

The Role of Archaeo-Ornithology in Environmental and Animal History Studies

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Abstract

This paper presents the use of avian bone remains recovered from archaeological excavations in comparison with other animal bone evidence. My aim was to give a brief overview on the topics that are usually faced by an archaeo-ornithologist. The wide scale of subjects includes bird bone preservation rate and methodologies concerning the identification and measurements taken on avian skeletal elements. Taphonomic characteristics involve differential bone density and preservation in archaeological deposits. This item may also be influenced by the special use of fowls or their body parts by people. Results on avian materials contribute considerably to palaeo-environmental studies, as the majority of species have special requirements regarding the occupied habitat, climate and breeding region. Different aspects considering the role of fowls in the cultural life and symbolic system of ancient people are also discussed. Bird bone artefacts and pathologies that exemplify physical changes and infectious conditions may introduce scholars to a special aspect of archaeo-ornithology.

1. Introduction

The present paper – as the written version of the lecture given at the EPOCH-Archaeolingua workshop – provides an overview on a research area pursued by a small number of specialists. The presentation of any particular field to scholars and its discussion with colleagues has a dual gain. Non-specialists get a general impression about rare subjects and about differences that exist among related domains. They may recognize the need of these fields and understand not just the theories, but practical achievements as well. On the other hand, professionals receive comments and questions that lead to further approaches of the study area.

I considered the subject archaeo-ornithology worth discussing due to its unique characteristics. Only a few specialists work on bird remains originating from archaeological or palaeontological remains all over Europe. However, there is an increasing interest towards avian remains (that usually are bones, rarely eggshells and feathers) from other scholars (e.g. archaeologists, ecologists, etc.) specialising in environmental reconstructions.

The small number of experts of this subject is due to at least three reasons: the amount of avian skeletal parts is small in comparison to mammal remains, even in the case of most accurate excavation methods. On the other hand, the class of birds is varied and both the identification of different bone types and the interpretation of archaeo-ornithological data needs special skills. Finally, considering the big number of possible wild species, the access to a comparative bone collection is more than desirable in the interest of accurate determinations.

Several specialists working in this area discussed the most common subjects in archaeo-ornithology. One of the first papers presenting the problems and solutions in interpreting archaeological bird remains was published by Rick who worked in Canada (RICK 1979). A later paper displayed the various aspects of classification of avian remains from archaeological deposits (MORALES MUÑIZ 1993). Gilbert and his colleagues published a manual that helps osteologists and archaeologists in the identification of the most common birds found in the avifauna of North America (GILBERT ET AL. 1996).

Various authors and papers targeted individual subjects within archaeo-ornithology, such as the potential of bird remains for environmental reconstructions (EASTHAM 1997), the role of avian remains in seasonal studies (RICK 1975; SERJEANTSON 1998), the interpretation of bird remains from a cultural point of view (SERJEANTSON 1997) or avian skeletal conditions (BROTHWELL 1993).

Few specialists from Hungary worked within this field of archaeozoology. The first Hungarian expert was Kálmán Lambrecht who also published the reference book dealing with fossil and subfossil avian remains in 1933, which was re-edited in 1964 (LAMBRECHT 1964). Famous biologists and palaeontologists such as Miklós Kretzoi and Dénes Jánossy contributed to archaeological projects and published useful data on avian remains (e.g. BÖKÖNYI 1984: 15, 93–95, 117–118; BÖKÖNYI and JÁNOSSY 1965; JÁNOSSY 1985).

2. Similarities and differences with other animal remains

Bird bones are usually excavated in much smaller quantities than mammal bones. We have all the reasons to consider that mammals had always been the most important target animals for ancient people and probably the most available source of animal protein, at least in our region, the Carpathian Basin. From a palaeo-economic point of view, it must have been more worth hunting large-sized mammals than fowling birds, with the same invested time and energy.

Bones of birds differ considerably from mammals, and this fact determines any kind of interpretation regarding their skeleton, the bone accumulations left, the taphonomic-, economic- and cultural characteristics. Birds have adapted to a higher degree of mobility than mammals, and in addition to the anatomical and physiological changes, their skeleton also modified. The bones of birds are considerably smaller and fragile than mammal skeletal parts. The penetration of air sacks into several skeletal parts in order to increase the efficiency of respiration and to decrease body weight makes these bones even more delicate and easy to break. Therefore we always have to count with a considerable taphonomic loss concerning avian remains.

Division of different animal bones from archaeological excavations made in two countries is illustrated on *Fig. 1*. The first diagram (a) shows the share of remains discovered at the Körös culture site Ecsefalva 23 (GÁL forthcoming a). The second graph illustrates the same subject observed in the case of the Gumelnița culture tell settlement at Borduşani Popina (GÁL and KESSLER 2003). It can be noticed that although the total number of identified animal bones is considerable, avian remains were found in a very small proportion (1–2%) compared with fish and mammal remains, although modern excavation methods such as dry and wet sieving were used in both excavations. It is also worth considering that similar numbers of remains give different proportions depending on the abundance of assemblages. Thus, any kind of interpretation connected to sample sizes and proportions of identified specimens or taxa should be followed with special attention.

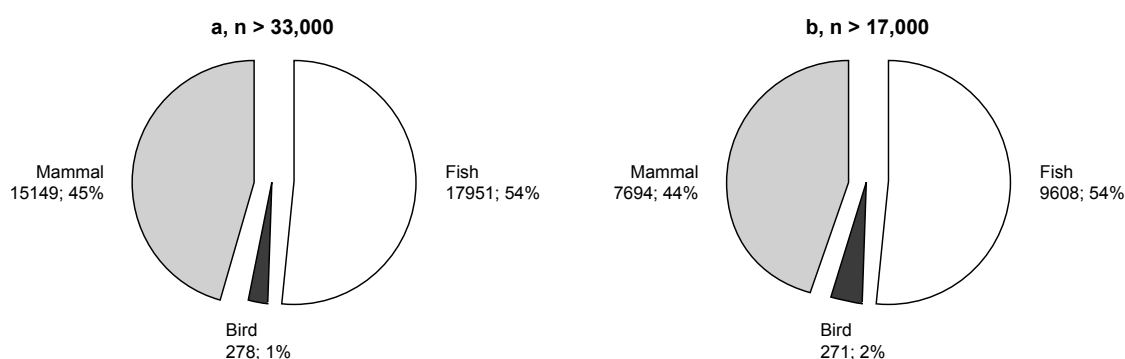


Fig. 1. Share of animal bones at the Early Neolithic (Körös culture) settlement Ecsefalva 23 (a) and the Early Copper Age (Gumelnița) culture settlement Borduşani Popina (b).

3. Identification and measurements

The class of birds includes a huge number of various species. The diversity is also pronounced in osteological features, therefore the identification of remains usually requires the use of a comparative collection. The description of osteological characteristics in Baumel's reference work (BAUMEL 1979) is probably the most in use among specialists. The comparative bird bone collection of the Hungarian Natural History Museum that was rebuilt by Dénes Jánossy after its burning down in 1956 is a very useful reference collection. It includes about 2000 complete and incomplete skeletons of about 300 species from Hungary as well as from other countries. The completion of the catalogue of this collection was started in 2002 and the first part has been published already (GÁL 2003a).

Certainly, characteristics as well as sizes of the most often met domestic species such as hen, goose and duck or the most common wild fowls (e.g., cormorant, swan, crane, etc.) can be memorized after a little practice. Exact identification, however, is made most successfully with the help of a well-provided comparative collection that contains several specimens and both sexes within a species.

The identification and data collection of the studied remains involves the measuring of bones as well. Information concerning the sizes of skeletal parts is quite important in birds where the ontogenetic development completes in a relatively short time and the majority of species reach the adult age (from an osteological point of view!) within one

year. Bone measurements should be taken with a calliper of at least 0.1mm precision. One of the first models for taking measurements on avian bones was given in a palaeornithological study (MOURER-CHAUVIRÉ 1975: 15, 17). The most commonly used standard seems to be the guide provided for measuring mammal and avian skeletal parts from archaeological assemblages (VON DEN DRISCH 1976: 103–129).

Taking additional measurements to these standards, however, is at the consideration of every specialist. The special shape and characteristics of bones of certain bird groups even requires particular methodologies. A pattern for grebe and corvid skeletal parts was given in independent works dedicated to the comparative osteological studies of these families (BOCHEŃSKI 1994; TOMEK and BOCHEŃSKI 2000).

4. Environmental approach

Excepting a small number of sedentary fowls, birds are mobile and thus their study does not contribute to stratigraphic analyses from a palaeontological point of view. Due to the complex specialisation of birds, the advantage of this animal group is in the palaeo-environmental investigations. Birds are specialized in many respects. First of all, they have special requirements towards the habitat to which they are adapted. This environment has to provide both the source of food and the place for breeding: conditions for subsistence and reproduction. Further needs concerning the climate and altitude may be observed in the case of many species.

For a short review of characteristics and the expansion of European species the handbook of Peterson et al. is recommended (PETERSON ET AL. 1977). A very comprehensive work about the details on birds from the Western Palearctic was edited in nine volumes by Cramp and Cramp and Perrins (CRAMP 1977; 1983; 1985a; 1985b; 1988; 1992; CRAMP and PERRINS 1993; 1994a; 1994b). A three-volume CD ROM of this manual provides modern audio-visual information such as short videos about the presented species or voices of birds. Comparative maps with user-friendly keys on the expansion of species are also available (CRAMP 1998). For a recent state of birds in Hungary current ornithological publications are advised (e.g. BANKOVICS 1991a; 1991b; NAGY 2000).

4.1. Ecological characteristics

4.1.1. Actualistic studies

The idea of actualistic studies is that we assume that features of recent species were characteristic of them in the past as well. Palaeontological data support the fact that ecological characteristics of birds did not change during the ages. Knowing the properties of the birds of our time, one may draw conclusions regarding the biological character of earlier environments. Actualistic studies are the more accurate the less time has passed. With the beginning of the Holocene, only remains of recent species appear in bone deposits. Therefore, one does not have to count with extinct birds but with the result of different human activities. These actions either caused the lack of certain local species or lead to the adaptation of many bird species to human environments.

A very useful classification of different ecotypes was given by Mourer-Chauviré, who separated birds in five groups. She distinguished aquatic species, birds attached to open areas, woodland birds, species attached to rocky environments and ubiquitous birds (MOURER-CHAUVIRÉ 1975: 20–21). Many species strictly fit in the aforementioned habitats. For example, duck or coot (*Fulica atra*) is an aquatic fowl as it feeds from the water and it also breeds in the water. The nest is made on floating plant remains or in the reed bed. Another ecotype is the bustard (*Otis*), which has adapted to a steppe environment.

It is worth considering, however, that several species live in mixed habitats. Many representatives of the family Ardeidae are attached to wooded areas on waterbanks for instance. These birds feed from the water but the nest is made in the bushes or on the trees. Forest steppe or groves – occupied by many perching birds such as thrushes (*Turdus*) – are also mixed habitats that include open grassy areas interspersed with trees.

4.1.2. Adaptation to human environment

Nevertheless, many species have adapted to human environment during the ages. Drainage of wetlands, deforestation, river regulation made in order to increase arable land and the human habitation area led to the massive loss of the natural habitat of many animals. A considerable number of bird species disappeared from their original habitat, while some of them have adapted to new conditions. For instance, black grouse (*Tetrao*

terix) today is characteristic of high mountainous areas in Central Europe but it was found in the lowlands all over Europe in the past, like today in Scandinavia and Russia (CRAMP 1998). This species, similarly to many others, lost its natural habitat and was constrained to inhabit high altitudes.

One must take into account that several birds profited from human environments that provided safe food resources and security against predators. A recently published book considering the avifauna of Budapest describes colourfully the aims and inventiveness of dozens of bird species in adapting to a metropolitan environment (SCHMIDT 2003). Archaeological bone evidence of several fowls excavated in Hungary as well as their modern extension and habits connected to human environments was discussed in a recent publication of mine (GÁL 2003b).

4.2. Seasonal characteristics

An important question always comes up during archaeozoological surveys: in which season were animals hunted or slaughtered, when did bone deposits develop? In the case of birds, remains of eggshells and those of different bone types may suggest seasonal fowling. Eggshell remains are not frequent archaeological finds and they are especially rare in the Carpathian Basin. The discovery of fragile eggshells requires adequate contexts (usually graves), good circumstances for fossilization as well as cautious methods used during excavations. References dealing with similar finds are also scarce (e.g., KEEPAX 1981; SERJEANTSON 1988). A methodology consisting of a seven-step technique and electron-microscopic pictures for the identification of avian eggshells was presented by Sidell (SIDELL 1993).

As referred to by Serjeantson, three aspects of bones can be used to evidence seasonality: the presence or absence of migratory or resident species, the discovery of skeletal parts from young individuals, and the presence of medullary bone in assemblages (SERJEANTSON 1998).

4.2.1. Migratory species

Analyses regarding the seasonal presence of birds represent another field of actualistic studies. Based on the recent ornithological studies and palaeontological data, we know the period of occurrence of certain species in certain geographical regions. When a species is identified from a settlement, we may rightly suppose that the bird in question was hunted in the respective period.

The easiest way for viewing the presence of species identified from a site is drawing a so-called “bird calendar” (GÁL forthcoming a). On this chart, one may illustrate the present-day occurrence of birds as well as earlier data regarding the time spent in the studied region. This caution and thoroughness is strongly required due to characteristics of the recent past. Ornithological data are mostly available from the last century, but human environments and the adaptation of many birds to these conditions are also recent phenomena. Therefore, a prudent scientist would search all the available sources about the avifauna of the area around the settlement under study, and take account of the observed changes before interpreting seasonality on avian evidence. For example, crane (*Grus grus*) bred until the end of the 19th century in Hungary. Later – most probably due to environmental disturbance – it became a passing species that moved over Hungary between the breeding and wintering area during springs and autumns (PETERSON ET AL. 1977: 107). According to recent information, this species is breeding again on the territory of the Hortobágy Natural Park (Pál Sümegi, personal communication).

When reading the bird calendar of a site, one may easily study the possible hunting period of fowls which would coincide with the time of inhabitation of the site unless the bird in question was not traded or deposited, or even originating from non-anthropogenic activity (SERJEANTSON 1998: 31–32). Furthermore, the absence of migratory species does not necessarily indicate a round-the-year occupied site but may be the result of a small excavated area or a considerable taphonomic loss in the bone deposit.

4.2.2. Skeletal parts of juveniles

Bones of chicks are good indicators to late spring and summer fowling. They are easily recognizable from the undeveloped shape of skeletal elements, from the partial or non-fused articular ends and from the porosity of bones (Fig. 2). As stated by Starck (STARCK 1994), the



Fig. 2. Three ontogenetic status (juvenile, subadult and adult) in humeri of kestrel (*Falco tinnunculus*).

development of bones differs between chicks of species that walk and swim soon after hatching and young that stay in the nest and are taken care of by adults.

Similarly to the aforementioned calendar used in the case of migratory species, if one knows the time of hatching of the species in question it may indicate the period when the young was hunted. This item gives a much more accurate date for the occasion of hunting, as the breeding period is shorter than the season from the arrival to the departure of migratory birds.

It is worth mentioning, however, that owing to the small size and weak structure of these undeveloped bones, they are usually found in small number compared with the skeletal parts of adults. In addition to losses due to structural and depositional features, we also have to reckon with the fact that these fragile bones were often eaten by humans, dogs and pigs as well.

4.2.3. Medullary bone

A third indicator for seasonal fowling is the medullary bone. This is a special tissue in the bird skeleton that develops only in females in the egg laying period. It is located in the medullar cavity of bones (Fig. 3) and it functions as a rich mineral deposit from which the calcium is transported into the eggshells. Skeletal elements gradually begin to fill up with medullary bone after the mating under the control of sexual hormones and reach the maximum degree when the egg is ready to receive the shell. After the last egg has been laid, a successive resorption takes place. Most skeletal elements store medullary bone, but its quantity differs widely from bone to bone. Medullary bone is better mineralized than cortical bone and its structure is more random and less compact (RICK 1975: 184–185).

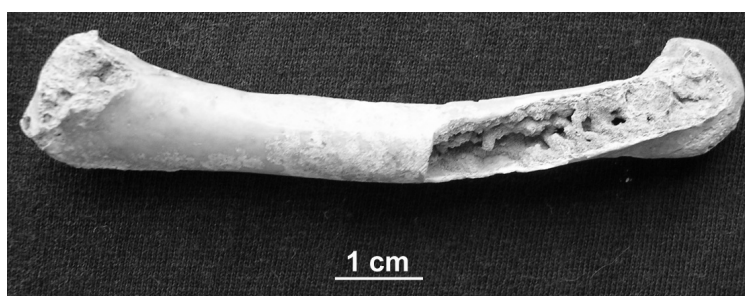


Fig. 3a. Medullary bone in a hen (*Gallus domesticus*) femur from the period of the Roman Empire.

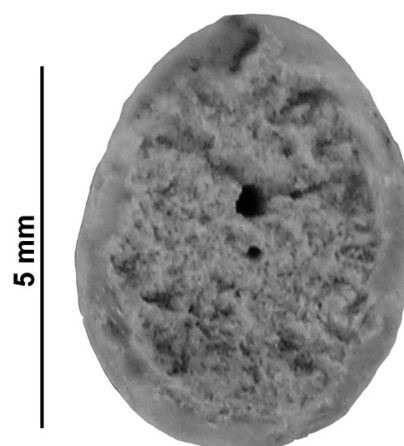


Fig. 3b. Cross section of a duck (*Anas cf. domesticus*) femur containing medullary bone.

Bone remains containing medullary bone are absolute indicators of egg laying fowls. In wild fowls that usually brood only once per year and lay few eggs, the medullary bone most possibly is present for a month. In birds, the release of eggs or the brood generates the development of reproductive instincts and the forming of new eggs. One of the aims of raising domestic fowls was egg production, therefore the egg laying period – and thus the state of medullary bone – is practically continuous in these birds.

Experiments regarding the medullary bone of domestic fowl (*Gallus domesticus*) found in British archaeological assemblages indicated that it was most common in the femur and the tibiotarsus (DRIVER 1982: 251). I found rare skeletal parts such as coracoid and humerus containing medullary bone in hens from Roman Period bone deposits (GÁL forthcoming b).

It is important to mention that given its origin linked to females, medullary bone provides information not only regarding the seasonality but the sex of the fowl. These additional data may help archaeozoologists to make further conclusions concerning the recognized species such as plumage, body size, behaviour, etc.

5. Cultural features

No birds were domesticated in European prehistory. Wild fowl provided meat as well as eggs, feathers and raw material for bone artefacts. The special quality of bird meat and the need for secondary products of fowls resulted in the domestication of some species. Due to differences in the intelligence, body size – and thus the provided meat

and marrow –, and in the grade of utilization of birds compared with mammals, however, much less species were domesticated. These fowls, as described in the following, satisfied several demands of people during the ages.

Beyond the economic value of birds, another exciting question is the spiritual importance of these animals or of their remains. Birds appeared in myths and legends, they were adored and disregarded in the different historical periods. An interesting difference from a mythological point of view is that while fowls known as gods (e.g. Zeus's eagle or Athena's owl) are identifiable species, birds described in legends such as the griffon or phoenix never existed (FARKAS 1982: 175–182).

5.1. Fowling and husbandry

The scale of hunted fowls in early ages is very colourful. Human localities in the Carpathian Basin provided mainly remains of middle- to large-sized aquatic and terrestrial birds. Bones of galliforms and birds of prey were often excavated from Palaeolithic settlements such as cave sites inhabited by people as well as predators. The most common species found from the Neolithic to the Iron Age were waterfowls (e.g. swan, *Cygnus*.; geese, *Anser*; duck, *Anas* and *Aythya*; and coot, *Fulica atra*), different wading birds such as grey herons (*Ardea*) and egrets (*Egretta*), and terrestrial birds attached to swamps and humid meadows (storks, *Ciconia* and crane) or dry steppe (bustards, *Otis*) (GÁL 2004; JÁNOSSY 1985). According to the few remains related to a big variety of species, we may assume that fowling was an opportunistic activity of people, most probably practised during the hunting periods. Differential share of bone elements suggest that body parts without any use were left at the hunting or butchery place and selected fragments were carried to the inhabited settlement (PIKE-TAY ET AL. forthcoming).

The most common domestic fowls are hen, goose (*Anser domesticus*), duck (*Anas domesticus*), pigeon (*Columba domestica*) and turkey (*Meleagris gallopavo*). The exact date and area of the domestication is a subject that raises debates. It is certain, however, that hen was the earliest tamed bird and its first appearance in Central Europe was dated to the Late Hallstatt Period (BENECKE 1993: 21). This species is known from the Iron Age of Hungary as well. Bone evidence for other poultry such as goose, duck and pigeon was found in our country beginning from the period of the Roman Empire (BÖKÖNYI 1974). The earliest turkey bones originating from reliable contexts date to the 15th–17th century, and are from settlements Szendrő – Upper Castle (GÁL forthcoming e), Székesfehérvár – Jókai Street (BARTOSIEWICZ 1997: 135, Table XIV) and Vác – Music School (BARTOSIEWICZ 1995: 22, Table 9).

Large-sized and prolific hen and turkey were kept for providing meat and eggs. Geese and duck bones are not so frequent in archaeological assemblages than hen remains. It is worth mentioning that while seeds are the base of food in galliforms, geese and ducks mainly feed on other plant remains such as grass, leaves, etc. The successful keeping of such waterfowls therefore must have been involved the closeness of meadows and swamps. These species were rather kept for their secondary products and they were slaughtered only on special occasions or at settlements where wealthy people lived. This idea is supported by the small number of excavated juvenile bones. Written sources and paintings also inform us about a special attitude towards tamed or semi-tamed fowls in royal palaces or other high status settlements. Remains of the ornamental bird peacock (*Pavo cristatus*) were excavated from the 15/16th–17th century settlements of Buda Castle, Páztó and Visegrád – Lower Castle (VÖRÖS 2002: 348, 351).

Ethnographic and culinary sources indicate the exploitation of much more species than usually thought. A cookery book written in the 17th century in Transylvania (!) gives an account of interesting recipes of food made from various wild and domestic fowls. In addition to species well known by gourmets (e.g. quail, *Coturnix coturnix* or storks, *Alaudidae*), rare and uncommon birds such as eagle (*Aquila*), ostrich (*Struthio camelis*), pelican (*Pelecanus onocrotalus*) or crane are listed as raw material for different soups, roasts, pâté, etc. (LAKÓ 1983: 134–160).

People have probably, Man has always been fascinated by the special characteristics of fowls, such as beauty, intelligence, velocity and persistence. The first evidence for falconry or hawking – the hunting of birds or mammals with trained birds of prey – comes from the Near- and Middle East during the 1st or 2nd millennium BC (DOBNEY 2002: 74). This hunting method was brought to Europe in the Period of Migrations, 3rd–4th century AD, and spread throughout our continent after AD 500. In Medieval Europe, hawking was a privilege of the nobility and of other high status people. According to recent observations, the best results in this sport were given by hawks (*Accipiter*) and falcons (*Falco*) (PRUMMEL 1997: 334–335).

Written sources indicate that Greeks bred, trained and used cocks for fights. Apart from the selection of proper animals, birds were armed with steel and bronze cock spurs. Eighteenth and nineteenth century examples from Britain and France show how these metal spurs were attached over the truncated spurs (WEST 1982: 256, 258, 260; Plate 1 and 2).

5.2. Grave offerings

Bird remains found as grave goods show another cultural aspect of birds to man. Most often bone evidences found in burials consist in food offerings, but sometime they represent bone tools or artefacts buried together with the owner.

Lauwerier (LAUWERIER 1993) analysed the type and symbol of birds found as Roman grave offerings. He found that domestic hen body parts were the most often placed gifts independently from the sex of the buried person. Examples for food offerings enclosed in graves are known from certain Roman Period cemeteries in Pannonia as well. It is worth mentioning that only remains of domestic hen occurred in these contexts. Prior to the recently discovered finds in Aquincum (GÁL forthcoming b), incomplete hen skeletons were found in the cemeteries at Balatonfüred and Bogád (BÖKÖNYI 1974: 345, 359). The grave of a child in the cemetery of Solymár contained hen eggshells on a tray. This find was described as not being a food donation but a religious custom relating to cosmology (VÖRÖS 1993: 353).

5.3. Birds as symbols

Although artistic reproductions on birds are not in direct connection with bone evidence, they provide many examples on how people have seen their surroundings and gained creative inspiration from it. Birds were symbolized by artists and described in myths, legends and stories. Great writers such as Varro, Columella and Pliny the Elder gave basic information on the variety and use of birds, and their habitat (SPARKES 1997: 350). They appear not only in written sources but also in beliefs, sayings and proverbs. Human cultic attitudes attributed both positive and negative properties to different species (GÁL 2003b).

5.3.1. Bird representations

The earliest avian depictions go back to the Palaeolithic when people gave evidence of the hunted animals and generally of the environment in rock carvings. Stone sculpting are among the first plastic illustrations. In addition to ornaments made from rock and wood, bird figurines made from clay are known as early as the Neolithic. Beginning from the Copper Age, the raw material for statuettes also included metals. The richness of representations regarding the creations, forms and substance is difficult to enumerate. The significance of these ornaments in different ages and regions most probably is extremely various. However, as most of them were excavated from tombs, they must have played an important role in the cultic life of people. Hungarian examples include Neolithic pottery (BÁNFFY and GOLDMAN 2003: 117, Fig. 25) and Bronze Age figurines (KEMENCZEI 2003: 171, Fig. 38) as well as items from younger periods like the owl headed stick of a sorcerer (FODOR 2003: 336–337, Fig. 26). Bird symbols are characteristic of the whole Bronze Age in Hungary, there were 20 avian representations excavated only from the settlement Füzesabony (SZATHMÁRI 2003: 156, Fig. 22).

The most well-known bird illustrations from younger periods are wall and vase paintings (e.g., Pompei). The Greeks and Romans showed a special interest in birds, which is exposed both in the written and illustrative art (SPARKES 1997). Different bird species such as eagles, falcons, pelicans, swans, etc. were minted on coins and belt buckles, and were included in coats of arms.

5.3.2. The use of bodies or body parts

Not only illustrations, but birds themselves or their body parts have had special meanings in cultures. The use of feathers was widespread: they provided closing and insulation in the early times; they have been used for decoration and social signalling (SERJEANTSON 1997: 257). A recent paper presented crane wing bones found together with a complete cattle horn core, goat horn cores, a complete dog head and a stone mace head at Çatalhöyük. Relying on another cultural background, namely the wall paintings depicting vultures with human legs and two facing cranes, the authors indicate that the perforated crane wing was used in “crane dancing” linked with rebirth and beginning of new life as marriage (RUSSEL and MCGOWAN 2003).

The dominance of wing skeleton parts over the leg bones concerning the material from the Early Neolithic settlement Ecsegfalva 23 was statistically demonstrated by the author of this paper. This result means that the distribution of elements is not uniform and some sort of heterogeneity existed in the accumulation. If this discrepancy is due to the curation of wing bones and not due to different density and the taphonomic loss of bones, we may imagine that the wings and/or feathers were used for a certain purpose in this ancient population (GÁL

forthcoming a). Ethnographic parallels from the Carpathian Basin, e.g., hat decorations worn by men, feather dusters and feather brushes used in housekeeping strongly support a similar use of bird wing tips and/or feathers.

A recent study on avian remains excavated from pit houses inhabited by Fremont settlers in Utah suggest that bird carcasses – especially corvids – were used as decorative items in houses (HIGGINS and ROOD 2004).

5.4. The medicinal use of birds

In addition to the symbolic value of birds or feathers, the use of birds in remedies is also an interesting attitude towards these animals. In some cultures, a special medicinal effect was assigned to the complete birds, organs, excretions or even nests of certain species (CORONA-MARTÍNEZ 2004). Corona-Martínez gives in his book (CORONA-MARTÍNEZ 2002: 93–99) a detailed list about fowls, their body parts and the treated diseases used by the pre-Hispanic people in Mexico. Data on the curative effects of seventeen species, belonging to five genus and six families could be gathered. The most used body parts of birds were meat, bile and gizzard grit. According to contemporary beliefs, a wide range of conditions were remedied by fowls, but fever, different pains, as well as sadness and jealousy were the most frequently treated illnesses (CORONA-MARTÍNEZ 2002: 95–96, Table 14).

5.5. Bone artefacts

In addition to the body (parts) and feathers, bones of birds also were utilized by people. Given the special shape and thin cortical walls of certain skeletal parts in birds such as the ulna, the tibiotarsus or the tarsometatarsus, they were often used for producing special tools or instruments. Talons were usually perforated and used as amulets.

The best-known bird bone artefacts are by all means wing instruments. A very detailed study on bone flutes was published in connection to the Mousterian bone flutes from Divje Babe I Cave site in Slovenia (OMERZEL-TERLEP 1997). Awls and other kinds of objects were found at Dutch Neolithic sites (WIJNGAARDEN-BAKKER 1997). In Hungary, double flutes excavated from the Avar Period graves were the most spectacular finds (BARTHA 1934; KOVRIG 1963: 173; KOZÁK 1997). A similar flute was found in the cemetery of Bijelo Brdo, Serbia (KOZÁK 1997). It is worth mentioning that the majority of the aforementioned artefacts were made from the skeletal parts of crane. This bird must have been widespread throughout Europe in the past. It was probably a hunting target for multiple reasons, such as the considerable quantity of meat per bird and its decorative feathers. On the other hand, the size and construction of crane bones seemed to be an ideal raw material for producing various objects.

I collected new bird bone artefacts from Hungary and Romania, and presented them in a recent paper (GÁL forthcoming c). Different skeletal parts of pelican, spoonbill (*Platalea leucorodea*), (domestic?) goose, (golden?) eagle, crane and eagle owl (*Bubo bubo*) were selected for making pipes, flutes, amulets, awls and other artefacts (Fig. 4).



Fig. 4. Bird bone awls from the Middle Byzantine site Capidava. a – distal fragment of ulna from golden eagle (*Aquila chrysaetos*); b – distal fragment of tibiotarsus from crane (*Grus grus*).

6. Bone pathologies

One receives information from bird bones not only concerning bone types and species, but they may also tell us about the state of health of these animals. The famous palaeornithologist Kálmán Lambrecht was among the first specialists who studied pathological conditions on avian remains. He presented several cases in his standard work “Handbuch der Paläornithologie” (LAMBRECHT 1964: 880–889), which was published first in 1933. András Tasnádi Kubacska also discussed several bird bone pathologies in his book (TASNÁDI KUBACSKA 1960).

The aforementioned authors treated mainly physical conditions such as dislocations, fractures and different injuries, which are mostly connected to the habits of fowls such as accidents throughout migrations, fights during the mating period, hunting strategies, etc. A more recent work dealing with animal bones showing pathological conditions presented further anomalies: osteopetrosis, tuberculosis and myeloma (BAKER and BROTHWELL 1980: 61–62, 77, 104). Among these infectious conditions, osteopetrosis caused by the avian leucosis virus (ALV) and typical of the domestic hen looks the most interesting. It influences only the skeleton system. Birds affected by this disease become anaemic and start limping. The pathological skeletal parts show very dense bones. In the case of long bones, only the shaft (diaphysis) is regularly or irregularly thickened, but not the bone ends (epiphyses) (FABIŠ 1997: 543). Usually complete or incomplete skeletons are found in archaeological contexts as sick birds, or the affected body parts were not consumed. We do not have many archaeological bone evidences for this condition. Roman and post-Roman cases were published from Britain (BROTHWELL 2002). Two remains also dated to the Roman Empire are known from the city of Troia (FABIŠ 1997). An evaluation on bird bone pathologies was given by Brothwell (BROTHWELL 1993).

I have recently studied a set of pathologies observed on bird remains coming from recent palaeontological and archaeological excavations. Especially skeletal dislocations and injuries were discovered, but osteopetrosis was also noted on an incomplete hen skeleton from the medieval site Teleki Palace in Buda Castle (*Fig. 5*) and on a hen ulna from the 17th century settlement Szendrő – Upper Castle. In my opinion, physical conditions of avian skeletal parts tell us mainly about the structure of bones and the ethology of birds, while contagious pathologies are in connection with the human-fowl relationship and provide important data regarding the geographical expansion of diseases (GÁL forthcoming d).



Fig. 5. Osteopetrosis observed in a hen skeleton (a, sternum; b, wing bones and c, leg bones) from the Middle Ages site Budapest – Teleki Palace.

7. A taphonomic approach

It has been discussed at the beginning of this paper that avian bones have a special construction and they usually occur in bone deposits in a smaller number than mammal remains. The representation of different bird skeletal parts also varies in any assemblage and depends on several natural (e.g. bioerosion of bones) and man-made factors.

An important question regarding the number and preservation of avian bones is whether people responsible for the respective deposit had a fowling or poultry keeping activity. If hunters had to carry animal bodies from a big distance, they most probably left the useless body parts at the place of hunting or butchery. This process would lead to the lack or small quantity of head and distal leg bones at the settlement, for instance. Boiled or roasted fragile skeletal parts and bones of juveniles may have been eaten by people and animals such as dogs and pigs as well. This practice also causes a considerable loss of certain bone types or bone parts, e.g., the end of bones.

Several osteological features characteristic to avian skeletal elements such as the presence of marrow in long bones, cortical wall thickness and pneumatic state affect bone density and in turn, preservation. All the listed aspects may vary among taxa, elements and within a single element (HIGGINS 1999: 1449–1452). Bone density varies among bird groups and even within species according to age, sex and season. Highly pneumatic bones such as the humerus contain less medullary bone than non-pneumatic elements. Medullary bone mineralizes better than cortical bone and its structure is more random and less compact (RICK 1975: 184). The relationship between wild turkey bone density and the survival of skeletal elements was demonstrated by Dirrigl Jr. He examined 20 archaeological assemblages and found that density-mediated erosion affected over a third of the studied assemblages (DIRRIGL JR 2001: 829).

Even using careful excavation and flotation techniques, when small finds such as fish bone are recovered, fragile bird elements such as skulls, vertebrae, sternum, clavícula and synsacrum are often underrepresented, as in the assemblage from Ecsegfalva 23 or the tell site Borduşani Popina (GÁL forthcoming a, GÁL and KESSLER 2003).

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