,8 cm
Maximum width shaft ventral-lateral	9,3 cm
Maximum width distal epiphysis ant.-post.	18,3 cm
Maximum width distal epiphysis ventr.-lateral	15,3 cm

Compared to three femora of the Holocene woolly mammoth which have been reported from Wrangel Island (in the Siberian Arctic Ocean) by Tikhonov *et al.* (2003), # 7176 in the Mammoth Museum is even smaller. The measurements given by Tikhonov *et al.* are as follows: 83,6 cm (for a subadult specimen with unfused epiphyses), 98,5 cm and 101 cm. The shoulder-height for # 7176 might be less than 180 cm. The length of # 7176 fits better in a total of 14 femora of *Mammuthus exilis* collected from the Channel Islands off the coast of California, USA. The length for these 14 femora are between 59 and 84,2 cm (Shoulderheights for *Mammuthus exilis* are estimated between 150 - 180 cm). The right femur of *Mammuthus primigenius* (#7176) in the Mammoth Museum in Yakutsk shows small woolly mammoths already existed more than 48.000 years BP on the continental part of Eurasia.

The most significant osteological exhibits in the museum are the skeletons of a woolly mammoth, a woolly rhinoceros and a steppe bison. Of great interest are the remains of partial carcasses such as legs of woolly mammoth, parts of internal organs and skin, horns of the woolly rhinoceros, part of a carcass of the Lena horse and a part of a carcass of an Early Holocene moose. There is also an extensive collection of fur (and underfur) of the woolly mammoth, the woolly rhinoceros and the steppe bison.

Some of the most interesting exhibits in this museum are:

- Part of the skin of the woolly mammoth found on the Bolshoy Lyakhovsky Island (New Siberian Islands), 1994 (Fig. 12). Max. length 219 cm., width 92 cm. This part of the skin is from the head, including the eye-opening, ear and a part of the shoulder, in some spots the fur and underfur is preserved. The thickness of the skin on the shoulder part is 22 mm. The skin belonged to an adult individual of medium size. This piece of skin was figured by Engesser *et al.* (1996) after its discovery on Bolshoy Lyakhovs-