Handbook of Landscape Archaeology

Bruno David, Julian Thomas

The Uses of Archaeological Faunal Remains in Landscape Archaeology

Publication details
Ingrid L. Mainland
Published online on: 15 Dec 2008

How to cite :- Ingrid L. Mainland. 15 Dec 2008, The Uses of Archaeological Faunal Remains in Landscape Archaeology from: Handbook of Landscape Archaeology Routledge
Accessed on: 20 Jul 2023

PLEASE SCROLL DOWN FOR DOCUMENT

Full terms and conditions of use: https://www.routledgehandbooks.com/legal-notices/terms

This Document PDF may be used for research, teaching and private study purposes. Any substantial or systematic reproductions, re-distribution, re-selling, loan or sub-licensing, systematic supply or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The publisher shall not be liable for an loss, actions, claims, proceedings, demand or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.
Animals inhabit the landscape, are affected by it, and are often catalysts for its modification or destruction. The presence of particular animals in a landscape will be limited by a species' biological and ecological adaptation to specific habitats and environments, while the terrain encountered by an animal may bring about skeletal adaptation and modification. For domesticates, human intervention determines the lifestyle of an animal within the landscape, by restricting its mobility and foraging through, at the one extreme, stalling, penning or hobbling, and at the other, supervised herding, transhuman systems, and range-managed animals. Moreover, the procurement of fodder and grazing for domesticates is one of the primary uses of the landscape by stock-holders, and the mismanagement of such resources has, and continues to have, a devastating impact on the environment in many areas of the world.

Archaeological animal remains are typically found within “on-site” contexts such as middens, ditches, and pits. More occasionally, non-anthropogenic deposits of animal bone are found within the landscape, in, for example, lake or river sediments, cave deposit, peat bogs, and tar pits. Although the recovery of faunal remains is primarily a “site-based” activity, analysis of animal bones can provide useful insight into both the nature of the landscape in the past and the use of the landscape by ancient herders and their animals. This chapter outlines the potential of archaeological animal remains to allow insight into the ancient landscape both in terms of its biotic and abiotic nature (that is, characterizing past environments) and the articulation and impact of pastoral activities within it.

**Animals as Indicators of Past Physical and Biotic Landscapes**

The distribution of many species is limited by inter alia physiology, foraging behavior, climate, and habitat with the result that some species are associated with very specific environments. Furthermore, the terrain traversed habitually by an animal can affect its skeletal morphology. This section explores how ecological, behavioral, and climatic factors, as well as the landscape itself, affect the animals living within a specific environment and explains how such information can be used to characterize past landscapes.

**Ecological, Behavioral, and Climatic Variables Affecting the Distribution of Vertebrates in the Landscape**

Any consideration of the distribution of vertebrate species—whether mammals, birds, fish, or...
herpetofauna—serves to indicate one basic fact: the geographic range of a species is limited; no species is everywhere (e.g., Stuart 1982; Yalden 1999). Moreover, some species have broad ranges, whereas others have very narrow ranges. This variability in vertebrate distribution can be attributed to various limiting factors, both abiotic (that is, physical and chemical factors) and biotic (living, generally the influence of other living organisms) (Krebs 1994). Of the abiotic factors, temperature and humidity are perhaps the most important, affecting distribution either directly through the physiological tolerances of particular species or indirectly by limiting the growth of vegetation on which a species, or its prey, is dependent. The winter distribution of many North American passerines, for example, typically correlates with average minimum January temperatures as, being endotherms, their metabolism cannot meet energetic requirements at lower temperatures (Root 1988). Similar gradients are found in other species, both endothermic and exothermic. For example, the roe deer (*Capreolus capreolus*) requires regular water intake, and hence the distribution of this species is limited by aridity; the presence of breeding populations of the European pond tortoise (*Emys orbitalis*) is indicative of summer temperatures of ca. >18–20°C, the temperature required for its eggs to hatch (Stuart 1979).

The distribution of vertebrate species also reflects habitat preferences. Here, one of the main factors governing distribution is foraging behavior, though other variables such as nesting and denning behavior and the need for camouflage are also important. Small mammals (for example, rodents, voles) are often highly habitat-specific (stenotopic) and thus are considered good indicators of past environments. Examples here include (in Europe) indicators of grassland such as the field vole (*Microtus agrestis*) and common vole (*Microtus arvalis*), and of woodland, the woodmouse (*Apodemus sylvaticus*) and the bank vole (*Clethrionomys glareous*). In general, larger mammalian fauna tolerate a broader range of environmental conditions (eurytopic) and consequently tend to be less useful as palaeoenvironmental indicators. Nevertheless, correlations do exist between habitat type and the modern distribution of many of the larger mammalian fauna, and these can be used to give some insight into local environmental conditions in the past; fauna such as the wild cat (*Felis sylvestris*) and wild boar (*Sus scrofa*) all preferentially inhabit temperate woodland, whereas nondomesticated horses (*Equus* sp.) are typically found in open grassland. Like small mammals, requirements for both feeding and nesting and thus permit high-resolution palaeoenvironmental reconstruction (Baird 1989; Morales Muñiz 1993). Reptiles and amphibians tend also to be stenotopic and as such can be very informative sources of evidence for past ecosystems (Stuart 1982).

The observation that many vertebrate species are limited by climatic conditions and/or habitat has played a key role in the analysis of faunal assemblages from Quaternary deposits (e.g., Benecke 1999; Gardeisen 1999; Lowe and Walker 1997; Montuire 1999; Roberts and Parfitt 1999; Schmitt and Lupo 2004; Schmitt, Madsen, and Lupo 2002; Stuart 1982). Palaeoenvironmental interpretation relies on analogy with the modern distribution and/or climatic and ecological tolerances of animals. Analysis typically considers presence/absence or the relative frequencies of indicator species. In their study of faunal assemblages in the Bonneville Basin, Utah, Schmitt and associates (2002; Schmitt and Lupo 2004; 2002) used several indices of species frequency to explore local environments and climate change during the Late Pleistocene and early-mid-Holocene. The lower ratio of cotton-tails (*Sylvilagus* sp.), which require dense perennial shrubs for cover, to jackrabbits (*Lepus* sp.), an indicator of open desert habitats, along with reduced proportions of seven species favoring cool montane or moist conditions and/or grass/sagebrush cover indicated a rapid onset of desertification during the middle Holocene (ca. 8,300 B.P.). More recently, studies have begun to focus on the structure and the evolution of mammalian communities. Montuire (1999), for example, has demonstrated an increasingly arid environment in Spain at the Pliocene-Quaternary boundary using species richness in Arvicolinae and Murinae.

**Faunal Palaeodietary Analysis and Ancient Landscapes**

As outlined above, foraging behavior is one of the key limiting factors determining an animal’s presence/location within a given landscape. Moreover, the diet of an animal will reflect the nature of the biomass available in its home range. Faunal palaeodiet thus provides a powerful tool for environmental reconstruction and has the advantage of being applicable to extinct fauna for which no modern analogues exist. The analysis of dental morphology is an established technique for assessing dietary adaptation (Janis 1990; Kay and Covert 1984; Van Valkenburgh 1988). This approach, which relies on the fact that the form and structure of teeth will be adapted to the main foodstuffs consumed, has
and thus habitat preferences in many extant and extinct species, including ruminants, primates, and carnivores. It is, however, limited in that it assumes that the diet to which teeth are adapted is "current" and is a rather broad-brush approach that does not allow the detection of minor dietary adaptations or seasonal shifts in diet, both of which can be very useful for understanding the nature of past landscapes.

A more refined approach, which is becoming increasingly common within palaeoenvironmental studies, is dental microwear analysis. The food consumed by an individual leaves recognizable traces, microwear features, on tooth surfaces. Analyses of microwear patterning in modern animals have demonstrated that both broad dietary adaptations (for example, browsing vs. grazing, folivory vs. frugivory) and seasonal shifts in diet can be detected in diverse species. This technique has principally been used to explore the dietary adaptation of hominines and other extinct primates (Rose and Ungar 1998). Microwear analyses by Grine (1986) suggested that *Australopithecus* (*A. africanus*) and *Paranthropus* (*A. boisei*) had very different diets. *Paranthropus* consumed a much more abrasive, or, grit-laden diet than did *Australopithecus*, which subsisted on a softer diet of folivorous or frugivorous material; this indicates that *Paranthropus* is likely to have lived in a much drier environment. Ungulate microwear has been used to identify landscapes characterized by C4 grasslands, high-altitude grasslands, and woodland and shrub environments (e.g., Merceron et al. 2005; Solounias and Semprebon 2002; Solounias et al. 2000), although with a few exceptions (e.g., Mainland 2006; Rivals and Deniaux 2003, 2005) such studies have been restricted to Tertiary contexts.

Palaeodietary evidence obtained from the isotopic composition of ungulate bone and teeth is a further useful palaeoenvironmental indicator (Bocherens et al. 1999; Price 1989; Sealy et al. 1991). Bone and apatite biochemistry will reflect the isotopic composition of food and water ingested, which, in turn, will be dependent on factors such as plant metabolism, climate (for example, temperature, aridity, degree of continentality), and the geology of the landscape (Bentley et al. 2003; Price 1989). In continental tropical zones, stable carbon isotopes (δ¹³C/δ¹²C) in herbivores can be used to distinguish between the consumption of terrestrial plants following C3 (flowering shrubs, trees, grasses growing in cool temperatures/high altitudes) and C4 photosynthetic pathways (mainly xeric environment grasses), effectively the ratio of winter rainfall vs. summer rainfall zones (DeNiro and Epstein 1978; Lee-Thorp and Beaumont 1995). In such regions as temperate Europe, where C4 plants are not present, Drucker and associates (2003) have suggested that δ¹³C ratios are depleted in animals consuming vegetation from the understorey of woodlands. They have used this effect in red deer bone to identify the development of wooded landscapes in continental western Europe during the Late Glacial/Early Holocene (but cf. Stevens, Lister, and Hedges et al. 2006). Isotopic evidence from higher trophic levels can also provide useful palaeoenvironmental evidence. Bocherens and colleagues (1999) have suggested that δ¹³C and δ¹⁵N values of carnivores from Scaldina Cave, an interglacial Upper Pleistocene cave site in Belgium, indicate consumption of herbivores from open environments.

**Postcranial Functional Morphology and Environmental Characterization**

An animal's locomotor anatomy will demonstrate adaptation to the substrate that it habitually traverses (DeGusta and Vrba 2005). By identifying characteristics of the skeleton that relate to locomotion in specific substrates/habitats, palaeoenvironmental reconstruction can thus be achieved. Kappelman (1988; Kappelman et al. 1991), for example, identified morphological criteria in the femur of African bovids, which enabled distinction between open (plains) and wooded environments with various degrees of cover. Similarly, DeGusta and Vrba (2005) have recently proposed that the morphology of phalanges in African bovids is indicative of habitat; species that inhabit forests and areas of light cover (light bush, tall grass and hilly areas) tend to have longer phalanges, whereas those in habitats with heavy cover (bush, woodland, swamp) or in open ecotones/arid zones exhibit shorter phalanges.

**Faunal Remains, Herds, and Herders in the Landscape**

With the advent of animal domestication and the subsequent dominance of domesticates in many archaeological assemblages, the potential of faunal data to provide insight into past landscapes is much reduced; humans have considerably extended the natural range of domesticated species through artificial feeding, landscape modification, and selective breeding—sheep, for example, originally an inhabitant of central Asia, today live
of domesticates is still limited to a certain degree by their basic physiology and dietary adaptations and can provide an indication, albeit rather generalized, of past environments. Dairy cattle need to drink water regularly and hence indicate access to water (for example, springs, wells, rivers) in the vicinity of a settlement where cattle were kept for milk. Sheep do not thrive in damp, marshy conditions or woodland (e.g., Halstead 1981), and the absence of suitable woodland habitats is often cited as a barrier to successful pig rearing (e.g., Church et al. 2005).

A more interesting application of faunal remains in postdomestication contexts is in allowing insight into the use of and impact on the landscape by herders and their stock. How a landscape is used by domestic herbivores depends on the mobility of the society concerned. Three broad strategies can be identified: (1) animal herding/husbandry by sedentary agropastoralists; (2) seminomadic pastoralism (often termed transhumance); and (3) specialized pastoralism (Arnold and Greenfield 2004; Chang 1993; Halstead 1996). Where sedentary farmers rear domestic herbivores as part of a mixed agropastoral economy, stock movements within the landscape are typically localized and of short distance. In seminomadic transhumance, a varied degree of arable agriculture is practiced, and herders will move between seasonally differentiated pastures (for example, summer pastures in the uplands and winter in the lowlands or vice versa). Differences traversed may be large or only a few kilometers. Specialized pastoralists do not undertake arable agriculture and will rely heavily on one or two species of herd animals. Movements in the landscape are typically extensive and usually involve whole communities.

The relative frequencies of the different herd animals reared and mortality/harvest profiles are two aspects of faunal assemblages that have been used to explore the mobility of herders. Halstead (1996) has argued that in the Mediterranean region, specialized pastoralists may potentially be identified by an emphasis on single species because of the difficulties of herding mixed groups of species together across vast areas. Mortality profiles in which neonates and young are emphasized are considered indicative of specialized milk production (reflecting the culling of sale of lambs and calves at about 6 weeks to maximize milk production) and hence specialized pastoralists (Halstead 1998). Likewise, Arnold and Greenfield (2004) have suggested that under transhumant pastoralism in the Balkans, where herders move between lowland winter and upland summer pastures, upland and lowland sites would be anticipated; for example, assuming a spring birth and migration into the uplands in early spring, mortality profiles for sheep would demonstrate a cull of 0–2 months old but lack 2–6 months old at lowland sites, whereas at upland summer pasture sites, 0–2 months would be absent and 2–6 months present.

These approaches demonstrate degree of mobility within a given landscape but not where within that landscape the herders were located. Palaeodiagnostic studies (microwear, fecal studies, isotope analysis) have begun to address this question and are allowing more specific insights into the use of past landscapes. Charles and Bogaard's (2005) study of sheep/goat dung-derived archaeobotanical deposits from the Neolithic settlement of Jeitun in Turkmenistan has suggested from the presence of summer fruiting taxa that transhumance was not practiced but that sheep were grazed in the vicinity of the site during summer. Bentley and associates (2003) have demonstrated mobility of cattle at LBK period sites in Germany using strontium isotopic ratios in teeth. Strontium isotopes vary according to the geology of the region. Levels recovered in cattle teeth from Vaihingen were lower than the local range expected, indicating the possibility that this species had been herded in a region of basaltic volcanic geology 50–60 km to the south. Oxygen isotopes in dental tissue are also potentially useful in detecting movement across the landscape (d'Angela et al. 1991; Fricke and O'Neil 1996; Mashkour et al. 2005). The ratio of 18O/16O in mammalian tissue reflects that within ingested water, which in turn varies with temperature, degree of continentality, evaporation, and altitude (Mashkour, Bocherens, and Moussa 2005). Movement of grazing animals across regions in which clear variability is evident within oxygen isotope ratios can thus potentially allow detection of where an animal had grazed and, if dental tissue are sampled, the season of grazing within that habitat.

The impact of domestic ungulates on the landscape can be profound (Evans 1998). Pastoralists and farmers remove woodland to provide grazing for their animals, and overstocking and overgrazing can bring about further modification. Dental microwear analysis has recently been used to explore the impact of ovicaprine on the marginal environments of the North Atlantic islands (Mainland 2006). In Medieval Norse Greenland, microwear patterns indicative of overgrazing were identified in the inland region of the Western and Eastern Settlements from A.D. 1150 onward and were also detected during the later phases of occu-
centuries A.D.). These results provide evidence to support suggestions that maladaptive grazing practices led to a decline in the viability of pastoral farming in Greenland and may have contributed to its eventual demise.

Conclusions

Vertebrate remains within archaeological contexts are typically used for the reconstruction of economic strategies, diet, and subsistence (Charles and Halstead 2000). As the preceding indicates, faunal assemblages can, however, also provide useful insight into past physical and biotic landscapes and the use of the landscape by herders and their animals. The reliability of such evidence will, however, be limited by a number of factors. For many of the approaches outlined above, palaeoenvironmental characterization is based on the modern distribution, habitat preferences, and physiological tolerances of vertebrates and assumes that these will have remained unchanged through time. This assumption will not always be valid, and care must be taken when one is using modern data in this way (Lowe and Walker 1997; Stuart 1982).

Distribution and habitat preference will, for example, be affected by predation and competition: the lion, which today has a very restricted African distribution owing to competition with humans, in the past was found in Eurasia (Stuart 1982). Taphonomy is a further complicating factor. Diverse processes bring about the formation of a faunal assemblage, including human activity, death, and accidental inclusion and the activities of predators (Lowe and Walker 1997). These will affect the species represented in an assemblage and how useful it is for landscape studies. Postdepositional factors, soil acidity, redeposition of deposits, weathering, and the like will further modify both species presence and anatomical representation. Any analysis of the nature and use of past landscapes using faunal remains must, therefore, make allowance for the various taphonomic processes that may have affected the assemblage.

References


Schmitt, D. N., and Lupo, K. D. 2004. Worst of times, the best of times: Jackrabbit hunting by middle Holocene human foragers in the


