THE NUMBER OF MAMMOTHS (Mammuthus primigenius /Blumenbach/) AT THE SITE CRACOW SPADZISTA STREET B

Piotr WOJTAL*

Summary

*In 1967, a large number of mammoths (*Mammuthus primigenius*) bones were accidentally discovered near Spadzista street in Cracow (Poland). The result of the excavations undertaken in 1968-1971 was the discovery of an Upper Paleolithic site, Cracow Spadzista Street B. Stone artifacts belonging to the Kostenki-Avdeevo culture were associated with the mammoth bones and teeth.*

New excavations were conducted at this site in 1989. A large number of paleontological and archaeological materials was discovered. Ninety nine per cent of the bones and teeth from the 1968-1971, 1989-1991, and 1994 excavations belonged to mammoths.

On the basis of the study of the mandibles and lower molars, it was possible to quantify the number of mammoths and to estimate their age. A second estimation was done, based on the postcranial bones. The MNI, calculated on the lower teeth and mandibles, indicated the presence of 75 individuals for the 1968-71, 1989-90, 1992-94 excavations. The MNI estimated with the postcranial bones vary from 58 (atlas) to 5 (Vthmetatarsal).

Résumé

Dénombrement des mammouths (*Mammuthus primigenius */Blumenbach/) du site B de la Rue Spadzista à Cracovie.

En 1967, de nombreux os de mammouths ont été découverts par hasard près de la rue Spadzista à Cracovie (Pologne). Les fouilles de 1968-1971 ont révélé la présence d'un site du Paléolithique supérieur, "Cracow, rue Spadizsta B". Du matériel lithique de la culture Kostenki-Avdeevo a été découvert associé aux os et aux dents de mammouth.

De nouvelles fouilles entreprises en 1989 ont livré un important matériel paléontologique et archéologique. Quatre-vingt-dix-neuf pour cent des os et des dents des fouilles de 1968-1971, 1989-1991 et 1994 ont été attribués au mammouth.

L'étude des mandibules et des molaires inférieures a permis une première estimation du nombre et de l'âge des mammouths. Une deuxième estimation a été faite avec les os du squelette post-crânien. Le NMI calculé sur les molaires inférieures et les mandibules indique 75 individus pour les fouilles de 1968-1971, 1989-1990, 1992-1994. Le NMI calculé sur le squelette post-crânien varie de 58 (atlas) à 5 (V^{e} métatarsien).

Zusammenfassung

Die Anzahl Mammuts (*Mammuthus primigenius */Blumenbach/) aus der Fundstelle "Cracow Spadzista Street B"

1967 wurde in der Nähe der Spadzistastraße in Krakau eine große Menge Mammutknochen entdeckt. Die Ausgrabungen von 1968-1971 erbrachten die Aufdeckung eines Siedlungsplatzes des Jungpaläolithikums (Cracow Spadzista B). Zusammen mit den Überresten des Mammuts wurden Steingeräte der Kostenki-Avdeevo Kultur gefunden.

1989 wurden die Grabungen an dieser Stelle wieder aufgenommen. Es wurde eine große Menge paläontologischen und archäologischen Materials ausgegraben. Die Knochen der Altgrabungen und der neuen Kampagne (1989-1991, 1994) stammen zu 99.9% vom Mammut.

Auf der Basis der Untersuchung der Unterkiefer und unteren Molaren wurden die Zahl und das Alter der Individuen ermittelt. Ebenso wurden die postkranialen Knochen zur Bestimmung der Mindestindividuenzahl verwendet. Mit Hilfe der Unterkiefer und Unterkieferzähne ergibt sich eine MIZ von 75. Bei den Knochen schwankt die Zahl zwischen 58 (Atlas) und 5 (Mt V) Individuen.

Key Words

Mammoth, Mammuthus primigenius, *Cracow Spadzista, Upper Paleolithic, Pleistocene.*

Mots clés

Mammouth, Mammuthus primigenius, *Cracow Spadzista, Paléolithique supérieur, Pléistocène.*

Schlüsselworte

Mammut, Mammuthus primigenius, *Krakau, Spadzista, Jungpaläolithikum, Pleistozän.*

* *Institute of Systematics and Evolution of Animals, Polish Academy of Sciences, Sławkowska 17, Kraków 31016 Poland.*

The main excavated area of the Paleolithic Cracow Spadzista Street Site B was situated upon a height connected with the main summit of Sw. Bronislawa hill (252 meters above sea level). The site is located on a rocky prominence overlooking the Rudawa Valley (about 47 meters above the valley).

This site contained a large accumulation of mammoth (*Mammuthus primigenius*) bones. Only a few isolated bones and teeth of other taxa (*Coelodonta antiquitatis*, *Equus caballus*, *Rangifer tarandus*, *Ursus* sp., *Canis lupus*, *Alopex lagopus*) have been found (Kubiak and Zakrzewska, 1974).

Stone artifacts associated with bones belong to the Upper Paleolithic industries of Kostienki-Avdeevo type. The radiocarbon dating of this site points to the age of about 21,000 years bp (Kozlowski *et al.,* 1974).

The zooarchaeological results of the 1968-71 excavations indicated the presence of some 60 individuals (MNI based on the mandibles and lower teeth; Kubiak and Zakrzewska, 1974). In 1989, new excavations were conducted at the site. The combined results of the old and new excavations indicated that bones from all parts of the mammoth skeleton have been found at the Spadzista site. The number of individuals, based on the teeth and mandibles, was estimated at a minimum of 75 animals. Beside the skeletal fragments described in table 1, there were also parts of skulls and many ribs and vertebrae.

There are several possible explanations for the origin of the bones found at this site:

1. the bones could have been brought by man (e.g. as building material for shelters or as fuel);
2. it is a site where one or several herds of mammoths died suddenly;
3. the place was a killing site where humans killed mammoths.

It is unlikely that many tiny bones such as the sesamoid (NISP=82) or hyoid bones, phalanges (NISP = 149) or tarsal bones, caudal vertebrae (NISP = 70) or patellae, which were of no practical value, were brought to the site on purpose. Comparing with Mezerichi, where elephant bones were brought from a nearby elephant graveyard to build shelters, the number of these bones was extremely low (phalanges NISP=17, sesamoid NISP = 2; Soffer 1985). Nor does it seem likely that the bones (70 caudal vertebrae or hyoid bones) were brought in as "baggage" along with the bones suitable for use by humans. To explain this hypothesis, we would have to suppose that whole animals were brought to the site. Even if Palaeolithic humans managed to quarter such an animal, its weight would still have been too heavy to accept that whole carcasses (of 75 individuals) divided into quarters were brought to the site (e.g. the bones of the hind leg weigh more than 40 kg; Soffer, 1985: 280). No more than a few ribs and other small skeletal fragments would have been left at the site where the animal was killed or the carcass of a dead animal was found.

Assuming that the minimum number of mammoths at the Spadzista site is 75, there is one animal per 1.9 square meters. For comparison, a mass death site at Shabi Shabi (Africa), covering 7 500 m^2, housed the remains of 215 animals (*Loxodonta africana;* 1 individual per 35 m^2). In

Table 1: Bone representation at Cracow Spadzista Street site B. MNI, Minimal Number of Individuals; NISP, Number of Identified Specimens.

BONE	MNI	NISP
Atlas	58	64
Mandibula	55	60
Ulna	39	66
Astragalus	29	57
Femur	26	50
Patella	26	47
Naviculare	25	46
Tibia	25	43
Humerus	24	46
Triquetrum	22	40
Hamatum	22	35
Cuneiforme laterale	19	31
IVth Metatarsale	18	31
Calcaneus	16	30
IIIrd Metacarpale	15	28
Trapezoideum	15	27
IVth Metacarpale	15	25
Capitatum	14	25
Cuboideum	13	24
IIIrd Metatarsale	13	23
Cuneiforme intermedium	12	23
Scaphoideum	12	23
Trapezium	12	22
IInd Metacarpale	12	22
Pisiforme	9	17
Cuneiforme mediale	7	13
Sternum	6	6
Vth Metatarsale	5	7
Phalange	–	149
Sesamoid	–	82
Caudal vertebra	–	70

Lememba (Africa), 21 individuals (*Loxodonta africana*) were discovered within 144 m^2 (1 individual per 6.8 m^2; Haynes, 1991). Such a high number of mammoths per square meter in the Cracow site excludes a single sudden death of one herd as a result of stress or hunting. The more likely explanation is that there were several events of deaths at the site (as in Africa; Haynes, 1988, 1991) and that the accumulation continued for a long period of time (several years or even decades).

The bones found at the site belonged to young animals (most of the epiphyses were not fused and were also found at the site), but regrettably we cannot say how many animals were in different age classes. On the basis of animal teeth it was estimated that there were 40% of young animals (age 0-12[1] AEY) and 12% of old animals (age 37-60 AEY).

Considering the age profile of the site, weathering, trampling and bite marks of predators, the events at the site could have spanned over several years (Haynes, pers. comm., believes that it lasted for about 15 years). The expected percentage of bones is similar to that at Shabi Sahbi and Berelekh (tab. 2). The over-representation of some parts of the skeleton at the Spadzista site, e.g. metacarpus, metatarsus, may result from the fact that at Shabi Shabi the bones were counted only at the surface, without excavation, while the Spadzista site represents a long-term bone accumulation counted after excavation work. The depth of the layer with bones at the Cracow site is 50-70 cm and the duration of sediment accumulation is not known.

Besides elephant bones, single specimens of other animals have been found at the African sites (Haynes, 1991). The same is true of the Spadzista site, where, besides mammoth bones, there were single bones or teeth of other tundra species (*Coelodonta antiquitatis, Alopex lagopus, Rangifer tarandus, Canis lupus, Equus* sp., *Ursus* sp.).

Table 2: Bone representation at mass death sites and Spadzista site. The percentages of elements calculated by comparing expected number of elements with actual numbers reported.

BONE	SHABI SHABI	SPADZISTA	BERELEK
Humerus	44%	30.7%	65%
Ulna	34%	44%	25%
Carpal	< 1%	19%	–
Metacarpal	< 1%	16.7%	–
Femur	61%	33.3%	63.9%
Tibia	27%	28.7%	60.35%
Patella	3%	31.3%	1.25%
Tarsal	< 1%	21.2%	–
Metatarsal	< 1%	16.9%	–

There are numerous predator bite marks on the epiphyses of the long bones while signs of cutting are rare. The overall number of mammoth remains and specimens at the site is very large. These data, plus the age profile, indicate that the bones represent a graveyard (Soffer, 1993). Hence, at Cracow Spadzista site B, individuals or herds of mammoths perished during several events. This finding is also supported by the presence of a few bones of a mammoth foetus. At the current stage of research, however, it is not possible to determine whether the animals were killed by hunters or met natural deaths.

Acknowledgements

This study was partly supported by grant N° 6 P204 038 037 of the Polish Scientific Committee.

Bibliography

HAYNES G., 1988.– Mass deaths and serial predations : comparative taphonomic structures of modern large mammal death sites. *Journal of Archaeological Science*, 15 : 219-235.

HAYNES G., 1991.– *Mammoths, mastodonts and elephants.* Cambridge : Cambridge University Press.

KOZLOWSKI J. K., KUBIAK H., SACHSE-KOZLOWSKA E., VLIET B. and ZAKRZEWSKA G., 1974.– Upper Paleolithic site with dwelling of mammoth bones - Cracow Spadzista Street (B). *Folia Quaternaria*, 44 : 1-110.

KUBIAK H. and ZAKRZEWSKA G., 1974.– Fossil mammals in Upper paleolithic site with dwelling of mammoth bones- Cracow Spadzista Street (B). *Folia Quaternaria*, 44 : 77-95.

SOFFER O., 1985.– *The Upper Paleolithic of the Central Russian Plain.* Orlando : Academic Press.

SOFFER O., 1993.– Upper Paleolithic adaptations in Central and Eastern Europe and Man - Mammoth Interactions. *In* : O. Soffer and N. D. Praslov eds., *From Kostenki to Clovis : Upper Paleolithic-Paleo-Indian Adaptations.* New York : p. 31-49.

[1] African Elephant Year = AEY.