

A Mass Burial of Brown Bears (*Ursus arctos* L., 1758) from the Upper Pleistocene of the Northern Urals

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Mass burial sites of several species of large mammals, caused by natural mortality and independent of human impact, have been found in Late Pleistocene deposits. The most studied sites are the so-called “mammoth graveyards” in Europe [1, 2], Asia [3], and North America [4]. Mass burials of the larger cave bear (*Ursus spelaeus* Rosenmüller, 1794) [5, 6] are numerous, and some “graveyards” of the lesser cave bear (*U. savini* Andrews, 1922) [7], and the steppe bison (*Bison priscus* Bojanus, 1927) [8] have also been discovered. Mass burial sites (“graveyards”) of the brown bear (*Ursus arctos* L.) were formerly only known from the Holocene. They were found in caves in the Alps [9], southern Siberia, and the Far East [10, 11]. Remains of brown bears are scarce in Late Pleistocene deposits. The only exception is the Geographic Society Cave in the south of the Far East, where a total of

175 bones belonging to nine animals were found [11]. However, there was a Late Paleolithic human settlement there, and the bone accumulations may have resulted from human activities as well as natural factors.

The largest mass burial of brown bears is known in the Nizhneudinsk Caves, where remains of more than 60 animals were found [12]. However, the time of formation of this burial site is unknown.

A new cave was discovered in the North Urals (Vizhay River, Ivdel raion, Sverdlovsk oblast, 61°55' N, 60°05' E) and named “Severnaya.” No signs of humans were found in the cave, but bones of large mammals were present on the cave floor. A total of 224 bones of the brown bear (*Ursus arctos*) were collected, and individual bones of mountain hare (*Lepus timidus*), sable or marten (*Martes* sp.), mammoth

Age composition of brown bears estimated from tubular bones from the Severnaya cave

Age, months	Bone									
	humerus		ulna		radius		femur		tibia	
	dextra	sinistra	dextra	sinistra	dextra	sinistra	dextra	sinistra	dextra	sinistra
Older than 60	11	10	9	8	6	11	9	6	2	4
36–60	1	—	4	2	—	—	2	1	—	2
24–36	1	3	1	1	—	—	2	1	1	3
11–14	—	1	—	—	—	—	1	1	3	3
3–6	2	—	—	—	—	—	3	3	1	1

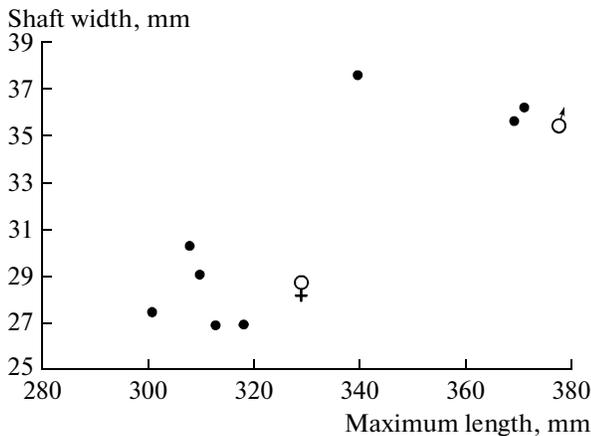


Fig. 1. Ratio between the maximum length and shaft width under the upper end of radius bones of brown bears from the Severnaya cave.

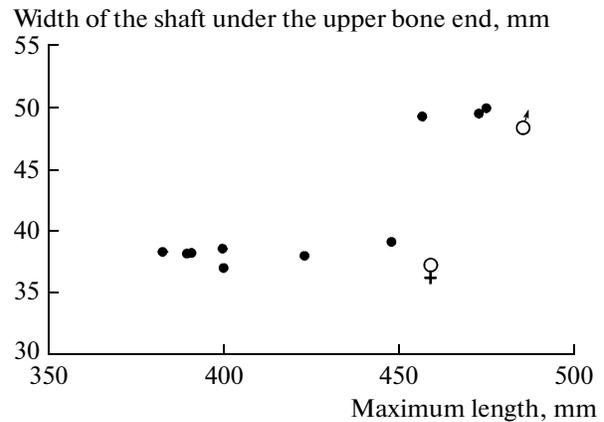


Fig. 2. Ratio between the maximum length and shaft width of femur bones of brown bears from the Severnaya cave.

(*Mammuthus primigenius*), moose (*Alces alces*), reindeer (*Rangifer tarandus*), bison (*Bison priscus*), and horse (*Equus ferus*) (stored in the collection of the museum of the Institute of Plant and Animal Ecology, no. 2079). Tubular bones (115) predominated among the remnants of brown bears. 45 ribs, 37 skulls and their fragments, and 27 bones from other parts of the skeleton were also found. No marks made by human tools were found on the bone surfaces.

Age of fauna. Radiocarbon dating of the brown bear bones gave an estimate of 27100 ± 250 BP; SOAN, 7916 or 29306–29011 cal. BC (1σ). This corresponds to the Briansk (Denekamp) Interstadial [13]. The species composition does not contradict this estimate.

Individual ages. Estimation of the individual ages of the dead animals was carried out using a range of features: stages of tooth eruption, accretion of epiphyses [14], and size of tubular bones [15]. Whole tubular bones of extremities predominated among the bear remains; therefore, they were the most useful tool to reconstruct the age composition of the animals. Animals of all age groups were represented in the collection, including newborns (table). Adult specimens predominated.

Sex composition. Sexual dimorphism is marked in brown bears: males are larger than females. Therefore, sex-related differences might determine the size of tubular bones. The ratios between the maximum length and minimum width of the shaft of the most abundant bones of adult animals (femur and radius bones) are presented on scatter plots (Figs. 1, 2). Samples of both kinds of bones are split into two groups. We consider that the groups of larger bones belong to males and those of smaller bones belong to females. Using the sizes of the femur bones, we identified three males and seven females (Fig. 1). Using the sizes of the radius bones, three males and five females were identified. Our results demonstrated that both males and

females had died in the cave, but more females than males. Predominance of females over males among dead animals was also reported in the Holocene brown bears from the Alps [9].

Absence of traces of human activities and good bone preservation indicate that this mass burial was a result of natural mortality. Numerous remnants of newborns showed that bears died during winter hibernation. This is the first “graveyard” of brown bears of the Pleistocene age.

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