CHAPTER TWO

Bones as Evidence of Meat Production and Distribution in York

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Bones – their Strengths and Weaknesses

Many books and papers have been written on the general principles and minutiae of using the animal bones recovered from archaeological deposits as a source of information on past diet.[1,2,3] A full discussion of methodological issues is beyond the remit of this chapter, but it is worth reminding ourselves that there are many stages between an animal being killed and used for food, and a pile of bones arriving on the bench. There is the initial stage of decision-making on the part of the human population, and of individuals within it, and possibly on the part of the animals as well. Those decisions bring people and animals together at the point of the animals' death, and may well be what we are seeking to infer from the archaeological record. After slaughter, animals of any size will be butchered in various ways, and parts of one carcass may be traded or redistributed to several locations, at each of which different people will take further decisions as to recipe and utilization. Some bones will have been separated from the carcass during initial butchering, and will be disposed of fairly immediately. After consumption (and different individuals will have different ideas as to what is worth eating), the remaining bones and other waste might be used in some other way (soup, glue, toothpicks), before being destroyed or deposited in some dump or refuse pit. Micro-organisms and geochemical agents then set to work, modifying and destroying some or all bone fragments through the centuries, until a residue reaches a tenuous equilibrium with the sediment around it, and survives until the archaeologists arrive on site.[4]

Each of these stages filters the data that we may obtain from the bones, distorts those data somewhat, and reduces them considerably. We

archaeologists then add more distortions as we decide how to excavate the site, retrieve the bones, identify and record them. At least we can examine and control these distortions to some extent.

To look on the bright side, we have the physical remains of dead animals, often bearing clear evidence of their use as food. The fact that the bones have been found in association with human occupation is strong circumstantial evidence that the animals were utilized in some way, although the remains of rats and mice serve to remind us that animals utilize us as well. Often, the evidence that animals served as food is quite direct, taking the form of bones that have obviously been chopped during the process of butchering, or more subtle cut-marks showing where a knife has been used neatly to remove meat from bone.

Our data, then, have been heavily filtered through the processes of butchering, cooking, and burial, yet they retain compelling evidence of quite small details of those processes. The filters which act on archaeological data are different to those which distort the historical record – accounts of banquets tend not to reflect the general diet – so we should not expect the archaeological and historical sources to tell the same story, nor should we get too flustered when they do not. Rather, the two different sources should be seen as complementary, requiring quite different expertise, but bearing upon common issues.

BONES FROM YORK - THEIR STRENGTHS AND WEAKNESSES.

The city of York has been the site of numerous excavations over a quarter of a century.[5] The great majority of that excavation work has been undertaken by the same organization, the York Archaeological Trust, and that gives to the archaeological record for the city a particular consistency. At many, though by no means all, of the excavated sites in York, there has been good preservation of large quantities of animal bones, often closely dated and in close association with particular structures. A very large dataset has been accumulated, covering the period from the city's origins at the end of the first century AD, through to early modern deposits of the eighteenth and nineteenth centuries, though this most recent period, curiously enough, is the least well represented. The large potential dataset is one of York's greatest strengths. It is not so much that we *need* to record tens of thousands of bones, but with such a large dataset it becomes possible to reject more of the poor quality data, and to concentrate

on well-recovered samples from those deposits that show the best integrity in terms of dating and human activities. It also becomes possible to look at different parts of the city over the same period of time, to gain an impression of spatial variation, as well as of changes through time.

Ironically, the sheer social complexity of York through much of its history presents both opportunities for research and major problems. The Roman fortress acquired a civilian settlement and became the chief city of northern Britannia. Through the fifth to seventh centuries, much of the city seems to have been more or less abandoned, until settlement of a greenfield site just outside the city around AD 700. By the later ninth century, the main focus of the city's economic activity seems to have shifted back into the old city centre, and from that point onwards the medieval city expanded in extent and developed in nature. Throughout, there were large-scale processes of trade and distribution going on, with smaller-scale household decisions complicating the interpretation of the animal bones. None the less, there are important questions that we can ask, both in terms of city-wide issues of supply and demand, and in terms of the smaller details that illuminate past lives. This chapter will attempt to answer a series of questions. What was eaten, or what were the main red meats, poultry and fish provisioning York through nearly two thousand years? Where did it come from, or what was 'farm produce', what came from peoples' backyards, what was hunted and fished? What changes can we see through time, and what might those changes indicate?

What was Eaten?

To cut a long story short, beef seems to have been the predominant red meat consumed in York throughout the city's history. Cattle bones predominate in most Roman and medieval bone assemblages from York, sometimes to a remarkable degree (Table 2). Converting amounts of bone to meat contribution is notoriously haphazard,[6] but making reasonable estimates of the carcass weight of medieval and earlier cattle, sheep, and pigs, and a few assumptions about utilization (i.e. how much of the potential meat plus offal was actually used), it looks as if beef comprised 70–80 per cent by weight of the red meat consumed in York from the second century to the seventeenth. The remaining 20-30 per cent is mutton and pork, varying with time from roughly equal proportions to about two-thirds pork. The main change through time here is a gradual increase in the amount of sheep bone entering

York's refuse through the late medieval period and into Tudor times. This trend is very obvious in terms of bones, though when converted to estimates of red meat, it does not amount to a big difference.

Of the other red meats, horse bones are scarce on most sites in York, with only the occasional specimen bearing knife-cuts to indicate some utilization of the meat. Given the well-known Papal condemnation of hippophagy at the time of St Boniface, this is hardly surprising. The few apparently butchered examples may represent the use of horse-meat as food for dogs, or unscrupulous butchers passing off horse-meat as venison. Venison itself seems to have featured hardly at all in the general diet, with occasional finds of roe deer bones in Roman deposits, and some fallow deer remains at medieval sites such as the Bedern.[7] Red deer is apparently well-represented in ninth to twelfth century deposits, but the great majority of identifications of this species are based on antler and represent the use of this precious raw material rather than the consumption of venison.[8]

Rabbit is absent until the medieval period, and only common in York from the mid-1300s onwards, particularly in sixteenth- to seventeenth-century features. One gains the impression that rabbits may have been out there in the countryside, but they only came into the urban food supplies once enough of them had escaped from managed coney warrens to establish large free-living populations that were worth hunting, and, perhaps, generally accessible. Hare is recorded only occasionally from York, with no particular concentration by period or site.

Domestic fowl – chickens – seem to have been around the city at all periods, though relatively scarce in Roman times. Of the Roman records, a high proportion appear to have been males (that is, the tarsometatarsal bones bear large spurs), which would be more consistent with their use for fighting or sacrifice than as food animals. Cockerels were sacred to the god Apollo, and their remains have been found in great abundance at some ritual sites.[9] Where preservation of organic materials is particularly good, as in Anglo-Scandinavian deposits at Coppergate,[10] eggshell fragments are often abundant, and this probably reflects the main reason for keeping chickens around the city. Although they ended up in the pot, it is a fair assumption that the main role of the chicken, at least in the post-Roman period, was as a convenient backyard source of eggs.

Geese, too, formed a part of the diet at all periods. Although most goose bones from Roman through to medieval times can probably be attributed to

Site and date	cattle	sheep	pig	other mammals	bird	Total
General Accident site Periods 3–7 Late 2nd–early 3rd century	63.1	15.5	12.7	1.8	6.9	7,393
Fishergate, Period 3 8th century	60.9	25.1	9.5	2.0	2.5	13,290
Coppergate, Period 3 Late 9th century	69.2	18.6	7.0	3.9	1.9	3,259
Coppergate, Period 4 Early-mid-10th century	57.2	27.3	9.6	1.3	4.4	9,687
Coppergate, Period 5B Late 10th–mid-11th century	52.1	19.8	18.8	1.3	7.5	13,917
Coppergate 13th century	47.9	26.5	13.4	1.8	10.4	24,089
Fishergate, Period 6A 13th century	55.7	30.7	8.8	2.5	2.2	1,515

Table 2. A summary of the percentage abundance of major taxa in animal bone samples from some sites in York, from the Roman period to medieval times. The samples are of bones collected during excavation, not by sieving, other than those from Fishergate, which were recovered by sieving through a 12mm mesh. Note the great preponderance of cattle bones throughout, but particularly in the earlier samples. Note too the increase in abundance of bird bones through the Coppergate sequence.

domestic geese, the confident identification of domestic birds, or of different species of wild geese, is problematic.[11] Recent work on fragments of DNA preserved in goose bones from sites in York has shown that it may be possible to identify goose species by this means, though DNA analysis is hardly likely to become a routine means of identifying archaeological bones. Taking both the preliminary DNA results, and the identifications made on the basis of the size and shape of bones, several wild goose species seem to have featured on the menu, at any rate during medieval times. Identifications of barnacle goose (*Branta leucopsis*) and of brent goose (*B. bernicia*) have been made with some confidence, and white-fronted goose (*Anser albifrons*) and pink-footed goose (*A. brachyrhynchus*) may also have been hunted. Similar difficulties pertain to the identification of ducks. Mallard (*Anas platyrhynchus*) is present in deposits of all periods, though whether as the wild form or as domestic ducks is a moot point,[12] and other duck species, notably tufted duck (*Aythya fuligula*) have been identified from the excavated bones.

The study of fish bones has figured large in the research that has gone on in York, and this, combined with the routine application of sieving as a means of recovering small bones, has led to the city having a particularly good archive of records of fish species (Table 3).

The detail of sources and of changes through time are dealt with later in this chapter. For the moment, we may note the presence of marine species, ranging from familiar fare such as herring (*Clupea harengus*) and cod (*Gadus morhua*), through to species that less often grace the table today, such as thornback ray (*Raja clavata*). The rivers around York were clearly important as a source of small river fish, and eels (*Anguilla anguilla*) are present at all periods. The other river fish present something of a problem in identification, as many of our familiar 'coarse' fish are of the family Cyprinidae, within which there are very close similarities between the bones of different species. As a result, it may only be possible to distinguish between two closely-related cyprinid species on the basis of one or two parts of the skeleton (often the pharyngeal teeth), so that the majority of bones can only be attributed to the family.[13] This obviously makes it difficult to make quantified statements about the relative importance of, say, eels and bream (*Abramis brama*) in the diet, as the first can be identified on nearly every bone of the skeleton, and the second on only a few.

Some of the archaeological records of fish from York have biogeographical significance; that is, they tell us something about the past distribution of species. The burbot (*Lota lota*) is represented in deposits of Anglian to Viking age, but not later. Today, this freshwater member of the cod family is extinct in Britain, though still quite common in parts of Scandinavia. Another uncommon species, the grayling (*Thymallus thymallus*) is identified with surprising frequency in York samples, principally from the large and distinctive scales. Grayling is one of several species that are typical of rather well-oxygenated rivers and that appear to have been found in the York area until about the tenth century, an observation that hints at changes in the water quality of York's rivers as the medieval city grew.[14] A similar conclusion can be drawn from the frequent finds of fish of the salmon family, some of them fairly certainly salmon (*Salmo salar*), from Roman to medieval deposits.

Occasionally, quite unexpected species are identified. Bones sieved from late second- to the early third-century levels at the Tanner Row site included a lot of rodent bones, amongst which were parts of a dormouse species which was clearly not the native hazel dormouse (*Muscardinus avellanarius*).[15] Given

		Coppergate C13th	Bedern C13th–14th
Thornback ray	*Raja clavata* L.	*	*
Herring	*Clupea harengus* L.	*	*
Salmon family	Salmonidae	*	-
Salmon	*Salmo salar* L.	*	-
Pike	*Esox lucius* L.	*	*
Carp family	Cyprinidae	*	*
Carp	*Cyprinus* sp.	-	*
Roach	*Rutilus rutilus* (L.)	*	*
Dace	*Leuciscus leuciscus* (L.)	*	-
Eel	*Anguilla anguilla* (L.)	*	-
Conger eel	*Conger conger* (L.)	-	*
Cod family	Gadidae	*	*
Whiting	*Merlangius merlangus* (L.)	*	*
Cod	*Gadus morhua* L.	*	*
Haddock	*Melanogrammus aeglefinus* (L.)	*	*
Saithe	*Pollachius virens* (L.)	-	*
Ling	*Molva c.f. molva*	*	*
Perch family	Percidae	*	-
Perch	*Perca fluviatilis* (L.)	*	*
Horse mackerel	*Trachurus trachurus* (L.)	-	-
Gurnard family	Triglidae	-	*
Right-sided flatfish	Pleuronectidae	*	*
Plaice	*Pleuronectes platessa* L.	*	*
Halibut	*Hippoglossus hippoglossus* (L.)	-	*
Witch	*Glyptocephalus cynoglossus* (L.)	-	*
Sole	*Solea solea* (L.)	-	*

Table 3. The presence (*) and absence (-) of fish taxa from two medieval sites in York, to show the range that can be recovered when, as here, soil samples are routinely sieved to 2mm. Note the predominance of marine taxa: this is typical of medieval samples. In earlier material, freshwater and estuarine taxa are more common and more diverse.

the frequent references in Roman literature to the eating of dormice (*glires*), and the equation of *glires* with the edible or fat dormouse (*Glis glis*), it would have come as no surprise had the bones been those of edible dormouse. However, the specimens were identified as the garden dormouse (*Eliomys quercinus*), a species not previously recorded alive or dead in Britain. So was this endearing rodent present in York as food – a northern Gaulish substitute for *Glis* – or was it a cargo stowaway? It is hard to say, as the riverside location would be appropriate for either, and there was nothing else in the context to lean the interpretation either way. The dormouse bones were found in a drain amongst the bones of rats and mice and bone fragments from food preparation and consumption.

There is a third possibility that has not been aired up to now. Although we know little about the population of Roman York with any certainty, it is likely to have included people from elsewhere in the Empire, not least Gaul and Germania: within the modern-day range of garden dormouse. One pattern of behaviour that is common amongst emigrants in recent times is the desire to take with them some living thing that is redolent of 'home'. This habit is thought to have contributed to the explosive colonization of eastern North America by European house sparrows (*Passer domesticus*) in the mid-nineteenth century,[16] and the attachment of Britons expatriated to East Africa and Australia to their rose gardens is well-known. Perhaps we should allow the possibility that garden dormouse was neither a stowaway nor a culinary delicacy, but merely a souvenir of somewhere warmer

WHERE DID IT COME FROM?

The obvious source of meat for York is the surrounding countryside. Given that cattle, sheep and pigs appear to have provided the overwhelming majority of the meat consumed in the city at all periods, it would be easy to fall into the trap of imagining the land around York as having been occupied by farms engaged in the business of raising meat animals. However, the bone samples that we recover from sites in the city tell quite a different story. By examining the state of wear of the teeth of cattle and sheep at death, we can gain a fairly accurate record of the age at which they died, presumably mostly as a result of having been selected for slaughter.[17] At all periods of the city's history, these age at death estimates show that beef and mutton were by-products of husbandry practices that were focused on the production of milk, wool, dung, and traction power. Cattle and sheep were routinely slaughtered at an age well beyond the optimal time for meat production (Table 4). That is not to say that old meat is necessarily tough or undesirable, but simply that once a certain stage of growth has been reached, further feeding leads to little additional muscle development. Most of the cattle that met their end in medieval York were five to seven years old, by which time useful growth would long since have ceased. These older cattle would have contributed muscle power and offspring to the farm before sale or slaughter, just as the mostly four to six year-old sheep would have contributed offspring, several clips of wool, and possibly a quantity of dairy produce.

To digress to dairy produce for a moment, this resource is difficult to 'see' through the archaeological record, and we tend to rely upon inference. When cattle are kept primarily as dairy animals, the females are the useful beasts, and males may be killed off when young, keeping only a few for breeding. It is this economic necessity that links the production of veal with the dairy industry today. Such production should be manifest in the archaeological record as samples of cattle bones in which very young individuals (perhaps three to six months old) are mingled with rather old ones (dairy cows, perhaps six years and older).[18] Samples with that age distribution have been recovered from York, but mostly only from the sixteenth century onwards, though a little earlier at the Bedern.[19] This suggests that the use of cattle as dairy animals on anything more than a household scale was quite a late development in the York area. However, samples of sheep bones showing a mix of young lambs and older sheep have been recorded from Roman deposits in York,[20] perhaps indicating dairy production based on sheep's milk. This is consistent with contemporary writers such as Columella.

We would argue from the animal bones, therefore, that the majority of York's meat supply through the years was derived from what the agrarian economy of the surrounding district could spare or no longer needed. This is an important conclusion, as it implies that the city did not constitute a sufficiently large market to alter what appears to have been a concentration on the production of grain, wool and dairy products. The sheep bones from Bedern show some subtle differences to those from medieval deposits elsewhere in the city, consistent with this ecclesiastical enclave having obtained much of its meat from different sheep populations to the rest of the city; a privileged supply, perhaps.[21]

Pigs, of course, are quite another matter, and the age at death distribution of pigs from most sites in York at whatever period show the majority to have been killed as sub-adult animals, at the optimal age for meat production. Given their well-known fecundity, only small numbers of adult pigs need be kept as breeding stock, and this is reflected in the small proportion of adults recovered in archaeological samples.[22] Two important questions remain, however. The first concerns the utilization of pig meat. Although today we would expect pigs slaughtered for pork to be younger than those slaughtered for bacon, it is not possible to discern any such distinction in the archaeological material, and it remains unclear how much of the pig meat utilized

in York at any period was eaten 'fresh', and how much cured. The distinction between porkers and bacon pigs may be a relatively recent one, in any case.

The second question concerns where the pigs were kept. Viking and medieval York certainly appears to have included backyard areas and open spaces where pigs could have been kept as a useful means of converting organic refuse into meat. There are a few records of neonatal pig bones from York, implying the presence of breeding sows. That would certainly be

	Neo	Juv	Imm	Sub	Adult	Old
CATTLE						
General Accident Site Late 2nd–early 3rd century	-	-	-	-	16	20
Fishergate, Period 3 8th century	-	2	2	6	9	2
Coppergate, Period 3 Late 9th century	-	2	4	11	25	2
Coppergate, Period 4 Early–mid-10th century	-	-	4	15	21	7
Coppergate, Period 5B Late 10th–mid-11th century	1	-	2	12	34	3
Coppergate 13th century	-	1	2	6	20	6
Bedern 13th–14th century	-	15	-	-	2	10
SHEEP						
General Accident Site Late 2nd–early 3rd century	-	19	5	11	24	1
Fishergate, Period 3 8th century	-	1	5	9	20	-
Coppergate, Period 3 Late 9th century	-	1	-	8	51	-
Coppergate, Period 4 Early–mid-10th century	-	6	11	12	35	1
Coppergate, Period 5B Late 10th–mid-11th century	-	-	4	12	18	-
Coppergate 13th century	-	14	1	18	84	4
Bedern 13th–14th century	-	4	1	3	62	-

Table 4. Cattle and sheep mandibles from a number of sites in York attributed to age categories, based on the state of eruption and wear of the teeth. For the cattle, note the high number of 'old' cattle (probably at least eight years old) in the Roman sample, and the unusual age distribution in the sample from the Bedern. The high proportion of 'juvenile' cattle (about three–six months old) at the Bedern, the remainder mostly being 'old', would be typical of animals culled from a specialist dairy herd. Similarly, the high proportion of 'juvenile' (about three–four months old) sheep in the Roman sample might indicate that dairy sheep were kept close to Roman York.

consistent with at least small numbers of pigs having been kept within the town. This is important, as it would have given the population of York a source of meat independent of the supply of cattle and sheep from the surrounding area. A similar interpretation can be made of the frequent finds of chicken and goose bones in Viking Age and medieval samples. Although cattle and sheep were the staples in all periods, the people of medieval York at least, do seem to have maintained some home-produced meat.

Hunting seems to have played very little part in supplying meat to the city, perhaps providing diversity in the diet rather than a significant amount of meat. From about the tenth century onwards, most sites yield bones of a range of wetland birds, principally ducks and waders.[23] On the whole these are species such as plovers (*Pluvialis* spp.) that flock in large numbers during the winter on estuaries and flooded riverside land showing, perhaps, that wild-fowling was largely a winter activity, maybe providing some income during a lull in the farming year.

Sources of freshwater fish for York are not hard to find, with the rivers Ouse, Foss, and Derwent within easy reach of the city. However, by medieval times, marine fish comprised the majority. It is quite plausible that boats went out from York, down the Ouse, to fish the Humber estuary and nearby coastal waters. Depending on the wind and tide, fish caught within a few kilometres of the east coast could have been on sale in York within two days, giving the city a reasonably fresh supply. Some deeper-water fish may have come to York as dried or salted fillets. Some of the larger species of the cod family, notably cod and ling, lend themselves particularly well to preservation by drying, with or without salting, and some proportion of the cod and ling bones found in medieval York might have derived from dried fish from northern Britain or Scandinavia. This raises the possibility that some of the finds of fish species rare or extinct in the region today could have been similarly imported. In most cases, the species can be shown to have declined in abundance and in range within recent times (e.g. barbel, grayling). As a member of the cod family, burbot might seem a candidate for importation, though there is no documentary record of this species being dried and transported, unlike its marine relatives, and some of the last sightings of burbot in England were made in Yorkshire. On balance, it is highly unlikely that the records of burbot from York represent anything other than a local population being driven into extinction.

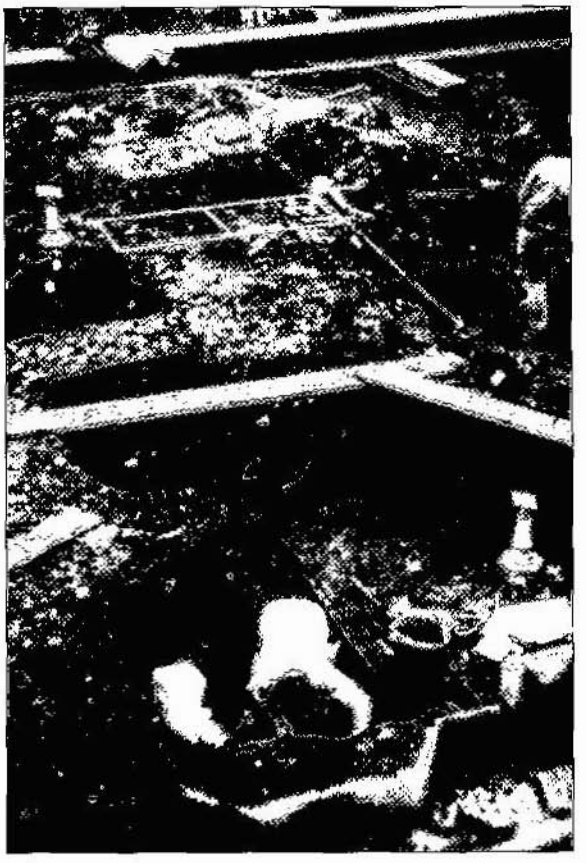

Figure 15. Excavating medieval pits at Wellington Row, 1989.

CHANGES THROUGH TIME

Changes in the bone samples from York through time are subtle rather than blatant. Samples of Roman date are particularly marked by a lack of fish bones (to which we return below), and by a low relative abundance of poultry. If our interpretation of the medieval chickens as mostly backyard animals is correct, then the rather low frequency of these birds in Roman samples may tell us something about the social topography of Roman York, or simply about contemporary attitudes to having hens scratching around the streets. One thing that does characterize Roman deposits at some sites is the presence of large dumps of bone debris from specialized butchering activity. At Tanner Row, Rougier Street, and Wellington Row, large spreads of heavily chopped-up bone have been found, consisting almost entirely of

fragments of the shafts of major marrow bones (humerus, radius, femur, tibia) and little else.[24] The degree of butchering goes well beyond that necessary to remove attached meat or to open up the marrow cavity, and gives the impression that the bones were being systematically reduced to pieces of a generally similar size. The purpose remains unclear, though the extraction of fat or stock seems a very likely explanation. Either way, these dumps represent a very thorough utilization of the carcass, that may be linked with an intensification of agricultural production as a whole during the Roman period.[25] Basically, the productivity of each hectare of pastoral land can be increased by keeping more animals on it, or by extracting more useful resource from each animal.

Another particular characteristic of Roman deposits in York is the presence of concentrated deposits of cattle shoulder blades. Typically, these show a rough perforation in the blade of the scapula, often with chop-marks 'trimming' the glenoid articulation and repeated knife-cuts running along the longitudinal axis of the blade.[26] There are parallels for these deposits at Roman sites along the Rhine, in the Netherlands. What they appear to represent is cattle shoulder joints being cut away from the carcass, perforated for suspension, then perhaps smoked or steeped in brine. Subsequently, the meat was cut away from the bone, and the shoulder blades discarded. Whether for smoking or salting, the meat appears to have been distributed off the bone: otherwise, the shoulder blades would have been dispersed to different households and deposited in ones and twos amongst other debris, rather than being found in concentrations of a dozen or two.

Such specialized deposits are not seen in the medieval period in York, and the rather variable patterns of butchering give the impression of carcasses being butchered on a small scale, perhaps almost household by household. By the thirteenth century, there are some indications of organization, as dumps of cattle and goat horn-cores indicate horn retrieval, perhaps showing that slaughtering and primary butchering was being done by sufficiently few people to facilitate the recovery of this useful resource.[27] By the late medieval period, butchering begins to look more systematic, with more consistent patterns from site to site. It is worth noting that virtually all of the direct evidence that we have of butchering procedures is derived from cattle bones. Although sheep and pig bones sometimes show evidence of carcasses having been dismembered by an axe or cleaver, most of the butchering of these species seems to have been carried out by using a knife.

Fish obviously were of appreciable importance in the medieval period, and we can see what was essentially individual enterprise, bagging river and estuarine fish, through the Roman to Viking periods, gradually being supplemented, then replaced, by a trade in marine fish. Initially, this was based on species from inshore waters, then increasingly from an offshore fishery which is quite familiar to us today. A typical Roman sample would include anadromous species (i.e. spending part of the life-cycle in saltwater, part in freshwater) such as salmon and shad (*Alosa* spp.), perhaps with a few bones of sea bream species (Sparidae), which may have been imported from more southerly waters.

Excavations by Leslie Wenham in 1961–3 and 1967 at St Mary Bishophill Junior church uncovered late Roman archaeology, including a spread of minute fish bones.[28] A subsample (4.2 litres) of the deposit was sieved, and a subsample of the residue (100ml) was sorted and recorded. The bones were found to be those of small herrings and sprats. From the number in the subsample, it was estimated that the whole deposit contained 40,000 fish. Young herring and sprat shoal together today off the Yorkshire coast, especially in summer, and netting such a shoal would not have been too difficult. However, herrings and sprat go off remarkably rapidly, and do not lend themselves to drying in the way that fish of the cod family do. One possibility is that the bones are the residue from the manufacture of a fish sauce, such as the *garum* or *liquamen* to which Apicius and others refer. There is a parallel from the Peninsular House site in London, for which the same interpretation has been offered.[29]

Fish bones from the Mid-Saxon site at Fishergate consisted largely of locally-available eels and river fish, and this pattern continued in the early Viking Age phases at Coppergate.[30] Through the tenth and eleventh centuries, herring bones become numerous, with the cod family becoming more important from the twelfth century onwards. In particular, the exploitation of deeper waters can be seen in the gradual increase in the numbers of bones of haddock (*Melanogrammus aeglefinus*) and ling (*Molva* c.f. *molva*). Herring and eel continue to be abundant throughout medieval deposits, and small numbers of river fish were evidently still being caught, though it is notable that the 'clean water' species such as grayling and burbot disappear from the archaeological record by Norman times.

In parallel with this change in fish exploitation, there is a gradual increase in 'backyard' and hunted resources at Coppergate from late ninth-century to early eleventh-century deposits. It has been argued that this may reflect some

Figure 16. Shetlands, modern cattle of similar size and build to those of the medieval period.

general economic change, with individual households having more control over their food supply,[31] both by keeping some livestock around the town, and perhaps by being able to trade directly for hunted game and fowl through the wider availability of coinage.

TO SUM UP

The information inferred from the study of animal bones from York gives us a picture of a city dependent for most of its history on a mixed farming hinterland, but with various means of mobilization of those resources. The predominance of cattle in late first- to mid-third-century deposits may be military influence: it is very much the pattern on Roman military sites elsewhere in northern England. The low diversity of vertebrate resources in the Mid-Saxon period may reflect redistribution of tithes by a local elite, and relatively little individual facility for keeping stock or hunting game. By the early eleventh century, changes are apparent, and it may be that people had more facility to keep a few pigs and chickens in backyards, and to hunt or purchase fish and fowl to vary the beef-dominated supplies. Whether the

changes in the fish coming into York at this time are the cause or the consequence of that change in procurement is an interesting question.

Animal bone data are very weak on resources such as eggs and dairy products, beyond recognizing where and when there were chickens, and making suggestions about husbandry for secondary products. We are also weak on sources, and rely on the historians to tell us where the medieval cattle may have been coming from. None the less, animal bones are an important and useful category of data pertaining to past diet, though not addressing the same questions as the historical sources, nor providing answers that can readily be cross-checked against historical sources. None the less, we can apply something of the historians' requirement for internal consistency, and seek to build up a structured knowledge base that sheds light on historical subjects from a different direction, so illuminating aspects and details that might not be apparent from the historical sources alone.

Notes

I am grateful to colleagues at York Archaeological Trust and at the Environment Archaeology Unit for their help and advice over the years.

Much of the information used here is published in the series *The Archaeology of York* (General editor, P.V. Addyman). Reference is made in abbreviated form to the following fascicles:

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