

Geographical differences for Sheep and Goat in the early Medieval Period

ROLF W. LIE AND ROLV TERJE LIE

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A medieval bone material of lesser livestock (sheep and goat) from Oslo and Trondheim is compared by means of discriminant analysis. Metacarpals and metatarsals were included in the study and four measurements of bone size were used. Bones from Trondheim were found to be wider at the distal end compared with bones from Oslo. The other measurements did not make any additional contribution to the differences between the populations. The fact that the differences were consistent for both species, suggests that the populations were partially isolated and possibly subject to different feeding conditions.

R. W. Lie, Museum of Zoology. R. T. Lie, Section for Medical Informatics and Statistics. University of Bergen, Norway. Correspondence to: Rolf W. Lie, Museum of Zoology, University of Bergen N-5001 Bergen, Norway.

INTRODUCTION

Large materials of bones have been excavated from medieval layers in the oldest cities in Norway during the last two decades. Still, the knowledge about size and age-distribution of domesticated animals in the medieval period is limited.

The aim of this paper is to compare bones of small bovids (sheep and goat) from Oslo and Trondheim with respect to simple morphological traits. Metapodials were chosen because they are easily identified as originating from either sheep or goat, and a linear discriminant analysis using four simple morphological measures (See Fig. 1) after classification confirms the discrimination of sheep from goat 100 per cent. The metapodials from sheep are somewhat longer and slimmer than those from goat, and a specialist can easily separate bones from the two species.

MATERIAL AND METHODS

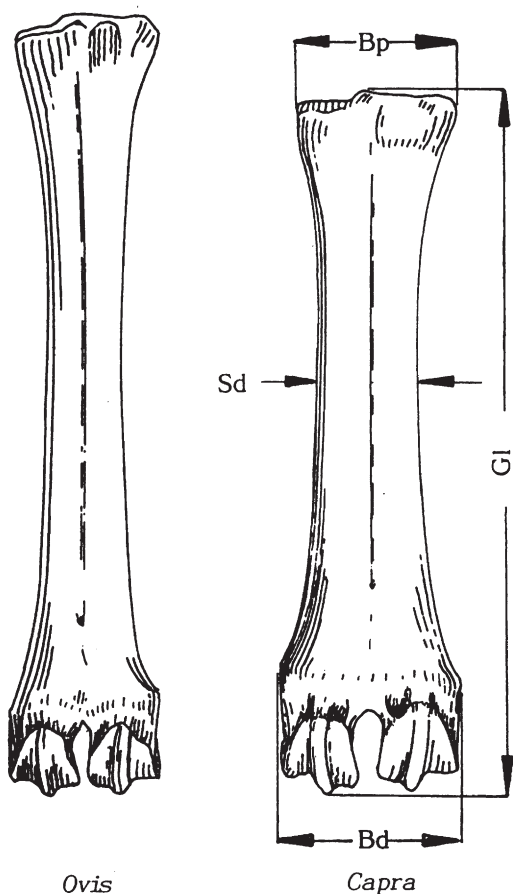
This study uses the metacarpals and metatarsals of respectively, sheep and goat from an archaeological material dated to the 11th and 12th century. Only whole bones with completed growth were used. Bones from «Mindets tomt» (Lie 1988) representing Oslo were selected from the oldest layers until fire-level 11. Thus, the material should stem from the

period prior to 1175 A.D.. The material from Trondheim (Lie 1989) was excavated on the Library site and belongs to phase 2 and phase 3. These phases were dated to the period from about 1000 A.D. to the middle of the 12th century. This excavation is described in detail by Ahlstrom and Hodkinson (1986) and Forsaker and Gotenberg (1986).

Four measures were taken on each of the metapodials (See Fig. 1). These were the total length, the proximal breadth and the minimal breadth according to Driesch (1976) and the maximum distal breadth of the bone which was measured according to Duerst (1926). The accuracy of the measurements was about 0.1 millimeter.

In the material from Oslo, 17 metatarsals and 13 metacarpals from sheep were identified. In Trondheim 12 metatarsals and 12 metacarpals were found. No metatarsals from goat were identified in the material from Oslo. However, 5 metacarpals were found in Oslo and 12 in Trondheim. Thus, only metacarpals from goat in Oslo and Trondheim were compared and both metatarsals and metacarpals from sheep were compared between the two cities.

The comparison was made using a multiple discriminant analysis and performed with the program P7M in BMDP/pc90 (Jennrich and Simpson 1988). The four morphological measures were used in a linear discriminant



function, and the measures not significantly contributing to separation of the two populations on a 5 per cent significance level were removed from the discriminant function. The discriminative potential of the final discriminant function was evaluated by the percentage of bones correctly classified by the discriminant function in a jackknifed classification procedure (Jennrich and Simpson 1988).

RESULTS

The means and standard deviations for the measurements are presented in Table 1. When each measurement is inspected in isolation, only the means of the distal breadth seem to differ between the two cities. The bones seem to be wider for Trondheim both for sheep and for goat. A discriminant analysis also takes the correlation between the measurements into account. However, only the distal breadth of the bones showed any discriminative potential between the two cities. This was found both for metatarsals and for metacarpals from sheep and for metacarpals from goat. For metatarsals from sheep, only 62.1 per cent of the bones were correctly

Fig. 1. Measurements taken on each metapodial: G1: The total length of the bone. Bp: The proximal breadth. Sd: The minimal breadth of the bone. Bd: The maximum distal breadth.

Table 1. Mean values in millimeters of four morphological measures for excavated metapodials from the medieval cities of Trondheim and Oslo.

Species	Bone	Measure	Trondheim		Oslo	
			Mean	St.dev.	Mean	St.dev.
<i>Ovis aries</i>	Metatarsus	Total length	139.08	7.13	137.66	6.62
		Proximal breadth	19.83	1.37	19.24	0.71
		Minimal breadth	11.99	0.59	11.81	0.67
		Distal breadth	23.53	1.42	22.44	1.12
		Number of bones	12		17	
	Metacarpus	Total length	127.96	6.46	124.16	5.83
		Proximal breadth	21.83	1.00	21.57	1.05
		Minimal breadth	13.79	0.85	13.19	1.01
		Distal breadth	25.26	1.88	23.65	1.12
		Number of bones	12		13	
<i>Capra hircus</i>	Metacarpus	Total length	108.75	3.33	107.14	2.26
		Proximal breadth	24.85	1.42	23.62	0.58
		Minimal breadth	16.92	1.56	16.96	0.84
		Distal breadth	29.30	2.42	26.62	0.60
		Number of bones	12		5	

assigned to the right city by a jackknifed classification by the simple discriminant function based on the distal breadth of the bone only. This discriminant function corresponds to assigning slim bones to Oslo and wide bones to Trondheim by defining an optimal cutoff value for the distal breadth. For metacarpals, 68 per cent were correctly classified, and for metacarpals from goat, 88.2 per cent were correctly classified.

DISCUSSION

The finding that the metapodials of sheep and goat from the medieval city of Trondheim were larger than those from the same period in Oslo may have several explanations. First, the roles played by the two sexes are not known. We have not attempted to identify the sexes in our data, and if the distal breadth are greater for one of the sexes and the sex ratios are different in Trondheim and Oslo, this may explain the result. However, the authors believe that only females the represented in the material.

Second, if the populations of bovids in Trondheim and Oslo were isolated genetically, morphological differences may have occurred. It is however strange that the same type of morphological discrepancy should occur both in sheep and goat.

Finally, the feeding conditions may have been different in the two cities. Bad feeding in the growth period may have caused selection of smaller, slow-growing individuals especially in Oslo. This seems to be the most plausible explanation for the difference in bone-size.

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