AUROCHS AND HECK CATTLE

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Summary

So-called Heck cattle, descendants of the experimental rebreeding of the aurochs by the German brothers Heinz and Lutz Heck, have been introduced in two Dutch Nature Development Projects. The population dynamics and social structure of the herds as well as its impact on the vegetation are subject to long-term monitoring.

The osteometric data of a male individual that died in 1987 are compared to the data of Danish aurochs assembled by Degerbol and Fredskild (1970). With the exception of the proximal and distal width of the humerus, none of the heck measurements were found to reach the size of the smallest Danish aurochs. Large discrepancies were found in the estimated shoulder height according to the skeletal element that is used.

Résumé

Les aurochs et les bovins de Heck.

Les bovins de Heck, descendants de la re-création expérimentale de l'aurochs par les frères allemans Heinz et Lutz Heck, ont été introduits dans deux Projets hollandais de Dévelopement de la Nature. Les dynamiques des populations et la structure sociale des troupeaux, de même que leur impact sur la végétation font l'objet d'un suivi à long terme.

Les données ostéométriques d'un individu mâle mort en 1987 sont comparées avec les données d'aurochs danois rassemblées par Degerbol et Fredskild (1970). À l'exception des largeurs proximale et distale de l'humérus, aucune des mesures prise sur les bovins de Heck n'atteint la taille des plus petits aurochs danois. Des écarts nets ont été trouvés dans les estimations des hauteurs au garrot en fonction de l'élément squelettique utilisé.

Zusammenfassung

Auerochse und "Heck-Rind".

Das sogenannte "Heck-Rind" entstammt der experimentellen Rückzüchtung des Auerochsen durch das deutsche Geschwisterpaar Heinz und Lutz Heck. Solche Tiere werden in den Niederlanden im Rahmen zweier Naturschutzprojekte gehalten. Populationsdynamik und Sozialstrukturen dieser Herden und ihr Einfluß auf die Vegetation sind Objekt längerfristiger Beobachtung.

Die Knochenmaße eines 1987 verstorbenen männlichen Tieres werden mit den von Degerbol und Fredskild (1979) zusammengestellten Daten dänischer Auerochsen verglichen. Mit Ausnahme der proximalen und distalen Werte des Humerus erreicht keines der Maße der Rückzüchtung die Größe der kleinsten dänischen Ure. Diskrepanzen wurden auch in der Widerristhöhe und den zur Berechnung verwendeten Skeletteilen festgestellt.

Key Words

Heck cattle, Aurochs, Shoulder height, Osteometry.

Mots clés

Bovin de Heck, Aurochs, Taille au garrot, Ostéomérie.

Schlüsselworte

"Heck-Rind", Auerochse, Schulterhöhe, Osteometrie.

Introduction

Around 1920 the brothers Heinz and Lutz Heck started separately an experimental rebreeding of the aurochs. The main thought behind the experiment was that all the characteristic attributes of the aurochs are still present in the genes of domestic cattle, but that these genes were divided over several current cattle breeds. By combination of a number of selected breeds it should be possible to obtain an animal whose exterior and behaviour were in accordance with the extinct aurochs.

For the exterior and conformation the Heck brothers based themselves on old descriptions, the famous Augsburg print and on Paleolithic cave paintings in France and Spain. Both aimed at an animal with a large body, long legs, long horns that curved towards the front and a small udder for the females. They took particular care to reconstitute the colour of the pelt: black for the males with a clear stripe along the back, brown for the females. Both males and females had to have a white nose.

As behavioral characteristics they aimed at a late maturity and timid, suspicious behaviour.

Lutz Heck who was director of the zoo at Berlin mainly used three breeds and their hybrids. He crossed Corsican cattle, a breed possessing a primitive colouring, with Span-

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ish and Camargue cattle. Animals from this crossing line have not survived the war.

His brother Heinz, director of the zoo at Munich, used more breeds, among them the Hungarian longhorn, Corsican cattle, Scottish Highland, Chillingham and several alpine breeds. After 11 years Heinz Heck had obtained a cow and a bull with more or less the desired colouring and conformation. It seems that most of the present day Heck cattle descend from this one pair. A small herd survived the war and since then several breeding groups have been set up, mainly in Germany.

Present day use

Because of their colouring and their timid behaviour, both very different from most recent cattle breeds, Heck cattle are often described in the popular press as "wild cattle". The fact that they are the product of interbreeding of fully domestic cattle is often not recognized. Neither has this been recognized by some legislators: under Dutch law Heck cattle are considered wild animals and thus subjected to game and hunting laws. Veterinary control is not necessary and none of the local and European legislation regarding cattle keeping is applicable.

The "wildness" of Heck cattle has also attracted those nature conservationists who are looking for large grazers to maintain open landscapes. Heck cattle have now been introduced into several nature development areas as large grazers.

In the Netherlands there are currently two relatively large nature conservation projects that use Heck cattle. The main aim of these projects is to reconstitute a more complete ecosystem with a high degree of self regulation. The two experimental grazing projects using Heck cattle started in 1983: one on the mudflats of Flakkee and one in the Oostvaardersplassen region. In each of the projects ca. 30 animals were introduced. In the Oostvaardersplassen the Heck cattle were accompanied from 1986 onwards by Konik horses and, since 1992, by red deer (Wigbels, 1994). Although conducted in very different environments, the grazing experiments have led in each case to more open terrain alternated with patches of higher vegetation. Following the changes of the vegetation under grazing pressure can be meaningful for the reconstruction of past environments where grazing of cattle is surmised.

Two other aspects are of importance to zooarchaeologists: the behaviour of the animals and the size of the skeleton.

Seasonality of behaviour

The group of Heck cattle from the Oostvaardersplassen, on which we will focus in this paper, has substantially increased its numbers. Since 1987 the birth rate clearly surpasses the death rate (fig. 1). The herd has twice been enlarged by the introduction in 1987 and 1989 respectively of 15 animals, but most of the increase is due to natural reproduction. In 1991 the total herd consisted of ca. 160 individuals (Blaakmeer *et al.*, 1992). Following the latest estimates there are now 265 free roaming animals (personal communication of the keeper, J. Griekspoor). Since the severe winter of 1987 there has been no extra provision of winter fodder. Consequently only natural deaths occur. These seem to take place mostly in march and april.

In the first years after introduction births took place the whole year round, but the last years they are seen to concentrate more and more in spring, March to May (fig. 2). The temporary more restricted births evidently are the result from a more restricted mating season in the late summer. At the same time a slow differentiation in the spatial distribution of the animals has been observed. Since a few years a pattern seems to emerge whereby a segregation of males and females takes place after the mating season. Small male groups, consisting of solitary males up to a maximum of five bulls, take up fixed winter territories, while the females and their young of the previous years make use of the whole terrain. So-called bachelor groups have been recognized in several wild bovid species such as the African buffalo and Water buffalo (Blaakmeer *et al.*, 1992: 30).

It is tempting to think, though not possible to prove, that the Heck cattle are exhibiting here a remnant of the original behaviour of wild cattle. In this respect the continuation of the monitoring of the behaviour of the Heck cattle in the Oostvaardersplassen region will be of great importance.

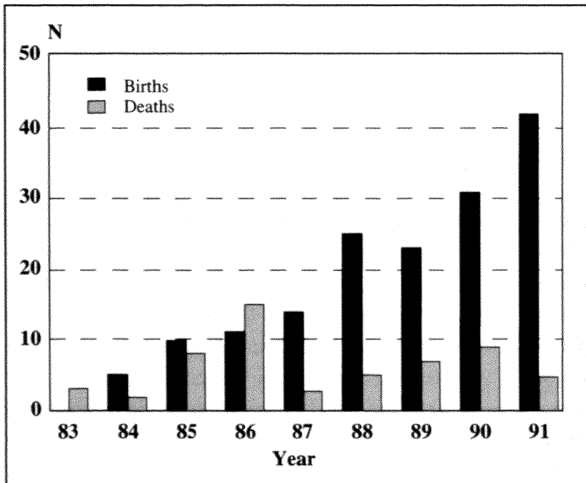

Fig. 1: Birth and death rate of the Heck cattle from the Oostvaardersplassen (1983-1991).

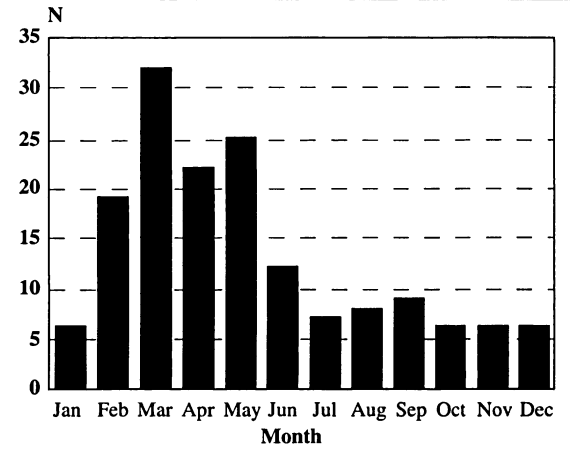

Fig. 2: Distribution of births of the Heck cattle from the Oostvaardersplassen (1983-1991).

The skeleton

In the winter of 1987 several animals of the group in the Oostvaardersplassen died. Most individuals died amidst the impenetrable reed area, but through pure chance one skeleton was discovered by the keeper. The zooarchaeology department of the University of Amsterdam was enabled to retrieve the skeleton.

The skeleton consisted of whitened, totally clean bones lying only slightly embedded in the sediment. It belongs to a seven-year old bull. In this paper I will concentrate on the osteometric data of the long bones.

The different long bones were measured according to von den Driesch (1976) (tab. 1). The measurements have been compared to the sample of male wild cattle from Denmark that has been assembled and published by Degerbol and Fredskild in 1970. The sample comes from the peninsula of Jutland as well as from the two largest Danish islands, Funen and Seeland. The finds are dated between the Late Dryas and the Subatlantic, i.e. roughly between 8000 and 3000 BC. From this comparison it is clear that with two exceptions none of the Heck measurements reach those of the smallest Danish male aurochs. When the measurements of the smallest Danish aurochs are considered as 100%, the greatest lengths of the respective long bones from the Heck skeleton remain obviously below the smallest wild cattle (fig. 3). The greatest proximal width follows the same pattern with the exception of the proximal humerus which exceeds the smallest humerus of male wild cattle. The same holds true for the distal width of the humerus (fig. 4). All the other measurements remain below those of wild cattle. The relative differences vary between 1% for the smallest diaphyseal width of the metacarpal to 13% for the distal width of the metatarsal (figs. 5 and 6).

The only two measurements that do not follow the general pattern, the proximal and distal widths of the humerus are respectively 6% and 7% larger than those of the smallest male aurochs. Some of the bones, most notably the metacarpal, give a very solid impression (fig. 7). When we compare its measurements it is obvious, because its length stays 12% under the smallest wild male, while the smallest width of the diaphysis is only 1% narrower.

Shoulder height

The original breeding experiment of the Heck cattle did not succeed in producing animals with a shoulder height comparable to that of the aurochs. The shoulder height of the skeleton in our collection is not known, because during its life the animal could not and never was approached by man to be measured. Its shoulder height has been estimated by making use of the multiplication factors established by Matolcsi (1970: 118). For the metapodials the factors for male cattle, as recommended by von den Driesch and Boessneck (1974: 338) have been used. The shoulder height

Table 1: Skeleton of Heck cattle: measurements of long bones in mm. Abreviations: see von den Driesch, 1976.

	left	right		left	right
Scapula			**Metacarpal**		
GI	412	411.5	GL	210	210
DHA	405	408	BP	71	72.5
LD	221	223	SD	43.5	44
SLC	71.5	71	BD	72	71.5
GLP	87	87			
LG	71	73	**Femur**		
BG	65.5	65.5	GL	444	442.5
			BP	150	149
Humerus			DC	53.5	54
GL	353	353	SD	49	48
GLC	314	314	BD	118.5	118
BP	134	134			
SD	49	49.5	**Tibia**		
BD	107	107	GL	396	397
BT	92	93	BP	116	116
			SD	49.5	47.5
Radius			BD	73	73
GL	328	328			
BP	102.5	103	**Metatarsal**		
SD	54	55	GL		244
BD	90.5	91	BP		58.5
			SD		36
Ulna			BD		63
GL	401	401			
LO	128	128			
DPA	85.5	85			
SDO	67	66.5			
BPC	54.5	54.5			

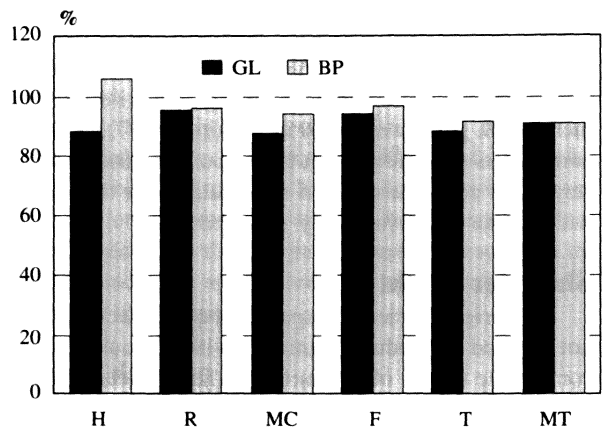

Fig. 3: Relative difference. Heck (male) vs Aurochs (smallest male; data from Degerbol and Fredskild, 1970). H, humerus; R, radius; Mc, metacarpus; F, femur; T, tibia; MT, metatarsus.

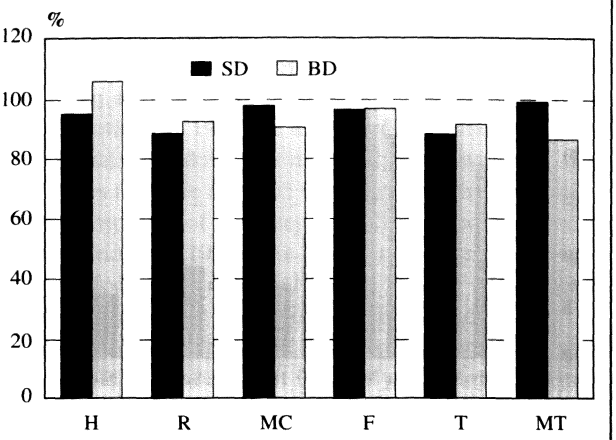

Fig. 4: Relative difference. Heck (male) vs Aurochs (smallest male; data from Degerbol and Fredskild, 1970) (abreviations: see fig. 3).

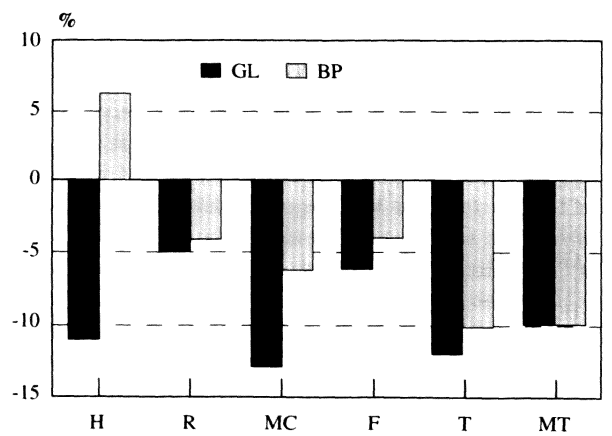

Fig. 5: Relative difference. Heck (male) vs Aurochs (smallest male; data from Degerbol and Fredskild, 1970) (abreviations: see fig. 3).

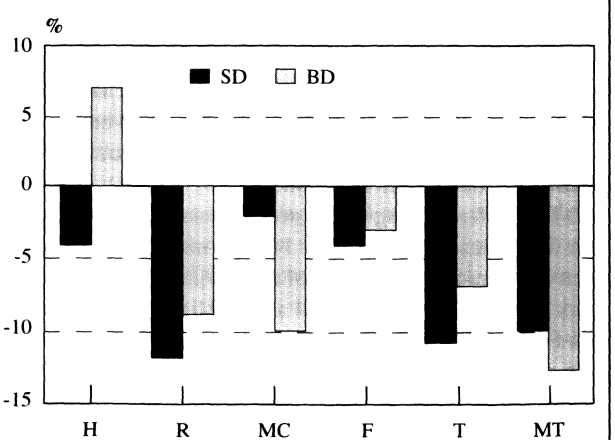

Fig. 6: Relative difference. Heck (male) vs Aurochs (smallest male; data from Degerbol and Fredskild, 1970 (abreviations: see fig. 3).

is found to vary between 132 and 149 cm (tab. 2). The data show that the humerus gives a different shoulder height according to the use of the Greatest Length (GL) or the Length from the caput (GLC) for the estimate. A check was made whether this holds also true for wild cattle. Here again the Danish sample was used. For 6 humeri both measurements were published (Degerbol and Fredskild, 1970: 106) and from these the shoulder height was estimated (tab. 3). Contrary to our findings for the Heck skeleton, we see here a superior height when the Greatest Length (GL) is used. It seems that here again the Heck data for the humerus do not conform to the general pattern of osteometric data of wild cattle. An explanation for these rather erratic results may perhaps been found in a correlation between the size of the

Table 2: Heck skeleton: estimation of the shoulder height. Type of measurement used and shoulder height in cm.

Humerus	GL	146
	GLC	149
Radius	GL	141
Metacarpal	GL	132
Femur	GL	143
Tibia	GL	137
Metatarsal	GL	137

Table 3: Danish aurochs: estimation of the shoulder height from the humerus. Site and date, type of measurement in mm, estimated shoulder height (SH) in cm.

HUMERUS					
Site	Pollenzone	GL	SH	GLC	SH
Terp	Late Dryas	430	178	358	170
Nyrup	Boreal	417	172	345	164
Store Damme	Boreal	410	169	340	162
Bonnelyke	Atlantic	410	169	350	166
Tinglev	Subboreal	400	165	345	164
Grejs Molle	Subboreal	425	175	360	171

Table 4: Estimated shoulder height in cm of Danish aurochs based on the greatest length of humerus, radius and metacarpal (Hum1, Rad, MC) and greatest length from the caput (Hum2) and proportional differences in % between the shoulder heights based on Hum1 and Rad (A); Hum2 and Rad (B); Hum1 and MC (B); Hum2 and MC (D).

Site	Pollenzone	Hum1	Hum2	Rad	MC	A	B	C	D
Terp	Late Dryas	178	170	156	158	13	8	11	7
Nyrup	Boreal	172	164	152	154	12	7	10	6
Store Damme	Boreal	169	162	156	162	8	4	4	0
Tinglev	Subboreal	165	164	150	156	9	8.5	5	5
Grejs Molle	Subboreal	175	171	159	175	9	7	0	+2
Heck	Recent	146	149	141	132	3	4.5	9.5	11

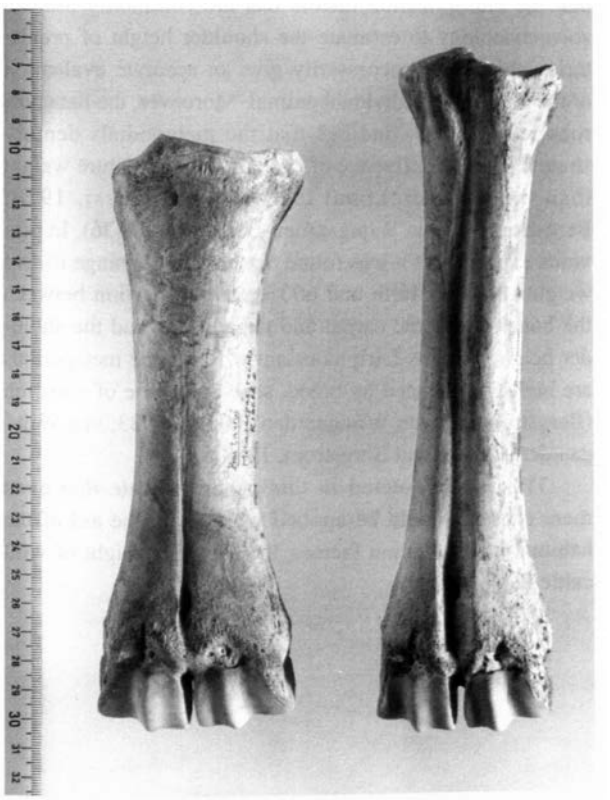

Fig. 7: Metacarpus (left) and metatarsus of the seven-year old Heck cattle bull from the Oostvaardersplassen region.

skull with horncores and that of the humerus, onto which much of the weight from the skull will be transposed. As the humerus is the latest fusing element of the foreleg, the forces generated by the weight of the skull would have a longer time in exerting their influence on the humerus than on the more distal leg bones.

The different estimates for the shoulder height in table 2 seem to follow a pattern whereby the more proximal skeletal elements give a higher height than the more distal elements. This observation has also been checked against the data of Danish aurochs (tab. 4). Table 4 presents evidence that in each case the shoulder heights that are estimated from the radius or metacarpal fall beneath those calculated from the humerus. The relative differences have been established by using the following indexes:

A: shoulder height Hum1 - shoulder height Rad x100 / shoulder height Hum1

B: shoulder height Hum2 - shoulder height Rad x 100 / shoulder height Hum2

Table 5: Estimated shoulder height in cm of Danish aurochs based on the greatest length of femur (Fem), tibia (Tib) and metatarsal (MT) and proportional differences in % between the shoulder heights based on Fem and Tib (A); Fem and MT (B).

Site	Pollenzone	Fem	Tib	MT	A	B
Vig	Preboreal	167	162	164	3	2
Store Damme	Boreal	169	167	165	1	2
Tinglev	Subboreal	153	157	158	+2.5	+3
Grejs Molle	Subboreal	167	165	176	1	+6.5
Heck	Recent	143	137	137	4	4

For the indexes C and D the shoulder height based on the greatest length of the radius is substituted by that based on the greatest length of the metacarpal.

For a discussion of the data presented in table 4 the greatest caution should be exercised. The multiplication factors established by Matolcsi (1970) are based on a group of 95 animals of different breeds without making a differentiation between males and females. Although the products of fairly extensive cattle husbandry, it remains the question if data extracted from domestic cattle can be applied to wild cattle.

Although the group of Danish aurochs is only small, table 4 shows some clear trends. Firstly, the height based on the humerus is in each case the greatest, followed by the one based on the metacarpal and with the one based on the radius giving the lowest shoulder height. For the Heck skeleton this last trend is reversed: here the height based on the metacarpal is smaller than the one based on the radius (respectively 9.5 and 3% of the height based on the humerus).

Secondly, in the earlier dated specimens the proportional difference between the shoulder height based on the humerus and the ones based on the radius or metacarpal is more pronounced: whereas the difference between the shoulder height based on the humerus and the metacarpal amounts to 20 cm (11%) for the specimen from Terp, the same difference is reduced to 0 for the individual from Grejs Molle. Degerbol comments himself for the find of Grejs Molle that "The metapodials are uncommonly large, the largest in the Danish material" (Degerbol and Fredskild, 1970: 22).

For the hind leg the data for comparison are even scarcer (tab. 5). As far as can be seen the differences between the shoulder heights based on the three long bones of the hind legs are less pronounced than for the front leg. The only exception is the skeleton from Grejs Molle which has a shoulder height based on the metatarsal that is 6.5% larger than the one based on the femur.

Discussion

Comparison with the measurements of the smallest Danish aurochs give evidence that the individual male Heck cattle did not reach the size of prehistoric wild cattle.

The osteometric data presented in this paper also show large discrepancies in the estimated shoulder height depending on the skeletal element that is used. For the Heck cattle and for the sample of Danish aurochs the more proximal elements give a higher shoulder height than the more distal elements. This finding is an important warning that the multiplication factors that are commonly used in zooarchaeology to estimate the shoulder height of prehistoric cattle do not necessarily give an accurate evaluation of the size of the individual animal. Moreover, the data corroborate previous findings that the metapodials demonstrate a stronger influence of age and thus of mature weight than the more proximal leg bones (Matolcsi, 1970; Bergstrom and van Wijngaarden-Bakker, 1983: 36). In previous experiments it was found that within the range of live weights between birth and 600 kg the proportion between the bones above the carpal and tarsal joints and the shoulder height remains fairly constant whereas the metapodials are highly influenced by breed, sexe and plane of nutrition (Bergstrom and van Wijngaarden-Bakker, 1983; van Wijngaarden-Bakker and Bergstrom, 1988).

The data presented in this paper indicate that even more caution should be applied when, with the aid of the habitual multiplication factors, the shoulder height of wild cattle is estimated.

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