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A BOW AS WEAPON OF HUNTING IN THE LATE NEOLITHIC

Finds hunting directly at use of weapon by prehistoric man and found in original position are scarcely known (NOE-NYGAARD 1974, 217-; PETERSEN-PETERSEN 1984, 174-). The number of stone and bone tools defined as weapons or weapons of hunting is strikingly low. It maybe due to the fact that the objects are examined and analysed only formally and not from formal-functional aspect. The funcional evaluation of stone and bone tools belonging to different weapon types can be carried out, however, only indirectly in lack of finds in original position.

The present paper discusses a long known silex arrow-head wedged in the cervical vertebra of an aurochs (Bos primigenius Boj.), which, in the same time, has never been analysed from the point of weapon, information it contains concerning the weapon of hunting, and the methodological conclusions and those of hunting technique will be described (BÖKÖNYI 1974, Fig. 4., 104.).

The main branches of food producing economy are plant cultivation, animal keeping and hunting. The bone remains of wild animals (= hunted), found in the settlements have always indicated the fact and success of hunting in a clearcut way. Concerning the tools of hunting, however, we can dispose only of indirect data.

The three basic factors of hunting are the object, the tool and the method that is what was hunted, with what and how. A change in any of the factors resulted inevitably in change of the other two ones.

The aim of the hunting was to take posession of the meat, the fur, the skin, the trophy etc. If the yield of hunting was meant for personal concommation (use or for exchange) trade, has always been defined by personal and collective requirements.

The bone remains of the hunted animals found in a settlement enable the definition of a species spectrum of the natural wild fauna selected by hunters, which contains nothing but species carried to the settlement as prey. All of the killed species, anyhow, are the aboriginal, permanent, or immigrant colouring elements of the natural wild fauna. It can be told from the data of prehistoric history of wild fauna that the more coherent part the hunting plays in the food producing economy the more species are hunted by the specialized hunters. If meat demands are met mostly or to a great degree by hunting, almost all the species of the large mammals are hunted. The knowledge of the milieu of the killed animals helps first of all the ecological reconstruction of the hunting-ground.

The quantity of the killed game depended mainly on the populational density of the hunted animal and the rate of demand.

The types of weapons of hunting can be defined from the bone injury caused by weapons, discovered on the remains of wild animals of archaeological sites. (NOE-NYGAARD 1974, 217-). The injury of bones, the remains of stone and bone weapons hint at technique and methods of hunting.

The use of bow in the Late Neolithic of Hungary is directly proved by a stone arrow-head wedged in the cervical vertebra of an aurochs (Fig. 1.):

Site: Polgár-Csöszhalom (I. B. Kutzián, 1957); I/6.b.
Type of site: central tell

Age: Late Neolithic, Csöszhalom Culture
Bln—509 3625±100 BC (KROLOPP 1977, Table 1.)
Bln—512 3825±100
Bln—510 3925±100
Bln—513 3990±100

Find in original position: silex arrow-head wedged in the lower part of the caudal articular surface of the atlas (first cervical vertebra) of an aurochs (fig. 1.).
Collection: HNM. Archaeozoological Collection, Inv. No. 60.9.358.
Weapon — arrow-head (fig. 1., 4.): definition and description was carried out by Viola Dobosi: „Ground-form: blade, slightly bent to the left, of triangular section, the material is ash-grey silex. The blade cannot be oriented as it is fixed in the bone. Its end at the arrow is regular, obliquely truncated with steady retouch. The top of the arrow-head is asymmetrical (the left edge goes over the crest) and of oblique angle: the edges, constituting the point meet in an angle somewhat larger than 90°. The left edge — easier to examine — is not retouched only obliquely cut, the right edge is covered by the bone. Measurements: length 13 mm, breadth 8 mm, height 2,4 mm. The arrow-head, if it were not found in a position unilaterally showing its function, would be one of the truncated blades generally found from the upper Palaeolithic till the end of the Copper Age, which are always present in abundancy on all the sites".
Atlas: the first cervical vertebra of an aurochs bull is injured: the edge of both branches: the cranial articular surface and the right side of arcus incisura caudalis are missing. The injury on the lower vault of the vertebra, on its right side is an evidence of the

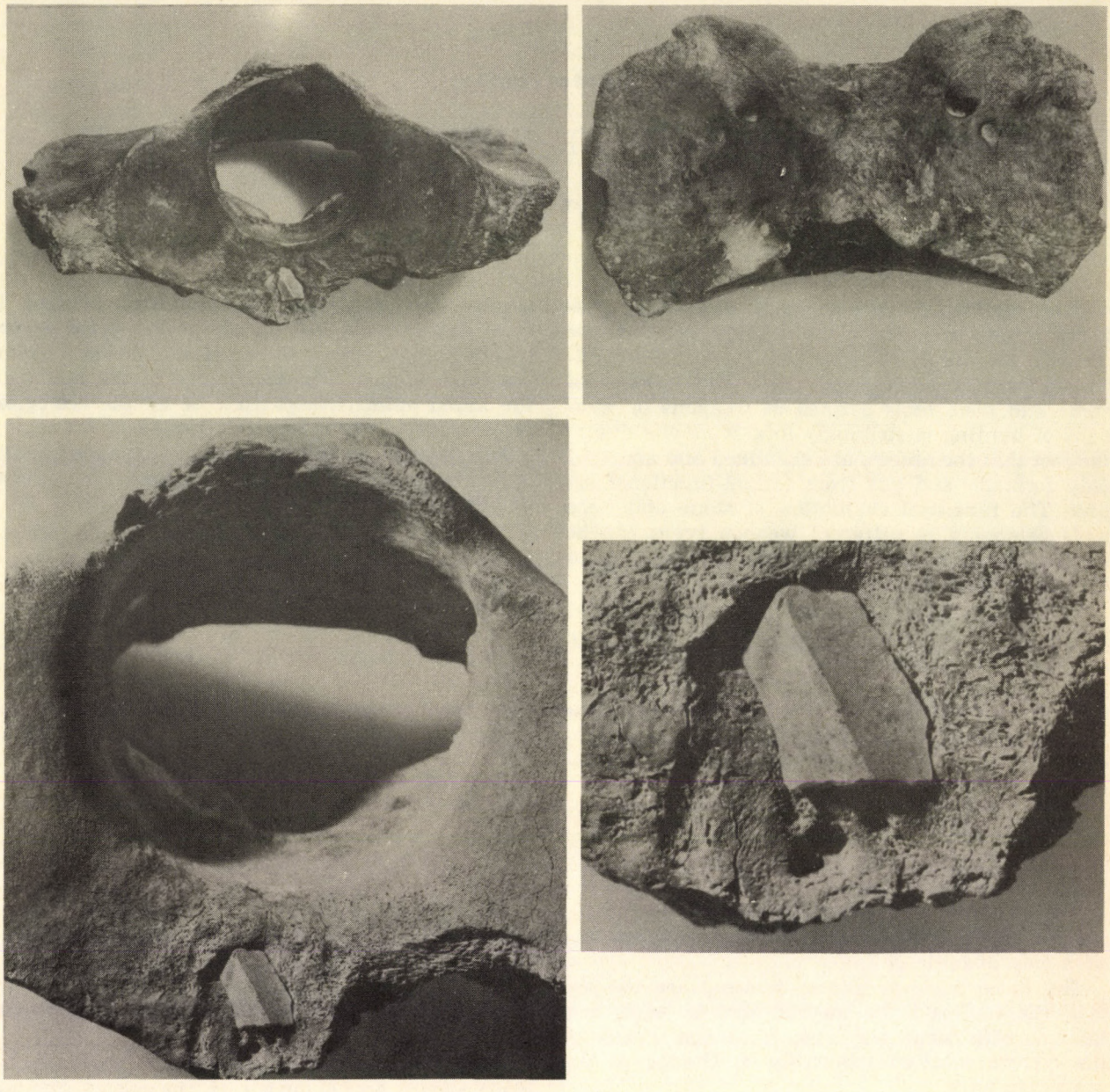

Fig. 1.1 Aurochs atlas. Polgár-Csöszhalom. Norma dorsalis; 2. Aurochs atlas with the fragment of the silex arrow-head. Norma caudalis; 3. Aurochs atlas (detail) with the fragment of the arrow-head; M:1 : 1. 4. Silex arrow-head in original position. M : 1 : 4.

butchering of the killed aurochs. Due to cutting-spliting a longitudinal cca 60—70 mm wide and 10—12 mm deep grove was formed (fig. 1., 2., 3.).

It is a lucky circumstance that the cutting off the head from the neck did not remove the arrow-head. Otherwise the arrow-head, if ever found, would be one of the silex blades in the stone tool material of the settlement.

It can be read from the above that this aurochs was hunted at least twice; first when it was shot in the neck by the arrow, but the injury was not grave and the animal survived the attack. The next time the hunter was successful.

The arrow the was shot in the neck of the aurochs from the side and from a short distance:
— due to the shooting from the right side the arrow hit between the atlas and the epistropheus (I. and II. cervical vertebrae);
— the forceful shot pushed the arrow-head between the closely connected cervical vertebrae so hard that it stopped only 4—5 mm from the spinal cord (fig. 1., 2., 3.). It is to be mentioned, that even if the arrow-head reaches the spinal cord, the dens axis of the epistropheus would hinder the injury of the spinal cord.
— the silex arrow-head hurt the articular surface. The living bone-tissue protected itself from it by dissolving the surface of the bone and letting the arrow-head sink in the bone. The bone-tissue was perforated on several places around the arrow-head (Fig. 1., 4.).
— judging from the deception of the arrow-head — supposing that the arrow-head has not moved — even the direction of shooting can be told: it closes a 60° angle to the horizontal. It means that it was aimed from astonishingly acute angle, from below (?). This kind of shooting may have been earried out — one can suppose — also ofter pulling down the animal; or by applying delaid-action release for the arrow.

Wall paitings, engraving have preserved the hunting technique and methods of palaeolithic men from the Upper Palaeolithic, Mesolithic Ages. According to the realistic depiction of animals (MÜLLER-KARPE 1966, Taf. 75—77., 113, 135/1, 157/7—11), hunting for aurochs was characterised by aiming the long, dry (meatless) head and the short, highattached neck jutting out from the line of the back. Accordingly it was not by chance that the hunter of Csöszhalom aimed the most vulnerable point of the aurochs, the neck.

The active and the passive hunting methods may have been used during the Neolithic separately or together, completing each other.

The most important weapon of active hunting was the bow and the arrow. The type of the applied arrow-heads depended on utilization. The skill of observation of Upper Palaeolithic hunters lead to the hunter technique innovation of killing the large animals by small "microlithic" arrows. The forceful stone arrow-heads of small diameter, thin section and edges on both sides penetrated more easily in the strong-muscled body of the animals, and, combined with correct aiming, they became safe killing weapons.

Hunting in the Neolithic was carried out, just like in earlier ages, by pedestrian hunters. The strategy and tactics of pedestrian hunters differed considerably from those of the later mobile and quick equestrian hunters with larger zone of approachment. Several hunters with different weapons and beaters must have taken part in hunting for meat. Arrow in case of killing large animals could stop the game and/or, if aiming was incorrect, weaken it; spear was a short or long distance throwing weapon; the stone axe and the antler adze ("antler hoe") played the role of pole-axe.

We have even less data concerning the prehistoric methods and tools of passive hunting than of the active one. The phalangi of aurochs and red deer found on Late Neolithic settlements, displaying injuries caused by spit daggers (?) on the diaphyses may indicate the use of a deepened pit on the paths of large games.

The ecological consequences of the "continental" arid-warm climate change during the Late Neolithic — Early Copper Age influenced indirectly, while the mass appearance of large games had a direct effect on the food producing activity of the cultures. This is the period when the aurochs, the maraloid red deer and the East European wild boar appear again in masses in the Carpathian Basin; the wild horse and the bison appear in smaller number; and the kulan, the fallow-deer and the Persian lion arrive from the Near-East (VÖRÖS 1981, 1983). In the domesticated stock a new goat type, the large horned "bezoar" domesticated goat appears, as far as we know, also in the same period (VÖRÖS, 1986).

The quantity of bone remains of animals killed by hunting suddenly grew on the Late Neolithic settlements as compared to those of the previous ages. In the Late Neolithic the main game of meat hunting was the aurochs on the forest-stepp territories of the Great Hungarian Plain. The biological base of the aurochs hunting was provided by the enormous mass migrating in the Carpathian Basin with the 2nd. Holocene migration wave of the species. The motivation of the intensive hunting on the other hand, was the procuration of a large amount of meat (KROLOPP-VÖRÖS 1982, 50) and not the domestication as it was earlier supposed (BÖKÖNYI 1974, 112-; 1977, 10,12—13). The ratio of occurence of the aurochs on the settlements of the Tisza Culture is 10—15%; on the settlements of the Herpály Culture along the Körös rivers 38—40%(!); the same ratio is reduced in the central tell of the Csöszhalom Culture to 23,5% (Table 1.).

The economical and demographical circumstances of the Late Neolithic settlement proving the use

of bow and arrow with a find in original position can be reconstructed from zoological aspect as well. The followings can be told based on the examination of animal bones coming from the unearthed territory of the Polgár-Csöszhalom central tell (BÖKÖNYI 1974, 394) (Table 2.):

— the basic part of the domestic stock was prowided by the cattle and the pig.

— meat hunting was one of the basic activity of the population, while hunting for fur was unimportant.

— the dispersion of bone remains of the aurochs according to body parts shows (Table 3.) that first of all the scapula-limb part with the cut legs and the head were transported to the settlement. On the butchering site the head of the upper arm bone and the knee part of the limb were removed.

— the useful meat quantity produced by the domestic animals and the meat games was 132 780 kg (Table 2.). Supposing that the tell existed through 200—250 years[1], and that a person consumed, beside the plant food, 500 gr meat daily, the estimated population in a year must have been 1328 — 1064, taking their mean value 1196 individuals[2]. The total meat quantity could support 4 persons per day. The duration of the tell was equal to 8 to 10 generations, what means that in case of 1 house (family) — 5 persons (JOHNSON 1973, 66). 240 families may have lived contemporarily on the tell.

Table 1.

Percentage composition of animal bone remains of Late Neolithic settlements

Site		Domesti-cated animals	Wild animals	Cattle	Aurochs
Lengyel Culture					
Zengővárkony[a]	NI	54,2	45,8	42,0	18,4
Aszód-Papi földek[b]	NP	42,7	57,3	31,0	13,4
Tisza Culture					
Szerencs-Taktaföldvár	NI	55,5	44,5	28,3	14,2
Kisköre-Gát	NP	57,2	42,8	39,0	10,2
Szegvár-Tüzköves[a]	NI	52,0	48,0	29,0	14,3
Hódmezövásárhely-Gorzsa[a]	NI	53,4	46,6	35,0	13,8
Herpály Culture					
Herpály (1955)[a]	NI	30,5	69,5	12,6	38,5
Berettyószentmárton[a]	NI	29,8	70,2	16,8	38,8
Csöszhalom Culture					
Polgár-Csöszhalom[c]	NI	36,0	64,0	20,1	23,5

NI — number of individuals; NP — number of pieces

[a] BÖKÖNYI 1959, 48—58.; [b] KALICZ 1985, 65.; [c] BÖKÖNYI 1974, 394.

Table 2.

Dispersion according to species and biomass reconstruction of the animal bone remains of the Polgár-Csöszhalom tell (BÖKÖNYI 1974, 394)

Species	bone number of pieces	number of individuals	meat kg/indiv.	total meat quant. kg
Cattle	501	151	250	37 750
Small ruminants	47	27	25	675
Pig	157	74	40	2 960
Dog	28	18		
Domestic animals	733	270		41 385
Aurochs	842	176	400	70 400
Red deer	403	124	100	12 400
Roe deer	95	48	15	720
Boar	298	105	75	7 875
Meat games	1 638	453		91 395
Fox	4	3		
Wolf	1	1		
Badger	2	1		
Brown bear	1	1		
Wid cat	1	1		
Fur games	9	7		
Bird/Turtle/Fish	26			
Altogether	2 406	703		132 780

Table 3.

The dispersion of bone remains of the aurochs according to body-regions in Polgár-Csöszhalom

Body-region	bone number	%	skeleton %	bone accumulation Q
Head region	123	14,6	3,12	4,67
Trunk region	175	20,8	53,12	0,39
Limb bones with meat	241	28,7	8,76	3,27
Dry limb bones	206	24,4	20,00	1,22
Phalangi	97	11,5	15,00	0,76

Q = the ratio of the unearthed and the theoretical (in the skeleton) % bone dispersion

Notes

1. Analogous with the relative duration of the Lengyel culture. See MAKKAY 1982, 134—135.
2. From the examination of support capacity of an average territorial unit MAKKAY estimated the population as 1177 individuals. In: MAKKAY 1982, 132—133.

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