LATE PALEOLITHIC REINDEER POPULATIONS IN CENTRAL AND WESTERN EUROPE

Jaco WEINSTOCK*

Summary

*It has long been recognized that reindeer (*Rangifer tarandus*) was an important resource for late Paleolithic people over a vast geographical area, and that yearly reindeer migrations in particular were an important factor determining the seasonal movements and subsistence strategies of past human populations. With a few exceptions, however, attempts to determine the movements of the reindeer herds have been based on doubtful seasonal data (mostly antler casting) or on unjustified assumptions about the behaviour of the animals and the size of the herds. This paper tackles this problem with osteometrical data of* Rangifer *material from northern and southern Germany, Switzerland and France. An attempt is made to distinguish possible reindeer populations in this area. The results show a clear distinction between "northern" and "southern" reindeer, both in their size and in their degree of sexual dimorphism.*

Résumé

Les populations de rennes du Tardiglaciaire en Europe centrale et occidentale.

*On sait depuis longtemps que le renne (*Rangifer tarandus*) était une ressource importante pour les hommes du Tardiglaciaire d'une vaste zone géographique, et que les migrations annuelles des rennes, en particulier, étaient un facteur important dans la détermination des mouvements saisonniers et des stratégies de subsistance des populations humaines du passé. À part quelques exceptions, les tentatives pour déterminer les mouvements des troupeaux de rennes se sont cependant basées sur des données saisonnières douteuses (essentiellement la chute des bois) ou sur des suppositions injustifiées sur le comportement des animaux et la taille des troupeaux. Cet article envisage le problème par les données ostéométriques du matériel de* Rangifer *du Nord et du Sud de l'Allemagne, de Suisse et de France. Une tentative est faite pour distinguer d'éventuelles populations de rennes dans cette aire géographique. Les résultats montrent clairement une distinction entre le renne "du nord" et le renne "du sud", à la fois dans la taille et dans le degré de dimorphisme sexuel.*

Zusammenfassung

Spätpaläolithische Rentierpopulationen in Mittel - und Westeuropa.

*Es wurde schon lange erkannt, daß Rentiere (*Rangifer tarandus*) eine wichtige Resource für die spätpaläolithischen Menschen innerhalb eines großen geographischen Gebietes waren. Im Besonderen mußten die jährlichen Wanderungen dieser Tierart ein ausschlaggebende Faktor für die saisonalen Bewegungen und Versorgungsstrategien der damaligen menschlichen Populationen gewesen sein. Trotzdem basiert das Wissen über die Wanderung der Rentierherden - bis auf wenige Ausnahmen - auf zweifelhaften Angaben in Bezug auf die Saisonalität (hauptsächlich Geweihabwurf) oder auf ungerechtfertigten Annahmen über das Verhalten der Tiere und der Herdengröße. Dieser Beitrag nimmt das Problem mit Hilfe osteometrischer Daten, gewonnen an Rentiermaterial aus Nord- und Süddeutschland sowie aus der Schweiz und aus Frankreich, in Angriff. Es wurde der Versuch gemacht, die verschiedenen Rentierpopulationen dieser Gebiete zu differenzieren, mit dem eindeutigen Ergebnis, daß es eine "nördliche" und eine "südliche" Rentierform gab, die sich sowohl in ihrer Größe als auch in der Ausprägung ihres Sexualdimorphismus unterschieden haben.*

Key Words

Reindeer, Late Palaeolithic, Migrations, Sexual dimorphism, Body-size.

Mots clés

Renne, Tardiglaciaire, Migrations, Dimorphisme sexuel, Stature.

Schlüsselworte

Rentiere, Spätpaläolithikum, Wanderungen, Sexualdimorphismus, Körpergröße.

* *Institut für Urgeschichte, Eugenstr. 40, 72072 Tübingen, Germany.*

Introduction

During most of the Last Glacial, reindeer (*Rangifer tarandus*) were a common prey of human and non-human hunters over a vast geographical area, extending from the Ukraine in the East to Great Britain in the West.

One of the most striking characteristic of most modern populations of this species is their yearly seasonal migrations, from the summer calving grounds to the wintering grounds in the Fall, and back to the calving grounds in the Spring. The extent of the migrations varies considerably, from a few dozen kms in some Norwegians herds to *ca.* 1 000 kms for the Barren-Ground caribou of the North American Arctic. This behaviour is presumed to have existed during the Palaeolithic as well, and people exploiting this resource on a large scale presumably adapted their settlement patterns to take these migrations into account, as recent hunters of the Arctic did until a few decades ago (Weniger, 1982). Assuming this was indeed the case, it follows that, if the migration route of a particular reindeer population is known, one should be able to trace possible seasonal movement of the human group or groups, exploiting it. Thus, the reconstruction of the migration patterns of the Palaeolithic reindeer herds is of no little relevance for the prehistorian.

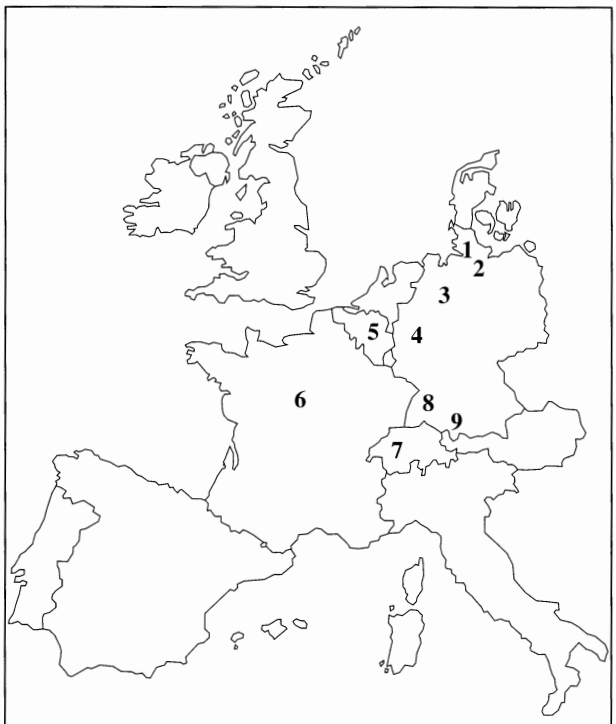

Fig. 1: Map showing location of sites mentioned in the text.

1) Stellmoor
2) Meiendorf
3) Hohlerstein
4) Karstein
5) Remouchamps
6) Pincevent
7) Veyrier
8) Petersfels
9) Schussenquelle

Most attempts to reconstruct likely migration routes of Palaeolithic reindeer have been largely based on unwarranted assumptions -for example on the size of particular herds and the ability of the environment to sustain them (e.g., Sturdy, 1975)-, and/or seasonality data, gained either from the study of cementum in thin-sections of *Rangifer* teeth (e.g., Gordon, 1988) or antler casting (e.g., Sturdy, 1975). These attempts, however, have remained largely unsatisfactory (Delpech, 1988; Clottes, 1988; White, 1989). In my opinion, a more promising approach is the use of osteometrical data. The assumption made here is that prehistoric reindeer populations differed in the mean size of its individuals ("size" meaning in this paper body-mass). This assumption can be justified both on theoretical grounds (Mayr, 1970) and on empirical data of modern *Rangifer* (Reimers, 1983; Reimers *et al.*, 1983; Skogland, 1983). Thus, if the size of reindeer in two geographical areas differed, it can be concluded that they could not be part of the same migrating population (of course, it is impossible to prove that reindeer of similar size did belong to the same population). This approach is not new, but it has only been applied to a restricted geographical area, namely Southwest France (Delpech, 1983) and more recently the Paris Basin area (Enloe, 1994). In the present paper, I use this method to shed light on an existing controversy about the relationship between northern and southern German late Palaeolithic reindeer.

During the late Glacial (ca. 14-10 ka) two techno-complexes are found in extensive areas of Western and Western Central Europe corresponding to a rough geographical division: the Magdalenian in the South and diverse, but related industries; in the North, the Hamburgian, the Creswellian, and the somewhat later Ahrensburgian (Gamble, 1986). A number of sites in both areas have rich faunal collections dominated almost exclusively by *Rangifer*.

Based on seasonality determinations from antler finds from the Magdalenian site of the Schussenquelle, in southern Germany, in one hand, and the Hamburgian and Ahrensburgian sites of Stellmoor and Meiendorf, northern Germany, on the other, Sturdy (1975) suggested that the reindeer remains in both regions represent a single population which spent the summers in the South German Highlands and moved then to their wintering grounds in the Northern German Plain, some 600 kms away. The two different industrial techno-complexes would then represent "seasonal kits"

of the same human groups following the animals in their seasonal movements. Hahn (1979) and Weniger (1982) reject this idea, and prefer to see the "southern " reindeer as migrating relatively short distances, in the order of 100-200 kms, probably to the alpine foreland.

Methods

In order to test the plausibility of both models, measurements were taken on post cranial bone remains from the Schussenquelle, Meiendorf and both the Hamburgian and Ahrensburgian layers at Stellmoor. The first two sites and the Hamburgian layer (HL) of the third one are roughly contemporaneous, all dating to the Bølling Interstadial (Fisher, 1991; Schüler, pers. comm.); thus, size differences between them due to chronological factors can be ruled out for them. Measurements on bones from additional late Paleolithic sites were taken by the author or extracted from the literature or personal communications (tab. 1). With the purpose of increasing the number of fragments to be compared, I used the "Variability Size Index (VSI)" method (Uerpmann, 1982), since it allows the comparison of various skeletal elements simultaneously by relating the measurements of each bone to that of the respective skeletal element of a standard population. The resulting index for each bone will take either a positive value in case it is larger than the standard, or a negative one in case it is smaller.

Because of the large quantity of their measurable bones (n = 1803), the reindeer of the Ahrensburgian layer (AL) at Stellmoor were selected as the "standard population". The Hamburgian sites of Meiendorf and Stellmoor (HL) were united into a single group, after finding no significant difference between them. Not included in the analysis were measurements on phalanges, carpals, the smaller tarsal bones, sesamoids, patella and vertebrae other than atlas and axis. Length measurements from long bones were ignored, both because of their scarcity and because of their relatively poor correlation to body mass (Scott, 1990). Bones which were recognized as that of young individuals were also left out of the analysis.

Results and discussion

From the analysis, a clear and statistically significant size distinction between *Rangifer* from the Hamburgian sites and those from the Schussenquelle emerges, the former being larger than the latter (tab.1, fig. 2). Establishing a difference in body-mass, however, does not automatically demonstrates that the animals belonged to different populations. Given that *Rangifer* is one of the most sexual dimorphic species among the cervids, and that sexual segregation takes place at some parts of the year, the possibility that the reindeer at the Schussenquelle and the Hamburgian sites represented respectively the females and males from a single population was investigated. Using the atlas and axis, skeletal elements which in horned/antlered species show a large degree of sexual dimorphism (Lengsfeld, 1975; Horwitz *et al.*, 1990), it can be demonstrated that both males and females were present at both the Schussenquelle and the Hamburgian sites (fig. 3, 4). The bimodal distribution of the size indices in both sites lends further support to this statement (fig. 5). It can now be concluded that reindeer in both areas did not belong to a single population; thus, Sturdy's model of long North-South migrations can be rejected.

But let us go a step further. What is the cause of this difference in size? In my opinion, the analysis of sexual dimorphism can go a long way to explain it. First of all, one important fact must be taken into consideration: the

Table 1: Comparison of Variability Size Indices (VSI). Sources: 1 - Weinstock, unpublished data; 2 - Baales, 1993; 3 - Studer, pers. comm.; 4 - Enloe, pers. comm.

Site	Period	Industry	Mean VSI	SD	Min	Max	n
Stellmoor AL[1]	Dryas III	Ahrensburgian	0.51	23.29	-53.21	70.49	1803
Hamburgian[1]	Bølling	Hamburgian	-4.11	25.42	-58.60	77.81	330
Karstein and Hohler Stein[2]	Dryas III	Ahrensburgian	-3.24	23.56	-36.06	55.30	32
Remouchamps[2]	Dryas III	Ahrensburgian	1.97	27.04	-60.50	50.39	27
Schussenquelle[1]	Bølling	Magdalenian	-17.51	27.27	-89.20	48.35	209
Petersfels[1]	Bølling /early Dryas II	Magdalenian	-22.42	28.43	-103.21	63.29	156
Veyrier[3]	Late Paleolithic	Magdalenian	-14.62	26.99	-114.22	33.53	74
Pincevent[4]	Dryas II	Magdalenian	-21.29	35.77	-136.08	88.11	613

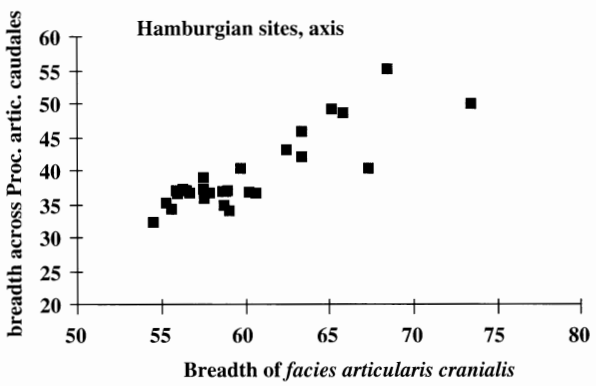

Fig. 2: Hamburgian sites, plot of axis BPacd vs. BFcr.

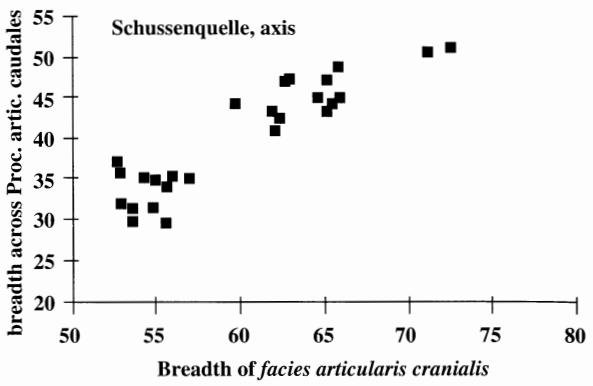

Fig. 3: Schussenquelle, plot of axis BPacd vs. BFcr.

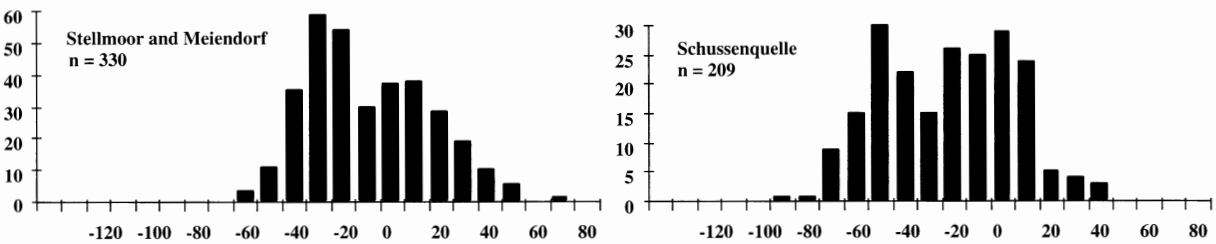

Fig. 4: Histogram of variability size indices for the Schussenquelle and the Hamburgian sites.

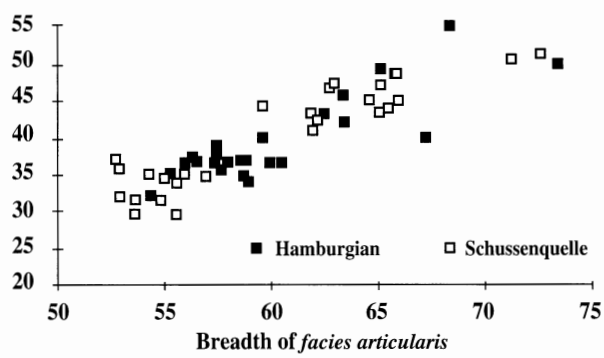

Fig. 5: Plot of Axis, BPacd vs. BFcr, Hamburgian sites include Meiendorf and Stellmoor HL.

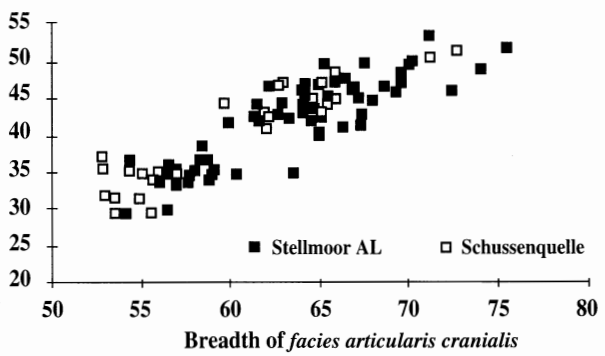

Fig. 6: Plot of Axis, BPacd vs. BFcr.

selection forces acting upon the male individuals from most species of polyginous ungulates, *Rangifer* among them, are not the same as those affecting the females. This is a result of different reproductive strategies and investment in both sexes (Clutton-Brock *et al.*, 1982). Males have to compete among themselves for access to females, and in this struggle large body size and large antlers are advantageous. Thus, a selection for heavier, large-antlered males is to be expected (Clutton-Brock *et al.*, 1980). Of course, environmental constraints still impose limits to maximal male adult body size. On the other hand, the adult body size in females depends on whether growth is continued after maturity. Skogland (1983), in his study of wild Norwegian reindeer, has shown that under conditions of food abundance females continued to grow after maturity. Under food limitation, however, females increased their reproductive effort by halting their own body growth. Thus, it can be expected that "*...the degree of sexual dimorphism* [will] *be enhanced by food limitation, given that males put a premium on developing large size to be a successful breeder, while female success is measured in terms of lactation*" (Skogland, 1989: 10). Thus, I would like to suggest that the size of female reindeer will show much clearer the effects of the environment upon a population than the size of males. Moreover, because of a stronger selective pressure, the size of females will tend to be more homogeneous in populations under environmental stress that in populations living under more favourable conditions.

In figures 5 and 6 the axis of the Schussenquelle are plotted against those of the Meiendorf /Stellmoor (HL) and Stellmoor (AL) respectively. It can be clearly seen that females from the Schussenquelle show a smaller size and narrower variation that those of the Hamburgian sites and Stellmoor (AL). According to the considerations exposed above, it can be concluded that the environmental stress (food shortage) suffered by the reindeer from the Schussenquelle was greater than that of the "northern" animals. A large part of the difference in mean size between the two "populations" was certainly due to the difference in the mean size of the females.

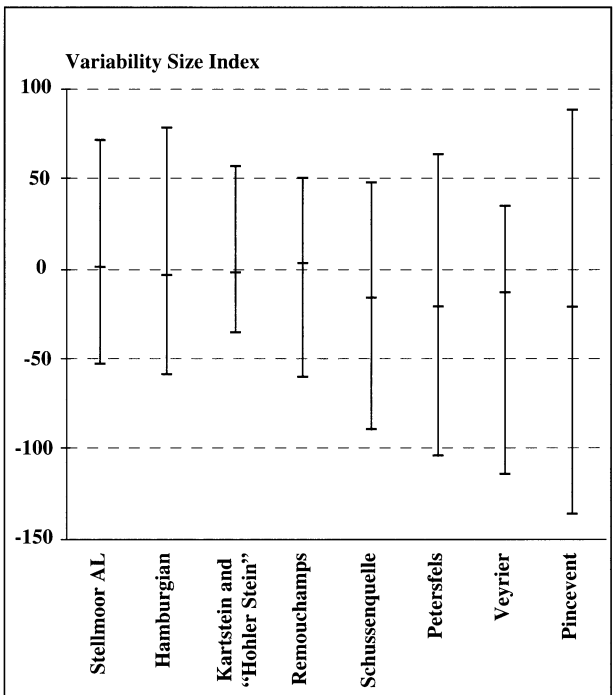

Fig. 7: Mean VSI and limits (max. and min.) for some Late Paleolithic sites (see also table 1).

Moreover, the difference in size found between *Rangifer* from the Schussenquelle and those from Stellmoor and Meiendorf fits into a larger, regional pattern: Reindeer from sites in the Northern European Plain ("Northern group") are consistently larger than their southern counterparts ("Southern group") in Southwest Germany, the Paris Basin, and western Switzerland (tab. 1, fig. 7). Although within each of both groups regional and/or temporal variation seem to exist (Weinstock, in prep.), the division North-South is clear. Whether genetic and/or environmental causes are accountable for it is, at present, impossible to say. Intriguing is also the apparent "correlation" between the two reindeer groups and the industrial techno-complexes found in their respective geographical areas. This is a question which should be pursued further, not only with faunal, but with other environmental and techno-typological data.

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