

OSTEOLOGICAL MATERIAL FROM THE LAKE MÄTÄJÄRVI

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Introduction

Turku Provincial Museum made archaeological excavations on the site of the ancient Lake Mätäjärvi in 1982. The Lake Mätäjärvi was situated in the outskirts of the urban area of Turku, and it was apparently used as a dump since the Middle Ages. In this article we analyse the osteological discoveries from these excavations. The urban refuse faunas have not previously been studied in Finland (see Taavitsainen 1980), but rather intensively in other Nordic countries (e.g. Lie 1979, Vretemark 1983). For other aspects of the Lake Mätäjärvi, see the articles by our collaborators in this volume.

Material and methods

The osteological material comes from three separate excavations (areas A, B, and C) close to each other. Within each area all soil from excavation layers was sieved (aperture size 3 mm) and examined by at least two workers. We therefore consider the collected bone material well representative of what really was in the excavated earth. In addition to the bones from excavation layers, some bones were also found above them. These scattered samples are not quantitatively comparable with samples from the excavation layers, and therefore they are not included in our analyses (except in Table 1). The bone material is very well preserved.

For dating methods, see Salonen et al. (this volume). The material comes from two successive periods, namely Period I (about 1400—1520 A.D.) and Period II (about 1520—1700). Eight excavation layers belong to Period I, five belong to Period II. Materials from both periods appear in all three areas.

The excavation areas differ considerably in their faunal composition. Statistically significant differences are found e.g. in the relative abundances of animal groups between A and B as well as in the species composition within these groups (e.g. the relative abundances of main domestic animals differ between A and B during Period I). These differences are not treated here in detail, because they may be results of sampling errors (one excavation area is too small to be representative) or, if not so, they in any case reflect locally very restricted differences in deposition patterns. The materials from separate excavation areas are therefore combined in our analyses (except in the chapter about the origin of cow remains).

The identified bone samples form roughly one half of the whole material. This is a crude estimate, because the unidentified bone fragments were neither counted nor weighed. The unidentified fraction mainly includes bone fragments of middle-sized or

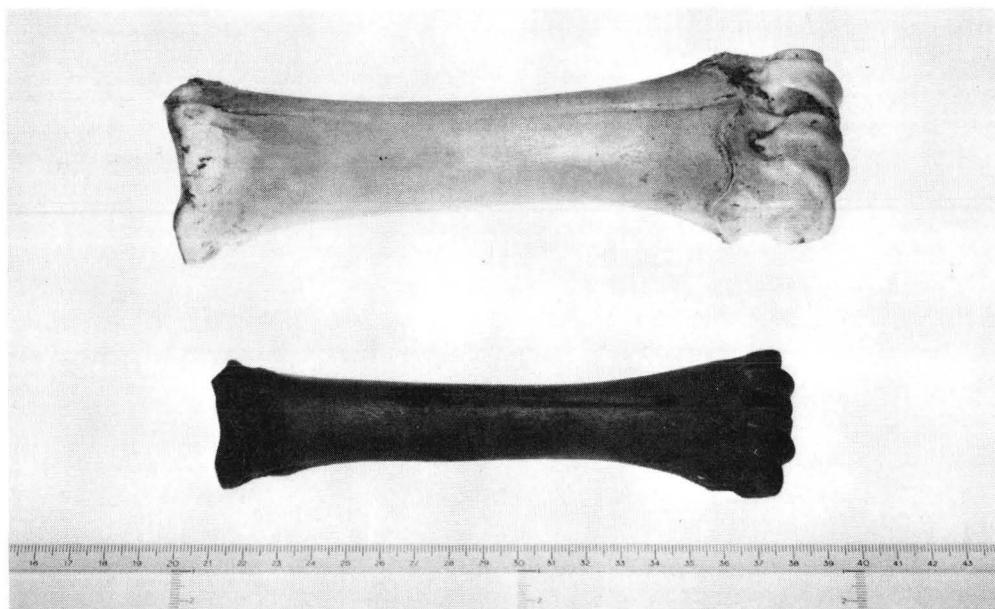


Figure 1. Size comparison of recent (above) and old (below) metacarpals of cow. The old specimen was found above excavation layers in Lake Mätäjärvi excavations. — Photo: Turku Provincial Museum/P. Kujanpää.

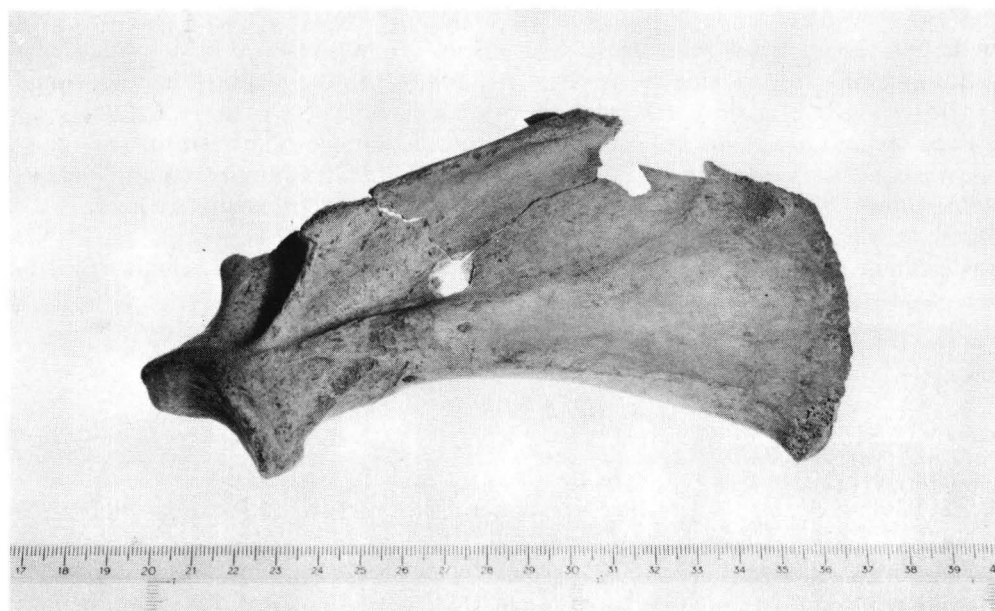


Figure 2. The left shoulder blade of Grey Seal *Halichoerus grypus* from Period II (1520–1700 A.D.). — Photo: Turku Provincial Museum/P. Kujanpää.



Figure 3. Distal part of humerus of Crane *Grus grus* from 1450—1500 A.D. (Layer 110). — Photo: Turku Provincial Museum/P. Kujanpää.

big domestic mammals (e.g. vertebrae and fragments of ribs and skull); these could not be identified due to the lack of complete reference skeletons. Remains of smaller mammals and birds were probably more frequently accepted to further studies than the remains of the same size of big mammals. These methodological weaknesses evidently bias our analyses in favour of rare and small species, at least when analyses are based merely on the numbers of samples. Fish remains are not included in this study.

Bone samples were identified partly with the help of a bone atlas (mainly Schmid 1972), partly by comparing the samples with bones from reference collections.

Each separate fragment was usually treated as one sample. The basic unit of analyses was one excavation layer. The estimates of minimum number of individuals (MIND) were made separately for each layer. MIND was calculated for a layer in the following way: 1) All samples of particular species were collected together, and MIND was estimated for each bone type separately. 2) The biggest MIND found was then chosen to be the MIND of that species in the excavation layer.

Results

Species composition data

Data on species composition is summarized in Table 1. Bone samples found above excavation layers and unidentified bird remains are not included in analyses outside Table 1.

The species can be divided into four groups by means of the probable origins of their remains. This group division is also shown in Table 1. Group A includes the most common domestic species used for agricultural production (cow, sheep/goat, pig, horse, and domestic hen). Group B is an assemblage of species firmly associated with human

Table 1. Species composition of identified osteological material in different periods. Numbers indicate numbers of samples (estimates of MIND). Group symbols: A = domestic species, B = species associated with man, C = game species, D = other species (see text for details).

GROUP SPECIES	PERIOD I	PERIOD II	PRESENCE (+/-) ABOVE EXC.LAYERS
D Frog/toad <i>Rana/Bufo</i> sp.	2 (1)	1 (1)	—
C Swan <i>Cygnus</i> sp?	2 (2)		—
C Goose <i>Anser</i> sp.	3 (3)	1 (1)	+
C Scoter <i>Melanitta</i> sp.	1 (1)		—
C Merganser <i>Mergus</i> sp.	3 (2)	1 (1)	—
C Duck <i>Anas</i> sp.	1 (1)		—
C Waterfowl <i>Anatidae</i>	4 —	4 —	—
C Capercaillie <i>Tetrao urogallus</i>	6 (3)	2 (2)	+
C Black Grouse <i>T. tetrix</i>	4 (3)	2 (2)	+
C Hazel Hen <i>Bonasa bonasia</i>	2 (2)	3 (2)	—
A Domestic Hen <i>Gallus domesticus</i>	10 (4)	5 (3)	+
D Crane <i>Grus grus</i>	1 (1)		—
D Raven <i>Corvus corax</i>		1 (1)	—
Unidentified birds <i>Aves</i>	18 —	17 —	+
C Hare <i>Lepus</i> sp.	43 (11)	34 (8)	+
B Rat <i>Rattus</i> sp.	2 (2)	3 (3)	—
C Squirrel <i>Sciurus vulgaris</i>	5 (5)	2 (1)	+
B Dog/Wolf <i>Canis</i> sp.	3 (1)	2 (2)	+
C Red Fox <i>Vulpes vulpes</i>	1 (1)	1 (1)	—
B Cat <i>Felis domesticus</i>	7 (3)	3 (3)	+
C Grey Seal <i>Halichoerus grypus</i>		1 (1)	—
A Horse <i>Equus caballus</i>		1 (1)	—
A Pig <i>Sus scrofa</i>	124 (20)	74 (15)	+
A Sheep/Goat <i>Ovis/Capra</i>	168 (27)	211 (26)	+
A Cow <i>Bos taurus</i>	729 (114)	475 (36)	+
Total	1139 (207)	844 (110)	

settlement (dog(/wolf?), cat and rat), but not used for production. (The possibility of wolf cannot be totally excluded when considering the remains of *Canis* sp.) Group C includes game species, and three subgroups can be found within it. These are game mammals (grey seal, red fox, hare, and squirrel), gallinaceous birds (capercaillie, black grouse, and hazel hen), and waterfowl (various ducks, geese and swans). Finally, Group D contains species which are neither clearly associated with human settlement nor regularly hunted (frog/toad, crane, and raven).

Remains of species belonging to Groups A or C most probably were deposited in Lake Mätäjärvi as a direct result of human activities. Thus they give us some information concerning human activities. Remains of species belonging to Groups B or D do not give us such information. Their appearance in the Lake Mätäjärvi deposits is probably more accidental than regular (perhaps excluding frog/toad), although the amount of Group B remains may be indirectly related to interesting human activities (slaughtering offals may have attracted cats and dogs etc.).

Temporal changes in relative abundances of groups

Statistically significant temporal changes in relative proportions of groups were observed neither in the numbers of samples ($G^2 = 0.45$; N.S.) nor in estimates of

Table 2. Temporal changes in relative abundances of groups. S = relative proportion of all samples (%), M = relative proportion of total MIND (%). Group symbols are explained in Table 1.

GROUP	PERIOD I		PERIOD II		CHANGE IN	
	S	(M)	S	(M)	S	(M)
A	92.0	(79.7)	92.6	(73.6)	+0.6	(-6.1)
B	1.1	(2.9)	1.0	(7.3)	-0.1	(+4.4)
C	6.7	(16.4)	6.2	(17.3)	-0.5	(+0.9)
D	0.3	(1.0)	0.2	(1.8)	-0.1	(+0.8)
n	1121	(207)	827	(110)		

MIND ($G^2 = 4.24$; N.S.). The data on relative abundances of groups is shown in Table 2. The differences are bigger in values of MIND.

Temporal changes in species composition within groups

Domestic species. The relative abundances of three most common domestic species (cow, sheep/goat and pig) change considerably from Period I to Period II (Figure 4). The difference is significant both in the numbers of samples ($G^2 = 60.95$; $P < 0.001$) and in estimates of MIND ($G^2 = 19.74$; $P < 0.001$). The direction of change is clear for cow and sheep/goat (see below):

SPECIES	CHANGE (%) IN PROPORTION OF NUMBERS OF SAMPLES	CHANGE (%) IN PROPORTION OF TOTAL MIND
Cow	- 8.9	-24.0
Sheep/goat	+11.3	+17.0
Pig	- 2.4	+ 7.1
Σ	0.0	0.1

the relative abundance of cow decreases, while the proportion of sheep/goat increases. The situation of pig is contradictory; its proportion of total MIND clearly increases, but the proportion of the number of samples slightly decreases.

Game species. No significant temporal changes could be observed in subgroup composition from Period I to Period II. This was true both for numbers of samples ($G^2 = 2.30$; N.S.) and for estimates of MIND ($G^2 = 3.01$; N.S.). It seems, however, that the proportion of game mammals has somewhat increased and the proportion of waterfowl decreased from Period I to Period II (Table 3).

Table 3. Temporal changes in relative abundances of subgroups of game species. S = relative proportion of all samples (%), M = relative proportion of total MIND (%).

SUBGROUP	PERIOD I		PERIOD II		CHANGE IN	
	S	(M)	S	(M)	S	(M)
Game mammals	65.3	(50.0)	74.5	(57.9)	+9.2	(+ 7.9)
Gallinaceous birds	16.0	(23.5)	13.7	(31.6)	-2.3	(+ 8.1)
Waterfowl	18.7	(26.5)	11.8	(10.5)	-6.9	(-16.0)
n	75	(34)	51	(19)		

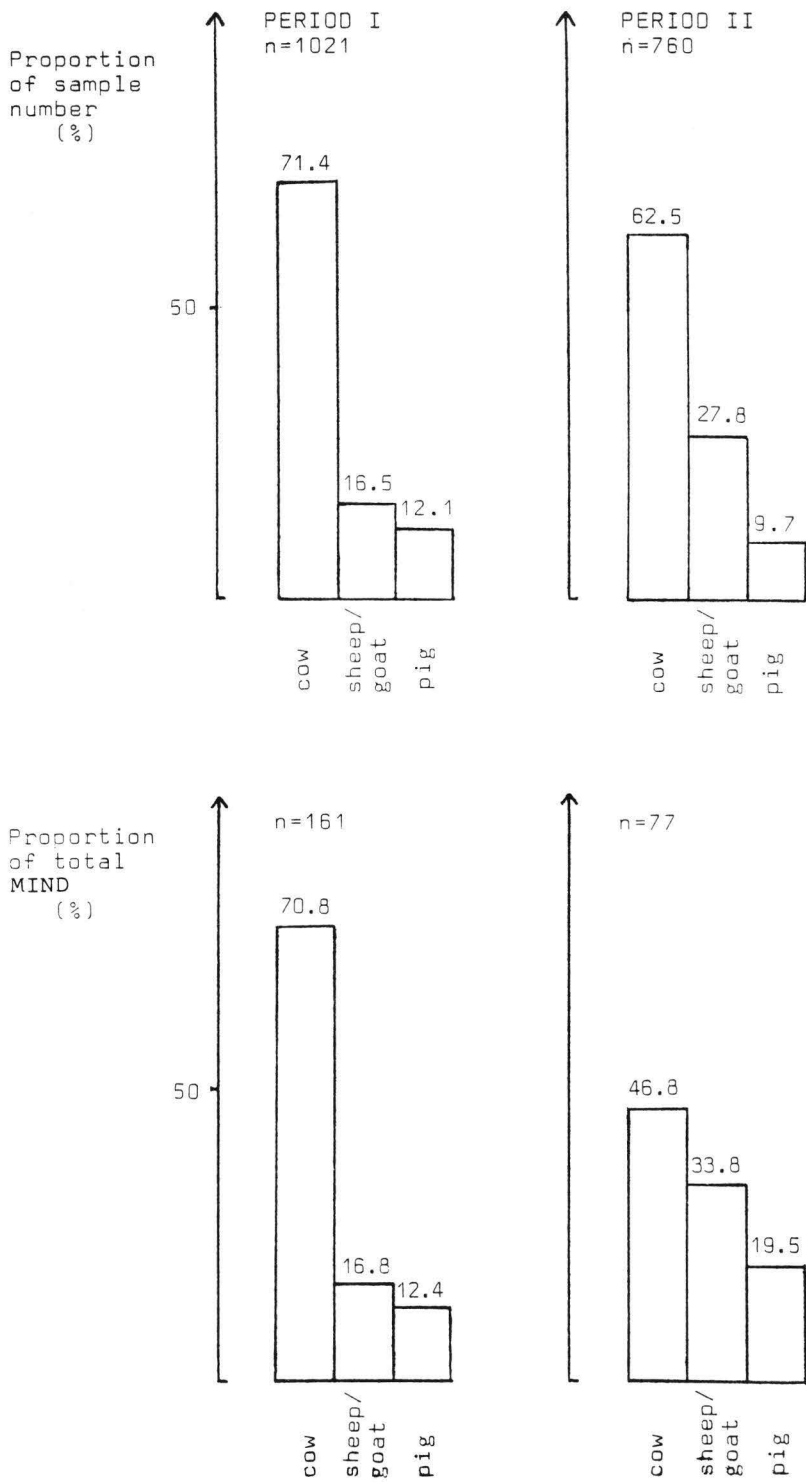


Figure 4. Temporal differences in relative abundances of main domestic species (cow, sheep/goat and pig).

The material may slightly exaggerate the relative abundance of waterfowl remains. This is due to the fact that (in the species accuracy) unidentified waterfowl bones could be put into the waterfowl subgroup, whereas the unidentified remains of gallinaceous birds could not be put into the gallinaceous birds' subgroup. The reason for this is the possible appearance of domestic hen in the unidentified material. The error is, however, small, because the total amount of unidentified remains of gallinaceous birds is only five.

Hare is clearly the most abundant game mammal species. In Period I, its proportion of all game mammal samples is 87.8 %, and the proportion of total MIND of game mammals is 64.7 %. The corresponding proportions of hare remains in Period II are 89.5 % and 72.7 %.

Origin of cow remains

Cow is the most abundant species in our material. In order to study the origin of cow remains the bone material was divided into three categories: samples of horn cores (H), food remains (F) and slaughtering offals (S). The data concerning the relative proportions of these categories is summarized in Table 4 (see also Figure 6). The difference between food remains and waste items is the following: offals include all parts of skull (excluding horn cores, but including atlas and axis) and the distal parts of legs, from distal radii and tibiae downwards. Other parts of the skeleton (again excluding horn cores) belong to food remains.

Table 4. Local and temporal differences in the origins of cow remains. Numbers are relative proportions (%) of all samples within area. H = horn cores, F = food remains, S = slaughtering offals.

EXCAVATION AREA:		A	B	C	Total
PERIOD I	H	50.3	8.7	60.0	40.2
	F	14.0	21.2	3.3	15.4
	S	35.7	70.1	36.7	44.4
	n	515	184	30	729
PERIOD II	H	13.3	0.0	8.9	10.5
	F	22.8	25.3	40.0	24.8
	S	64.0	74.7	51.1	64.6
	n	347	83	45	475

When the areas are combined, a significant difference is found in the relative proportions of different categories between Period I and Period II ($G^2 = 209.4$; $P < 0.001$, see also Fig. 6). This difference is mainly due to horn cores, because the relative proportions of food remains and waste items do not differ temporally ($\chi^2 = 0.47$; N.S., areas combined and horn cores excluded from the test). The difference between the proportions of horn cores is, as expected, significant in the two periods ($\chi^2 = 124.2$; $P < 0.001$, areas combined and food remains and waste items clumped together). Horn cores are significantly more abundant in Period I than in Period II. Furthermore, there are differences in the number of horn cores between the areas during Period I. Horn cores are significantly less abundant in area B than in area A ($\chi^2 = 98.3$; $P < 0.001$) and area C ($\chi^2 = 50.8$; $P < 0.001$). There is no difference between areas A and C ($\chi^2 = 1.07$; N.S.). Therefore, the temporal and local differences observed may largely be due to local accumulation of horn cores (Figure 5) in areas A and C during Period I.



Figure 5. Bovine horn cores from Period I (Layer 10, 1400—1520 A.D.). — Photo: Turku Provincial Museum/P. Kujanpää.

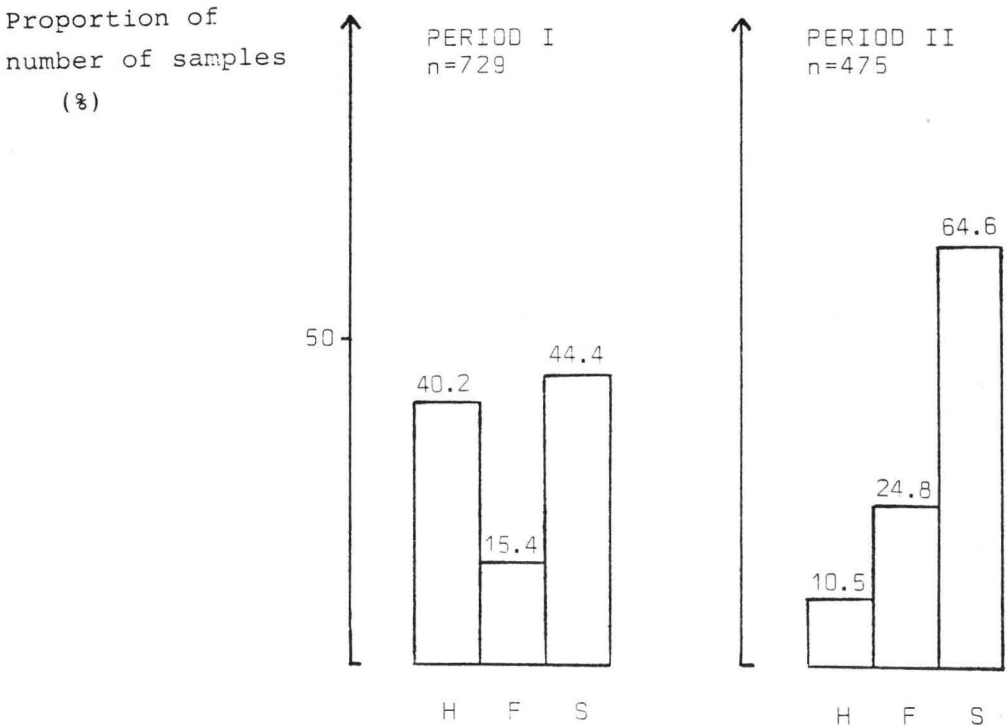


Figure 6. Temporal changes in the origins of cow remains. H = horn cores, F = food remains, and S = slaughtering offals.

Waste items are systematically more abundant than food remains in our material. The proportion of waste items may, however, be overestimated for two reasons. First, the parts of animal body in the offals simply contain more bones (e.g. teeth and phalanges) than edible parts. Second, the species of a big proportion of bones from edible parts (rib fragments and vertebrae in particular) could not be identified. Thus they are not included in our analyses. Both of these sources of error are, however, systematic and do not affect the observed changes.

Discussion

How representative is the collected material of all the bone material actually deposited in the Lake Mätäjärvi? As was already mentioned, it probably represents fairly well the material *preserved* in the earth, at least within excavation areas. Because even the oldest bones are very well preserved, decaying has evidently not much changed the quantitative composition of bone remains. The collected material (but not necessarily the analysed material, see Chapter 2) may thus be considered satisfactorily representative of the original deposits.

What does the osteological material tell us about the past human activities? At least the following facts: 1) Domestic animals were evidently widely bred in Turku during the two periods. Cows were probably numerous. The temporal changes in relative proportions of cow, sheep/goat and pig may be more an »artifact» than a real phenomenon. The locally restricted accumulation of bovine horn cores in areas A and C is largely responsible for the differences. 2) As indicated by the cow evidence, the Lake Mätäjärvi was apparently used as a dump for both waste items and food remains. The high abundance of horn cores during Period I may be a result of local handicraft activity. If this is so, the pond was used as a dump also for other waste products than those from agricultural activities. Other archaeological evidence supports this conclusion. 3) The remains of game species indicate hunting activity. Its intensity is very difficult to estimate, but the species hunted live both in marine environment (scoters, grey seal) and in inland area.

The nearly complete absence of horse remains is interesting. Apparently horse was not used for food nor were its bones used as raw material in handicraft.

Summary

The osteological material from the Lake Mätäjärvi is well preserved and comprises nearly 2000 identified samples. The material comes from two successive periods, namely 1400—1520 A.D. (Period I) and 1520—1700 (Period II). The two main groups are domestic animals (over 90 % of all samples in both periods) and game species (about 6 % of all samples in both periods). The most abundant domestic species are cow, sheep/goat and pig. Game species include game mammals (hare being most abundant), gallinaceous birds and waterfowl. A clear change was observed in the relative quantities of main domestic species (cow, sheep/goat and pig) from Period I to Period II. The reasons for this as well as for other observed differences are discussed. The Lake Mätäjärvi was apparently used as a dump for both waste items and food remains. Bovine horn cores were significantly more numerous in Period I than in Period II, which indicates systematic use in the former period.

Acknowledgements

We are very grateful to Dr. Ann Forstén, Dr. Kauko Huhtala, Dr. Johannes Lepiksaar, Mr. Arvo Ohtonen, M.A., and Prof. Seppo Sulkava for invaluable help in identification problems. Without their help our work would have been impossible. We are also indebted to Drs. Risto Lemmetyinen and Pekka Niemelä for useful comments on the manuscript, to Miss Penina Blankett for technical assistance and to Leena Hilpinen, M.A., for checking the English. We also thank the personnel of the Biological Museum of Turku for pleasant working facilities and our collaborators in the Lake Mätäjärvi project for stimulating discussions.

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