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Woolly rhino (*Coelodonta antiquitatis*) distribution in Northeast Asia

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An analysis of the geographical distribution of woolly rhino remains in Northeast Asia is given. Obviously, the ancestor of *C. antiquitatis* starts to disperse from the Pribaikalie or Transbaikalia territory northward to Southern Yakutia during the Early Pleistocene. In the Middle Pleistocene the woolly rhino was widely distributed from Central to North Yakutia up to Chukotka. Most of the *C. antiquitatis* finds are dated Late Pleistocene. During that period these mammals inhabited the valleys of practically all the long rivers and watersheds in Northeast Asia. Rhino remains are found in Central Chukotka and on Wrangel Island, but are not yet found in Alaska. Possible causes, preventing the dispersal of the wooly rhino to the New World, are discussed.

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INTRODUCTION

The genus *Coelodonta* was widely distributed in the Eastern part of the Northern Palaearctic during the Pleistocene. There are many data on their finds in East Siberia: in Pribaikalie and Transbaikal region (e.g. Chersky 1891, Ermolova 1978, Kalmykov 1990), in Yakutia (e.g. Chersky 1891, Vangengeim 1961, Russanov 1968, Agadjanian 1972, Lazarev & Tomskaya 1987). Finds of *C. antiquitatis* in areas of Northeast Siberia such as the Kolyma River basin, Chukotka and the adjacent territories, are less well known. This paper deals with a discussion of the finds from the latter areas and with a possible explanation of why the woolly rhino never reached Alaska.

MATERIAL

Woolly rhino remains in the Institute of Geological Sciences of Yakutsk, collected by different geological services in the districts of Yakutia, Chukotka and Magadan, were studied. Data of most of these finds were never published. Also fossil mammal material, which was stored in some museums of the Cities of Yakutsk, Irkutsk, Verkhoyansk, Aldan and the villages of Chersky, Betenkes, Khandyga and Ust-Tatta, was studied. Based on these collections some new data on *C. antiquitatis* finds were obtained. Further, material was studied that was collected during expeditions of the Mammoth Museum to the lower stream of the Kolyma River, New Siberian Islands, some mammoth sites on the Lena and Aldan Rivers, during 1994-1998.

RESULTS AND DISCUSSION

Apparently the genus *Coelodonta* originated in Central Asia in the territories of Northern China and Transbaikalia during the Early Pleistocene (Vangengeim *et al*. 1966) and probably dispersed to Southern Yakutia. A find near Olyekminsk City belongs to this period (Vangengeim 1961, 1977). During the Middle Pleistocene woolly rhinos were already widely distributed in the territory of Yakutia and adjacent regions. Finds of their remains in the Nizhnyaya Tunguska River valley (Vangengeim 1977), the Aldan river at Mamontova Gora (Russanov 1968, Agadjanian 1972), in the lower stream of the Yana and the Kolyma Rivers (Lazarev & Tomskaya 1987) and the Malyi Anyui river at Western Chukotka near Utkinsky Kamen (Sher 1971), belong to this period. Nevertheless, most finds of *C. antiquitatis* remains in this region originate from fluviatil e deposits which are dated Late Pleistocene. These finds testify that these mammals inhabited valleys of practically all long rivers and many watersheds (Fig. 1). Especially in Central Yakutia, many woolly rhino remains were found in the territory between the Lena and Aldan Rivers. A complete skeleton of *C. antiquitatis* with some soft tissues was found here at Churapcha village in 1972 (Lazarev 1977). Parts of skeletons were found in the Mamontova Gora outcrop, one in 1976, another in 1997, and one on the bank of the Khandayiky stream in 1990. Many remains of *C. antiquitatis* were also found in the middle stream of the Vilyui River. In 1771 an entire carcass was found near Verkhnevilyuisk City, however, only the head and two legs were saved. In 1858 a rhino skeleton was found at the place 'Kentik' near the Vilyui River (Chersky 1891).

In addition to the material mentioned above, many remains were also found in the Yana River basin. The most interesting finds of this site are: a carcass from the banks of the

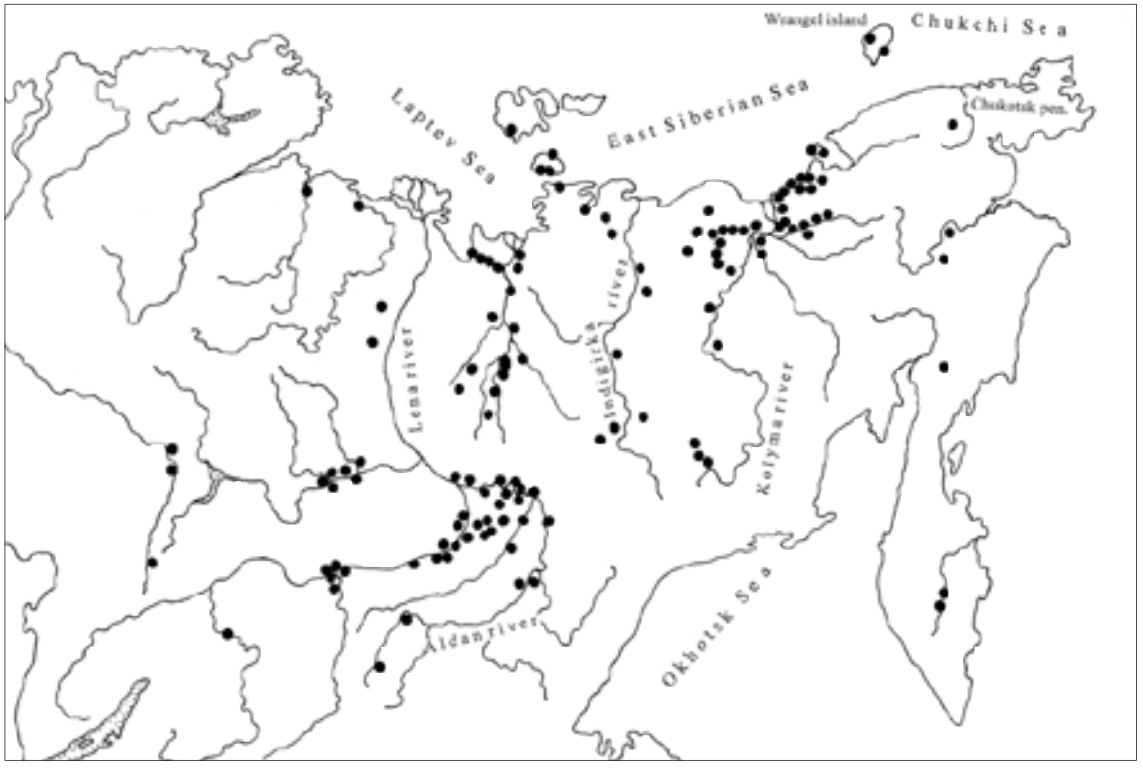

Figure 1 Distribution of *Coelodonta antiquitatis* in Northeast Asia.

Khalbuy River found in 1877, and a part of a skeleton from the banks of the Khontolog River, found in 1901. Obviously *C. antiquitatis* inhabited different biotopes. Their remains were found both in lowlands and on the plateaux. High mountain ridges were probably essential obstacles for them.

It was assumed that woolly rhino remains are more numerous in Central Yakutia with a plain landscape, than in Northern Yakutia with large mountaineous territories (Lazarev & Tomskaya 1987). Nevertheless, a high percentage of *C. antiquitatis* bones was observed by Sher (1976) in some northern parts of this region, on the Yukagirskoye plateau and in the Bolshoy Khomus Yuryakh River basin. Woolly rhino bones were here represented by more than 25 % of all the fossil mammal bones. The highest frequency of woolly rhino bones was observed on the plateaux and in the mountain river valleys, while in the lowlands and in the long river valleys the rhino remains were rather rare, usually about 1% (Sher 1976; Chernova *et al*. 1998). During 1995 and 1997 material was collected at a Late Pleistocene outcrop in the lowland of Duvanny Yar at the lower stream of the Kolyma River. The *C. antiquitatis* remains represented here 1,3% and 1,65%, respectively, of the fossil mammal bones. The frequency of *C. antiquitatis* bones was higher, between 5,3% and 9,1%, in the outcrops of the Malyi Anyui River, west Chukotka, situated on higher places. Numerous remains of the woolly rhino were also found in mountaneous regions, in the basins of the Yana and the Indigirka Rivers at altitudes of 500-700 m above sea level.

It is also assumed that *C. antiquitatis* preferred an arid climate. The largest number of their remains are found in the Transbaikal region, where a zone of dry steppes with parts of semi-deserts was present in the Pleistocene (Garutt *et al*. 1970; Vangengeim 1978). Probably there were convenient conditions for existing on some highlands of Northeast Asia. Woolly rhino remains were found in the north of the Russian Far East on the Kamchatka Peninsula and the Koryak Highlands (Gromov 1948; Sulerzhitsky & Romanenko 1997).

Poor finds of bones are known from mountaineous Western and Central Chukotka, where the mountain-valley glaciation was present during the Middle and Late Pleistocene (Petrov 1965; Bojarskaya 1980). Obviously, this glaciation prevented dispersal of *C. antiquitatis* into this region. Rhino remains are mainly found in Northwest Chukotka on the East Siberian Sea shore, including Ayon Island. Although easternmost finds of Northeast Asia are known from Wrangel Island (Sulerzhitsky & Romanenko 1997, Tikhonov 1997), in Central Chukotka from the Ekityki River basin (Garutt 1998) and the Anadyr River basin (Agadjanian 1980; Garutt 1998), it is a puzzle why *C. antiquitatis* could not pass the Bering Land Bridge. They did not reach Alaska, at least no Alaskan woolly rhino bones have yet been found.

Gromov (according to Garutt *et al*. 1970) assumed that they became extinct in North Siberia after the Early Würm. Other authors supposed that the woolly rhino dispersed in the northern and northeastern directions very slowly. They should have reached the outermost part of northeast Asia only at the end of the Late Pleistocene and so they could not reach the Bering Land Bridge 'in time'. Nevertheless, the finds in the Utkinsky Kamien outcrop, in Western Chukotka (Sher 1971), testify that *C. antiquitatis* inhabited already the outermost northeast of Asia at least during the Samarovian glaciation of the Middle Pleistocene. Radiocarbon dates show that the above mentioned assumptions are wrong. *C. antiquitatis* was already widely distributed in the outermost northeast of Asia, at least from the Karginian interglacial (24.000-50.000 yBP), until almost to the end of Sartanian glaciation (14.000 yBP, see Table 1).

Table 1. Radiocarbon dates of *C. antiquitatis* remains from northeast Asia.

Locality	Dating in yBP	Reference
N.Yakutia, Yukagirskoye plateau	14.260 ± 150	Sulerzhitsky & Romanenko 1997
N.Yakutia, the Bolshoy Khomus Yuryakh river basin	15.130 ± 50	Sulerzhitsky & Romanenko 1997
N.Yakutia, the Bolshoy Khomus Yuryakh river basin	15.130 ± 90	Sulerzhitsky & Romanenko 1997
N.Yakutia, the Indigirka river	15.850 ± 80	Sulerzhitsky & Romanenko 1997
Central Yakutia, Churapcha village (skeleton)	19.500 ± 120	GIN-9594*
N. Yakutia, the Khroma river	20.400 ± 200	Sulerzhitsky & Romanenko 1997
Kamtchatka peninsula, the Kamtchatka River	20.800 ± 200	GIN-3400*
Central Yakutia, the Aldan river basin	23.500 - 35.000	Mochanov 1977**
Northern Yakutia, the Kolyma river	> 26.000	GIN-6005*
Northern Yakutia, the Kolyma river	26.900 ± 400	Sulerzhitsky & Romanenko 1997
Chukotka, the Malyi Anyui river	27.300 ± 300	Sulerzhitsky & Romanenko 1997
Northern Yakutia, the Berezovka river	> 28.600	GIN-6007*
Wrangel island	29.800 ± 340	Sulerzhitsky & Romanenko 1997
Northern Yakutia, the Bolshoy Khomus Yuryakh river	30.900 ± 200	Sulerzhitsky & Romanenko 1997
N.Yakutia, the Indigirka river basin	> 32.000	Sulerzhitsky & Romanenko 1997
N.Yakutia, the Khalbuy river, near Verkhoyansk sity	> 33.000	Heintz & Garutt 1965
N.Yakutia, Kolyma river basin	33.100 ± 400	Sulerzhitsky & Romanenko 1997
N.Yakutia,the Bolshaya ChukochiyacRiver	37.700 ± 1100	Sulerzhitsky & Romanenko 1997
N.Yakutia, the Elgi river	> 38.000	Heintz & Garutt 1965
Central Yakutia, the Aldan river, Mamontova Gora outcrop	> 38.000	Sulerzhitsky, pers. comm.
N.Yakutia, the Berelekh river	39.900 ± 500	Sulerzhitsky & Romanenko 1997
N.Yakutia, upper stream of the Yana river	40.000 ± 500	Sulerzhitsky & Romanenko 1997
N.Yakutia, the Kolyma river	> 42.300	Sulerzhitsky & Romanenko 1997
N.Yakutia, the Bolshaya Chukochiya river	43.700 ± 1000	Sulerzhitsky & Romanenko 1997
Kamtchatka peninsula	46.700 ± 1200	Sulerzhitsky & Romanenko 1997
Chukotka, the Bolshoy Anyui river	> 49.000	Sulerzhitsky & Romanenko 1997

* data obtained in the Geological Institute of the Russian Academy of Sciences, Moscow by dr L.D. Sulerzhitsky

** - data obtained by layers of paleolithic sites including woolly rhino bones

Flerov (1967) assumed that the main food of the woolly rhino were twigs of bushes. In his opinion the absence of bushes in the territory of the Bering Land Bridge prevented dispersal. However, analyses of food remains caught within and between the teeth of some woolly rhinos (Garutt *et al*. 1970; Guthrie 1990) and of gastrointestinal contents of the Churapcha rhino (Lazarev 1977) show that these rhinos were mainly grass-eaters. Ermolova (1978) assumed that the abundant areas with crusted snowcover in the outermost Northeast of Asia, at the beginning of the Sartanian glaciation, prevented *C. anti - quitatis* to migrate toAlaska.

All modern rhinos (genera *Rhinoceros*, *Dicerorhinus*, *Diceros*, and *Ceratotherium*) are characterised by low fertility and low ability for migration (according to Walker *et al.* 1968). *C. antiquitatis* obviously did not differ from the modern rhino in these respects. It is possible that very small populations lived during the last glaciation in the outermost northeast of Asia.

During the period of the Sartanian glaciation, when the Bering Land Bridge connected Asia with North America for the last time, there were periglacial landscapes with a xerophytic tundra-steppe vegetation in the territory of the modern Bering Strait (Sher 1967; Bojarskaya 1980). Such conditions must have been convenient for *C. antiquitatis*; at least some rhinos must have been able to reach Alaska. Here it is suggested that woolly rhino remains will be found in Alaska in the future. Nevertheless, in the Late Wisconsinan the Bering Land Bridge was narrower than in previous epochs (Degtiarenko 1971). It is also shown that a tundra with light bushes and sedge swamps was situated on the territory of Northern Yukon during 16.000-12.000 yBP (Ritchie & Cwynar 1982). Such biotopes with poor food resourses were probably not attractive for them. Even if a small number of *C. antiquitatis*, mammals with low migration ability, had reached Alaska through the narrow corridor of the Bering Land Bridge, they must have been stopped by the numerous glaciated mountain ridges of Alaska.
It is suggested here that this can explain the fact that no Alaskan *C. antiquitatis* bones have yet been found.

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