The amount of information that could be gained from the wider studies of bones that are now routine was not appreciated. I was an early advocate of more detailed study including, of course, the measurement of bone remains from livestock (Ryder 1958), but later, daily contact with animal geneticists, who commonly held the view that archaeozoology was impossible (because one could not replicate the findings), led me gradually to question the way in which bone measurements could be interpreted.

In a discussion of the problem (Ryder 1982, 21), I pointed out that there have been virtually no studies of variation in the size and proportions of the skeleton either between or within modern breeds of livestock, and I cautioned that it is going to be an enormous task to distinguish differences in size that reflect breed from within-breed variation related to sex, diet or genetic variation. Ten years on, Geist (1992) makes the same point more strongly, and in a more sophisticated way, in order to stress the difficulty of using metrical criteria to identify animals suspected of being killed in contravention of conservation laws. The fact that his discussion refers to wild animals strengthens rather than weakens the argument. I quote his statement in full:

`A fatal flaw in much large-mammal taxonomy is the use of comparative morphometrics as a taxonomic tool. Comparative morphometrics of crania or skeletons of free-living populations can no more be used to measure taxonomic (genetic) differences than a rubber band can be used to measure distance. Every set of compararable measurements conceals genetic, epistatic, environmental and statistical variation. That is, the gross variation is a mixture of different types of variation, within which the genetic variance is undefined. It remains indefinable, despite various approximations. Comparative morphometrics as a taxonomic tool is logically flawed. It confuses phenotype with genotype, analogy with homology, ecotype with taxon, and does not reveal the taxonomic and evolutionary differences between the populations compared. The origins of the differences revealed remain obscure.

This flaw is not uncommon in other branches of biology when quantitative comparisons between populations are used to bolster evolutionary analysis. Such comparisons are futile if the proportion of variance attributable to heredity is unknowable. The closer the relationship between populations of a given form, the more speculative must be the conclusions about evolutionary relationships, because large phenotypic differences can arise from closely related phenotypes in different environments. Taxonomic or evolutionary differences in close relatives should be studied experimentally provided [the] different variables affecting ontogeny are subject to effective control.'

This does not mean that we should stop measuring bones—remember all those frustrating reports from the early years in which no measurements were given—but rather that we should be more cautious about how we interpret changes in animal size between periods. Some people might prefer a genetic explanation resulting from a change of breed. Others might think that a change in the plane of nutrition was the cause. The true reason is likely to be more complicated. The application of statistics to archaeozoology is in its infancy. The investigation of biochemical polymorphisms (blood types and DNA) in bones is only just beginning. A full interpretation of metrical variations in bones must await evidence from these and other techniques as yet undiscovered.

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Sheep fleece and bird legs: a pathological observation

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Introduction

In a recent systematic programme to improve and enlarge the comparative collections of the Environmental Archaeology Unit, numerous specimens of mammals and birds have been

Figure 66. Modern curlew tarsometatarsus, anterior aspect, showing prolific bony growth at the distal end of the shaft, and associated phalanges showing other evidence of infection.

Figure 67. As Figure 66, posterior aspect.

acquired and prepared using the methods outlined by Davis and Payne (1992).

As part of this programme, a trip to my old home on the island of Hoy, in the Orkney Islands, Scotland, enabled me to collect the carcasses of a number of seabirds, waders and wild geese, which were brought back to York for preparation. Of these, two curlews (*Numenius arquata* (L.)) proved of particular interest since they both exhibited a distinctive pathological condition which may possibly be recognised in archaeological bird bone assemblages.

Figure 68. Modern curlew tibiotarsus anterior aspect, indicating loss of limb and subsequent remodelling of the bone.

Figure 69. As Figure 68, medial aspect. Note tapering of distal callus.

The material

Specimen 1 shows evidence of quite excessive `periosteal new bone' growth or osteophytic apposition in a fairly localised area above the distal articulation of the left tarsometarsus (Fig. 66). The morphology of this localised lesion shows a marked flattening on the anterior surface and a distinctive groove running horizontally through the middle of the lesion on the anterior, medial and lateral aspects, the posterior surface seeming to be little affected (Fig. 67). In addition there appears to be associated degeneration of the distal articular surfaces, the medial trochlea most severely affected, and more generalised periosteal new bone development along the shafts of the associated phalanges (Fig. 66). This type of lesion is very reminiscent of that caused by the practice of `hobbling' or tethering larger domestic mammals.

Specimen 2 shows the complete absence of the distal third of the left tibiotarsus with, instead, a large rounded bony callus evident at the most distal point (Fig. 68). The morphology of the callus exhibits a very rounded appearance on the anterior and distal surfaces with a noticeable tapering towards the posterior aspect (Fig. 69). It appears from the evidence that the distal portion of the leg has been lost, perhaps the result of some specific traumatic event, and the extent of subsequent remodelling of the bone indicates that the individual survived for some considerable time.

Aetiology

The aetiology of these lesions is relatively straightforward and involves the `tourniquet-like' effect of sheep wool. Its presence was clear from the unprepared carcase of specimen 1 where a `knot' of fleece of fairly long staple length was noted around the area of the left tarsometatarsus previously described. In this case it is clear that the pressure exerted by the tightening knot irritated the periosteum thus stimulating osteoblast activity in a very localised area of the shaft. It appears that there was little or no associated infection since adjacent areas of shaft show no signs of any diffuse new woven bone. The more generalised infection that appears to be evident on the phalanges is likely to have been a direct result of accidental trauma associated with the semi-immobilisation and possible loss of sensation in the limb below the knot. It is likely that a slow necrosis of the distal portion of the shaft and leg was occurring which, if prolonged, would have resulted in rarefaction of bone in that isolated region of the shaft. This would render the bone far more prone to fracture during normal use, leading ultimately to the loss of the limb below this region.

This is exactly what appears to have occurred with specimen 2, whose owner had survived much longer, as shown by the substantial remodelling of the affected region. The flatter and more rounded areas are located on the anterior surface whilst the more pointed and less well modelled areas are toward the posterior surface. The tapering seen on both specimens is almost certainly a direct result of differential pressure exerted on the shaft the tightening of the knot during forward locomotion. The trailing knot of fleece would almost certainly snag on vegetation, for example, leading to a compensatory action by the bird which would exert more force in pulling the leg forwards, producing more pressure on the dorsal surface and less on the plantar.

Interpretation and archaeological implications

During the period in which I lived at the southern end of Hoy, on the island of South Walls, I often observed large flocks of waders feeding in fields used primarily for grazing cattle and sheep. This usually occurred during or immediately after spells of bad weather and during the nesting season. Numerous unimproved and semi-improved sheep breeds (particularly coloured Shetlands and Shetland cross-breeds) are kept by a number of farmers on the island in addition to, and sometimes instead of, the more improved modern breeds. During the late spring and early summer months the fleeces of these unimproved sheep `rise' and if not plucked, sheared or collected will gradually fall off in small clumps and remain in the fields. Much is caught on vegetation (particularly thistles) or is blown onto barbed wire. It is at this time that the waders, particularly curlews and oystercatchers, are at most risk. I have observed a number of birds with sheep fleece wrapped around one or both legs and once had to `despatch' an oystercatcher, both of whose legs were fractured in exactly the region affected by the fleece and hanging on only by soft tissue.

The condition was observed quite commonly, usually affecting medium-sized waders and some smaller species. It occurs only at a particular time of the year and is associated with the presence of domestic unimproved or semi-improved sheep, whose fleeces, being of limited economic importance, were mostly left to rise and disperse naturally.

With the refinement of systematic recovery procedures, more useful assemblages of bird bones are likely to be obtained and the condition discussed here may well be recognised. It may provide an insight, albeit tentative and somewhat second-hand, into one aspect of sheep husbandry from coastal settlements.

Reference

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