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Faunal remains from Mediaeval Bergen

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The paper discusses the osteological material found in two layers dated to the beginning and the end of the 15th century excavated in Bergen, Norway. Nearly 95% of the material is identified to stem from cattle, sheep/goat, and pig. Survivorship curves of cattle, sheep/goat, and pig are derived from age identified long-bones. The cattle metapods and pelves are sex identified. Sheep and goat are identified from the shape of the metapods. An estimation of the height at the withers of cattle, sheep/goat, and pig is also calculated from these.

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INTRODUCTION

The study of faunal remains from archaeological sites is a growing science all over the world. Archaeologists gradually are realizing the information on earlier cultures obtainable from animal remains. To recover this information is primarily a zoological problem, which must be solved by the zoologist, not only as a service to the archaeologist, but also as a branch of faunal history.

Bergen has one of the best known mediaeval societies in Scandinavia, but nothing has as yet been published on its faunal remains. The present study presents some of the material found in an excavated site dated to the 15th century.

Table 1. Remains of mammals from the excavation at Rosenkrantzgt. 4, Bergen.

Species	Number of fragments Layer 1	Layer 2
Whales (Cetacea)	1	0
Dog *(Canis* (domestic))	1	0
Cat *(Felis* (domestic))	4	2
Seals (Phocidae)	1	1
Horse *(Equus* (domestic))	1	1
Pig *(Sus* (domestic))	39	89
Red Deer *(Cervus elaphus)*	6	11
Moose *(Alces alces)*	1	0
Reindeer *(Rangifer tarandus)*	6	2
Cattle *(Bos* (domestic))	337	478
Sheep/goat *(Ovis/Capra* (domestic))	219	146
Number identified	616	730
Number not identified	502	421
Total number of bones	1118	1151

Table 2. Remains of birds from the excavation at Rosenkrantzgt. 4, Bergen.

Species	Number of fragments Layer 1	Layer 2
Gannet *(Sula bassana)*	1	0
Goose *(Anser anser/Anser* (domestic))	0	1
White-tailed eagle *(Haliaetus albicilla)*	3	0
Fowl *(Gallus* (domestic))	2	2
Common gull *(Larus canus)*	1	0
Raven *(Corvus corax)*	0	2
Number identified	7	5
Number not identified	0	1
Total number of bones	7	6

Table 3. Remains of fish from the excavation at Rosenkrantzgt. 4, Bergen.

Species	Number of fragments Layer 1	Layer 2
Cod *(Gadus morhua)*	2	0
Ling *(Molva molva)*	3	1
Number identified	5	1
Number not identified	9	1
Total number of bones	14	2

MATERIAL

The material is from the excavation carried out in the period from May 1978 till May 1979 at Rosenkrantzgt. 4, Bergen, Norway under the supervision of the National Antiquarian.

The material is stratified according to five fire layers. Two of the stratas are dealt with here; «under fire layer C», called layer 1 and «over fire layer A», called layer 2. They are dated to the beginning of the 15th century before the fire in 1413 A.C. and to the end of the same century after the fire in 1476 A.C. respectively. A fuller description of the excavation site was given by Lindh (1980).

The material in layer 1 was found in a building (No 31) with unknown function and in a passage (No 4) between this building and the so called «Wine-cellar». The material in layer 2 was found on both sides of a passage (No 3). Layer 2 was situated above layer 1 in the same rectangle of 60 m^2. The material consists of 2298 bones and fragments of which 1370 have been identified. The unidentified part consists of vertebrae, ribs, and thoroughly fragmented bones (Tabs. 1—3).

The material is now deposited at the Osteology Section, Museum of Zoology, Bergen.

Table 4. The distribution of the metapodial index of cattle according to Howard (1963).

	Metacarpi	Metatarsi
Females	12.9-19.5	11.5-14.7
Males	18.6-24.5	14.7-19.2
Male castrates	14.0-18.3	12.7-15.8

METHODS

All visible bones were collected by hand during the recovery of the site.

The bones have been identified by comparison with material of recent animals in the collection of the Osteology Section, Museum of Zoology, Bergen.

Distinguishing between bones of sheep and goat presents great difficulties, and they are hence referred to as «sheep/goat» in most of this study. Certain parts of their skeleton do, however, display some diagnostic differences (Boessneck 1969). Own experience from Norwegian material is that the metapods are among those showing these differences most clearly, the metapods of goat being shorter and stouter than those of sheep.

Lie (1980) distinguished between sheep and goat by using the maximum length of the metapods only. In the present work the maximum length of the metapods plotted against the index

$$\frac{\text{minimum thickness} \times 100}{\text{maximum length}}$$

is used for separation.

The age determinations are based on fusion of the epiphyses of the long bones (Habermehl 1961).

The sex identification of cattle is made from the maximum length and the index

$$\frac{\text{minimum breadth} \times 100}{\text{maximum length}}$$

of the metapods (Tab. 4) (Howards 1963) and from the pelvis (Lamppenau 1964).

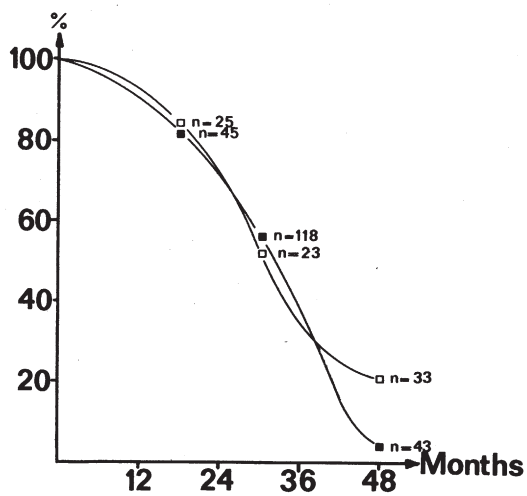

Fig. 1. The survivorship curves of cattle from layer 1 (□) and layer 2 (■) from the excavation at Rosenkrantzgt. 4, Bergen. n is the sample size of each age group.

Table 5. The distribution of the sex identified pelves of cattle from the exavation at Rosenkrantzgt. 4, Bergen.

	Layer 1	2
Females	6	4
Males	2	19

Table 6. The max. length and the metapodial index of cattle from the excavation at Rosenkrantzgt. 4, Bergen.

Metacarpi Max.length (mm)	Index	Metatarsi Max. length (mm)	Index
162.0	19.1	200.5	10.0
158.8	17.7	183.9	12.1
156.9	15.6	188.4	12.3
159.2	17.4	199.2	11.3
182.6	16.1	187.0	11.6
164.3	17.0	179.8	11.8
169.9	16.7	182.0	13.4
162.3	16.8	172.5	12.3
151.3	18.9	195.1	12.8
179.3	15.6	188.0	12.3
168.6	17.7	175.7	12.2
159.0	17.8	175.7	13.2
160.9	16.3	192.6	11.6
152.6	19.2	182.1	12.4
156.6	18.0	200.8	11.7
155.0	18.5	177.1	13.5
163.5	18.5	191.7	12.8
151.7	17.1	173.9	12.5
165.3	16.4	189.2	12.4
165.3	16.5		
161.8	19.0		
154.6	16.2		
166.3	16.7		
176.2	15.5		
172.2	15.8		
174.5	16.3		
177.3	15.9		
161.7	14.2		
156.4	16.8		
159.5	18.4		
169.2	15.3		

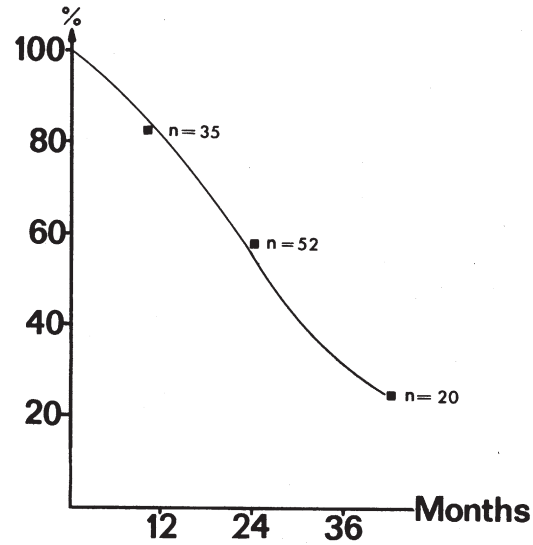

Fig. 2. The survivorship curve of sheep/goat from layer 1 and 2 (pooled) from the excavation at Rosenkrantzgt. 4, Bergen. n is the sample size of each age group.

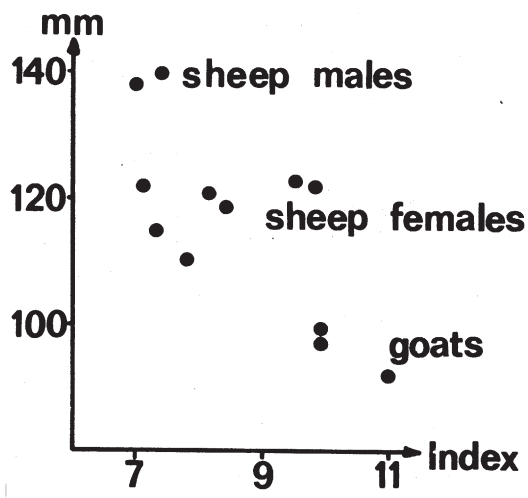

Fig. 3. The relation between the max. length and the

$$\text{index} = \frac{\text{min. thickness} \cdot 100}{\text{max. length}}$$

of the metacarpi of sheep/goat from the excavation at Rosenkrantzgt. 4, Bergen.

Table 7. The max. length and metapodial index of the metacarpi, and species, sex, and estimated height at the withers of sheep and goats from the excavation at Rosenkrantzgt. 4, Bergen.

Layer	Max. length (mm)	Index	Species	Sex	Height at the withers (cm)
1	96.1	10.0	Goat		55.3
1	135.0	7.9	Sheep	Male	66.4
2	99.0	9.9	Goat		56.9
2	91.8	11.0	Goat		52.8
2	98.8	9.9	Goat		56.8
2	140.3	7.4	Sheep	Male	69.0
2	122.6	9.5	Sheep	Female	59.6
2	121.7	9.8	Sheep	Female	59.1
2	121.1	8.1	Sheep	Female	58.9
2	118.5	8.4	Sheep	Female	57.6
2	122.2	7.1	Sheep	Female	59.4
2	110.0	7.8	Sheep	Female	53.5
2	114.8	7.3	Sheep	Female	55.8
2	137.8	7.0	Sheep	Male	67.8

Table 8. The max. length and metapodial index of the metacarpi, and species, and estimated height at the withers of sheep and goats from the excavation at Rosenkrantzgt. 4, Bergen.

Layer	Max. length (mm)	Index	Species	Height at the withers (cm)
1	118.9	9.5	Goat	63.5
1	116.0	8.5	Sheep	52.8
2	106.8	9.3	Goat	57.0
2	114.8	10.3	Goat	61.3
2	125.8	7.2	Sheep	57.2
2	139.5	6.8	Sheep	63.5
2	134.1	7.2	Sheep	61.0
2	131.0	7.3	Sheep	59.6
2	125.2	7.2	Sheep	57.0
2	136.1	6.9	Sheep	61.9

The sex identification of sheep metapods is made from the same figures as used for distinguishing between sheep and goat, since male metapods are much longer than female metapods.

An estimate of the height at the withers is calculated from the maximum length of the metapods (Haak 1965, Schramm 1967).

In the present study scientific names of domestic animals follow Corbet (1978). However, this nomenclature is much discussed. Groves (1971) requested The International Commission on Zoological Nomenclature to exclude names proposed for domestic animals from zoological nomenclature. No decision has as yet been taken.

The statistical methods used follow Campbell (1974) and Langley (1979).

RESULTS

Nearly 95 % of the identified material in both layers originates from cattle, sheep/goat, and pig. The rest stems from whales, dog, cat, horse, red deer, moose, reindeer, gannet, goose, white-tailed eagle, fowl, common gull, raven, cod, and ling (Tabs. 1—3).

Cattle (*Bos* (domestic))

Cattle has the highest relative abundance in both layers.

Most of the cattle were slaughtered before they were mature (four years in recent populations) (Fig. 1). However, layer 1 contains significantly more mature specimens than layer 2 ($x^2 = 5.41$, $P < .05$).

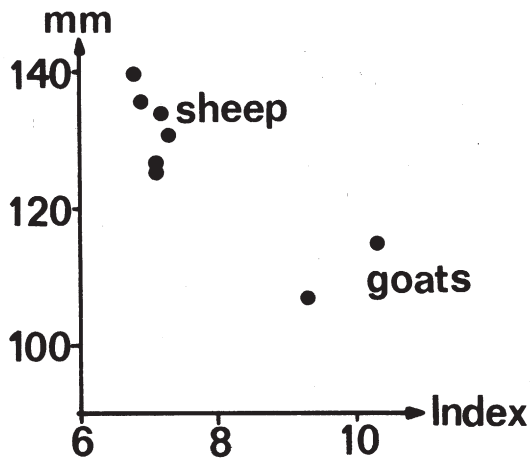

Fig. 4. The relation between the max. length and the

$$\text{index} = \frac{\text{min. thickness} \cdot 100}{\text{max. length}}$$

of the metatarsi of sheep/goat from the excavation at Rosenkrantzgt. 4, Bergen.

Based on identification on the pelves there are significantly more females in layer 1 than in layer 2 ($P < .01$, Fisher's exact test) (Tab. 5).

In layer 1 only one metapod could be measured, a metatarsus with maximum length 193 mm and index 10.6. According to Howard (1963) this must be a female.

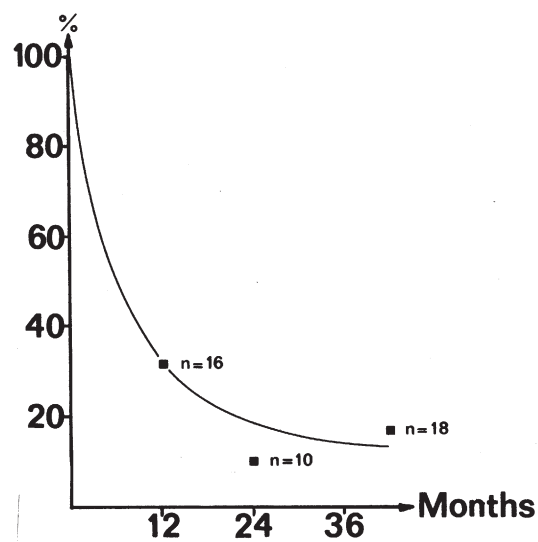

Fig. 5. The survivorship curve of pig from layer 2 from the excavation at Rosenkrantzgt. 4, Bergen. n is the sample size of each age group.

In layer 2 32 metacarpi and 20 metatarsi could be measured (Tab. 6). The indices of the metacarpi lay mainly in the area of overlap between females, males, and castrated males. The indices calculated from the metatarsi lay mainly in the female area but also some in the area of overlap between females and castrated males.

Sheep/goat (*Ovis/Capra* **(domestic))**

Sheep/goat has the second highest relative abundance in both layers.

The survival frequencies are not significantly different between the layers in any of the age classes ($P > .05$). The material from the two layers has hence been pooled in the survivorship curve (Fig. 2). Approximately 25% of the individuals seem to have reached maturity (3.5 years in recent populations).

In layer 1 one metacarpus and one metatarsus from each of the two species were identified. The sheep metacarpus is supposed to have come from a male. In layer 2 nine metacarpi and six metatarsi were identified as sheep, and three metacarpi and two metatarsi as goat. Two of the sheep metacarpi were identified as males, the others as females (Tabs. 7 and 8, Figs. 3 and 4). It was not possible to identify the sex of the sheep metatarsi or the goat metapods.

The mean height at the withers has been estimated to be about 68 cm for rams, 58 cm for ewes, and 58 cm for goats.

Pig (*Sus* **(domestic))**

Pig has the third highest relative abundance in both layers.

Its lifespan distribution was calculated only from the material in layer 2. Only 10% of the animals seem to have reached maturity (3.5 years in recent populations) (Fig. 5).

No complete long-bone of pig was found. Accordingly the height at the withers was not calculated.

DISCUSSION

The majority of animal bones originally deposited on any archaeological site does not survive to recovery. All faunal samples therefore are biased towards the denser bones (Maltby 1979). Payne (1972, 1975) and Clason & Prummel (1977) have shown that unsieved faunal materials also tend to be biased towards the larger mammals since the bones of smaller mammals,

birds, and fish are more likely to be overlooked during excavation. This has certainly also affected the present sample. However, since the layers have been deposited relatively close in time and the sampling technique used has been the same in both, any differences between the two layers are supposed to reflect different distribution of the bones originally deposited.

Unfortunately there exists no certain method for ageing subfossil animals. The method of Habermehl (1961) is based on recent populations while mediaeval populations of domestic animals probably reached maturity at a higher age (Ekmann 1973). The survival frequencies obtained must be considered as maximum figures as bones from younger individuals are more vulnerable to destruction and smaller bones have less chance for recovery in unsieved samples. This will, however, not effect the comparisons between the two layers.

The sex identification based on metapods is not as accurate as the one based on pelves, due to a high degree of overlap between the sexes. The fact that the values given by Howard (1963) are based on recent populations will also undoubtedly give a bias. However, by combination of the two methods, the results are supposed to give a fair estimate of the sex proportions.

The factors for the estimation of the height at the withers from the metapods also are based on recent populations. This might give a bias in the estimates. The method, however, gives an indication of the size of the animals.

Bearing in mind that survivorship curves are biased towards mature specimens very few of the cattle actually were mature. The material in both layers thus is supposed to come from populations mainly raised for slaughter, as milk producers would have reached a much higher age.

Females, both as meat and milk producers, generally are older than males. The higher survival rate to mature age found in layer 1, thus might be due to the excess of females in this layer as compared to layer 2.

In cattle most of the indices of the metacarpi in layer 2 were situated in the area of overlap between all the three sex groups. The indices of the metatarsi were situated mainly in the female area and in the area of overlap between females and castrated males. However, considered as samples from the same population, the same sex ratios should be obtained from the metapods as the one obtained from the pelves. As the present cattle probably were meat producers and castrated males would give the highest yield, the smallest metacarpus and the smallest metatarsus are identified as females, while the remaining metapods are regarded as males, mainly castrates.

In layer 2 the mean maximum length of the metacarpi is 165.6 mm and of the metatarsi 185.6 mm. This is approximately 10% less than previously recorded in mediaeval Scandinavia (e.g. Ekmann 1973, Lepiksaar 1979).

The estimated height at the withers based on the metacarpi and the factors of castrated males is 100 cm. The same height is obtained from the metatarsi. It is thus evident that this cattle was extremely small.

The survival curve of sheep/goat indicated that also these animals came from populations raised for meat production, as populations raised for wool production undoubtedly would have consisted of more mature specimens.

The length of the metapods and the estimated height at the withers (Tabs. 7 and 8) indicate that the size of the sheep and goats were the same as in Gamlebyen, Oslo (Lie 1980), but smaller than those recorded from Sweden (Ekmann 1973, Lepiksaar 1979).

Most of the pigs were slaughtered during their first year. This is the same as found at other sites (Ekmann 1973, Lie 1980) and confirms that pig was a pure meat producer. Due to its high fecundity a pig population can survive such high rates of immature slaughter.

Although there are some bias in the sample and little knowledge of the human activity at the site exists, cattle are supposed to have been the most important animal resource in this mediaeval society. The relative abundance of sheep/goat also indicates that these two species combined were more important than pig. This is the same pattern as found in other investigations of mediaeval societies (Ekmann 1973, Lepiksaar 1979).

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