Birds in Archaeology

Proceedings of the 6th Meeting of the ICAZ
Bird Working Group in Groningen (23.8 - 27.8.2008)

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Edited by W. Prummel,
J.T. Zeiler & D.C. Brinkhuizen

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The proceedings are dedicated to the memory of Anneke (A.T.) Clason, one of the founding fathers of ICAZ and former professor of Archaeozoology at the Groningen Institute of Archaeology.

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Front cover: collage of illustrations in this volume: chapters 1 (fig. 4), 7 (fig. 5), 9 (fig. 2), 10 (fig. 12), 15 (fig. 2), 21 (fig. 6), 24 (fig. 1) and 25 (fig. 4)
Back cover: Participants during the bird watching trip to the Lauwersmeer, the Netherlands (photograph Erika Gál)

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BONE COMMONS

ICAZ

KONINKLIJKE NEDERLANDSE AKADEMIE VAN WETENSCHAPPEN

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Table of contents

Part IV: Paleontology and zoogeography of birds

Part V: Miscellaneous

Preface

These proceedings present the results of the 6th Meeting of the ICAZ Bird Working Group in Groningen.

The wide scope of the contributions makes clear that this subfield in archaeozoology is thriving. In itself this is a valuable conclusion and enough validation for the importance of archaeological bird research per sé. In this preface I would like to address two issues: the contribution of archaeological bird research to the field of archaeology at large and the relevance of archaeological bird research for present-day society.

To start with the first issue. In my opinion it would be sad if this volume would reach an in-crowd audience only. Like the other archaeozoological groups, bird remains are often an important find category, not only in numbers, but also in importance for societies in the past. Many of the contributions in this volume focus on their importance in terms of nutritional value, but it remains difficult to quantify and compare to other sources of protein as mammals, snails, and fish. It is my opinion that in archaeology the importance of mammal bones as indicators of past behaviour is often overestimated and that more often fish and birds were used of a daily basis as source of protein. Other contributions focus on the non-functional meaning of birds. This is a topic that is often left out of consideration, but should receive more attention because it is sparse opportunity to gain insight in the way past societies perceived, categorised and enculturated their surroundings. These topics should attract readers from across archaeology to see how archaeological bird research might contribute to understanding past subsistence and society.

To turn to the second point, I am impressed by the large popularity of birding in the Netherlands. Many are frequent watchers, making fieldtrips abroad in search of specific birds. As such they are part of an international community of birding, not unlike scientific research groups. In my opinion the scientific relations between the ICAZ Bird Working Group and this community might be of great importance: this community is a knowledge base for interpreting archaeological remains and at the same time a first-class audience for archaeological bird research. In present-day society the societal relevance of research is increasingly important and this potential great relation between the archaeological bird scientists and society lies waiting to be exploited....It would be worthwhile to see if a next ICAZ Bird Working Group Meeting could encompass specialists from both archaeozoology and birding to compare past and present-day patterns of bird behaviour.

I hope you find great inspiration in the contributions presented in this volume.

Prof. dr. D.C.M. Raemaekers
Director Groningen Institute of Archaeology

Poster session, from left to right: Angelica Tivoli, Masaki Eda, Christine Lefèvre, Wietske Prummel, Miguel Angel Giardina, Luminita Bejenaru (photograph Erika Gál).

GIA Reference collection, from left to right: Robert Kosters, Jessica Grimm, Zbigniew Bochenski, Teresa Tomek, Sheila Hamilton Dyer, Jørn Zeiler (photograph Erika Gál).

Introduction by the editors

Forty ornitho-archaeozoologists – archaeozoologists working with bird remains – came together between the 23rd and 27th of August, 2008 for the 6th Meeting of the Bird Working Group (BWG) of the International Council for ArchaeoZoology (ICAZ) in Groningen, the Netherlands. Twenty-four oral presentations and thirteen poster presentations were given during the three days of the conference. Lively discussions were held after the oral presentations, during the poster presentation, during the visit to the archaeozoological reference collection of the Groningen Institute of Archaeology (GIA) and during coffee and lunch breaks (see photo's on p. 8).

On the 26th of August, a very successful excursion was made to the former salt marsh and mud flat area to the north of the city of Groningen, where people lived since the Iron Age on artificial dwelling mounds (*terpen*), and to the Lauwersmeer, a Mecca for bird watchers (see photo on p. 10). Many of the birds discussed during the sessions were observed there alive.

We are happy that 26 of the 37 original oral and poster presentations were transformed into manuscripts, that are published in this book, *Birds in Archaeology*, the Proceedings of the 6th BWG Meeting.

The Meeting and the publication of the Proceedings would not have been possible without the financial and other aid given by many people and organizations. We are very grateful to Mr. Luuk Tol, the administrator of GIA, who did the financial administration of the Meeting, to Sara Whitcher Kansa who published the announcement and the abstracts on BoneCommons, to Mr. Robert T. Kosters and Mr. Tom P. Jacobs, the zoological preparators of GIA, who showed the participants the skeletons they wanted to see in the reference collection, to Lazar Brinkhuizen who showed the participants many interesting birds in the Lauwersmeer and to Nynke Tiekstra, who did the layout of this book.

Financial aid for the Meeting and the publication of the Proceedings was given by the Groningen Institute of Archaeology (GIA) of the University of Groningen, the Koninklijke Nederlandse Academie van Wetenschappen (KNAW), the Groninger Universiteitsfonds (GUF), the Stichting Nederlands Museum voor Anthropologie en Praehistorie (SNMAP), the University of Groningen, the Province of Groningen and the Municipality of Groningen. We are very grateful to all these people and organisations that enabled the Meeting and the publication of these Proceedings.

Wietske Prummel, Jørn T. Zeiler and
Dick C. Brinkhuizen

Field trip to the Lauwersmeer (photograph Erika Gál).

25 Beyond chicken: avian biodiversity in a Portuguese late medieval urban site

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Abstract

A series of 137 silos originally used to storage cereal grains were excavated outside the wall of the city of Beja (Alentejo, Portugal). Avian remains found in 35 of these silos have been analysed with the aim of recognising the economic, social and cultural roles played by birds in this Portuguese urban settlement during the late medieval period. Consumption of domestic fowl and red-legged partridge appears to have been regular whereas other food items such as geese, ducks, pigeons, plovers, crane, little bustard, thrushes and starlings are less frequent. Yet, their occurrence evidences the wide variety of wildfowl exploited, maybe to be served at the upper classes table. Hawking was probably one of the hunting techniques more commonly used. In addition, hunting of large birds of prey is not only demonstrated by the remains of eagles with cut marks but it is also supported by documentary sources. The manufacture of artefacts from the ulnae of vultures may account for the presence of wing bones of these scavengers among the town refuse. Finally, the pathological condition observed on a tarso-metatarsal of a jackdaw and the cut off spurs of two tarsometatarsals of domestic fowl are tentatively interpreted as archaeological evidence of two different cultural practices: keeping corvids in captivity and cock-fighting, respectively. It is shown that birds from medieval sites offer an opportunity to highlight aspects of the daily life of an urban community which otherwise would remain unknown.

Key words

Domestic fowl, wild birds, birds of prey, documentary sources, late-medieval Portugal

Introduction: the archaeological context

The city of Beja is situated inland the Portuguese region of Alentejo (fig. 1). Despite this fact, it was not an isolated urban settlement. Two important trade routes allowed the medieval town dwellers to have access to the Atlantic seacoast, the south of the country and the Mediterranean. One was the terrestrial route that linked Beja with the city of Alcácer do Sal and the estuary of the river Sado, located to the NW and the other was the fluvial route of the river Guadiana through the village of Mértola. Thus, Beja was placed in the centre of these trading routes through which all sorts of commercial goods, luxury items, food products and animals circulated between the west and south coasts and the inland. In late medieval times this town was one of the most prosperous and important south to the river Tejo.
Between 2003 and 2004, prior to the construction of an underground parking in the Avenue Miguel Fernandes, an archaeological rescue excavation was carried out by a team of archaeologists from the company *Crivarque*. The site is located in the NW and SE area of the parking, outside the city walls (fig. 1). The excavations uncovered 137 silos, of which 109 were fully excavated. The high concentration of silos turned out to be the most striking find of the archaeological works. Gullies and modern water pipes on top of the mouths of the silos, as well as all sort of infra-structures still in use were also identified. The silos were not associated to any particular building (*i.e.*, castle, convent or manor house). They were distributed in three rows along this area south of the city walls (Martins *et al.*, 2007).
These structures are of variable shape and size. Their depth ranges from 1.50 m to 5 m, averaging 3 m per silo. In terms of volume this corresponds to a low average of 6 m^3 per silo. They were originally used to storage food products, mainly cereal grains. Once that function was abandoned

Figure 1. Map of Portugal to show the location of Beja and view of the archaeological site at Avenue Miguel Fernandes. Note that all silos are situated immediately outside the city walls, marked by a dotted line.

(for sanitary or administrative reasons or due to their location) they were re-used to throw in urban waste, becoming rubbish dumps.
The archaeological excavation allowed the identification of different techniques of infilling of the silos. Some were filled up during a short period of time with homogeneous contents. However, in the majority of cases there was a succession of layers corresponding to different episodes of refuse disposal. Some of these layers presented burnt material, charcoal and ashes which attest to combustion layers in order to compact the waste and/or also as a sanitary procedure (animal carcasses, domestic debris, and so on). The analysis of the material culture dated the contents of most of the silos to the transition from the medieval to the post-medieval period, between 15th-16th centuries AD.
Avian remains were recovered from 89 of these silos. Here we describe the avian remains from 35 silos. They account for more than 50% of all avian remains from the 89 silos. Our aim is to understand if, beyond their dietary role, birds played any other part in the daily life of this Portuguese urban community in late medieval times.

Recovery and analytical methods

The animal bone was retrieved by hand during excavation; no sieving programme was carried out. Obviously this means that the recovery was probably biased against small-sized species and bones. Bird bones were hand-sorted from mammal, fish and molluscs remains by a technician in the lab. They were washed and cleaned with a soft brush before they were stored in plastic bags.

Identifications were done using the comparative collection housed at the Archaeozoology Lab (IGESPAR) in Lisbon (Moreno-García *et al.* 2003). Skull fragments, ribs, vertebrae, fragmentary bits of sterna and pelvis, upper and lower phalanges were not identified specifically. They are included in the undetermined fraction together with bone splinters and bones of some immature individuals.
In addition to the anatomical and taxonomical identification, butchery marks, carnivore and rodent damage was also recorded. Due to the good state of preservation of most of the identifiable remains these marks were clearly evident with the naked eye.
Medullary bone was recorded for coracoid, ulna, femur and tibiotarsus of galliformes. Also the presence or absence of a spur or evidence of a spur scar on tarsometatarsals of domestic fowl and red-legged partridge was noted.

Composition of the bird assemblage: economic, social and cultural aspects

Although nearly 90% of the remains belong to a single family, the Phasianidae, and the most common species are domestic fowl (*Gallus gallus domesticus*) and red-legged partridge (*Alectoris rufa*), the main characteristic of the sample analysed is the wide range of birds represented - thirteen families and twenty-nine species (table 1). The large variety of wildfowl and birds of prey, particularly diurnal and nocturnal raptors stands out. Such diversity of taxa has the potential of highlighting aspects of the medieval past undetectable through the study of more common species. For instance, it not only shows

Table 1. Bird bones recorded by order, family and species. Percentages represented by each family in the assemblage of the 35 silos.

	nr	% family
Anseriformes		
Anatidae		**3.0**
1. cf. *Anser albifrons*	1	
2. *Anser anser*	13	
Anser sp.	20	
3. *Anas platyrhynchos*	16	
Anas sp.	4	
Total	**54**	
Accipitriformes		
Accipitridae		**2.0**
4. *Gyps fulvus*	2	
5. *Aegypius monachus*	1	
Gyps/Aegypius	1	
6. *Aquila chrysaetos*	6	
7. *Aquila adalberti*	9	
8. *Hieraaetus fasciatus*	3	
9. *Accipiter nisus*	13	
Unidentified	**1**	
Total	36	
Falconiformes		
Falconidae		**0.1**
10. *Falco tinnunculus*	2	
Total	**2**	
Galliformes		
Phasianidae		**89.6**
11. *Gallus gallus domesticus*	1050	
cf. *Gallus gallus domesticus*	53	
12. *Alectoris rufa*	574	
13. *Phasianus colchicus*	1	
Unidentified	17	
Total	**1695**	
Gruiformes		
Gruidae		**0.1**
14. *Grus grus*	1	
Otididae		**0.7**
15. *Tetrax tetrax*	13	
Total	**14**	
Charadriiformes		
Charadriidae		**0.1**
16. *Pluvialis apricaria*	1	
Total	**1**	
Columbiformes		
Columbidae		**1.0**
17. *Columba livia/oenas*	2	
18. *Columba palumbus*	18	
Columba sp.	1	
19. *Streptopelia turtur*	1	
Total	**22**	
Strigiformes		
Strigidae		**1.0**
20. *Strix aluco*	10	
21. *Tyto alba*	4	
22. *Athene noctua*	9	
Total	**23**	
Piciformes		
Picidae		**0.1**
23. *Picus viridis*	1	
Total	**1**	
Passeriformes		
Turdidae		**0.1**
24. *Turdus* sp.	1	
Corvidae		**2.0**
25. *Pica pica*	8	
26. *Corvus monedula*	2	
27. *Corvus corax*	27	
Corvus sp.	2	
Sturnidae		**0.2**
28. *Sturnus vulgaris*	2	
29. *Sturnus unicolor*	2	
Total	**44**	
Total identified	1892	100
Total unidentified	361	
Total assemblage	**2253**	

Table 2. Distal breadth of geese humerus (measurements in mm, after von den Driesch, 1976). Data from Silves in Davis *et al.* (2008), data from Norwich in Moreno-García (1995).

	Bd
cf. *Anser albifrons* from Beja	19.8
A. *albifrons* CIPA Nº 334	20.6
A. *anser* CIPA Nº 1971 ♀	23.4
A. *brachyrhynchus* CIPA Nº 1293 ♂	23.7
Anser sp. Silves, Portugal (12th-13th centuries), (n=2)	23.7 – 24.6
A. *anser* Castle Mall, Norwich, UK (15th century), (n=16)	22.6 – 25.2

that hunting must have been a regular activity practised by the town dwellers of Beja but also that the environment around this locality was probably very rich in prey.

a) Anatidae, ***Geese and ducks***

Geese and ducks follow from far domestic fowl and partridges - a situation common to Iberian sites if compared to other European countries (Hernández Carrasquilla & Aguilar Baltar, 1994). Geographical and environmental conditions more than cultural reasons can be pointed as the responsible factors. Most of the remains were identified as belonging to greylag goose (*Anser anser*) and mallard (*Anas platyrhynchos*). They lack suitable metrical criteria on which to differentiate the wild or domestic species (Bacher, 1967; Barnes *et al.*, 2000). However, we noticed that one of the two distal humerus fragments of goose was smaller than the greylag goose specimen in our reference collection (table 2). Its distal breadth (Bd) measurement falls also outside the range recorded for greylag goose for the British late medieval site of Castle Mall (Moreno-García, 1995; 2009). Visual comparison with the smaller white-fronted goose (*A. albifrons*) evidences great similarities. On morphological and metrical grounds, the presence of this species is advanced as a possibility.

The distribution of white-fronted goose does not include the Iberian Peninsula. It breeds on tundra, migrating to winter in west, central and southeast Europe (Mullarney *et al.*, 1999). However, its occurrence has occasionally been recorded in Portugal and Spain (Matias *et al.*, 2007) and bones attributed to *A. albifrons* have been recorded from archaeological sites in Spain as listed in the survey published by Hernández Carrasquilla & Morales Muñiz (1995). Its sporadic presence in these southern latitudes cannot be ruled out.

The best cuts of meat from wings and legs were discarded here (table 3). No butchery traces were recorded for ducks but the bones of geese show cut and chop marks which indicate the removal of wing tips and distal legs perhaps

Figure 2. Vultures ulnae. A. Distal fragment of griffon (*Gyps fulvus*) left ulna with clear cut marks. B. Diaphysis of a vulture ulna (*Gyps/ Aegypius*), showing two perforations on its dorsal side (enlarged box). C. Diaphysis of black vulture (*Aegypius monachus*) with cut marks on its distal portion (enlarged box). These examples illustrate diaphyses of vultures were common raw material used in bone crafting in Iberia during the late medieval period.

before consumption (table 6). Geese and mallard are mentioned in Iberian medieval chronicles as part of the banquets enjoyed by the royals or the nobility (Arié, 1974-1975; de Castro Martínez, 1996). Thus, their presence is more common on sites of high status than in urban or rural contexts of lower status (Albarella & Thomas, 2002). Here, the low numbers may be interpreted as a reflection of geese and ducks not representing staple elements of the diet of the town dwellers of Beja and thus being presumably wild.

b) Accipitridae and Falconidae, Birds of prey

Four bones of the two big vultures that occur in Iberia, griffon (*Gyps fulvus*) and black vulture (*Aegypius monachus*), were found in four silos. All of them are wing bones - three ulnae and one radius (table 3). What is most interesting is that all the ulnae show clear cut marks and one presents also two small holes on its dorsal surface, close to the distal articulation (fig. 2B). Recent research on archaeological fragments of musical instruments, dated from the Roman period to Post-medieval times in different localities of the Iberian Peninsula, demonstrates that the ulna of vultures has been the preferred raw material to fashion such objects (Moreno-García & Pimenta, 2004; 2007a; 2007b; 2009; Moreno-García *et al.*, 2005). They are long, thin, hollow and light bones. By removing their proximal and distal ends one is left with a tube through which air can be blown and sound produced. The cut marks present on the distal fragment of a griffon ulna found in silo 80 (fig. 2A) and on the black vulture diaphysis from silo 68 (fig. 2C) evidence both specimens were intentionally processed. If the purpose was to manufacture an aerophone (wind musical instrument) or any other artefact remains unknown. These bone fragments were probably waste, unfinished objects and/or faulty items that ended up mixed with food refuse in secondary deposits such as these dumps (Serjeantson & Waldron, 1989). They attest to bone crafting activities nearby (MacGregor, 1989).

Eagles are rarely associated with urban contexts because of feeding behaviour and breeding habitat. They are considered active predators rather than scavengers. It seems unlikely they utilized the human refuse produced in medieval towns (O'Connor, 1993; Mulkeen & O'Connor, 1997). In the Beja assemblage, several wing and hind limb elements of *Aquila chrysaetos*, *A. adalberti* and *Hieraaetus fasciatus* were found in three different silos (table 3). As table 4 shows Spanish imperial eagle (*A. adalberti*) and golden

Table 3. Anatomical elements present in the bird sample of the 35 silos. Key: SK skull; MN mandible; Q quadrate; MX maxilla; VX vertebra; FUR furcula; ST sternum; RIB rib; COR coracoid; SC scapula; HU humerus; RA radius; UL ulna; CMC carpometacarpus; CA carpal; DIG wing digit; SYN synsacrum; FE femur; TBT tibiotarsus; FI fibula; TMT tarsometatarsus; PH leg phalanx; LB limb bone splinter.

		HEAD					AXIAL						WING					LEG						
	total	SK	MN	Q	MX	VX	FUR	ST	RIB	COR	SC	HU	RA	UL	CMC	CA	DIG	SYN	FE	TBT	FI	TMT	PH	LB
Anser cf. *albifrons*	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Anser cf. *anser*	13	1	-	-	-	-	-	-	-	5	1	2	-	-	-	-	-	-	1	3	-	-	-	-
Anser sp.	20	1	-	-	-	-	-	-	-	3	-	-	5	2	4	-	-	-	1	2	-	2	-	-
Anas cf. *platyrhynchos*	16	-	-	-	-	-	-	1	-	-	1	4	-	3	2	-	-	-	-	2	-	3	-	-
Anas sp.	4	-	-	-	-	-	-	2	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-
Gyps fulvus	2	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-
Aegypius monachus	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Gyps/Aegypius	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Aquila chrysaetos	6	-	-	-	-	-	-	-	-	-	-	1	1	1	-	-	-	-	-	-	-	2	1	-
Aquila adalberti	9	-	-	-	-	-	-	-	-	2	-	1	-	-	-	-	-	1	2	2	1	-	-	-
Hieraaetus fasciatus	3	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-
Accipiter nisus	13	1	1	-	-	-	-	2	-	-	1	2	-	-	-	-	-	1	2	2	-	1	-	-
Accipitridae	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Falco tinnunculus	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-
Gallus gallus domesticus	1050	8	4	-	2	7	48	41	-	78	43	97	123	88	33	-	-	82	126	158	5	107	-	-
cf. *Gallus gallus dom.*	53	-	-	-	-	-	4	-	-	8	1	6	2	1	-	-	-		5	16	-	10	-	-
Alectoris rufa	574	4	1	-	-	-	22	34	-	62	35	56	47	32	5			34	85	123	-	34	-	-
Phasianus colchicus	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Phasianidae	17	-	-	-	-	-	-	-	-	-	-	2	-	2	-	-	-	-	1	7	-	5	-	-
Grus grus	1	-	-	-	-	-	-	-	-	-	-	-	-		1	-	-	-	-	-	-	-	-	-
Tetrax tetrax	13	-	-	-	-	-	-	1	-	1	-	-	3	3	-	-	-	1	-	2	-	2	-	-
Pluvialis apricaria	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Columba livia/oenas	2	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-
Columba palumbus	18	-	-	-	-	-	2	-	-	3	1	1	2	3	1	-	-	-	3	1	-	1	-	-
Columba sp.	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Streptopelia turtur	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Strix aluco	10	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	2	1	-	2	-	-
Tyto alba	4	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-		1	1	-	-	-	-
Athene noctua	9	-	-	-	-	-	-	-	-	1	-	1	1	2	1	-	-	-	2	-	-	1	-	-
Picus viridis	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Turdus sp.	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Pica pica	8	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	5	-	1	-	-
Corvus monedula	2	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Corvus corax	27	-	-	-	-	-	-	-	-	2	-	3	1	5	1	-	1	2	3	6	-	3	-	-
Corvus sp.	2	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-
Sturnus vulgaris	2	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-
Sturnus unicolor	2	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-
Undetermined	361	6	-	-	-	4	23	56	6	3	9	21	25	8	3	-	1	33	25	58	2	30	2	46

eagle (*A. chrysaetos*) separate confidently well on metrical data. Also, females are clearly larger than males. The Spanish imperial eagle from silo 86 is larger than the modern specimen in our reference collection (which unfortunately is unsexed). Therefore, it could belong to a female. The golden eagle from silo 76 compares well with the male individual CIPA Nº 1727 and it is smaller than female CIPA Nº 1995 (table 4).

In the case of Spanish imperial eagle and Bonelli's eagle the isolated elements found may belong to single individuals (table 3). Oppositely, golden eagle is probably represented by two individuals. Not only are the radius and ulna found in silo 76 from another stratigraphic unit than the other four remains (one distal humerus fragment, two complete tarsometatarsals and a third distal phalanx) but they are in a pristine preservation state too. They appear to have undergone different taphonomical processes or maybe they were discarded at another stage.

The modern ecology of the three taxa concerned indicates that in Iberia they explore a wide variety of habitats (*Atlas das aves nidificantes em Portugal*, 2008). *A. adalberti*, an Iberian endemic species, shows the largest densities in slightly hilly lowlands, with important arboreal cover but where openings and pastures are abundant too.

Figure 3. Butchery traces on eagle bones. A. Humerus of golden eagle (*Aquila chrysaetos*), in anterior and posterior views. B. Right tarsometatarsal of golden eagle. C. Proximal humerus fragment of Spanish imperial eagle (*Aquila adalberti*). The arrows point to the location of transversal cut marks in each of these bones.

A. chrysaetos prefers open landscapes and avoids extensive forested areas, although for nesting it likes steep cliffs. Finally, Bonelli's eagle occurs in mountainous regions and lowlands with more or less deep river valleys which provide cliff-ledges for nesting. Yet, in the south of Portugal it nests on big trees (Palma, 1994).

How these birds of prey ended up in urban dumps if they were not part of the food economy or of the commensal community characteristic of towns? Reichstein & Pieper (as cited in Mulkeen & O'Connor, 1997: 443) suggest that the wide distribution of early medieval records of *Haliaeetus albicilla* in Germany, mainly represented by wing bones, is related to some extent to the specific use of pinion feathers of this species on projectiles such as arrows. Such might be the case in our assemblage but as mentioned above other body parts are also present.

A close examination of the remains allowed us to identify the occurrence of clear cut marks on two of the golden eagle bones (the medial shaft of the humerus and near the proximal articulation of the right tarsometatarsal; fig. 3A & B) and on the Spanish imperial eagle lateral diaphysis of the humerus (fig. 3C). Such butchery traces indicate wings and legs were deliberately disarticulated from the rest of the carcass. Turning to contemporary Portuguese documentary sources one can find the description of a practice that may explain how those remains were introduced in these anthropogenic contexts. The Ordinances of King Afonso V note that:

"*Eagles prey on flocks. Cross-bowmen are obliged by law to hand in every year, in the months of May and June, to the judges and paymasters, a certain number of claws of these harmful birds. It is a curious scene to see them* [the eagles] *fluttering on the plains of the river Tejo, free of their powerful*

Table 4. Metrical data for *Aquila* remains from Beja compared to modern specimens of Spanish imperial eagle (*A. adalberti*) and golden eagle (*A. chrysaetos*) from Portugal. Note the large sexual dimorphism of these raptors.

	BEJA Silo 86 (A. *adalberti*)		BEJA Silo 76 (A. *chrysaetos*)		A. *adalberti* CIPA Nº 1921	A. *chrysaetos* ♂ CIPA Nº 1727	A. *chrysaetos* ♀ CIPA Nº 1995
HU							
GL	-		-		173.4	181.1	194.7
Bp	33.5		-		32.1	36.0	38.3
SC	-		13.1		12.1	13.1	14.3
Bd	-		31.9		28.8	32.3	34.8
RA							
GL	-		197.3		195.0	200.4	209.3
SC	-		5.7		5.3	5.7	6.4
Bd	-		13.5		13.0	14.3	15.3
UL							
GL	-		210.1		204.0	213.3	223.7
Bp	-		20.2		18.7	21.2	21.8
Dip	-		23.4		20.6	24.2	25.1
SC	-		9.6		9.3	9.5	11.0
Did	-		15.7		15.1	15.4	16.6
FE	**Left**	**Right**					
GL	110.3	110.2	-		101.8	126.0	131.0
Lm	106.0	105.9	-		97.3	121.6	125.9
Bp	22.6	22.6	-		22.0	25.6	28.3
Dp	-	15.1	-		14.1	16.1	16.7
S	10.8	10.9	-		11.9	12.2	14.0
Bd	24.9	24.9	-		23.5	28.6	30.2
Dd	16.7	16.5	-		16.0	20.2	20.8
TBT	**Left**	**Right**					
GL	-	-	-		145.1	172.6	176.7
La	-	-	-		140.0	167.7	171.4
Dip	-	24.0	-		22.8	27.5	30.0
SC	9.7	10.2	-		10.6	10.8	12.0
Bd	-	-	-		17.3	20.3	22.8
Dd	-	-	-		12.2	14.2	15.9
TMT			**Left**	**Right**			
GL	-		108.5	108.7	-	108.1	109.9
Bp	-		21.3	21.1	-	21.8	24.0
SC	-		10.0	9.9	-	10.4	11.5
Bd	-		22.9	23.1	-	23.9	25.7

wings and no faraway, the frightful vulture, of a fierce appearance, and slow in its flight, looking for prey". (Ordenações Afonsinas, Book I, LXVIII, 37; own translation)

This historical text demonstrates human persecution of large raptors, that has endangered the survival of some species, extends far back in time. In late medieval Portugal hunting of large raptors was not only supported by local authorities but also it was enforced within an institutional framework.

One more Accipitridae, the sparrowhawk (*Accipiter nisus*) is present in the assemblage studied. One partial skeleton was found in silo 92 and a single complete scapula was recovered in silo 76 (table 3).

According to the Portuguese book entitled "*Arte da Caça de Altaneria*" or Art of Falconry, written by Diogo Fernandes Ferreira at the beginning of the 17th-century, this bird species was greatly valued for hawking among ordinary people, "*... more than three hundred enter this kingdom every year, and there is no lack of buyers to whom sell them...*" (Ferreira, 1616: 28). He refers also that in his father's house more than fifty-five sparrowhawks and seven goshawks were bred in one year (pp. 10). Prummel (1997) points out five types of evidence that help in identifying the practice of this activity on a site: 1) the falconer's equipment; 2) the skeleton of a bird of prey buried alone or together with a human being; 3) the presence of bones of hawks among other finds from a site; 4) the preponderance of female birds among those

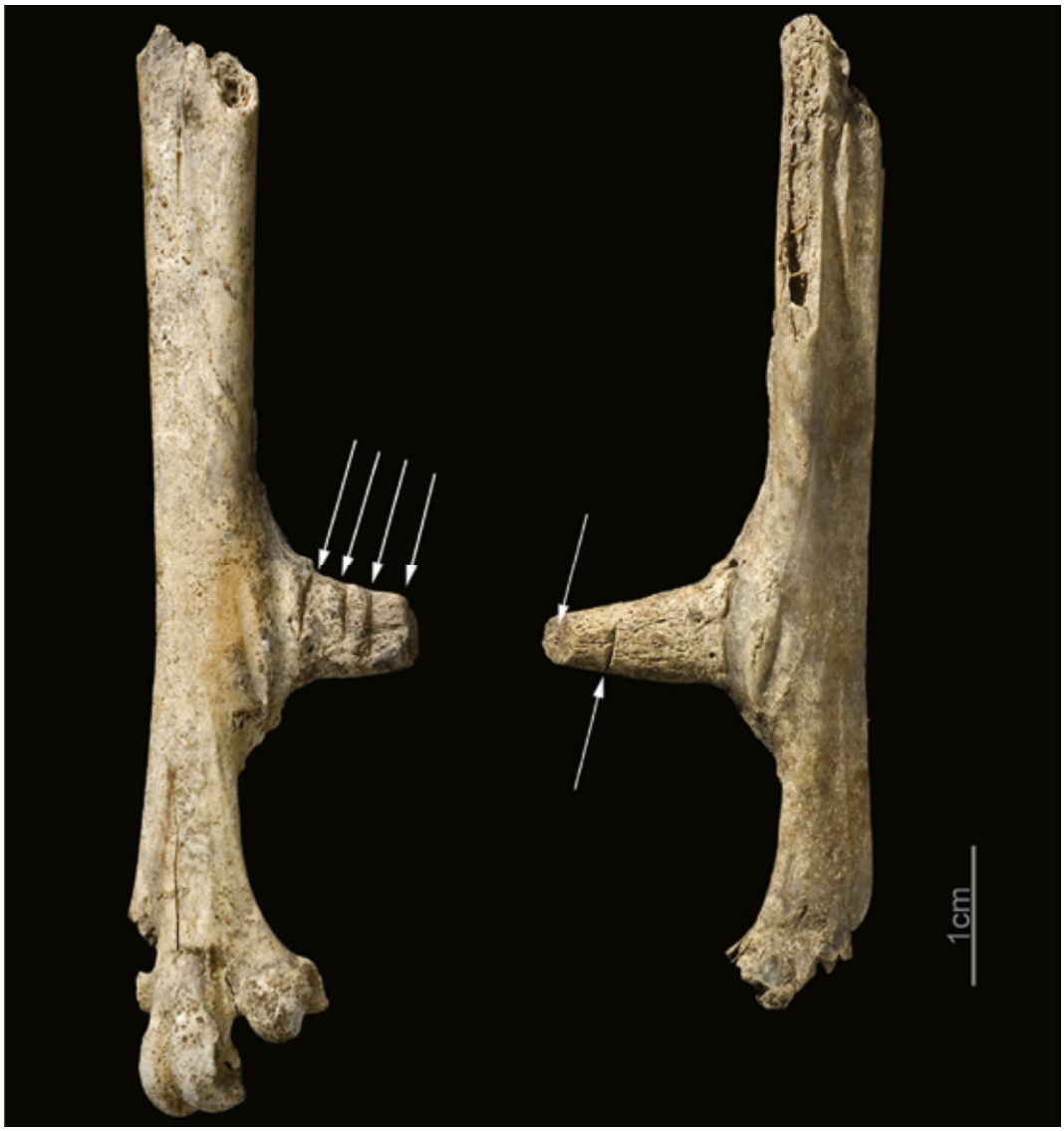

Figure 4. Two tarsometatarsals of domestic fowl (*Gallus gallus domesticus*). Note that the tips of the spurs were removed. The arrows point to cut marks further down.

of goshawk and sparrowhawk; and finally, 5) the remains of the game caught by these trained birds. Although our sample number is reduced (MNI= 2), the last three criteria are accomplished. The bodies of trained hawks, owned by people of certain status within the city (*i.e.* merchants, gentry), once dead were probably thrown into the general waste hip. Based on metrical comparisons with modern sparrowhawks from our collection, the partial skeleton found in silo 92 is attributed to a female bird (table 5). Finally, it cannot be proved that red-legged partridge and all other medium and small-sized wildfowl (*i.e.* pigeons, starlings and thrushes) were hunted with trained hawks, but as supported by historical documents (Ferreira, 1616; Rodrigues Lapa, 1931; López de Ayala, 1965) they represent their main prey species. The aim of low-flight hawking as practised with short-winged hawks is mostly to supply game for the table (Prummel, 1997: 334-5). In conclusion, hawking could have been a more generalised hunting technique in the Alentejo region of Portugal than the recovery of these two sparrowhawks actually suggest.

The big falcons are absent from the Beja assemblage, only two leg bones of a kestrel, *Falco tinnunculus*, were found.

c) Phasianidae, Domestic fowl, partridges and a pheasant

The Phasianidae comprise nearly 90% of the total number of bird bones. Domestic fowl (*Gallus gallus domesticus*) dominates, but red-legged partridge (*Alectoris rufa*) follows as the second most abundant species with over 30% of the identified remains in the assemblage (table 1).

Table 5. Metrical data for *Accipiter nisus* remains from Beja compared to modern male and female skeletons from Iberia. Note the large sexual dimorphism of this species.

	BEJA Silo 92		*Accipiter nisus* CIPA ♂ (n= 4)	*Accipiter nisus* CIPA ♀ (n= 6)
HU	**Left**	**Right**		
GL	64.1	64.1	49.3 - 51.0 $\bar{x}$ = 50.2	56.1 - 62.4 $\bar{x}$ = 59.7
Bp	14.9	15.0	11.0 - 11.6 $\bar{x}$ = 11.4	13.0 - 14.3 $\bar{x}$ = 13.8
SC	5.9	5.8	4.4 - 4.5 $\bar{x}$ = 4.5	5.3 - 5.7 $\bar{x}$ = 5.5
Bd	12.3	12.3	9.6 - 10.1 $\bar{x}$ = 9.8	11.1 – 12.1 $\bar{x}$ = 11.7
FE	**Left**	**Right**		
GL	56.1	-	44.6 - 44.9 $\bar{x}$ = 44.7	49.8 - 54.6 $\bar{x}$ = 52.1
Lm	54.5	-	43.3 - 43.8 $\bar{x}$ = 43.6	48.0 - 53.0 $\bar{x}$ = 50.5
Bp	10.4	10.0	7.1 - 7.8 $\bar{x}$ = 7.4	8.9 - 9.8 $\bar{x}$ = 9.4
Dp	5.6	5.4	4.2 - 4.7 $\bar{x}$ = 4.4	5.0 - 5.7 $\bar{x}$ = 5.4
SC	4.6	4.6	3.5 - 3.6 $\bar{x}$ = 3.5	4.4 - 4.7 $\bar{x}$ = 4.6
Bd	9.7	-	7.0 - 7.4 $\bar{x}$ = 7.2	8.8 - 9.6 $\bar{x}$ = 9.2
Dd	7.2	-	5.1 - 5.4 $\bar{x}$ = 5.2	6.2 - 6.9 $\bar{x}$ = 6.6
TBT	**Left**	**Right**		
GL	75.7	76.0	58.7 - 60.7 $\bar{x}$ = 60.1	67.0 - 73.2 $\bar{x}$ = 70.3
La	74.1	74.1	57.8 - 59.8 $\bar{x}$ = 59.0	66.1 - 72.0 $\bar{x}$ = 69.2
Dip	9.5	9.3	7.0 - 7.4 $\bar{x}$ = 7.2	8.6 - 9.3 $\bar{x}$ = 9.1
SC	4.0	4.1	2.9 - 3.0 $\bar{x}$ = 2.9	3.4 -3.9 $\bar{x}$ = 3.7
Bd	7.6	7.6	5.7 - 6.0 $\bar{x}$ =5.9	7.0 - 7.6 $\bar{x}$ = 7.4
Dd	5.5	5.5	4.3 - 4.5 $\bar{x}$ = 4.4	5.0 -5.3 $\bar{x}$ = 5.1
TMT	Left	Right		
GL	-	-	51.9 - 53.8 $\bar{x}$ = 52.8	56.8 - 61.6 $\bar{x}$ = 59.6
Bp	-	-	5.9 - 6.2 $\bar{x}$ = 6.0	7.3 -7.6 $\bar{x}$ = 7.5
SC	-	2.9	2.0 - 2.1 $\bar{x}$ = 2.1	2.7 - 3.3 $\bar{x}$ = 3.0
Bd	-	8.0	6.0 - 6.2 $\bar{x}$ = 6.1	7.6 - 8.0 $\bar{x}$ =7.8

Table 6. Butchered bones (B) and bones displaying tooth puncture marks (GW). Percentages are given for domestic fowl and red-legged partridge. For geese, ducks and pigeons the numerator represents the number of bones with traces and the denominator the total count for that particular bone.

	Anser		*Anas*		*Gallus*		*Alectoris*		*Columba*	
	B	**GW**	**B**	**GW**	**% B**	**% GW**	**% B**	**% GW**	**B**	**GW**
COR	1 / 8	4 / 8	-	-	5	10	11	2	-	1 / 3
SC	-	-	-	-	5	2	-	3	-	-
HU	1 / 2	-	-	1 / 4	9	27	4	18	-	1 / 3
RA	1 / 5	-	-	-	-	2	-	-	-	-
UL	-	-	-	1 / 3	3	13	3	9	-	1 / 3
CMC	-	-	-	-	6	3	-	-	-	-
PEL	-	-	-	-	-	10	-	-	-	-
FE	1 / 2	-	-	-	17	23	5	14	-	1 / 3
TBT	4 / 5	2 / 5	-	-	15	25	11	4	-	-
TMT	-	1 / 2	-	-	5	6	-	-	-	-

Figure 5. Pathological tarso-metatarsal of jackdaw (*Corvus monedula*) next to modern specimen CIPA Nº 340. Note the green stained coloration on the upper part of the diaphysis. Could it be evidence of the presence of a metallic ring? Would this bird have been kept in captivity?

Femora and tarsometatarsals of galliformes were checked for characteristics of pheasant and guinea fowl (Erbersdobler, 1968). Only one femur was recognized as pheasant. Therefore this species appears to have been rarely consumed.
The distribution of skeletal elements (table 3), the presence of cut marks and especially teeth puncture marks produced probably by a small carnivore (*i.e.* cat; table 6) indicate the remains of Phasianidae derive mainly from table refuse. Documentary sources (Carlé, 1977; de Castro Martínez, 1996) and published archaeozoological data suggest domestic fowl meat was both consumed by people of high and low status in early (Islamic period) and late medieval Iberia (Hernández Carrasquilla & Aguilar Baltar, 1994). Hens, chickens and capons were commonly sold in town markets (García Sánchez, 1983-1988; Puñal Fernández, 1992; Constable, 1997). Similarly, red-legged partridge was very much appreciated by noblemen and gentry. Yet in those areas where it was abundant, peasants and ordinary people used to hunt them as well. At present, red-legged partridge is widely distributed in Portugal, but it has its strongholds in the region of Alentejo, where Beja is situated. The ratio between bones of domestic fowl and bones of partridge at several medieval Portuguese sites evidences partridges were frequently consumed in this geographical region (table 7). In addition, the variety of techniques for trapping partridges and quails (with nests, snares, using trained birds, dogs, and so on) described in contemporary historical documents (Ferreira, 1616; Baeta-Neves *et al.*, 1980-1993) demonstrates that hunting of small game (*i.e.* medium and small-sized wild birds, rabbits and hares) was the best and most economic reinforcement to the diet of low classes.
Broken shafts of coracoid, ulna, femur and tibiotarsus containing medullary bone allowed the identification of laying hens. The tibiotarsus was the bone that presented the highest percentage of observations: 26.5%. Equally, three tibiotarsals of red-legged partridge contained medullary bone which indicates this species was hunted even during its breeding season.
Nearly a quarter of the tarsometatarsals of domestic fowl (25 out of 107) presented a spur. The variations observed in their size (length range: 13 mm to 19 mm) suggest we may be dealing with different fowl breeds and/or that not all of them should be attributed to cocks (West, 1982; De Cupere *et al.*, 2005). In the case of partridges, 19 out of 34 tarsometatarsals had a spur.
Most interesting among the tarsometarsals of domestic fowl is that two specimens presented cut off spurs (fig. 4). The tip was removed from the shaft in both, at about 0.8 cm and 1.3 cm respectively. Three additional cut marks were made further down on the anterior surface of one of the examples whereas the other one presents just a single cut also on that side. Thys & Van Neer (see this volume) describe one tarsometatarsal with a sawn spur from the site of Zavel at Brussels and review the data available in the literature. They conclude that their sample '*can be seen as evidence for cock-fighting, rather than a measure to protect other fowl or to avoid people getting hurt while handling live cocks*'. Since the samples from Beja are just partially modified all these are plausible hypotheses.

d) Columbidae, Pigeons and doves

Twenty-two remains of Columbidae were found in nine out of the thirty-five silos studied. Taking into account the small size of their bones and

Table 7. Ratio between domestic fowl and red-legged partridge at several medieval sites in the southern half of Portugal, organised by region from north to south. Note that the highest percentages of partridge occur in the Alentejo region; c: century/centuries.

Region	Site	*Gallus* N	*Alectoris* N	Average % of partridge alr/ (gag+alr)x100	Reference
Estremadura	Alcáçova de Santarém, 14th-15th c	14	1	7%	(Davis, 2006)
	9th-12th c	168	9	5%	
	Convento de S. Francisco, Santarém, 10th-11th c	21	2	9%	(Moreno-García & Davis, 2001)
	Castelo de Alcácer do Sal 9th-10th c	37	4	10%	(Moreno-García & Davis, 2001)
Alentejo	Beja, 15th-16th c	1103	574	34%	present study
	Evoramonte, 15th c	17	6	26%	(Costa, 2006)
	Praça do Giraldo 56, Évora 14th-15th c	27	5	16%	(Antunes, 2004)
	Casa II Mértola, 13th c	19	5	21%	(Antunes, 1996)
	Alcáçova de Mértola, 12th c	407	286	41%	(Moreno-García & Pimenta, in prep)
	Alcáçova de Mértola, 11-12th c	7	34	83%	(Hernández Carrasquilla, 1993)
Algarve	Alcaria de Arge, Portimão, 12th-13th c	140	9	6%	(Moreno-García *et al*., 2008)
	Arrabalde Islâmico Silves, 12th-13th c	132	16	11%	(Davis *et al*., 2008)
	Castelo de Silves, 12th-13th c	451	96	17,5%	(Pimenta *et al*., 2010)

that no sieving was carried out it can be assumed that the presence of pigeons and doves in late medieval Beja was not unusual. During the Islamic period (early medieval times) breeding of pigeons was common in the territory of Al-Andalus (Moslem Iberia). They were used as couriers, their meat was consumed (Ruiz Bravo-Villasante, 1980) and their dung was collected to fertilize fruit trees (Millás Vallicrosa & Aziman, 1955). Christian medieval chronicles and culinary treatises distinguish well between the consumption of rock dove (*Columba livia*) and wood pigeon (*C. palumbus*) (Huici Miranda, 1966; de Castro Martínez, 1996). In the Beja assemblage *C. palumbus* is more abundant than *C. livia* and turtle dove, *Streptopelia turtur*, a fact maybe related to recovery bias. Discrimination between *C. livia* and *C. oenas* and also between wild and domestic forms of *C. livia* was not possible.

e) Strigidae, Owls

Owls are represented by partial skeletons of one tawny owl (*Strix aluco*), one barn owl (*Tyto alba*) and one little owl (*Athene noctua*) found in silos 111, 68 and 93, respectively. How these nocturnal small raptors ended up among urban waste is a question with no straightforward answer but it is known all of them are frequently found near man in towns. Tawny owl usually breeds in forests and wooded farmland but it can easily adapt to habitats with few trees such as urban settlements. Barn owl nests in holes in trees, buildings or ruins and little owl is partly diurnal so it often can be seen perching exposed.

There are no references to the use of any of these species as decoys to trap big falcons, hawks and other wild birds, as described in detail by Ferreira (1616: 123) in the case of eagle owls (*Bubo bubo*). This author refers only that tawny owl and barn owl are attracted to dovecots where they feed on pigeons and their nestlings.

f) Crows and passerines

This group of birds follows the Accipitridae in the number of species represented. Ravens, the largest in size, are distributed among seven different silos whereas jackdaws, magpies, thrushes and starlings are represented by few bones in one to four silos. Ferreira (1616) in his *Book of Falconry* notes none of the corvids are food items. Since they scavenge on carrion their flesh is considered disgusting. They are prey for hawks and are taken as couriers of sad news. Thus their occurrence among urban waste is likely due to accidental introductions (Albarella & Thomas, 2002).

A tarsometatarsal of a jackdaw presents a pathological condition – a healed fracture of the shaft with exostosis (fig. 5). In addition, a green stained patch is clearly visible close to its proximal articulation. Could that evidence this animal wore a metallic ring to which a chain might have been attached? Was this a bird kept in captivity? The abilities of corvids, in particular to produce sounds, may have prompted such condition. The medieval manuscript on birds *Livro das Aves* reports that: "*In order to learn how to say articulated words, the jackdaw that was captured is sometimes locked in a cage*". (Livro das Aves, XLVI, 141; own translation).

In the Portuguese Alentejo as well as in other parts of the world such cultural practise is still common (Savage, 1997). Corvids are seen as an interesting curiosity or form of entertainment.

In relation to the small passerines it can be argued that they were probably among the most commonly consumed wild birds but are always negatively affected by recovery bias.

g) Other birds

Crane (*Grus grus*), little bustard (*Tetrax tetrax*), golden plover (*Pluvialis apricaria*) and green woodpecker (*Picus viridis*) are the species that complete the range of birds found in the assemblage studied. With the exception of green woodpecker, the other taxa are among the birds hunted to be served at aristocratic tables. Crane and golden plover are not resident species in Iberia but winter migrants which may explain their being considered as a delicacy. It is worth noting golden plover is recorded for the first time in the zooarchaeological record of Portugal.

Conclusion

The evidence discussed above reflects that birds were essential elements of the economic, social and cultural background of the urban community of Beja in the late Middle Ages. As part of the food economy, domestic fowl and red-legged partridge are the most commonly consumed birds. The high frequency of the latter and the presence of a wide variety of other game birds point to a broad-spectrum consumption of wildfowl among the town dwellers. However, since the waste disposed in the silos is of a mixed origin it is impossible to recognise the association of some species to a particular social group. Historical data shows that geese, ducks, pigeons, doves, plovers, crane and little bustard were commercialised in town markets and that many of them were regarded as luxury food, affordable to people of high status. But documentary sources also note that hunting of wildfowl was a usual activity practised by all social groups in regions with a rich biodiversity that allowed ordinary people to increase their consumption of meat and improve their diet. The location of Beja and its rich environment certainly made easy the hunting of wildfowl to common town dwellers.

The presence of birds of prey and scavengers which were not consumed by man indicates that neither all hunting activities were exclusively related to the acquisition of meat for the table nor all waste was of a domestic nature. Royal and municipal ordinances show persecution of birds of prey was institutionalised in this period and that certain skeletal parts were brought to town as proof of the catch. In addition, it cannot be ruled out that the archaeological remains of large raptors derived from the use of particular elements by local craftsmanship. For example, the use of pinion feathers on projectiles or the use of wing bones to manufacture diverse artefacts. It is possible also that the traces observed in some remains of domestic fowl and corvids may be interpreted as a result of the role played by these species in cultural practices which involve birds as a form of entertainment.

In sum, this analysis shows birds were an integrated part of the late medieval economy and society. Archaeozoological analysis of large avian urban assemblages provides the means to begin to understand the diversity of roles they played in the daily life of medieval town dwellers.

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