

**Biological remains from excavations at Carr Naze, Filey,
N. Yorkshire: Technical Report**

by

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Summary

A moderate-sized assemblage of hand collected animal bones, and a series of samples, containing vertebrate, mollusc and plant remains, was submitted for full analysis from the late Roman Signal Station at Carr Naze, Filey, Yorkshire. The remains of major domesticates show a characteristic 'Roman' diet (although cattle remains are poorly represented) and, along with the limited numbers of oyster shells, clearly indicate that the signal station was systematically provisioned. Numerous small mammal and amphibian remains from the uppermost courtyard deposits have been interpreted as the remains of ?barn owl pellets which roosted in the abandoned tower once occupation had ceased. Botanical remains, although scarce, suggest the burning of heather brushwood and turves which must have been brought from some distance.

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CHARRED PLANT REMAINS; MOLLUSCS

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Introduction

During 1993 and 1994, excavations were carried out under the direction of Dr Patrick Ottaway (York Archaeological Trust) at the Roman signal station at Carr Naze, Filey, N. Yorkshire. The signal station, thought to be of late fourth century date, is one of a group of five situated along the coast of Yorkshire. They are believed to have been constructed in an attempt to strengthen the coastal defences possibly against invasions or raids from the sea by the Picts.

Biological remains recovered from the 1993 excavations proved (during assessment, Carrott *et al.* 1994) to be mostly of limited value because there were only very low concentrations of remains. Useful assemblages of plant and invertebrate macrofossil remains were largely absent from the sediment samples. The vertebrate assemblage, although small, showed considerable potential, however, and was of interest because of its date, the range of species present, and the rarity of assemblages from this type of site.

Following the initial assessment phase, a more extensive sampling strategy was instigated during the 1994 season to enable the recovery of a larger and more representative vertebrate assemblage.

Sediment samples from the 1994 excavations showed that plant remains were restricted to small concentrations of charcoal and occasionally also charred fruits and seeds (including cereal grains and small legume seeds) and some herbaceous material from certain contexts, notably the dark coloured 'occupation

deposits' within the courtyard of the signal station. A limited programme of further work was recommended by Carrott *et al.* (1995) to attempt to make more secure determinations of the probable food plants, and of the charcoal. Land snails were noted in small numbers and there were a few remains of insects, the latter all apparently modern. A moderate-sized assemblage of both hand-collected and sieved animal bones was recovered, including proportionally high numbers of measurable bones. Also of interest were moderate amounts of small mammal bones from the 'occupation deposits' within the courtyard.

This report aims to address a number of research questions as outlined in the second assessment (Carrott *et al.*, *op cit*):

- (1) Does the assemblage represent systematic provisioning of a late Roman military establishment or does it derive from the immediately post-Roman squatter occupation?
- (2) Is the specialised nature of the occupation reflected in the food debris?
- (3) Can characteristic elements representing abandonment of the station be recognised?
- (4) Are there any significant characteristics which may help to place the deposits within a chronological framework?

Methods

As a result of the revised sampling and recovery programme, all contexts (where appropriate) were sampled following the guidelines for sampling outlined by the EAU (*sensu* Dobney *et al.* 1992). In

particular, the so-called 'occupation deposits' identified within the signal station courtyard during the evaluation excavation in 1993 were targeted for numerous General Biological Analysis (GBA) and Bulk-Sieving (BS) samples. From each well-defined context (or spit in the case of Contexts 12024-5 and 12027-8) a series of spatially separated GBA and BS samples were taken, those for a GBA comprising a single standard sample tub (approximately 10 kg of sediment), and those for BS a minimum of three tubs (approximately 30 kg of sediment). Material from the remaining sediment was excavated by hand and the vertebrate and molluscan material from the two recovery regimes was kept separate. All sediment samples were processed at the EAU after the completion of the excavation.

Animal and plant remains were recovered from BS samples using a 500 µm mesh for the 'washover' and a 1 mm mesh for the residue. These fractions were subsequently dried and sorted. All samples containing identifiable vertebrate and mollusc remains were recorded in this study. Plant and mollusc remains have been examined variously from both the dried washovers and residues, whilst vertebrate material was examined only from residues.

For plant remains, no attempt has been made to quantify the material beyond a simple four-point scale of abundance from 1 (one or a few individuals or fragments per kg of raw sediment) to 4 (a major component of the sample, see caption to Table 1). In this case, the sediments were such that a very high proportion of the raw sediment passed the 1 mm meshes and residues were generally small; of these, only a very small proportion, in turn, was charred plant material (cf. the figures for sample and residue weights in Table 1), so scores for identifiable botanical components rarely exceed 1 (i.e. '+').

Counts for mollusc remains are given as the minimum number of individuals (MNI), calculated on whole or incomplete shells or valves where apices or beaks were present. No attempt was made to estimate numbers of possible additional individuals from the large quantity of small fragments present. These have all been classed as unidentifiable.

We can be confident, as a consequence of the systematic sampling procedure, that the bioarchaeological assemblage will at least be representative of the material present in those contexts which were excavated and free from the usual size bias inherent in hand-collected material. This can be clearly demonstrated from the vertebrate assemblage by the recovery of abundant fish, amphibian, bird and small mammal elements from the courtyard deposits and their scarcity in the hand-collected material from these same contexts (see Tables 2-8).

Recording method

Vertebrate data from both the assessment and main phase of the project were recorded electronically directly into a series of 'Paradox' data tables using a purpose-built graphical input system.

For full details of the various recording protocols utilised here, see Dobney *et al.* forthcoming. In brief, semi-subjective, non-quantitative data were recorded for each context regarding the state of preservation, colour, and the appearance of broken surfaces ('angularity'). In addition, semi-quantitative data were recorded for each context concerning fragment size, dog gnawing, burning, butchery and fresh breaks. Identification was carried out using the reference collection of the EAU.

Detailed recording of all identifiable fragments of major domesticates or large wild mammals followed the diagnostic zones scheme outlined by Dobney and Rielly (1988). All identifiable bird bones with articular ends were recorded, as were all identifiable fish and small mammal bones. All mammal vertebrae (apart from the atlas and axis) were grouped into either large mammal (assumed to be cow-size) or medium mammal (assumed to be sheep-size). Similarly, rib and shaft fragments were recorded under the unidentifiable category as either cow-size or sheep-size. As well as numbers of fragments, total weights were recorded for all identifiable and unidentifiable categories.

Caprine tooth wear stages were recorded using those outlined by Payne (1973; 1987), whilst those for cattle and pigs followed the scheme of Grant (1982). Cattle, pig and caprine mandibles were assigned to the general age categories outlined by O'Connor (1988) whilst, in addition, recording of caprine mandibles and isolated teeth followed the age categories detailed by Payne (1973; 1987).

Mammal bones were described as 'juvenile' if the epiphyses were unfused and the associated shaft fragment appeared spongy and porous. They were recorded as 'neonatal' if they were also of small size. Bird bones which exhibited 'spongy' (i.e. incompletely ossified) articular ends were recorded as 'immature'.

Measurements (unless otherwise specified) followed von den Driesch (1976). Additional measurements, not detailed by von den Driesch, followed those outlined by the sheep-goat working-party (Davis 1992 and Dobney *et al.* forthcoming). Pig cheek teeth measurements follow Payne and Bull (1988).

Species identification

Although the differentiation of caprine (sheep/goat) bones can be problematic, certain elements can readily be differentiated and recorded to species level with the aid of good comparative specimens and using the criteria outlined by Boessneck (1969). For the Filey assemblage, sheep/goat differentiation was routinely attempted for deciduous cheek teeth (dP3 and dP4), distal humerus, distal radius, metacarpal, distal tibia, calcaneum, astragalus, metatarsal and all phalanges. The possible presence of *Capra* (goat) at Filey is attested to merely by a single fragment of horncore of late Roman date. The remaining moderate-sized assemblage of medium-sized bovid remains have all been identified as either definitely sheep; or as caprine. For the purposes of this report, it is assumed that those fragments identified simply as caprine are mainly *Ovis* (sheep).

A single leporid bone has been identified from the Filey assemblage. Although distinctions between hare and rabbit are obvious, differentiation of brown hare (*Lepus europaeus* Pallas) and mountain/blue hare (*L. timidus* L.) was not attempted. It has been assumed, purely on biogeographical grounds, that the remains are those of the brown hare.

The differentiation of chicken (*Gallus f. domesticus*), pheasant (*Phasianus colchicus* L.) and guinea fowl (*Numida meleagris* L.) can be extremely difficult. Commonly employed features such as spurred metatarsi 'lacking the posterior continuous keel' (MacDonald 1992), and the presence of an air-sac foramen on the proximal femur, were utilised. Since definite identification of pheasant was made using these criteria, it is again assumed that the vast majority of Galliforme (i.e. chicken and chicken/pheasant) bones are those of

chicken.

Only eight geese bones were recorded from the late Roman and post-Roman periods. Six belonged to larger grey geese (*Anser*), whilst two fragments were identified as black geese (*Branta*). On the basis of size alone, these two smaller fragments are most likely to be from barnacle goose (*Branta bernicla* (L.)). The specimens of the larger (grey) species, although of various sizes, could not be further identified, but probably represent both domestic and wild grey geese.

The remains of duck were identified in small numbers, most being only distinguished as 'mallard-size'. Although there may have been some exceptions, it is suggested that this group represents mostly wild mallards (*Anas platyrhynchos* L.), the few larger individuals most likely being domestic stock. A single element identified as teal (*Anas crecca* L.) was easily distinguished from the rest on the basis of morphology and size.

A total of 14 fragments were identified as larger auk (Alcidae), these being either razorbill (*Alca torda* L.), guillemot (*Uria aalge* Pontoppidan) or black guillemot (*Cephus grylle* *). Identification of the two possible fragments of black guillemot were made on the basis of size and morphology but remain tentative at present since only a single, rather greasy, comparative specimen was available. Differentiation of razorbill and guillemot, can be difficult using the post-cranial skeleton and in the case of the material from Filey definitive identifications were only made when obvious differences could be noted between the numerous specimens of Alcidae in the EAU reference collection.

Some passeriform (more specifically Turdidae) bones were recovered from both

the hand-collected and bulk-sieved samples. These are not easily identified to species and, as a result, most have been identified to family or tribe level. Again, using the numerous specimens in the EAU collection, tentative and more specific identifications were made where obvious differences could be noted. However, it is possible that some of these bird remains have been misidentified and the records should be treated with caution.

Four small Corvidae fragments were identified from modern and post-Roman deposits at Filey. All were identified as jackdaw (*Corvus monedula* L.) on the basis of detailed comparisons with the extensive reference collection of corvids at the EAU. Although there are obvious problems with the differentiation of jackdaw and magpie (*Pica pica* (L.)), specific identifications were only made where it was felt genuine differences occurred. However, these corvids may have been misidentified.

Small mammal bones were plentiful in the bulk-sieved samples from the courtyard deposits and identifications were undertaken mainly using a low-power binocular microscope. The bones of shrews (Soricidae) could be almost always separated on the basis of morphology and size, as could the remains of the larger water voles and moles. Problems, however, occur when differentiating the smaller bank vole (*Clethrionomys glareolus* Schreber) and field vole (*Microtus agrestis* (L.)). Although these are readily distinguished from each other by their distinctive mandible and dental morphology, they are seemingly impossible to separate using post-cranial elements. As a result, all definitive identifications of the voles were made using only teeth and mandible fragments.

Similarly, separating the smaller Murinae

(mice) is difficult using the post-cranial elements and teeth, although the third molar (M3) is sufficiently different between the house mouse (*Mus musculus* L.) and *Apodemus* spp. to allow some confidence in separation. In addition, some shape and size differences do occur between the two native *Apodemus* species, which sometimes allows some degree of confidence in separation. Distinguishing between voles and mice using post-cranial elements is also fraught with problems; only the proximal tibia, femur and ilium of the pelvis are used here as definitive separators.

The bones of amphibians were also numerous in the bulk-sieved samples. The obvious differences in the morphology of the pelvis (specifically the acetabular crest) were used as criteria for differentiating between frogs and toads. Almost all (i.e. 14) pelvis fragments were identified as toad (*Bufo bufo* L.), only one being recorded as frog (*Rana temporaria* L.). Most postcranial elements were large and robust, reinforcing the likelihood that toad predominated. However, three very long and slender tibiae were tentatively recorded as frog.

Reptile bones were also present in the bulk-sieved material, the identifiable elements representing mainly pelvises and vertebrae. Identification to species was not possible on the basis of the limited comparative material available. However, the small pelvises are of a lizard (most likely the common lizard (*Lacerta vivipara* Jaquin) or possibly the sand lizard (*L. agilis* L.) and the vertebrae are from a small snake species (either adder (*Vipera berus* L.) or grass snake (*Natrix natrix* L)).

Quantification

Several standard methods of species quantification have been employed. They involve simple fragment counts, weight of bone, and estimation of the minimum number of individuals (MNI). Although none of these methods is free from problems, all can be used to highlight gross changes.

Calculation of the total number of fragments involves the simple counting of all recorded identifiable fragments (number of individual skeletal parts or NISP). Unidentifiable fragments are recorded and quantified separately. Calculation of the MNI is done simply using the most frequently occurring diagnostic zone (recorded as more than 50% of that zone present) for any element and from any side (Dobney and Rielly 1988). At best, quantification using simple variations in numbers of fragments provides limited data on absolute numbers of individuals present in the assemblage.

Quantification using weight of bone, however, can be used as a basis for an alternative, possibly more realistic, method of assessing the economic importance of the main domesticates.

Quantification of material from the bulk-sieved samples was similar to the methods employed for the main hand-collected assemblage, i.e. mainly involving NISP and MNI counts. For small mammals, identifiable fragments included only isolated teeth, maxilla and mandible fragments, pelvises and the major long bones (humerus, femur, and tibia). MNI counts were made only on the basis of first molars. Similarly for amphibians, identifiable fragments include only pelvises, elements of the pectoral girdle and the major long bones (humerus, radio-ulna, femur, and tibia).

As well as presenting the data as total

fragment counts, actual concentrations of vertebrate remains are given in the form of numbers of bone fragments per kilogram of deposit processed. This method of quantification enables a more realistic method of comparing assemblages from different samples or contexts without the biasing effect of widely differing sample size. In the case of Filey, however, this factor is less problematic since almost all bulk-sieved samples were of similar size (i.e. *circa* 30 kg).

The economic basis

Tables 1-10 show that a wide range of plant, invertebrate and vertebrate taxa was identified from this comparatively small assemblage, a major factor here being the intensive and systematic sampling and recovery programme implemented on the site.

The vertebrate assemblage

Not surprisingly, the vast bulk of the mammal remains from the late Roman and supposed post-Roman hand-collected assemblages is made up of bones of the common domestic mammals (main domesticates) i.e. cattle, caprine, and pig. Minor domesticates (in this case dog, chicken and possibly some of the grey geese fragments), wild mammals and fish make up very small proportions of the remaining material. Bones of wild birds, although contributing only a small proportion of the total assemblage, provided some useful information.

As can be seen from Tables 11-14 and Figures 1 and 2, the chief significance of the bulk-sieved material lies in the sheer quantity of small mammal and amphibian bones, with small numbers of bird, fish and reptile bones also present (these are

discussed in more detail below).

Main domestic mammals

Tables 15-20 and figures 3-5 show the basic quantification methods used to compare the relative frequencies of cattle, sheep, pig and chicken remains from the signal station. It is interesting to note that the results obtained from these methods are very similar and show that the remains of sheep are those most frequently represented in the Filey assemblage, followed by pig and then cattle. Evidence from the bulk-sieved samples shows that pig remains may actually be slightly under-represented in the hand-collected material, whilst cattle remains are perhaps over-represented (although the differences are negligible). In general, data from the unidentifiable fraction are consistent with those from the identified material (Tables 21 and 22 and Figure 6). The fragments of large mammal (in this case assumed to be mainly from cattle) and medium mammal (assumed to be caprine and pig remains) show similar frequencies to simple NISP and MNI counts for identified bones.

Comparisons of the relative numbers of different species can be misleading when trying to interpret their economic significance, and these simple quantification methods make no allowance of body size (and thus carcase weight). This must be an important consideration when assessing the true economic importance of each species, since the carcasses of large animals obviously provide more meat and other useful products than those of smaller ones.

Rough calculations of carcase size can be made on the basis of average body weight (calculated using modern comparative examples) and although it must be remembered that variations in the size of different breeds, sexual variation, and the

importance of nutritional status mean that the application of this technique to archaeological material must be somewhat cautious, such calculations can and have been used as a broad indication of the dietary importance of each species (Bourdillon and Coy 1980; O'Connor 1991; Dobney *et al.* 1996). In the case of the Filey data, calculations are based on the Manching data (Boessneck *et al.* 1971, 9) taking the mid-points in the range (i.e. cattle live weight @ 275kg, pig @ 37.5kg and sheep @ 8.5kg and after O'Connor (*op. cit.*), who calculated the ratios of 7.3 sheep to a single cow and 2.3 sheep being equivalent to a single pig.

Tables 23 and 24 and Figure 7 show the relative proportions of meat that cattle, sheep and pigs made to the diet, based on calculations of their postulated body weight ratios. These figures are arrived at by multiplying the live weight ratios (outlined above) by the total fragment counts for each species. It is interesting to note that calculated values for carcase weight (from NISP and MNI counts) from both bulk-sieved and hand-collected material once again present a broadly similar picture of the relative importance of the main domesticates to the diet. Contrary to the data previously presented from Figures 3-5, the importance of beef and pork in the diet of the inhabitants of the signal station is highlighted at the expense of mutton. In fact, it would appear that the contribution made to the diet by the three major domestic mammals was probably roughly equal. This is somewhat unusual given that cattle usually predominate at most Roman military sites in England.

Wild mammals (excluding microfauna)

Very few bones of the larger wild mammals were identified from the Filey assemblage. Of note are the deer (Cervidae) remains, which include four

fragments of eroded red deer/?red deer (*Cervus elaphus* L.) antler from both late Roman and so-called post-Roman deposits, and single ?red deer and roe deer (*Capreolus capreolus* L.) scapulae (both from late Roman contexts). Although the scapula fragments certainly do not indicate that venison was an important component of the diet, the fact that these major meat bearing bones are the only post-cranial remains of cervid recovered tentatively supports the evidence from the domestic mammal assemblage for the possible organised provisioning of the station (see below). In contrast, the eroded (and sometimes worked) antler fragments are most likely waste from individual small-scale craft activity and/or personal items (as evidenced by a putative piece of worked handle showing iron oxide staining (from Context 12027).

The two teeth fragments (canine and first molar) of badger (*Meles meles* L.) recovered from late Roman deposits perhaps indicate the opportunistic use of badger pelts, although this is pure speculation. Both the cervid and mustelid remains perhaps suggest that some woodland was present in the vicinity of the signal station, although there is, of course, no evidence that these animals were procured locally.

Wild birds

The list of wild birds from Filey is unusual for an assemblage of this date in that it is quite extensive and includes numerous sea birds as well as more usual edible species (Tables 3 and 6). At such a site, the origins of such remains should be questioned closely. It is not necessarily the case that all these bones represent actual domestic food waste of the occupants. For example, it is argued below that the small mammal,

amphibian, and Turdidae bones recovered from the upper courtyard deposits are from decayed owl pellets. However, it could be argued that the thrush (Turdidae) bones might reflect the distinctly Roman practice of eating small birds (particularly thrushes) which were regarded as delicacies (Lauwerier 1988).

The common seabirds and waders could be the remains of natural fatalities so often seen along the cliffs and coastline today, which became incorporated into the domestic courtyard refuse and later abandonment deposits. However, the presence of definite cut marks on the humerus of a guillemot, and the possible chop marks on the tibiotarsus of a juvenile cormorant, indicate that at least these specimens came from birds that were consumed by the inhabitants. It is interesting to note that guillemot bones have been recovered from urban deposits in Anglo-Scandinavian York (O'Connor 1989; Allison 1985) and post-Conquest Beverley (Scott 1992), but never from Roman deposits. It has been suggested by O'Connor (*op. cit*) that a short-lived trade in edible seabirds existed between the coast and inland urban markets during the Anglo-Scandinavian and early medieval periods in East Yorkshire. What is suggested by the evidence from Filey is that the inhabitants of the signal station were already utilising these locally available resources some 500 years earlier. Although no clear butchery marks are present on the bones of many of the other species, it could be argued that most, with the exception perhaps of some of the smaller passeriformes, could represent species which were opportunistically caught and eaten.

Fish

The fish remains recovered from Filey are

unremarkable, being very limited in terms of actual numbers of specimens and range of species (Tables 4 and 7), despite the implementation of a systematic recovery regime. This is entirely in keeping with other Roman assemblages e.g. from Lincoln and York, where fish apparently played a negligible role in the diet of the citizens. Their absence at Filey is made more remarkable in terms of the actual location of the signal station, i.e. being positioned on the coast, with access to these readily available marine resources. It would seem that the established Roman pattern of limited reliance on fish in the diet is still represented at Filey in the late fourth century and is perhaps evidence of the continuation of 'Roman values' into this late period. The data from fish remains strengthen the argument for direct provisioning of the station, since such a locally and easily obtainable food resource would surely have been utilised had there not been a centrally controlled system of victualling. It could be argued that a large number of the fish remains were deposited by seabirds scavenging the shore and sea, and bringing the remains back to the cliff to feed. This could certainly be the case for the remains in the upper courtyard levels and may explain the remains of horse mackerel (*Trachurus trachurus* (L.)), a species present in Anglo-Scandinavian deposits from York and not frequently eaten today (O'Connor 1989; 1991). However, the large gadid, turbot, and salmonid elements present in the hand-collected assemblage, and the thornback ray, herring, and eel elements recovered from the bulk-sieved samples, are almost certainly food refuse.

Marine molluscs

A small assemblage of marine molluscs was recovered from both hand-collected and bulk-sieved deposits (Tables 9 and 10). The marine molluscs on the site need

not necessarily all relate to human activity. It could be argued, for example, that all but the oyster shells were deposited by seabirds. However, since oysters (*Ostrea edulis* L.) must have been imported to the site from much further afield, i.e. from beds off the Kent, Essex and Suffolk coasts or the Forth estuary (Winder 1992 and pers. comm.), it is probable that at least some of the other commonly consumed shellfish, such as mussels (*Mytilus* spp.), razorshells (Solenidae), periwinkles (*Littorina littorea* (L.)) and whelk (*Buccinum undatum* L.) were also exploited by the inhabitants of the signal station. Limpets (*Patella* spp.) are present throughout the courtyard deposits, being particularly frequent in Context 12027 and 12028 and merely present in the uppermost layers (i.e. Context 12022). Limpets are not usually considered as commonly edible species, although there is no doubt that they were eaten in the past and they still are in some parts of Britain. Their frequent presence at some sites has been interpreted as reflecting their use as a source of bait for fishing or for baiting crab or lobster pots. However, the small fish and marine crustacean assemblage found at the site hardly supports this hypothesis. Limpets are collected and eaten in large quantities by seabirds and this may be a more reasonable explanation for their prevalence at the site. However, the fact that their highest frequencies occur in clear occupation deposits (i.e. Contexts 12027 and 12028) and the lowest frequencies are to be found in the uppermost supposed abandonment levels (12022 and 12024) strongly suggests that limpets were utilised by the inhabitants (see below).

All of the identified taxa, except oyster, are commonly occurring species along the adjoining coast today (McMillan 1968). In contrast with the evidence from the major domesticates, and complementing the data provided by the fish bone assemblage, it is

clear that shellfish formed a relatively minor component of the diet, despite their obvious availability. This fact, together with the presence of imported oysters, again supports the hypothesis of a centrally organised provisioning system and perhaps the continuation of distinctively 'Roman' dietary preferences continuing into the late Roman period, even at such an apparently isolated military outpost.

Plant remains

Table 1 summarises the results of analyses of plant macrofossils. It is evident that small amounts of charred plant material of various kinds were present in all the contexts. However, only the 'twig' fragments (probably a mixture of aerial twig and creeping root) of Ericaceae (probably heather, *Calluna vulgaris* (L.) Hull) were ever present as more than a few specimens (in samples from Contexts 12028, 12027 and 12025) and charcoal was similarly somewhat more abundant in a sample from 12025. Altogether, the charred plant content of any one sample was never more than a few grammes in samples which were as large as 31 kg.

Identification of charcoal was limited by the size and degree of fusion of the fragments—it was difficult to obtain freshly-broken surfaces large enough to discern the cell anatomy. Amongst the material, oak (*Quercus*) was identified from Contexts 11038, 12022 and 12028 and hazel (*Corylus*) from Contexts 11038 and 12022 (and tentatively from 12024).

The charred cereals were not identifiable beyond genus, though the better preserved wheat grains were consistent in size and shape with spelt wheat (*Triticum spelta*) and the two glume-bases recovered (see Table 1) may well have been this species.

It was observed that some of the charred cereal grains were very much better preserved than others, suggesting that some had perhaps been reworked; there was, however, no particular trend in this respect through the deposits. The few charred legume cotyledons were not identified further; if pea (*Pisum*), they were very small (<4 mm in maximum dimension) and may, rather, have been a wild species of vetch (*Vicia*).

The charred herbaceous rhizome/tuber fragments were not identified further. Some seem likely to be grass or sedge rhizomes and all are very likely to have been burnt in turves deliberately used for fuel (or perhaps in structural material burnt during demolition). The presence in several contexts of charred sedge nutlets and ribwort plantain seeds perhaps also argues for this kind of origin. The Ericaceae twig fragments are perhaps the best evidence for the burning of turves—a large proportion of the surface material in turves cut from stands of heather would consist of twigs of the size recorded (up to about 5 mm in maximum diameter) and these would be the most durable remains in terms of surviving both burning and also post-depositional and post-excavational damage; it is not impossible, though, that they represent material from cut brushwood. The absence of any other parts of the plant is perhaps surprising if either turves or brushwood had been burnt, although they are mostly much more delicate than the parts recovered.

Integrity of the post-Roman material

Comparisons between the late Roman and post-Roman material (Figures 1, 3, 5 and 6) show that the basic frequencies of the various categories of vertebrate remains are very similar. Although the numbers of fragments from post-Roman deposits are limited, the similarity between the two groups, in terms of the range and frequency of taxa, could lead to the conclusion that much of the material from post-Roman deposits is reworked from late Roman levels. The presence of a single oyster shell fragment in the uppermost courtyard deposit (Context 12022—interpreted as the final abandonment phase, see page 19) may reflect similar processes.

Carcase components and the question of provisioning

The representation of different skeletal elements can provide important information regarding a whole range of activities from provisioning, meat consumption, craft and other industrial activities, to evidence for socio-economic status and the organisation of refuse disposal. In the case of the Filey signal station, one of the primary objectives, highlighted during the assessment phase, was to investigate whether evidence of provisioning of this military establishment could be gleaned from the vertebrate assemblage. The large proportion of pig bones seems to indicate that a major element of the classic ‘Roman’ military diet (King 1984) persisted on the east coast of Yorkshire in the terminal Roman period, although the presence of probable dense woodland, persisting in the surrounding environs of the signal station, would have been an ideal environment in which to run pigs. Although other signal stations have been excavated, biological

remains have never before been systematically collected and so directly comparable datasets do not exist. The importance of the Filey assemblage, therefore lies in the fact that the economic dynamics of this supposed military establishment can be used as a baseline for the other rather enigmatic structures.

Figures 8a, 9a and 10a and Tables 25-27 show the frequency of individual skeletal elements for the major domestic mammals (using simple MNI counts). What is immediately apparent, particularly for sheep and pigs (the same is true for chicken bones, see Appendix 4), is the over-representation of major meat-bearing bones. The predominance of these types of skeletal elements indicates the presence, not only of kitchen or table waste, but also of high quality cuts of meat. More interesting is the absence of some of the distal limb and head elements, such as metapodials, phalanges, mandibles and teeth, usually more commonly associated with evidence for primary slaughter and butchery at or near the site, as well as with aspects of craft and industry. When compared with similar data from late Roman Lincoln (Dobney *et. al* 1996) (Figures 8b, 9b, and 10b), it is clear that the assemblage from Filey represents a completely different part of the consumer spectrum.

Heads and feet are removed when the carcass is 'dressed', leaving a carcass ready for further division and butchery. On the basis of this information, it can be reasonably assumed that, at the very least, dressed carcasses were being regularly supplied to the occupants of the signal station. If one looks at the skeletal element information in more detail, further interesting observations can be made. Sheep remains (Figure 9a) are dominated by fore- and hindlimb elements in roughly equal proportions (although femur

fragments are very poorly represented compared with adjacent bones such as pelvis and tibia). Frequencies for pig (Figure 10a) perhaps indicate that higher numbers of forelimb joints are present, although the differences in frequency between fore- and hindlimb elements are not significant. It must also be borne in mind that minor differences in frequency between the various post-cranial bones may conceivably reflect differential preservation and ease of identification of certain elements.

Thus, if the larger vertebrate remains recovered from the courtyard deposits are truly representative of the refuse deposited by the inhabitants, it would appear that wholesale provisioning of the signal station was being carried out (evidence for the likely sources of these animals is discussed in the biometry section pages 13-15). As has been previously indicated, there is no doubt that prepared carcasses were regularly being supplied to the station and, although it is more difficult to prove, it may have been the case that some of these remains represent selected or even cured joints. This may certainly have been the case for pigs in the form of cured hams/bacon (smoked, salted, or wind-dried). We know from earlier sources that the Roman military diet on the Continent relied heavily on bacon (Davies 1971) and it is therefore interesting to postulate that this tradition may be reflected at Filey as late as the 4th century. Although, as has already been stated, the evidence for the presence of cured meats is largely speculative, the presence of four sheep scapula fragments showing characteristic hook damage to the blade may be tantalising evidence of such practices. Similar kinds of damage has been noted by numerous authors (O'Connor 1988; Lauwerier 1988) on cattle scapulae from a wide range of Roman assemblages both from Britain and

Europe, with numerous late 4th century examples recorded from Lincoln (Dobney *et al.* 1996). It is a well-known phenomenon and has usually been interpreted as evidence of curing of shoulders of beef by various means. It is tempting to postulate that the sheep scapulae from Filey also represent this typically Roman tradition, although they may equally have been caused by the convenient storage of perishable supplies by hanging them on hooks.

Biometry

Although the vertebrate assemblage from Filey was of moderate size, the unusually skewed skeletal element composition resulted in certain post-cranial bones (particularly for sheep) being well represented. This factor, combined with the good overall preservation and low degree of fragmentation, has meant that a significant number of fragments could be utilised for biometrical analyses. This is particularly important since very few biometrical datasets of the late 4th century exist for study. The few exceptions include material from the waterfront excavations at Lincoln (Dobney *et al.* 1996), from the fort and *vicus* at Piercebridge (Gidney and Rackham forthcoming) and from Chichester (Levitan 1989). The material from Filey is, however, unique since it represents a small, ostensibly military, outpost some distance from a major urban settlement or military base. The opportunity to see whether the skeletal elements represent animals of varying stature may throw further light on the whole question of the provisioning of the signal station, particularly where these biometrical data can be directly contrasted with the large urban civilian dataset from 4th century Lincoln.

Sheep

Figures 11-13 show simple histograms of the most frequent single sheep measurements from Filey contrasted with parallel data from Lincoln. Although, in some cases, numbers of specimens are somewhat small, what is immediately apparent is that values from Filey are consistently smaller than those from Lincoln. It is most striking for the tibia (Figure 13), but is also apparent for the radius and possibly even the humerus (Figures 11 and 12), although here the numbers of measurable elements were limited in the Lincoln assemblage.

This can be better illustrated by the use of bivariate plots (Figures 14-18). Again the most striking differences between the contemporary Filey and Lincoln datasets are to be found in the tibia (Figures 16 and 17). In this case it is clear that the individuals from Lincoln are larger and more robust than those from Filey. A similar trend is also present in the data for the scapula (Figure 14), humerus (Figure 15), and calcaneum (Figure 18), but again numbers of Lincoln specimens are smaller. A simple student t-test shows that there are highly significant differences between selected sheep measurements from Filey and Lincoln (see Table 28).

These data suggest that the sheep at Filey are of a smaller, more gracile nature to those from contemporary Lincoln. This is an exceedingly interesting observation since it is the first time that late Roman biometrical datasets have been directly compared. On the basis of the available data, it could be argued that the individuals from Filey are more akin (in carcase conformation) to small gracile prehistoric and early Romano-British stock and that those from Lincoln could indicate the presence of a locally improved or even an imported variety. This lends credence to

the idea that provisioning of the signal station (indicated by the skewed skeletal element representation figures) was undertaken from the locally available small, gracile unimproved native sheep. Perhaps the larger, improved varieties only found their way into the surviving large urban markets of late Roman Britain on the basis of consumer-led market forces.

Cattle

A similar picture is presented by analysis of the limited cattle assemblage. Only tibia measurements are present in large enough numbers to allow for some interpretation. Figure 19 shows that the few individuals from Filey cluster in the lower half of the spread of values for bones from Lincoln, indicating the presence of small cattle at Filey. It is interesting to note that the very large dataset available from 4th century Lincoln indicated that larger cattle may have been introduced in the 3rd century and the wide spread of values for 4th century animals represents a genetic mix of both the smaller native varieties and larger introduced animals (Dobney *et al.* 1996). Figure 19 shows that the Lincoln data can be separated into two groups at around the values of the largest Filey examples, perhaps indicating sexual dimorphism, the presence of cows, oxen, and bulls or even different varieties. Whatever is the case for the 4th century Lincoln cattle, it is clear that those few individuals represented at Filey are more likely to have been small native Romano-British stock, procured locally.

Pig

Although moderate numbers of pig post-cranial remains were present in the Filey assemblage, few measurable elements were available for analysis. This is a

common phenomenon in most archaeological pig assemblages and is a direct result of the nature of pig exploitation (i.e. the optimal time for killing animals primarily raised for meat is well before skeletal maturity is attained). The result is that a large proportion of remains are of immature animals with unfused epiphyses. Measurement of selected teeth has proved to be useful in such circumstances (Payne and Bull 1988) although, in the case of Filey, the apparent provisioning of the signal station with prime joints of bacon has meant that teeth are very much under-represented.

Biometrical analysis, using the log ratio technique, provided some interesting results, although numbers of specimens are really too small to be reliable. All log ratio plots for pig showed values well below 0.0, i.e. the 'standard wild boar' (after Payne and Bull *loc. cit.*). The pig remains from Filey can therefore be considered as being from a small domestic variety. Figure 20 shows the data for humerus measurements (BT and HTC) for material from Filey and Lincoln. As was the case for sheep, it would appear that the two datasets only overlap at their extremes, the Filey values being generally smaller than those from Lincoln. Since the actual measurements used are the maximum breadth and depth of the trochlea, it appears that the Lincoln pigs are more robust than their Filey counterparts.

Domestic chicken

Measurable fragments of chicken, although limited in terms of numbers of specimens, provided comparisons with the dataset from Lincoln. The use of the log ratio method enabled the inclusion of a range of post-cranial elements for comparison. Figure 21a and b shows greatest length (GL) data of selected

chicken post-cranial elements from Filey and Lincoln. What is immediately apparent is that although the actual ranges of values overlap considerably, the frequency of small and large individuals is reversed between the two samples. Thus, there appears to be an emphasis on taller specimens at Lincoln and shorter ones at Filey. What is consistent is that all the values fall well within the range shown for the modern comparative Old English Gamebird/bantam varieties (i.e. small unimproved breeds). The presence of smaller females and larger males is supported by the presence of four spurred and four unspurred tarsometatarsi from late Roman deposits. Figure 22 similarly shows two separate groups of values for measurements of the distal femur which also possibly represent hens and cockerels.

As has been tentatively demonstrated for the sheep, pig, and perhaps even cattle remains, the chickens are likely to have been procured from local sources where small numbers of bantam-like birds were kept by individual households. The predominance of major meat-bearing elements (particularly legs), and the lack of heads, suggest that the fowl arrived already dead, perhaps already prepared as split portions.

The vertebrate microfaunal assemblage: Autochthonous death assemblage or predator accumulation?

A large microfaunal assemblage was recovered from the upper levels of the courtyard deposits through the programme of systematic sampling and sieving. Tables 5, 6, 7 and 8 show the range and frequency of the small mammal and amphibian remains, in addition to the less frequent lizard and passeriforme bones also identified. This assemblage is extremely important in that it provides a

wealth of zoological, ecological and archaeological information.

Before a full appraisal of these various avenues of information can be made, a more detailed consideration of the taphonomic history of these remains must be undertaken, since this will have a major bearing on the interpretative potential of the data.

The presence of such a diverse species list from Filey, incorporating species of somewhat differing habitat preferences, points strongly towards a predator accumulation. The dominance of one species (field vole) provides corroborative evidence for prey accumulation, since predators often introduce a bias into the prey assemblage related to the nature and extent of their hunting territories. Andrews (1990), in his exhaustive study of modern and fossil microfaunal assemblages, showed not only that predator assemblages could be recognised using a variety of criteria (e.g. species diversity and bone modifications), but also that the predator could sometimes be identified with a varying degree of certainty. He also showed that useful ecological information could be gleaned from these assemblages once the inherent biases were taken into consideration.

Many birds of prey regurgitate pellets which contain the indigestible remains of their prey, including bones. These can accumulate in large numbers if they are deposited from regular roosting or nesting places. Owl pellets can contain up to 40-50% bones (Duke *et al.* 1975), whilst pellets of diurnal raptors contain much less (5-10%) as a result of the greater efficiency of their digestive tract (see below). On the basis of Andrews' detailed work, it is postulated that bone is more extensively broken by the diurnal species during feeding and less so by owls, since

owls nearly always take prey smaller than themselves, ingesting them whole. As a general rule, owl pellets therefore contain more bone which is less broken, whilst diurnal raptor pellets contain less bone which is more broken.

The microfaunal assemblage from Filey appears to be well preserved, the elements mostly being only slightly fragmented and sometimes complete, indicating (on the basis of Andrews' criteria) that most of the remains probably represent decayed owl pellets. This conclusion is further supported by the fact that numbers of the bones and teeth show characteristic bone modifications and evidence of mild acid etching, consistent with semi-digestion within the digestive tract. The level of acidity in the stomach of predators varies from species to species (e.g. owls have stomach acid pH values of between 2.2-2.5 whilst for falcons and eagles the range is 1.8-3.0) (Andrews 1990). Thus, ingestion by falcons will cause greater degrees of bone modification than in the case of owls (Yalden and Yalden 1985; Mayhew 1977).

Having established that the microfaunal remains from upper courtyard deposits at Filey are probably the remains of owl pellets, it is possible to make some further observations regarding the species of owl or owls responsible for this accumulation. Tawny owls (*Strix aluco* (L.)), as well as being shown to produce higher levels of bone modification than other species of owl (Raczynski and Ruprecht 1974; Lowe 1980), do not usually produce large concentrations of pellets as a result of their lack of preference for specific roosting trees.

The range of prey species represented is more ambiguous when attempting to use them to identify predator species, as well as attempting to reconstruct palaeoecological information. The

problems involved with this level of detailed interpretation have been detailed by Andrews (1990) where he states that most predators (with the exception of specialist feeders) will adapt their dietary requirements to a wide range of seasonal, climatic, regional and ecological variants. Seasonal prey variation can also be a complicating factor, i.e. where some owls switch from rodents during winter to insects and birds during the summer, because of the difficulty of locating their prey in thick summer vegetation (Southern 1954). Changes of diet may also be directly related to habitat. For example, tawny owls living in wooded areas eat more moles and fewer birds, whereas in more open areas they eat more voles and birds (Southern 1954). In general terms, however, tawny owls eat more or less equal quantities of a wide range of prey types, whereas long-eared owls (*Asio otus* (L.)) are vole and bird specialists (with shrews taken at a rate far below that for barn and tawny owls) Short-eared owls (*Asio flammeus* (Pontoppidan)) are vole specialists and barn owls (*Tyto alba* (Scopoli)) are vole and shrew specialists. The tawny owl produces the most representative prey assemblage from its habitat (including rare species), whilst the barn owl preys on the most abundant small mammal species present, adapting to different sized prey depending on availability. The size range of tawny owl prey is similar to that for barn owl, so that a prey species size spectrum is not predator specific.

On the basis of the information presented above, what can be deduced from the Filey data? The high proportions of field voles, shrews and amphibians strongly suggest that the assemblage has accumulated by the roosting activities of barn owls. The presence of a wide range of less common species such as ?field mouse, passeriformes and the rare species such as

harvest mouse, lizard, and snake are less consistent with this conclusion (although these species do occur in barn owl pellets). The presence of reptile remains must indicate that these were caught during the warmer parts of the day (in spring to late summer) when they are most active. This may suggest that the short-eared owl, which is more diurnal than other owls, may be responsible (although, unlike barn owls, the regurgitated pellets are released in widely separate places in the summer). In winter, however, short-eared owls may roost communally on the ground or in trees (possibly as many as 30-40 individuals) where large concentrations of pellets may accumulate (Andrews 1990).

In conclusion, on the basis of the bone modification data and species representation, it would appear that short-eared or, more probably, barn owls, roosting or nesting in the abandoned signal tower (see below), were responsible for the accumulation of the Filey microvertebrate assemblage.

Palaeoecological reconstruction

It has been argued that useful palaeoecological data can be gleaned from the study of fossil bones from owl pellets, on the basis that the prey assemblage must reflect the range, if not the proportions of, the habitats present in the general vicinity (Andrews 1990). However, there are a number of problems which can occur when making such simplistic extrapolations. For example, strictly nocturnal predators may always miss a common species if it is diurnal (Andrews *op. cit.*). Prey species may also be under-represented in the predator assemblage if it inhabits less favoured hunting grounds. For example, under-representation of bank voles in the Filey assemblage may be because they favour dense microhabitats

whilst most owls favour hunting in more open terrain. The numerous field vole remains perhaps support this interpretation, because this species occurs in the owl's preferred hunting territory. However, if a species is present, it does indicate, at the very least, that certain kinds of habitats did exist within the hunting range of the owl and this, in turn, can throw some light on the physical and natural setting of the signal setting.

Small mammals

As previously mentioned, the small mammal assemblage is large and comprehensive in terms of the range of species represented (Table 5), and includes most of the common British small mammals. By far the most commonly represented group are the voles, almost exclusively identified as field vole (*Microtus agrestis* (L.)) (interestingly, no definitive identification of bank vole was made from the Filey assemblage). Shrews (Soricidae) are represented by the three mainland species, i.e. common, water and pygmy shrew, with the remains of common shrews being most numerous. Mice (Murinae) were present in moderate frequencies, the only definitive identifications being woodmouse and harvest mouse. The presence of yellow-necked mouse (*Apodemus flavicollis* (L.)) although hinted at by some large post-cranial murine elements, could not be corroborated by reference to comparative specimens. Its presence in the assemblage remains a possibility, however, and this is reflected in the levels of identification shown in Table 5.

Small mammal bones can provide some information regarding the general characteristics of the vegetation that surrounds a site, on the basis that different species often frequent certain habitat

types. For example, the presence of numerous field voles in the Filey assemblage, and the apparently complete lack of bank voles, strongly suggest that, in the immediate environs of the signal station, rough ungrazed open grassland was present (bank voles preferring thicker more 'closed' vegetation in either woodland or grassland habitats). The somewhat high frequency of field mouse indicates a somewhat contrary picture. Mice tend to prefer denser ground cover and often avoid habitats with high densities of bank or field voles. The common and pygmy shrew species indicate the presence of low, thick vegetation or grass cover, whilst the water shrew, although usually found in and around fast-flowing rivers, streams, ponds or drainage ditches, still occurs today amongst the boulders of rocky beaches in North-West Scotland. The proximity of the site at Filey to a similar coastline may suggest that this phenomenon was more widespread in the past.

The identification of several harvest mouse (*Micromys minutus* (Pallas)) bones is intriguing. This species favours areas of tall vegetation (Gordon and Harris 1991) where it builds nests in long grass, reed beds, grassy hedgerows, ditches, bramble patches and stands of cereals. They are usually taken by avian predators (mainly owls, hawks, corvids or shrikes) but are rarely important food items, usually forming less than 1% of the diet and nationally occurring in only 0.8% of barn owl pellets examined (Glue 1974). Since harvest mice remains in owl pellets can therefore be taken as a general indication that they are common in a particular area, it can be assumed that this species was not uncommon in the general vicinity of the signal station during the late Roman period. This corroborates well with modern records which indicate central and southern Yorkshire to be the northernmost

limit of its present day distribution (Gordon and Harris 1991).

Terrestrial molluscs

Whereas the small mammal assemblage can provide only general information regarding the habitats which fell within the hunting territories of roosting owls, the small land snail assemblage provides direct evidence of vegetation cover in the immediate vicinity. Only the bulk sample from Context 12022 yielded an interpretable assemblage of terrestrial taxa (see Table 10). The assemblage was dominated by two species: *Vallonia excentrica* Sterki and *Lauria cylindracea* (da Costa). *V. excentrica* is characteristic of open grasslands, and is virtually unknown from woodland or shaded habitats (Evans 1972, 161). In contrast, *L. cylindracea* is a rupestral species, occurring in shaded habitats, on rocks and under logs (Evans *op. cit.*, 151). Other less common species included *Cochlicopa lubrica* (Müller), *Pupilla muscorum* (Linnaeus) and *Vertigo pygmaea* (Draparnaud). With the exception *V. pygmaea* and *P. muscorum*, all the species present are indicative of generally open grassland which contains some limited areas of shade (Evans 1972). *V. pygmaea* and *P. muscorum* are of less interpretative value as a result of their catholic habitat preferences, although the latter species may suggest a more open and unstable ground surface.

Amphibians and small lacertids

The well preserved amphibian remains from the bulk-sieved assemblage comprised almost exclusively large robust elements. Where specific identification could be made (using the innominate bone), 15 were identified as toad (*Bufo*

bufo) and only four as frog (*Rana temporaria*) (Table 8). Both are found in a wide variety of terrestrial habitats with toads, being largely nocturnal, spending the daytime in holes, crevices, under wood or in burrows. As a result they are of little significance in palaeoecological reconstruction. The small lizard (*Lacerta* spp.) is likely to be the common or viviparous lizard. Although sea cliffs are amongst the wide range of somewhat humid habitats it currently frequents in Britain, it may have found refuge in the stone walling of the signal station once it fell into disuse.

Evidence of occupation and abandonment

The best sequence for plotting chronological change in the deposition of biological material was from Trench 12. The courtyard deposits here consisted of a build-up of occupation-derived material of heterogeneous character containing many microstrata of silt, clay, ash and charcoal. It was not possible to excavate each stratum separately and so the deposits were excavated in four spits (12024-5, 12027-8) each *circa* 3-5cm thick. Above the latest spit, 12024, was a deposit (12022) distinct in colour and texture from the material below, and containing less in terms of artefacts and large animal bones. Detailed analysis of the frequency of different vertebrate and invertebrate taxa recovered from the courtyard deposits in Trench 12 (Contexts 12022, 12024, 12025, 12027 and 12028) provides some clear evidence of the sequence of occupation and final abandonment (see Figures 23-27 and Tables 29-32) at the site. When considering the bulk-sieved samples from each context, it is apparent that large numbers of small mammals and amphibians were present in deposits from the upper two contexts (i.e. 12022 and

12024) with the largest land snail assemblage also recovered from the uppermost deposit (see Figures 24 and 26). Context 12024 also contained significant numbers of wild bird (mainly Turdidae) and reptile remains (the latter almost certainly a small lacertid, probably the common lizard). Below these, deposits from Context 12025 contained more modest numbers of small mammals (Figure 24), whilst those from 12027 and 12028 contained very few. Interestingly, bones from what are here termed 'main domesticates' (i.e. cattle, sheep, and pig) are scarce in the uppermost and lowest layers (12022 and 12028 respectively), whilst they are moderately well represented in the intervening ones (12024, 12025 and 12027).

Comparison of these results with vertebrate remains from the hand-collected assemblage, shows an interesting feature (Figure 23). Whilst deposits from Contexts 12022 and 12024 produced limited numbers of vertebrate remains, particularly of the main domesticates, those from Contexts 12025, 12027 and 12028 contained significantly higher quantities. This is particularly clear for layer 12027, where numbers of fragments of main domesticates are between three and eight times more common than anywhere else in the sequence. A similar pattern can be seen when considering the hand-collected marine mollusc data (Figure 25 and Tables 33 and 34)). The frequency of those species classified as 'edible' appears to match the data from the main domesticates, i.e. being most numerous from Contexts 12027 and 12028

It has been argued (above) that the copious remains of small vertebrates from the upper deposits of Trench 12 (Contexts 12022, 12024 and 12025) represent the contents of numerous raptor pellets, probably those of either barn owl or short-

eared owl, or perhaps both. Although it is true that barn owls will roost in agricultural buildings (i.e. barns, stables, dovecotes) where human disturbance is very infrequent, they are unlikely to have roosted in the vicinity of a structure where there was much human activity, favouring abandoned buildings as roosts. Short-eared owls are much more timid and would have avoided any close proximity to man. The evidence from the pellet remains found in the upper levels of the courtyard sequence therefore suggests that the signal station was probably unoccupied or only intermittently occupied during its latest phases, the interface being perhaps Context 12025. The limited evidence from terrestrial molluscs from the stratigraphically distinct uppermost courtyard deposit (Context 12022) indicates a grassland habitat consistent with an early phase of abandonment.

Evidence from the hand-collected vertebrate remains provides support for this hypothesis. It has already been noted that the greatest concentrations of pig, sheep, and cattle bones (i.e. main domesticates) occur in deposits from Context 12027, with appreciable quantities also present in 12028. These fragments represent classic occupation/domestic refuse dumped into the courtyard area. Evidence from skeletal element distribution, and butchery of pig and sheep bones indicating the provisioning of the tower garrison with prime and perhaps cured joints of meat, clearly shows a period of intense human occupation in the lower courtyard deposits. Such evidence is almost wholly absent in the assemblages from Contexts 12022 and 12024 where supposed owl pellet material is most common.

It is interesting to note that although 12022 and 12024 were distinct from one another in terms of their sedimentological

characteristics, they were extremely similar in terms of the frequency and range of vertebrate taxa present in each. Conversely, deposits from those homogeneous deposits which were dug as spits (i.e. 12024-12028) contained vertebrate assemblages which were significantly different in frequency and range of taxa. How can this apparent paradox be explained? One answer may lie in the fact that occupation was irregular and intermittent, becoming more so as the station declined into disuse. This may explain the presence of some small mammal, bird and reptile bone (still almost certainly from owl pellets) even from deposits where evidence of the most intense period of human occupation occurred (i.e. 12027). The large quantities of pellet remains recovered from Context 12024 represent material which must have been deposited directly onto the surface of the final phase of occupation deposits (since the material was excavated in spits it is impossible for us to establish whether all the owl pellet remains were present in the top 2 cm, for example). A more likely explanation lies in the fact that the small vertebrate remains are more mobile and in such shallow deposits the movement of material through voids in the sediment (e.g. through the activity of worm and other soil fauna) is only to be expected.

The nature and pattern of refuse disposal or bird pelleting may also bias our interpretation of simple stratigraphic data, since these episodes will almost always occur as discrete spatial events. The nature of sampling, in some instances, may therefore fortuitously recover collections of bones or shells where frequencies of remains were high, whilst in other cases, similar high concentrations would be missed. This is graphically illustrated by Figure 27, where numbers of vertebrate fragments have been plotted for separate samples from the same stratigraphic unit

(in this case Context 12024). It can be seen that much variation exists between these similar sized samples in terms of the range and frequency of remains recovered.

Discussion

Bioarchaeological evidence from Carr Naze, Filey has undoubtedly provided a detailed insight into the basic economic dynamics of the occupants, important information regarding the sequence of occupation and final abandonment and some useful palaeoecological data regarding the environs of the site during the late Roman period.

There is no doubt that the vertebrate remains (particularly the main domestic mammals) provide indisputable evidence that the site received the vast bulk of its dietary provisions through organised victualling. This fact is further corroborated by the presence (in small numbers) of oyster shells which, as far as available evidence exists, could only have been transported from the Kent, Essex or Suffolk coasts or the Firth of Forth (Winder 1992 and pers. comm.). Typically for the Roman period, there is little evidence to suggest any more than small-scale exploitation of wild resources, particularly wild birds, fish, edible shellfish. This phenomenon has great significance for this particular assemblage, given the proximity of the site to the coast and what must have been readily available sources of all of these commodities. This observation not only lends strong credence to the provisioning hypothesis, but also indicates that many of the characteristic elements of a 'Romanised' diet, were present in this isolated East Yorkshire military outpost as late as the end of the fourth century.

King (1978 and 1984) has attempted to produce a framework within which to study the process of so-called 'Romanisation' in Britain and North-Western Europe. By using simple frequency counts of the main domestic mammal bones (cattle, caprine, and pig), he found, in broad terms, that different classifications of sites (e.g. villas, towns, military and civilian) often showed distinctive temporal and geographical patterning when the relative frequencies of remains were considered.

Figures 28 and 29 show King's summarised data (reproduced directly from his 1984 publication) with data points for late 4th century Filey and Lincoln superimposed. As can be seen from Figure 28, the assemblage from Carr Naze falls at the absolute extreme of the distribution of later Roman military sites, and well outside those described as civilian settlements. In contrast, the Lincoln data fall within the distribution of military type sites and also within a major group of civilian sites showing very high frequencies of cattle remains. A similar pattern is noted when contrasting military and civilian sites from eastern and western England (Figure 29). Again, Filey falls at the absolute extremes of distribution for both civilian and eastern sites, and well outside those identified as military type assemblages. However, this may not provide a truly comparative dataset for the Filey material, since military establishments of short-term occupation (a category of site into which the Carr Naze fits very well) were not presented by King. Data from Lincoln, on the other hand, appear more closely akin to those for the Roman military assemblages of other eastern England sites.

On the basis of King's framework, it is clear that the vertebrate assemblage from Carr Naze, Filey is unique in terms of

those recorded from Roman sites in Britain, and certainly does not fall within any previously defined group. It is also unique in terms of the category of site which it represents. Although several other late Roman signal stations existed along this particular coastline, the other excavated examples were dug at a time when the routine collection of bones and other bioarchaeological remains was not routinely undertaken (Kitson-Clark 1935). As a result, no comparative data exist. In terms of understanding the wider political, social, and economic significance of these late Roman coastal defences, the material from Filey, although standing in splendid isolation, can be used as a bench-mark for the others. It is reasonable to assume that contemporaneous sites, of ostensibly similar function and in such close proximity to one another, would all have been centrally controlled, administered and provisioned by a well-organised political body. The evidence from Filey indicates that this centralised administrative network still possessed much of the 'cultural baggage' of the Roman tradition as late as the very end of the fourth century. This is also a conclusion that has been drawn from a late 4th century vertebrate assemblage excavated from Lincoln, where the large-scale and centrally organised provisioning of a still substantial urban population (either civilian or military) has been postulated (Dobney *et al.* 1996, 28). It is tantalising to suggest, on the basis of the evidence from Filey, Lincoln and perhaps even York (O'Connor 1988; Carrott, *et al.* 1995), that the late 4th century (at least in Yorkshire and Lincolnshire) was not, as traditionally thought, a time of gradual decline and decay of the Romanising influence, but may instead have been a period in which there urban society flourished prior to a rapid decline.

The evidence of such standardised provisioning must indicate the presence of

a small military garrison, perhaps of regular troops or local militiamen. However, the recovery of womens' jewelry (in the form of metal pins and brooches) from the site indicate that women were certainly present, i.e. the soldiers' families may have been living within the bounds of the station. The recovery of a single resorbed human infant deciduous incisor lends some credence to this hypothesis.

Although the assemblage of plant remains is too small for any detailed discussion, some observations pertinent to the interpretation of the courtyard deposits can be made. It is perhaps surprising that, in view of the proximity of the lighthouse, greater concentrations of charred fuel were not preserved. There are a number of reasons why this may be so: ash from the *pharos* may well have been dumped elsewhere; the ash may have been dumped in the courtyard area but contained very little charcoal because the fires from which it came burned at a high temperature or for long periods, leaving very little identifiable charcoal; or, at the period represented by the deposits in question, the lighthouse may no longer have been in use and the small amounts of charcoal represent only debris from domestic fires.

The evidence for the burning of heather brushwood and turves might suggest that there was, by this stage, a shortage of wood in the vicinity, something which appears consistent with the evidence from the small mammal assemblage. Heather-dominated moorland can be found today on the North York Moors, some 15 km to the North-West. It seems rather unlikely that heather moor would have flourished closer to the Carr Naze in late Roman times, so it is inferred that this material must have been brought from further afield.

Evidence for the final abandonment of the station in the early fifth century is clear from the numerous owl pellet remains, recovered from the terminal courtyard deposits, indicating that the complex was used as a regular roosting (and possibly nesting) site for owls. Evidence from the small land-snail assemblage is also consistent with this interpretation, indicating areas of semi-open ground, rubble, and also light vegetation within the courtyard.

Conclusions

The bioarchaeological assemblage from the Carr Naze, Filey has provided important economic, and cultural evidence which lends further fuel to the debate on the nature of society during the final stages of Roman Britain. Data from the signal station supports the idea that, at least in some areas of the country, major Roman towns (such as Lincoln and York), and the hinterlands which they controlled, not only continued to flourish well into the late fourth century, but also maintained many of the economic, administrative and political mechanisms of earlier Roman society.

Archive

The vertebrate assemblage from Filey is stored at the York Archaeological Trust, whilst all extracted fossils and flots are currently stored in the Environmental Archaeology Unit, University of York. The paper and electronic records pertaining to the work described here will be deposited (along with the material) with YAT as well as with the EAU and Ancient Monuments Laboratory of English Heritage.

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Table 1. Results of analyses of plant remains from Carr Naze, Filey. All plant material was preserved by charring. Superscript numbers indicate the largest sizes of fragments observed in washover or residue. * indicates samples for which the sorted residues were not checked by ARH; () indicates tentative identifications only. Abundance of all components on a four-point scale from + to ++++; numbers indicate actual numbers of items observed.

Context	11050	11038	12028	12027		12025			12024		12022
Sample	53	51*	49	40*	45	30*	34	36	21*	24	12*
Sample weight (kg)	23.5	27	31	27	28	27	28	27	27	26	30
Residue weight (kg)	0.78	2.2	1.2	2.0	1.56	2.3	0.62	1.39	3.1	3.32	not recorded
Residue weight as % sample weight	3.3	8.1	3.9	7.4	5.6	8.5	2.2	5.1	11.5	12.8	-
stone			++		++		+	+		+++	
gravel	++		++		++		++	+		++	
coal	+ ¹⁰		+ ¹⁰		+ ¹⁰		+ ¹⁵	+ ¹⁵		+ ¹⁵	+ ¹⁵
mortar	+ ¹⁰		+ ¹⁰		+ ¹⁰		+ ¹⁵	+		++ ²⁰	
glassy 'slag'	+	+ ²			+		+ ⁵			+ ⁵	
brick/tile					+ ¹⁰					+ ³⁰	
pottery			+ ¹⁰				+ ²⁵				
charcoal	+ ¹⁰	+ ²⁵	+ ¹⁰	+ ²⁵	+ ¹⁰	+ ¹⁵	+ ¹⁰	++ ²⁵	+ ²⁵	+ ¹⁰	+ ¹⁰
'rhizome/tuber' fragments	+	+	+	+	+	+	+ ²⁰	+	+	+	+
<i>Corylus avellana</i> (nutshell fragments)							+ ¹⁰				
<i>Rumex</i> sp(p). (nutlets)				+				+	+		

Context	11050	11038	12028	12027		12025			12024		12022
Sample	53	51*	49	40*	45	30*	34	36	21*	24	12*
Leguminosae (cotyledons)					+	+	+				
Ericaceae 'twig' fragments	+	+	++	+	++	+	+	++	+	+	+
<i>Galium</i> sp(p). (fruits)						+					
<i>Plantago lanceolata</i> L. (seeds)		+		+		+					
Gramineae (small caryopses)		+	+	+		+		+			
Cerealia indet. (grains)						+		+			
<i>Triticum</i> sp(p). (grains)				(+)		+					
<i>Triticum</i> sp. (glume bases)	1									1	
<i>Hordeum</i> sp(p). (grains)	(+)	+		(+)	+	+	+			+	
Gramineae/Cerealia culm nodes									+		
<i>Carex</i> sp(p). (nutlets)	+	+		+	+	+			+	+	
crab shell fragments	1		+		+		+				
marine mollusc shell fragments	1		+								
oyster shell fragments						+				+ ¹⁰	
?whelk shell fragments						1					
land snails			+		+		+				+
fish scale			+							+	
fish bone			+		+					+	
mammal bone							++	+		+	

Context	11050	11038	12028	12027		12025			12024		12022
Sample	53	51*	49	40*	45	30*	34	36	21*	24	12*
burnt bone							++	+			

Table 2. Carr Naze, Filey. Mammal taxa from the hand-collected assemblage (fragment counts).

Species		Post-Roman	Roman	Total
<i>Lepus</i> sp.	hare	0	1	1
<i>Arvicola terrestris</i> (L.)	water vole	4	0	4
Canid	dog family	1	0	1
<i>Canis</i> f. domestic	dog	0	2	2
<i>Meles meles</i> (L.)	badger	0	2	2
<i>Equus</i> f. domestic	horse	0	1	1
<i>Sus</i> f. domestic	pig	23	254	277
Cervid	deer	0	2	2
<i>Cervus elaphus</i> L.	red deer	5	0	5
cf. <i>Cervus elaphus</i> L.	?red deer	0	2	2
<i>Capreolus capreolus</i> (L.)	roe deer	0	1	1
<i>Bos</i> f. domestic	cattle	27	134	161
cf. <i>Capra</i> f. domestic	?goat	0	1	1
<i>Ovis</i> f. domestic	sheep	14	91	105
Caprine	sheep/goat	46	223	269
Total		120	714	834

Table 3. Carr Naze, Filey. Bird taxa from the hand-collected assemblage (fragment counts).

Species		Post Roman	Roman	Total
cf. <i>Phalacrocorax carbo</i> (L.)	?cormorant	0	1	1
cf. <i>Phalacrocorax aristotelis</i> (L.)	?shag	0	1	1
<i>Anser</i> sp.	goose	0	5	5
cf. <i>Anser</i> sp.	?goose	0	1	1
cf. <i>Branta leucopsis</i> Bechstein	?barnacle goose	0	2	2
<i>Anas</i> sp.	duck	0	4	4
<i>Anas</i> cf. <i>platyrhynchos</i> L.	?mallard	0	12	12
<i>Anas crecca</i> L.	teal	1	0	1
<i>Gallus</i> f. domestic	chicken	3	37	40
cf. <i>Gallus</i> f. domestic	?fowl	3	32	35
cf. <i>Rallus aquaticus</i> L.	?water rail	1	0	1
cf. <i>Haematopus ostralegus</i> L.	?oystercatcher	1	0	1
<i>Numenius arquata</i> (L.)	curlew	0	1	1
cf. <i>Scolopax rusticola</i> L.	?woodcock	1	0	1
Alcidae	auk	1	0	1
<i>Alca turda</i> L.	razorbill	0	3	3
cf. <i>Alca turda</i> L.	?razorbill	3	0	3
<i>Uria aalge</i> (Pontoppidan)	guillemot	0	1	1
cf. <i>Uria aalge</i> (Pontoppidan)	?guillemot	1	0	1
cf. <i>Cephus grylle</i> (L.)	?black guillemot	0	2	2
Columbidae	pigeon/dove	1	0	1
Turdidae	thrush/blackbird	3	3	6

Passeriforme	Passeriforme	1	0	1
cf. <i>Sturnus vulgaris</i> L.	?starling	2	0	2
<i>Corvus monedula</i> L.	jackdaw	3	0	3
Total		25	105	130

Table 4. Carr Naze, Filey. Fish taxa from the hand-collected assemblage (fragment counts).

Species		Post-Roman	Roman	Total
cf. <i>Clupea harengus</i> L.	?herring	0	11	11
Gadidae	cod family	0	1	1
<i>Molva molva</i> (L.)	Ling	4	0	4
cf. <i>Scophthalmus maximus</i> (L.)	?Turbot	1	0	1
cf. <i>Salmo salar</i> L.	?Salmon	0	1	1
cf. Osmeridae	?smelt	0	5	5
Total		5	18	23

Table 5. Carr Naze, Filey. Mammal taxa from the bulk-sieved samples (fragment counts).

Species		Post-Roman	Roman	Total
<i>Talpa europaea</i> L.	mole	0	10	10
<i>Sorex araneus</i> L.	common shrew	0	91	91
<i>Sorex minutus</i> L.	pygmy shrew	0	14	14
<i>Neomys fodiens</i> (Pennant)	water shrew	0	13	13
cf. <i>Neomys fodiens</i> (Pennant)	?water shrew	0	2	2
<i>Lepus</i> sp.	hare	0	1	1
Microtine	vole	0	113	113
<i>Microtus agrestis</i> (L.)	field vole	0	154	154
<i>Arvicola terrestris</i> (L.)	water vole	0	12	12
Microtine/murine	vole/mouse	0	54	54
<i>Apodemus</i> spp.	wood/yellow necked mouse	0	44	44
cf. <i>Apodemus sylvaticus</i> (L.)	?wood mouse	0	3	3
<i>Micromys minutus</i> (Pallas)	harvest mouse	0	2	2
<i>Canis</i> f. domestic	dog	0	1	1
<i>Mustela nivalis</i> L.	weasel	0	1	1
<i>Equus</i> f. domestic	horse	0	1	1
<i>Sus</i> f. domestic	pig	2	55	57
<i>Bos</i> f. domestic	cattle	0	14	14
<i>Ovis</i> f. domestic	sheep	0	7	7
Caprine	sheep/goat	3	52	55
Total		5	644	649

Table 6. Carr Naze, Filey. Bird taxa from the bulk-sieved samples (fragment counts).

Species		Post-Roman	Roman	Total
<i>Anas</i> cf. <i>platyrhynchos</i> L.	?mallard	0	1	1
<i>Gallus</i> f. domestic	chicken	0	9	9
cf. <i>Gallus</i> f. domestic	?fowl	0	3	3
<i>Scolopax rusticola</i> L.	woodcock	0	1	1
cf. <i>Larus ridibundus</i> L.	?black-headed gull	0	1	1
Alcidae	auk	0	1	1
<i>Uria aalge</i> (Pontoppidan)	guillemot	0	4	4
cf. <i>Uria aalge</i> (Pontoppidan)	?guillemot	0	2	2
<i>Fratercula arctica</i> (L.)	puffin	0	1	1
Columbidae	pigeon/dove	0	1	1
cf. <i>Troglodytes troglodytes</i> (L.)	?wren	0	1	1
Turdidae	thrush/blackbird	0	10	10
cf. Turdidae	?thrush/blackbird	0	4	4
cf. <i>Turdus merula</i> L.	?blackbird	0	2	2
cf. <i>Turdus philomelos</i> Brehm	?thrush	0	1	1
Passeriforme	Passeriforme	0	7	7
<i>Sturnus vulgaris</i> L.	starling	0	1	1
cf. <i>Sturnus vulgaris</i> L.	?starling	0	1	1
Total		0	51	51

Table 7. Carr Naze, Filey. Fish taxa from the bulk-sieved samples (fragment counts).

Species		Post-Roman	Roman	Total
<i>Raja clavata</i> L.	thornback ray	0	4	4
Gadidae	cod family	0	2	2
<i>Anguilla anguilla</i> (L.)	eel	0	5	5
<i>Trachurus trachurus</i> (L.)	Horse mackerel	0	16	16
cf. <i>Trachurus trachurus</i> (L.)	cf. Horse mackerel	0	10	10
Total		0	37	37

Table 8. Carr Naze, Filey. Amphibian and reptiles from the bulk-sieved samples (fragment counts).

Species		Post-Roman	Roman	Total
Amphibian	amphibian	0	120	120
<i>Bufo bufo</i> L.	toad	0	14	14
cf. <i>Bufo bufo</i> L.	?toad	0	1	1
<i>Rana temporaria</i> L.	frog	0	1	1

cf. <i>Rana temporaria</i> L.	?frog	0	3	3
Lizard sp.	lizard	0	19	19
cf. Lizard sp.	?lizard	0	1	1
Snake	snake	0	3	3
Total		0	162	162

Table 9. Carr Naze, Filey. Hand-collected molluscs (MNI).

Species		Post-Roman	Roman	Total
Terrestrial				
<i>Cepaea</i> sp.		2	4	6
Marine				
<i>Patella</i> spp.	limpet	83	216	299
<i>Littorina littoralis</i> (L.)	flat wrinkle	2	34	36
<i>Littorina saxatilis</i> (Olivi)	rough wrinkle	0	15	15
<i>Littorina littorea</i> (L.)	winkle or periwinkle	8	60	68
<i>Nucella lapillus</i> (L.)	dog whelk	0	14	14
<i>Buccinum undatum</i> L.	whelk	1	2	3
<i>Mytilus edulis</i> L.	common mussel	14	86	100
<i>Ostrea edulis</i> L.	oyster	5	14	19
? <i>Astarte</i> sp.		3	9	12
Solenidae	razorfish or spoutfish	0	9	9
Unid. fragments		97+	298+	395+

Table 10. Carr Naze, Filey. Molluscs from the bulk-sieved samples (MNI).

Species		Roman	Total
Terrestrial			
<i>Cochlicopa lubrica</i> (Müller)		11	11
<i>Vertigo pygmaea</i> (Draparnaud)		27	27
<i>Pupilla muscorum</i> (L.)		48	48
<i>Lauria cylindracea</i> (da Costa)		107	107
<i>Vallonia excentrica</i> Sterki		143	143
<i>Clausilia</i> sp.		13	13
? <i>Trichia</i> sp.		10	10

<i>Cepaea</i> sp.		9	9
Marine			
<i>Patella</i> spp.	limpet	36	36
<i>Littorina littoralis</i> (L.)	flat winkle	48	48
<i>Littorina saxatilis</i> (Olivi)	rough winkle	10	10
<i>Littorina littorea</i> (L.)	winkle or periwinkle	6	6
<i>Nucella lapillus</i> (L.)	dog whelk	5	5
<i>Buccinum undatum</i> L.	whelk	1	1
<i>Mytilus edulis</i> L.	common mussel	46	46
<i>Ostrea edulis</i> L.	oyster	3	3
? <i>Astarte</i> sp.		2	2
Solenidae	razorfish or spoutfish	0	0
Unid. fragments		>2800	>2800

Table 11. Carr Naze, Filey. Different vertebrate categories from the hand-collected assemblage (fragment count).

Species	Post-Roman	Roman
fish	5	18
amphibian	5	0
reptile	0	0
wild bird	19	31
domestic bird	6	69
small mammal	4	0
wild mammal	5	8
minor domesticates	1	3
main domesticates	110	703
Total	155	836

Table 12. Carr Naze, Filey. Different vertebrate categories from the hand-collected assemblage (frequencies).

Species	Post-Roman	Roman
fish	3%	2.2%
amphibian	3%	0%
reptile	0%	0%
wild bird	12%	3.7%
domestic bird	4%	8.3%
small mammal	3%	0%
wild mammal	3%	0.9%
minor domesticates	1%	0.4%
main domesticates	71%	84.1%

Table 13. Carr Naze, Filey. Different vertebrate categories from the bulk-sieved assemblage (fragment counts).

Species	Post-Roman	Roman
fish	0	37
amphibian	0	139
reptile	0	23
wild bird	0	39
domestic bird	0	12
small mammal	0	513
wild mammal	0	1
minor domesticates	0	2
main domesticates	5	128
Total	5	894

Table 14. Carr Naze, Filey. Different vertebrate categories from the bulk-sieved assemblage (frequencies).

Species	Post-Roman	Roman
fish	0%	4%
amphibian	0%	16%
reptile	0%	3%
wild bird	0%	4%
domestic bird	0%	1%
small mammal	0%	57%
wild mammal	0%	0%
minor domesticates	0%	0%
main domesticates	100%	15%

Table 15. Carr Naze, Filey. Total number of fragments of main domesticates (hand-collected material).

Species	Post-Roman	Roman
Cattle	27	134
Caprine	60	315
Pig	23	254
Chicken	6	69
Total	116	772

Table 16. Carr Naze, Filey. Frequencies of main domesticates (hand-collected material.)

Species	Post-Roman	Roman
Cattle	23%	17%
Caprine	52%	41%
Pig	20%	33%
Chicken	5%	9%

Table 17. Carr Naze, Filey. Total number of fragments of main domesticates (bulk-sieved material).

Species	Roman
Cattle	14
Caprine	59
Pig	55
Chicken	12
Total	140

Table 18. Carr Naze, Filey. Frequencies of main domesticates (bulk-sieved material).

Species	Roman
Cattle	10%
Caprine	42%
Pig	39%
Chicken	9%

Table 19. Carr Naze, Filey. Minimum number of individuals (MNI) for main domesticates (hand-collected material).

	Post-Roman	Roman
Species	MNI	MNI
Cattle	3	6
Caprine	4	29
Pig	2	15

Table 20. Carr Naze, Filey. Frequency of main domesticates using minimum number of individuals (MNI) counts (hand-collected material).

	Post-Roman	Roman
Species	MNI%	MNI%
Cattle	33	12
Caprine	45	58
Pig	22	30

Table 21. Carr Naze, Filey. Total fragment counts for unidentified categories (hand-collected material).

Unidentifiable	Post-Roman	Roman
large mammal	119	757
medium mammal	202	1462
unidentifiable	112	647
Total	433	2866

Table 22. Carr Naze, Filey. Frequency of unidentified categories (hand-collected material).

Unidentifiable	Post-Roman	Roman
large mammal	27%	26%
medium mammal	47%	51%
unidentifiable	26%	23%

Table 23. Carr Naze, Filey. Body weight ratios of main domesticates. Key: hc = hand-collected material; bs = bulk-sieved material; NISP = number of identified specimens; MNI = minimum number of individuals.

Species	NISP (hc)	NISP (bs)	MNI (hc)
Cattle	985.5	102.2	43.8
Caprine	315	59	29
Pig	584.2	126.5	34.5

Table 24. Carr Naze, Filey. Frequency of main domesticates by body weight ratios. Key: hc = hand-collected material; bs = bulk-sieved material; NISP = number of identified specimens; MNI = minimum number of individuals.

Species	NISP (hc)	NISP (bs)	MNI (hc)
Cattle	52%	35%	41%
Caprine	17%	21%	27%
Pig	31%	44%	32%

Table 25. Carr Naze, Filey. Cattle MNI data and frequencies for Late Roman period.

Element	MNI	MNI%
Horncore	0	0
Mandible	2	20
dp4/P4	0	0
M1/M2	0	0
M3	0	0
Scapula	6	60
Humerus	10	100
Radius	7	70
Ulna	4	40
Metacarpal	1	10
Innominate	10	100
Femur	2	20
Tibia	9	90
Astragalus	4	40
Calcaneum	7	70
Metatarsal	2	20
Phalanx 1	9	23
Phalanx 2	9	23
Phalanx 3	8	20

Table 26. Carr Naze, Filey. Caprine MNI data and frequencies for Late Roman period.

Element	MNI	MNI%
Horncore	0	0
Mandible	16	37
dp4/P4	0	0
M1/M2	3	2
M3	2	37
Scapula	30	70
Humerus	32	74
Radius	40	93
Ulna	15	35
Metacarpal	2	5
Innominate	30	70
Femur	15	35
Tibia	43	100
Astragalus	12	28
Calcaneum	8	19
Metatarsal	5	12
Phalanx 1	2	1
Phalanx 2	0	0
Phalanx 3	0	0

Table 27. Carr Naze, Filey. Pig MNI data and frequencies for Late Roman period.

Element	MNI	MNI%
Mandible	10	38
dp4/P4	0	0
M1/M2	0	0
M3	0	0
Scapula	14	54
Humerus	15	58
Radius	20	77
Ulna	26	100
Metacarpal 3	1	4
Metacarpal 4	1	4
Innominate	16	62
Femur	12	46
Tibia	12	46
Astragalus	8	31
Calcaneum	17	65
Metatarsal 3	2	8
Metatarsal 4	2	8
Phalanx 1	3	3
Phalanx 2	0	0
Phalanx 3	1	1

Table 28. Statistical significance of size differences between Late Roman Filey and Late 4th century Lincoln (caprine and pig).

Taxon	Element	Measurement	Filey (No)	Lincoln (No)	Probability
Sheep	Tibia	Bd	26	54	0.000**
Sheep	Tibia	SD	19	24	0.000**
Sheep	Radius	BFp	24	16	0.000**
Sheep	Humerus	BT	29	10	0.001**
Pig	Humerus	BT	8	9	0.040*

(Probability values marked ** indicate a highly significant difference, <1% probability that the difference is due to chance
Probability values marked * indicate a significant difference, <5% probability that the difference is due to chance).

Table 29. Carr Naze, Filey. Total numbers of fragments for different vertebrate categories from Trench 12 deposits (hand-collected material).

Species	12022	12024	12025	12027	12028	Total
fish	0	0	0	1	16	17
wild bird	4	3	1	4	1	13
domestic bird	1	3	1	13	8	26
wild mammal	1	0	0	2	0	3
minor domesticates	1	0	1	0	0	2
main domesticates	22	23	44	170	66	325
Total	29	29	47	190	91	386

Table 30. Carr Naze, Filey. Total numbers of fragments for different vertebrate categories from Trench 12 deposits (bulk-sieved material).

Species	12022	12024	12025	12027	12028	Total
fish	12	14	2	7	1	36
amphibian	82	44	10	0	2	138
reptile	9	11	2	1	0	23
wild bird	11	14	7	4	2	38
domestic bird	2	4	2	1	3	12
small mammal	228	225	43	7	3	506
wild mammal	0	1	0	0	0	1
minor domesticates	1	1	0	0	0	2
main domesticates	9	34	25	39	12	119
Total	354	348	91	59	23	875

Table 31. Carr Naze, Filey. General mollusc categories from Trench 12 deposits (hand-collected material).

Context	Group	MNI
12022	Other marine	0
	Edible marine	3
	Limpets	4
	Terrestrial	1
12024	Other marine	2
	Edible marine	3
	Limpets	5
	Terrestrial	0
12025	Other marine	3
	Edible marine	8
	Limpets	14
	Terrestrial	1
12027	Other marine	35
	Edible marine	68
	Limpets	87
	Terrestrial	2
12028	Other marine	8
	Edible marine	22
	Limpets	57
	Terrestrial	0

Table 32. Carr Naze, Filey. General mollusc categories from Trench 12 deposits (bulk-sieved material).

Context	Group	MNI
12022	Other marine	3
	Edible marine	4
	Limpets	2
	Terrestrial	276
12024	Other marine	16
	Edible marine	5
	Limpets	8
	Terrestrial	21
12025	Other marine	17
	Edible marine	14
	Limpets	10
	Terrestrial	24
12027	Other marine	14
	Edible marine	6

	Limpets	8
	Terrestrial	23
12028	Other marine	9
	Edible marine	6
	Limpets	6
	Terrestrial	3

Table 33. Carr Naze, Filey. Total numbers of fragments (by sample) for different vertebrate categories from Context 12024.

	Sample	20	21	22	23	24	25	26	27	61	Total
Group											
fish		0	7	1	0	3	3	0	0	0	14
amphibian		10	10	11	4	4	0	0	3	2	44
reptile		5	1	3	0	0	0	1	1	0	11
wild bird		6	2	1	2	1	0	0	2	0	14
domestic bird		0	0	0	0	1	2	1	0	0	4
small mammal		83	59	19	25	10	5	6	18	0	225
wild mammal		0	0	0	0	1	0	0	0	0	1
minor domesticates		0	0	0	0	0	0	0	1	0	1
main domesticates		10	0	4	2	5	4	2	7	0	34
Total		114	79	39	33	25	14	10	32	2	348