Biodiversity – Preferred Mammals and Seasonal Hunting by Early Man

Henryk Kubiak

Introduction

It is now generally recognized that the activity known as hunting by man is a complex adaptation to a faunal community as well as to the variable structure of the environment. Several factors indicate that the environment is the major one influencing the relative abundance of species available for exploitation. This may be through such variables as the depth of snow cover, changes in vegetation and temperature. The result is that the structure of the animal community changes through time and this is reflected in the hunting strategies of palaeolithic hunters. The variation in carnivore representation and the relative proportions of the large herbivores speak more for the opportunities provided by local topography and the role of a site in the local settlement system than for the hunters supplying the archaeologist with an exact faunal imitation of the animal community (GAMBLE 1979; 1984).

Some of the problems concerned with generalizing about palaeolithic exploitation strategies can be seen in the traditional comments upon the nature of European palaeolithic adaptations. These have largely ignored the wider ecological perspective and sought comparisons that are based upon classifications of the excavated evidence. They refer to the animals exploited and characterize hunting activity by the most abundant species that are present in a level, site, or chronological period. Hence, we find cave bear, reindeer, mammoth and horse hunters. Such labels do not tell us very much about hunting activity except the rather obvious fact that the hunters had some degree of success in killing prey. The super-abundance of certain species, e. g. reindeer and mammoth, has led to descriptions of specialized economies although such a description is not used in an ecological sence. Of more interest are a number of regional diachronic studies where changes in the prey populations have been analysed (GAMBLE 1979, 35).

In Europe, and in the recent territory of Poland as well, several sites are known with large numbers of mammal bones in which remains of one species make the majority of the bone material. Those are e.g. mammoth, reindeer, horse, Bison or Bos, and among carnivores cave bear and arctic fox.

The purpose of this paper is to try to show, by means of the study of some examples, why particular mammal species were preferred by hunter-gatherer groups and if there seasonal hunting could have taken place.

Mammoth hunters

The Upper Palaeolithic site Spadzista Street B (Kraków, Poland) contained a huge number of bones of large mammals. The age of this site dated by ^{14}C is about 20 000 years B.P. This site may be regarded as a settlement of mammoth hunter-gatherer groups. The majority of the bones excavated belongs to the mammoth (about 99 per cent). Most of the bone material consists of large bones, especially lower jaws, blade bones (scapulae and pelvis), limb bones, ribs, vertebrae, molar teeth and tusks. Besides the mammoth bones, remains of single individuals of woolly rhinoceros, horse, reindeer, bear, wolf and arctic fox could be recognized.

While considering the faunal composition of this site one ought to keep in mind that the bone remains, in view of the overwhelming majority of mammoth bones, may have been purposefully collected there, and that the single occurring bones of the other mammals mentioned above, could have been brought there only accidentally. Thus, the preference of mammoth bones over bones of other mammals is evident. In this case the mammals besides the mammoth seemed as a rule to be eliminated (KUBIAK & ZAKRZEWSKA 1974).

If we assume that the mammoth bones found on this site came from animals killed not only in order to acquire constructional elements for erecting dwelling structures (three dwellings made of mammoth bones were recognized), but also for food, we may infer that the site was inhabited for an extended period of time. This conclusion is based on the following calculation. On the conditions of the steppe-tundra, which could not provide any large quantity of food other than meat, the inhabitants of the camp required daily about two kilograms of meat per person (to cover the daily demand for about 7000 calories). Since mammoths were practically the only game the calculation of the weight of the consumed meat must be based on the approximate weight of these animals. One mammoth of an average size could give about 1000 kilograms of edible meat. Therefore, the meat of one mammoth could be sufficient for 10 persons for about 50 days. Since the site contained bones of at least 60 mammoths, it may be supposed that their meat would feed a group of ten during 3000 days, i.e. 100 months, or over 8 years. This period could have been shorter if we assume that palaeolithic man could have picked up bones of dead animals in the steppe-tundra.

Nevertheless, the above calculation appears to be illusory since the bone material for construction must have been assembled in a comparatively short period of time. On the other hand some parts of the skeletons would not have been carried to the site as food – e.g. mandibles, as it has

been suggested in the publication from 1974 (KUBIAK & ZAKRZEWSKA 1974). Probably the hunters took with them from the killing place to their settlement the lower jaws together with the tongues of the slaughtered animals which they ate (KUBIAK 1980). Therefore, in order to determine the length of the period of time during which the site was inhabited one must make use primarily of archaeological data. The analysis of stone inventory indicates that the proportion of tools (20 per cent) in comparison with cores, blades and splinters is too high for a site supposed to have been inhabited permanently for several years. Even if it would be assumed that the high proportion of hunting weapons was connected with their transport to the site together with the game, the total amount of tools is still to high in comparison with splinters, cores and blades and in comparison with analogous habitation camps, e.g. in Moravia or in the Kostienki-Borsevo area. The small number of tools for domestic use in comparison with other sites is also noteworthy. The structure of the stone inventory would suggests that the site was used only seasonally. One must also note the absence of such elements as bone artifacts and art objects, suggesting that the site does not reflect the results of the full time activities of its inhabitants in all aspects of life.

Reindeer hunter-gatherer groups

One of such a site is Raj Cave (near Kielce, Poland). According to most of the data obtained, the deposits of Raj Cave range in age from the interstadial preceding the first climatic deterioration of the last glaciation (Baltic Glaciation, Würm – Layers 1–3) through the maximum phase of it, with which the aeolian loess deposits are associated (layer 9), up to the post-maximum phase (Layer 10) characterized by the rehumidification of the climate and redeposition of loess (KOWALSKI et al. 1972, 137).

The bone material from Raj Cave comes from layers varying in their lithological composition which have been distinguished in the sediments of the cave. The environmental changes accompanying the sedimentation of particular layers have been reconstructed on the basis of abundant faunal remains (KOWALSKI 1972). In the upper cultural horizon, layer 6, some shed antlers of reindeer collected by man were found beside the remains of animals presumably killed by him, at the entrance to the cave. Detailed faunistic, stratigraphic and archaeological studies on Raj Cave have been published by MADEYSKA (1972), KOWALSKI (1972), KOWALSKI et al. (1972) and KOZŁOWSKI (1972), and especially the reindeer material by CZYŻEWSKA & USNARSKA (1980).

Studies on teeth of the reindeer from Raj Cave indicates an adaptation to life in the tundra-forest environment; the great width of molars made it possible for this animal to crumble and grind food, which suggests that it was rather hard, comprising e.g. twigs and a certain amount of bark. Such food was supposedly derived from a tundra region with shrubs or even woods. During their migrations, herds of reindeer probably reached the forest-tundra zone, where they found suitable climatic and ecological conditions for wintering (DEGERBØL & KROG 1959). The composition of the assemblage from Raj Cave indicates that reindeer herds stayed in the neighbourhood of the cave in the period of spring and autumn migrations, when bucks usually form separate groups, independant of the main herds consisting of females and juveniles.

People gathered shed antlers of females and young reindeer in Raj Cave and used them to build an enclosure of the cave (KOWALSKI et al. 1972). Judging by the number and character of the shed antlers from Raj Cave, this region may have been a calving site of reindeer. The calving season of reindeer falls in May and the beginning of June; the females shed their antlers several days after calving. The presence of shed antlers of females in Raj Cave (layer 6) indicates the presence of reindeer herds in the vicinity of the cave in spring. People inhabiting the cave may have collected the shed antlers during the summer and autumn when there was no snow yet.

In Raj Cave, only few fragments of reindeer frontal bones with the pedicles and parts of the antlers as well as different bones of the postcranial skeleton of reindeer were found. These remains are probably remnants of animals killed by man. People living in Raj Cave did not hunt reindeer in great numbers, but took them among other species (CZYŻEWSKA & USNARSKA 1980).

The huge number of reindeer antlers in the layers of Raj Cave is striking, a vast majority of them being shed antlers and therefore gathered in the tundra, not derived from killed animals. The bones and teeth of the reindeer are not the most numerous in the fauna, being exceeded by those of other large mammals such as cave bear (one of the most abundant species in Raj Cave), horse, Bos or Bison (KOWALSKI 1972; KOWALSKI et al. 1972).

Keeping in mind the fact, that people gathered shed antlers and also the time when the reindeer were killed, it may be supposed that the cave was inhabited by people from early spring to the beginning of the summer. However, it may well be that they also stayed here in other seasons, e.g. in autumn or winter, as suggested by the evidence of some antler pedicles (CZYŻEWSKA & USNARSKA 1980).

The inhabitants of Raj Cave of the lower cultural horizon (layer 4) most likely lived under the conditions of moist tundra (grassland or shrub type). It should, however, be emphasized that the settlement of tundra areas in the lowlands by Middle Palaeolithic people has already been documented from Germany, e.g. from Salzgitter-Lebenstedt (KOWALSKI et al. 1972, 137).

The site Salzgitter-Lebenstedt (N.W. German Lowlands) became known as a Middle Palaeolithic reindeer hunters camp-site, due to a report (KLEINSCHMIDT 1953) which only mentions that the majority of the bone fragments belong to reindeer. Besides the animal bones and the rich content of flint tools of Upper Acheulian type, the fragment of a Pre-Neanderthal human skull has made the site famous. The examination of the animal bone material, mainly from the 1977 excavation, as well as geological studies were carried out by STAESCHE (1983).

As already mentioned above, the majority of the bones ex-

cavated belong to reindeer (74,8%). Besides the reindeer bones, remains of mammoth (10,6%), horse (8,2%), bison (17%), and woolly rhinoceros (1,3%) were identified. A few bones belong to giant deer (0,3%), wolf (0,3%), cave lion (0,1%), jerboa and unidentified fish (less than 0,1%). However, these proportions are only valid on the basis of the numbers of bones. If we consider the bone weights, the picture changes somewhat. Then the reindeer makes up only 26,2% of the total weight of identified bones. Mammoth increases to 39,8%, horse to 14,0% and rhinoceros to 10,7%. STAESCHE (1983, 176, 178) did not intend in his paper to discuss the significance of bone weight and fragment number methods. However, the author stated that the proportion of weight of unidentifled bones that can be allocated to large, medium and small animals does not correspond to that of the identified species as perfectly as it does when the numbers of bones are considered. But because of the relatively small unidentified material the percentages of the different species based on weights are probably correct. After Staesche (op.cit.) it is, without doubt, the amount of flesh yielded by the different animal species that is comparable with the bone weight of the animals. Thus it must be stated, that reindeer was not the main source of food supply for Palaeolithic man at Salzgitter-Lebenstedt.

While the hunters who specialized in reindeer hunting would have had to migrate with the reindeer herds, Salzgitter man could have lived for longer periods of time at this, presumably comfortable place. The geological observations allow us to reconstruct the morphology of the area at the time when palaeolithic man lived there: the valley itself was deeper and its edges were higher. In the surrounding landscape, the flat area must have been interrupted by deep-cut valleys with steep slopes like small canyons. These valleys gave shelter against cold winds and snowstorms, and they allowed some trees to grow, as we know from the excavated remains of pine, birch and willow (SCHWAAR 1982). Unfortunately, the bone material does not give any hint as to the season of occupation.

Musk ox hunters

The arctic hunting site at Umingmak in the Canadian Arctic may be a typical example of seasonal hunting of one species. The age of this site dated by ^{14}C is about 3500 years B.P. About 80 to 90 per cent of the bones belong to musk ox. The remaining part of the material comes from reindeer, arctic fox, birds and fish. This site became known as a musk ox hunters' settlement.

The fauna shows that the ecological conditions of this open tundra site during the time when it was settled were similar with those of today. The bones were probably preserved due to the permafrost soil. The bones were not used for firing. This means that almost the whole bone material is preserved, which allows us an interpretation of the activity of the hunters.

An intensive hunt is demonstrated by the extensive musk ox bone material at this site. The milk dentition of 84 jaws were analyzed. The results reveal a discontinuous representation of wear stages of the teeth, suggesting that only one annual season is represented. Three groups of wear stages in the dentition of musk oxen from Umingmak could be recognized, i.e. 1) calves about 5 months old (the calving season of musk ox falls in April and at the beginning of May), 2) specimen of about 15 months, 3) musk oxen aged about 27 months. However, a lack of intermediate wear stages in the whole bone material could be stated. Thus it follows that the musk oxen were hunted only during a short hunting season, and not during the entire year. From comparisons with recent farm animal wear stages of teeth a hunting season between late summer and early winter can be deduced. This verifies the assumption that many musk oxen were hunted during a short period of time in order to stock up meat and bone marrow for the winter months (KOENIGSWALD & KUBIAK 1979; KUBIAK 1983).

Conclusions

A. The activity of mammoth, reindeer and musk ox hunters, and perhaps also horse, cave bear, arctic fox hunters was connected with:

1. the environment as the major factor influencing the relative abundance of species available for exploitation,
2. animals hunted for particular purposes (preferred mammals in order to acquire meat, skins, bones for structures and firing),
3. the knowledge of the hunters on: a) the migration and behaviour of mammal species, b) the calving season of mammals available, c) specialized hunting methods.

B. The determination of seasonal hunting may be possible by the analysis of:

1. the daily consumption of meat by the hunters,
2. the season of migration and calving of the animals hunted,
3. wear stages in the dentition,
4. the evidence for the reconstruction of the activities of the hunter-gatherer groups (topographic, climatic, archaeological data).

Author's address:

Prof. Dr. Henryk Kubiak
Institute of Systematics and Evolution of Animals
Polish Academy of Sciences
ul. Sławkowska 17
31-016 Kraków
Poland

Literature

BRET-HARTE, M. S., G. R. SHAVER, J. P. ZOERNER, J. F. JOHNSTONE, J. L. WAGNER A. S. CHAVEZ, R. F. GUNKELMAN, S. C. LIPPERT & J. A. LAUNDRE (2001): Developmental Plasticity Allows *Betula nana* to Dominate Tundra Subjected to an Altered Environment. Ecology 82, 18–32.

CZYŻEWSKA, T. & K. USNARSKA (1980): Remains of the reindeer Rangifer tarandus (L.) from Raj Cave near Kielce (Poland). Folia Quaternaria Kraków, 51, 17–30.

DEGERBØL, M. & H. KROG (1959): The reindeer (*Rangifer tarandus* L.) in Denmark. Biol. Skr. Dan. Vid. Selsk., København, 10, 1–165.

GAMBLE C. (1979): Hunting Strategies in the Central European Palaeolithic. Proc. of the Prehist. Soc. 45, 35–52.

GAMBLE C. (1984): Regional Variation in Hunter-Gatherer Strategy in the Upper Pleistocene of Europe. Hominid Evolution. Acad. Press, London, 10, 237–260.

KLEINSCHMIDT A. (1953): Die zoologischen Funde der Grabung Salzgitter-Lebenstedt 1952. Eiszeitalter und Gegenwart, Oehringen, 3, 166–188.

VON KOENIGSWALD W. & H. KUBIAK (1979): Jahreszeitbestimmung der Moschusochsenjagd von Umingmak, einer Pre-Dorset-Station in der kanadischen Arktis. Quartär, Erlangen, 29/30, 7883.

KOWALSKI K. (1972): Fossil fauna. In: Studies on Raj Cave near Kielce (Poland) and its deposits. Folia Quatern., Kraków, 41, 45–60.

KOWALSKI K., J. K. KOZŁOWSKI & T. MADEYSKA (1972) In: Studies on Raj Cave near Kielce (Poland) and its deposits. Folia Quatern., Kraków, 41, 133–142. (Notes on chronology and palaeoecology).

KOZŁOWSKI J. K. (1972): Archaeological materials. In: Studies on Raj Cave near Kielce (Poland) and its deposits. Folia Quatern., Kraków, 41, 61–132.

KUBIAK H. (1980): The hyoid bone in the mammoth *Mammuthus primigenius* (Blumenbach). Folia Quatern., Kraków, 51, 47–56.

KUBIAK H. (1983): Determination of seasonal hunt on Musk ox at Umingmak, a Pre-Dorset-Station in the Canadian Arctic. Archaeozoology, Szczecin, 1, 216–217.

KUBIAK H. & G. ZAKRZEWSKA (1974): Fossil mammals. In: Upper Paleolithic site with dwellings of mammoth bones – Cracow, Spadzista Street B. Folia Ouatern., Kraków, 44, 77–95.

MADEYSKA T. (1972): Stratigraphical and sedimentological study of the deposits. In: Studies on Raj Cave near Kielce (Poland) and its deposits. Folia Ouatern., Kraków, 41, 17–44.

SCHWAAR J. (1982): Kaltzeitliche Vegetationsstrukturen im Bereich der mittelpalaeolithischen Fundstelle Salzgitter-Lebenstedt. Telma, Hannover, 12.

STAESCHE U. (1983): Aspects of the life of Middle Palaeolithic hunters in the N.W. German Lowlands, based on the site Salzgitter-Lebenstedt. In: J. CLUTTON-BROCK & C. GRIGSON (Eds.), Animals and Archaeology: 1. Hunters and their Prey. BAR Intern. Ser. 163, 173–181.