

Bird remains of Medieval and Post-Medieval coastal sites at the Southern Baltic Sea, Poland

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Abstract. Rescue excavations in Gdańsk and Kołobrzeg starting in the early 1990's provided new hand collected bird remains. The present paper deals with the results of bird remains analyses of three sites from Gdańsk (12th -18th century) and one site from Kołobrzeg (10th-12th century). The most frequent bird species was domestic fowl, followed by goose, and ducks both in Gdańsk and Kołobrzeg. The list of wild species contains White-tailed Eagle, Crane and Capercaillie most frequently. Introduced species are documented from Gdańsk in the form of one bone of peafowl and several turkey remains. The Gdańsk material exhibits a decrease in the relative frequency of domestic fowl and an increase in the relative frequency of goose over time, reflecting a gradual increase in goose breeding starting in Late Medieval time. A metric analyses showed a general increase in body size of domestic fowl over time.

Key words: Birds, Medieval, Post-medieval, Poland, morphology, environment.

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I. INTRODUCTION

During the second half of the 10th century Gdańsk and Kołobrzeg were important cities of the early Polish State, due to their location on the Baltic Sea (Fig. 1), providing opportunities for trade both over seas and inland. At the time of highest economic prosperity both centers were members of the Hanseatic League. During Medieval and Post-medieval time merchants from Western European countries influenced the cultural development of Gdańsk and Kołobrzeg.

Excavations carried out in the 1950's and 1960's provided knowledge on the utilization of animals for food (JAWORSKI 1952; KRYSIAK 1955, 1956, 1967; KUBASIEWICZ 1977) and showed evidence of crafts with antler and bones (HILCZERÓWNA 1961). Most of these papers dealt with the breeding of mammals, hunting, and fishing.

A c k n o w l e d g e m e n t s. This paper presents results of a project on "Archaeozoological research of fish and birds from Polish Baltic sites in medieval and postmedieval periods", performed in the Copenhagen Biosystematics Centre of the Zoological Museum, supported by the European Commission's Human Potential Programme ("Transnational Access to Major Research Infrastructures").

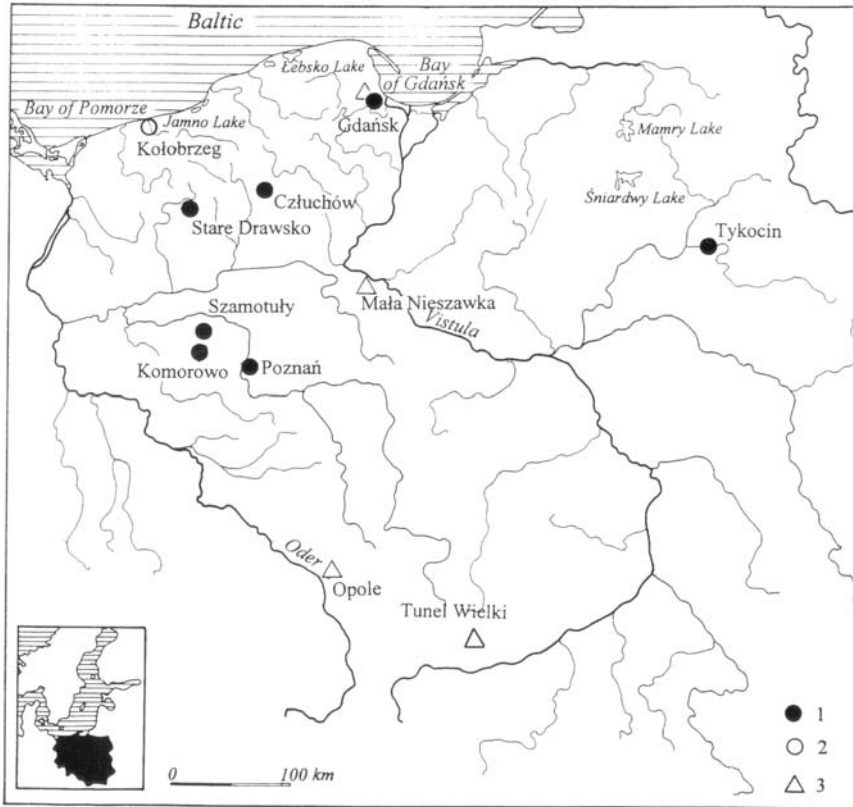


Fig. 1. The main sites from Poland mentioned in the text. 1) finds of the Turkey, 2) location of Kolobrzeg, 3) finds of the Peacock.

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II. MATERIAL AND METHODS

G d a ń s k

Previous studies on bird bones from Gdańsk are few, however, species lists from various places of the castle town – castrum (Table I) were published by JAWORSKI (1952), KRYSIAK (1955, 1956, 1967), and KUBASIEWICZ (1977) with some short comments. The synthesis of NOGALSKI (1984) on birds from archaeological sites from Pomerania contained species lists including some osteometrical data. All records reported derived from Castle Towns and concerned the Slavonic and Piast City stages. The previous research emphasized the high economical significance of the domestic fowl, followed by the goose (domestic and/or wild) and ducks, and in addition the presence of several wild species were reported.

Table I

Gdańsk. Bird bones from the Slavonic and Piast City stage. NISP – number of identified specimens

Taxa		Castle town (site 1)					
		JAWORSKI (1952)	KRYSIĄK (1955,1956)	KRYSIĄK (1967)	NOGALSKI (1984)	Total	
		NISP	NISP	NISP	NISP	NISP	%
<i>Gavia arctica</i> (LINNAEUS, 1758)	Black-throated Diver	0	0	1	0	1	0.1
<i>Gavia</i> sp.	Diver	0	1	0	0	1	0.1
<i>Phalacrocorax carbo</i> (LINNAEUS, 1758)	Cormorant	0	0	0	3	3	0.2
<i>Ardea cinerea</i> LINNAEUS, 1758	Grey Heron	0	0	3	0	3	0.2
<i>Ciconia</i> sp.	Stork	0	0	2	0	2	0.2
<i>Cygnus</i> sp.	Swan	0	3	9	0	12	1.0
<i>Anser anser</i> (LINNAEUS, 1758)/ <i>/A. anser</i> f. <i>domestica</i>	Domestic/Greylag Goose	0	0	0	30	30	2.5
<i>Anser</i> sp.	Goose	12	4	45	0	61	5.2
<i>Anas platyrynchos</i> LINNAEUS, 1758/ <i>/A. platyrynchos</i> f. <i>domestica</i>	Mallard/Domestic duck	0	0	0	8	8	0.7
<i>Anas</i> sp.	Duck	0	5	81	0	86	7.3
<i>Haliaeetus albicilla</i> (LINNAEUS, 1758)	White-tailed Eagle	0	0	0	5	5	0.4
<i>Acipiter gentilis</i> (LINNAEUS, 1758)	Goshawk	0	0	0	4	4	0.3
<i>Tetrao tetrix</i> LINNAEUS, 1758	Black Grouse	0	0	0	9	9	0.8
<i>Tetrao urogallus</i> LINNAEUS, 1758	Capercaillie	1	0	2	6	9	0.8
<i>Perdix perdix</i> (LINNAEUS, 1758)	Partridge	0	0	2	2	4	0.3
<i>Gallus gallus</i> LINNAEUS, 1758	Domestic fowl	61	97	477	279	914	77.7
<i>Fulica atra</i> LINNAEUS, 1758	Coot	0	0	0	3	3	0.2
<i>Tyto alba</i> (SCOPOLI, 1769)	Barn Owl	0	0	0	1	1	0.1
<i>Columba</i> sp.	Dove	0	2	19	0	21	1.8
<i>Corvus corax</i> LINNAEUS, 1758	Raven	0	0	0	1	1	0.1
Total		74	112	641	351	1178	100

The new material, dealt with in the present paper, was retrieved from three different sites. The site, “Olejarna St.” (Fig. 2a), providing bird bones dating from the end of the 12th century to the 18th century, was excavated by the Archaeological Museum of Gdańsk in 1996. From 1150 to 1308 this part of the city belonged to the craftsmen of the Slavonic port borough (suburbium), (CIEŚLAK & BIERNAT 1988). During the following centuries the Old Town was founded, however, the influence of craftsmen continued in this part of the city (KOŚCIŃSKI 1998).

The site, “Green Gate”, is located upon the Motława river (Fig. 2b), close to the harbor in the western part of the Main Town. This site was rescue excavated during the year 2000 by an archaeological team from the Archaeological Museum of Gdańsk. This part of Gdańsk, one of the four centers of the city, was the most important from about year 1330. The bird material derived mainly from the 14th-15th century, but also to a minor extent the 16th-17th century.

The locality, “Hevelius Square” (Fig. 2c), was excavated during 1995-1998 by the Archaeological Workshop of Dorota MIKŁASZEWICZ from Gdańsk. Traces of intensive occupation in this area

date back to the second half of 15th century. However, from 1380 onwards it constituted part of the Young Town created by the Teutonic Knights (BISKUP 1985: 361). Close to the area, after the year 1380, the church of Saint Bartholomew was built. The bird remains were dated to the 15th to 17th century.

Considering the history of Gdańsk and the chronology of the avifauna we decided to divide our material into three phases: 12th-14th century, 14th-16th century, and 16th-18th century. These chronological phases agree fairly well with key events of political and economic importance in the development of the city. Until the beginning of the 14th century Gdańsk was one of the coastal centers of the Slavonic and Piast City. From 1308 it developed under Teutonic rule. From the year 1466 the prosperity stage of Gdańsk as a part of Polish kingdom commenced (CIEŚLAK & BIERNAT 1988).

K o ł o b r z e g

Bird remains from early medieval Kołobrzeg, site Budzistowo 1, were described by NOGALSKI (1984). The species list comprised 13 taxa among them the most frequently occurring were domes-

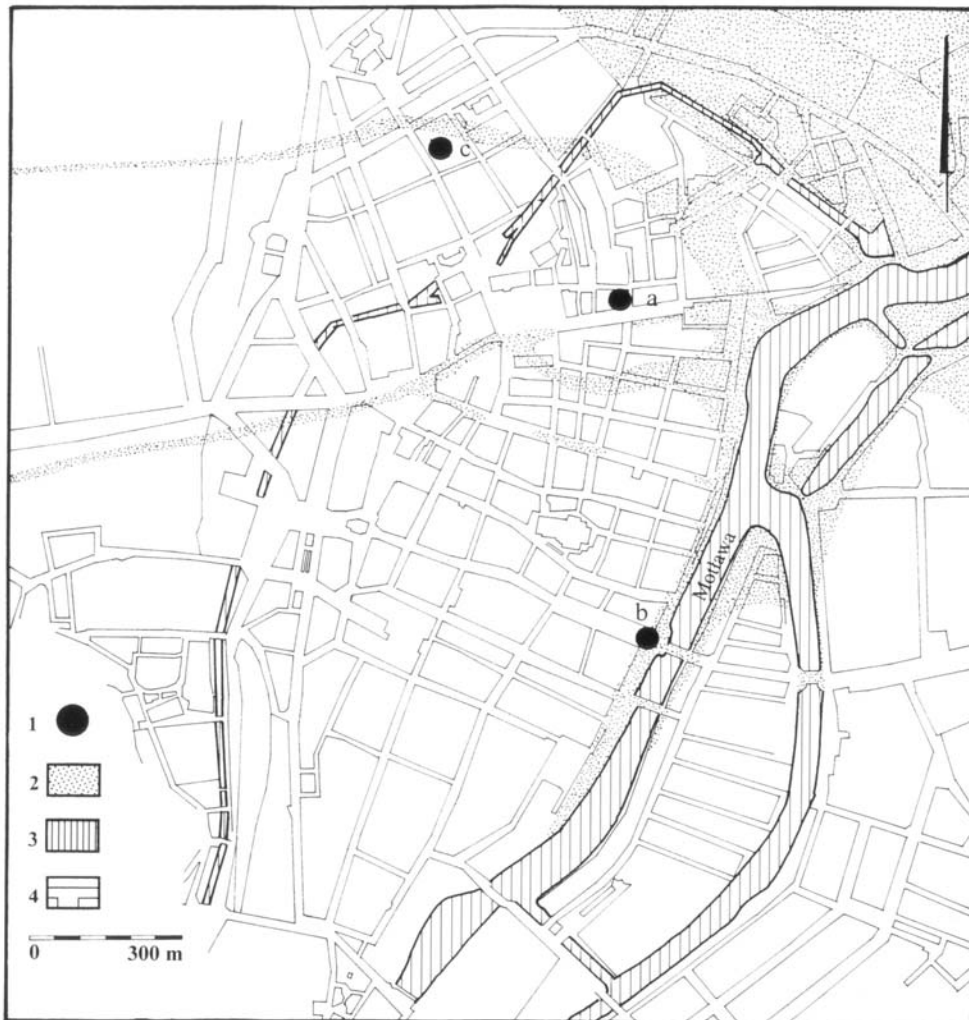


Fig. 2. Location of sites with bird records from Gdańsk: 1- sites: a) Olejarna St., b) Green Gate, c) Hevelius Square; 2 – network of rivers in 9th-14th century; 3 – present-day network of rivers; 4 – streets.

tic fowl, goose, and duck. The new bird material was retrieved from the same site in 1997 by a research team of the Institute of Archaeology and Ethnology of Polish Academy of Sciences from Kołobrzeg. The excavated site revealed a settlement complex of castle and suburb dating back to the 10th-13th century (LECIEJEWICZ & RĘBKOWSKI 2000). The political and economical development of Kołobrzeg was based on fisheries as well as the salt and herring trade.

The bird remains were identified using the reference collection of Zoological Museum, University of Copenhagen. Some of the duck bones were identified by means of diagnostic criteria described in WOELFLE (1967) goose and swan bones were according to BACHER (1967). Ulnae, femora, and tibiotarsi of domestic fowl were broken to investigate the presence or absence of medullary bone in order to estimate the importance of egg production. For domestic fowl the sex ratio was assessed from presence or absence of spurs on the tarsometatarsus. This method was chosen even though in rare instances hens are known to develop rudiments of spurs (COY 1985). All bones researched were hand collected and measurements were taken according to DRIESCH (1976).

III. RESULTS

G d a ń s k

In total 870 bones were analyzed of which 812 (93%) were identified as belonging to 28 taxa (Table II). The high frequency of identified bones is due to the excavation method consisting of hand collection without sieving. The majority of bones constitute food and kitchen remains with traces of filleting and butchering. The most frequent species was domestic fowl, followed by domestic/wild geese and some ducks. Apart from these species, White-tailed Eagle and Capercaillie are the only species present in all phases. Two imported species, the Peacock and the Turkey, were also identified. One Peacock *carpometacarpus* was retrieved from Hevelius Square in layers from the 15th-16th century. The Turkey, represented by 9 bones derived from Olejarna St., and 17 bones from Hevelius Square dated to the 17th-18th and 17th century respectively. In the diagram (Fig. 3) the bird remains are presented according to phases. There is a noteworthy decrease in the relative proportion of domestic fowl and an increase in geese, while the percentage of ducks and others birds remains unchanged.

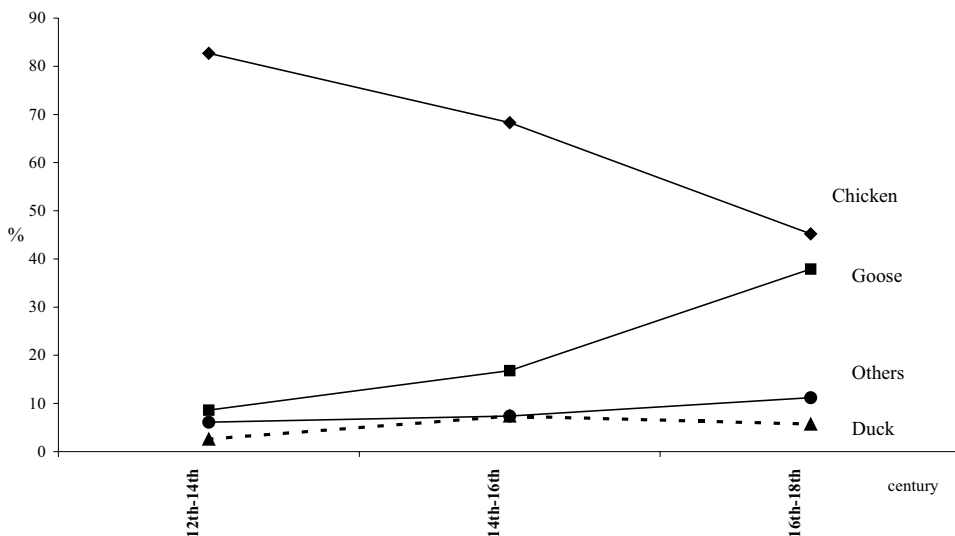


Fig. 3. Gdańsk – all sites. Percentage of bird remains of the main groups according to chronology.

Table II

The list of birds from Gdańsk and Kołobrzeg according to chronology. NISP – number of identified specimens; * 17th – 18th century; ** from one individual

Taxa		Gdańsk				Kołobrzeg		
		12 th -14 th	14 th -16 th	16 th -18 th	Total	10 th -12 th	13 th	17 th -18 th
		NISP	NISP	NISP	NISP	NISP	NISP	NISP
1	2	3	4	5	6	7	8	9
<i>Gavia stellata</i> (PONTOPPIDAN, 1763)/ <i>Gavia arctica</i> (LINNAEUS, 1758)	Red-throated Diver/ Black-throated Diver	0	0	1	1	0	0	0
<i>Phalacrocorax carbo</i> (LINNAEUS, 1758)	Cormorant	0	0	1	1	0	0	0
<i>Ardea cinerea</i> LINNAEUS, 1758	Grey Heron	0	1	0	1	0	0	0
<i>Cygnus olor</i> (GMELIN 1789)	Mute Swan	1	0	0	1	0	0	0
<i>Anser anser</i> (LINNAEUS, 1758)/ <i>Anser anser</i> f. <i>domestica</i>	Greylag/ Domestic Goose	4	17	136	157	7	0	0
<i>Anser</i> sp.	Goose	16	10	23	49	9	0	0
<i>Branta leucopsis</i> (BECHSTEIN, 1803)/ <i>Branta bernicla</i> (LINNAEUS, 1758)	Barnacle/Brent Goose	0	0	3	3	0	0	0
<i>Branta bernicla</i> (LINNAEUS, 1758)	Brent Goose	0	0	0	0	1	0	0
<i>Anas penelope</i> LINNAEUS, 1758/ <i>Anas acuta</i> LINNAEUS, 1758	Widgeon/Pintail	0	0	1	1	0	0	0
<i>Anas platyrhynchos</i> LINNAEUS, 1758/ <i>Anas platyrhynchos</i> f. <i>domestica</i>	Mallard/ domestic duck	4	9	22	35	3	0	0
<i>Anas</i> sp.	Duck	2	3	2	7	7	0	0
<i>Melanitta fusca</i> (LINNAEUS, 1758)	Velvet Scoter	0	1	0	1	0	0	0
<i>Mergus albellus</i> (LINNAEUS, 1758)	Smew	0	0	1	1	0	0	0
<i>Haliaeetus albicilla</i> (LINNAEUS, 1758)	White-tailed Eagle	7	3	6	16	1	0	0
<i>Milvus milvus</i> (LINNAEUS, 1758)/ <i>Milvus migrans</i> (BODDAERT. 1783)	Kite	0	0	1	1	0	0	0
<i>Acipiter gentilis</i> (LINNAEUS, 1758)	Goshawk	3	0	0	3	0	0	0
<i>Meleagris gallopavo</i> LINNAEUS, 1758	Turkey	0	0	26*	26	0	0	0
<i>Tetrao urogallus</i> LINNAEUS, 1758	Capercaillie	3	1	1	5	0	0	0
<i>Gallus gallus</i> (LINNEUS, 1758) f. <i>domestica</i>	Domestic fowl	191	110	190	491	49	0	0
<i>Pavo cristatus</i> (LINNEUS, 1758) f. <i>domestica</i>	Peacock	0	1	0	1	0	0	0
<i>Grus grus</i> (LINNAEUS, 1758)	Crane	0	2	1	3	0	0	0
<i>Larus argentatus</i> PONTOPPIDAN, 1763/ <i>Larus fuscus</i> LINNAEUS, 1758	Herring Gull/ Lesser Black-backed Gull	0	1	0	1	0	0	0
<i>Larus</i> sp.	Gull	0	0	0	0	1	0	0
<i>Columba oenas</i> LINNAEUS, 1758/ <i>Columba</i> f. <i>domestica</i>	Stock dove/ domestic Dove	0	0	1	1	0	0	0
<i>Columba</i> sp.	Dove	0	0	3	3	0	0	0
<i>Corvus corone</i> LINNAEUS, 1758/ <i>Corvus frugilegus</i> LINNAEUS, 1758	Carrion Crow/Rook	0	2	1	3	0	1	5**
	Identified	231	161	420	812	76	1	5
	Not identified	19	15	23	58	4	0	0
	Total	250	176	443	870	80	1	5

Bones of the most frequent species are represented by a variety of skeletal elements. Therefore, it is important to note that bones of White-tailed Eagle consist entirely of wing bones except for one pelvic bone (Table III).

Table III

Anatomical distribution of identified specimens for each species from Gdańsk

Taxa	Cranium	Mandibulla	Coracoid	Furcula	Sternum	Scapula	Humerus	Radius	Ulna	Carpometacarpus	Synsacrum	Pelvis	Femur	Tibiotarsus	Fibula	Tarsometatarsus
<i>Gavia stellata</i>														1		
<i>Phalacrocorax carbo</i>														1		
<i>Ardea cinerea</i>													1			
<i>Cygnus olor</i>			1													
<i>Anser anser</i> / <i>Anser anser</i> f. <i>domestica</i>	1	1	10		6	6	35	15	10	17	2		13	33		8
<i>Anser</i> sp.			2	6	7	5	4	3	6	4	1		3	8		
<i>Branta leucopsis</i> / <i>Branta bernicla</i>								1	1	1						
<i>Anas penelope</i> / <i>Anas acuta</i>										1						
<i>Anas platyrhynchos</i> / <i>Anas platyrhynchos</i> f. <i>domestica</i>		1	3	1	2		12	2	4	3		1	2	3		1
<i>Anas</i> sp.			1	1		1	2							2		
<i>Melanitta fusca</i>			1													
<i>Mergus albellus</i>							1									
<i>Haliaeetus albicilla</i>								3	8	4		1				
<i>Milvus milvus</i> / <i>Milvus migrans</i>							1									
<i>Accipiter gentilis</i>					1				1					1		
<i>Meleagris gallopavo</i>			3		1	1	4	1	3			1	3	7		2
<i>Tetrao urogallus</i>			1		1		1	1				1				
<i>Gallus gallus</i> f. <i>domestica</i>	3		34	8	44	10	51	21	36	4	7	30	65	136	1	41
<i>Pavo cristatus</i> f. <i>domestica</i>										1						
<i>Grus grus</i>			1						1			1				
<i>Larus argentatus</i> / <i>Larus fuscus</i>									1							
<i>Columba oenas</i> / <i>Columba</i> f. <i>domestica</i>												1				
<i>Columba</i> sp.					1								1	1		
<i>Corvus corone</i> / <i>Corvus frugilegus</i>									1					2		

At all three sites medullary bone was documented in 31-36% of the examined bones of domestic fowl (Table IV). At Olejarna St. the female: male ratio is 2:1, and at Hevelius Square among 8 individuals 4 belong to females and 3 to males, while one could not be assessed. Some tarsometatarsi had pathological changes in the bony process bearing the spur (Fig. 4). These scars resemble scars documented on chicken tarsometatarsi from the medieval town of Svendborg, Denmark (HATTING 1987), which were considered to belong to capons. The scar shown in Fig. 4a is quite prominent while scars in Fig. 4b-c are weaker presumably as a result of the ontogenetic age of the individual when the spur was removed.

Table IV

Gallus f. domestica. Number of bones (ulna, femur and tibiotarsus) containing medullary bone (MEBO) from all sites. + designates little, ++ half filled and +++ completely filled with medullary bone. * In brackets is given the number of observations

Stage of MEBO	Gdańsk – Green Gate (n=13)*	Gdańsk – Hevelius Square (n=73)	Gdańsk – Olejarna St. (n=151)	Kołobrzeg-Budzistowo (n=29)
empty	9	50	97	19
+	0	9	18	6
++	3	11	19	4
+++	1	3	17	0
Total of MEBO	4	23	54	10
% of MEBO	30.8	31.5	35.6	34.5



Fig. 4. Tarsometatarsi of capons from Gdańsk. A – Capon with prominent scar dated to the 17th century. B-C – capons with insignificant scars dated to the 13th and 17-18th century respectively. Caudal view. (Photographed by Geert BROVAD).

Based on the measurements of the humerus, femur, tibiotarsus, and tarsometatarsus it was documented that the bones were larger in the 16th-18th century than in the 12th-16th century (Fig. 5 & 6). It is noteworthy that the longest tibiotarsus (maximum length 126, 9 mm) belonged to a female. The mean value of female tarsometatarsi from the 16th-18th century was found to be higher than from the 12th-16th century. The measurements of other taxa are documented by Appendix I-III.

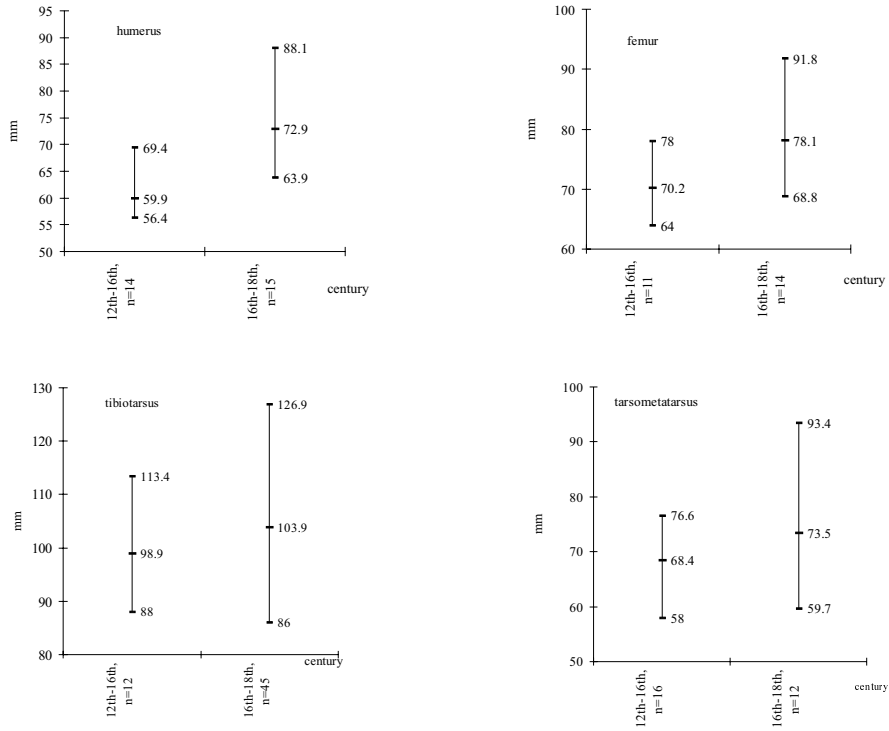


Fig. 5. Gdańsk. *Gallus gallus f. domestica* – GL (greatest length) of humerus, femur, tibiotarsus and tarsometatarsus at two phases.



Fig. 6. Domestic fowl tarsometatarsi from Gdańsk. A – female dated to the 14-15th century; B – cock dated to the 13th century; C – female and D – capon, both dating from the 17th century. Caudal view. (Photographed by Geert BROVAD).

K o ł o b r z e g

Only 81 bones were discovered in medieval layers. Domestic fowl was the most frequent species with geese and ducks as the second and third most important species (Table II, Fig. 7). Remains of other species e.g. White-tailed Eagle, a middle sized gull, and *Corvus* sp. (either Crow or Rook) were also recognized. Out of 5 tarsometatarsi of domestic fowl 3 belonged to females and 2 to males. Among the 19 bones of domestic fowl one third (34.5%) contained medullary bone (Table IV).

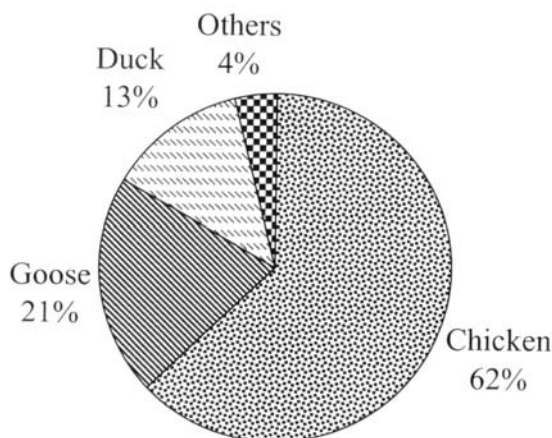


Fig. 7. Kołobrzeg-Budzistowo. Percentage of bird remains of the main groups (10th-12th century).

IV. DISCUSSION

The nature of the bone material from a long spread of time and relatively few bones retrieved from each stratum, does not allow detailed sociological analyses of the inhabitants of each site in Gdańsk. However, when dividing the material into three phases it may still be possible to elucidate changes over time.

During the medieval time citizens of Gdańsk and Kołobrzeg mainly consumed poultry meat from domestic fowl and to a lesser extent from geese and ducks. Beside meat consumption, domestic fowl were kept for egg production. In the Middle Ages high frequencies, about 70% and more, of domestic fowl are characteristic at many Slavonic settlements of Pomerania (NOGALSKI 1984) and other regions of Poland (WALUSZEWSKA-BUBIEŃ 1984). The dominance of this species is reported in historical documentation concerning the 12th-15th century (CHMIELEWSKI & DĄBROWSKI 1964: 395; DEMBIŃSKA 1963: 96). From the 16th-18th century and onwards, domestic fowl played a less important role than during the 12th-14th century. Geese, the domestic and wild form, had taken over and became the more important species of fowl.

Concerning these changes we suppose that in Post-medieval times the above described process was characteristic not only in Gdańsk but also in other cities, too. We found a similar tendency in Poznań. From the medieval stage in the city, bones of hen achieved 80% of the whole assemblage of 261 bones (WALUSZEWSKA-BUBIEŃ 1977). The situation had already shifted in the 17th-18th century with about 60% of the identified bones belonging to domestic and wild geese and only c. 20% deriving from domestic fowl from a total of 358 bones (PTASZYK unpubl.). NOGALSKI (1990/91) reports an increase of goose bones in the materials from the area of the Old Town in Poznań. The share of geese is c. 77% in the 2nd half of the 18th and the 19th century, and chicken only from c. 16%. In other sites, such as Tykocin (NOGALSKI & KOSIŃSKA 1991) and the castle in Ciechanów

(NOGALSKI & KOSIŃSKA 1993), dating from the end of Medieval and Post-medieval time, the share of chicken is lower than goose. The preponderance of geese in rural farms of the archbishop of Gniezno in 16th-18th century is reported in historical records. In the 16th century at 18 farms there were 463 geese and 116 hens (TOPOLSKI 1958: 244). According to BARANOWSKI (1964: 225) a large number of geese were transported to western countries such as Berlin in Germany.

Apart from domestic fowl and geese, ducks played a role in consumption. It was very difficult to assess the relative frequency of domestic duck in our material because of the scarcity of diagnostic measurements. According to historical information breeding of this bird started in royal farms during the 15th century in southern Poland (CHMIELEWSKI & DĄBROWSKI 1964: 354). Ducks were rare birds still in the 17th century and the “domestic” birds were bred from eggs of wild species (TOPOLSKI 1953). In the 16th-18th century, at farms where fishponds were one of the important contributors to the economy, duck breeding did not take place because of the potential damage to the fish (BARANOWSKI 1964: 223). From ethnographical investigations we know that even during the 19th century duck breeding among Slavs was not common compared to goose and domestic fowl production (MOSZYŃSKI 1967: 135).

A new species among domestic birds in the Post-medieval menu was the Turkey. The species is reported from archaeological sites in Poznań at two places, from Komorowo and Szamotuły, both near Poznań, in Człuchów and Stare Drawsko in the Pomerania region and a further one in Tykocin (Table V, Fig 1). The oldest finds with a reliable chronology are from the 17th-18th century and are all located in the northern part of Poland. Historical investigations on rural economy reported that in the first half of the 17th century Turkey breeding was only poorly developed (TOPOLSKI 1953). According to GRYCZ (1964) Turkey farming had not yet started in countrymen’s cottages during the 17th century in Great Poland. In farms it did not spread until the 18th century, where its meat was considered a delicacy (BARANOWSKI 1964: 225).

Table V

Archaeozoological records of bones of the Turkey *Melagris galapavo* LINNAEUS, 1758 in Poland

Site	Type	Chronology	Number of bones	References
Człuchów	Castle	16 th ?-17 th century	1	NOGALSKI, SAŁACIAK (1989/90)
Stare Drawsko	Castle	16 th ?-18 th ? century	14	KRUPSKA, WALUSZEWSKA-BUBIEN (1984)
Komorowo	Tavern	17 th -18 th century	1	MAKOWIECKI (1999)
Poznań, Szyperska St. 21	Old Town – slaughter-house	17 th -18 th century	44 (11.5%)	PTASZYK (unpubl.)
Tykocin	Town	2 nd half of 17 th -18 th century	1	NOGALSKI, KOSIŃSKA (1991)
Poznań	Old Markt 48	2 nd half of 18 th -19 th century	2	NOGALSKI (1990/91)
Szamotuły	Castle of Górka family	2 nd half of 19 th -20 th century	1	KRUPSKA (1987)
Gdańsk, Olejarna St.	Old Town	17 th century	9	Present paper
Gdańsk, Hevelius Square	Young Town	17 th -18 th century	17	Present paper

Based on the above-mentioned information we conclude that introduction of Turkey into Northern Poland happened not later than the 17th century and that over-seas trade at coastal centers such as Gdańsk played a key role in it. The meat of this species was eaten by high social ranking citizens of towns.

Another imported species in our material is the Peacock (Fig. 8). In excavated materials from Poland this species is rare. Only three bones from three sites were found (Fig. 1). One bone is from the 13th century at Opole-Ostrówek (WALUSZEWSKA-BUBIEŃ 1982), another is from the 14th to the first half of the 15th century at a Teutonic castle in Mała Nieszawka (NOGALSKI et al. 1992). The third was found in humus at a rockshelter below Tunel Wielki, near Ojców and its chronology is only approximately determined as Late Holocene (BOCHENSKI 1993). In the 18th century the species was kept only by the rich nobility (BARANOWSKI 1964:224) and in cities it was eaten very rarely (WIĘCŁAWSKI 1989: 84). We suppose that Peacocks were bred for its beautiful plumage, not only in gardens but on the table when the bird was served as a meal surrounded by their own feathers (GRAHAME 1984, BENECKE 1994).

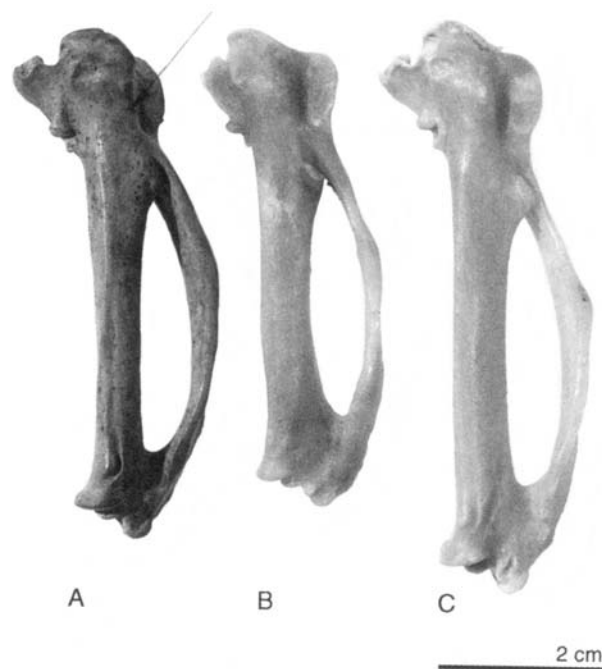


Fig. 8. A – Carpometacarpus of Peacock *Pavo cristatus* from Gdańsk, Hevelius Square, dated to the 15th-16th century. Note cut mark indicated by arrow. B-C – Recent carpometacarpi from female and male Peacocks respectively (reference collection of the Zoological Museum, Copenhagen). Dorsal view. (Photographed by Geert BROVAD).

Out of the total number of species of identified avian remains the amount of wild species comprised c. 11%, 14% and 11% for the three chronological phases, respectively (12th – 14th C, 14th – 16th C and 16th – 18th C). This frequency was obtained by considering the bones of *Anas* sp. to derive from wild and *Anser* sp. to derive from domestic birds. Other north European early medieval coastal sites exhibit higher frequencies e.g. Haithabu with 18% (REICHSTEIN & PIEPER 1986), Arkona with 25% (MÜLLER 1974), Opole with 32% (WALUSZEWSKA-BUBIEŃ 1973), and Eketorp with as much as 56% wild species (BOESSNECK & DRIESCH 1979). It must, however, be kept in mind that sieving at Gdańsk and Kołobrzeg would have increased the number of many small sized wild species of e.g. waders and passerines.

The more important wild species providing the inhabitants with meat were: Greylag Goose, Mallard, Capercaillie, and others. Dominance of wing elements of White-tailed Eagle over other elements of the skeleton is not only characteristic in our material. A similar situation is reported by NOGALSKI (1984) from medieval coastal settlements of the Pomerania region e.g. Wolin, Szczecin, Kołobrzeg and Gdańsk. In medieval bird materials from Haithabu (REICHSTEIN 1974, REICHSTEIN & PIEPER 1986) and Eketorp (BOESSNECK & DRIESCH 1979), wing elements were reported to be in preponderance. REICHSTEIN (1974) pointed out that hunting White-tailed Eagles may have served several purposes also mentioning the symbolic role of this species, although the use of feathers may have been most important use. In Poland, the use of feathers from the wings of White-tailed Eagle for arrow production is reported by 16th century books (SAMSONOWICZ 1991). A special instruction advises keeping the species in baskets to get feathers twice or three times a year, which is useful for arrows or targets, and for wings used in the armory of Hussars. The birds were also used for hare hunting (SAMSONOWICZ 1991: 110).

According to historical investigations, the Crane was another valuable bird because of its meat and feathers, which were used as decoration on clothing (SAMSONOWICZ 1991). The species served as a good guard at farmhouses (SAMSONOWICZ 1991:121). Professor M. SOBOCINSKI witnessed a similar utilization of cranes as recently as the 1920'ies and 1930'ies in Ukraine (personal communication to one of us (D.M.)).

Judging from the species list (Tables I and II) with at least 17 wild species the surroundings of Gdańsk was rich in a variety of biotopes. According to historical records in the 16th-17th centuries some years were so fertile that wild birds were brought to the town in carts (BOGUCKA 1997:151).

The proximity of the sea was indicated by presence of coastal species such as divers, gulls, the Cormorant, and representatives of waterfowl like Smew and Velvet Scoter. Grey Heron and White-tailed Eagle required large lakes, rivers or estuaries with good fishing possibilities and large trees for nesting. The Mute Swan prefers shallow water pools and lakes with dense vegetation of e.g. reeds and other water plants. A number of terrestrial species were also present. The Crane prefers large moors, woodlands, or steppes, while the Goshawk and Capercaillie indicate the presence of wooded areas. It is also possible that the Dove also indicates the presence of wooded areas, however, dove bones may also be an indication of the keeping of domestic doves in the city. The corvids, Carrion Crow and Rook, have since early farming and the opening up of the landscape been closely associated to human refuse dumps and the keeping of poultry. Based on morphological criteria one humerus of the Kite could not be assigned to species. Both species of kite are present in Poland today, and especially the Black Kite, like the corvids, benefit from human refuse dumps today (MIKKELSEN & FALK 1989) and possibly did so in former times also. However, Kite, Goshawk, and White-tailed Eagle are species often associated with high status sites. These birds of prey may have been used for sporting and hunting activities. Other wild birds such as Grey Heron, Crane and Capercaillie, as well as the Peacock and Turkey also indicate high status.

All bones of wild species were from adults. Several of the coastal species, Brent Goose, Velvet Scoter, and Smew, which are not Polish breeding birds were probably hunted during autumn or spring migrations. Goose remains at Gdańsk and Kołobrzeg most likely derive entirely from domestic geese, although some wild geese may occur. Three bones could be assigned to *Branta* sp. and one carpometacarpus was from Brent Goose, presumably a spring or autumn guest as passage migrant.

IV. BIOMETRIC CONSIDERATIONS

Separation of bones of Mallard and early breeds of domestic ducks based on morphological criteria is impossible. Measurements of humerus showed a GL (greatest length) range of 88.8-96.8 mm with a mean of 93.0 mm (N=6) and for Bd (greatest breadth of the distal end) a range of 13.9-16.1 mm and a mean of 14.9 mm (N=11) (from Appendix II). Duck bones in early medieval settlements showed a range in GL of 90.0-95.0 mm with a mean of 92.3 mm (N=14) and a Bd of 13.6-15.7 mm with a mean of 14.8 mm (N=22) for Haithabu (REICHSTEIN & PIEPER 1986) and a

GL of 88-100.1 mm with a mean of 91.5 mm (N=39) for Eketorp (BOESSNECK & DRIESCH 1979). For recent Mallards the GL of the humerus is 86.0-99.1 mm with a mean of 93.3 mm (N=49) (data from REICHSTEIN & PIEPER 1986).

Measurements of duck bones in the present study fall below the range of the humerus GL of recent domestic ducks, 99-112.0 mm mean 108.1 mm (N=33). The presence of domestic duck bones cannot be completely ruled out at the Gdańsk and Kołobrzeg sites, especially when it may be expected that early domestic breeds were smaller compared to recent breeds. In the present assemblages the majority of duck bones are assumed to be from wild ducks especially considering the historic information on duck breeding in Poland.

Carpometacarpi of White-tailed Eagle had a GL range of: 114.1-127.2 mm and a mean of 119.6 mm (N=3) (from Appendix III). The carpometacarpus with a greatest length of 127.2 mm falls outside the range of 108-125 mm and a mean of 116.4 mm (N=31) obtained from Haithabu (REICHSTEIN & PIEPER 1986). The very large individual most likely derives from a female.

Crane (*Grus grus*) remains are recognized from 14th to 16th century and post medieval layers in Gdańsk (Table II). The bones derive from adult birds, most likely breeding birds and it is presumed that suitable breeding habitats existed in the surroundings of Gdańsk. Even today Northern Poland is a favoured breeding area for Cranes with at least 600 breeding pairs (FJELDSÅ 1989, TOMIAŁOJC 1990). One ulna with the dimensions of GL: 281 mm, Bp (breadth of the proximal end): 23.9 mm and SC (smallest breadth of the corpus): 9 mm was the only measurable bone element (Appendix III). The greatest ulnar lengths belonged to two recent crane specimens in the reference collection of the Institute of Systematics and Evolution of Animals in Kraków, being 266 and 235 mm respectively (BOCHEŃSKI Z. pers. comm.). Measurements of crane skeletons at Zoological Museum, Copenhagen (3 ♂♂, 1 ♀ and 2 unsexed) showed the range of GL: 244.3-271.1 mm with a mean of 256.6 mm, Bp: 20.9-23.7 mm with a mean of 21.9 mm, and SC: 8.1-9.3 mm with a mean of 8.6 mm. The subfossil ulna is larger in GL and Bp than measurements of the comparative material. Crane bones at Eketorp also seem to be larger or at least in the upper range of dimensions of recent crane bones, which is considered a result of good living conditions for the species (see BOESSNECK & DRIESCH 1979). The Siberian White Crane (*Grus leucogeranus*) is slightly larger than the common crane and measurements gave a GL range of 258.6-270.4 mm and a mean of 266.2 mm, while their Bp measurements range was 23.7-24.7 mm with a mean of 23.9 mm, and their SC range was 9.24-10.2 mm with a mean of 9.6 mm (2 ♀♀ and 1 unsexed). This species was in former times more widespread but after catastrophic decline in numbers during the last 100 years it is now rare with a disjunct breeding range (CRAMP & SIMMONS 1980). The results are inconclusive. It seems that in the western part of Europe prehistoric crane bones were in fact larger than the bones of present day cranes (STEWART 2001). It is therefore considered the more plausible conclusion that the crane bone from Gdańsk is from the western palearctic crane.

V. CONCLUSIONS

We conclude, that in Gdańsk the diet included a high diversity of bird meat. Domestic fowl was the staple in the fowl based economy although favourable environmental conditions surrounding the city created good hunting possibilities of wild species. Domestic fowl were kept for both meat and egg production. The urban assemblages at Gdańsk produced species, both domestic and wild, associated with high status. The presence of the Peacock and the Turkey reflects over-seas trade and cultural contact of Gdańsk's citizens with Europe and globally. This contact could have influenced the introduction of Turkey into the interior of Poland during the 17th century.

At the sites examined fowl rearing changed during the course of centuries; a trend also seen in other parts of Poland. The keeping of domestic birds with a larger body size e.g. geese instead of domestic fowl was more profitable because of higher yield of energetic products like fat and meat as well as a higher amount of feathers. Improved and more sophisticated methods of fowl keeping in more recent times may have contributed to this.

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Appendix I

The measurements of goose bones. Bones: coc – Coracoid; s – Scapula; h – Humerus; r – Radius; u – Ulna; cmc – Carpometacarpus; of – Femur; tit – Tibiotarsus; tmt – Tarsometatarsus.

Name	Century	Bone	GL	Bp	SC	Bd
<i>A. anser/A. anser f. domestica</i>	16-18	coc	76.7	0	0	0
<i>A. anser/A. anser f. domestica</i>	16-18	coc	82.1	0	0	0
<i>Anser sp.</i>	16-18	s	94.3	0	0	0
<i>A. anser/A. anser f. domestica</i>	16-18	s	96.2	0	0	0
<i>Anser sp.</i>	12-14	s	97.2	0	0	0
<i>A. anser/A. anser f. domestica</i>	16-18	h	0	32.1	0	0
<i>A. anser/A. anser f. domestica</i>	14-16	h	0	32.9	0	0
<i>A. anser/A. anser f. domestica</i>	16-18	h	0	34.3	0	0
<i>A. anser/A. anser f. domestica</i>	14-16	h	0	34.8	11.7	0
<i>A. anser/A. anser f. domestica</i>	16-18	h	0	35	0	0
<i>A. anser/A. anser f. domestica</i>	16-18	h	0	35.2	0	0
<i>A. anser/A. anser f. domestica</i>	16-18	h	0	38.4	0	0
<i>A. anser/A. anser f. domestica</i>	16-18	h	0	0	9.9	21.5
<i>A. anser/A. anser f. domestica</i>	16-18	h	0	0	0	21.9
<i>A. anser/A. anser f. domestica</i>	14-16	h	0	31	0	22.8
<i>A. anser/A. anser f. domestica</i>	16-18	h	0	0	0	23.3
<i>A. anser/A. anser f. domestica</i>	16-18	h	0	0	11	23.3
<i>A. anser/A. anser f. domestica</i>	16-18	h	0	0	10.8	23.4
<i>A. anser/A. anser f. domestica</i>	16-18	h	0	0	0	24.1
<i>A. anser/A. anser f. domestica</i>	16-18	h	0	0	0	24.6
<i>A. anser/A. anser f. domestica</i>	16-18	h	0	0	0	25.2
<i>A. anser/A. anser f. domestica</i>	16-18	h	0	0	11.7	25.4
<i>A. anser/A. anser f. domestica</i>	16-18	h	0	0	11.7	25.8
<i>A. anser/A. anser f. domestica</i>	16-18	h	0	0	0	27
<i>Anser sp.</i>	12-14	h	150.1	29.6	10.2	20.9
<i>A. anser/A. anser f. domestica</i>	16-18	u	0	0	7.4	0
<i>Anser sp.</i>	12-14	u	0	15	0	0
<i>Anser sp.</i>	12-14	u	144	0	7.5	0
<i>Anser sp.</i>	16-18	u	146	15.3	7.8	0
<i>A. anser/A. anser f. domestica</i>	16-18	u	149.3	15.4	7.4	0
<i>A. anser/A. anser f. domestica</i>	16-18	u	151.4	9	5.8	10.5
<i>A. anser/A. anser f. domestica</i>	16-18	u	160.3	15.7	8.2	0
<i>A. anser/A. anser f. domestica</i>	16-18	r	143.5	0	4.2	9.9
<i>A. anser/A. anser f. domestica</i>	16-18	r	0	0	4.6	9.9
<i>Anser sp.</i>	16-18	r	0	0	0	10.7
<i>A. anser/A. anser f. domestica</i>	16-18	cmc	0	0	7	10.3
<i>A. anser/A. anser f. domestica</i>	16-18	cmc	0	20.9	0	0
<i>A. anser/A. anser f. domestica</i>	16-18	cmc	78.8	19.8	0	0
<i>Anser sp.</i>	16-18	cmc	81.9	20.8	0	10.5
<i>A. anser/A. anser f. domestica</i>	16-18	cmc	83.1	20.3	6.9	9.8

Appendix I cont.

Name	Century	Bone	GL	Bp	SC	Bd
<i>A. anser/A. anser f. domestica</i>	16-18	cmc	87.6	19.1	0	0
<i>A. anser/A. anser f. domestica</i>	16-18	cmc	90.6	21.8	0	0
<i>A. anser/A. anser f. domestica</i>	16-18	cmc	91.7	22.1	0	0
<i>A. anser/A. anser f. domestica</i>	16-18	cmc	93.4	0	0	0
<i>A. anser/A. anser f. domestica</i>	16-18	cmc	97.4	22.3	0	11.9
<i>A. anser/A. anser f. domestica</i>	16-18	cmc	98.2	23.5	0	13.2
<i>A. anser/A. anser f. domestica</i>	16-18	cmc	100.1	24.8	0	11.4
<i>A. anser/A. anser f. domestica</i>	16-18	cmc	105.7	26.6	0	0
<i>A. anser/A. anser f. domestica</i>	16-18	of	0	0	8.6	0
<i>A. anser/A. anser f. domestica</i>	16-18	of	0	0	8.3	20
<i>A. anser/A. anser f. domestica</i>	16-18	of	0	0	8.1	20.3
<i>A. anser/A. anser f. domestica</i>	16-18	of	0	0	9	21.4
<i>Anser sp.</i>	16-18	of	0	17.5	7.4	0
<i>Anser sp.</i>	14-16	of	0	17.6	0	0
<i>A. anser/A. anser f. domestica</i>	16-18	of	0	18.9	0	0
<i>A. anser/A. anser f. domestica</i>	16-18	of	77.6	19.7	7.8	19.7
<i>A. anser/A. anser f. domestica</i>	14-16	of	77.8	20.1	8.5	20.3
<i>A. anser/A. anser f. domestica</i>	16-18	of	79.2	19.3	7.6	20.3
<i>A. anser/A. anser f. domestica</i>	16-18	of	80.4	0	8.6	17.7
<i>A. anser/A. anser f. domestica</i>	16-18	of	81.8	21.2	8.4	20.2
<i>A. anser/A. anser f. domestica</i>	16-18	of	83.1	19.9	8.4	21.4
<i>A. anser/A. anser f. domestica</i>	16-18	tit	0	0	8.1	14.8
<i>A. anser/A. anser f. domestica</i>	16-18	tit	0	0	7.9	15.8
<i>A. anser/A. anser f. domestica</i>	16-18	tit	0	0	8.4	16.6
<i>A. anser/A. anser f. domestica</i>	14-16	tit	0	0	0	16.9
<i>Anser sp.</i>	14-16	tit	0	0	8.4	16.9
<i>A. anser/A. anser f. domestica</i>	16-18	tit	0	0	9.1	17.3
<i>A. anser/A. anser f. domestica</i>	16-18	tit	0	0	0	17.3
<i>A. anser/A. anser f. domestica</i>	16-18	tit	0	0	0	17.3
<i>A. anser/A. anser f. domestica</i>	16-18	tit	0	0	0	17.9
<i>A. anser/A. anser f. domestica</i>	16-18	tit	0	0	0	18.1
<i>Anser sp.</i>	14-16	tit	143.5	25.1	8.4	16.7
<i>A. anser/A. anser f. domestica</i>	16-18	tit	147.3	0	8.4	17.5
<i>A. anser/A. anser f. domestica</i>	14-16	tit	148.2	0	8.6	17.3
<i>A. anser/A. anser f. domestica</i>	16-18	tit	148.8	0	8.6	17.4
<i>A. anser/A. anser f. domestica</i>	16-18	tit	151.5	29.2	9.4	18.6
<i>A. anser/A. anser f. domestica</i>	14-16	tit	154.6	0	8.1	17.1
<i>A. anser/A. anser f. domestica</i>	16-18	tmt	0	18.3	7.8	0
<i>A. anser/A. anser f. domestica</i>	14-16	tmt	78.7	16.6	7.2	17.5
<i>A. anser/A. anser f. domestica</i>	16-18	tmt	81.2	17.8	8.3	19.2
<i>A. anser/A. anser f. domestica</i>	14-16	tmt	83.5	18.1	7.9	19.2
<i>A. anser/A. anser f. domestica</i>	16-18	tmt	83.6	17.4	8.4	19.8
<i>A. anser/A. anser f. domestica</i>	16-18	tmt	88.1	19	8.9	20.9
<i>A. anser/A. anser f. domestica</i>	16-18	tmt	88.7	19.1	8	19.5

Appendix II

The measurements of duck bones

Name	Century	Bone	GL	Bp	SC	Bd
<i>A. platyrhynchos/A. platyrhynchos f. domestica</i>	14-16	coc	57.4	0	0	0
<i>A. platyrhynchos/A. platyrhynchos f. domestica</i>	16-18	coc	53.5	0	0	0
<i>A. platyrhynchos/A. platyrhynchos f. domestica</i>	16-18	h	93.9	21.5	7.4	16.1
<i>A. platyrhynchos/A. platyrhynchos f. domestica</i>	16-18	h	90.9	21.6	7.5	14.5
<i>A. platyrhynchos/A. platyrhynchos f. domestica</i>	14-16	h	0	0	7.7	15.4
<i>A. platyrhynchos/A. platyrhynchos f. domestica</i>	16-18	h	96.8	22	7.4	15.8
<i>A. platyrhynchos/A. platyrhynchos f. domestica</i>	16-18	h	91.5	0	7.1	14.4
<i>A. platyrhynchos/A. platyrhynchos f. domestica</i>	14-16	h	0	0	0	13.4
<i>A. platyrhynchos/A. platyrhynchos f. domestica</i>	16-18	h	0	20.4	0	0
<i>A. platyrhynchos/A. platyrhynchos f. domestica</i>	16-18	h	96	22.8	7.5	15.7
<i>A. platyrhynchos/A. platyrhynchos f. domestica</i>	12-14	h	0	20.1	0	0
<i>A. platyrhynchos/A. platyrhynchos f. domestica</i>	16-18	h	0	0	7.2	15.1
<i>A. platyrhynchos/A. platyrhynchos f. domestica</i>	16-18	h	88.8	19.7	6.8	13.9
<i>A. platyrhynchos/A. platyrhynchos f. domestica</i>	14-16	h	0	21.2	0	0
<i>Anas sp.</i>	14-16	h	0	0	7.1	15.1
<i>Anas sp.</i>	16-18	h	0	0	7.1	14.2
<i>A. platyrhynchos/ A. platyrhynchos f. domestica</i>	16-18	r	74.2	0	3	7
<i>A. platyrhynchos/ A. platyrhynchos f. domestica</i>	16-18	r	74.6	0	2.9	6.9
<i>A. platyrhynchos/ A. platyrhynchos f. domestica</i>	16-18	u	0	9.2	5.1	0
<i>A. platyrhynchos/ A. platyrhynchos f. domestica</i>	16-18	u	76	9.5	5.5	0
<i>A. penelope/A. acuta</i>	16-18	cmc	50.7	12	4	6.3
<i>A. platyrhynchos/ A. platyrhynchos f. domestica</i>	16-18	cmc	58.7	0	4.8	7.5
<i>A. platyrhynchos/ A. platyrhynchos f. domestica</i>	16-18	cmc	58.2	13.7	0	7.6
<i>A. platyrhynchos/ A. platyrhynchos f. domestica</i>	14-16	cmc	56.4	13.6	0	7.5
<i>A. platyrhynchos/ A. platyrhynchos f. domestica</i>	12-14	of	0	9.7	0	0
<i>A. platyrhynchos/ A. platyrhynchos f. domestica</i>	16-18	tit	0	0	5.6	10.4
<i>A. platyrhynchos/ A. platyrhynchos f. domestica</i>	16-18	tit	0	0	4.7	9.7
<i>Anas sp.</i>	16-18	tit	0	0	0	9.1
<i>Anas sp.</i>	14-16	tit	0	0	0	10.7
<i>A. platyrhynchos/ A. platyrhynchos f. domestica</i>	14-16	tmt	45.4	9.5	5.8	9.6

Appendix III

Measurements of bones of the remaining birds

Name	Century	Bone	GL	Bp	SC	Bd
<i>Acipiter gentilis</i>	12-14	tit	105.4	0	6.1	11.4
<i>Acipiter gentilis</i>	12-14	u	101.7	11	5.5	0
<i>Ardea cinerea</i>	14-16	of	0	13.7	7.1	0
<i>Branta leucopsis/Branta bernicla</i>	16-18	r	119.3	7.5	3.3	8.9
<i>Branta leucopsis/Branta bernicla</i>	16-18	u	125.8	12.7	6.2	0
<i>Branta leucopsis/Branta bernicla</i>	16-18	cmc	72.2	17.9	0	0

Appendix III cont.

Name	Century	Bone	GL	Bp	SC	Bd
<i>Columba</i> sp.	16-18	of	44.2	8.8	3.9	8.2
<i>Corvus corone/Corvus frugilegus</i>	14-16	u	0	10.3	0	0
<i>Corvus corone/Corvus frugilegus</i>	16-18	tit	0	0	4.2	8.4
<i>Corvus corone/Corvus frugilegus</i>	14-16	tit	85.4	0	4.4	8.2
<i>Gavia stellata</i>	16-18	tit	0	0	7.9	11.8
<i>Grus grus</i>	14-16	u	281.7	23.9	9	0
<i>Haliaeetus albicilla</i>	16-18	cmc	127.2	24.8	0	17.3
<i>Haliaeetus albicilla</i>	16-18	u	0	23.6	0	0
<i>Haliaeetus albicilla</i>	16-18	u	0	0	10.1	0
<i>Haliaeetus albicilla</i>	14-16	cmc	117.5	0	9.2	26.2
<i>Haliaeetus albicilla</i>	14-16	u	0	23.2	0	0
<i>Haliaeetus albicilla</i>	16-18	r	238.8	11.7	6.9	16.2
<i>Haliaeetus albicilla</i>	12-14	cmc	114.1	26.1	0	15.6
<i>Haliaeetus albicilla</i>	12-14	u	246	22.3	9.7	0
<i>Haliaeetus albicilla</i>	12-14	r	353.4	10.6	5.8	14.7
<i>Haliaeetus albicilla</i>	12-14	r	0	10.5	0	0
<i>Haliaeetus albicilla</i>	12-14	u	0	0	10	0
<i>Larus argentatus /Larus fuscus</i>	14-16	u	0	12.1	0	0
<i>Melanitta fusca</i>	14-16	coc	54.8	0	0	0
<i>Meleagris gallopavo</i>	16-18	u	130.3	15.7	7.5	0
<i>Meleagris gallopavo</i>	16-18	tmt	109.3	20.6	8.1	19.2
<i>Meleagris gallopavo</i>	16-18	tmt	125	21.5	9.1	22.1
<i>Meleagris gallopavo</i>	16-18	tit	0	0	10.3	22
<i>Meleagris gallopavo</i>	16-18	h	123.1	34.7	12.3	25.5
<i>Meleagris gallopavo</i>	16-18	h	0	0	12.3	25.6
<i>Meleagris gallopavo</i>	16-18	of	126.8	0	11.7	27.3
<i>Meleagris gallopavo</i>	16-18	of	126	0	11.7	0
<i>Meleagris gallopavo</i>	16-18	coc	98.4	0	0	0
<i>Meleagris gallopavo</i>	16-18	tit	126.3	24.2	8.8	22.3
<i>Meleagris gallopavo</i>	16-18	coc	95.4	0	0	0
<i>Meleagris gallopavo</i>	16-18	tit	187	31.9	10.2	20.9
<i>Meleagris gallopavo</i>	16-18	r	110	0	5.1	11.4
<i>Meleagris gallopavo</i>	16-18	tit	184.7	0	10.6	21.3
<i>Meleagris gallopavo</i>	16-18	h	125.2	34.4	12.4	26.1
<i>Meleagris gallopavo</i>	16-18	h	135.2	38	14.8	30.5
<i>Meleagris gallopavo</i>	16-18	u	124	16	7.5	0
<i>Meleagris gallopavo</i>	16-18	of	0	0	11.9	28.2
<i>Meleagris gallopavo</i>	16-18	coc	92.4	0	0	0
<i>Mergus albellus</i>	16-18	h	71.1	15.9	4.5	10.3
<i>Milvus milvus/Milvus migrans</i>	16-18	h	114.7	23.2	7.5	19.2
<i>Pavo cristatus f. domestica</i>	14-16	cmc	62.3	18.3	7.1	10.3
<i>Phalacrocorax carbo</i>	16-18	tit	0	0	7.5	13.3
<i>Tetrao urogallus</i>	12-14	r	0	0	5.4	11.4