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GENERAL BIOLOGY

Findings of the Giant Deer *Megaloceros giganteus* in the Holocene of the Ural Mountains

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The giant deer *Megaloceros giganteus* Blumenbach, 1803 is a typical species of faunal assemblages from the Middle and Late Pleistocene of Eurasia and North Africa [1]. To date, its bones are only known from Holocene deposits of Ireland. In the Middle and South Ural Mountains, isolated bones of this species were found in cave and alluvial deposits [2–4]. A unique, almost complete skeleton of this species was registered in the center of the Trans-Ural Region [5]. These findings were dated to the Middle–Upper Neopleistocene on the basis of faunal or geological data [2]. Absolute dating of these specimens has not been performed.

Recently, several isolated bones of giant deer from Ural localities have been dated by the acceleration mass spectrometry (AMS) (table). The dates obtained are noncalibrated.

Nev'yanskii Prud locality (no. SM-NB/1287)[1]. A cranial fragment was discovered at the bottom of a pond in the town of Nev'yansk (Sverdlovskaya oblast) in lacustrine–alluvial deposits. The bone was dated as 10 825 ± 65 years old, i.e., at the boundary between two climatic standards of the terminal glacial period, the warm Alleröd (AL) and the cold Late Drias (DR-3).

Sikiyaz-Tamak 7 locality (no. IERZh-856)[2]. A right upper jaw of a young deer was found in Bed 8 of the Sikiyaz-Tamak 7 grotto (Chelyabinsk oblast, Satkinskii raion). The bone was dated as 10775 ± 75 years old, i.e., at the onset of a cold phase of the Late Drias (DR-3). The accompanying fauna includes *Lepus tanaiticus, Spermophilus major, Marmota bobac, Cricetus cricetus, Alopex lagopus, Mustela erminea, Equus (Equus)* sp., *Rangier tarandus, Bison priscus,* and *Saiga tatarica.*

Kul'metovskii locality (IERZh-522). A left upper jaw of a young deer was found in the lower horizon of Bed 3 of the Kul'metovskii grotto (Chelyabinsk oblast, Satkinskii raion). The bone was dated as 10260 ± 55 years old, i.e., close to the transition from the late glacial (DR-3) and the Holocene (Early Preboreal warming, PB-1). The accompanying fauna includes *Castor fiber, Cricetus cricetus,* and *Capreolus pygargus.*

Bobylek locality (no. IERZh-528). The second lower molar of an adult deer was found in the Bobylek grotto (Sverdlovskaya oblast, Krasnoufimskii raion). The tooth is 9960 ± 55 years old, i.e., fits into the boundary of the Early Boreal warming (PB-l) and the Late Boreal cooling (PB-2). The accompanying fauna includes *Lepus tanaiticus, Ochotona* sp., *Spermophilus major, Cricetulus migratorius, Allocricetulus eversmanni, Clethrionomys* ex. gr. *rutilus-glareolus, Lagurus lagurus, Eolagurus luteus, Dicrostonyx guilielmi, Lemmus* cf. *sibiricus, Arvicola terrestris, Microtus gregalis, Microtus oeconomus,* and *Microtus arvalis* [6].

Shigirskii Torfyanik locality (CM-8976/ASh-1007). A dagger produced from an antler fragment was found in the cultural layer of the Shigirskii peatbog (Sverdlovskaya oblast, Kirovogradskii raion). The bone is 7990 ± 45 years old, i.e., fits into the boundary between the Late Boreal cooling (BO-3) and the Early Atlantic warming (AT-1). The accompanying fauna includes *Lepus* sp., *Castor fiber, Canis lupus, Ursus arctos, Lutra lutra, Sus scrofa, Capreolus pygargus, Alces alces,* and *Rangifer tarandus.*

The above dates are evidence that the giant deer inhabited the Middle and northern South Ural Mountains at the boundary between the Pleistocene and Holocene and in the Early Holocene; i.e., it had passed the Pleistocene–Holocene transition. During that time, this species participated in different faunal assemblages. In the Late Drias of the South Ural Mountains (Sikiyaz-Tamak 7 locality), it participated in an assemblage that was mainly composed of species of the Mammoth Fauna, i.e., *Lepus tanaiticus, Alopex lagopus, Equus (Equus)* sp., *Rangifer tarandus, Bison priscus,* and *Saiga tatarica.* The Holocene Fauna is represented in this fauna by *Cricetus cricetus* [7]. In the

[1] SM, Sverdlovsk Regional Museum of Local History.
[2] IERZh, Institute of Plant and Animal Ecology, Ural Division, Russian Academy of Sciences.

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Radiocarbon dating of bones of the giant deer (*M. giganteus*) from Ural localities

Specimen no.	Coordinates	Skeletal element	Laboratory no.	Date	$\delta^{13}C$, %	Phase
SM-NB/1287	57°30′ N 60°12′ E	skull	OxA-11065	10825 ± 65	–19.7	DR-3
IERZh-856	55°11′ N 58°38′ E	″	OxA-10704	10775 ± 75	–19.4	DR-3
IERZh-522	56°19′ N 37°39′ E	″	OxA-10676	10260 ± 55	–19.5	PB-1
IERZh-528	56°19′ N 37°39′ E	tooth	OxA-11063	9960 ± 55	–19.6	PB-2
SM-8976	57°22′ N 60°10′ E	antler	OxA-11064	7990 ± 45	–19.7	AT–1

Early Atlantic of the Middle Ural Mountains, the giant deer was included in a typical Holocene mammalian assemblage along with *Castor fiber, Ursus arctos, Lutra lutra, Sus scrofa, Capreolus pygargus*, and *Alces alces* [8]. Earlier, in the Middle and Late Pleistocene, *M. giganteus* was a member of geographical and chronological mammalian assemblages of the Pleistocene Theriofauna. Thus, this species is relatively eurybiontic and tolerant of other mammalian species.

The foregoing raises the question as to the reason for its extinction. Currently, we can consider this question. It is noteworthy that the five dates obtained in the present study (table) fall on the boundaries between climatic phases; the first two dates are at the boundary of the warm Alleröd and the cold Late Drias; the third, fourth, and fifth dates are at the boundaries of the cold Late Drias and warm Preboreal 1, warm Preboreal 1 and cold Preboreal 2, and cold Boreal 3 and warm Atlantic 1, respectively. In the localities dated to approximately the middle of these phases, the giant deer has not been found. It is evident that, during the change of climatic phases, the occurrence in the burial substantially increases in probability. This is associated with an increase in mortality. At the transition between warm and cold climatic phases, the *M. giganteus* population substantially decreased in number. Apparently, the latest decrease was so significant that the population could not restore; as a result, the species became extinct. It is not inconceivable that a certain role in this process was played by humans, since, at the end of the Early Holocene, the number of archeological sites increased; this is evidence for an increase in the human population at the end of the Mesolithic.

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