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Mammoth population from Cracow Spadzista Street (B) site

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Abstract. New excavations and analyses of materials from the Upper Paleolithic site Cracow Spadzista Street (B) indicate that 71 mammoths may have been killed at the site (or died there naturally), probably not all at once. About 99% of the site's 9000 bones are from mammoth. The lower jaws and teeth give the highest MNI (71), but other bones represent varying numbers (from 58 represented by the atlas to 5 represented by metatarsal V). The site's age profile is typical of a stable population.

Key words: Cracow Spadzista, Upper Paleolithic, Pleistocene, mammoth, taphonomy.

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I. INTRODUCTION

The main excavated area of the paleolithic site Cracow Spadzista Street (B) is situated upon a height connected with the main summit of Św. Bronisława hill (252 meters above sea level). The site is associated with 5 other Upper Paleolithic sites, all situated within about 100 m of each other on a rocky prominence overlooking the Rudawa Valley (47 meters above the valley).

Site (B) contains 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*) were also found (KUBIAK & ZAKRZEWSKA 1974).

The bone accumulation has been interpreted as the remains of two or three possible dwellings, heavily disturbed by solifluction. The stone artifacts associated with the bones belong to the Upper Paleolithic industries of the Kostienki-Avdeevo type. The radiocarbon dating of this site indicates an the age of about 21 000 years B.P. (KOZŁOWSKI et al. 1974).

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II. RESULTS AND DISCUSSION

As a result of excavations undertaken in 1968-71, a minimum number of individuals (MNI) for mammoth based on the mandibles and lower teeth was estimated at 60 (KUBIAK & ZAKRZEWSKA 1974). In 1989-90 and 1992-94, excavations at this site were continued. The estimated number of

individuals, based on the teeth and mandibles found, has now been revised to a minimum of 71 animals. The eruption sequence and wear of the lower teeth were used to reconstruct the age distribution of the fossil remains of the site's mammoths. The mammoths' ages were determined in AFRICAN ELEPHANT YEARS (AEY), which is the life-age based on comparison with dental criteria in modern African elephants (HAYNES 1991). HAYNES (1991) classified african elephants and other proboscidean individuals in twelve-year intervals, and described four different types of age profiles in fossil assemblages, which are:

Type A: subadults predominate, the other age classes are represented in decreasing proportions.

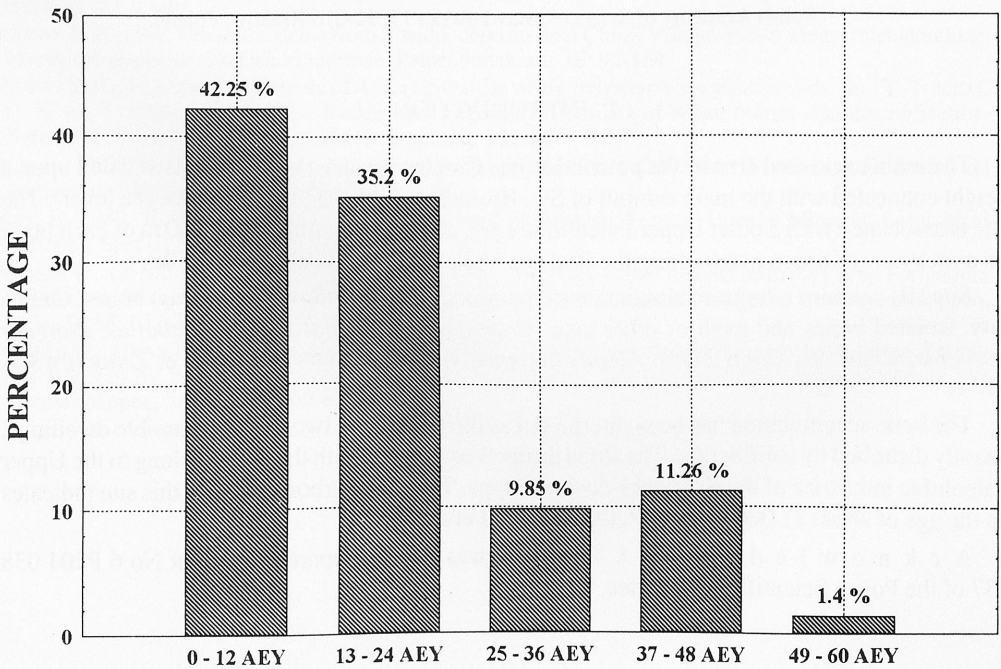
Type B: subadults are predominant, greatly outnumbering the mature animals.

Type C: prime adults predominate, and subadults are rare.

Type D: composed of small assemblages for which an age profile is not clear.

The mammoth age profile from Cracow Spadzista Street (B) (Fig. 1) approximates HAYNES's type A: subadults (0-12 AEY) predominate, while the older animals (13-48 AEY) are less numerous, and only one individual represents the most senior adults age category (49-60 AEY). This age profile could originate in several ways. For example, time-averaged (but nonselective) deaths in nature create a type A age profile; or abrupt, nonselective kills affecting whole herds also create this type (HAYNES 1991, SOFFER 1993).

At the Spadzista site, all parts of the mammoth skeleton were found. Apart from the skeletal fragments listed in Table I, there were also fragments of skulls, tusks, and a very large number of ribs and vertebrae (although preservation of these bones was very poor). The frequency of MNI representation by different elements ranges from 58 (atlas) to 5 (V metatarsale). In the earlier papers



N = 71
AEY = African Elephants Years.

Fig. 1. Age profile of Cracov Spadzista Street (B) mammoths.

Table I

Bone representation at Cracow Spadzista Street (B)

Bone	MNI	NISP
Atlas	58	64
Mandibulum	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
IV Metatarsale	18	31
Calcaneus	16	30
III Metacarpale	15	28
Trapezoideum	15	27
IV Metacarpale	15	25
Capitatum	14	25
Cuboideum	13	24
III Metatarsale	13	23
Cuneiforme intermedium	12	23
Scaphoideum	12	23
Trapezium	12	22
II Metacarpale	12	22
Pisiforme	9	17
Cuneiforme mediale	7	13
Sternum	6	6
V Metatarsale	5	7
Phalanx	–	149
Sesamoid	–	82
Caudal vertebra	–	70

MNI - Minimal Number of Individuals
NISP - Number of Identified Specimens

about the site (KUBIAK 1980, WOJTAL 1994), the difference between the number of mandibles and long bones was interpreted as a result of human activity (certain kinds of mammoth bones were thought to have been gathered as construction material to erect dwellings). However, now we think that the clear differences between the highest and the lowest MNI reflect a number of other factors including bone preservation and recovery techniques. HAYNES (1991) suggests that smaller bones of younger animals could have been filtered out of assemblages by diagenetic processes after deposition. The Spadzista (B) bone assemblage contains a great number of relatively small but robust bones such as patellae or carpal and tarsal bones, most of them belonging to maturing subadults and adults. Small bones of the youngest individuals are rare, although the site's age profile based on mandibles and lower teeth shows that very young animals should be well represented. We suggest that originally the complete skeletons of very small animals were presented. A few bones of at least one mammoth foetus have been found at the site (WOJTAL 1994).

A considerable number of caudal vertebrae, sesamoid bones and hyoid bones also have been found. KUBIAK (1980) estimated MNI on the basis of hyoid bones at 15-18 (from the excavations of 1968-71); at present, after the recent excavations, the number of hyoids has increased. Therefore many bones have been recovered that would not have been useful for huts construction. We suggest on the basis of above data that at the Cracow Spadzista Street (B) site, complete mammoth skeletons were at one time present. It is logical to assume that complete skeletons probably came from animals which had died at or very near the location where their bones are now found.

In spite of the numerous stone tools associated with bones at the site, cut marks are very rare on any bones, while on many parts of certain elements (especially the heads and condyles of humeri and femora) carnivore gnawing marks are clearly visible. SOFFER (1993) suggests that remains of large numbers of mammoths together with evidence for the presence of all skeletal elements and all age classes, as well as a paucity of cut marks and an extensive record of scavenger gnaw marks, may indicate mammoth "cemeteries". However it must be noted that, experiments and ethnographic observations show that human utilization of elephantids may leave few or no identifiable cut marks (HAYNES 1991).

We suggest that the site bones probably were deposited in the same place the mammoth died. Such a large skeletal accumulation (71 mammoths) on such a relatively small surface (the original site surface may have been about 150 m^2) suggests a place where a prolonged process of bone accumulation occurred, and not a location where a single event took place. Our data do not permit us to decide if Spadzista reflects human hunting on mammoth herds or on individual animals, or if the bones resulted from natural mortality of mammoths and the subsequent utilization of the animal carcasses by Paleolithic man. We can not rule at a combination of these different events.

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