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A peculiar composition of animal remains under a Magdalenian rock shelter south of Göttingen, Nortwest Germany

Una peculiar composición de restos de animales bajo un abrigo bajo roca del Magdaleniense al sur de Göttingen, noroeste de Alemania

KEY WORDS: Magdalenian, rock shelter (Abri), reindeer, horse, antler, rib, human activities.
PALABRAS CLAVE: Magdaleniense, abrigo bajo roca, reno, caballo, asta, costilla, actividades humanas.

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ABSTRACT

By extending the former excavation under a special abri an accumulation of animal remains was dicovered. The material of Magdalenian age consists mainly of reindeer antlers and horse ribs. Remains of limb bones, which indicate that reindeer, horse and some other animal species were hunted and butchered are, in contrast, scarce. It is assumed that the antlers and ribs were deposited separately from the butchering refuse. As the ribs as well as the antlers are not strong enough to serve as raw material for tool production, a more profane use of this special accumulation is here proposed: it might have been used as base of the resting places, an isolation against moisture and coldness of the earth.

RESUMEN

Al ampliar la excavación anterior por debajo de un abrigo bajo roca especial se descubrió una acumulación de restos animales. El material de la época magdaleniense está principalmente formado por asta de reno y costillas de caballo. Por el contrario, son pocos los restos óseos de extremidades que indiquen que se cazaban y despiezaban aquí renos, caballos y algunas otras especies animales. Se supone que las astas y costillas se depositaban separadas del resto de los residuos del despiece. Puesto que las astas y las costillas no son lo suficientemente resistentes como para utilizarlas como materia prima para la construcción de herramientas, se propone en este caso un uso más profano: tal vez se usaran como base de los lugares de descanso, como material aislante contra la humedad y el frío de la tierra.

LABURPENA

Aurrealdeko indusketa bat zabaltzean, harri bereziko haitz aterpe baten azpian, animalien hezur-hondakin batzuk agertu ziren. Aurkitutako materiala Madelein aldikoa zen, besteak beste, elur-oreinaren adarra eta zaldiaren saihets batzuk. Alabaina, leku honetan aurkitutako hondakinak ez dira nahikoa elur-oreinak, zaldiak eta beste animalia batzuk ehizatu eta zatitzen zituztela esateko. Uste da animaliak zatitu eta adarrak eta saihetsak bereizi egiten zituztela gainontzeko zatietatik. Kontuan izan behar baita adarrak eta saihets-hezurrak ez direla oso gogorrak, ez behintzat tresna eta erremintak egiteko modukoak; beraz, esan daiteke beste erabilera bat ematen zitzaiela, adibidez: ohatze azpiak egiteko, lurraren hezetasunetik eta hotzetik isolatzeko edo.

INTRODUCTION

Reinhausen Forest, a plateau of compact sandstones of Lower Triassic (Buntsandstein) age, south of the City of Göttingen, Lower Saxony, Northwest Germany, is subdivided by a number of narrow valleys. Along the slopes of these valleys numerous half-caves (abris) are developed which arose by selective weathering of different sandstone layers. Below these abris, having worked as rock shelters, remains of human activities from different prehistoric periods were known since long. Systematically investigated were these abris for the first time in the year 1979 by a special research program. More than hundred such abris could be traced in the following and examined by the program, and part of them excavated. Deposits of human activities from the Younger Palaeolithic by the Mesolithic and Neolithic until the Iron Age were proved (GROTE 1994). Thus the Reinhausen Forest turned

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out to be one of the richest areas for the interpretation of prehistoric human activities, comparable to those of the cave areas of Southern Germany. Remains of animals as refuse of human activities were preserved under the shelter of the abris, as well. Outside of the shelters such remains were not found at any of the investigated places. The calcareous material must have been completely destroyed by weathering during the thousands of years since. The animal remains excavated under a significant number of abris allow additional insights into the way of life of the prehistoric men and affirmes the development of the animal populations nearly continuously from the last glacial until the present time (STAESCHE 1994). One of the investigated abris is Stendel XVIII (fig. 1). Cultural layers were proved beginning with the Younger Palaeolithic through the Mesolithic, the Bronze Age up to the Early Iron Age.

By an additional geomorphologic program in the year 1997 beneath this abri a new accumulation of animal bones, fragments of antlers and rodent teeth was found. The finds were densely packed in a lens of only 20 cm thickness but extraordinary rich in animal remains.

DISCOVERY OF THE SITE, STRATIGRAPHY

The systematic excavations of the Abri Stendel XVIII in the year 1989 revealed a series of cultural layers in a thickness of 2,20 to 2,70 m (see GROTE 1994). The rocky base of the shelter was not reached by the excavation because it was hidden by huge sandstone blocks which must have fallen down from the roof of the abri when this was later partly destroyed.

The oldest sediments which could be excavated consist of red sands. These are overlain by a stratum of pumice which is an excellent marker for the stratigraphical classification of the deposits. This pumice can be traced to the explosion of the Laacher Lake volcano which is dated 12.900 years BP, in the Alleröd interstade of the Late Glacial of the last (Weichselian) glaciation. That means that the red sands were deposited during the Older Dryas (Dryas II) stade. Remains of animal bones from these oldest layers are scarce, only two fragments, one of a horse, one of a bison were excavated from the Alleröd layer, no finds at all from the red sands. A rich fauna of reindeer, horse, bison and mountain hare is, on the other hand, represented from layers of the same age under other abris excavated in the course of the same project.

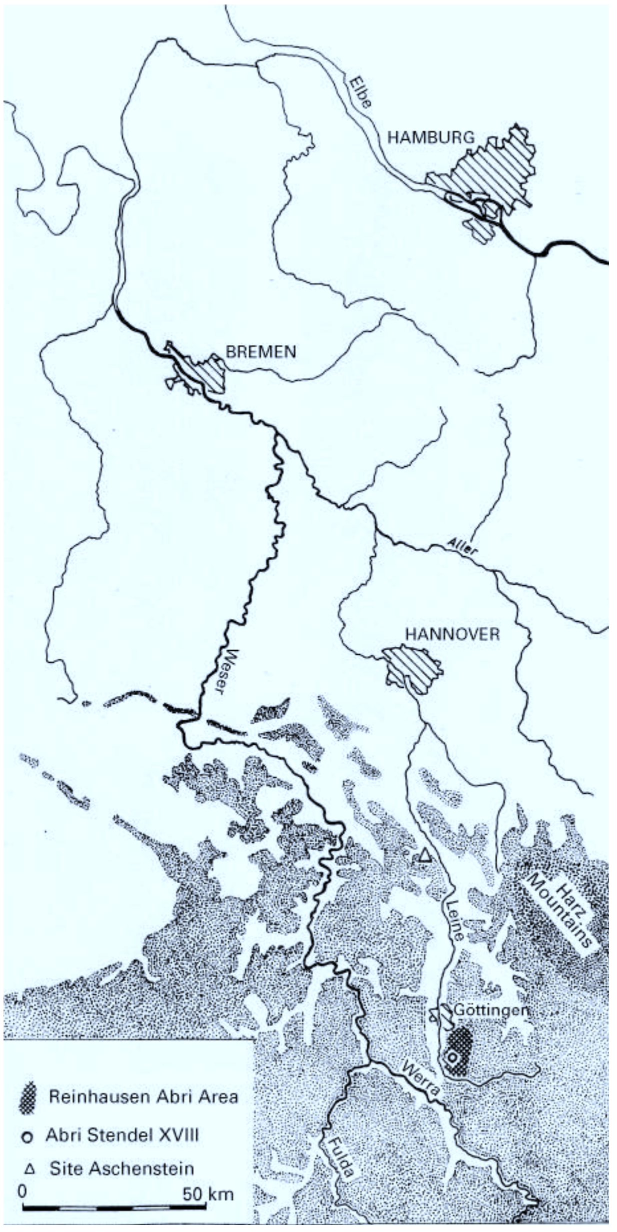

Fig. 1. Location of the abri Stendel XVIII in the Reinhausen Forest, Northwest Germany.

In the year 1997 a trench was dug with heavy equipment from below the abri Stendel XVIII to the bottom of the valley in order to investigate its geomorphologic history. By this trench the sequence of strata under the rock shelter could be extended to the depth without hiatus. Below the red sands the new diggings revealed weathered yellowish-brown loess, partly in interchange with thin red sandy beds. These layers didn't contain any finds, neither from animals nor from human activities. Not before about seven meters lower, and twelve meters from the back wall of the abri, a rich accumulation of animal bones, fragments of antlers and teeth of rodents could be met within the loess sediments (fig. 2). These fossils are now situated far outside of the roof of the rock shelter; it was not expected that bones could have been preserved in this position. They were indeed protected from weathering by a huge rock which covered this accumulation. The rock was component of the former roof of the abri which must have been partially broken short time after the animal remains were deposited.This can be concluded by the fact that such huge rocks and a big amount of smaller ones are embedded in the red sands on top of the loess. The situation deeper and farther from the original place of deposition can be explained by solifluction. Under a permanent change of freezing and thawing at the transition of the Ice Age to the Holocene soils moved downwards even at only slight inclinations of a slope.

Solely one square meter of this fossil accumulation of about 20 centimetres thickness was excavated in order not to completely destroy this special deposit. From this restricted space the amount of more than 1200 fragments was gathered with a weight of more than 3 kg's. Sieving of the sediment revealed fine splinters of silex and chert which indicate manufacturing of stone tools at this site (GROTE 1998). Many of the animal remains correspondingly show cutting and blowing marks from such tools.

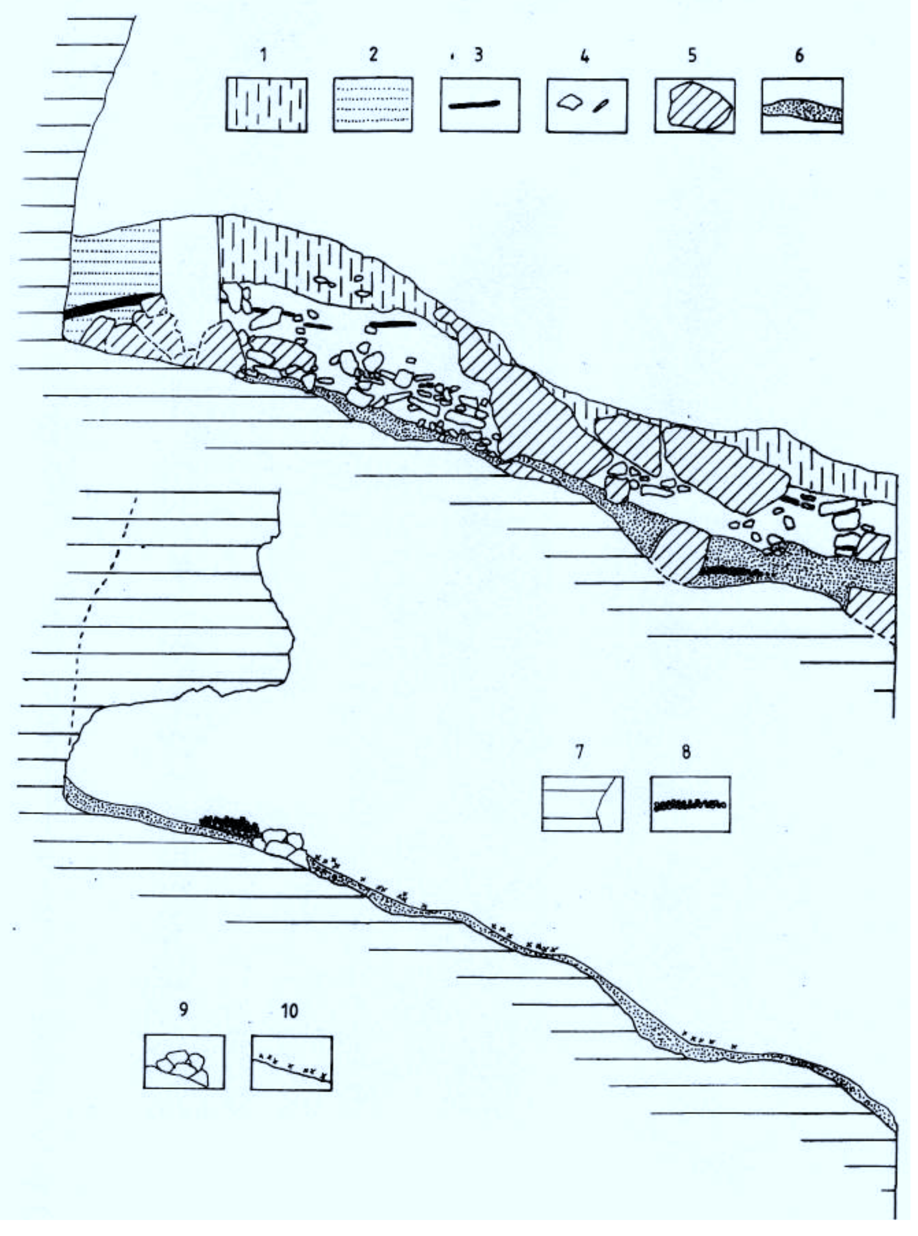

Fig. 2. Cross section of the deposits at the abri Stendel XVIII with its extension.
Above - as found by the excavation
Below - hypothetic reconstruction of the conditions at the time of the use of the rock shelter by the magdalenian men.
1 = Recent soil, former structures destroyed by weathering.
2 = Strata of the first excavation.
3 = Layer of fine pumice from the Laacher Lake explosion (Alleröd).
4 = Red sands of Late Glacial (Dryas II) containing blocks of downfall sandstone blocks.
5 = Bigger sandstone rocks (downfall).
6 = Yellowish-brown loess of Late Glacial (Dryas II).
7 = Solid sandstone rock of the abri wall.
8 = Accumulation of antlers and bones.
9 = Stones piled by magdalenian men (hypothetic).
10 = Refuse of butchering, meal preparation etc. (hypothetic).

Small mammals from this layer were investigated by G. STORCH, Frankfurt/Main, who already did the determination of the small mammal finds from the former abri project (STORCH 1994). From more than 1400 teeth he ascertained a clear dominance of the highly arctic collared lemming *Dicrostonyx gulielmi* (53,8 %) and the arctiv vole *Microtus gregalis* (46,0 %) besides the complete absence of insectivores. The composition of this fauna implies a cold dry climate with no signs of warming during summer which only allows a scarce vegetation like that of high arctic tundra. By the Oxford Radiocarbon Accelerator Unit (ORAU) using bone material from this accumulation a date of about 13.000 BP (calibrated) was determined (STREET & TERBERGER 2002).This means an age of the Older Dryas (Dryas II) at the end of the last (Weichselian) glaciation. Archaeologically it corresponds with Late Palaeolithic, Upper Magdalenian.

THE ANIMAL REMAINS

All the fragments of bones and antlers here discussed were recovered from the thickly packed layer. Most of the material is broken into small pieces, brittle by the loss of part of its calcium content, and mostly corroded at the surface. This fragmentation has for the most part been prior to the deposition together with the loess, but it will probably have been intensified by the solifluction and the weight of the huge rocks when they had fallen upon the bone accumulation.

The following animal species could be determined. The numbers of fragments of each species, together with their weight, are shown in table 1. All material is stored in the archaeological collections of the Landkreis (district administration) Göttingen.

Reindeer (*Rangifer tarandus*)

Remains of reindeer are the most frequent under the animal species of this bone accumulation. Of the reindeer remains fragments of antlers make up more than 80 %. Most pieces are small and very small fragments of beams and tines, few of them contain the burr, and these specimens all indicate to be shed antlers. Measurements of the burr diameter are shown in figure 3. In this figure the measurements of the antlers from the abri Stendel XVIII are compared with that of the site Aschenstein, presumably a destroyed rock shelter, equally on the side of the Leine Valley, about 60 km north of the Reinhausen Forest. As the antlers of the Aschenstein site descend from small animals (STAESCHE 1999), the same is to say of those from Stendel XVIII. The animals were females or juvenile to subadult males, respectively, but even of small size compared to the average of Weichselian reindeers (see e.g. BAALES 1996). All the other antler fragments that could not be measured show small diametres, too, so that we can expect that none of them will descend from adult males or other bigger grown animals.

Animal Species	No of pieces	%	Weight	%	% *
Reindeer, complete	263	20,4	1.509,6	48,5	
Reindeer, without antlers	37	2,9	234,6	7,5	12,9
Horse	104	8,0	1.015,4	32,6	55,8
Bison	1	< 0,1	1,9	< 0,1	0,1
Ibex	1	< 0,1	8,4	0,3	0,5
Wolf	6	0,5	2,7	0,1	
Fox	19	1,5	14,0	0,5	
Mustelids	13	1,0	1,6	< 0,1	
Hare	81	6,3	68,2	2,2	3,7
Grouse	6	0,5	2,6	< 0,1	0,1
Goose	1	< 0,1	1,1	< 0,1	< 0,1
Birds, indetermined	9	0,7	3,6	0,1	0,2
indeterminable, big size	42	3,3	165,3	5,3	9,1
indeterminable, big to medium	284	22,0	217,7	7,0	12,0
indeterminable, medium size	29	2,2	12,4	0,4	0,7
indeterminable, medium to small	409	31,7	76,7	2,5	4,2
indeterminable, small size	24	1,9	12,9	0,4	0,7

Table 1. Animal species and unidentifiable fragments of abri Stendel XVIII; representation by find numbers and by weight.

* Last column: Percentage of animal remains suited for food supply (implied that under the indeterminable pieces the percentage of other animals will be as low as under the determined ones).

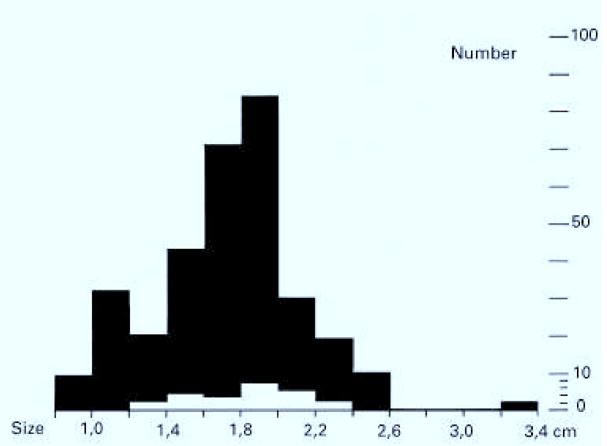

Fig. 3. Size of reindeer antlers (diameter of the burr just below the pedicle); white of the abri Stendel XVIII, black of the site Aschenstein.

Antlers of juvenile reindeers as well as that of the females are shed during spring. The many shed antlers which are found in this accumulation indicate that reindeer herds during their migration grazed in the neighbouring area, presumably the Leine Valley, during spring. As the pregnancy time of the reindeer cows ends at the same time, the cows may have searched for protected calving grounds in some of the narrow side valleys. But complete herds will not have entered the deeper valleys with their steep and rocky slopes.

The antler fragments show many signs that they have been object of human activities. On figure 4 a small selection of such marks is presented. One of the antlers has been treated in the known manner to produce a chip of the hard outer layer to be used as a tool of some kind. Two parallel furrows are cut through the outer compact layer and the piece between these furrows then is broken out (fig. 4 A, find No. 7/031). However, the figure shows that the compact layer is very thin, the material therefore is of restricted value for a tool. Of another antler the bez tine was shortened and the beam behind the tine cut off. By this a small hook like gear arose. The end of the tine shows scratch-marks that might have derived from use, but this remains uncertain (fig. 4 B, 7/003). Another antler is treated in the same way but the beam is cut directly behind the tine (fig. 4 C, 8/003) Striking here is that the marks which

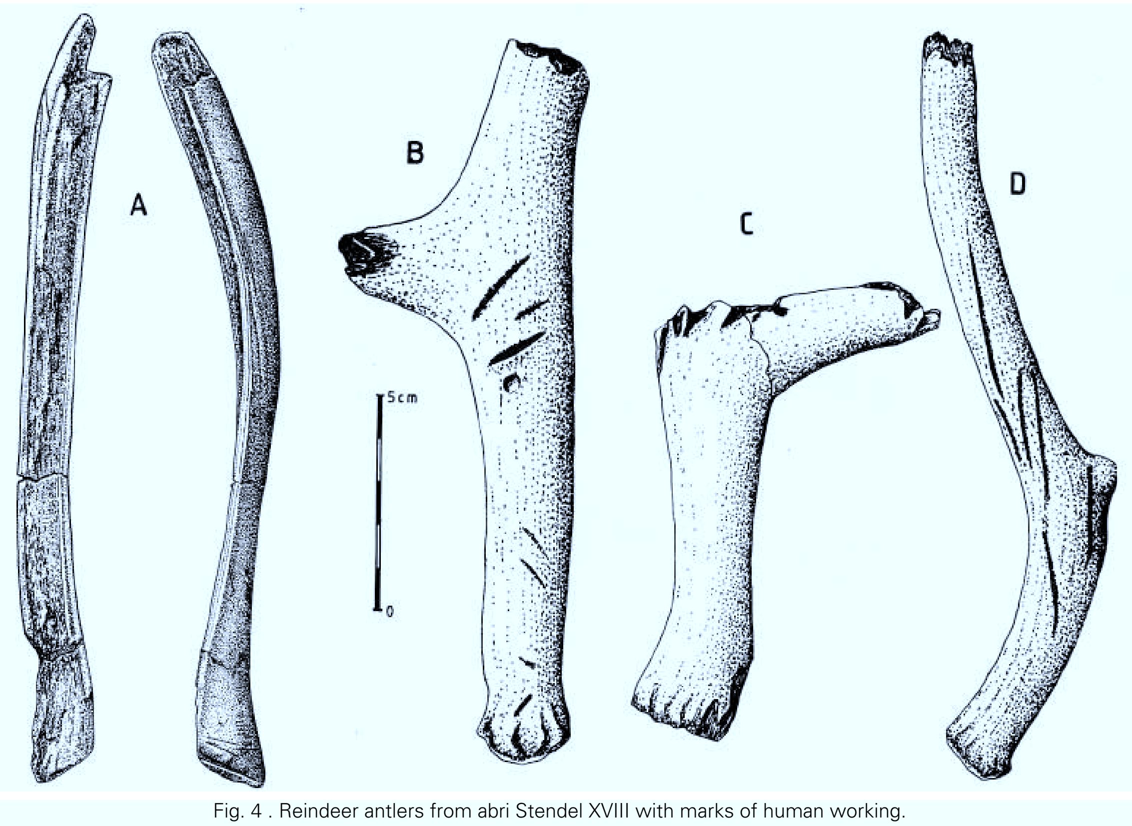

Fig. 4 . Reindeer antlers from abri Stendel XVIII with marks of human working.
A - Find No. 7/031: By two parallel cuts a long chip of the compact outer layer is broken out. Drawing D. Raschke/Göttingen.
B - Find No. 7/003: Bez tine and beam cut off; deep blow-marks on the surface; signs of working on the end of the bez tine (uncertain).
C - Find No. 8/003: Beam cut off above the bez tine by hard blows more or less longitudinal to the length of the beam.
D - Find No. 7/005: Beam with longer slightly curved deep cut-marks.

originate from cutting or better hacking the beam, run more or less in the direction of the length of the beam and not transverse as would be expected. Other antlers carry cut-marks that don't look like an attempt to produce a tool. On the example of fig. 4 D, 7/005 long and deep cut-marks run slightly curved along the length of the beam, neither enabling the breaking out of a splinter nor cutting off a part of the beam.

From the other materials of reindeer, about half are fragments of ribs, followed by that of metapodials, tibia, skull and vertebral column (tab. 2). All bones are incomplete, measurements could only be taken from one metatarsus (for all measurements see the appendix). It also descends from a small, but adult, animal (fig. 5 A, 7/007). The surface of this bone reveals a group of fine cut-marks. The shaft fragment of another metatarsus shows by its massiveness to be of a really big animal, probably a bull. On the contrary, the remains of one tibia are still of light and porous structure, proving to be from a kalv.

Horse (*Equus* sp.)

Second place under the animal remains take in the fragments of horse bones. The utmost frequent parts are ribs comprising 88 % of the horse remains. Besides that three fragments of vertebrae are present, one of which from a juvenile animal as the epiphysis is not ossified together with the corpus.The fragment of a humerus and that of a main metacarpus represent the limb bones together with two lateral metapodials and the noticeable finds of two complete sesame bones of the hoof, usually seldom among archaeologic material. The lateral metacarpus fits exactly with the main metacarpus like deriving from one animal. The shaft of the main metacarpus is split longitudinally in the typical kind of fractioning to extract the marrow. A strong blow produced an arched fracture on one side and a wreckage split on the opposite side (fig. 5B, 7/006). Completed is the horse collection by one lateral incisor of a foal. All these incomplete bone fragments don't allow measurements that could help in the determination of the horse species. According to the investigations of MUSIL (1974) it can be presumed that the horses belonged to the group of *Equus germanicus*. Horses which will have lived in herds will likewise not have entered the narrow side valleys like the Stendel (old name for stony valley), but will have been hunted near the Leine.

Under the ribs only one is almost completely preserved together with the capitulum. Additionally eight half broken heads supplement the number of the proximal ends of the ribs. All other pieces are fragments of the blade with lengths of only 4 cm up to 20 cm. Most frequent are fragments of the seventh to the seventeenth ribs.The second and third ribs are represented by one and two fragments respectively. Between the third and the sixth rib there is a deficiency of finds. These numbers coincide with BINFORD's (1978)

Element	Reindeer	Horse	Bison	Ibex	Wolf	Fox	Ermine	Weasel	Mustela indet.	Hare
Antler	225									
Skull	1							1	1	1
Mandible							3	4		4
Tooth		1	1			2				3
Vertebra	1	3			1			1	2	6
Rib	19	94				3				1
Scapula										
Humerus		1				2		1		10
Radius						2				6
Ulna										4
Metacarpus		2			1	1				20
Pelvis										2
Femur						1				2
Tibia	3					4				2
Fibula					1					
Calcaneus						1				1
Talus						1				
Metatarsus	9	1		1	3	1				10
Metapodial indet.	4					1				4
Phalange										6
Os binum		2								

Table 2. Numbers of different skeleton elements of the animal species of abri Stendel XVIII.

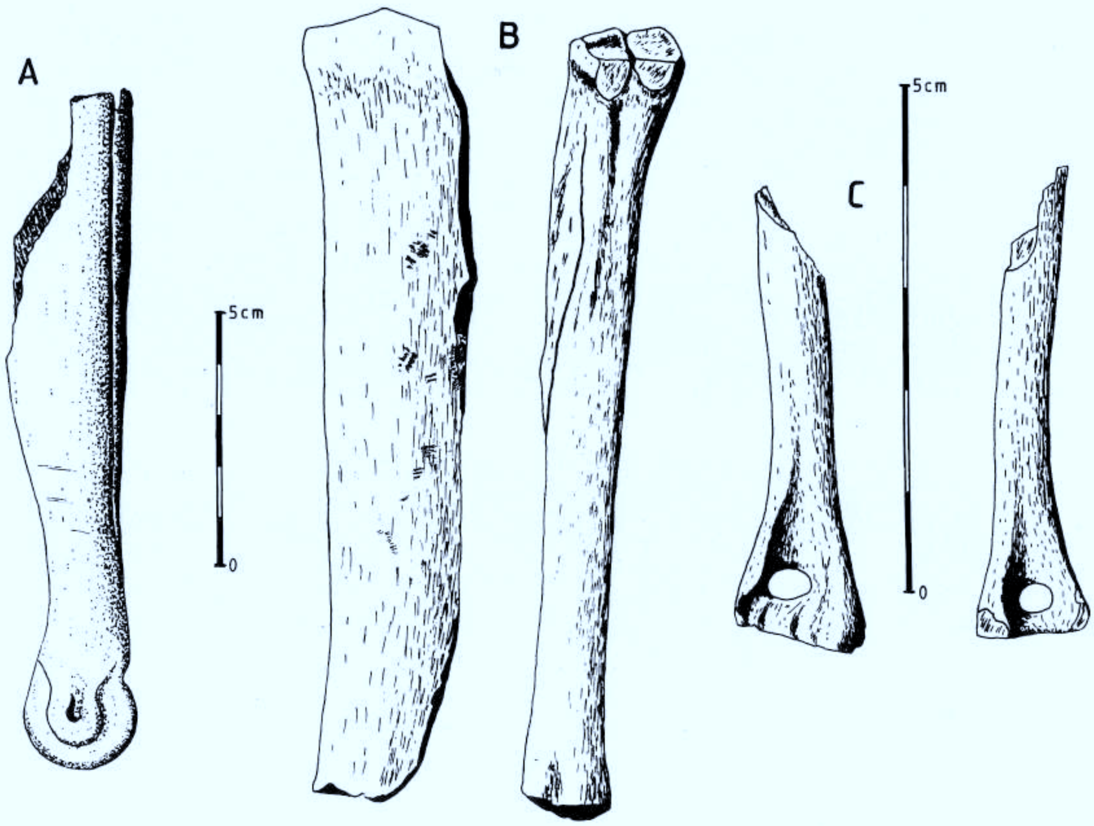

Fig. 5. Limb bones from abri Stendel XVIII with marks of human working.
A - Find No. 7/007: Metatarsus fragment of reindeer; fine cut-marks transverse to the length of the shaft.
B - Find No. 7/006: Metacarpus fragment of horse; groups of fine cut- marks in different directions; the bone split along with typical arched break from the blow, splinter fraction on the opposite side.
C - Find No. 10/059 and 10/006: Humerus fragments of mountain hares: outer ends of the distal joints cut off strait.

observations of modern Eskimo hunters: When they shot a prey far from home, they butchered it in a special way to yield easy transportable portions. They cut the rib cage in the manner that the first ribs stay together with the sternum and the thoracic vertebrae, whilst the hind ribs are separated from the body by cracking the brisket at the attachement of the ribs with the vertebrae and then cut it into handy slabs. By this treatment the heads of the ribs generally break off and stay fixed with the vertebrae. The low percentage of rib heads in comparison with the other rib fragments in our collection seems to support the possibility that the palaeolithic man used corresponding butchering techniques as the modern Eskimo. It would as well confirm the assumption that the horses were hunted in greater distance from the habitation under the rock shelter, and that the meat was transported in special cut portions.

More than half of the horse ribs contain cut-marks. These marks are less coarse than that of the reindeer antlers, and they run in different directions along the bone. Most of them are transverse to the longitudinal extension of the bone. Only a few run more or less parallel to the fore or hind edge of the ribs, as should be the case when the complete rib cage will be cut into slabs of several ribs or when the ribs are separated from each other. Some of the marks show the typical "double spur" caused by silex tools. Seldom are short, relative deep marks that can be interpreted as coming from a blow. A group of short, triangle shaped marks remind of the pressure-marks for retouching and sharpening silex tools. A combination of all kinds of marks which were found on the horse ribs is drawn together on one standardized rib in figure 6.

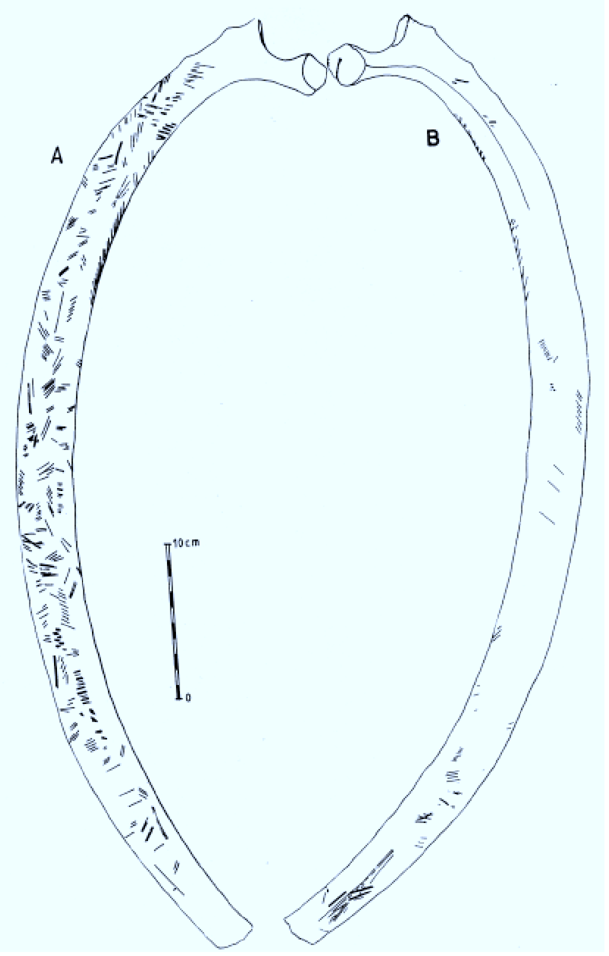

Fig. 6. Combination of cut-marks from the surfaces of about 50 horse rib fragments of abri Stendel XVIII.
A - Marks on the slightly convex lateral side of the ribs.
B - Marks on the slightly concave medial side of the ribs.

Steppe Bison (*Bison priscus*)

The big bovides are represented by only one fragment of a tooth. From this fragment it is not possible to distinguish between the bison and the aurochs (*Bos primigenius*).The aurochs lived in forests of moist plains, but all other animals point to a tundra like environment of the area at the time of the deposition (see below). Remains of steppe bison are frequently found in other sites of same age. So there are good reasons to determine this piece as *Bison priscus*.

Ibex (*Capra ibex*)

Likewise by one single fragment the ibex is proved. It is the fragment of a metatarsus of which one measurement was possible. Ibex was not found earlier in sites of Lower Saxony but it doesn't seem unlikely that it lived within the rocky hill area of the Reinhausen Forest as it is documented from the comparable landscapes of the Suebian Alp, Southern Germany (VON KOENIGSWALD 1983).

Mountain Hare (*Lepus timidus*)

Of this small hunting prey a lot of 71 remains is found. Another ten fragments are so incomplete that they can't be determined up to the species. But these bones can't be mistaken for any other of the here determined animals. So we can attribute these pieces to the mountain hare with good conscience. Nearly all elements of the skeleton are represented, highest portion, however, take in the extremities. Only remnants of the toes are missing. Toes remain usually together with the fur. Maybe that already the palaeolithic men will have esteemed the beautiful furs of the hares and deposited them on a d ifferent place. Two humerus fragments, on the other hand, show clearly that the hares were hunted for their meat. These bones are properly cut shortly above the elbow articulation to divide the front legs (fig. 5 C, 10/059, 10/006). From the humerus bones measurements could be taken. One of the pieces derives from a juvenile animal. Several other fragments of metapodials, one each of the skull, the pelvis and the calcaneus are of juvenile animals, likewise.

Arctic Fox (*Alopex lagopus*)

Out of the carnivores, remains of the arctic fox are most frequent. Besides three fragments of ribs and two lower incisors only the limb bones are represented. Measurements could be taken from the distal end of a tibia as well as from one calcaneus and one talus, respectively. We can't decide wether the arctic fox was hunted by the palaeolithic men for meat, for its fur or if its bones were sedimented together with the remains of the other animals incidentally. The fox might have looked after meat remains in times the human inhabitants of the abri were outside. On the delicate bone fragments no signs of working by the men could be discovered.

Wolf (*Canis lupus*)

The wolf is represented by six bone fragments. These are one fragment of the metacarpus, three of the metatarsus, one of the fibula, and one of a cervical vertebra. This last mentioned piece is of such porous structure that it obviously belonged to a whelp. All pieces are so fragmented that measurements can't be taken. It seems probable, really more probable than with the fox, that the wolf was not hunted for meat or fur. The wolf might have been hunted to kill a troublesome competitor, or the bones came into the accumulation just incidentally. But there are some fine cut-marks on the surface of one of the bones (metatarsus, 3/007). That means that men put at least hands on the bones even of the wolf.

Ermine (*Mustela erminea*) and Weasel (*Mustela nivalis*)

Fragments of the skull or mandible are the most frequent finds of the mustelids. That makes the determination of the species easier than it would be by fragments of the very tiny limb bones. The insignificant number of the elements of the extremities seems to depend on the fact that they were incidentally placed on the material of the micro mammals where they were not identified as for the determination of the rodents only the teeth are interesting. The ermine as well as the weasel might have been hunted for the use of their fur. The bones don't carry any marks which could prove that they were handled by the man.

Birds

Birds are represented by 16 pieces. Of these only seven can be determined up to the genus. The others show only the typical structure of bird bones which distinguishes them clearly from those of the mammals. One humerus fragment indicates a goose bird (*Anser sp.*), the others derive from grouse (*Lagopus sp.*). The grouse is a typical prey of human hunters during the Palaeolithic, but could here, on the other hand, have been placed by owl pellets. Direct proof that the birds were hunted and eaten by men, like cut-marks etc., are not found. Another method, which was introduced by MOURER-CHAUVIRÉ (1983) to distinguish whether the birds were eaten by men or by owls, is the statement that the distal parts of the extremities of the prey, that are carpometacarpus and tarsometatarsus, are over represented in owl pellets, whilst this is true with the proximal parts, i.e. humerus and femur, in bone accumulations produced by men. Our material is not sufficient for such a statistical judgement, and both distal and proximal parts are represented by exactly the same numbers.

Measurements of the few completely present grouse bones, two carpometacarpals, lie in the size variation of the ptarmigan (*Lagopus mutus*). Because of the overlap of these measurements with that of the somewhat bigger willow grouse (*Lagopus lagopus*), we can't exclude the existance of the willow grouse, which is adapted to less arctic conditions than the ptarmigan. The tarsometatarsus which allows a better distinction of the two species is unfortunately represented by only one incomplete fragment.

Completed are the finds of birds by some fragments of egg shells, which were determined by G. RICHTER. He stated that this fragments equal that from the other abris, which he investigated earlier (RICHTER 1994). The egg shells belong to a species of large bird of prey, for instance the gyrfalcon (*Falco rusticolus*).

ENVIRONMENT AND OCCUPATION OF THE ABRI

Reindeer, mountain hare, and arctic fox are today animals of the subarctic region, from the open landscape of the herb tundra to the region of the light forests. The impressing small size of the reindeers from our site indicates that the climate was especially dry, continental (WEINSTOCK 2000). Thus it corresponds well with the statement by the small mammals. The finds of horse and bison stand for a dry, steppe like landscape in the surroundings of the abri area. Embedded were the animal remains by loess sediments. These fine, dust like masses were blown by heavy western winds from some distance into the narrow glens of the Reinhausen Forest. The places from where the calcareous earth was blown out, must have been covered at that times by a very scarce vegetation of low plants.

For the seasonal migration of reindeer, BAALES (1996) developed the model that the herds followed during spring the wide valley of the Leine from the northern lowlands to the mountainous areas in the south. The Leine Valley has its origin in a south-north directed tectonic depression, which caused the wide plane for the relative small river in comparison to the narrow and steep valley of the much stronger Weser River. Althoug BAALES= model was created for the slightly younger Ahrensburg Culture of the End Glacial (Dryas-III-Stadial), it seems plausible for the Magdalenian of our area, too. Antlers of juvenile and female reindeers which are shed in spring were found on several sites along the Leine Valley.

Besides our abri a significant antler accumulation existed at the Aschenstein site (see above) and, with lower numbers, under another abri of the Reinhausen Forest above the brook Garte about 5 km north of the Stendel XVIII (see GROTE 1994).

We can hold that reindeer herds moved along the Leine Valley during spring. Their females and juvenile males shed their antlers at that time and left them in the area not far from the abri. The Magdalenian men that occupied the abri Stendel XVIII might have collected the antlers at any time of the year. But among the animals which they hunted, there were young animals, too. There is the tibia fragment of a reindeer calf, probably newly born, several bones of very young mountain hares, and some bones of juvenile arctic fox and wolf. This combination makes spring to early summer likely as hunting season of the Magdalenian inhabitants of the rock shelter Stendel XVIII. For the consideration whether the abri was used by the hunters for the short spring season only, or for longer times, even the year round, the bone material doesn't give hints.

The high amount of horse remains, especially, shows that the Magdalenian hunters of the Reinhausen Forest were not as much fixed to reindeers as were the hunting groups of the younger Ahrensburg Culture. The preference of horse is more comparable with sites of Middle Germany - Thuringia (see MUSIL 1974).

EXPLOITATION OF THE ANIMALS

We can start from the assumption that the large animals, horse, bison, and reindeer as well as the hares and the grouse will have been a wellcome prey for the palaeolithic men also in the area of the Reinhausen Forest. It seems, therefore, obvious that the animal remains must be refuse of hunting activities. This consideration seems to be confirmed by the material of the mountain hare, of which nearly all elements of the skeleton are represented. That means, these small animals will have been carried to the habitation site undivided. As shown above, signs of butchering are to be found on the humerus bones of the hare. Typical other activities like marrow fractioning are found, too, on the metacarpus of a horse (fig. 5). But these signs that the animal bones are remnants of meat preparation are very scarce compared with the high number of animal remains of the complete sample. The composition of the different skeleton elements is a peculiar one (tab. 2), which does not correspond with the relations known from bone accumulations of other hunting sites.

The most frequent elements, i.e. antlers of reindeer, are not usual remains of butchering activities. Obviously the antler fragments of our finds don't derive from the hunt because proved are only shed antlers which will have been collected from the ground independent of the search for food. Known is that the palaeolithic men used antlers to make tools. However, as shown above, the coarse blowing or cutting marks which are found on our material don't look like attempts to make tools. The only specimen that is treated in the manner known from other sites (see fig. 4 A), is not really suited as source for good tools, as the material is not strong enough. All the here collected antlers are of young female or juvenile deers, and therefore of small size and with only thin compact outer layer.

Next frequent in number after the antlers are the ribs of horse and reindeer. The rib cage is a part of the body that contains good portions of meat. Especially when the prey had to be transported over a longer distance from the hunting area to the living place, these portions are favoured (BINFORD 1978). As mentioned above, the reindeer herds as well as that of the horses would not have entered the narrow glens within the sandstone plateau of the Reinhausen Forest.They will have been hunted in the wide valley of the Leine River, more than three kilometres distant from the abri Stendel XVIII.

However, other parts of the animal body contain abundant and good meat, too. Especially the legs belong to these parts. That means that elements of the limb bones should be represented by numbers comparable with that of the ribs, which is not the case in our material (see tab. 2). Even when we take into consideration that the number of ribs in the skeleton is higher than that of the extremities, the ratio of the leg bones should be higher. In fact, usually just the metapodials and the tibia as parts of the limb bones are over represented in archaeologic excavations as the material of these bones is much stronger than that of the ribs.

There is no doubt that the animal remains were brought to the abri by the palaeolithic men. The reindeer antlers show enough marks which were produced by sharp silex tools as mentioned above, and the cut-marks on the bones prove the human origine of the accumulation, too. But the high number of such cut-marks especially on the ribs doesn't derive from the preparation of the meat. None of the directions of the marks on the ribs coincides with marks that would arise when the meat is removed from the bones with a knife. It is agreed, on the other hand, that in hunter cultures the meat on the ribs wasn't cut off with a knife at all. The meat will have been gnawed directly from the bones. BINFORD (1978) gives the additional observation that fresh ribs were broken and sucked at the ends of the break for the juice and small amounts of marrow contained inside. Also this method of treating the ribs does not produce such marks as can be found on the surfaces of the ribs from our collection, but it would explain the strong destruction of the ribs.

The question remains what caused the many marks on the ribs. Whilst one of the reindeer antlers might have been used for making tools, this seems very unlikely in case of the ribs. None of the marks cut as deep into the bone as necessary to break it or to cut out a chip or splinter or any kind of a tool. Moreover, the material of the ribs of our collection is really not strong enough to allow the ribs or parts of them to be used as a tool. The compact outer layer is thinner even than that of the antlers, and much weaker than that of the few represented limb bones.

I assume that the antlers were picked up somewhere in the distance not with the purpose to use them for making tools. Most of them were dismembered by hacking the bulky tines from the beam. The remaining fragments of beams and tines were left as simple staffs without outsticking points. In case the remaining parts were well fitted to be hold in the hand they might have been used as some kind of simple tool, for scraping, for to hold a cord of sinew etc. (see fig. 4 B- C, 7/003, 8/003), or they served as foundation when meat, skin, sinew etc. should be cut. The ribs, too, could have been served in the same way. Their relative flat surface must have been very suited for such foundation; and the slightly convex lateral (outer) side of the rib surface still better than the somewhat concave surface of the medial (inner) side (fig. 6). These ribs, as well as the antler fragments were deposited at a special place, not together with the refuse of the butchering, meat preparing, or marrow fractioning activities. Otherwise such remains should be found in much higher numbers in the company of the antlers and ribs. I assume that the butchering refuse was discarded somewhere outside, supposedly downslope, where it was easily out of the way, but where it, too, came out of the shelter against weathering, and where it at the end completely disappeared. Only under the roof of the abri the ribs together with the antler fragments were sheltered from the destructive influence of the climate. This material must have been of higher worth to the people than only rubbish. The high number of cut-marks on the surface of the ribs indicate that there was a need of material as base for such cutting activities. This is understandable as the climatic conditions (see above) didn't allow the growth of wood, and the use of stone flags would blunt the delicate silex tools too fast. However, the combination of the ribs together with the antler fragments in one deposit indicates that there must have been another purpose for this accumulation. I like to introduce a simply profane use of said material and would appreciate any discussion. Why not think of the antlers and bones as layer of the resting places, isolating the bed from the moisture and the coldness of the earth. I think of layers like that which are made out of pine branches by the nomads of the boreal forest zone, or of the "hunting beds" filled with heather as overnight shelter of West Greenland caribou hunters (MELDGAARD 1983). This suggestion I expressed already earlier, when discussing the animal remains from the site Aschenstein (STAESCHE 1999), probably a destroyed former rock shelter .

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APPENDIX

Explanation of the Appendix

Documentation of size of the animal bones (fragments) of abri Stendel XVIII.

The measurements follow VON DEN DRIESCH (1976). Some additional ones which are not used otherwise are here added because of the incompleteness of the pieces. They are easy to take and to reproduce. All measurements in mm.

1 = Greatest length; 2 = Greatest breadth; 3 = Greatest breadth, proximal; 4 = greatest depth, proximal; 5 = Smallest breadth of the diaphysis; 6 = Greatest breadth, distal; 7 = Greatest depth, distal; 8 = Greatest breadth of the trochlea; 9 = Greatest diameter of the trochlea; 10 = Smallest diameter of the trochlea; 11 = Smallest depth of the olecranon

Rangifer tarandus	Measurement No:	Metatarsus No: 7/007, distal half
	5	17,3
	6	38,2
	11	22,0
Capra ibex		Metatarsus No: 3/008, proximal end
	3	18,8
Alopex lagopus		Tibia No: 10/058, distal end
	6	12,4
	7	8,3
		Calcaneus No: 2/015, nearly complete
	1	24,5
	2	9,4
		Talus No: 10/112, nearly complete
	1	14,4

***Lepus timidus*, Humerus**						
Measurement No:	No: 10/001 distal half	No: 10/002 distal half	No: 10/003 distal end	No: 10/004 distal end	No: 10/005 distal end	No: 10/056 proximal end
4						16,8
8	13,4	12,9	12,7	12,4	12,9	
9	10,3	10,2	9,5	9,1	9,8	
10	7,6	7,4	6,7	6,7	7,1	

***Lepus timidus*, Radius**				
Measurement No:	No: 10/011 proximal half	No: 10/012 proximal half	No: 10/013 proximal half	No: 10/069 distal end
3	9,5	9,0	10,8	
6				10,8
7				6,1

***Lepus timidus*, Ulna,** proximal part				
Measurement No:	No: 10/007	No: 10/008	No: 10/009	No: 10/010
12	11,2	11,8	11,6	11,4

Lepus timidus	Measurement No:	**Femur**, distal end No: 10/057	**Tibia**, distal half No: 10/015
	6		13,5
	7	13,5	10,9

Lagopus sp.	Measurement No:	**Carpometacarpus** No: 10/160	**Carpometacarpus** No: 10/161	**Tarsometatarsus** No: 10/166
	1	34,6	36,6	
	3	9,8	9,9	
	6	6,6	7,2	9,0

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