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BABY MAMMOTH LYUBA'S STORY

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Just as dinosaurs, mammoths are among the most widely known extinct animals on Earth. Both public at large and scientists show great interest in them. Indeed, is there anything more surprising than, say, an elephant frozen in ice, both for an ordinary person or in terms of science? On the one hand, mammoths are a graphic example of the species' adaptive potential and of their mysterious abrupt extinction, on the other one. Incidentally, their fate and their biota's fate happens to be the last known global ecological disaster that had occurred on the planet for natural reasons. There are lots of documentary proofs testifying to it that give grounds for hope to reveal the symptomatic precursors of such an event for its forecasts in the future.

sia's extreme north is practically the only place on Earth where they occasionally discover in permafrost the remains of animals that roamed the area tens of thousands of years ago. At present we know of several scores of these finds, largely such as fragments of the mammoths' hides or bodies and even whole mammoth bodies-on rare occasions. Mammoths' whole bodies could have been preserved for millennia solely owing to the unique combination of circumstances. For instance, the animal's body could have been rapidly buried in permafrost after its death, for it was only in that case that the body could not have been decomposed or devoured by predators. Moreover, those frozen remains were preserved in that form in the course of the subsequent millennia, and now that they have appeared on the Earth's surface they should be found and preserved. Regrettably, we also know of the cases when only skeletons remained of the well preserved carcasses due to the failure to adopt proper measures in due time for their preservation. Exactly that happened to one of the first finds of this kind, i.e. the Lensky mammoth discovered in the Lena River

mouth in 1799. However, after Mikhail Adams (active member of the St. Petersburg Academy of Sciences from 1805) had arrived on the site on the Academy's instructions, all he found was the skeleton with scanty tissue remains. The same sad fate befell the Mongochensk Mammoth discovered in Gydansk Peninsula*. The local Nenets residents found it unexpectedly in 2000, while the report of the find was received at the Salekhard museum in 2004. As ill luck will have it, by the time the specialists arrived there all they saw were the mammoth's skeleton, wool and intestine contents.

As a rule (and relatively often) only the mammoths' bone remains are found. Curiously, it was historian Vasily Tatishchev, an outstanding official in the period of Peter the Great's rule, who was the first to supply information about them in world scientific writing. In paying tribute to Tatishchev in October 2007, Nina Arkhipova, an honorary member of the Russian Geographic Society and of the Ural Society of Students of Local Lore, History and Economy,

^{*} See: "Mammoth From the Gydansk Peninsula", Science in Russia, No. 1, 2006.-Ed.



Baby mammoth Lyuba was found on August 25, 2007.

pointed out that back in 1721, while on a visit to Tobolsk, in Siberia, he inspected mammoth bone remains and wrote an article in Latin, entitled "The Tale of the Mammoth Beast". The article was published in Sweden in 1725 and later in London in 1743.

At present we know about three relatively preserved mammoth carcasses, each of them assigned its own name. The first one, the Berezovsky Mammoth, that for a long period of time served as the unique find of this kind, was discovered on the Berezovka River, the Kolyma right tributary. The expedition, rapidly organized by the Royal Academy of Sciences, brought it to the Zoological Museum (St. Petersburg)* in 1902. The second one, the body of a baby mammoth, was found in 1977 in the vicinity of a mine in the upper Kolyma reaches. This one has become widely known as Dima. The third one, a female baby mammoth, later referred to as Masha, was discovered on the bank of a small river in Yamal Peninsula in 1988. All of the mammoth bodies had been more or less damaged for some or other reasons. Wolves or polar foxes had nibbled the Berezovsky Mammoth's back and head, the bulldozer bucket had destroyed Dima's right side and cadaver-eating insects, birds and lemmings had damaged Masha's body.

The next, fourth, baby mammoth was discovered on May 16, 2007. Some time prior to that it was spotted by Yuri

Khudi who was driving reindeer herds to their summer pastures on the Yuribei River bank (Yamal Peninsula)*. The local indigenous population's attitude to the extinct animals is not simple. On the one hand, they appreciate the value of their tusks (true, the baby mammoth in question had not yet got them) and on the other one, mammoth appears as a dark force in their legends, as a nether world being. However, the reindeer breeder took a responsible attitude to his find. Having left his herds behind, he made his way to the Yar-Sale Settlement and told about it Gennady Zaitsey, director of the local museum. And the latter, in his turn, informed about it specialists of the Yamal Area Museum-and-Exhibition Complex named after I. Shemanovsky (Salekhard) and of the Institute of Plant and Animal Ecology of the RAS Ural Branch (Yekaterinburg). Relying on the Institute researchers' advice, the staff members of the Complex made arrangements for the baby mammoth to be brought to Salekhard, an exploit of sorts if you take into account financial difficulties. First, the carcass was brought to the Novy Port Settlement where a local businessman offered to keep it in his underground freezer while a helicopter was being prepared for a special flight. Andrei Gusev, the archeology and ethnography department manager of the Yamal museum, brought the baby mammoth's body to Salekhard where it was placed into the freezer chamber at minus 7°C.

^{*} See: A. Alimov et al., "Alma Mater of National Zoology", Science in Russia, No. 3, 2003.–Ed.

^{*} See: "Unique Find-Baby Mammoth", Science in Russia, No. 6, 2007.-Ed.



Yuribei river bank (Yamal Peninsula).

The operation was carried out very rapidly. A press conference was held in the Yamal Museum on May 30. The baby mammoth was extracted from the freezer chamber and shown to journalists. It was revealed at close inspection that some predator, probably a dog, has nibbled the tail and the edge of the right ear, while the rest of the body was intact. It was indeed a sensation: for the first time ever the researchers had received the extinct animal's practically undamaged carcass. The female baby mammoth was 5 or 7 months old. Its fat hump was well manifested which served as a testimony that it had been quite plump and that it had probably died either in late summer or in autumn. No injuries caused either in its lifetime or after its death were visible. Wool had been preserved solely on several spots of its body and legs. Its body looked very flat on the sides and it had been entirely mummified. So it may be concluded that the baby mammoth had died all of a sudden and had been buried very rapidly. It must have been frozen ever since. This gives grounds for hope for the unique state of preservation of its internal organs and tissues.

There is a tradition in Russia's mammoth studies to assign a certain name to each new mammoth find based either on the place or author of its discovery. So this female baby mammoth has been named Lyuba, i.e., after Yuri Khudi's wife.

Another tradition of Russian science in this sphere dates back to the early 20th century, to the period of research carried out into the Berezovsky Mammoth, that is, a comprehensive approach to the study of these unique finds. In that period morphologists, histologists, paleobotanists and chemists, inter alia, took part in the process. The same practice is used today.

Field works carried out at the place of the baby mammoth's discovery revealed that its location was not ordinary. According to Yuri Khudi, he had spotted it on the river's low bank, not far from water, and it was practically clean. Lyuba then lay on its right side, with small frozen ground pellets sticking to it. It is not clear whether they had separated from the rock it had been frozen in or had frozen on the body later at the place the body was discovered. The baby mammoth must have been found not *in situ* but had been brought by the water current and the initial place of its burial must have been located in the upper reaches of the river. The nearest high bank from which the carcass could have been washed is located over 1 km upstream. It may have been frozen there and later brought to the place of its discovery back in 2006.

However, an expedition was organized in August 2007 in search of Lyuba's initial burial place and field works were carried out in the region of its discovery. The expedition also set itself the task of collecting materials for the reconstruction of natural conditions in the period when the area served as the habitat of the mammoth population. Taking part in the work were Pavel Kosintsev, Alexander Borodin and Anatoly Yakovlev, all of them Cand. Sc. (Biol.), Artyom Tyaptin, who had joined them on a voluntary basis, and Maxim Kryachko, a representative of the Yamal-Region Television and Radio Company. Igor Kornelyuk, a represen-



Buried peat bog of the Holocene Period (tree stumps serve as its foundation). The extinct animal's carcass must have been buried here.

tative of the Yamal Television and Radio Company, joined the group in the closing stage of work.

So, the place of discovery is now located in the zone of southern brushwood tundra. It includes a part of the Khoy elevation and looks like a rolling boggy flat country with absolute heights up to 60 m and with its predominant sloping hills, drained and divided plains, with willows reaching 2 m in height growing along river valleys and shallow gullies. About 300-m thick permafrost is omnipresent there. Surface sediments in the area dating back to the Middle and Late Pleistocene periods, i.e., formed from ten to two hundred thousand years ago, consist of clays, loam, sandy loam and sands, occasionally with the inclusion of fragmentary material. And we deduce that it was precisely in the late Pleistocene Period that the baby mammoth was buried initially.

We analyzed the available data before setting about the search of its probable burial place. I have mentioned above that the baby mammoth had practically no visible injuries. Even its dried trunk, the most brittle part of the body, was completely intact; the body surface was almost clean, and no rock remnants had been found at the place of its discovery. Moreover, the mummified carcass was relatively heavy, with its floating capacity close to nil. Since the nearest outcrop of surface Pleistocene sediments is located 1.5 km farther upstream, given Lyuba's above-mentioned insignificant floating capacity, it must have been carried by the river for at least 1.5 km without any injuries in the process. That would be most likely, had some kind of floating material enveloped the carcass. In the region in question it could be nothing but ice or peat. Consequently, their outcrop on the surface had to be found.

We decided to set up our expedition camp several kilometers farther upstream from the place of the baby mammoth's discovery, on the Yuribei River bank. We found three exposures there with the outcrops of Quaternary sediments and one farther upstream. Later we set about inspecting them on a planned basis assisted by favorable weather conditions.

First, we started inspecting the exposure located farther upstream from the camp. It was 10 to 12 m high and consisted of well washed light sands and sandy loam, and at the water edge we found a layer of slightly washed rough crystalline rock fragments. A fragment of strongly mineralized mammoth rib was discovered on the bank of the river. The composition and structure of the layers and also the fact that it was found quite far from the place of the baby mammoth's discovery made its further examination senseless. Next, we turned to the exposure located farther downstream– with very promising results.

The 8- or 9-m-high exposure in question consisted of light-gray sandy loam interspersed with layers of plant remains. It was obvious that the baby mammoth of interest to us had not been washed out of this exposure. And the examination of those plant remains will allow us not only to obtain data on them in Late Pleistocene but also date them with greater precision by the radiocarbon method. The



One-meter-thick ice layer which most probably encased the baby mammoth's body.

remains of insects may well be discovered in them and this would considerably add to our knowledge of Yamal's "mammoth" ecosystems. It was resolved to study more closely and describe this exposure in future and also select samples for palynological, carpological and entomological analyses. Next, 1 km farther downstream from the former exposure, in the cliff of the flood plain terrace, we found a buried peat bog dating back to the Holocene period, with the stumps of trees, largely birches and larches, forming its foundation (we collected samples of wood for dendrologists). Several millennia back climate in the area must have been much warmer and forest tundra dominated the view instead of the tundra of our days*.

The Yuribei flood plain spread for several kilometers farther, with high terraces looming far away. The map showed that the latter were located on the opposite bank. We were determined to come back when all of a sudden a dark patch was spotted on the light sand of the nearest river bend. It was an enormous peat chunk (probably of the Holocene Period) that had been brought by high water. And it reminded us of the existing hypothesis that initially seemed to be the least probable: that massive chunk surely could have carried Lyuba. However, in that case a considerable amount of peat should have remained at the place of Lyuba's discovery but we had failed to reveal it. In general, the inspection of exposures in the camp's vicinity showed that Lyuba could have been hardly buried there initially. Then we decided to examine two more exposures next to the place of her body's discovery, on the opposite river bank, some 8 or 10 km from the camp.

The closest exposure, some 20 to 23 m high, consists of light gray sand loam. We had not discovered either buried ice or any peat there. The second one, some 10 or 15 m high and consisting of light gray sandy loam, is 1 km farther upstream, beyond the river bend. That is why at first glance it looked much like the former one. However, a closer inspection revealed a substantial detail, i.e., a buried ice layer was observed in its upper part. It lay at a depth of only 1 m. So it became clear that there was a high probability of its being the initial place of the baby mammoth's burial. On the next day we went on with the examination of this exposure on the spot. We sunk a hole on its edge down to the buried ice layer and took the samples of both for analyses. In the lower part of the erosion we found a thick peat layer extending beyond the water edge. The examination of its composition and structure showed that the ice layer was alluvial, i.e., wavebuilt, interspersed with sandy loam layers. Such sediments have not got any floating capacity and that is why they could not have served as the initial place of Lyuba's burial. Finally, we found the most probable place of the animal's burial: it was the laver of buried ice in the second exposure farther upstream from the place of its discovery. The carcass, encased in an ice block, must have dropped from it in the

^{*} See: S. Zimov, "Mammoth Steppes and Future Climate", Science in Russia, No. 5, 2007.–Ed.



Exposure of ancient frozen rocks located in close proximity to the place of the baby mammoth's discovery.

past year, and the river must have carried it farther downstream where the carcass was discovered.

However, the second problem has not been resolved to the full, for we had failed to complete the collection of materials dealing with the history of the region's "mammoth" ecosystems. So we had to go on with the examination of the exposure near the camp. In the process of detailed examination we discovered the remains of the respective wildlife species—reindeer, horses, prehistoric bison and mammoth. Incidentally, we were lucky enough to discover the remains of bison that once roamed the northernmost regions in Western Siberia, a record of sorts so far.

Our research and its results lead us to the conclusion that the discovery of an intact baby mammoth carcass is something next to miracle. Why? For this happened as a result of the happy coincidence of a whole range of unique circumstances. First, the baby mammoth was buried either at the time of or immediately after its death, with no chance for carrion eaters to devour it. Second, it was immediately buried in frozen rock ruling out the process of decomposition. Third, the layer its body was encased had not been destroyed either by the river or landslide. Fourth, this layer had not been subjected to thawing for any protracted period of time. Fifth, the animal was buried with a great amount of ice, and that is why after it had dropped out from the layer, it had neither been drowned nor destroyed by the river as it carried the carcass. Sixth, there were no polar foxes, northern owls or lemmings in the region in the previous year, so

they could not have destroyed the carcass in the period of time it lay on the bank. Seven, snow on the river bank had thawed as a result of warm fair weather that prevailed for several days there before its discovery, so the small dark carcass could be easily observed on the light sand. And the snowfall that occurred a day after the animal's discovery could have covered the baby mammoth. As a result, it could have been concealed from view, so Yuri Khudi would have never spotted Lyuba and it would have been carried away by the spring high water. Precisely this place lies on the route of many reindeer breeders' migration, but Yuri Khudi rode close enough to Lyuba and took note of it. Having examined his find, he made up his mind to report about it, although, as mentioned above, Nentsi regard mammoths as residents of the "nether (underground) world" that is hostile to man, and you may meet with ill luck if you cross their way. Yuri went to Novy Port, 150 km away, without hesitation, and from there to the Yar-Sale Settlement to inform about his find. And it should be taken into account that it was a busy period in the shepherd's life when the reindeer were migrating to spring pastures for calving. And the personnel of the Salekhard Museum-and-Exhibition Complex made arrangements without delay for the baby mammoth to be delivered to the museum and for its proper storage. As we see, it was an almost incredible combination of circumstances.

Consequently, the first stage of works has been completed. The obtained results by far exceed what has been expected. The probable place of the baby mammoth's burial has been



Baby mammoth Lyuba.

found, the perspective region has been determined and a considerable amount of materials has been collected for the study of the dynamics of the Arctic natural conditions in the Pleistocene and Holocene. Next, we shall analyze the material accumulated for a broad range of specialists. The carcass has been almost completely preserved, so, its examination will yield a lot of interesting results.

Primarily, a comprehensive research program should be drawn up with measures to be worked out for the animal's conservation and storage, and the place of discovery should be again thoroughly inspected. A letter of Valery Chereshnev, chairman of the RAS Ural Branch, has been forwarded to Yuri Neyelov, Governor of the Yamalo-Nenets Autonomous Area, with the proposal to form a working group with the participation of representatives of the Area administration, the Yamal museum and of researchers of the Institute of Plant and Animal Ecology of the RAS Ural Branch who have penned this article.

On June 18-22, 2007, the 4th International Mammoth Conference was held in Yakutsk attended by representatives from Russia, the United States, Great Britain, Germany, Italy, The Netherlands and Poland, inter alia. Pavel Kosintsev informed the audience about the new find. And an international group of experts was formed. They paid a visit to Salekhard, inspected Lyuba and made decision on works to be carried out in future. They pointed to the need for computer tomography and X-ray photographs to be made, and then it would be clear whether autopsy was necessary or it was sufficient to take the samples of tissues and organs for biopsy. The program of research into the baby mammoth was also discussed at the Mammoth Committee under the RAS Zoological Institute (St. Petersburg).

An idea was also put forward of the possibility of mammoth's cloning on the basis of these remains. In purely theoretical terms this reconstruction is possible, the idea does not conflict with the laws of nature. DNA sections are stored in various tissues and even in wool. For instance, their fragments were isolated from the Mongochensk Mammoth's wool. However, isolated bits are insufficient for cloning, for they reflect only a small part of the mammoth's genome. It would probably be necessary to isolate DNA section to be used for a certain mosaic, with the missing fragments restored by making use of the genetic material of the elephants of our days whose genome insignificantly differs from that of mammoths. Yes, it is theoretically possible to reproduce the extinct giant, but it is impractical in reality, to say nothing of the outlays for sophisticated technologies. Consequently, the idea of mammoth clones is a thing of remote future so far.

And Lyuba, that was behind this research, is currently stored in the freezer chamber of the Salekhard Museumand-Exhibition Complex. The program of its comprehensive studies has been worked out and is being implemented.

Illustrations supplied by the authors