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Module 2: Introduction to African Archaeology: Methods

Introduction to Zooarchaeology

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1. ZOOARCHAEOLOGY

The main goal of zooarchaeology is to interpret human and environment interactions based primarily on the animal remains recovered from archaeological sites. These remains are derived mainly from the hard parts (bone, tooth, otolith, and shell) of animals eaten in the past. Remains of animals which were used for other purposes like transport, or which happened to co-exist with early humans, are also sometimes found. Much of the work in faunal analysis concerns large-bodied mammalian taxa, but the approach encompasses the analysis of fish, shellfish, birds, reptiles, and indeed all animals remains found in association with archaeological sites. Zooarchaeology serves to build up for the archaeologist to a more complete picture of our ancestors' way of life and the environment they inhabited (Davis, 1987).

Zooarchaeologists work in archaeological sites all over the world. Major themes in African faunal analysis include the origins of human ancestral diet and hunting ability, as well as questions common in later time periods. The later include analyses of early human diet, reconstruction of the transition from hunting and gathering to food production, and evaluation of the historical role of animals in trade, exchange, and social status (see Thopmson 2020, and references therein).

2. METHODOLOGICAL ISSUES IN ZOOARCHAEOLOGY

In its early days, zooarchaeologists were merely expected to provide a list of identified species. Today we know that much more information can be obtained. Quantitative data like the age distribution and sex ratios of each species present may tell us how they were exploited in the past: were they hunted or husbanded, an if the latter, were they kept primarily for meat wool and milk? Size estimates and sclerochronology can also address fundamental questions related to site seasonality: during which season people procure resources and occupy archaeological sites? The zooarchaeologist job is then to extract as much information as possible from bones.

- ***Taphonomy.*** Animal bones can become incorporated into archaeological contexts through human behaviours and natural processes (fluvial processes, animal burrows and dens), and usually a combination of actions. They may represent a single event or a short sequence of actions, or an extended series of events and processes, which might include periods of abandonment (Lyman 1994). Site-formation processes can be examined through taphonomic modifications: preservation state; traces found on the material (cut, burn, breakage, gnawing, weathering, etc.); intraskeletal distribution, i.e. the type and number of skeletal elements found for each vertebrate group; the statigraphical context of bones; and the kind of animal found and their life habits.

- ***I the field: hand collection, sampling, flotation, and coarse sieved assemblages.*** Archaeofaunal remains are often collected by hand. However, a hand collected assemblage is often a biased one because only those remains visible in the field are collected (bones and teeth of larger species). Hand collected assemblages do not produce representative assemblages of smaller taxa (such as birds, fish and micromammals). Hand recovery also misses the smaller bones and teeth of large mammals, namely loose teeth, phalanges and foetal or neonatal bones, resulting in biased body part and age distributions. Samples can be taken for processing by sieving and flotation to reduce the effect of this recovery bias. Samples should always be recovered from stratified and well-sealed deposits. The most common approaches to minimise recovery bias are flotation and coarse sieving. Flotation samples are generally taken for the recovery of charred plant remains but are also effective for recovering bone assemblages (Baker and Worley, 2019).
- ***Taxonomic identification.*** Following cleaning and mending, faunal remains must be identified to the highest taxonomic level possible. Since most zooarchaeologists will compare the archaeofaunal remains with modern skeletons, the first step in archaeological bone identification is to establish a comparative collection of reliably identified aged and sexed skeletons of modern animals. In the absence of comparative collections, there is a growing number of online resources and books which provide 3D models, photographs and detailed drawings of animal bones likely to be found on archaeological sites.
- Identification of archaeological bones to their families (and even genus) is usually straightforward. Distinguishing between two or more closely related species (such as salmon and trout, or sheep and goat) may be difficult. Relying on robust reference material, studies on biometry and geometric morphometrics can allow us to distinguish between closely related species. Taxonomic identification can also be achieved through destructive histological or chemical analyses, such as protein analysis and ancient DNA (aDNA). Chemical or histological identification is dependent on suitable preservation, will require specialist advice and facilities, and may incur cost. Destructive techniques should only be applied after standard recording.
- ***Recording and quantifying abundance.*** The selection of a recording system will depend on the nature of the assemblage and the research questions of the project. Methods should be clearly stated. While some practitioners choose not to record every single bone from an assemblage, instead selecting a series of diagnostic elements that occur frequently, are of zooarchaeological value, and can be readily identified (Davis 1987:35; Reitz and Wing 1999:155), others are all inclusive or use a middle-ground strategy that includes a further list of elements that are recorded in special cases, or if those bones contain valuable zooarchaeological data relating to butchery marks, pathologies, or non-metrical variations. As specimens are very rarely entire bones, some system must be in place to record which part of a bone is present. The use of published zone systems allows comparison within and between

assemblages recorded in a similar manner. They can assist in further quantification of abundance and description of characteristics (e.g. location of butchery marks).

- Quantification methods should also target research questions. Fragment counts yield a raw count of specimens identified to a pre-determined taxonomic level, most referred to as the number of identified specimens (NISP). The strength of fragment counts is that, when the method is clear, NISP data can be directly combined and compared. Secondary data are derived through mathematical manipulation of primary data (NISP), for example estimates of the minimum number of individuals (MNI) or elements (MNE). The calculation of MNI or MNE is used to interpret the original number of animals or skeletal elements represented in an assemblage. Use of minimum numbers circumvents problems of differential anatomy and fragment inter-dependence. However, their serious limitation is that different counts may be produced depending on the level of aggregation, i.e. whether estimates are calculated by context, area, phase, or entire sites.
- ***Age at death: epiphysial fusion, dental age classes and Sclerochonology.*** Mortality profiles (age at death) and sex data/ratios can inform on animal management. The size, shape, structure and/or composition of teeth and bones change as animals mature. Teeth also erupt, become worn and are lost during life. In mammals and birds, age is typically assessed through tooth wear stages (mammals) and epiphyseal fusion data (Grant 1982; Payne 1987). In the case of epiphyseal fusion, the fusion ages of modern animals can be applied to specimens recovered archaeologically (Silver 1969). Comparison with reference material of known age is often the best guide, assuming that differences in size between ancient and modern animals are kept in mind. The study of physical and chemical variations in the accretionary hard tissues of animals (Sclerochronology) can also provide data on age and paleoclimatology (for example, sea surface temperate variation during the life of an animal) and is a powerful tool to study seasonality.
- ***Sexing animal bones and teeth.*** Morphological characteristics reflecting the sex of an individual can be difficult to detect during primary identification. In some cases, castration can blur the distinction between males and females, allowing recognition of castrates but complicating sex identification (Davis 2000). Certain diagnostic bones reflect sex, including the presence of distinctive canines in male pigs and red deer, the presence of a baculum in males of some species, the presence of medullary bone in the long bones of female birds during egg laying and the presence of tarsometatarsal spurs in some male birds (Reitz and Wing 1999: 168).
- ***Metrical recording and analysis.*** A range of factors can influence bone size and shape: species, breed, sex, age of the individual, nutritional status and pathology. For most assemblages specimens are too fragmented to provide measurements. Among zooarchaeologists there is widespread acceptance of von den Driesch's (1976) system of measurements for mammals and birds (see Reitz and Wing 1999:169 for variations and additions). Mammal and bird metric data are often used to assess domestication, sex and 'breed' – not applicable to fish. Fish

continue to grow throughout their lives, so the size of a fish can provide an approximate indication of its relative age and size. However, this is greatly dependent on the comparative data available and the population being studied. Regression equations applied to fish element measurements can be used to estimate fish total length or weight during the analytical process (Wheeler and Jones 1989).

3. INTERPRETING DATA

Towards the end of the preliminary analysis the zooarchaeologist will have identified and recorded all the animals represented their frequencies and various within species data such as size, sex and age, butchery marks, etc. The overall synthesis of data and the comparison of the results to other sites is key to formulate hypothesis concerning human cultural development, environmental change, and evolution of the animal species.