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A SURVEY OF THE SUBSISTENCE AND SETTLEMENT PATTERN OF THE HAMBURGIAN CULTURE IN SCHLESWIG-HOLSTEIN

A re-evaluation of the faunal evidence from Meiendorf, Stellmoor and Poggenwisch (North Germany) has provided the basis for a set of hypotheses concerning the organization of the hunting economy of the Hamburgian culture in Schleswig-Holstein. A reconstruction of the taphonomic history of each recorded species revealed the economic choices at work and helped as well to define the seasonal limitations of the samples. The very restricted seasonal nature of the Schleswig-Holstein assemblages emphasizes the lack of direct factual evidence concerning the general structure of the Hamburgian economy. The close cultural ties between the Central European Magdalenian and the Hamburgian culture of the North European plain did however warrant a survey of possible similarities in the hunting economy of the two groups. Data from a selection of Magdalenian faunal assemblages from Central Europe actually indicate seasonally changing priorities in the hunting pattern which may have had importance for the Hamburgian culture as well.

THE FAUNAL SAMPLES FROM NORTHERN GERMANY

Faunal assemblages from Hamburgian sites are rare. The majority of the presently known material comes from the three classic sites Meiendorf, Poggenwisch and the lower layer, AbH, from Stellmoor. All three sites were excavated by Alfred Rust (Rust 1937; Rust 1943; Rust 1958), and are situated in the Ahrensburg tunnel valley north of Hamburg (fig. 1 a-b).
Only Meiendorf has provided a large and apparently uncontaminated sample[1] of app. 2000 bone and antler fragments. The equally large sample from the Hamburgian layers of Stellmoor, Stellmoor AbH, is to some (unfortunately not calculable) extent mixed with Ahrensburgian material. From Poggenwisch a few bones and antlers form a very small, but presumably uncontaminated Late Glacial sample. Since the samples were published more than thirty years ago (Krause 1937; Kollau 1943; Herre and Requate 1958) bones from reindeer as well as from the rarer species have been lost. It is only possible to check exactly what is missing now for the rarer species, as, apparently, very fragmented reindeer bones were not counted in the palaeozoological reports (tab. 1). In general, however, the important trends in the composition of the samples are still clearly documented.
It may be noted as the irony of research history, that the fifty years gone since Rust´s pioneering fieldwork on Meiendorf have brought about an abundance of mapped findspots, but only a few excavated sites. A planned fieldprogramme explicitly directed at possible faunal deposits remains a desideratum.

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[1] For a differing view, cf. Tromnau 1992.

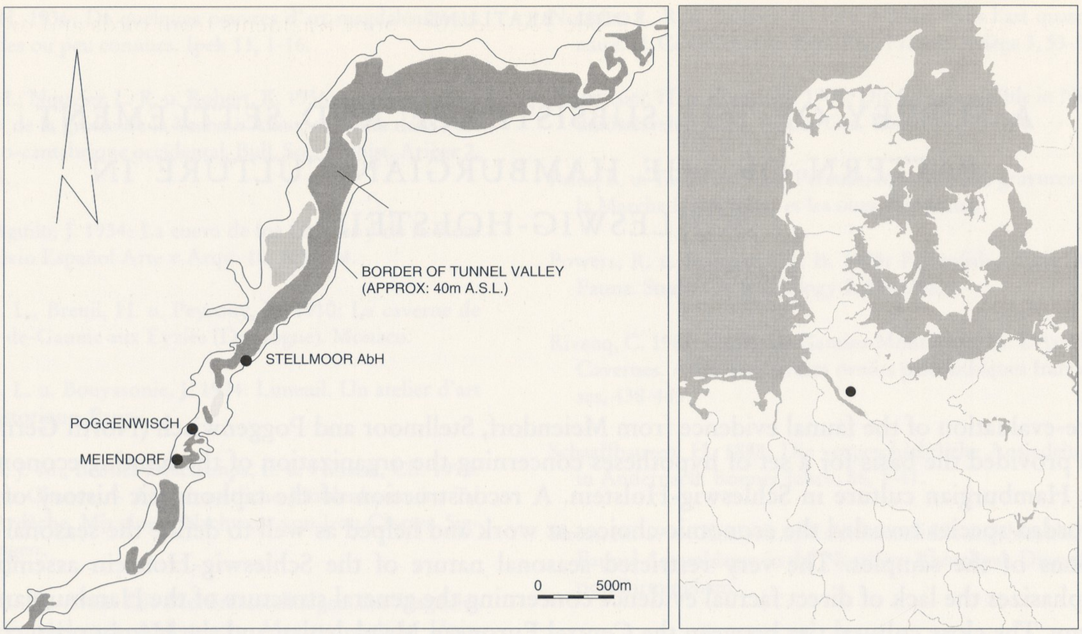

Fig. 1 a Ahrensburgian tunnel valley. – b Location of Hamburgian sites under discussion.

Site	Present 1990: No. of fragments bone	antler	Previously published: No. of fragments bone	antler
Meiendorf	1931	320	1207 (Krause) 1937, Gripp 1937)	Min. 114
Stellmoor AbH	1904	80	1148 (Kollau 1943)	?
Poggenwisch	206	9	190 (Herre and Requate 1958, Rust 1958)	6

Tab. 1 Hamburgian sites. Reindeer. *Rangifer tarandus*. Loose fragments present 1990. – NB. The reindeer skeletons from Meiendorf and Stellmoor AbH are not included in this table (Vide Bratlund 1991).

The predominance of reindeer in the Meiendorf and Stellmoor AbH samples has, despite the obvious seasonal limitation, invoked the impression of a specialized reindeer dominated economy for the Hamburgian Culture. Reasonable doubt concerning this generalization has, however, been expressed more or less explicitly in the recent literature (Schild 1984; Grønnow 1985), and the following analysis of the samples may support this view.

Meiendorf

The faunal assemblage, today stored in the Archäologisches Landesmuseum in Schleswig, comprises a total of 1931 loose bone fragments and 321 antler fragments from reindeer. Hereto must be added the incomplete skeleton of a subadult reindeer. The 100 recorded bone fragments from birds and different species of mammals fall in two groups: 67 pieces still present, and 33 lost since 1937.

The relatively rare species may here be considered first, before the more abundant reindeer material.

In tab. 2, the available bones from the rarer species are listed, according to species determination, minimum number of individuals (MNI), and the traces of modification found on the bones. As already mentioned a number of fragments have been lost since Krause's compilation in 1937. These missing fragments are listed separately as it was impossible to check the species determination or possible traces of modification. Consequently, their taphonomic status must remain an open question.

One of the more conspiciuous properties of this part of the Meiendorf sample is the high quota of artefacts and their corresponding blanks relative to simply cutmarked or broken bones, especially from the larger species of birds.

Whooper swan, *Cygnus cygnus*

The swans are predominantly represented by the long bones of the wing: humerus, radius and ulna, all fragments being more or less artificially modified (fig. 2; Taf. 54, 1-2). The material thus comprises blanks still in the shape of whole bones, unmodified but for scraping marks from cleaning of the diaphysis and slight breakage of the articular ends from detachment in the wing joints as well as useworn and, apparently, unused artefacts made from the diaphysis.

The exact function of these bird bone artefacts is not clear. Basically, the articular ends are cut off, thus turning the diaphysis into a tube. The inner side is not worked, and eventual lamellae left untouched. The use wear can be considerable. It is limited to the ends of the artefact, where parts of the sharply cut edges of the bone tube may be smoothed into rounded facets. Judging from the degree of modification and use wear humeri must have been the favorite raw material, tab. 3.

Besides one cutmarked sternum piece, all 15 fragments present are from wing bones.

The eight now missing fragments comprised the same kind of wing bones plus a tibia, a fibula and one cervical vertebra. The tibia and one of the humeri were from a young swan (Krause 1937).

All in all the whooper swans have an MNI of six: one young swan and five adults. Especially the latter figure is most probably misleading. The non-wing bones only indicate the presence of a minimum of one (young) swan carcass, which should be considered local butchery waste. In contrast to this the wing bones from adult swans represent material curated and used for artefacts. The MNI of a further five adult swans is thus the absolute minimum number of kills necessary to provide the excavated sample. The number of swans actually killed most likely is much higher.

Geese, *Anser sp./Branta sp.*
(incl. grey lag goose, *Anser anser*, and barnacle goose, *Branta leucopsis*)

The same general picture is seen for the geese material. All four bones still present are modified wing bones, two of which could be determined to greylag goose, *Anser anser*. The missing fragments are, beside wing bones, »a bone, probably the tibia of a young goose« (Krause 1937) and the cranium of a barnacle goose. Whereas the non-wing bones from swans comprised at least one cutmarked (and present) piece, none of the corresponding geese bones can be studied. Perhaps one (barnacle) goose was killed and butchered nearby, but the possibility remains, that the fragments come from natural deaths in the lake.

The wing bone artefacts and blanks recorded call for a minimum of four adult geese.

Grouse, *Lagopus lagopus*

Grouse remains are the most frequently encountered type among the bird bones. The total of 29 pieces represent all segments of the body, and are, with the exception of fragile bones like the sternum, undamaged. Only two left humeri have cutmarks across the diaphysis near the proximal articular end of the bone.

Species	N	N	MNI	Modifications of N present			
	present	lost	(all)	none	cutmark	blank	artefact
Desman: *Desmana desmana*	1	–	1	1	–	–	–
Wolverine: *Gulo gulo*	1	–	1	1	–	–	–
Horse: *Equus sp.*	5	3	1	2	2		1
Larger mammals	3	–	–	2	–	–	1
Whooper swan: *Cygnus cygnus*	16	8	6	–	1	5	10
Grey Lag goose: *Anser ?anser*	2		2	–	–	–	2
Goose: *Anser sp.*	2	5	2	–	–	1	1
Duck: *Anas sp.*	1	9	1	1	–		–
Grouse: *Lagopus lagopus*	29	4	5	27	2	–	–
Galliform.	4	–	1	4	–	–	–
Aves unident.	1	–	–	–	–	–	–

missing	N	NMI
Hare: *Lepus sp.*	23	(2)
Badger or Wolverine: *Meles meles/Gulo gulo*	1	(1)
Red fox: *Vulpes vulpes*	2	(1)
Barnacle goose: *Branta leucopsis*	2	(1)
Spotted Crake: *Porzana porzana*	1	(1)
Crane: *Grus grus*	2	(1)
Laridae	2	–

Tab. 2 Meiendorf. Birds and mammals present 1990, excl. Reindeer, *Rangifer tarandus*.

Fig. 2 Wing bone artefacts. Position of long bones curated.

	Articular ends cut or broken off		Only breakage and cutmarks
	Usewear:		
	Heavy	Slight	No usewear seen
<u>Meiendorf:</u>			
Cygnus cygnus:			
Humerus	4	2	1
Radius	2		
Ulna		2	4
Anser ?anser:			
Humerus	1	1	
Anser sp.:			
Humerus	1	1	
<u>Stellmoor AbH:</u>			
Cygnus cygnus:			1
Humerus	1		
Anser anser:			
Humerus		1	
Anser fabilis:			
Humerus			1
Haliaeëtus albicilla:			
Ulna	1		1*
<u>Poggenwisch:</u>			
Cygnus cygnus:			
Humerus		1	
Radius			2*

Tab. 3 Modification traces on wing bones from the larger bird species. Specimens present 1990. Note: The usewear is recorded as to whether it could be seen with the naked eye (heavy) or not (slight). The group without usewear recorded includes specimens (marked *), which due to fragmentation lack the usually worn parts of the diaphysis.

The minimum number of individuals are five adult birds. Since different skeletal parts are present, and at least two carcasses had been handled by man, it seems justified to interprete the grouse remains in toto as the outcome of local hunting or trapping.
Four subadult bone fragments from a galliforme the size of a grouse most probably represent one additional young bird.

Other birds:
ducks, *Anas sp.*, crane, *Grus grus,* spotted crake, *Porzana porzana*, lark, *Laridae sp.*

With the exception of one duck tibiotarsus all bone fragments from the remaining bird species must be considered irretrievably lost. All species noted in 1937 (Krause 1937) live close to water and the bones might well represent natural deaths. It thus remains an open question, whether these species were hunted at all.

Horse, *Equus sp.*

The horse bones still present are a cutmarked fragmented femur from a subadult horse, and four more or less complete ribs, one of which is cutmarked and one a piece of an ornamented broken artefact. Three fragments noted in 1937 (Krause 1937), one 2. and two 3. phalanges, are no longer to be found.
The MNI for horse thus includes one subadult, and considering the fused epiphysises of the ribs, one adult horse as well.
Whether both – or any – were killed near Meiendorf is open to discussion. Bones like the phalanges are not likely to have been transported unless attached to whole joints. The femur fragment may, however, be the remnant of such a joint, just as the ribs (No. 6, 7 and 10, all from the left side) theoretically could come from the same piece of meat.
The broken rib artefact has its exact parallels in pieces made from large reindeer ribs, and might as well as these have been manufactured locally.
To produce this kind of artefact the posterior side on the middle part of a stout rib is removed by means of crushing the bone, and the concave inner margin smoothed to a fairly sharp working edge (Rust 1937 Taf. 47) (fig. 7; Taf. 56,3).
By analogy to similar pieces with an ethno-historically known use, this kind of artefact may be considered a two-hand scraping tool for leatherworking.

Large mammals, unident

One piece is a ventral fragment of a rib artefact of the same type as mentioned above. Most probably the material is a horse rib.
A further cutmarked rib piece and two diaphysis splinters cannot be identified to species.

Other mammals: desman, *Desmana desmana,* hare, *Lepus sp.*, wolverine, *Gulo gulo,* red fox, *Vulpes vulpes*

One complete tibia of desman still present shows no traces of modification. As this species lives near water the bone probably represents a natural death occurring in the Late Glacial lake.
The hare bones are now all missing, but different parts of the skeleton from a minimum of two hares were recorded in 1937 (Krause 1937). Without documented cutmarks to prove the idea, the hare fragments may yet be considered traces of local hunting or trapping.
From the carnivores only a fragmented mandible without cutmarks from an adult wolverine remains. This, and the missing fox bones, could be from hunted animals too.
Unfortunately the species determination for the fox bones can not be checked.

Reindeer

The reindeer material from Meiendorf is characterized by overrepresentation of a few carcass segments: the neck segment, sacra, and unshed antlers, and by a very high percentage of cutmarked bones.

Loss of excavated material

The bone loss mentioned above for the rarer species has affected the reindeer remains too. After the evacuation from the Kieler museum during the war the bones and antlers from Meiendorf and Stellmoor were kept for years in large unclosed containers. Only the fact that most of the pieces had been marked shortly after the excavation made it later possible to sort out mixed material and reconstruct the excavated entities.

Considering the bones from Meiendorf the losses seem to be limited, for example has Krause in 1937 listed 71 sacra, but the present count is only 69 pieces (Krause 1937). The results based on the recent survey of the material may thus be considered fairly representative.

The antler material on the other hand has not had the same luck. Of the 105 antlers (i. e. pieces comprising the antler base) counted by Gripp in 1937, only 74 are found in the collection today (Gripp 1937). The juveniles and the unsexed (young?) antlers are the most severely affected groups. As many antler pieces show modern fractures, and the marked area is small (and in many cases was restricted to an attached tag), it is quite likely that Hamburgian antler lies hidden in the vast Ahrensburgian material from Stellmoor. Another possibility is, however, that antlers once borrowed for exhibitions still exist in other museum collections.

For the antlers from Meiendorf, anyway, it is necessary to use two parallel tables, one based on Gripp's compilation and another on the material still present.

Fragmentation and cutmarks

In general all marrow bones in Meiendorf are badly fragmented and a very high percentage of all bones have cutmarks.

The only exception to this rule is the incomplete skeleton of a subadult reindeer. The skeleton comprises both frontlegs, ribs, and most of the vertebral column, and has not been included in the tables. Apart from cutmarks from skinning on a metacarpus no obvious traces of handling are seen, but the missing hindquarters are – for taphonomic reasons – most likely a sign of partial butchering (Bratlund 1991).

The most frequently encountered loose bones are sacra and neck vertebrae. The latter can be refitted to more or less complete segments of the neck vertebral column +/- the first thoracic vertebra (or more). The author was, however, unable to reconstruct the segments to the same level of completeness as Krause (Krause 1937). The neck segments correspond to the articulated entities seen but unfortunately not recorded during the excavation (see Rust 1937 Taf. 2 and 23). Despite the low meat yield of the sacrum and neck segments these parts in general show cutmarks from meticulous filleting (Taf. 54,3).

The same goes for the bones of the more meaty segments of the carcass: ribs were scraped for meat, longbones filleted and marrowbroken, on crania cutmarks are found even in the eyesockets, phalanges are marrowfractured a.s.o. The general impression is a very economical treatment of the game, where even the tiniest scraps of meat are saved without much consideration of the invested work effort.

The cutmarks have predominantly clean v-shaped cross sections indicating the use of unretouched flakes or blades (Klingen). The cutmarks showing parallel striation and v- or more n-shaped cross sections are markedly less common, and mainly found in difficult positions, where a turning or scraping motion was required, and may rather represent use damaged edges than intentionally retouched artefacts.

When the inventory of flint artefacts from the lake sediments and the neighbouring site uphill (Meiendorf 2) are compared, this idea seems supported. Considering the difficult conditions for excavation in the lake sediments only the frequencies of the larger artefacts, i.e. the blades and tooltypes made on blades, can reasonably be compared between the two samples. Based on Rust's lists (Rust 1937) the lake sediments yielded 175 unretouched blades and 48 retouched tools made on blades, whereas the dry land section only had 245 unretouched blades but 749 retouched tools. For the latter assemblage some blades should be added as Rust's category »Abschläge« comprises flakes as well as broken blades (Rust 1937). Still, the difference between the two areas seems evident. Tacitly supposing that this dissimilarity has a functional explanation, it can be seen as the difference between a specialized butchering area near the shore of the lake and the uphill settlement proper.

STRUCTURE OF THE REINDEER SAMPLE IN TERMS OF AGE CLASSES, SEXRATIOS AND CARCASS EXPLOITATION

The quantification of the game is best surveyed using the calculated MNI (Minimum Number of Individuals) values for the different types of bone. Here the MNI is calculated simply by counting the highest number of occurrences of a defined part of the bone in question for each side of the body and each specified age class. This differs from the method proposed by Binford, where a mean value of both sides is calculated, so used f. ex. by Grønnow in his analysis of Meiendorf and Stellmoor (Grønnow 1985). The 'classic' MNI gives, however, a more direct picture of the number of reindeer actually required to build up the sample.

The MNI values for the different age classes are presented in tab. 4. The table is based on the reindeer bones surveyed by the author, and minor differences to Krause's lists can be found.

The conspicuous concordance in numbers between bones from the same body parts lead Grønnow to the hypothesis, that the initial butchering was carried out in segments, which later were sorted according to the amount and quality of meat on the joints. The neck segments were interpreted as waste, directly disposed of. The overrepresentation of sacra on the other hand should show import of double hindquarter segments from hunting some way from the site. These double segments were then later processed at the site and the connecting sacra disposed of. (Grønnow 1985). Whereas the general segmentation pattern proposed by Grønnow can be accepted, the more specific interpretations must be modified. Firstly, the neck segments were thrown into the lake still articulated, but – judging from the cutmarked majority – in a completely filleted state. Secondly, when the age and sex ratios of the sample are considered, only a minority of the sacra may not be accounted for as hunting output from the immediate vicinity of Meiendorf.

The representation of the different segments is roughly surveyed in fig. 3 (In order to include the antlers, the MNI value for this element in fig. 8 is based on the reports from 1937 [Gripp 1937, 70; Krause 1937])

In general the meatier carcass segments have an MNI of less than 20. Necks go up to 45, whereas sacra have 71 (69) and antler 57 respectively. The exploitation of the game may be described – or rather imagined – in a little more detail using the age class information.

Exploitation according to age class

Considering the representation of bones from the various carcass segments in relation to age classes a pattern of exploitation can be modelled. This model only describes one way to build up a sample like the excavated Meiendorf material. It does, however, accomodate the found minimum number of each carcass segment, and may when not taken as an exact account at least hint the general trends of the exploitation of the game.

	AD	AD/SA	SA	JU	Total
Mandibula	8		1	1	10
Atlas		41		17	58
Axis	16		14	15	45
3. Cervical vertebra	14		17	14	45
4. Cervical vertebra	12		15	15	42
5. Cervical vertebra	9		14	18	41
6. Cervical vertebra	15		19	17	51
7. Cervical vertebra	6		15	15	36
1. Thoracic vertebra	10		11	12	32
2.-7. Thor. vertebra	7		6	1	14
8.-13. Thor. vertebra	6		7		13
14. Thor. vertebra	5		3	1	9
1.-4. Lumb. vertebra	3		4	3	10
5. Lumb. vertebra	6		8	7	21
Sacrum	39		15	15	69
Costa	5		6	2	13
Sternum		10			10
Scapula		14		2	16
Humerus	9	1	2	2	14
Radius+Ulna	8		5		13
Metacarpus	10		5		15
Pelvis		7		3	10
Femur	7		1		8
Tibia	5		3		8
Calcaneus	4		4		4
Talus		7			7
Metatarsus	6		4		10

Tab. 4 Meiendorf. Reindeer, *Rangifer tarandus*. MNI for skeletal elements present 1990. – Note. Cf. Krause 1937.

According to the recent status, tab 4, a minimum of 69 reindeer: 39 adults, 15 subadults and 15 juveniles, were killed near the site. Of these seven adults, one subadult and three juveniles were probably exploited completely, down to the marrowfracturing level, on the spot. From a further two adults and four subadults, the hindquarters were taken away, but the rest used completely. (The incomplete skeleton is so to speak the reverso of this group, as the hindquarters were taken away, but the rest of the carcass disposed of in whole.)

The very high MNI values for subadult and juvenile sacra are met again at the neck segments. (The slightly higher MNI for juvenile necks [18] against juvenile sacra [15] may be explained partly by the bone loss since 1937, as Krause then counted 18 calf sacra. Minor differences considering the criteria for age determination may however play a role here too). The consequence for this estimation is, that necks and sacra from five or six adults and the rest of the subadults and juveniles were selected and filleted, but all other segments of the carcass taken away.

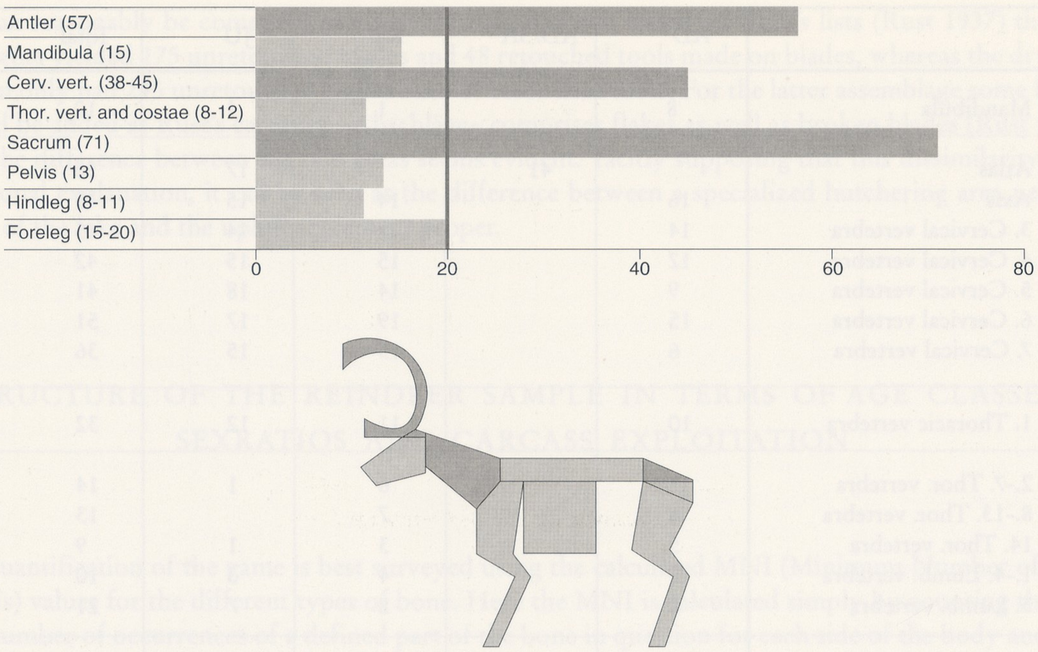

Fig. 3 Meiendorf. Summary of MNI for whole carcass segments (based on Gripp 1937 and Krause 1937).

Left are 23 adult sacra and ten atlas vertebrae from adult (or subadult) reindeer. The latter need some comments as the new status counts 58, but the 1937-reports only reported 45 pieces. First, only a few of these vertebrae were marked. Apparently was on Krause's (later disintegrated) refittings only the second vertebra marked. Second, the new status presented here includes broken pieces, which were not considered in the published tables for Meiendorf (nor later for Stellmoor). The broken atlas fragments account for one extra juvenile and seven adult/subadults. The more correct MNI value for Meiendorf may thus be 45 + 8 = 53 for the atlas. The five pieces in surplus must be a secondary admixture.

It is quite posssible, that a few atlas vertebrae arrived to the site articulated to a cranium as envisaged by Grønnow (Grønnow 1985). One of the special features of the Meiendorf butchering mode is, that not only the first, but also the second cervical vertebrae often bear transversal cutmarks, thus hinting that the severing of the neck not always was precisely between the cranium and the atlas.

Considering Grønnows hypothesis of imported hindlegs from stalking near Meiendorf, this may provide a satisfying explanation for the 23 sacra left, as there are no other bones to prove that whole carcasses have been present near the excavated lakeside dump. On the other hand, whole carcasses may off course have been present here too, but then the bones, apart from the sacra, were not disposed of in the excavated parts of the lakeside dump. As the reindeer antlers treated below hint an artificially distorted sex ratio an addition of selected parts of (large male) carcasses does seem the more plausible idea.

Recapitulating the account, the reindeer sample can be interpreted as representing kills from the immediate vicinity of the lakeside of app. 45 reindeer, equally taken from the three age classes. On top of this, choice segments (antlers and hindquarters) of app. 25 adult (or subadult) reindeer can be interpreted as representing hunting at some transport distance from the site.

From the total amount of game only a fraction can be demonstrated to have been consumed locally, say the equivalent of some 20 reindeer. It may be noted, that the segment types necks and sacra predominantly selected for local consumption, – in addition to some whole carcasses – are the pieces less suitable for conservation by drying.

A. Fragments

	Adult		Subadult		Adult/Subad.		Juvenile	
	sin	dx	sin	dx	sin	dx	sin	dx
Male.								
uncompact	–	–	1	2	–	–	–	–
compact	8	5	3	8	–	–	–	–
shed	4	1	–	–	–	–	–	–
Female.								
uncompact	–	1	–	–	–	–	–	–
compact	7	7	3	4	–	5	–	–
Unknown.								
uncompact	–	–	–	–	1	–	–	–
compact	–	–	–	–	5	6	1	3

B. Minimum number of individuals.

	Adult	Subadult	Adult/Subad	Juvenile
Male	8	8	–	–
Female	7	4	5	–
Unknown	–	–	6	3

C. After Gripp 1937, p. 70

	sin	dx	sum:
Juvenile	10	6	16
Female	15	15	30
Male	21	14	35
Indeterm.	12	8	20
Sum:	58	43	101 (+ 4 shed antlers)

Tab. 5 Meiendorf. Reindeer antlers (comprising antler base) present 1990 (Archäologisches Landesmuseum Schleswig). N: 75. Gripp 1937 includes 2 shed antlers in this table, and notes the presence of 4 antlers more.

Antlers and sexratios

The difficulties in age and sex determination from antlers especially for subadult reindeer are well known. The numbers reported in tab. 5 are thus no more than fair estimates.

Following Gripp's estimates (Gripp 1937, 70) a total of 57 killed reindeer are represented by antlers. To this come six shed antlers. The older age classes are not detailed out by Gripp, but it may be assumed that the definite males and females are adults or older subadults, and the indetermined category mainly comprises the subadults. In this case, the 57 individuals are 35 adults (app. 20 bulls and 15 cows), 12 subadults (indet.) and 10 juveniles (indet.). When compared to the highest MNI-values from the bones a notable concordance is seen. The sacra present documented 39 adults, 15 subadults and 15 juveniles (The values reported earlier by Krause are slightly different: 32 adult, 22 subadults and 18 juveniles [Krause 1937]).

The main difference between the MNI for antler and for bones is thus found for juveniles, i. e. an age group where the antlers are very small or not developed at all. It should thus be possible to regard the sex ratio of the antlers as fairly representative of the game processed at the site, and not greatly distorted by secondary selective raw material management.

The sex ratio, bulls to cows, is – based on antler from the adult and older subadult reindeer – app. 1:1 in the recent count, and based on Gripps numbers app. 1,3:1.

In recent populations an equal sex ratio would be regarded highly unusual. The reported ratios for Greenland caribous are f. ex. 1:2, and populations suffering stronger sport hunting pressure, like the reindeer in South Norway, often show even lower percentages of adult bulls. An exception is the preserved Spitzbergen reindeer, where at least one of the studied groups (Reindalen) had a sex ratio of 43:57, or quite close to 1:1 (Meldgaard 1983; Skogland 1989).

If the surplus of sacra and atlas vertebrae from adult reindeer mentioned above really represents selected segments from nearby kills, this might help to explain the sex ratio of 1:1, when it is assumed that not only meat, but also antler from adult bulls was imported for further processing.

The little surplus of first cervical vertebrae over the rest could then be seen as the remains of segments comprising antlers, cranium and first vertebrae of bulls. A moderate contribution of this size should be enough to bring the sex ratio up on 1:1 (or 1,3:1), and – as the majority of antlers have been worked – represents a supplement of the most prized raw material. It may be mentioned that the shed antlers reported by Gripp all had been worked (Gripp 1937).

It remains an open question, whether the extra bulls were hunted selectively, or represent the only visible fraction of a mixed kill. It is, however, quite conceivable that hunting drives resulting in the basic mixed (with regard to age and sex) sample were supplemented by hunting by stalking and antler collecting from recognizance trips in the surrounding territory.

Seasonality and curation of artefact material

Regarding the season of settlement at Meiendorf the reindeer material delivers the most obvious clues. With the possible exception of one or two small vertebrae, all bones from juveniles are of a size and in a state of bone fusion(s) consistent with large autumn yearlings. The importance of the mentioned small vertebrae should at present not be overstated, as the exact range of variation in the skeletal development of reindeer calves is little known.

The antlers are mainly unshed and compact. A few mostly subadult ones seem not to be fully compacted, and some bull antlers had been shed. The small spikes from yearlings are of the expected »first autumn« size. Considering the male antlers, the recorded types, i. e. not thoroughly compacted subadult, compact adult, and cast adult, may well be found within a relatively short span of time in the autumn, more precisely in September-Oktober around the rut.

The degree of exploitation of the antler material can only be detailed for the still present sample (tab. 6). The primary target was the strong, and mostly fairly straight, anterior side on the lower half of the antler beam. Using two parallelly cut grooves and a series of small bone or antler pegs, the massive part of the blank was first cut free, then leavered out of the antler (Taf. 55, 1-2; Rust 1937) On large bull antlers the grooves were extended up under the beginning of the crown. On the smaller antlers (female or indeterminate) are often found a single groove or a pair of unfinished parallel grooves, but with no blanks removed. Most probably these pieces represent tested, but insufficient, i e. too thin, and thus rejected antler material.

The big antlers from adult bulls are the most commonly worked specimens: of ten unshed antlers five had scars from removed blanks, one had been ringed above the bez tine, and all five cast antlers had scars from blank removal (tab. 6). The archaeological material comprises a small sample of antler points and some unfinished pieces (Rust 1937 Taf. 38), but not an amount of worked material nearly equalling the scars on the antlers.

Reindeer versus swan hunting

The season of hunting indicated by the reindeer is in some conflict with the bird material. Focusing on the whooper swan, the presence of this bird inland, in the middle of the Late Glacial continent, in the autumn – and apparently not in small numbers – needs some explanation.

	Adult			Subadult			Adult/subadult		
	S	G	/	S	G	/	S	G	/
Male.									
uncompact	–	–	–	–	–	3	–	–	–
compact	9+	2	2	–	2	8	–	–	–
shed	5*	–	–	–	–	–	–	–	–
Female.									
uncompact	–	–	–	–	–	–	–	–	–
compact	2	7	5	–	3	2	–	2	3
Unknown.									
uncompact.	–	–	–	–	–	–	–	–	1
compact	–	–	–	–	–	–	2	2	7

Tab. 6 Meiendorf. Worked antler. – S: scar from removed blank; * incl. 1 ringed piece; + incl. 2 ringed pieces; G: unfinished groove; / no traces of working.

The annual cycle of modern whooper swans consists, generally speaking, of a summer breeding season spent inland in the tundra near clear lakes and a wintering period passed on the large rivers and – depending on ice conditions – later at the sea shores. After the breeding season adult and young birds moult in their inland quarters, and are thus unable to fly for several weeks in the late summer, mainly from late July till the beginning of September. After moulting they leave for the winter quarters not to return inland until the following spring (Cramp 1978).

The greylag geese today have a patchy distribution over the west Palaearctic due to a dependence on a combination of secure aquatic and open grassland habitats. The breeding area for greylag geese thus includes arctic tundra as well as boreal and temperate habitats. The present scandinavian populations tend to leave the breeding habitats in mid-September to winter in mild climates. Adult birds moult post-breeding and depending on range the moult may start as early as mid-May, the main moulting period being mid-July to mid-August (Cramp 1978).

In contrast barnacle geese have a marked preference for arctic breeding habitats and oceanic conditions. Nests are usually found less than 1 km. from the sea and preferably on inaccessible sites on precipices or islands. The wintering areas today are mainly coastal lowlands providing suitable grazing. The migrations from the arctic breeding areas start in late August or the beginning of September and may include passages overland. The adult birds moult shortly after the breeding season usually in the period mid-July to mid-August (Cramp 1978).

If the Late Glacial barnacle geese had a similar strong preference for oceanic breeding habitats as the recent birds, a find as far inland as Meiendorf in the Ahrensburgian tunnel valley is surprising. Possibly their presence could have been restricted to stopovers during overland migrations.

Concerning the whooper swans and greylag geese which certainly were hunted by the Hamburgians this possibility seems far less likely as the lake systems in the Ahrensburgian tunnel valley bear strong resemblance to their modern summer quarters, which are left for riverine or coastal habitats after moulting in August. The timing of the reindeer hunting to September-Oktober accordingly does not agree with the idea of swan hunting from the same sites.

Remembering that these big birds, with the exception of an MNI of one young swan and possibly one young goose, were only represented in the Meiendorf sample by wing bone blanks or used artefacts, the

	Meiendorf	Stellmoor AbH
1. Local hunting:	reindeer	reindeer
	horse (?)	–
	grouse	grouse
	hare	hare
	red fox, wolwerine	souslik (?)
	whooper swan (MNI: 1),	–
	geese (MNI: 1	geese (MNI: 1-2)
	other birds (?)	other birds (?)
2. Imported:	whooper swan (MNI: 5, or more)	whooper swan (MNI: 1)
	geese (MNI: 4, or more)	geese (MNI: 2)
	–	whitetailed eagle (MNI: 1)
	horse (?)	–
3. Natural background:	desman	–
	–	lemming
	–	souslik (?)
	aquatic birds (?)	aquatic birds (?)
	–	(fishes (?)

Tab. 7 Species exploitation at Meiendorf and Stellmoor AbH.

idea of curated raw material lies close at hand. The only question is from where the bones came. Theoretically, the blanks could have been curated from the previous year from the hunting of wintering swans in the nearby Elbe valley.

A more simple explanation would, however, be to hypothesize an inland (tunnel valley) site settled about a month earlier than Meiendorf. In this case the hunters could have taken advantage of the flightless moulting period of the birds. At the same time this could account for the presence of younger birds in the material.

If the horse bones do not represent a local kill, they may have brought to Meiendorf from the same hypothetical site, in the shape of imported provisions for the time before the reindeer hunting started.

When the faunal assemblages from Meiendorf and (the admittedly less reliable) Stellmoor AbH are tentatively split into taphonomical units according to the interpretations presented here, at least three elements must be considered: the natural background, imported material and local hunting, tab. 7. In the last unit may even be included an exported or cached subunit, as most of the reindeer meat and good antler material has been extracted from the samples.

Species present:	N	N	MNI		Modifications on N		
	present	lost	(all)		none	cutmark	blank
artefact							
Souslik: *Spermophilus superciliosus*	1	–	1	1	–	–	–
Whooper swan: *Cygnus cygnus*	2	1	1	–	–	1	1
Bean Goose: *Anser fabilis*	1	–	1	–	–	1	–
White-fronted Goose: *Anser albifrons*	1	–	1	–	1	–	–
Pink-footed Goose: *Anser brachyrh.*	1	–	1	1	–	–	–
Grey Lag Goose: *Anser ?anser*	1	–	1	–	–	–	1
Dunlin: *Calidris alpina*	1	–	1	1	–	–	–
Grouse: *Lagopus lagopus*	3	–	1	3	–	–	–
White tailed Eagle: *Haliaeetus albic.* *broken artefact or blank?	2	–	1	1*	–	–	1

	N lost	MNI
Hare unid.: *Lepus sp.*	3	(1)
Lemming: *Lemmus lemmus*	1	(1)
Anatinae	3	(1)

Tab. 8 Stellmoor AbH. Birds and mammals present 1990, excl. reindeer, *Rangifer tarandus.*

STELLMOOR AbH AND POGGENWISCH PARALLELS

Despite its probable contamination with later material the Hamburgian sample from Stellmoor, Stellmoor AbH, tab. 8-10, still seems to reflect the same general pattern as Meiendorf, when subjected to the criteria used in the case study above.

Other species than reindeer are rare, but again in Stellmoor AbH grouse and hare are seen, these species and a few of the geese may have been hunted locally.

Regarding blanks and artefacts the same curation and discard modes are encountered. Wing bones from large birds, whooper swan, geese and whitetailed eagle, are found showing heavy use wear as well as still in the shape of blanks (tab. 3 and 8).

	AD	AD/SA	SA	JU	Total
Mandibula		7		2	9
Atlas		34		4	38
Axis	19		11	5	35
3. Cerv. vertebra	12		19	9	40
4. Cerv. vertebra	11		17	3	31
5. Cerv. vertebra	10		19	6	35
6. Cerv. vertebra	15		23	4	42
7. Cerv. vertebra	5		19	3	27
1. Thor. vertebra	4		12	1	17
2.-14. Thor. vertebra	6		9	1	16
1.-14. Lumb. vertebra	10		10	1	21
5. Lumb. vertebra	14		4	2	20
Sacrum	27		6	4	37
Costa		6			6
Sternum		9			9
Scapula		17		5	22
Humerus	2		7	1	11
Radius + Ulna	2	3	7	4	16
Metacarpus	6	2	3	2	13
Pelvis		12		3	15
Femur	6		3		9
Tibia	3		4	2	9
Calcaneus	2		4		6
Talus		3			
Metatarsus	3	1	2	2	8

Tab. 9 Stellmoor AbH. Reindeer, *Rangifer tarandus*. MNI for skeletal elements present 1990. – Note. Cf. Kollau 1943.

The bird species not encountered in Meiendorf: bean goose, whitefronted and pinkfooted goose and whitetailed eagle all comprise races or populations today inhabiting tundra environments in the summer. Some taiga breeding populations of the polytypic bean goose may spend some time in the tundra after moulting, but in general all the mentioned geese species leave after the post-breeding moulting in July-August. White-tailed eagles breeding in the tundra are migratory as well, young birds departing in September and the adults about a month earlier (Cramp 1978).

Considering the reindeer material the general MNI values, tab. 9, just as in Meiendorf suggest an extraction of the meatier segments for use elsewhere, and a local consumption directed more towards the leaner parts. The overrepresentation of sacra is, however, not seen, and the MNI values for cervical vertebrae (28-41) and antler (27) may suggest a smaller hunting output. The MNI values from meatier segments (thoracic and lumbar vertebrae 14-23, scapula 19) just as in Meiendorf indicate a local consumption limited to the equivalent of app. 20 reindeer.

Again, the discarded antlers in the Stellmoor AbH material often show scars from the extraction of blanks.

In Poggenwisch the very limited faunal sample (tab.11-13) hints the characteristic elements of the Meiendorf economy: for the reindeer bones cervical vertebrae are dominant, from the antlers blanks

A. Number of fragments	Adult		Subadult		Adult/subad.		Juvenile	
	sin	dx	sin	dx	sin	dx	sin	dx
Male.								
uncompact	–	–	–	–	–	–	–	–
compact	5	3	–	–	–	–	–	–
shed	–	–	–	–	–	1	–	–
Female.								
uncompact	–	–	–	–	–	–	–	–
compact	14	11	–	–	–	–	–	–
Unknown.								
unknown	–	–	–	–	–	–	–	–
compact	5	1	–	–	–	–	2	3

Tab. 10 Stellmoor AbH. Reindeer antlers (comprising antler base) present 1990 (Archäologisches Landesmuseum, Schleswig). N: 45.

	Adult			Subadult			Adult/Subadult.		
	S	G	/	S	G	/	S	G	/
Male.									
uncompact	–	–	–	–	–	–	–	–	–
compact	7	1	–	–	–	–	–	–	–
shed	–	–	–	–	–	1	–	–	–
Female.									
uncompact	–	–	–	–	–	–	–	–	–
compact	–	6	19	–	–	–	–	–	–
Unknown.									
uncompact	–	–	–	–	–	–	–	–	–
compact	–	1	5	–	–	–	–	–	–

Tab. 11 Stellmoor AbH. Worked antler. – S: scar from removed blank; G: unfinished groove; / no traces of working.

have been extracted, and from whooper swans a humerus artefact as well as some fragmented wing bones are present (Herre and Requate 1958).

Interpreting the samples from the Ahrensburgian tunnel valley

The faunal samples presented here may of course have accumulated from several years use of the same lakeside dumps, but considering the size and the exceptional frequencies of refitting the author tends to consider the excavated Meiendorf, Stellmoor AbH and Poggenwisch samples representative of single occupational seasons, if, however, with a widely differing degree of preservation from site to site.
Regarding Meiendorf the site (Md.2) excavated uphill from the kill and butchering area most probably represents a corresponding settlement. Due to the very large artefact sample recovered the possibility of

Species	N		N	MNI	Modifications on N		
	present	lost	(all)	none	cutmark	blank	artefakt
Whooper swan: *Cygnus cygnus*	3	?	2	2	–	–	1
Grouse: *Lagopus lagopus*	2	?	1	2	–	–	–
	N lost	MNI					
Souslik: *Spermophilus superciliosus*	1?	1?					
Polecat: *Mustela putorius*	2?	1?					
NB. 1 worked ulna of goose, Anser sp. found 1990. Not recorded by Herre and Requate 1958.							

Tab. 12 Poggenwisch. Birds and mammals present 1990 excl. reindeer, *Rangifer tarandus*. NB. No specified list of the number of fragments has been published, cf. Herre and Requate 1958.

a prolonged use phase, perhaps by repeated seasonal occupations of the kind reflected in the faunal sample from the lake side dump, should be considered.

In tab. 14, the interpretation presented here of the faunal assemblages from Meiendorf, Stellmoor AbH and Poggenwisch is summarized. The sites are seen as temporary stops on the seasonal round, on the way from – and to – somewhere else. The majority of the waste on the sites reflects the limited local hunting pattern, but significant elements show previous hunting practices or foreshadow life on the coming settlement.

To spell out the tale about Meiendorf: Once upon a time in late summer an unknown site in the tunnel valley is settled. Flightless swans and geese are hunted, and perhaps one or two horses killed too. The wing bones are curated (and one may imagine feathers for the weapons as well), and brought to Meiendorf in September. Here the reindeer hunting takes place, probably as hunting drives supplemented by selective stalking resulting in a total bag of about 70 reindeer. In addition grouse and hares are trapped. On the site only the equivalent of some 20 reindeer is consumed, and the meatier segments selectively brought away. Reindeer antler blanks are procured and brought away. The bird bone artefacts as well as the unused blanks are discarded.

The next question is of course where the reindeer meat went. This needs not to be any greater distance than the settlement site uphill from the lake side dump. A store of about 50 reindeer could make a prolonged settlement well into the winter possible, an idea which would be in keeping with the large, tool dominated flint inventory found here[2].

In that case, however, one would like to trace more complete reindeer carcasses in the lakeside midden

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[2] Given the number of app. 20 reindeer consumed locally, and presuming this represents one seasonal settlement, it should be allowed to try an estimate of the number of people involved in the hunting. Whether or not the rest of the ressources were used later on the site or from someplace else this could hint the initial group size. For such estimates the ethnographically reported minimum of 25 reindeer needed pr. person pr. year for hunters solely dependent on reindeer can be applied as a rule of thumb. During an estimated hunting season of – for the sake of convenience – one month, two reindeer pr. person should then be the necessary minimum. For Meiendorf a fair estimate would thus be about ten persons, or two-three families. It is of course presumed that the assemblage represents a single occupational season – and everyone is free to suggest other values for the variables. An interesting detail is, however, that a group of people this size could be supported by 50 stored reindeer only until midwinter.

	AD	AD/SA	SA	JU	Total
Atlas		6		6	12
Axis			6	5	11
3. Cerv. vertebra	1	1	4	7	13
4. Cerv. vertebra	1	1	7	6	15
5. Cerv. vertebra		2	5	4	11
6. Cerv. vertebra	1	1	4	6	12
7. Cerv. vertebra		1	2	4	7
1.-14. Thor. vertebra	3	14	3		4
1.-4. Lumb. vertebra	4	1			2
5. Lumb. vertebra				1	1
Costa		2			2
Scapula		1			1
Metacarpus		1			1
Pelvis		2		1	3
Tibia		1			1
Calcaneus		1			1
Talus		1			1
Metacarsus		1			1

Taf. 13 Poggenwisch. Reindeer, *Rangifer tarandus*. MNI for skeletal elements present 1990. Note. Cf. Herre and Requate 1958.

A. Number of fragments.	Adult		Subadult		Adult/subad.		Juvenile	
	sin	dx	sin	dx	sin	dx	sin	dx
Male.								
uncompact	–	–	–	–	–	–	-	–
compact	1	1	2	–	–	–	–	–
shed	–	–	–	–	–	–	–	–

Tab. 14 Poggenwisch. Reindeer antlers (comprising antler base) present 1990, Archäologisches Landesmuseum Schleswig. N: 4.

B. Worked antler.	Adult			Subadult			Adult/subadult		
	S	G	/	S	G	/	S	G	/
Male.									
uncompact	–	–	–	–	–	–	–	–	–
compact	1	–	–	2	–	–	–	–	–
shed	–	–	–	–	–	–	–	–	–

Tab. 15 Poggenwisch. Reindeer antlers. Worked antler. S: scar from removed blank; G: unfinished groove; / no traces of working.

range:			Ahrensburg tunnelvalley			?
camp:	?	?	site x	Meiendorf and Stellmoor AbH Poggenwisch	site x?	
import:	?	?	----------► artefacts		----------► meat	
hunting: (species ident.)	?	?	swans geese horse?	reindeer hare grouse horse?	?	?
season:	spring	early summer	late summer	autumn	early winter	late winter

Tab. 16 Hamburgian hunting economy.

than only 20, or must be obliged to conclude that this was not the only dump ever used by the Meiendorf settlement.

The rigorous extraction of antler blanks rather than storage of whole antlers may indicate that the hunters wished to leave the site carrying as little ballast as possible. The deposition of apparently undamaged artefacts could point in the same direction. Another possibility is thus that the meat stores were cached locally, and later exploited from a winter settlement not identical to any of the tunnel valley sites.

The Hamburgian and the Late Magdalenian hunting economy

One of the more unpleasant consequences of the interpretation sketched above is the implicit statement, that the Hamburgian economy is barely known but for a few months in the autumn (plus some summer or winter practices to be imagined): for more than two thirds of the year darkness rules. And even this limited spotlight may not be on »the Hamburgian« economy, but on a single procurement pattern among several others.

Returning to the North German assemblages the proposed splitting of the faunal samples (tab. 7) brought forward a group of locally (or presumably so) hunted species. It repeated the combination of game commonly encountered in Late Magdalenian assemblages: reindeer and horse, supplemented with grouse and hare.

Due to the seasonally restricted nature of the North German samples, the alledged reindeer specialization of the Hamburgian hunters may be regarded a grave oversimplification. Exactly which other resources were important in the seasonal round is at present not indicated by facts. But, before descending into pure fiction – or despair – it should be allowed to consider the hints inherent in the species found at Meiendorf apart from reindeer, and in the strong cultural links between the Hamburgian and the Magdalenian universe, fig. 4.

A rewiev of some of the most important and geographically closest Magdalenian faunal asssemblages – slightly older or contemporary with the Hamburgian sites – may serve as a starting point.

In the Petersfels (P1 AH3) assemblage reindeer dominates with an MNI of 25, based on 1453 fragments (or app. 70% of the identified bones). A 185 fragments from horse document at least two individuals. A few bones from red deer, chamois, ibex and a large bovid were recorded too. Hares are rather common, with 1266 fragment providing an MNI of 8. Bird bones are sparse, but grouse the most often identified species.

Fig. 4 Hamburgian and Magdalenian territories in Northern and Central Europe (after Breest and Veil 1991 with additions). – On the simplified, modern map is indicated with a *wavy line*: the approx. southwestern border of the Fenno-Scandinavian ice-cap, and with a *simple line*: the approx. northern coastline in the first half of the 13. millenium BP. The Hamburgian territory is marked in a *light shade, black dots* show the known sites. The northern extent of the Magdalenian territory is shown in a *dark shade.* An *open circle* marks the site Schweskau in the hypothetical border zone (*medium shade*) between the major territories.

The seasonal evidence is restricted to reindeer jaws and antler, here indicating late summer-fall hunting. Another Petersfels horizon (P1, AH4) had antler remains indicating spring hunting (Albrecht 1983 et al.). Due to the distribution of the bones from reindeer in the settlement area of P1 AH3 several occupations are considered likely, and the seasonal timing based on reindeer remains may not necessarily apply for the horse hunting (Berke 1983).

Considering the integrity of the faunal assemblages from the different layers of Teufelsbrücke a few critical comments may be warranted. The deepest cultural layer 2 and the basal horizon, layer 1, show a very limited species list: horse, reindeer and saiga with fairly equal MNI's of two-three individuals (if the MNI values from both layers are summed one or two more of each species may be added). In the basal layer bone from juvenile horses and »very young« reindeer are recorded. In layer 2 the »very young« reindeer remains are mentioned as »relatively common«. In addition to horse and reindeer, bones from a large bovid, hares, foxes and a grouse are recorded (Musil 1980).

The richest cultural layer is the following layer 3. A variety of bird species are represented, which among others include mute swan and pheasant. Together with a roe deer bone these species show an admixture of Post Glacial material in the sample. Presumably, however, the remains of the same cold species as recorded in the lower layers belong to the Magdalenian occupation. In layer 3 horse dominates with an

MNI value of 17, over reindeer, MNI of 5, and saiga, MNI 1. Hares are common, MNI 23, foxes, bear and grouse present as well. Juvenile horses (»foals«) and young hares are recorded. Concerning the reindeer, antler is generally scarce, but bone remains »from all age classes« (?!) are taken as indication of hunting during the whole year (Musil 1980).

In Kniegrotte the stratigraphical position of the faunal remains from (too) early excavations had to be reconstructed, but most of the material is considered to be from the Magdalenian cultural layer (Musil 1974). Generally speaking, horse dominates among the larger species. Reindeer is not common, and mainly represented by antler remains, including several cast antlers from two-three year old animals. Bones from juveniles are present. A few bones of saiga completes the list (Musil 1974).

According to Berke could an unshed male antler and some unshed antlers from young reindeer possibly indicate autumn hunting. Bones from horse fetuses, about 230-300 days old, are more explicit, indicating hunting in late winter, i. e. January-February (Berke 1989).

The famous Gönnersdorf complex has delivered a rather meagre bone assemblage, by far dominated by fox bones (1400, or an MNI of 30 snow foxes and three red foxes.). The next common species is horse with an MNI of 13 based on 500 fragments, predominantly teeth. Reindeer (MNI 4, from 180 fragments) is less common than hare (MNI seven from 300 fragments). Also present are bison and saiga (Poplin 1976).

The horse remains comprise juvenile bones from young foals killed in summer, as well as bones from late winter fetuses. The two age groups are, however, related to different occupational subunits. (Poplin 1976; Bosinski 1987).

Some massacred male reindeer antler and larger amounts of shed male antler in Gönnersdorf (Street 1993) may be considered supportive evidence for a winter occupation.

Andernach-Martinsberg has in the recent years been excavated and analysed by Martin Street (Street 1993). In many aspects of the archaeological inventory from the Magdalenian occupational level similarities to the neighbouring Gönnersdorf are found. Like in Gönnersdorf, several occupational subunits or concentrations could be identified. If, however, the faunal assemblage is seen in toto, horse is the dominant species: 2.188 identified pieces making up almost the half of all fragments recovered, and supplying an MNI of twelve individuals. Reindeer comes in second with 515 fragments, the majority being antler fragments and incisors from ornaments. The latter gives the MNI of eight, which, however, cannot be taken at face value as the number of locally killed reindeer. The MNI of three based on molar dentition is considered the more reliable figure. Other species commonly taken are arctic fox, MNI seven, and hare, MNI two. Birds are relatively rare, but bones from grouse, raven and unspecified geese were identified (Street 1993).

Considering the season of occupation foetal bones from horse place at least two subunits, the Concentration I and III, in the winter. Aged milk teeth from horse might indicate construction or renewal of the structures in late autumn or early winter (Street 1993). Again shed male reindeer antler is suggestive of winter occupations.

In his analysis of the Andernach-Martinsberg assemblages Street points out the possibility of an association between this settlement and hypothetical sites seasonally spezialised in reindeer hunting. The incisor ornaments found in Andernach show that reindeer had been killed previously at another location, and are thus indirect evidence of what could be a very important part of the annual round (Street 1993).

A larger sample of faunal material from the classic site Schussenquelle has been surveyed by Schuler (Schuler 1991). Unfortunately the very comprehensive material was collected unsystematically in the last century and from the beginning spread over several collections. The general impression is, however, of a spezialised reindeer kill site. The sample surveyed by Schuler comprised 141 antler fragments (early reports mentioned 400-500 pieces). Of the fragments with antler base, 89,5% or 68 pieces were from massacred reindeer, representing young animals as well as adult males and females. The MNI from antlers, 34, correspond by and large to the MNI from the vertebrae, ranging from 21 from thoracic vertebrae to 41 for the second cervical vertebrae. Apart from reindeer the collection included 15 fragments from horse (MNI three), and a few bones each from several other species of animals. The bird material comprises fragments identified as whooper swan. Bones from different part of the skeleton were found, including worked and ornamented wing bones.

The seasonal determination of the antler material indicates a spring hunting season, as well as late summer/early autumn kills. Hunting in the latter period could be supported by dental evidence (Schuler 1991).

The Pincevent assemblage (section 36) excavated and published by Leroi-Gourhan is dominated by reindeer as the single most important game animal. Using the combined tabulations of aged toothrows the MNI for reindeer can be calculated to 43 individuals (David 1972). A detailed determination of age at death based on tooth eruption and -wear shows marked peaks for late spring and autumn respectively (Leroi-Gourhan 1972 fig. 90). The autumn hunting season is supported by the presence of massacred male antlers. An examination by Gordon of incremental lines in a sample of reindeer teeth supported the spring hunting season, but failed to demonstrate late summer or autumn kills (Gordon 1988).

Besides the reindeer remains, bones from hare, wolf and horse are found in small numbers (Leroi-Gourhan et al. 1972).

Another assemblage dominated by reindeer is Verberie, with a preliminary MNI of 24 reindeer but no other large mammals reported. The analysis of tooth wear indicates autumn kills (Audouze and Enloe 1991).

The seasonal and faunal evidence from this small selection of sites from the northern border of the Magdalenian territory suggests a differentiation of horse versus reindeer hunting over the year. For Teufelsbrück the safest seasonal indicator, the young foals, would place this horse dominated sample in the summer. All evidence from Kniegrotte, again horse dominated, could be accomodated within a winter and esp. a late winter occupation season. In Gönnersdorf the less than optimal conditions for bone preservation turn estimates of species frequencies into risky guesses. By all means, however, the horse hunting evidence indicates winter respectively summer occupations. In Andernach the safest seasonal evidence point to a winter settlement with horse as the most often hunted game.

In contrast hereto the samples dominated by reindeer: Petersfels, Schussenquelle, Pincevent and Verberie have indications of a fall hunting season, and Schussenquelle and Pincevent of a spring hunting season as well.

This survey does of course not aim at a thorough description of the Late Magdalenian economy or settlement system. Nor does it pretend to be an exhaustive account of all possibly useful faunal information. The survey is intentionally limited to sites bordering the northern Lowlands and presenting samples large enough to indicate which (if any) of the larger meat species could have been preferentially exploited from the site. And where the remains of these species themselves delivered the relevant data for a determination of the hunting season.

Although the antlers may make it comparatively easy to place reindeer, rather than the horses, in the fall or spring season, it must be remembered that the majority of the seasonal indicators quoted above for both species are based on or strongly supported by the evaluation of tooth wear stages, or the age of fetuses or young animals, evidence which should have a fairly equal chance of preservation for both species. From a methodological point of view a greater problem is that the seasonal determination in many cases must be based on far too few fragments.

With these reservations in mind this survey of the Magdalenian evidence apparently indicates explicit seasonal priorities: reindeer for the fall and spring hunting, and horse in the winter and summer, fig. 5.

The motivation for this seasonal change in procurement activities can so far only be conjectured. One of the greater obstacles for serious hypotheses is the very limited ethnohistorical evidence concerning hunting of wild horse, this being mainly the story of decimation down to the level of near extinction of the eastern eurasian populations during the last centuries. Sources describing stable exploitation patterns for reindeer (or caribou) or even details of the hunting strategy are by comparison bountiful and may thus indirectly prompt an undue focus on the reindeer facies of the prehistoric hunting economies.

The faunal composition of the quoted Magdalenian sites may show a seasonal preference for reindeer in

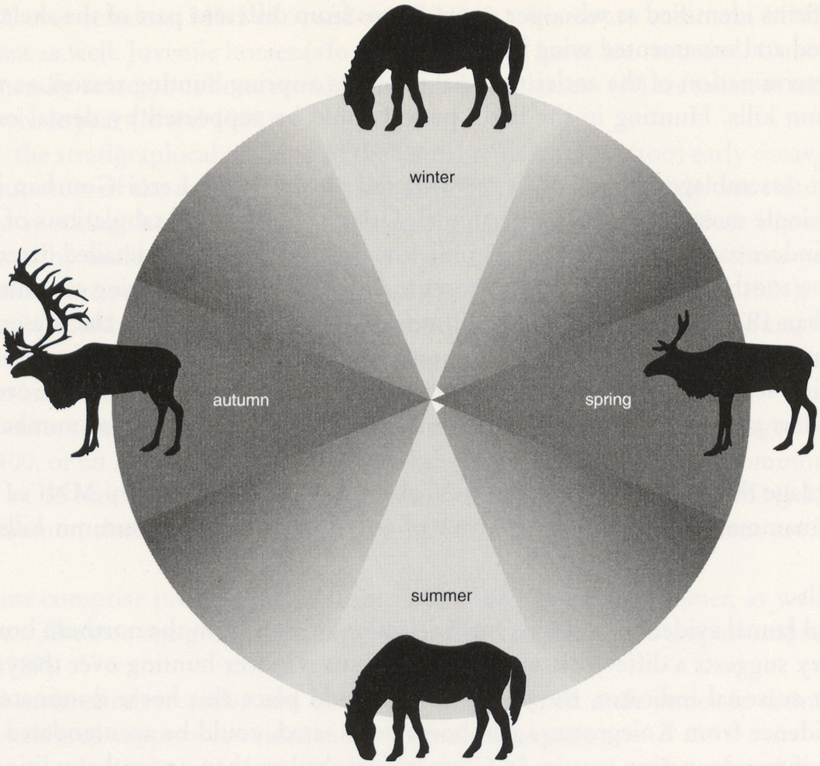

Fig. 5 Model of Magdalenian annual cycle.

the fall or spring but, with the possible exception of Verberie not an exclusive reliance on this species. In Pincevent and Petersfels a few horses (and in Petersfels a large bovid) entered the assemblage too. This may of course indicate a prolonged stay, but it could just as well mean that the inhabitants did not go about hunting in a mechanistic way. Even if the primary objective of a settlement was the harvesting of reindeer other game might still be added when available.

The horse dominated sites surveyed here apparently have a less specific targetting on a single species. Here reindeer, saiga or bison may be encountered in numbers suggesting more than chance supplements. It may be tentatively suggested that primarily the reindeer were taken in seasonal drives on large herds. The horse dominated, but often varied, assemblages could then be interpreted as accumulations of a more normal stalking mode of hunting, possibly augmented by drives on horse bands.

In this connection one may mention the fauna recovered from Maszycka cave. This assemblage is earlier, Magdalenian III, than the ones under discussion here, but represents for its time an expansion too into northeastern territories. When illustrated by rigorous MNI counts the game species found in fairly equal numbers were: horse, reindeer, saiga – and wooly rhinoceros (Lasota-Moskalewska 1993), thus opening for the suspicion that communal hunting may not have been restricted to drives on herds or bands of game animals.

Considering the archaeological evidence the connection between the Hamburgian and the Magdalenian culture is well established (Burdukiewicz 1985; Breest and Veil 1991).

Regarding the hunting equipment proper typological precursors (or similis) for both the antler and flint points of the Hamburgian are present in the Central European inventories.

As pointed out by Breest and Veil shouldered or backed points always occur along with backed bladelets in the Magdalenian assemblages, and conversely the lack of backed bladelets in the northern lowland complexes should be regarded one of the essential differences to the Magdalenian (Breest and Veil 1991).

The Hamburgian reindeer hunting mode

The hunting lesions from the Hamburgian bone material have been treated in some detail elsewhere (Bratlund 1990). As one additional fracture in a vertebra from Meiendorf (Taf. 56, 1-2), has been added since, some of the more important points may, however, be shortly summarized here.

The new specimen fits well into the previously known sample of ten hunting lesions, five from Meiendorf and five from Stellmoor AbH. As the majority of these it represents a shot with a flinttipped arrow or spear hitting one of the neck vertebrae, i. e. the sixth cervical vertebra. The shot has come straight from the left and left only splintered fragments of the flint arrowhead in the bone[3]. On impact the arrow has cut across the anterior part of the corpus under the vertebra. This should be regarded an immediately fatal wound, as the major arteries running just below the vertebrae must have been damaged. Even though lesions like this from the hunters point of view may be regarded highly successful, the prevalence of hunting lesions in neck vertebrae should rather be seen in the light of the general composition of the bone samples.

The five, resp. six lesions with embedded fragments of the flint point are no doubt only a fraction of the bone fractures caused by hunting weapons in the two samples. But they are the only ones, which can be proved. Due to the brittleness of flint a point is often damaged on impact in bone, whereby the range of breakage may reach from crushing the point to a simple snap fracture.

The wellknown lesion from Stellmoor AbH published by Rust in 1937 representing an almost complete Hamburgian point embedded in a vertebra is exceptional, Taf. 55,3. In this particular case apparently only the tang was broken. A scanning of the vertebra, Taf. 55,4, does, however, show how the tip of the embedded point has been damaged too. This kind of very small fragments as well as splinters »retouched« off the edges of the arrowpoint are usually the only hard evidence of hunting lesions, and together with the depth and shape of the fracture form quite distinct features.

Contrary to this must weapons like the Hamburgian antler points – being of a tougher material – be expected to leave diagnostic fragments in bone fractures only in very exceptional cases, – a rather depressing fact, as antler points obviously were manufactured on the sites under discussion, and some use damaged specimens even discarded here (Rust 1937 Pl. 38; Rust 1943 Pl. 26.) Rust might thus very well be correct in ascribing some of the fractures in bones from reindeer as well as the ones in the Meiendorf swan sternum[4] to hunting lesions (Rust 1937 Pl. 53; Rust 1943 Pl. 35).

The impact angles found for the hunting lesions with flint remains from Meiendorf and Stellmoor AbH are restricted to shots from positions at about the same level as the reindeer and coming directly from a position to the side or slightly behind the animal, fig. 6. More than half of the recorded shots had not been immediately fatal or severely hindering the reindeer from fleeing, thus necessitating at least one more shot to kill the animal, – and so most probably indicating the presence of more than one active hunter.

The present interpretation tends to see the Hamburgian reindeer hunting at the sites from the tunnel valley as organized ventures, but, probably, still with a strong reliance on stalking rather than a spezialisation in hunting drives (Bratlund 1990).

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[3] Kat. no. Meiendorf 6: Lesion in 6. cervical vertebra, shot most probably coming from the left side, sliding across the ventral sie of the vertebra. H: 270, S: 0, M: 0. Fatal.
Max. length of bone fracture: 11,4 mm.
Max. length of embedded flint: 2,0 mm.

[4] The sternum was published as crane (*Grus grus*) (Krause 1937) It is, however, from whooper swan, *Cygnus cygnus*.

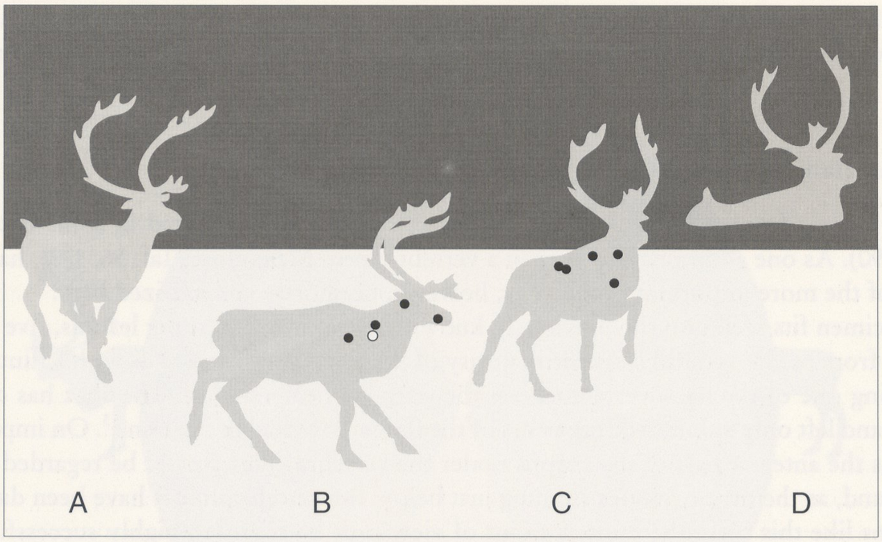

Fig. 6 Position of Lesion Meiendorf 6 (*).

The question which kind of hunting weapons the Hamburgians actually employed is still open to much discussion as only the points of the arrows or spears are known. The use of flinttipped projectiles foreshadows the spezialised archery equipment documented from the Final Palaeolithic, i. e. the Ahrensburgian culture, whereas the rounded single bevelled antler points are firmly settled in the continental spearthrower tradition.

Based on a considerable body of ethnographical, archaeological and experimental evidence U. Stodiek has been able to deliniate the parameters of the spearthrower technique (Stodiek 1993). Focusing on the limitations, the ethnographically known use of spearthrowers was usually connected with long, spearlike types of projectiles, which had to be carried along in one hand, thus restricting the number of possible spearshots per hunter or warrior to three or five. Perhaps more important, due to more complicated mounting and a necessary deposition of the extra spears during stalking, the delay between subsequently fired shots could be considerable (cf. Stodiek 1993).

Furthermore, measured by the precision of the shots the spearthrowers experimentally showed an acceptible share of hits only up to about 20 m distance from the targets, this being in good concordance with the rare ethnohistorical data.

The qualities of the spearthrower equipment against bow-and-arrows are thus primarily to make possible very powerful and damaging shots, but – even within a short range the hunter must accept a fair share of misses and in any case a limited number of possible shots.

On this background the tough antler point (with or without a cutting edge of backed bladelets) seems the logical armature for the spearthrower technology as it should be less prone to serious breakage on hitting hard ground, than are flint points. These, however, have an obvious penetrating ability, which – given a sufficient supply of good flint – could well make up for the inconveniences.

In the Hamburgian hunting practice, the flint points were evidently used as tips of projectiles. Some of the discarded antler points have damaged tips, which indicate their use as weapon too.

It may thus be conjectured, that the flint points show the presence, side by side with the spearthrower-antler point gear, of a more precise weapon with a potentially larger range, namely the bow and arrow. The possibility that the use, or perhaps rather more common use, of the bow and arrow played an important role in the early phase of expansion into the Northern Lowlands of the Late Magdalenian has already been noted by Bosinski (Bosinski 1989).

Besides hunting the procurement of quality flint might well have been a weighty motive for initial recognizance trips into the Northern Plains.

The unique Late Glacial combination of abundant game and abundant ressources of raw material in the Plains and a hunting gear, which made the hunters less dependent on topographical obstacles in their strategy, may thus together form the rationale behind the Late Magdalenian expansion into the northern and northwestern Lowlands and in consequence of the emergence of the Hamburgian culture.

Dating and Radiocarbon problems

The evolution of the Late Glacial environment is still a much discussed subject, esp. when the question of chronologically relevant subdivisions comes up. One of the main problems in this respect lies in the difficulties of long distance correlation of ecological events or horizons as the growing body of palynological or faunistic investigations increasingly underlines the importance of variables like topography, soil development, drainage ect. on the local imprint of even the major climatic changes. An annoying, but eventually self-inflicted, problem regards terminology as a conceptual stretching of existing termini defined for one region (f. ex. Bølling) may occur when used in the description of neighbouring regions, and thus complicate rather than help in the search for a general conceptual framework.

The major five part subdivision of the Late Glacial in South Scandinavia rests on the palynologically defined phases of Iversen (Iversen 1954), where Dryas I (Oldest Dryas) designates the initial vegetational evolution in the recently deglaciated areas up til the first optimum, Bølling, defined by a rise in the Betula frequencies. A distinct, but possibly shortlived, phase unfavourable for the development of humus soil and woody vegetation, the Older Dryas, divides Bølling from the optimum of Allerød, before the major deterioration of the Younger Dryas ends the Late Glacial sequence.

Considering the Dryas I-Bølling transition recent research in South Scandinavia and North Germany has revealed a steadily progressing vegetational environment through the two phases and consequently tends to play down the contrast between Dryas I and Bølling (Kolstrup 1991; cf. Bokelmann 1991). The beginning of Bølling sensu stricto in South Scandinavia is generally dated to app. 12 500 BP The beginning of the first marked vegetational optimum in Central Europe should probably be dated a few hundred radiocarbon years earlier (12 600-12 800 BP). Unfortunately this interval host a major dating plateau (Ammann and Lotter 1989).

In a recent synthesis of the absolute dating evidence from Late Glacial and Postglacial sites in the Rhineland Street et. al. have presented a comprehensive body of calibrated radiocarbon datings (Street et al. 1994).

Relevant for this survey are in particular the new radiocarbon datings from Andernach and the calibrated values of previously published datings of some of the Magdalenian and Hamburgian sites presented by Street.

From the Magdalenian settlement phase in Andernach a series of six new radiocarbon datings combined to a mean value of app. 12 980 + 60 BP. As the settlements of Andernach and Gönnersdorf are considered quasi contemporary radiocarbon datings from the latter site previously considered to old must now be accepted as correct. Moreover, these values correspond well to Upper Magdalenian dates from Northern France (Street et. al. 1994).

The main implication of the revised datings of Andernach, Gönnersdorf and the horizon P1 AH3 of Petersfels is to demonstrate a Magdalenian settlement at the northern border of the Central European Upland zone before the major Late Glacial climatic amelioration becomes evident in the palynological records. The dates from the Hamburgian sites in the Ahrensburgian tunnel valley considered here all have central values lying 200 or more radiocarbon years later. These northern settlements thus appear well after the beginning of the amelioration, i. e. within the Bølling period *sensu stricto*, and are contemporary with the late Magdalenian settlements of Petersfels and Pincevent (Street et al. 1994).

The single very early date from from the Hamburgian site Olbrachice in Poland, 12 685 + 235 BP (Lod – 111) (Burdukiewicz 1986), may possibly suggest an Hamburgian presence in the Lowlands even before the Bølling.

In consequence the emergence of a distinct Hamburgian culture and the re-settlement of Northern

Plains may be considered an only slightly belated continuation of the initial northward expansion of Upper Magdalenian territories in Central Europe.

The precise character of what could be called the transitional territory (in a cultural as well as a geographical meaning) is very hard to describe at present, not least because of the lack of dated sites from the Northern Lowlands. The artefact assemblage excavated at Schweskau in Niedersachsen most probably represents one of the expected transitional inventories combining Magdalenian and Hamburgian elements, situated, however, surprisingly far to the North (Breest and Veil 1991).

For the later part of the Pre-Allerød millennium the Hamburgian and the northwestern facies of the Late Magdalenian culture apparently were neighbours. Open-air sites like Pincevent are in this connection important as they exemplify the Late Magdalenian interest in seasonal reindeer hunting.

Unfortunately the radiocarbon datings from the Hamburgian culture do not comprise series made on the same item, but only one, two or at most three dates on material from the same find. Even without particular problems such as the afore mentioned plateau 12 800-12 600 BP single dates are not very conclusive. In this connection the small series of datings from one of the Condover mammoths is suggestive, as the central values of five datings of the same individual lie in the range 12 720-12 300 BP (Lister 1991).

The calibration curve presented by Street et al. 1994 moreover indicates that the 500 radiocarbon years between 12 500 and 12 000 BP correspond to a larger span of calendar years, i. e. about 750 calendar years, or app. the time between 12 750 and 12 000 cal. BC. The contraction of the time scale in BP may be at least partly responsible for several deviations from expected values.

Over the years several attempts at chronological subdivisions of the Hamburgian Culture have been undertaken (cf. Burdukiewicz 1986). None of the resulting systems could, however, be reliably related to the absolute radiocarbon chronology, and remembering the problems already mentioned this may not be too surprising.

The radiocarbon dates presently available for the Hamburgian Culture are thus not very conclusive concerning suggestions for chronological subdivision of the material.

The three sites from the Ahrensburgian tunnel valley considered here all have a 'classic' Hamburgian flint inventory. Due to the faunal finds they have provided most of the existing datings, so Poggenwisch: 12 440 + 115 BP (K-4331 as well as K-4577) and 12 570 + 115 BP (K-4332), Meiendorf: 12 360 + 110 BP (K-4329) and Stellmoor AbH: 12 190 + 125 BP (K-4261) and 12 180 + 130 BP (K-4328) (Fischer and Tauber 1986).

The early radiocarbon date mentioned before from Olbrachice in Poland, 12685 + 235 BP (Lod – 111) (Burdukiewicz 1986) relates to a 'classic' Hamburgian inventory as well.

Datings from inventories featuring tanged 'Havelte' points are not very conclusive either.

From Holland radiocarbon datings are published from Oldeholtwolde, the combined date of three values being 11650 + 65 BP (Stapert 1992). This very late value is debatable, however, and the geological dating of the find level to Dryas II is considered the more reliable (Stapert 1992).

The danish sites have so far not provided organic material suitable for absolute datings. Reindeer antler from a testpit in a kettle hole near the excavated areas of Slotsengen (in South Jutland) has been radiocarbondated to 12520 + 190 BP (AAR-906) (Holm and Rieck 1992) and may be related to the excavated flint assemblage.

A dating from a worked piece of reindeer antler dredged from Øresund (»off Solrød Strand«) may be mentioned here as well: 12140 + 110 BP (AAR-1036) (Vang Petersen and Johansen 1991) if however the cultural setting of the piece remains obscure.

The Havelte group could on a typological basis, and supported by the more northerly distribution of sites, well be somewhat younger than the classic Shouldered point group (or groups). The recent date from Slotsengen is, however, similar to or even older than the known dates from the 'classic' sites in the Ahrensburg tunnel valley.

The conclusion of this survey could thus be, that attempts at chronologically meaningful subdivisions of the Hamburgian culture at present might better be restricted to cautious employment of classic archaeological methods.

The Hamburgian art objects

Objects of art from the Hamburgian culture are rare. As a matter of fact only a handful of decorated bone and antler objects predominantly from the same three hunting camps in the Ahrensburgian tunnel valley exist[5]. These objects do, however, attest the northern extension of general features already known from the Magdalenian repertoire, and – in a single case, i. e. the Poggenwischstab, even prove elaborate enough to warrant a direct comparison with southern parallels.

This sad situation can possibly be explained, partly at least, by the type of sites excavated up till now, as the dumps of seasonally spezialised hunting camps may not be the place where to expect any greater amount of deposited art objects.

One of the major problems concerning the Late Glacial art objects relate directly to the difficulties of obtaining reliable radiocarbon dates from the finds. The typological or stylistic correlations between single objects or sites can thus in most cases not be independently tested, and one may end up with an uncannily wide geographical range between the dated assemblages of reference. One such case is the beforementioned Poggenwisch-baton, which apparently is firmly settled in the middle of the 13th millennium. The closest, and very good, parallels are found in the decorated baguettes demi-rondes of the Magdalenian IV from the Pyrénées, and in several details this piece as well as the other decorated Hamburgian objects correspond well to features of the Magdalenian IV phase of the southwestern Europe (Bosinski 1982).

If this sound stylistic correlation is considered to have a chronological value as well, inconvenient consequences arise for the dating of the later Magdalenian phases (V-VI). In particular, important art objects from Gönnersdorf and Petersfels have been ascribed to these late phases (Bosinski 1982), but the assemblages are – especially when given the new calibration mentioned above – radiocarbon dated to a period of time immediately before (or at most contemporary with) the Hamburgian finds. In this situation one may feel unwell about the chronological value of the later Magdalenian phases at large, or may court the idea of a certain stylistic conservatism in the North European, i e. Hamburgian, decorative art. The latter possibility is of course a Pandora's box as well, potentially challenging the concept of a universal chrono-stylistic framework.

For the time being serious attempts at a description of a specific Hamburgian art concept or style do not seem justified. A short review of the limited inventory of decorated objects may, however, be of relevance. The already mentioned Poggenwisch-baton has been analysed in detail by Bosinski (Bosinski 1978; 1982 ff. ref.). One of the most interesting features of the piece, apart from the indisputable stylistic connection with the Magdalenian of the Pyrénées, is the fact that the decorated antler surface had been reworked. The first ornament of freely meandering, but not very deeply excised lines had been replaced by an ornament of deeper cut, symmetrically ordered and repeated meander loops. This later ornamentation phase did, however, retain an anthropomorphic profile on the distal end of the piece clearly belonging to the original layout (Rust 1958; Bosinski 1978). According to Bosinski the first ornamentation phase, i e. the anthropomorphic face and the finer meandering, finds its best correlations in the older magdalenian art, whereas the later phase of deeply cut, ordered meander loops has direct parallels in the Magdalenian IV of southwest Europe (Bosinski 1978; 1982).

A not very distinct ornament found on one of the 'Riemenschneider'–antler handles from Stellmoor AbH (Rust 1943 Taf. 27), could have affinity to this type of deeply incised decor.

The artistically modified objects from Meiendorf are perhaps not as conspicous, but, seen as a group none the less interesting.

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[5] To the surveyed sample of Hamburgian art objects may be added a bone or antler point from Grosswüsterwitz (Germany). The shape of the distal end may be interpreted as showing a musk ox head (Bosinski 1982).

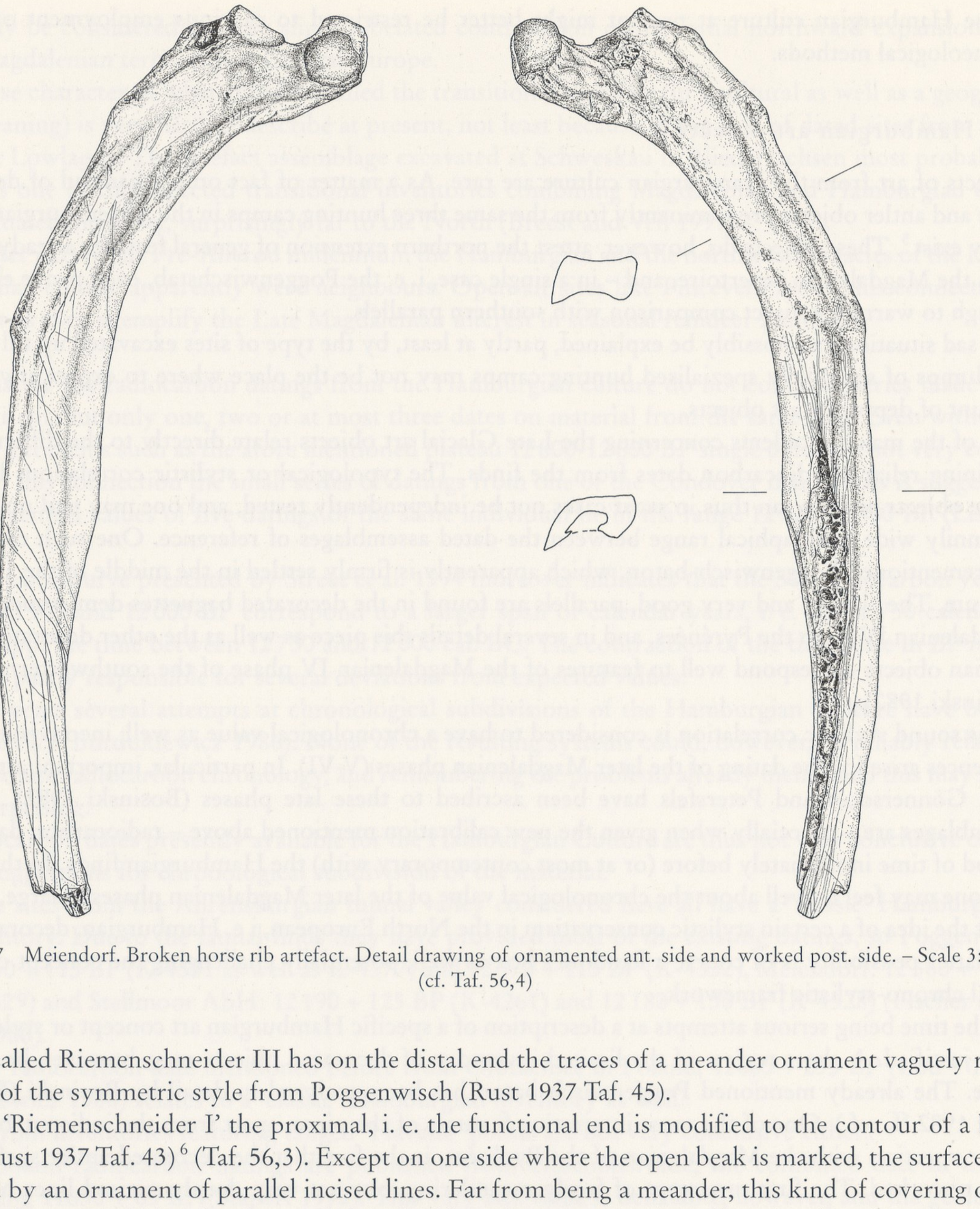

Fig. 7 Meiendorf. Broken horse rib artefact. Detail drawing of ornamented ant. side and worked post. side. – Scale 3:5. (cf. Taf. 56,4)

The socalled Riemenschneider III has on the distal end the traces of a meander ornament vaguely reminiscent of the symmetric style from Poggenwisch (Rust 1937 Taf. 45).

On the 'Riemenschneider I' the proximal, i. e. the functional end is modified to the contour of a birds head (Rust 1937 Taf. 43)[6] (Taf. 56,3). Except on one side where the open beak is marked, the surfaces are covered by an ornament of parallel incised lines. Far from being a meander, this kind of covering ornament is characterized by closely parallel, incised long lines running in mellow bends, where the movement of the first incised line dictates the amplitude of the following, neighbouring lines.

A recently identified decoration on one of the fragments of horserib artefacts (Taf. 56,4; fig. 7) can be described as a set of subparallel lines incised after the same principle. As two of the lines end a few millimeters from the fracture, the incision should rather be interpreted as practice or doodling on the smooth surface of an already broken artefact, than an ornament proper.

The largest object from Meiendorf is the fish figure made of the minimally modified crown of a big reindeer bull antler (Rust 1937 Taf. 41-42; Rust 1943). Here an existing antler shape apparently inspired the spontaneous manufacture of an object, without reference to stylistic conventions or a practical function.

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[6] The bird head was first recognized by K. Bokelmann. An exact species determination is hazardous, whenever the shape of neck and beak suggests a big waterfowl, like a swan or goose.

Both impressions need, however, a grain of salt. As to the practical function, the object shows the imprints of several hard blows, near the base of the 'tail' and in the part turned into the 'fish head', the latter group producing the impression of an eye. Apparently the flat antler crown was used as a working surface, but whether this happened after the piece had been worked into a fish, or it was the scars of the blows that prompted recognition of the fish shape can not be said for sure. The latter possibility could by reference to the other finely executed antler objects be regarded the more plausible alternative.

Secondly, the inspired use of a given shape of the raw material is seen in the bird head of the 'Riemenschneider I' as well as in a host of the more elaborate animal representations from the Magdalenian of Southwest Europe.

The three objects from Meiendorf may thus be considered an interlinked group: the spontaneous fish figure connecting with the birds head profile of the 'Riemenschneider' in the deployment of an existing outline of the raw material, the latter again connected to the horse rib fragment by the surface covering of parallel lines.

If, however, exact counterparts for the Meiendorf pieces are lacking, an indirect and general agreement with art objects from the Magdelenian IV can be found here too. At present the best (and geographically closest) parallel is seen in the countour decoupé from the Oberkassel grave (Bosinski 1982 Taf. 71,1). Here again the same principle of ornament, where long cautiously executed parallel lines cover the surface of the object, is seen. A margin of short parallel linies more or less perpendicular to the edge recalls the design of more elaborate, naturalistic pieces like the splendid series from Mas d'Azil. In the Southwestern material a surface covering of close parallel lines is apparently not in use, whenever stylized coat patterns of 'dotted lines' may come very near.

The importance of the silhouette for the impression of a fish or a bird in the Meiendorf pieces may as well be linked to the principle of a 'contour decoupé'.

To recapitulate, the decorated antler and bone objects from the Hamburgian sites are well integrated in the Central European universe with the best overall correspondance found for the Magdalenian IV horizon. The first ornament phase of the Poggenwisch baton may, however, suggest even earlier contacts.

THE NORTH-EASTERN BORDER OF THE HAMBURGIAN SETTLEMENT

In Schleswig-Holstein the Hamburgian preference for site locations in the valleys of the older, western moraines is a long established fact. Beside the many sites in the intensely surveyed Ahrensburgian tunnel valley a cordon of sites are found on the moraines parallel to the Elbe (fig. 8 a) The majority of these are of course only surface collected finds comprising one or a few characteristic artefacts, but they do reveal the Hamburgian presence. Since Tromnau's compilation (Tromnau 1975), only a few new ones have been added. With the exception of a Havelte point from Nübel near Schleswig all new finds are from locations in the vicinity of (or identical to) already known findspots, thus repeating the known distribution pattern.

In Tromnau's opinion this pattern implied a general north-west directed movement under avoidance of the lower, sandy and presumably wet areas east of the old moraines (Tromnau 1975).

If, however, the interpretation of the faunal samples from the tunnel valley sketched above is extended to all Hamburgian sites in a similar setting, i. e. the slopes of a (tunnel) valley in the old moraines about 20-30 km. northeast of the Elbe, a different explanation may be proposed, fig. 8 b. Here the sites are seen as specialized hunting stations related to a hypothetical settlement territory in the Elbe valley. This model implies a seasonal movement inland to the strategically best locations for reindeer hunting. After the optimal reindeer season the settlement must move to a different eco-zone, the nearest possibility here being the Elbe valley, in order to get near an alternative ressource basis. Considering the Magdale-

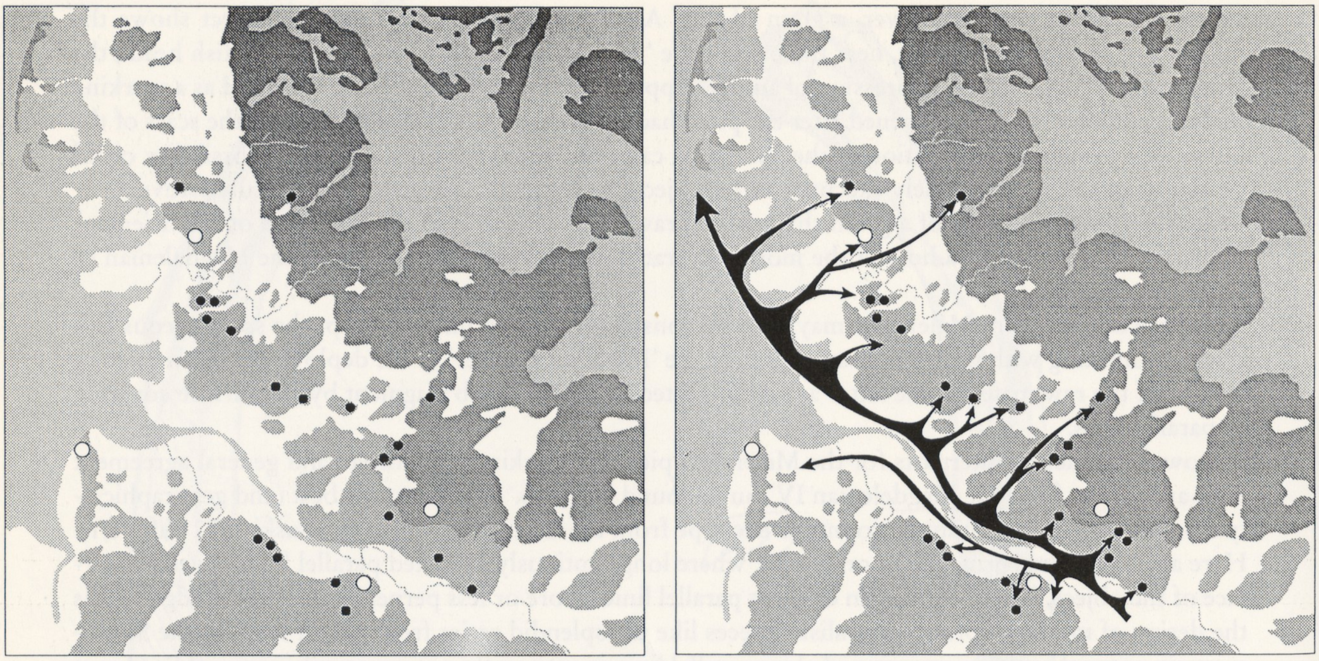

Fig. 8 Distribution of Hamburgian sites in Schleswig-Holstein. – a. Sites. – b. Model of settlement system. – The maps are based on the modern, simplified geomorphology of Schleswig-Holstein, North Germany. *Light shade*: North Sea (west) and Baltic (east); *medium shade*: Older moraine hills; *heavy shade*: Younger moraine hills. *White* marks Elbe valley, tunnel valleys and sandy outwash lowlands. Base of the map covers approx. 210 km. – Single Hamburgian sites are marked with *black dots*, site concentrations with *white dots*. – On the right map do *black arrows* along the Elbe valley indicate hypothetical areas of major Hamburgian activity, seasonally reaching sideways into the morainic country.

nian material summarized above, horse hunting could have provided a fair alternative to reindeer in the late winter or summer months.

The proposed settlement areas in the Elbe valley are of course pure imagination as no sites are recorded. It is, however, necessary to remember that the Late Glacial terrasses are now lying under Postglacial sediments up to 8 m thick, and that erosion since the early Late Glacial has played a role in site destruction.

Considering the Hamburgian settlement to the North and East of Schleswig-Holstein the maximum glaciation limit of the Weichselian seems to present a border of more general relevance. The Polish sites are by and large restricted to the areas south of this limit, as are the very few finds of Hamburgian artefacts from eastern Germany (Burdukiewicz 1986; Gramsch 1987).

To the northwest the only evidence of a Hamburgian presence beyond the moraine border is found in South Scandinavia. The material is however very limited: in Jutland the sites Jels, Brænøre and Slotsengen in the eastern moraines as well as not very well documented single shouldered points from Bjerlev Hede (Becker 1970; Holm and Rieck 1992), and in eastern Denmark the site Sølbjerg on the island of Lolland (Vang Petersen and Johansen 1991). Further northeast only the worked antler pieces from Øresund mentioned above (Vang Petersen and Johansen 1991) and a small artefact assemblage of possible Hamburgian affinity from Mölleröd in Scania indicate the presence of humans earlier than the Allerød period (Larsson 1993).

The faunal evidence from South Scandinavia does however show that reindeer were present and probably even abundant in the Pre-Allerød millennium (Aaris-Sørensen 1992; Degerbøl et al. 1959). Moreover, faunal remains from Blomvågen in South Norway comprising reindeer, sea mammals and birds have been dated to Bølling or Oldest Dryas, thus suggesting a rich coastal environment (Indrelid 1975; Lie 1990). Considering the other large game species only a single date for elk and one for saiga antelope lie before the Allerød (Liljegren in print). So far the still scarce dated Late Glacial material goes the more varied land fauna complex, comprising horse, elk and giant deer first arrives – or probably more correct: becomes abundant – in the Allerød (Aaris-Sørensen 1992).

It may thus be proposed as a working hypothesis that the Hamburgian culture maintained a hunting economy of a basically continental structure, and in consequence that a lack of suitable game ressources alternative to reindeer posed a major obstacle for the northward expansion into the recently deglaciated areas.

RESUMÉ

A survey of the Hamburgian faunal assemblages from Meiendorf, Stellmoor AbH and Poggenwisch in North Germany is presented. The analysis of seasonal indicators and carcass representation suggests that several economic events from late summer till early winter can be traced: a hunting season for swans and geese bringing curated raw material to the sites, reindeer hunting from the sites proper, most probably followed by export or caching of reindeer meat as the sites were left.

By refence to a selection of sites with seasonally determined hunting from the closely related Magdalenian culture a model for the annual cycle is proposed. In this reindeer is the main prey in the spring and autumn, whereas horse-dominated, but more varied hunting takes place in the winter and the summer months.

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