Journal of Archaeological Science 37 (2010) 1532–1542

Contents lists available at ScienceDirect

Journal of Archaeological Science

journal homepage: http://www.elsevier.com/locate/jas

Post-medieval sheep (*Ovis aries*) metapodia from southern Britain

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ARTICLE INFO

Article history:
Received 31 October 2008
Received in revised form
5 January 2010
Accepted 6 January 2010

Keywords:
Sheep bones
Improvement
Biometry
Metacarpal
Metatarsal
Pathology
Post-medieval

ABSTRACT

The 'improvement' of sheep (*Ovis aries*) in southern Britain during the post-medieval period is examined using measurements taken on the metacarpals and metatarsals from the late 18th to 19th centuries AD site of Tumbling Fields, Tiverton, Devon. This data set is a rare and important metric archive from which is derived information on the conformation (size and shape) of sheep. Comparisons are presented from other medieval and post-medieval sites, which demonstrate that Tumbling Fields is comparable to other sites of a similar period. The comparisons presented also reveal temporal variation with bones from later sites being taller and more robust on average than those from earlier sites. In addition, the abnormalities of sheep (*O. aries*) metapodia are examined. In particular, two different conditions are discussed: small, oval cavities in the proximal articulation of the metacarpals, and a ridge of bone on the proximal anterior shaft of the metatarsals. Comparisons are presented from other medieval and post-medieval sites, and potential aetiologies are discussed.

1. Introduction

1.1. Archaeological background

The assemblage of 113 ovicaprid metapodia were recovered from the former Nitrovit site, Tumbling Fields, Tiverton, Devon (Fig. 1) during an evaluation to assess the potential for the survival of below ground archaeological remains (Wessex Archaeology, 2007: 1). The assemblage is post-medieval in date, with pottery, brick, slate and glass dating to the 18th and 19th century accompanying the bones (Wessex Archaeology, 2007: 4). The pre-dominance of sheep metapodials in the animal bone assemblage indicates that the assemblage does not represent average food waste. The metapodials were clearly collected after the processing of the sheep carcasses. Large quantities of metapodials were for instance used in the creation of knuckle-bone floors or to mark flower beddings. The fact that some are worn on the proximal and some are worn on the distal end might indicate that the pattern created involved the different shapes of both ends. In both cases, the bones originally represent tawing waste, as has also been proposed for assemblages such as that from Bonners Lane, Leicester (Baxter, 1998), foot bones commonly being left attached to the skins. The tawing process was used to produce softer and suppler leather for the manufacture of clothing, bags and book covers. The skins of sheep and goat were placed in wooden barrels and were preserved with alum. The skins were left in the mixture for up to eight days and were subsequently walked by humans to stretch them. Subsequently the skins were treated with grease to make them suppler (Nenno, 1996: 487). The fact that the site yielded 113 metapodia but only one of the 678 theoretically accompanying phalanges (each metapodial has six phalanges) was found shows that this is not the site of the tawing itself. Since no cut marks were seen on the metapodia, it is likely that disarticulation took place between the distal radius or tibia and the carpal and tarsal bones. Subsequently, remaining tendons were removed in such a manner that the bones were not scratched (i.e. boiling or leaving to rot). This underlines their use as some sort of decorative object.

The use of animal bones as decorative building material was a widespread practice in southern and south-western England in the late 17th–early 18th centuries (Divers et al., 2002: 71). The Tumbling Fields assemblage bears great similarity with the knuckle-bone floor found at 8 Tyers Gate, Bermondsey (London). However, this floor was made entirely of the distal ends of the metapodials which were broken-off mid-shaft (Divers et al., 2002: 71). A drawing and description of a knuckle-bone floor from a private house in Holywell Street, Oxford shows that the bones could cover an area of 71 m^2 (c. 24,460 bones) and display quite elaborate patterns with the initials of the owners (Taunt, 1907). Apparently here the bones were halved and embedded with their distal part upwards into the ground. The floor was coated with

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doi:10.1016/j.jas.2010.01.014

a layer of thin lime mixed with fine gravel. Surviving examples of knuckle-bone floors can be found at Audley End House (Essex) where the early 18th century Bath House has a knuckle-bone floor (Norfolk Broads Guide, 2008). Another example comes from Stiles Almshouses, Newbury Road, Wantage where the floor of the entrance is made of bones, said to be sheep knuckle-bones (Stiles Genealogy, 2002), although images suggest these may in fact be cattle (*Bos taurus*) phalanges.

1.2. Improvement and the Agricultural Revolution

Other authors (*e.g.* Albarella, 2002; Davis, 2008; Rowley-Conwy, 1998) have demonstrated how biometry can help to address important questions such as species identification, ecology and cultural history. The assemblage from the Tumbling Fields site was considered to represent a rare and important metric archive from which information regarding the Agricultural Revolution could potentially be derived, the nature, timing and even existence of which has been the subject of great debate (Thomas, 2005a: 72). As has previously been noted (ibid: 73), archaeozoological data can be used to address this issue via two pathways: the examination of changes in the conformation (size and shape) of animals in order to identify 'improvement', and the analysis of mortality patterns in order to identify the decoupling of flesh growth from skeletal maturation that facilitated an increased supply of meat (ibid: 73–74). This paper will focus upon the first of these pathways, biometrically analysing the assemblage from Tumbling Fields with the intention of determining whether such 'improvement' can be seen and how it compares with the results from other sites.

1.3. Pathology

Disease is an all-pervading phenomenon that has affected both human and animal evolution, and it has been culturally formative, whether in determining rituals, impeding armies, or influencing the elaboration of therapeutic practices (Brothwell, 1988). The information provided by the study of animal health in both wild and domestic taxa can provide helpful insights into human–animal interactions, as well as the environment in which both are living (Vann and Thomas, 2006; Vann, 2008). In addition to analysing the metric data, therefore, this paper will examine the pathologies exhibited by the metapodia at this site in order to determine what types of abnormalities are present and their aetiology. The intention was to examine what such data could contribute to discussions about the lifestyle and environment in which sheep were kept during the post-medieval period in Devon.

2. Material and methods

The overall preservation of the bones was fair, but some were in a poorer condition with laminating bone surfaces. No evidence of cut marks was found (Wessex Archaeology, 2007: 4). Metacarpals and metatarsals were equally represented: 55 metacarpals, 57 metatarsals and some pairs seemed to belong to the same animal. Published criteria (Boessneck, 1969) were used to identify 69 metapodia (61% of the assemblage) as belonging to sheep (*Ovis aries*). None were positively identified as goat (*Capra hircus*). It is therefore presumed that the metapodia for which distinguishing criteria were absent are also most likely to be sheep. The majority of the bones had a fused distal epiphysis; three (2.6% of the assemblage) had an unfused distal epiphysis and one (0.8%) had a distal epiphysis that was in the process of fusing. This would indicate that the majority of the bones came from animals slaughtered at an age greater than 20–24 months (Habermehl, 1975).

The metapodia were measured to the nearest tenth of a millimetre using vernier callipers. The measurements taken were as defined by von den Driesch (1976) and Davis (1996) and were as follows:

GL: greatest length taken along the long axis of the bone 'in projection';
Bp: width of the proximal articular surface in medio-lateral axis (i.e. with the calliper jaws parallel to the medio-lateral axis);
SD: smallest width of the shaft measured in the medio-lateral axis;
BFd: width of the distal articulation in medio-lateral axis;
WCM: medio-lateral width of the medial condyle;
WCL: medio-lateral width of the lateral condyle;
DEM: anterior–posterior diameter of the external trochlea of the medial condyle;
DVM: anterior–posterior diameter of the verticillus of the medial condyle;
DIM: anterior–posterior diameter of the internal trochlea of the medial condyle;
DEL: anterior–posterior diameter of the external trochlea of the lateral condyle.

All potential palaeopathological data was inputted into a database following the methodology of Vann (2008), details of which are summarised in Vann and Thomas (2006). Generic terms were used to describe all pathologies. For example, smooth outgrowths of bone were simply noted as 'nodules', a term that includes both enthesophytes, that is projections or spicules of bone at sites of tendinous or ligamentous attachment, and osteophytes, or small abnormal bony outgrowths or protuberances around the joint margin, as well as bone outgrowths whose origins were much less clear. Hollow areas within a bone, on the other hand, were noted as 'cavities', a term that includes cysts, 'abnormal sacs in the body that are filled with a fluid or semi-solid and enclosed in a membrane', and abscesses, 'collections of pus or other matter contained in a localised area of the body', amongst other things. This was done with the intention of making the methodology comprehensible to non-specialists, but simultaneously providing sufficient descriptions to cover the great majority of pathologies (Vann and Thomas, 2006: 4.3).

3. Results and discussion

3.1. Biometry

Appendix 1 gives the individual measurements of all 113 metapodia. As male animals are typically larger than females, the average size of a sample consisting of more males will generally be greater than that of a sample from the same population consisting of more females (Davis, 2008: 994). It, therefore, seemed appropriate to begin by attempting to determine the relative proportion of each sex. Metapodial slenderness versus length has been identified (Davis, 2000: 389) as a potentially useful method for distinguishing males, females and castrates in an archaeological sample. As noted in Davis (2000: 389), "ewes tend to have short and slender metapodials, rams tend to have longer but more robust metapodials, and wethers have long slender metapodials." Thus, whilst there is no clear-cut separation of the sexes, the majority of the specimens can be found within different regions of the graph (Davis, 2000: 385).

The general distribution of metapodia at the Tumbling Fields site (Figs. 2 and 3) compares well with the assemblage of unimproved adult Shetland sheep used by Davis (2000: Fig. 8) in his analysis , suggesting the presence of both rams and ewes in the assemblage