PART 2

The environmental remains

The environmental evidence comprised carbonised plant remains, animal and fish bone, and soils and sediments. The data were collected during the initial evaluation, various set-piece excavations and watching briefs. During the main excavation, data collected by hand were supplemented by an intensive programme of soil sieving. In particular, the extensive spreads of 'garden soil' were targeted and the results of this work can be found in Part 2.5. The reports on the carbonised plant remains (Part 2.2) and the faunal remains (Part 2.3) deal with the assemblages from the main excavation and Queensberry House separately, but each considers the results in a final discussion.

2.1 SUMMARY OF RESULTS

STEPHEN CARTER

Analysis of the soils and sediments focused on the relationship between the natural topography of the site and how this has influenced settlement patterns, the soil processes which have shaped this part of the Canongate to the present day and how these processes have enabled us to interpret the history of past settlement here.

The strange angle at which Queensberry House sits in relationship to the Canongate street frontage, for example, is due to the odd angle of the underlying slope, which runs from north-west to south-east across the site. This frontage area has also been significantly terraced over the centuries, to such an extent that no archaeological levels survive here. In fact, the topography of the whole area has been subject to much alteration, particularly of the natural drainage channels, which have been diverted to create areas suitable for settlement (HAPT 2008, Fig. 2.1). These channels are thought to have taken water down past the tail-end of the plots that extended both north and south from the Canongate street frontage to what are now Calton Road and Holyrood Road respectively. The process of draining this area was almost certainly undertaken by the abbey in order to improve what must have been marginal land. Elsewhere on the site, the level terrace that forms the central area of the site was clearly an attractive place to establish the formal gardens that occupied this area in the post-medieval period.

The analyses of the soils and sediments and the carbonised plant remains both confirm that coal was the dominant source of fuel from very early on. This also supports the evidence from the study of the metal-working debris. Only in the very earliest period (Period 1) was coal absent. This coincides with the use of wood as both fuel and constructional material, and perhaps also with the use of turf. The disappearance of coal from the archaeological record in the 17th century neatly marked the end of the use of these properties for light industrial use and the establishment of formal gardens, as individual plots were bought up and larger properties created, a process which started with Dame Balmakellie. This radical change in use is also reflected in the carbonised plant assemblage. Here, grain was concentrated in the early levels only. Much of this grain is thought to have come in from East Lothian and the barley in particular is thought to have been used in brewing, an industry which became synonymous with this area from the late 18th century onwards.

Coal ash, thought to have derived from domestic and light industrial middens subsequently dumped across the site, was the single largest component in accumulation of soils on the site. Analysis of these soils and their deposition confirms the archaeological findings that the western half of the site has a very different history from the eastern. This may relate to the eastern half being part of, or at least associated with, the abbey until quite late in the medieval period. Even if this area was laid out as properties from which rent was derived as income for the abbey, it would seem that they were not used for light industrial or craft-working as the western plots were.

The influence of the abbey may also be seen in the faunal remains recovered from the site. The dominance of sheep/goat over cattle in the assemblage is a pattern that has been identified in the Borders and is unlike most other east coast burghs where cattle are the dominant component. In the Borders, the dominance of sheep/goat is thought to have been due to the large flocks of sheep maintained on the vast estates of the four great abbeys, Melrose, Dryburgh, Kelso and Jedburgh. Wool and woolfells (whole skins) were the staple goods of the Scottish economy in the medieval period and were exported through the many ports on the east coast of Scotland (most notably Berwick-upon-Tweed) to the great Flemish cities of Bruges and Ghent. The meat itself would have been a lesser by-product.

The diet did not only consist of beef, mutton and lamb however, for pork, rabbit, hare, poultry, partridge, red grouse, cormorant, fish and shellfish were also on the menu. There appears to have been consistent consumption of mainly white fish (cod, haddock, whiting), herring and mackerel, with some freshwater fish (salmon or trout) and shellfish. The last were significant from the earliest times, particularly oysters, for which the Firth of Forth was famous until they were over-exploited in the 18th century.

In terms of craft-working, there appears to have been a tradition of leather workers in this part of the Canongate. A number of the animal bones recovered from the site showed knife cuts consistent with skinning but, interestingly, these were foxes, dogs, cats and horses, which perhaps suggests that they were not processed in a commercial tannery.

2.2 CARBONISED PLANT REMAINS

TIM HOLDEN AND MHAIRI HASTIE

2.2.1 Methodology

During the course of the excavations 363 standard samples, ranging in size from 10 to 30 litres, were taken for flotation and wet sieving. Most well-stratified deposits were sampled with the purpose of recovering material that might help to identify the nature of activities being undertaken in the backlands of the Canongate and how any such activities were distributed across the site. The samples were processed through a system of flotation and wet sieving in a Siraf-style flotation tank. The floating debris was collected in a 250µm sieve and, once dry, scanned using a binocular microscope. Any material remaining in the flotation tank was wet sieved through a 1mm mesh and air-dried. This was then sorted by eye and any material of archaeological significance removed for identification.

Identifications were made with reference to the collection of Headland Archaeology Ltd and standard seed atlases. This account draws out some of the main observations of the analysis. The complete dataset forms part of the site archive report. A summary of the results is provided in tables 2.1 and 2.2.

2.2.2 Main excavation site

Preservation of most organic remains on site was by charring, although two samples (1657, 1730) contained waterlogged remains and occasional fragments of uncharred wood. Compared with most urban archaeological sites, an unusually small percentage of samples contained charcoal, which

Table 2.1 Summary of carbonised plant remains by period

			Period 1	Period 2.1	Period 2.2	Period 2.3	Period 3	Period 4.1	Period 4.2	Period 5.1	Period 5.2
		Total number of sample	**9**	**38**	**75**	**122**	**45**	**88**	**9**	**4**	**3**
		Total sample vol. (litres)	**190.5**	**716**	**1423.25**	**1349**	**936**	**1570**	**180**	**100**	**30**
LATIN NAME	**PLANT PART**	**COMMON NAME**									
Wild taxa											
Corylus avellana L	nutshell	hazel			+						
Corylus avellana L	nut	hazel			1						
Polygonum sp	nutlet	knotgrass			1			1			
cf Polygonum sp	nutlet	knotgrass			1						
Polygonum persicaria/ lapathifolium L	nutlet	persicaria/ pale persicaria			1		1	3			
Rumex sp	nutlet	dock			5		1	1			
cf Rumex sp	nutlet	dock			1						
Stellaria media (L). Vill	seed	chickweed						1			
Chenopodiaceae indet	nutlet	goosefoot	1				1				
Chenopodium album L	nutlet	fat hen			1						
Atriplex sp	nutlet	orache			1						
Spergula arvensis L	seed	corn spurrey			1						
Agrostemma githago L	seed	corn cockle			1						
Raphanus raphinustrum L	siliqua	charlock	1	1	2			1			
Raphanus raphinustrum L	seed	charlock			1						
Raphanus/Brassica	seed	charlock/mustard			1						
cf Centaurea L	seed	knapweed			1						
cf Centaurea nigra L	seed	lesser knapweed			1						
Euphorbia helioscopia L	seed	sun spurge									
Vicia/Lathyrus sp	seed	vetch/pea	1		3	1	1				
cf Vicia/Lathyrus sp	seed	vetch/pea			1						
Galium aparine L	fruit	goosegrass/cleavers			1						
Calluna vulgaris (L) Hull	bud	ling/heather					1	1			
Plantago sp	seed	plantain			1	2					
Plantago lanceolata L	seed	ribwort				1					
Rosaceae indet	seed	rose family							1		
Chrysanthemum sp	achene	marigold						1			
Conium maculatum L	seed	hemlock				1					
Cynosurus cristatus L	caryopsis	crested dog's-tail					3				
Sieglingia decumbens (L) Bernh	caryopsis	heath grass			1						
Gramineae (small)	caryopsis	small-grained grass			1	1		2			
Gramineae (medium)	caryopsis	medium-grained grass	1	1	2	2	1	1			
Gramineae (large)	caryopsis	large-grained grass									
Cyperaceae indet	nutlet	cotton-grass/spike-rush			2						
Carex sp	nutlet	sedge		1							
cf Sparganium	seed	bur-reed			1						
Indeterminate	seed	indeterminate			3		1	1	1		
Indeterminate	stem/leave	indeterminate			1						

Table 2.1 (*cont.*) Summary of carbonised plant remains by period

			Period 1	Period 2.1	Period 2.2	Period 2.3	Period 3	Period 4.1	Period 4.2	Period 5.1	Period 5.2
		Total number of sample	**9**	**38**	**75**	**122**	**45**	**88**	**9**	**4**	**3**
		Total sample vol. (litres)	**190.5**	**716**	**1423.25**	**1349**	**936**	**1570**	**180**	**100**	**30**
LATIN NAME	**PLANT PART**	**COMMON NAME**									
Potential economic species											
Vitis vinifera L	seed	vine				1					
Linum usitatissimum L	seed	cultivated flax				3	1		1		
Cereals				1							
Triticum aestivo-compactum L	caryopsis	bread/club wheat	34	43	124	71	58	9	4		
cf Triticum aestivo-compactum L	caryopsis	bread/club wheat		3	15	7	1	5	2		
Triticum sp	caryopsis	wheat	8	14	27	14	12	4			
cf Triticum sp	caryopsis	wheat		8	12	9	9	5			
Triticum sp	rachis	wheat			3		3				
Triticum/Hordeum	caryopsis	wheat/barley		7	5	11	3	7		1	
Hordeum sp	caryopsis	barley indet	23	42	91	60	145	59	11	1	
cf Hordeum sp	caryopsis	barley indet	1	7	12	6	19	14		1	
Hordeum vulgare (hulled)	caryopsis	hulled barley	2	3	11	22	48	61	5		
Hordeum vulgare (hulled – straight)	caryopsis	hulled barley			1	2	1	5			
Hordeum vulgare (hulled – twisted)	caryopsis	hulled barley									
Hordeum sp	rachis	barley indet					1				
Secale cereale	caryopsis	rye		3	1	3	3				
cf Secale cereale	caryopsis	rye	1		2		2				
Avena strigosa L	caryopsis	small/bristle/black oat			5	4	1				
Avena sp	caryopsis	oat	22	52	109	107	123	30	13	2	
cf Avena sp	caryopsis	oat		1	13	7	4	1	3		
Avena sp	palea/lemma	oat		1	8	1	2	1			
Cereal indet	caryopsis	cereal indet	16	32	55	29	62	15	1		
Culm nodes	caryopsis	straw				+					

Rare +, Occasional ++, Common +++, Abundant ++++

seemed to indicate that coal was the main fuel throughout occupation. The most common charcoal component in each period was oak (*Quercus* sp) but smaller amounts of alder (*Alnus* sp), birch (*Betula* sp), hazel (*Corylus avellana*), heather (*Ericaceae* indet), pine (*Pinus* sp), blackthorn (*Pinus spinosa*) and willow (*Salix* sp) were also present.

In contrast to the charcoal, many samples contained occasional cereal grains and weed seeds but few large concentrations were encountered. Most grain-bearing samples contained barley (*Hordeum vulgare*) and wheat (*Triticum aestivo-compactum*) in approximately equal proportions, frequently with similar concentrations of oat (*Avena* sp). Rye (*Secale cereale*) grains were occasionally present. Virtually all of the cereal identifications were made on the grain, as chaff was extremely rare. A concentration of barley and oat chaff dominated by culm fragments was recovered from one Period 3 context (Context 1511, Phase 5) and a small number of flax (*Linum usitatissimum*) and grape seeds (*Vitis vinifera*) seeds were recovered from Period 2 (Phase 4). The 'weed seeds' comprised common weeds of cultivation and waste places and, in view of the low concentrations, offered little scope for detailed analysis.

Table 2.2 Waterlogged plant remains

Latin name	Plant part	Common name	ME 1657	ME 1730	QH 7007	QH 7105
		Context number	1657	1730	7007	7105
		Sample number	3361	4425	5383	5551
Wild taxa						
Urtica dioica L	seed	stinging nettle	+	++		
Polygonum persicaria/lapathifolium	nutlet	persicaria/pale persicaria	+	+		
Polygonum sp	nutlet	knotgrass	+			
Rumex sp	nutlet	dock	++	++		
Chenopodium sp	nutlet	fat hen family	++	+		
Atriplex sp	nutlet	orache	+	+		
Stellaria media (L) Vill	seed	chickweed	+	+		
Ranunculus sp	achene	buttercup	+	+		
Euphorbia helioscopia L	seed	sun spurge	+	+		
Conium maculatum L	seed	hemlock	++++			
Lamium purpureum L	seed	red-dead nettle	++++	+		
Stachys sp	seed	woundwort				
Sambucus nigra L	seed	elder	+	+		
Cirsium sp	achene	thistle	+			
Carex sp	nutlet	sedge				
Degraded wood fragments					+	+
Potential economic species						
Corylus avellana L	nutshell	hazel	+	+		
Ficus carica L	seed	fig	++			
Papaver somniferum L	seed	opium poppy	+			
Rubus cf idaeus/fruticosus	seed	raspberry/blackberry	+			
Rubus sp	seed	raspberry/blackberry			+	+
Fragaria sp	seed	strawberry	+		+	
Pyrus/Malus sp	seed	pear/apple				+
Vitis vinifera L	seed	grape				+
Carbonised cereal grains			+			

ME: main excavation; QH: Queensberry House
Rare +, Occasional ++, Common +++, Abundant ++++

The base of a tree stump of rowan (*Sorbus aucuparia*) was identified from Context 803 (Period 3). The only waterlogged deposits from the main excavation were from a well (Context 1727, Period 2) and a wood-lined late medieval pit (Context 1664, Period 3). The preservation was better than elsewhere but still restricted to degraded wood fragments and other more robust plant parts (table 2.2). The pit contained a small number of wild taxa and was of only limited interpretative value. From the well, however, it was possible to identify hazel shell (*Corylus avellana*) and the remains of a number of edible fruits such as pear/apple (*Pyrus/Mallus*), blackberry/raspberry (*Rubus* sp) and strawberry (*Fragaria* sp). These would all have been locally available and probably formed seasonal additions to the diet. Other species such as fig (*Ficus carica*) and grape must have been imported as dried fruits. A seed of the poppy (*Papaver somniferum*) was also encountered and is likely to represent the remains of a spice used in food preparation. The above taxa are all common on medieval sites and are frequently associated with faecal material. Also present were considerable numbers of seeds of plants that rapidly colonise damp, waste ground (eg hemlock – *Conium maculatum*). This would be consistent with the well having been open and somewhat overgrown at some point and, together with the food species, seems to indicate that this was a deposit associated with abandonment of the feature.

2.2.3 Queensberry House

Five samples were taken during excavations within Queensberry House basement, from two brick features within the kitchen and a number of culvert fills. The charred assemblage was extremely small, with only two cereals of oat and wheat (*Avena* sp and cf *Tritcum* sp) recovered from Context 485. Charcoal was sparse and only present in one culvert fill (Context 7016). Two other culvert fills (Contexts 7007, 7105) were notable for the presence of a small quantity of waterlogged plant remains (table 2.2). The assemblages consisted mainly of fruit seeds/pips, with no evidence for soft tissue or cereal bran. The taxa recovered are likely to represent food remains, including locally grown species such as apple/pear, and more exotic fruits such as grape. The origin of the remains is unclear, but their presence within the culvert suggests that they represent either kitchen waste or the remains of human faecal material.

2.2.4 Discussion

The plant remains were characterised by an extremely low diversity, rarely comprising more than five taxa per sample. Barley, oats and wheat occurred in most samples. Other economic species, flax, grape, apple/pear, were only rarely present.

The concentration of identifiable components in most samples was so low that there would be little value in discussing any detailed aspects of context-related variation. However, a number of broad trends could be identified:

1. The concentration of wood charcoal across all phases of the site was extremely low as opposed to the high concentrations of coal. The most obvious explanation for this has to be that coal was the main source of fuel on the site from the earliest medieval period.
2. Charcoal was concentrated in the earliest phase (Period 1) and perhaps indicated a greater prevalence of wood as a fuel and potentially also as a construction material at that time. Across both the site and throughout each period carbonised oak remained the dominant wood type. Other species present represented smaller shrub material such as alder and willow. Pine appeared within the post-medieval period and could have reflected increased imports of Baltic timber through the port at Leith (Mowat 1994).
3. The concentrations of grain in the earlier periods (1–3) were significantly higher than in the later ones (4 and 5). This reflected the changing use of the area from the backlands of burgage plots to formal gardens, military grounds and brewery.
4. One notable observation was the uniformity in the concentration of charred remains across the site. Almost none of these appeared to have been charred in situ and this gives the impression that the sediments, particularly the extensive soil horizons, had been thoroughly mixed by animal and human agencies.

Based on evidence from the Byre Theatre excavations, St Andrews, and elsewhere, Carter (2001) has suggested that soil horizons such as those seen at the Parliament site may represent a sediment accumulation brought about at least partially by repeated building and demolition of timber and turf structures. The topography of the Parliament site suggested that much of the material forming the accumulation may have migrated downslope from the frontage areas. In this interpretation the charred remains are likely to represent material reworked from domestic and other structures. Here, as at many other urban sites in towns such as Perth, St Andrews (Holden & Hastie 2001) and Dundee (Holden 1998; Hastie & Holden 2000), direct evidence for the source of the charred plant remains is often lacking. However, large quantities of burnt grain could have been created as a result of accidents in corn-drying kilns or ovens, and also the cumulative effect of many smaller accidents in a domestic context. The construction materials used in medieval structures such as wattle and daub and turf would only have had a short lifespan and would need to be demolished and rebuilt repeatedly. In an active soil interspersed with periods of small-scale cultivation and the cutting of pits and other features, the charred cereal and other remains would quickly be distributed through the accumulating soils.

The burgesses may have cultivated a proportion of the grain themselves, although their plots or tofts were probably used more for the cultivation of vegetable crops and fruit. Dennison suggested that it was likely that the burgesses had land in Broughton and this was a potential place for them to have grown cereal crops (HAPT 2008, Chapter 4.6). Although detailed records regarding the grain trade only survive from later periods, it can be assumed that the patterns observed in the 17th century reflected similar, although possibly less well-developed, patterns in the medieval period. East Lothian was clearly an obvious source of grain, which, with its favoured environment and fertile soils, was capable of growing a wide variety of crops, including wheat for bread-making. East Lothian was the setting for many agricultural improvements affecting productivity and the production of surpluses that could be sold in the markets of Edinburgh and Canongate. As a result, by the end of the 17th century, the old infield–outfield system of agriculture was changing and systems involving more complicated crop rotations, liming and fallow were being introduced (Fenton 1963; Whyte 1976).

Until the Turnpike Act of 1750 the difficulty of overland transport was, however, a major constraint on the provisioning of Edinburgh and the Canongate from East Lothian (Snodgrass 1953). In 1744, for example, potatoes designated for the city were brought from no further than six miles because of transport costs (Marshall 1986). Much of the grain for the burghs was brought by sea via the Port of Leith (Mowat 1994). By the 17th century surviving records show grain coming not only from ports in East Lothian but also others on the east coast, as far away as Eyemouth to the south and Moray in the north (McNeill & MacQueen 1996). This trade probably had much older roots and emphasised both Edinburgh's and the Canongate's roles as consumer centres, and Leith's as an entrepôt.

A proportion of the cereals entering the Canongate would have been in the form of flour and meal rather than as grain, and would have left little trace in the archaeological record. During the earlier periods it is possible that hand-milling using quern stones and corn-drying over the hearth were undertaken, but this would have been restricted to small-scale domestic activity. Most cereal producers would have been thirled to an estate mill and obliged to grind their corn there rather than in the burgh.

There were, however, evidently some mills in the vicinity but their history is somewhat obscure. One is known to have been granted to the canons of Holyrood by David I in the

12th century (Stevenson et al 1981). Later, they had mills in the area that became known as Canonmills and by the early 18th century there were numerous other mills on the Water of Leith. Still less grain would have entered the Canongate itself as the occupants of the site ceased processing their own grain and began to purchase processed grain products. Unfortunately, reworking of earlier sediments into what are commonly called 'garden soils' confuses the archaeological data and it is difficult to identify any clear trends.

Throughout the medieval and early post-medieval periods, grain, particularly barley, would undoubtedly have been brought to the site for the purposes of brewing. This could be undertaken both commercially and domestically and it is known that, at least in the 14th century, each burgess would have had his own brewing vat (Ewan 1990). Brewing requires the production of malt and this is undertaken by soaking the grain in order to promote germination, kilning in order to kill the sprouting grain and grinding the grain. This was probably one of the main reasons why kilns such as that found at the Byre Theatre Site, St Andrews (Moloney & Baker 2001) were still being used in a 13th- to 14th-century urban context. Unfortunately for this hypothesis, only rarely do traces of the sprouted grain that are characteristic of malting come to light in any quantity.

The above possibilities offer some explanations of how and why cereal grain might have been brought to a medieval burgh. Somehow, a fraction of the total amount brought into the town became charred, later to be incorporated into thick organic-rich sediments that form horizons over large areas of the backlands. Throughout the excavation these horizons were routinely sampled in order to identify any temporal or spatial trends in the presence of charred plant and other remains. No specific trends were identified, as the grain was consistently present but only in low quantities. This situation has already been noted from the so-called 'garden soils' on other urban excavations in Edinburgh, St Andrews, Perth and Dundee, but rarely is it clear whether the small quantities of grain are the result of a low number of major conflagrations or numerous smaller incidents in, for example, the kitchen. Whatever the source, human activity and the biologically active soils into which they were deposited have served to mix and distribute the charred grain over much of the site. It can only be hoped that future excavations will provide the direct evidence for the source of the charred material that is presently lacking. This, combined with a focused analysis of the historic sources for potential evidence, will one day undoubtedly help us to explain an apparently common phenomenon.

2.3 MAMMALIAN, BIRD AND MOLLUSCAN REMAINS

CATHERINE SMITH

2.3.1 Selection criteria for mammal bone samples

Animal bones were retrieved from the Holyrood site both by hand excavation and by an extensive programme of soil sieving (Part 2.4), recovering more than 23 standard boxes of bone. However, the condition of the animal bone was found to vary from context to context. Although some of the material was well-preserved and the individual fragments of a large size, the condition of much of the bone was unfortunately less good than might have been hoped. Many of the bones were abraded and fragmentary, and thus could not provide the anatomical measurements or epiphyseal fusion data which are essential for the estimation of age and stature of animals. The soil-sampling process retrieved much bone, but unfortunately the prevailing conditions of preservation were such that the majority of the smaller mammalian fragments recovered by sieving were not identifiable. Thus approximately 75% of the material from bulk-sieved samples consisted of small, abraded fragments which could not be identified either to species or body part. A selection process was employed to separate out those contexts which contained the best-preserved material, using the following criteria:

- degree of surface abrasion
- recognisability of the fragments (as to bone and species)
- fragment size
- numbers of fragments per context

Stratigraphic importance was also taken into account. Contexts representing the fills of pits, or fills of other features, were selected in order to help establish their function.

During the assessment process, the entire animal bone assemblage was briefly examined as to its suitability for inclusion. The opportunity was taken at this point to extract all bird, fish and amphibian bone. Thus the entire bird assemblage, from both the sieved and hand-excavated samples, was recorded.

The mammal and bird bones were identified by direct comparison with modern comparative material and were allocated to particular bone and species where possible. Where it was not possible to identify bones as far as species, the terms *large ungulate*, *small ungulate* and *indeterminate mammal* were used: thus all large vertebrae other than the atlas and axis were described as large ungulate, while small vertebrae were described as small ungulate. Ribs were similarly allocated depending on their size. On the basis of probability, large ungulate bones were most likely to have come from cattle, but could also have come from horse or red deer. Similarly, small ungulate bones were most likely to have come from sheep, but could possibly have originated from goat, pig or roe deer. All other mammalian fragments for which neither species nor bone could be ascertained were described as indeterminate mammal. Boessneck's (1971) criteria for differentiating between the bones of sheep and goat, which are morphologically very similar, were applied where feasible.

Measurements were made in accordance with the scheme of von den Driesch (1976) and are expressed in millimetres. Mandibular tooth wear and eruption patterns were assessed using Grant's (1982) scheme for cattle, sheep/goats and pigs, as well as Payne's (1973) scheme for sheep/goats. Horn cores were aged using Armitage's (1982) criteria.

Mammal, bird and mollusc species present

The range of mammalian species present in the hand-excavated samples was essentially similar to that recovered from the sieved samples, although rather more extensive. Thus, the hand-excavated species were mainly domesticated mammals: cattle, sheep/goat, pig, horse, dog and cat, although wild roe deer (*Capreolus capreolus*), fox (*Vulpes vulpes*) and rabbit (*Oryctolagus*

Table 2.3 Total number of mammal bones in sampled and hand-excavated contexts at the Parliament site, by phase

	Phase 1		Phase 2		Phase 3		Phase 4		Phase 5		Phase 6				
Species	**Sampled**	**Hand-ex**	**Sampled**	**Hand-ex**	**Sampled**	**Hand-ex**	**Sampled**	**Hand-ex**	**Sampled**	**Hand-ex**	**Sampled**	**Hand-ex**	**Total Sampled**	**Total Hand-ex**	**Grand Total**
Cattle				4	1	49	15	87	4	11	2	52	22	203	225
Sheep/goat				4	4	66	47	144	4	31	11	106	66	351	417
Pig						1		5		4		5		15	15
Horse						4		27		1*		13		45	45
Roe deer								1						1	1
Dog		2				2		3				9		16	16
Dog/Fox				1				3				1		5	5
Fox				1								1		2	2
Cat								1	4	5	1	1	5	7	12
Rabbit						1		2						3	3
Large ungulate		1		2	1	40	3	71		11	1	64	5	189	194
Small ungulate				1		12	3	24		2	5	48	8	87	95
Indeterminate Mammal				12	13	84	272	210	58	55	69	194	412	555	967
Total		3		25	19	259	340	578	70	119	89	494	518	1479	1997

*excludes skeleton

cuniculus) were also present. The sieved samples contained only cattle, sheep/goat and cat bones (see table 2.3). It is noteworthy that sheep/goat bones were more plentiful than those of cattle in both the medieval and post-medieval periods. Certainly it is the bones of these two economically important species which dominate the faunal assemblage.

Tables 2.4 and 2.8 present a comparison of the numbers and percentages of the larger food-forming mammals found at the main Parliament site, Queensberry House and at other medieval and post-medieval sites in Scotland. From these figures it can be seen that the dominance of sheep in the Parliament animal-bone assemblage is similar to the Borders sites of Briggait (Smith 2003), in the burgh of Peebles (medieval Phase 2), as well as to the religious site at Jedburgh Friary (Grove 2000, 65) but contrasts sharply with medieval sites in Perth such as 75–7 High Street (PHSE) and Meal Vennel, where cattle predominate (Smith 1996; 2003). Data covering the post-medieval period in Scotland are scanty; but the cattle/sheep ratio in the later phases of occupation at Castle Park, Dunbar (Phases 22 and 23) is more similar to that at the Parliament site than it is to the medieval phases at Dunbar itself (Smith 2000a, 202).

Bones of pigs, although occurring in most of the later site periods, are relatively scarce. Horse bones are more common than those of pigs in all of the periods. A pit in Period 3 containing a single horse skeleton is thought to represent the burial of a fallen casualty.

Amongst the birds, the domestic fowl was the most common species, followed by goose (table 2.5). The goose bones may have come from either the domestic bird, or its wild progenitor, the greylag (*Anser anser*). Similarly, bones of duck came either from the mallard (*Anas platyrhynchos*) or its domesticated descendant, although all duck bones from the site were small and referable to the wild species. Other bird species occurred only in small numbers and included grey partridge (*Perdix perdix*), red grouse (*Lagopus lagopus*), black-headed gull (*Larus ridibundus*), possible cormorant (*Phalacrocorax* cf *carbo*), feral pigeon/rock dove (*Columba livia*) and crow (*Corvus corone*).

Mollusca were mainly marine, although a few shells of garden snail (*Helix aspersa*) were present. The molluscan assemblage was dominated by oyster shells, and it was apparent that mortar was adhering to many of the oyster valves. These had probably been incorporated as pinning in walls or other stone structures. Other marine species were edible and included limpet (*Patella* sp), cockle (*Cerastoderma* sp), whelk (or periwinkle, *Littorina littorea*), and flat periwinkle (*L obtusata*), buckie (*Buccinum ondatum*), mussel (*Mytilus* sp) and queen scallop (*Aequipecten opercularis*). Several *Nucella* shells, a species which parasitises other marine mollusca, were also present. These may have been brought into the site in building sand as they are not considered to be edible. A full catalogue of mollusc identifications is available in the site archive.

2.3.2 Summary of animal bone by period

Period 1 (12th–14th centuries)

Few bones were recovered and identified from Period 1 contexts. Context 756, which contained mammal and bird

Table 2.4 Comparisons of numbers and percentages of food-forming mammals

	Medieval Phases2, 3 & 4		Post-medieval Phases 5 & 6		Total	
	n	%	n	%	n	%
Cattle	156	34.0	69	28.3	225	32.0
Sheep/goat	265	57.7	152	62.3	417	59.3
Pig	6	1.3	9	3.7	15	2.1
Horse	31	6.8	14	5.7	45	6.4
Deer (all species)	1	0.2			1	0.1
Total	459	100.0	244	100.0	703	99.9

bone as well as fragments of mollusc shell, was a natural silt inwash in a boundary ditch and may represent material which originated elsewhere or accumulated in the ditch over a protracted period of time. The presence of two bones from a very large dog may be explained as resulting from a medieval midden deposit. Amphibian bone from 1761 is evidence of a damp environment.

Period 2 (14th–15th centuries)

Period 2.1

The mammalian and bird species present were cattle, sheep/goat, fox, foetal dog/fox and domestic fowl. As in Period 1, the bone and mollusc shell originated mainly from ditch fills and may represent a deposit which built up over time. Amphibian bones were associated with a large sub-circular feature and, as for Period 1, must represent damp conditions.

Period 2.2

Medieval garden soil and associated features. Present in Period 2.2 were cattle, sheep/goat, pig, horse, dog, rabbit and domestic fowl bones, originating mainly from pit fills. A deposit covering the top of a well (Context 1731) also contained animal bone, including, not surprisingly, amphibian. The suite of mammalian species is typical of the medieval period, with the possible exception of the single rabbit bone in Context 1500, the primary fill of an industrial feature. Since rabbits are burrowing animals, the bone may represent an intrusion from a later period. Sheep/goat bones were more numerous than those of cattle. Of interest in Period 2.2 is the presence of a butchered horse bone in Context 1730, the fill of a sub-circular cut, and a dog bone with cut marks in 740, a pit fill. These two bones may represent the waste products of skinning.

Period 2.3

Medieval features. A substantial faunal assemblage, including bones of cattle, sheep/goat, pig, horse, roe deer, dog, dog/fox, cat, rabbit, domestic fowl, goose and amphibian was recovered from Period 2.3. As in the previous phase, sheep/goat bones were more numerous than those of cattle, while pig bones were very scarce. Types of feature in which bones were present included fills of pits, stone structures and a twin tank feature. Notable amongst the mammal bones contained in the fills of the twin tank were horse bones bearing knife cuts (Contexts 811 and 835). Stone structure 775 contained dog bones with knife cuts (Context 806) amongst the mammalian assemblage. The presence of these butchered horse and dog bones is again indicative of a small-scale skinning industry. The tanks may thus have been involved in a process connected with skinning or tanning, which later became filled with debris.

Period 3 (16th–17th centuries; post-medieval garden soil and associated features)

Mammals and birds present in post-medieval Period 3 were cattle, sheep/goat, pig, horse, cat (and kitten), domestic fowl, duck and feral pigeon. Following the medieval trend in Period 2, sheep/goat bones outnumbered those of cattle while pigs were not plentiful. It is notable that Period 3 is the first in which duck bones appear. They are absent from the medieval phases. A single horse skeleton was recovered from a pit (Context 1513). The bones were unbutchered and the skeleton, although in a fragmentary condition, was substantially complete. Standing at approximately 15:2 hands height, this horse was larger and sturdier than the typical pony of the medieval period. The animal may have been a natural casualty, buried close to the spot at which it died. The partial cat and kitten skeletons showed no evidence of knife cuts, and thus may also represent natural casualties rather than skinned carcasses, although this is by no means certain.

Period 4.1 (17th–18th centuries)

Mammalian species present in Period 4.1 were cattle, sheep/goat, pig, horse, dog, fox, dog/fox and cat. As in the previous contexts, sheep/goat bones were more plentiful than cattle. Horse bones were, as in Period 2, more plentiful than those of pig. The presence of fox is interesting, since it implies that animals may have been skinned at the site for their pelts. In addition, horse bones with skinning cuts were recovered from Contexts 710 and 859 (the latter being the upper fill of a pit). This seems to be evidence for a continued small-scale skinning industry at the site.

Period 4.1 contexts also contained a wider range of bird species than found in earlier phases. Edible species present, besides domestic fowl, goose and duck, were red grouse, partridge, cormorant and black-headed gull. Bones of crow and passerine species probably came from natural casualties rather than birds which were eaten.

Table 2.5 Total number of bird bones in sampled and hand-excavated contexts at the Parliament site, by phase

Species	Phase 1		Phase 2		Phase 3		Phase 4		Phase 5		Phase 6				
	Sampled	Hand-ex	Sampled	Hand-ex	Sampled	Hand-ex	Sampled	Hand-ex	Sampled	Hand-ex	Sampled	Hand ex	Total Sampled	Total Hand-ex	Grand Total
Goose (*Anser anser*)							1	2				9	1	11	12
Duck (*Anas platyrhynchos*)									1	1	1	3	2	4	6
Fowl (*Gallus gallus*)			1			3	3	5	4	3	20	69	28	80	108
cf Fowl											3	9	3	9	12
Red Grouse (*Lagopus lagopus*)												1		1	1
Grey Partridge (*Perdix perdix*)												1		1	1
Galliform sp												1		1	1
cf Cormorant (*Phalacrocorax*)												1		1	1
Black-headed Gull (*Larus ridibundus)*											1		1		1
Feral Pigeon (*Columbia livia)*									1				1		1
Crow (*Corvus corone*)												1		1	1
Passerine sp.											1		1		1
Indeterminate bird			1		4	1	3	3	5	2	16	51	29	57	86
Total			2		4	4	7	10	11	6	42	146	66	166	232

Table 2.6 Comparisons of numbers and percentages of food-forming mammals from Scottish medieval and post-medieval sites

		Cattle		Sheep/goat		Pig		Horse		Deer	
Site	**Date**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Parliament Phases 2, 3 & 4	medieval	156	34.0	265	57.7	6	1.3	31	6.8	1	0.2
Parliament Phases 5 & 6	post-medieval	69	28.3	152	62.3	9	3.7	14	5.7		
Peebles, Briggait, Phase II	medieval	93	35.6	142	54.4	7	2.7	10	3.8	9	3.4
Peebles, Briggait, Phase III	15th–17th/18th century	152	28.0	350	64.5	17	3.1	22	4.1	2	0.4
Dunbar, Castle Park, Phases 22 &23	post-medieval	538	38.3	606	43.2	202	14.4	39	2.8	19	1.4
Perth, PHSE	medieval	12572	63.5	5366	27.1	1636	8.3	200	1.0	26	0.1
Perth, Meal Vennel, Phases 6–7	post-medieval	1645	62.0	828	31.2	122	4.6	54	2.0	3	0.1

Table 2.7 Total number of mammalian bones recovered from Queensberry House

Species	Period 2.1	Period 3	Period 4.1	Period 4.2	Period 5.2	Total
Cattle	14	24	62	7	2	109
Sheep/goat	16	19	82	18	1	136
Pig		2				2
Horse			3			3
Hare			2	1		3
Rabbit		1	5	1		7
Rat			2			2
Large ungulate	2	5	35	5	2	49
Small ungulate		6	51	7	2	66
Indeterminate mammal	37	27	107	9		180
Total	69	84	349	48	7	557

The rabbit bone present in this phase could not have been intrusive, since it bore a knife cut. Its presence in a post-medieval context (512) is not, however, problematic.

Queensberry House (Periods 2–5)

Faunal remains were recovered from watching briefs and excavation carried out at Queensberry House. Bones and mollusc shells were recovered from Periods 2, 3, 4 and 5, and were generally well preserved, and in most cases appeared in better, less eroded condition than those from the main Parliament excavation.

Mammalian bones recovered from Queensberry House were mainly those of large domestic animals (cattle, sheep/goat, pig and horse), although hare (*Lepus capensis*), rabbit (*Oryctolagus cuniculus*) and brown rat (*Rattus norvegicus*) were also represented. Bird species were domestic fowl (*Gallus gallus*), domestic or greylag goose (*Anser anser*), duck cf mallard (*Anas* cf *platyrhynchos*), grey partridge (*Perdix perdix*) and small Passerine species. Amphibian bones were also recovered from Period 3. The range of species is thus similar to those recovered from the main excavation, although less extensive.

Shown in tables 2.6 and 2.7 are the numbers of mammalian, bird and amphibian bones present in each phase at Queensberry House. The total bone sample (n=621) recovered from Queensberry House is much smaller than that recorded from outside the building (n=1997) and this should be borne in mind when comparing results. As at the main excavation, the total number of sheep/goat bones was greater than that of cattle; in this case 135 sheep/goat bones as compared with 107 cattle, excluding modern Period 19.2. However, the bias towards sheep/goat is not as marked as at the site outside the building. This may be due to sample bias, since bulk sieving was not carried out, in contrast to the main excavation, or, much more likely, due to better conditions of preservation

Table 2.8 Total number of bird and amphibian bones recovered from Queensberry House

Species	Period 3	Period 4.1	Period 5.2	Total
Domestic fowl	2	31	3	36
cf Domestic fowl		1		1
Grey partridge			1	1
Goose		4		4
Duck cf mallard		1		1
Small passerine sp		1		1
Indeterminate bird sp	1	13	1	15
Amphibian	5			5
Total	8	51	5	64

Table 2.9 Cattle mandibles arranged by Grant's (1982) wear stages

Phase	Hand-excavated or Sampled	Context	IADB	Grant TWS	Grant MWS	5th cusp of M3
3	H-ex	740	2397	lkj	45	in wear
4	H-ex	668	1515	lk-	42–46	in wear
4	H-ex	1780	5039	-ll	50–51	in wear
5	H-ex	1523	4055	kkk	45	in wear

TWS: tooth wear stage; MWS: mandible wear stage; H-ex: hand-excavated; S: sampled

at Queensberry House as compared to the main Parliament excavation. The excavators noted the presence of large quantities of lime-based mortar containing oyster shell fragments, associated with the rubble of demolished buildings. This would have the effect of lowering the acidity of the soil, hence the better local preservation of bone. Finally, there was some indication that the material recovered from Queensberry House originated from levelling dumps prior to the erection of the building itself. The assemblage almost certainly contained re-deposited bone from earlier phases of the site.

Pig bones were scarce at Queensberry House: only two were recovered, from Phase 5 (Period 3). Horse bones were much less numerous than outside the building, where it is likely that natural casualties had been buried. Of the wild animal species, rabbit bones occurred in three periods, all of post-medieval date. Hare occurred in two post-medieval periods. Although some of the rabbit bones could have been intrusive, it is likely that, as at the main Parliament site, their meat had been eaten, as with the hares.

With the exception of the small Passerine bird species (a bird the size of a sparrow or its like), all of the other bird species were probably eaten.

As noted above, oyster shells were plentiful in the assemblage. In some cases, the shells were coated with mortar, and had probably been used as pinning material in building construction, once the oyster flesh had been consumed (Context 7046, Period 3; Context 7053, Period 4.1; Context 7089, Period 4.1). A very few fragments of other marine species, periwinkle or whelk (*Littorina littorea*), buckie (*Buccinum ondatum*), mussel (*Mytilus edulis*) and cockle (*Cerastoderma* sp), were also present. The smaller specimens may have come from imported beach sand, while the larger shells such as buckie may represent food detritus. Two shells of large land snail (*Helix* and *Cepea*), both species favouring cool, shady habitats such as walls, were also found.

2.3.3 The domestic livestock

Ages of mammals at death

In order to understand better the role of the domestic livestock in the economy of the Holyrood site, the question of the culling pattern has been addressed by assessing the age at which animals were killed. It should be pointed out that some methods of assessing age at death are more reliable than others. In particular, age estimated on the basis of mandibular tooth eruption and wear pattern gives a more accurate result than that estimated from the state of epiphyseal fusion of the long bones. However, because of varying conditions of preservation across and between different archaeological sites, as well as varying butchery and rubbish disposal practices, the bones required to give the most accurate result are not always the ones which are retrieved. In the case of the Holyrood assemblage, it has already been noted that conditions of preservation were not particularly good and it seems very likely that more delicate bone elements have not survived as well as denser ones. Thus, bones and mandibles of young animals, being less densely mineralised than those from older animals, have not survived well, and have been subject to 'differential preservation'. In addition, particular bone elements, such as the dense, hard, distal epiphysis of the humerus of an adult animal, survive more readily than the proximal epiphysis, which has a more spongy, friable honeycomb structure.

With these shortcomings in mind, tables 2.9 and 2.10 show the numbers of mandibles from cattle and sheep assessed as

Table 2.10 Sheep/goat mandibles arranged by Grant's (1982) and Payne's (1973) wear stages

Phase	Hand-excavated or Sampled	Context	IADB	Grant TWS	Grant MWS	Payne stage	Age inference
2	H-ex	1734	4965	ggf	35	F	3–4 years
3	H-ex	1568	4196	-f	–	F	3–4 years
4	S	1538	4295	gfc	31	E	2–3 years
4	H-ex	794	37	kgf	38	F	3–4 years
4	H-ex	806	2564	mhg	42	H	6–8 years
4	H-ex	811	2505	gge	34	F	3–4 years
4	H-ex	811	2505	-gd	33–35	E	2–3 years
4	H-ex	825	2580	ggb	31	E	2–3 years
5	H-ex	1620	4506	hgg	37	G	4–6 years
6	H-ex	512	983	ggd	33	E	2–3 years
6	H-ex	859	3385	-b		E	2–3 years

Table 2.11 Age categories based on epiphyseal fusion of long bones (after Silver 1969)

Date of fusion	Bone	Age Category: Unfused	Age Category: Fused
Early	Scapula	J	I/A
Late	Humerus (proximal)	J/I	A
Early	Humerus (distal)	J/I	I/A
Early	Radius (proximal)	J/I	I/A
Late	Radius (distal)	J/I	A
Late	Ulna (proximal)	J/I	A
Late	Ulna (distal)	J/I	A
Intermediate	Metacarpal (distal)	J/I	A
Late	Femur (proximal)	J/I	A
Late	Femur (distal)	J/I	A
Late	Tibia (proximal)	J/I	A
Intermediate	Tibia (distal)	J/I	A
Late	Calcaneum	J/I	A
Intermediate	Metatarsal (distal)	J/I	A
Early	1st phalange (proximal)	J/I	I/A
Early	2nd phalange (proximal)	J/I	I/A

Key: J – Juvenile; J/I – Juvenile/Immature; I – Immature; I/A – Immature/Adult; A – Adult

to their relative age after the methods of Grant (1982) and Payne (1973).

Tables 2.12–2.14 show epiphyseal fusion data for cattle sheep/goat and pig. A key to the dates of fusion, based on data compiled by Silver (1969), is shown in table 2.11. Here, long bones fusing at either an early, intermediate or late date are grouped together in age categories. Unfortunately, because of overlapping ages of fusion of certain bones, it is in some cases impossible to distinguish between immature and adult bones, or similarly, between juvenile and immature bones. For example, the distal humerus fuses at an early date, while the proximal epiphysis of the same bone fuses at a late stage. If both epiphyses are present and both are fused, then the animal must be mature. If the distal is fused and the proximal unfused, then the animal is immature, but if only a fused distal end is present, the animal may be either immature or adult. This demonstrates the need for an age category immature/adult (I/A), and is the reason for the large number of cattle and sheep/goat bones falling into this category in tables 2.12 and 2.13.

It can be seen that only four cattle mandibles survived in both the hand-excavated and sieved samples. All of these came from adult animals in which the third molar, the last of the cheek teeth to erupt, was present and in wear. The high value of the mandible wear stage (MWS) is an indicator that the animals were fully advanced in maturity, and the wear

Table 2.12 Cattle long bones in each age category, by phase

Phase	Hand-excavated or Sampled	Age Category J/I	I/A	A	Total
3	S				
3	H-ex	1	8	11	20
4	S		4		4
4	H-ex	3	9	11	23
5	S				
5	H-ex		1		1
6	S				
6	H-ex	2	11	4	17
Total Sampled	S		4		4
Total Hand-excavated	H-ex	6	29	26	61
Grand total		6	33	26	65
%		9.2	50.8	40.0	100.0

Table 2.13 Sheep/goat long bones arranged by age category

Phase	Hand-excavated or Sampled	Age Category J	J/I	I	I/A	A	Total
2	H-ex				1	1	2
3	S		1				1
3	H-ex		7	2	18	12	39
4	S		3		5	2	10
4	H-ex	2	10	13	26	18	69
5	S						
5	H-ex		6	1	3	6	16
6	S				1		1
6	H-ex	3	7	3	9	15	37
Total Sampled			4		6	2	12
Total H-ex		5	30	19	57	52	163
Grand total		5	34	19	53		175
%		2.9	19.4	10.9	36.0	30.9	100.1

on the fifth cusp of the third molar indicates that they were probably all at least five years old in modern terms. The epiphyseal fusion data for cattle confirms the presence of adult animals in Periods 2.2, 2.3 and 4.1, but also indicates that younger, juvenile or immature beasts were killed (or died) in the same periods. No very young (foetal or neonatal) cattle bones were found, but for reasons of poor preservation, this is not surprising.

In the case of sheep/goat, more mandibles survived than was the case for cattle (table 2.10). Because the time period spanned the medieval and post-medieval phases it was not possible to compile a meaningful culling diagram. It can only be stated that individual animals died at particular estimated ages: over the whole time period, five sheep/goats died between the ages of 2 and 3 years, four between the ages of 3 and 4 years, one between the ages of 4 and 6 years and one between the ages of 6 and 8 years. The greatest number of mandibles (six examples) occurred in Period 2.3 (14th/15th centuries), which also contained the oldest individual at 6–8 years of age.

A larger sample of sheep/goat bones than that of cattle was available for epiphyseal assessment. Results are presented in table 2.13. Although adult sheep/goats were well represented (30.9% of bones were in age category A), a substantial number were from juveniles (2.9%), juvenile or immature (19.4%) and immature (10.9%). Of sheep/goats, 30.9% were in the age category which included immature or adult (I/A) individuals. These figures may be compared with those for cattle, where 9.2% were juvenile or immature (J/I), 50.8% were immature or adult (I/A)

Table 2.14 Pig long bones by age category and phase

Phase	Hand-excavated/ Sampled	Age Category J	J/I	I	I/A	Total
3	H-ex				1	1
4	H-ex		1	1		2
5	H-ex	1	1			2
Total		1	2	1	1	5

Table 2.15 Catalogue of butchered horse bone

Phase	Hand-excavated/ Sampled	Context	IADB	Bone	Details
3	H-ex	1730	5047	L humerus (distal)	Shaft very probably chopped mediolaterally.
4	H-ex	694	1879	L mandible	Knife cut on ascending ramus, near condyle. Possibly chopped.
4	H-ex	811	2505	L calcaneum, astragalus and lateral splint	Represent left hind leg (metatarsal II/III also present). Knife cuts on posterior aspects of calcaneum, astragalus and lateral splint (metatarsal I). Knife cuts probably caused by skinning of lower hind leg.
4	H-ex	835	2614	R tibia, distal	Shaft chopped mediolaterally.
6	H-ex	710	2235	L scapula	Possible knife cuts on neck and anterior blade (abraded).
6	H-ex	859	3385	1st phalange	Parallel mediolateral knife cuts near lateral edge of shaft, distal.

Table 2.16 Catalogue of butchered dog bone

Phase	Hand-excavated/ Sampled	Context	IADB	Bone	Details
3	H-ex	740	2397	R ulna	7 knife cuts on posterior shaft, distal to medial articulation.
4	H-ex	806	2564	L metacarpal III	Knife cuts on and around distal articulation.
4	H-ex	806	2564	L metacarpal IV	Knife cuts on and around distal articulation.

and 40.0% were fully adult. It would seem that more sheep were killed at a younger age than was the case for cattle. The culled lambs were probably surplus males, fattened and killed before their first winter.

As regards the pigs, very little information on age at death was available. No mandibles and few suitable long bones survived in the sample. Table 2.14 indicates only the presence of one juvenile (J), two juvenile or immature animals (J/I), one immature (I) and one immature or adult animal (I/A). Given the very small number of pig bones in the sample, it is not surprising that mature adult animals were absent.

In the case of dogs, cats and horses, there was evidence of the presence of both juvenile and adult animals. Although most of the very small sample of cat bones came from adults, one partial skeleton of a kitten was present in Period 3, in association with bones from an adult cat. Most of the dog bones were from mature animals, with the exception of an unfused tibia (Context 679) and unfused femur (Context 694) in Period 2.3, which came from juveniles. In Period 2.1, a single tibia from an adult fox was found in association with an unfused humerus, possibly from a foetus of the same species (Context 760). All of the horse bones in the selected contexts were thought to have come from adult animals. One fragmentary horse skull in Period 4.1 (Context 974) was in poor condition but the teeth were in a reasonable state of preservation and provided an estimated age of between 7 and 10 years at death (Silver 1969).

Butchery

Cut and hack marks were present on many of the bones of large mammals, and on some bird bones. The main meat-bearing animals were naturally the most heavily butchered, but in some cases bones of dog and horse were also affected (tables 2.15 and 2.16). In the case of the carnivores, these marks were merely knife cuts and perhaps implied only that the animals had been skinned for their pelts. For example, two associated dog (or possibly fox) metacarpals from Period 2.3 bore knife cuts both on and around their distal articulations. These knife cuts would have been caused during removal of the paws, at the point in the skinning process where the pelt is freed from the body. Similarly, a dog ulna from Period 2.2 (Context 740) bore approximately seven knife cuts on the posterior aspect of the shaft, distal to the medial articulation. This bone corresponds with the stifle joint, or elbow, which in the live animal lies very close to the surface of the skin. Hence it would be relatively easy to cut through to the bone when removing the pelt.

When the butchered horse bones are considered, however, it seems feasible, given the evidence, that not only were carcasses skinned, but meat was removed, presumably to be eaten. Long bones were chopped across the shaft in a manner identical to that used in butchering cattle. Whether the meat was then eaten by humans or used as dog food is not known, but there is ample evidence from Scottish urban sites of medieval and post-medieval date for the practice of horse butchery (Smith 1998). Interestingly, eight horse bones out of a total number of 45 (17.8%) from Periods 2 and 4, show some evidence of butchery. Another process which may have been carried out involves boiling hooves in order to produce glue. Thus a horse phalange or toe bone was marked by several parallel knife cuts which indicated either skinning of the lower limb, or perhaps removal of the soft tissue, to be used in glue manufacture.

The types of cuts produced on the bones are characteristic of the fleshing implements used. Thus skinning and meat removal was usually carried out with metal blades, which produce a typical V-shaped profile. Long bone shafts were chopped or hacked mediolaterally (from side to side), sagittally (lengthwise, in the median plane) or dorso-ventrally (lengthwise, at right-angles to the median plane), generally by means of axes or cleavers. Vertebrae were also chopped with axes rather than saws. There was little evidence of sawing at the site in Periods 1 to 4.1.

The butcher's axe is referred to in early burgh records of Scotland, the *Statuta Gilda* (Innes & Thomson 1854, I, 436), under the term *securis* (simply, an axe). The axe, as a symbol of the trade, often appears on post-medieval gravestones and in heraldic devices such as the coat of arms of the Nine Incorporated Trades of Dundee, displayed in St Andrews Trades Kirk (built 1722) (Smith 1995, Fig. 1). Here, the axe is shown as possessing a curving handle and flat, almost quadrilateral blade, curving at the leading edge. It is crossed in the coat of arms with a pole-axe, the implement used both to dispatch the animal and then dismember it. The pole-axe is hafted centrally with a long handle, and the posterior part of the blade terminates with a cylindrical knob. This is probably the implement known from medieval documents as *securis danica*. The beast was tethered to a low ring in the floor so that its head was lowered almost to the ground; the knob of the pole-axe was then driven into the beast's skull. Roping the animal in this way is no longer legal, but was previously the most common method used (Gerrard 1977, 66).

Size and stature of animals

Anatomical measurements were made on the bones where the conditions of preservation allowed (after von den Driesch 1976; table 2.17). Abraded or eroded bones were not measured, with very few exceptions (where withers heights could not otherwise be estimated). A summary of measurements is available in the site archive. With the single exception of a dog bone from Period 1, all other measurements were made on bones from medieval Period 2 or the post-medieval period (Periods 3 and 4) and have been grouped together accordingly in order to aid comparison.

Unfortunately, the number of cattle measurements available was small in both the medieval group (Period 2) and the post-medieval group (Periods 3 and 4). Comparison with the largest Scottish urban medieval assemblage currently known, that recovered from the excavation at 75–7 High Street, Perth (Perth High Street Excavations (PHSE); Hodgson et al forthcoming) indicates that all of the bones from the Scottish Parliament site fell within the PHSE size ranges. However, comparing mean measurements from both sites indicates that the Parliament means were in many cases slightly greater than those for PHSE. As already stated, however, the Parliament measurement sample is extremely small and it is not feasible to compare them statistically. As an example, a single cattle metatarsal with greatest length (GL) of 208mm was recovered from the Parliament site. The PHSE range was 178–215mm, but in this case 73 examples were found, with a mean metatarsal length of 198mm. The Parliament example was thus 10mm greater than the PHSE mean, but still well within the medieval size range. Estimated withers heights based on the metatarsal are 1.14m for the Parliament beast and 0.97–1.17m at PHSE. These animals would have been small by modern standards.

A greater number of measurements was available for sheep/goat from the Parliament site. Comparison with sheep/goat bones from PHSE indicates that, as with the cattle, all of the bones fell within the medieval ranges at PHSE. Fourteen mean measurements from the Parliament sheep/goats lay above the corresponding PHSE means, three were below and five means were identical. The comparison between the two sets of measurements probably indicates populations of a similar stature.

Several intact sheep/goat long bones were recovered from the Parliament site, from which it was possible to calculate withers heights, or height at the shoulder (after Teichert 1975). Based on a complete radius, metacarpal and tibia, three medieval individuals were estimated to stand at 0.53m, 0.56m and 0.58m respectively; all fell well within the medieval range estimated for PHSE of 0.46–0.66m. As for cattle, sheep at the Parliament site in both the medieval and post-medieval phases were small by modern standards, but were the norm for animals found at medieval Scottish sites.

Unfortunately, no measurements were available for pigs at the Parliament site, due partly to their very insignificant presence, and partly to poor preservation. The surviving bones, however, suggest that they were of a similar size to animals found at Scottish medieval sites. Indeed, pigs changed little in size in some remote parts of Scotland until the early years of the 20th century (Smith 2000b).

Survival of a few intact horse bones allowed estimation of the withers heights to be made, after the method of Kieswalter (quoted in Ambros & Muller 1980, 30). A humerus and metatarsal from medieval Period 2.3 were estimated to come from small horses of 1.34m and 1.19m at the withers. Heights of live horses are usually expressed in hands, a unit of four inches. The heights of the Period 2.3 horses are equivalent to 13 hands and 11:3 hands respectively. Any horse of 14:2 hands (1.48m) or under is defined as a pony and these two animals may be considered as such. An investigation into the heights of medieval Scottish horses (Smith 1998) showed that animals from Perth, Stirling, Aberdeen and Dunfermline did not exceed 14:2 hands height, and that in common with horses in medieval Lincoln, York and Southampton, heights clustered around 13 to 14 hands. The smallest Scottish animal came from Stirling, and at 12 hands was slightly taller than the 11:3 hands-high horse found in Period 2.3 of the Parliament site.

Table 2.17 Size range summary

Cattle

		Phases 2, 3 & 4			Phases 5 & 6		
Bone	**Measurement**	**Range**	**n**	**Mean**	**Range**	**n**	**Mean**
Horn core	max	36.0–47.0	3	40.0			
	min	31.5–39.0	3	57.6			
	BC	106–135	3	116.7			
	OC	*100–157	3	119			
Axis	BFcr				87.4	1	
	SBV				47.8	1	
Scapula	SLC	46.0	1				
Radius	Bp	69.4–70.4	2	69.9			
	BFp	64.2–65.8	2	65.0			
	Bd	57.8	1				
	BFd	56.0	1				
Metacarpal	Bp	54.6	1				
	Dp	31.8					
Innominate	LAR	58.0	1				
Tibia	Bd	51.0–54.8	4	52.9			
	Dd	37.0–41.0	3	39.5			
Astragalus	GLl				56.0–64.0	2	60.0
	Bd				36.6–41.0	2	38.8
Naviculo-cuboid	GB	47.0	1		51.6	1	
Metatarsal	GL	208	1				
	Bp	45.0	1				
	Dp	42.9	1				
	Bd	46.4–49.0	3	47.3			
	SD	24.8	1				
	Dd	27.8	1				
1st phalange	GLpe	48.2–51.8	5	50.1	48.6–51.4	2	50.0
	Bp	24.6–28.0	5	46.5	26.0–27.0	2	26.5
	Bd	25.2	1		23.6–24.8	2	24.2
	SD	20.6–24.8	3	22.3	20.6–23.2	2	21.9
2nd phalange	GL				31.0–32.0	2	31.5
	Bp				23.0–24.0	2	23.5
	Bd				18.6–19.8	2	19.2
	SD	22.2	1		18.6	1	
3rd phalange	DLS				64.2	1	
	Ld				44.4	1	

Table 2.17 (*cont.*) Size range summary

Sheep/goat

		Phases 2, 3 & 4			Phases 5 & 6		
Bone	**Measurement**	**Range**	**n**	**Mean**	**Range**	**n**	**Mean**
Axis	LCDe				57.0	1	
	BFcr				41.5	1	
	SBV	23.0	1		25.0	1	
Scapula	SLC	16.4–20.4	8	19.2	18.0–20.2	2	19.0
	GLP	29.8–35.6	8	32.5			
Humerus	Bp				38.6	1	
	Bd	28.2–32.0	7	29.2	28.3–32.0	2	30.1
	BT	26.2–28.6	5	27.1	27.6	1	
	HT	16.0–19.6	9	17.5	14.8	1	
	HTC	13.0–15.4	9	14.0	18.2	1	
Radius	GL	131.0	1				
	Bp	27.8–32.4	8	30.0	30.8	1	
	Bd	26.0–26.8	2	26.4			
	SD	15.0–15.2	2	15.1			
Ulna	DPA	23.9–25.0	3	24.5	28.6	1	
	SDO	19.8–21.4	2	20.6	25.1	1	
Metacarpal	GL	*115	1				
	Bp	23.0	1		17.6–21.6	2	19.6
	Bd	25.2–28.0	2	26.6			
Innominate	LAR	23.4	1				
Femur	Bp	46.0	1				
	Dp	20.3	1		20.0	1	
	Bd	37.6	1				
Tibia	GL	194	1				
	Bp	39.2–42.2	2	40.7			
	Bd	24.2–26.0	5	25.2	23.8–27.6	5	25.2
	Dd	19.2–20.4	3	19.7	18.2–22.8	5	19.8
	SD	13.8–14.8	3	14.3			
Calcaneum	GL	59.8	1		47.2	1	
Naviculo-cuboid	GB				22.8	1	
Metatarsal	Bp	19.2	1		20.8	1	
	Dp	20.0	1				
	Bd	21.8–24.0	3	22.7	24.8	2	24.8
	Dd	14.6–17.0	2	15.8	16.2	1	
	SD	10.0–14.8	2	12.4	16.2	1	
1st phalange	GLpe	33.0	1		32.0	1	
	Bp	13.0	1		17.4	1	
	SD	8.2–10.1	2	9.2	10.2	1	
2nd phalange	Bd	7.8	1				

Table 2.17 (*cont.*) Size range summary

Horse

Bone	Measurement	Phases 2, 3 & 4 Range	n	Mean	Phases 5 & 6 Range	n	Mean
Atlas	GL	90.2	1				
	GB	134.4	1				
	BFcr	87.2	1				
	BFcd	80.2	1				
Scapula	SLC				69.2	1	
	GLP				95.4	1	
Humerus	GL	278	1				
	GLl	275	1				
	Bp	90.4	1				
	Bd	73.0–77.4	2	75.2			
	BT	69.8–72.0	2	70.9			
	HT	44.4	1				
		34.6	1				
		35.6	1				
	HTC	34.6	1				
	SD	35.6	1				
Radius	Bp	78.2	1				
	BFp	70.4	1				
	Bd	73.3	1				
	BFd	62.4	1				
	SD	36.0	1				
Ulna	DPA	56.0–62.4	2	59.2			
	SDO	42.5	1				
Metacarpal	GL				241–247	2	244
	Ll				231–240	2	235.5
	Bp				55.0–55.8	2	55.4
	Dp				35.2	1	
	SD				37.4–37.7	2	37.6
	Bd				52.4–53.6	2	53.0
	Dd				39.2–39.6	2	39.4
Patella	GL	67.2	1				
	GB	67.0	1				
Tibia	Bd	72.0	1				
	Dd	43.6	1				
Astragalus	LmT	50.5	1				
	BFd	44.6	1				
	GB	54.0	1				
	GH	51.0	1				
Calcaneum	GL	83.0–110.5	3	99.8			
Metatarsal	GL	230	1		296	1	
	Ll	223	1		293	1	
	Bp	42.8	1		58.0	1	
	Dp	34.4	1		49.0	1	

Table 2.17 (*cont.*) Size range summary

Horse (*cont.*)

		Phases 2, 3 & 4			Phases 5 & 6		
Bone	**Measurement**	**Range**	**n**	**Mean**	**Range**	**n**	**Mean**
	Bd	42.4	1				
	Dd	32.6	1				
	SD	26.2	1		35.4	1	
1st phalange	GL				73.0–85.0	3	790.2
	Bp				50.0–58.0	3	52.7
	BFp				45.8–52.6	2	49.2
	Dp				35.0–37.8	2	36.4
	SD				30.2–37.7	3	33.8
	Bd				39.9–50.8	2	45.4
	BFd				37.2–46.8	3	42.7
	Dd				25.5	1	
2nd phalange	GL	47.9	1		47.4–50.0	2	48.7
	Bp	50.6	1		53.8–56.2	2	55.0
	BFp	43.8	1		31.2–49.6	2	40.4
	Bd	44.6	1				
	SD	39.8	1		43.6–48.4	2	46.0
3rd phalange	BF	46.0–61.6	2	53.8	50.0	1	
	LF	25.6–26.4	2	26.0			

Dog – Phase 1

Bone	Measurement	Range	n
Radius	GL	221	1
	Bp	22.4	1
	Bd	29.8	1
	SD	16.2	1
Innominate	LAR	26.4	1
	Lfo	30.8	1

Dog – other phases

		Phases 2, 3 & 4			Phases 5 & 6		
Bone	**Measurement**	**Range**	**n**	**Mean**	**Range**	**n**	**Mean**
Humerus	Bp				18.4	1	
	Dp				23.0	1	
	Bd				21.0	1	
	SD				8.0	1	
Ulna	DPA	30.4	1				
	SDO	26.4	1				
Metatarsal III	GL				86.8	1	
	Bd				12.0	1	

Table 2.17 (*cont.*) Size range summary

Cat

		Phases 2, 3 & 4			Phases 5 & 6		
Bone	**Measurement**	**Range**	**n**	**Mean**	**Range**	**n**	**Mean**
Humerus	Bd				17.4	1	
Ulna	DPA				11.0	1	
Femur	GL				130.0	1	
	Bp				19.4	1	
	Bd				17.2	1	
	SD				9.0	1	
Tibia	Bd	12.4	1				
	SD	6.4	1				

Roe deer

		Phases 2, 3 & 4			Phases 5 & 6		
Bone	**Measurement**	**Range**	**n**	**Mean**	**Range**	**n**	**Mean**
Tibia	Bp	40.6	1				

Domestic fowl (*Gallus gallus*)

		Phases 2, 3 & 4			Phases 5 & 6		
Bone	**Measurement**	**Range**	**n**	**Mean**	**Range**	**n**	**Mean**
Coracoid	GL				48.8–55.3	3	52.5
	LM				50.4–52.0	2	52.2
	BF				13.0	2	13.0
Scapula	DiC				11.2–11.4	2	11.3
Humerus	GL	71.9–72.8	2	72.4			
	Bp	17.4–21.0	3	19.2			
	Bd	15.4–15.8	2	15.6	14.4	1	
	SC	7.6	2	7.6			
Ulna	GL				60.6–70.6	3	69.3
	Bp				8.4–10.9	8	9.0
	Did				8.2–10.0	8	9.0
	SC				3.9–5.6	4	4.7
Carpo-meta-carpus	GL				35.4–35.6	2	35.5
	Bp				10.3–11.6	2	10.8
	Bd				7.1	1	
Femur	GL				70.0–86.2	5	76.1
	Bp				14.0–19.0	10	15.6
	Bd	16.8	1		14.2–17.4	9	15.1
	SC	7.9	1		6.0–7.7	7	6.9
Tibio-tarsus	GL	113.6	1		96.8	1	
	Dip	22.6	1		12.7–22.2	4	17.4
	Bd	12.0–12.6	2	12.3	10.0–14.6	7	11.7
	SC	6.6–7.4	2	7.0	5.4	2	5.4
Tarso-metatarsus	Bp	11.8	1				
	Bd	12.2	1		15.2	1	

Table 2.17 (*cont.*) Size range summary

Goose (*Anser anser*)

		Phases 2, 3 & 4			Phases 5 & 6		
Bone	**Measurement**	**Range**	**n**	**Mean**	**Range**	**n**	**Mean**
Radius	Bd				10.8	1	
Ulna	Bd				13.4	1	
Tibio-tarsus	Bd				18.6	1	

Duck cf Mallard (*Anas platyrhynchos*)

		Phases 2, 3 & 4			Phases 5 & 6		
Bone	**Measurement**	**Range**	**n**	**Mean**	**Range**	**n**	**Mean**
Humerus	Bp				20.1	1	
Carpo-meta-carpus	Did				7.4	1	
Femur	GL				50.8	1	
	Bp				13.4	1	
	Bd				12.6	1	
	SC				5.1	1	

Note: Measurements are made according to the scheme of von den Driesch (1976) and are expressed in millimetres. Additional measurements on the humerus are after Legge and Rowley-Conwy (1988). Horn core measurements are as follows: max. = maximum diameter; min = minimum diameter; OC = outer curvature; BC = basal circumference; * indicates an estimated measurement.

In the post-medieval period at Parliament, there was some evidence of animals which stood taller than pony height.Thus, two metacarpals from Period 4.1 were estimated to come from animals of 14:2 hands/1.48m (a pony) and 15 hands/1.54m (a horse). One fragmentary skeleton from Period 3 had an estimated withers height of 15:1 hands/1.56m. The smaller medieval ponies may have been pack animals, but the larger post-medieval individuals may well have been riding horses.

Two bones of dog, probably from the same individual, were amongst the very small animal bone sample from early medieval Period 1. This animal proved to be a large one, standing at approximately 0.72m high at the shoulder, calculated using the method of Harcourt (1974). In a study of medieval Scottish dogs, the archaeological evidence showed that the largest animal came from a site at Meal Vennel in Perth, and was approximately 0.64m tall at the shoulder (Smith 1998, 862). Another tall individual is known from the Byre Theatre site in St Andrews, of about 0.7m (Smith 2001). However, the shoulder height of the Byre dog was calculated by a different method, that of Clark (1995, 22), based on the metapodials, and thus there is a danger of not comparing like with like. The dog from Period 1 at the Parliament site is, however, probably still slightly larger than other known medieval individuals. It may represent a hunting animal.

A dog ulna from Period 3 also came from a large animal, of approximately 0.71m shoulder height. In Period 4.1, a post-medieval dog metatarsal was estimated to have come from an animal of approximately 0.65m, using Clark's (1995) factors. The dog bones from the Parliament site are interesting in that the medieval examples are larger than those already known from Scotland.

The assemblage of cat bones from the site was unfortunately small. Of the measurable material, the single medieval bone, a tibia from Period 2.3, fell within the known range at PHSE, as did a post-medieval humerus and ulna. A single large femur from post-medieval Period 3 was much larger than typical medieval examples. However, since medieval cats appear to have been much smaller than their modern-day equivalents, this is possibly not surprising. It may have come from a large male domestic cat, or even the wild species, although there is no proven method for distinguishing between the long bones of the two.

Measurable bones of domestic fowl were present in both the medieval and post-medieval periods, although perhaps more plentiful in the latter. However, with one exception (a proximal femur), both the medieval and post-medieval birds were within the PHSE ranges (Smith & Clark forthcoming). Similarly, the goose bones were within the PHSE ranges.

Abnormalities of bone

A catalogue of abnormal bones is presented in table 2.18. In general, these abnormalities were infrequent and often fairly insignificant and only the most severe are discussed here. Cattle, sheep/goats and horses were the only species affected. The poor condition of the bones may, however, be responsible for the apparently low incidence of diseases affecting the skeleton.

Dental abnormalities

Dental abnormality was apparent on a cattle incisor (Period 2.3) which displayed a degree of enamel hypoplasia on its buccal surface. This condition manifests as ridges in the tooth enamel and is caused by disruption during the period when

Table 2.18 Catalogue of abnormal bone

Phase	Context	IADB	Species	Bone	Details
3 H-ex	1568	4196	Cattle	1st phalange	Extension of proximal articulation.
4 S	794	2421	Cattle	L mandible	PM2 absent. Alveolus pitted and rough. Probable ante-mortem tooth loss.
4 H-ex	694	1879	Cattle	1st phalange	1 Type 1 lesion in proximal articulation; 1 large lesion, distal; extension of distal articulation.
4 H-ex	726	2245	Cattle	Skull	Smooth-edged perforations in parietal. Eight holes present, varying in diameter from 4.8mm to 11.2mm. Distributed mainly in centre and on right parietal with exception of one hole near junction of left frontal.
4 H-ex	776	2391	Cattle	Tooth	Incisor; enamel hypoplasia on buccal surface.
4 H-ex	811	2505	Horse	L calacaneum	Small interarticular lesion on sustentaculum (articulation for astragalus). Slight bone deposition around edge of facet. Slight degree of eburnation corresponding to articular facet of astragalus (q v).
4 H-ex	811	2505	Horse	L astragalus	Bone deposition and slight eburnation on articulation for calcaneum (q v). Slight eburnation and interarticular lesion on medial edge of navicular facet.
4 H-ex	811	2505	Horse	Lateral splint (metatarsal I)	Interarticular lesion around edge of proximal articulation. Associated with astragalus, calcaneum above, as well as metatarsal II/III and medial splint; represents lower left hind leg.
4 H-ex	825	2580	Large Ungulate (cf horse)	Thoracic vertebra	Caudal articulation of vertebral centrum and rib facets deeply pitted and eroded; extension of articular facets; bone deposition extending to body of vertebra, ventral. Slight eburnation on caudal rib facet. Rib facets on cranial aspect are extended.
4 H-ex	825	2580	Large Ungulate (cf horse)	Ribs	Three examples with new bone formation on shafts. May be associated with above vertebra.
5 H-ex	1620	4526	Sheep/goat	Tooth	Lower M3 Fifth cusp reduced. Root twisted and deformed.
6 H-ex	236	383	Sheep/goat	Metatarsal (distal)	New porous bone formation on anterior ridge of shaft (? caused by lifting of periosteum; traumatic damage).
6 H-ex	859	3385	Sheep/goat	R metatarsal (distal)	Medial distal trochlea extended. Interarticular lesions present on bony extension.
6 H-ex	859	3385	Horse	Navicular tarsals	Fused tarsals: navicular, lateral cuneiform and mid cuneiform. Specimen in poor, abraded condition, but some evidence of interarticular lesions on lateral cuneiform and slight new bone growth.

the tooth is forming in the jaw. An infectious or other serious illness during this formative period is sufficient to cause such a disruption. Possible ante-mortem tooth loss was observed in a cattle mandible from Period 2.3. Here, the lower second premolar was absent and the corresponding alveolar region of the jaw was pitted and roughened, which would not be the case if the absence had been congenital. The tooth is most likely to have been lost because of the effects of periodontal disease, or possibly traumatic damage. A further dental abnormality was noted in a sheep/goat third molar, in which the fifth cusp was of a reduced size. This abnormality occurs fairly regularly in archaeological material, and has been observed in Scottish cattle, sheep/goats and red deer from the Iron Age onwards. It is thought to be congenital in origin (Andrews & Noddle 1975) and would have had no effect on the health of the affected animals.

Abnormalities of joints

A small collection of articulating horse tarsals, the remains of a left lower hind leg, was affected by interarticular lesions between the tarsals, bone deposition around the edges of articulating facets and slight eburnation (polishing) of the joint surfaces (Period 2.3). Affected were the calcaneum, astragalus and proximal articulation of the lateral splint (metatarsal I). The major metatarsal was also present but was not visibly affected. The condition may be described as spavin, which is an arthropathy of the hock joint. Baker and Brothwell (1980, 118) consider several causal factors to play a part in this disease, including bad conformation of the leg, faulty shoeing, heavy work and concussion against hard surfaces. Spavin interferes with the flexion of the joint and results in lameness, most obvious when the horse first comes out of the stable, but decreasing with exercise (Smythe & Goody 1975, 66). Incidentally, the Parliament horse bones bore evidence of knife cuts, and it is interesting to speculate that the animal was deliberately culled and skinned because of its lameness.

A further group of horse tarsals (Period 4.1) was fused together by a disease process. The group consisted of the navicular tarsal, lateral cuneiform and mid cuneiform, and there was some evidence of interarticular lesions on the lateral cuneiform accompanied by slight new bone growth. This is probably also a case of spavin which would have resulted in lameness.

An arthritic condition was noted on a large ungulate (most probably horse) thoracic vertebrae and three associated ribs. The vertebra was affected by extensive new bone formation, extension of the articular surfaces, eburnation on the caudal rib facet and pitting of the articular surfaces, while the ribs were affected by a well-developed new bone growth on the shafts. The pathology meets the criteria for osteoarthritis (Baker & Brothwell 1980, 115). As with the horses affected by spavin, this animal may have been culled because of its poor state of health.

2.3.4 Discussion of the mammalian and bird remains

Perhaps the most notable aspect of the Parliament faunal assemblage is the dominance of sheep/goats over cattle. This is at first sight unusual in a medieval urban context, since at most of the sites which have been investigated to date, cattle have been the predominant species (see Smith 1996, table 4 for a summary of relative frequencies for sites in Perth). It is thought that bulk sieving did not bias the retrieval of bones in favour of sheep/goats, and the reason for their prevalence may have more to do with factors of site economy than with taphonomy.

Although sheep bones were also in the majority at Queensberry House, the bias towards sheep with respect to cattle was not so marked as outside the building. Several factors may be responsible for this difference: firstly, the conditions of preservation outside the building may not have been identical to those at Queensberry House. Here, bones showed evidence of better preservation, probably because of the presence of lime mortar and crushed oyster shell in the surrounding deposits ensuring less acidic (and thus more favourable) conditions. Secondly, some of the material from Queensberry House was recovered from a long-term watching brief, rather than controlled excavation. These factors may have favourably affected the retrieval of cattle bones with respect to sheep bones at Queensberry House.

To date, the majority of excavations at medieval sites have taken place on Scotland's north-eastern seaboard, but despite this geographical similarity, there is a clear contrast with the Parliament site, at least as regards the relative frequencies of the most economically important species. As noted above, however, investigations in medieval Peebles have also recovered evidence of a primarily sheep-based economy, which continued into the post-medieval period. In the Borders, the influence of the great medieval religious houses of Melrose, Jedburgh, Dryburgh and Kelso provided the impetus for sheep-rearing, and it may be that the Abbey of Holyrood, intimately associated with the burgh of Canongate, was similarly influential as regards the occupiers of the Parliament site.

Sheep were of vital importance in the economy of Scotland because of the wool and woolfells (skins with the wool still attached) which they produced. Customs raised on these products sustained the economic life of the burghs. In the later medieval period, an important trade took place between Edinburgh and Bruges in the Low Countries, involving hides, wool, woollen cloth and skins (Davidson & Gray 1909, 130). The bones from the medieval phases of the Parliament site may reflect the importance of this trade. On the evidence of the Exchequer Rolls, Edinburgh raised more revenue on wool, woolfells and woollen cloth between 1460 and 1599 than any other Scottish burgh (Guy 1982, Fig. 3.1). Although the Parliament site was situated within the adjacent burgh of Canongate, rather than in Edinburgh itself, it is not unreasonable to suppose that the high relative frequency of sheep bones found at the site relates to this lucrative trade in sheep by-products. While sheep predominated, cattle hides were nevertheless an invaluable source of taxable revenue, and during the period between 1460 and 1599 the Exchequer Rolls indicate that Edinburgh was the top hide-exporting burgh in Scotland (ibid, Fig. 4.5).

In addition to the products of the larger domesticated mammals, documentary evidence shows that smaller animals were also exploited for their pelts. The record of the toll to be paid, the *Assisa Tolloneis*, records an early reference to the custom to be raised on different types of skins, or 'peloure': 'of a tymmyr of skynnis of toddis quytredis mertrikis cattis beveris sable firrettis . . . iiijd'. In other words, a custom of fourpence was to be paid on a quantity of skins called a 'timmer', about 40 skins held between two boards, or timbers. These skins were of fox, stoats or weasels, martens, cats (wild or domestic), beavers, sables or ferrets. A timmer of squirrel ('skurel') skins, on the other hand, raised only twopence (APS, c2, I, 667). The presence of fox bones at the Parliament site is probably evidence of this trade in pelts.

However, as well as furs and hides from the more obvious domesticates, there is evidence from the site of skinned dogs and horses. This is not unusual in medieval and post-medieval Scotland: similar evidence has been found at sites in Perth, Inverness, Stirling, Aberdeen and Elgin (Smith 1998). However, at the Parliament site the skinning may be related to a tradition of leather workers living in the Canongate.

There was no evidence for any animal-related industry such as skinning having taken place at Queensberry House. Here, the bones were probably domestic in origin and indicated a diet containing the meat of cattle, sheep, pig, rabbit, hare, domestic poultry, partridge and marine shellfish.

Although it is not known whether any fleshers (butchers) inhabited the site, there is ample evidence on the animal bones for their activities. Interestingly, an entry in the Acts of Parliament of Scotland for the year 1540 'For policy in Edinburgh' warns all fleshers dwelling in the wynd on the east side of 'halzyrudhouse' against 'temyng of intellis of beistis generand corruptioun' under the pain of confiscation 'of all sic flesche slane' by the provost and baillies of Edinburgh and the Canongate (APS, c20, II, 374). The act seems to have been necessary because of the squalor caused by dumping of entrails in the streets 'quairby all strangearis and utheris . . . passis and repassis' (ibid).

In addition to the large animals which were the fleshers' stock-in-trade, smaller creatures were killed and eaten. These included domestic poultry, wild birds such as grey partridge and red grouse and, in the later medieval period, rabbits. The relative prices of these in Edinburgh in the year 1553 indicate that the best quality 'cunnyng' (rabbit) should cost 18 pence, a capon 16 pence, a 'tame guis' 20 pence and a 'wild guis' the same (Davidson & Gray 1909, 40). Smaller wild fowl are also listed; the range of birds sold and consumed in Edinburgh in the 16th century included partridge ('pordrik'), red grouse ('mure hen'), capercailzie, black grouse ('black cok' and 'gray hen'), woodcock, snipe, pigeon ('pudzeon'), wild duck ('wyld duik') and teal, which are all still consumed at the present day, as well as several species which are no longer commonly eaten: lapwing, plover, dotterell and larks or 'lawerocks', which sold at fourpence the dozen. To this list of edible birds might be added the cormorant and the black-headed gull, whose bones were found at the Parliament site in Period 4.1. The habitat of some of these wild birds and mammals may have been the environs of Arthur's Seat, described by Fynes Moryson in 1598 as being situated in a 'Parke of Hares, Conies and Deare' (Hume Brown 1891, 83).

The diet of the inhabitants of the Canongate also included large quantities of fish (Part 2.4) and shellfish, most notably oysters (tables 2.19 and 2.20). While many of the oyster shells found on site were coated with mortar, having apparently been used as pinning between masonry, it seems likely that the contents were eaten first. The oyster beds of the Forth were at one time extremely bountiful, and in the 18th century supported a fishery based in Prestonpans, Cockenzie and Newhaven (Yonge 1960, 157). In the late 16th century they yielded, according to Fynes Morison, 'plentifully . . . (among other fish) store of oysters and shel fishes' (Hume Brown 1891, 85). A sense of the rate at which the Forth beds were depleted is indicated by the record of exports from the Port of Leith: in the year 1666, 721,000 casks went out through the port, yet in 1690, the number had fallen to 10,000 (Mowat 1994, 219). Now, alas the oyster beds in the Forth are extinct, mainly due to continued overfishing.

Table 2.19 Mollusc catalogue (hand-excavated contexts; for abbreviations, see table 2.20)

				Oyster (*Ostrea edulis*)			
Phase	Context	IADB no.	Species	Upper	Lower	Fragment	Other species
0	019	071	*Helix aspersa*				11
0	049	068	*Ostrea edulis*			1	
0	143	073	*Ostrea*		1		
0	145	075	*Ostrea*	2	4	3	
0	176	033	*Littorina littorea*				1
0	182	078	*Ostrea* (2 valves have mortar adhering)	3			
0	182	078	*Patella* sp				1
0	182	078	*Mytilus edulis*				1
0	190	533	*Ostrea*		1		
0	685	1877	*Ostrea*		1		
0	1000	059	*Ostrea*		1		
0	1000	060	*Ostrea*	1	1		
0	1000	063	*Ostrea*				
0	1000	065	*Ostrea*	1	1		
0	1000	065	*Buccinum*				1
0	1000	369	*Aequipecten opercularis*				1
0	1000	369	*Ostrea*	21	18		
0	1000	369	*Buccinum*				1
0	1000	369	*Helix aspersa* (land species)				3
0	1000	4502	*Ostrea*	1	1		
0	1415	5009	*Ostrea*	1			
0	1733	5000	*Ostrea*	11			
1	756	2242	*Ostrea*	2	1	+	
2	734	2248	*Ostrea*			3	
2	745	2227	*Ostrea*	16	17	+	
2	745	2227	*Nucella*				1
2	1726	4996	*Ostrea*	1	1	+	
3	752	2208	*Ostrea*	1	1	1	
3	763	2253	*Ostrea*	5	8		
3	763	2253	*L littorea*				1
3	763	2253	Unidentified			+	
3	785	2486	*Ostrea*		1		
3	1634	3516	*Ostrea*	1			

Table 2.19 (*cont.*) Mollusc catalogue (hand-excavated contexts; for abbreviations, see table 2.20)

				Oyster (*Ostrea edulis*)			
Phase	Context	IADB no.	Species	Upper	Lower	Fragment	Other species
3	1640	4625	*Ostrea*	12	10	7	
3	1640	4625	*Buccinum*				1
3	1727	4837	*Ostrea*	3	3		
3	1730	5018	*Ostrea*	1	1		
3	1730	5049	*Ostrea*	2		+	
3	1731	4429	*Ostrea*	3	1	+	
3	1754	5006	*Ostrea*	3	4	+	
4	668	1516	*Ostrea*	4	5		
4	668	1516	*Buccinum*			1	
4	679	1952	*Ostrea*	2	4	3	
4	687	1885	*Ostrea*		1		
4	694	1880	*Ostrea*	8	7	1	
4	697	1817	*Ostrea*		1		
4	700	2004	*Ostrea*	1	1		
4	725	2212	*Ostrea*	3	2		
4	725	2212	*L littorea*				1
4	726	2264	*Ostrea*		1		
4	735	2008	*Ostrea*		1		
4	776	2392	Unidentified (abraded)				1
4	776	2392	*Ostrea*		1		
4	806	2495	*Ostrea*		2		
4	807	2501	*Ostrea*		1	++	
4	811	2509	*Ostrea*	10	12	+	
4	811	2509	*Buccinum*				1
5	215	855	*Ostrea*	3			
5	302	1240	*Ostrea*			+	
5	563	2563	*Buccinum*				1
5	660	1353	*Ostrea*		1		
5	682	1595	*Ostrea*		1		
5	738	1998	*Ostrea*		1		
5	803	2493	*Ostrea*	2	1	+	
5	803	2493					
	Nucella				1		
5	1620	4507	*Ostrea*	7	9	+	
5	1620	4507	*L littorea*				1
5	1620	4707	*Buccinum*				1
5	1676	4813	*Ostrea*	1	1	+	
5	1766	4436	*Ostrea*		1	+	
6	227	511	*Ostrea*	4	2	2	
6	236	384	*L littorea*				1
6	242	556	*L littorea*				1
6	316	1362	*Ostrea*	1	2		
6	512	987	*Ostrea*	22	27	+++++	
6	514	593	*Ostrea*	2	1	+	
6	514	593	*L littorea*				2

Table 2.19 (*cont.*) **Mollusc catalogue (hand-excavated contexts; for abbreviations, see table 2.20)**

Phase	Context	IADB no.	Species	Oyster (*Ostrea edulis*) Upper	Lower	Fragment	Other species
6	514	1188	*Ostrea*	7	10	++	
6	518	865	*Ostrea* (1 fragment with mortar adhering)	2		3	
6	518	865	*Cerastoderma* sp				1
6	540	439	*Ostrea*			2	
6	540	474	*Ostrea*		1		
6	540	632	*Ostrea*			+	
6	540	632	*L littorea*				2
6	540	641	*Ostrea*			1	
6	540	648	*Ostrea*			+	
6	540	648	*L littorea*				1
6	540	648	Unidentified (abraded fragment)				1
6	540	660	*Ostrea*	1	1	++	
6	540	660	*Nucella*				1
6	540	660	*Buccinum* (juvenile; very small)				1
6	540	675	*Ostrea*			+	
6	540	685	*Ostrea*			2	
6	540	733	*Ostrea*			2	
6	556	553	*Ostrea*		1		
6	558	803	*Ostrea*	10	12	++	
6	558	803	*Patella*				3
6	559	1090	*Ostrea*	8	5	8	
6	559	1090	*Nucella*				1
6	559	1090	Unidentified (abraded fragment)				1
6	560	1149	*Ostrea*	1	1		
6	560	1149	*Mytilus*		1	6	
6	561	630	*Ostrea*	4	1		
6	590	1203	*Ostrea*	6	6	9	
6	590	1203	Gastropod cf *Buccinum*				1
6	631	1222	*Ostrea*		1		
6	634	1228	*Ostrea*	1	1		
6	636	1371	*Ostrea* (1 valve with mortar adhering)	2	1		
6	690	2085	*Ostrea*	2	4		
6	707	1800	*Ostrea*	2	1		
6	709	1970	*Ostrea*	5	5	4	
6	713	1781	*Ostrea*		2	4	
6	739	1898	*Ostrea*	1			
6	1600	4445	*Ostrea*	3	2	5	
6	1600	4445	*L obtusata*				1
6	1600	4445	*Cerastoderma*				1
6	1604	4449	*Ostrea* (mortar adhering)	3			
6	1608	4453	*Ostrea*	1	1		
6	1610	4455	*Ostrea*		1		
6	1612	4460	*Ostrea*	3	1		
6	1614	4485	*Ostrea*	3	2	3	

Table 2.19 (*cont.*) Mollusc catalogue (hand-excavated contexts; for abbreviations, see table 2.20)

Phase	Context	IADB no.	Species	Oyster (*Ostrea edulis*) Upper	Lower	Fragment	Other species
6	1616	4493	*Ostrea*		1	1	
6	1618	4471	*Ostrea*	1	2	5	
6	1622	4480	*Ostrea*	3	2	+	
6	1622	4480	*L littorea*				1
6	1625	4509	*Ostrea* (1 valve with circular hole bored through)		2	1	
6	1625	4509	Gastropod				2
6	1625	4509	*Patella* sp				1
6	1625	45009	*L littorea*				1
6	1638	4628	*Ostrea*	2	5	+	
6	1638	4628	*Buccinum*				1
6	1652	4660	*Ostrea*		1		
6	1654	4819	Unidentified				1
6	1656	4666	*Ostrea*		1	1	
6	1657	4669	*Ostrea*	1	1		
6	1657	4669	*L littorea*				1
6	1657	4669	*Ostrea*	1	1		
6	1659	4648	*Ostrea*	1		2	
6	1678	4676	*Ostrea*		1		
6	1678	4676	*L obtusata*				1
7	235	346	*Nucella lapillis*				1
7	277	829	*L littorea*				1
7	277	829	*Nucella*				1
7	280	839	*Ostrea*	2	3	2	
7	617	1214	*Ostrea*	1	3	1	
7	632	894	Unidentified cf *Lutraria* (abraded)				1
7	1738	5003	*Ostrea* (mortar adhering to 1 valve)	2	1	+	
7	1739	4968	*Ostrea* (mortar adhering to 1 valve)	1	2	5	
7	1776	5015	*Ostrea*	1			
7	1783	5025	*Ostrea*	6	5	++	
7	1787	5021	*Ostrea*		1		
8	176	033	*Ostrea*	2			
8	269	611	*Mytilus*				1
8	269	611	Unidentified				1
8	273	493	*cf Ostrea*			1	
8	277	829	*Ostrea*			1	
8	287	568	*Mytilus*				3
8	536	795	*Buccinum ondatum*				1
8	615	880	*L littorea*				1
9	532	520	*Ostrea*		1		
9	532	520	*Cerastoderma* sp				1
9	541	1194	*Modiolus* sp (2 valves filled with mortar)				1
9	594	812	*Ostrea*	1	2		

Table 2.20 Mollusc catalogue (retents)

					Oyster (*Ostrea edulis*)			
					Valve			
Phase	**Context**	**Sample**	**IADB**	**Species**	**Upper**	**Lower**	**Fragment**	**Other species**
0	39	002	227	*Ostrea edulis*	1		2	
0	145	23	4699	*Littorina littorea*				1
0	190	44	4701	*Ostrea*			3	
0	557	513	1267	*Ostrea*		1	3	
0	557	513	1267	*L littorea*				1
0	860	2610		*Ostrea*			2	
0	936	2903		*Ostrea*	1			
0	942	2909	3367	*Ostrea*		1	5	
0	942	2909	3367	*L obtusata*				1
0	992	3428	4708	Unidentified sp				+
0	992	3429	4709	*Ostrea*		1	4	
0	992	3430		*Ostrea*			2	
0	992	3432	3570	*Ostrea*		1	14	
0	1000	0369		*Ostrea* (mortar adhering to 1 valve)	4	4		
0	1000	0369		*Cerastoderma*				1
0	1000	3278		*Ostrea*		1		
0	1001	3488		*Ostrea*	2			
0	1088	3259	3547	*Ostrea*			++	
0	1088	3500		*Ostrea*		1		
0	1103	3380		*Littorina sp*				4 fragments
0	1564	3852	4209	Unidentified				+
0	1572	4084		*Ostrea*	1	3		
0	1572	4084		*L littorea* (mortar adhering)				1
0	1646	4351		*Ostrea*		1		
0	1646	4352		*Cepea hortensis* (land species)				1
0	1680	4366		*Ostrea*			1	
0	1733	4393		*Ostrea*	1			
1	790	2339	043	Pectinidae				1
2	745	1788	4875	*Ostrea*	1	3	15	
2	758	1979	2259	*Ostrea*			+++	
2	768	2014	2307	*Ostrea*		1	++	
2	768	2014	2307	*L littorea*				1
2	768	2015		*Ostrea*		1		
2	778	2033	2175	*Ostrea*	2	3	+++	
2	778	2033	2175	*Buccinum*				1
2	778	2033	2175	Gastropod				1
2	778	2033	2175	Pectinidae				1
2	778	2163		*Ostrea*				2
2	861	2689		*Ostrea*	1	2		
2	1767	4413		*Ostrea*	1			
2	1767	4413		*L littorea*				1
3	612	1606	2149	Unidentified				1

Table 2.20 (*cont.*) Mollusc catalogue (retents)

Phase	Context	Sample	IADB	Species	Oyster (*Ostrea edulis*) Valve Upper	Lower	Fragment	Other species
3	612	2671		*Ostrea*	1	1		
3	612	3033	3333	*Ostrea*			1	
3	612	3093	3214	*Ostrea*	1			
3	667	1103	2094	Unidentified				1
3	733	1782	4873	*Ostrea*	1		2	
3	742	1785	4874	*Ostrea*			1	
3	743	1786		*Ostrea*	1			
3	743	1786		*L littorea*				1
3	763	2009	2287	*Ostrea*	2	1	+	
3	763	2009	2287	*Nucella*				1
3	763	2076	2299	*Ostrea*	1		+	
3	763	2076	2299	*L littorea*				1
3	781	2165	4876	*Ostrea*			4	
3	785	2330	2467	*Buccinum*				1
3	1568	3858	4249	*Ostrea*			2	
3	1634	4344		*Ostrea*	1		2	
4	611	1598	4938	*Ostrea*			2	
4	652	2101	994	*Ostrea*			2	
4	679	2173	2406	*Ostrea*		1	+	
4	679	2173	2406	cf *Mytilus*				1
4	681	2162	2263	*Ostrea*		1	6	
4	687	1357	1906	*Ostrea*			+++	
4	687	1358	1586	*Ostrea*			5	
4	687	1358	1586	*L littorea*				1
4	687	1423	3994	*Ostrea*			1	
4	687	1423	4943	*Ostrea*			2	
4	694	1596	4944	*Ostrea*	1			
4	726	1740	4871	*Ostrea*			1	
4	727	1771	4872	*Ostrea*			1	
4	727	1771	4872	Gastropod cf *Buccinum*				1
4	807	2222	2453	Unidentified				1
4	811	2340	2515	*Ostrea*	1		5	
4	822	1822	2535	*Ostrea*	1	1	7	
4	825	2581		*Ostrea*		1		
4	835	2615		*Ostrea*	9	15	+	
4	835	2615		*Buccinum*				1
4	835	2615		Pectinidae				1
4	836	2374	4706	*L littorea*				1
4	837	2376	2759	*Ostrea*			7	
4	837	2376	2759	*L littorea*				2
4	837	2376	2759	Gastropod				1
4	912	2919		*Ostrea*	2	4		

Table 2.20 (*cont.*) Mollusc catalogue (retents)

					Oyster (*Ostrea edulis*)			
					Valve			
Phase	Context	Sample	IADB	Species	Upper	Lower	Fragment	Other species
4	993	3463		*L littorea*				2 (mortar embedded in mouth of one shell)
4	993	3463		*L obtusata*				2
4	993	3463		*Ostrea*	6	1	3	
4	1536	3810	4282	*Ostrea*		1		
4	1538	3811	4297	*Ostrea*		1	4	
4	1538	3811	4297	Gastropod				++
5	215	420	1055	*Ostrea*			5	
5	215	1093	1390	*Ostrea*	1		1	
5	215	1094	1459	*Ostrea*			1	
5	215	1094	1459	*L littorea*				1
5	215	1095	1549	*Ostrea*			1	
5	215	1096	2030	*Ostrea*			1	
5	215	1099	1866	*Ostrea*			3	
5	215	1100	1396	*L littorea*				1
5	215	1100	1396	*Ostrea*			1	
5	563	949	1856	*Ostrea*			2	
5	563	955	1702	*Ostrea*		1		
5	563	955	1702	Unidentified fragment				1
5	563	966	1334	*Ostrea*	1	6		
5	563	967	1502	*Ostrea*	1			
5	563	968	1339	*Ostrea*		1		
5	563	971	1473	*Ostrea*	1		3	
5	563	972	1755	*Ostrea*			1	
5	563	973	1762	*Ostrea*		1	3	
5	563	976	1773	*Ostrea*			2	
5	563	2897	3177	*Ostrea*			2	
5	563	2897	3177	*Cerastoderma* sp				3
5	563	2897	3010	*Ostrea*			+	
5	563	2959	3351	*Ostrea*	1		5	
5	563	2962	3189	*Ostrea*			1	
5	659	1213	1510	*Ostrea*	1	2	4	
5	659	1213	1510	*L* cf *littorea*				1
5	659	1213	1510	*L obtusata*				1
5	659	1213	1510	*Littorina sp*				1
5	659	1213	1510	cf *Nucella*				1
5	659	1213	1510	Pectinidae				1
5	659	1213	1510	Unidentified				1
5	659	1230	4940	*Ostrea*		1		
5	659	1230	4940	*L littorea*				2
5	659	1230	4940	*L obtusata*				1
5	659	1248	1579	*Ostrea*	1		1	

Table 2.20 (*cont.*) Mollusc catalogue (retents)

					Oyster (*Ostrea edulis*)			
					Valve			
Phase	**Context**	**Sample**	**IADB**	**Species**	**Upper**	**Lower**	**Fragment**	**Other species**
5	659	1249	4939	*L littorea*				2
5	659	1249	4939	*L obtusata*				1
5	803	2294	4705	*Ostrea*		1		
5	1502	3884		*Ostrea*			4	
5	1507	3483	3690	*Ostrea*	21	14	+++++	
5	1507	3483	3690	*L obtusata*				2
5	1507	3483	3693	*L littorea*				1
5	1507	3483	3693	Gastropod				1
5	1507	3483	3693	Unidentified				2
5	1507	3484		*Ostrea*	13	6	1	
5	1507	3484		*Littorina* sp				1 (embedded in mortar)
5	1507	3484		*L obtusata*				2 (very small)
5	1507	3484		*L littorea*				4 (very small)
5	1507	3484		*Littorea* sp				3
5	1507	3484		*Turritella* sp				1
5	1507	3484		*Nucella lapillus*				1
5	1511	3695		Unidentified fragments				+
5	1513	3691		Unidentified fragments				+
5	1513	3692	4312	*Ostrea*			3	
5	1513	3694	4304	*Ostrea*		1	1	
5	1523	4057		*Ostrea*	3		1	
5	1525	3711		Unidentified fragments				+
5	1525	3711		Gastropod				+
5	1620	4331		*L littorea*				1 (very small)
5	1670	4409		*Nucella lapillus*				1
5	1670	4409		*L obtusata*				2 (very small; mortar adhering)
5	1766	4412		*Ostrea*			2	
5	1766	4412		*L littorea*				1
5	1766	4412		*L obtusata*				1
6	307	775	1140	*Ostrea*		1	2	
6	307	775	1140	Gastropod				1
6	307	775	1140	Unidentified fragments				2
6	307	776	1532	Unidentified bivalve				1
6	307	777	1540	*Ostrea*			2	
6	307	778	1555	*Ostrea*			3	
6	307	779	1262	*Ostrea*			1	
6	316	997	4704	*Ostrea*	1		6	
6	514	463	4864	*Ostrea*		1		
6	514	463	4864	*L littorea*				1
6	514	463	4864	*L obtusata*				1 (mortar embedded in mouth)

Table 2.20 (*cont.*) Mollusc catalogue (retents)

Phase	Context	Sample	IADB	Species	Oyster (*Ostrea edulis*) Valve Upper	Lower	Fragment	Other species
6	540	416	1422	Unidentified fragment				1
6	540	1143	040	*Cerastoderma* sp				1
6	540	2543	3130	Gastropod				1
6	540	2543	3130	Unidentified				8
6	540	2544	3082	*Ostrea*	1		+	
6	540	2544	3082	cf *Mytilus*				1
6	540	2545	3147	*Ostrea*			2	
6	540	2545	3147	*L littorea*				2
6	540	2545	3147	Unidentified				1
6	540	2546	2831	*L littorea*				1
6	540	2546	2831	Unidentified				1
6	540	2547	2693	*Ostrea*			2	
6	540	2548	2702	Gastropod				1
6	540	2548	2702	Unidentified				1
6	540	2548	2702	Unidentified				1
6	540	2550	2716	*Ostrea*	1		+	
6	540	2550	2716	*Mytilus*				1
6	540	2550	2716	*Cerastoderma* sp				1
6	540	2550	2716	*L littorea*				1
6	540	2551	3099	*Ostrea*			3	
6	540	2553	2731	*Ostrea*	1		+	
6	540	2554	2740	*Ostrea*			+	
6	540	2555	3118	*Nucella*				1
6	540	2556	2846	*Ostrea*	1		+	
6	558	494	4865	*Ostrea*	5	4	2	
6	558	507	1288	*Ostrea*	5	6	10	
6	558	507	1288	*L littorea*				2
6	559	470	4866	*Ostrea*	1	1	5	
6	559	470	4866	Pectinidae				1
6	559	470	4866	*Cerastoderma* sp				1
6	559	470	4866	*L littorea*				2
6	559	470	4866	*L obtusata*				1
6	559	470	4866	Gastropod				1
6	561	531	1296	*Ostrea*	8	5	9	
6	561	531	1296	*L littorea*				1
6	561	531	1296	*L obtusata*				1
6	561	531	1296	*Cerastoderma* sp				3
6	561	691	4867	*Ostrea*	4	1	8	
6	561	691	4867	*Turritella* sp				1
6	562	518	1301	*Ostrea*			1	
6	562	518	1301	Gastropod cf *Nucella*				1
6	589	516		*Ostrea*	1			
6	591	522		*Ostrea*			2	

Table 2.20 (*cont.*) Mollusc catalogue (retents)

Phase	Context	Sample	IADB	Species	Oyster (*Ostrea edulis*) Valve Upper	Lower	Fragment	Other species
6	591	522		*L littorea*				1
6	592	692		*L littorea*				2
6	634	1641	1645	*Ostrea*			5	
6	643	3381		*Ostrea*	1	2	2	
6	663	1024	4942	*L littorea*				1
6	709	1718	4868	Gastropod				+
6	712	1614	4869	*Ostrea*		1		
6	712	1614	4869	*L littorea*				2
6	715	1819	4870	*Ostrea*			1	
6	859	2910	3262	*Ostrea*		1		
6	859	2911	3255	*Ostrea*	1			
6	859	3386		*Ostrea*	3	4	+	
6	859	3386		Gastropod				1
6	888	3041	3453	*Ostrea*		1		
6	888	3042	3399	*Ostrea*		1	3	
6	888	3043	3407	*Ostrea*		1	3	
6	888	3045	3478	*L obtusata*				1
6	888	3045	3478	Unidentified cf *Ostrea*				2
6	888	3046	3468	*Ostrea*		1		
6	921	2825	4719	*Ostrea*			1	
6	921	2825	4719	*L littorea*				1
6	921	2825	4719	Gastropod				1
6	921	2868	4707	*L littorea*				1
6	949	2946	3376	*Ostrea*		1	9	
6	951	3026		*L littorea*				1 (embedded in mortar)
6	961	3027		*Ostrea*	1			
6	961	3027		*L obtusata*				1
6	961	3027		*Littorina* sp				2
6	961	3027		*Unidentified* sp				+
6	974	3231		*Ostrea*	1			
6	1087	3507		*Ostrea*	1		1	
6	1610	4334		*Ostrea*		1		
6	1612	4333		*Ostrea*	1	1	1	
6	1614	4336		*Ostrea*	1			
6	1616	4337		*Ostrea*	1			
6	1622	4324		*Ostrea*			2	
6	1626	4332		*Littorina* sp				1 (very small)
6	1626	4332		*Ostrea*	1			
6	1638	4349		*Ostrea*	2	2	2	
6	1648	4356		*Ostrea*		1	6	
6	1656	4360		*Ostrea*		1		
6	1700	4383		*L littorea*				4

Table 2.20 (*cont.*) Mollusc catalogue (retents)

					Oyster (*Ostrea edulis*)			
						Valve		
Phase	Context	Sample	IADB	Species	Upper	Lower	Fragment	Other species
6	1700	4383		*Littorina* sp				3 fragments
6	1704	4385		*Ostrea*		1	1	
6	1706	4386		*Ostrea*		1		
6	1710	4387		*L littorea*				1
6	1729	4392		*Ostrea*	3			
6	1742	4398		*Ostrea*	1			
6	1742	4398		*L obtusata*				1
6	1746	4400		*L littorea*				3 (very small)
6	1746	4400		*Littorina* sp				1 (very small)
6	1771	4414		*L obtusata*				1 (very small)
6	1773	4415		*L littorea*				1 (very small)
6	1773	4415		*L obtusata*				1 (very small)
6	1773	4415		Unidentified sp				1 fragment
7	177	29	4700	*Ostrea*		1		+++
7	177	29	4700	*L littorea*				1
7	177	29	4700	Gastropod				+
7	633	1026	4941	*Ostrea*	3	2	3	
7	633	1026	4941	Gastropod				1
7	1056	2929		*Ostrea*	1			
7	1056	2929		*Mytilus*				1
7	1062	3497		*Ostrea*	1			
7	1739	4396		*L obtusata*				1
7	1777	4418		*Ostrea*		1	++	NB Oyster valve encrusted with mortar
7	1777	4418		Unidentified				+
7	1777	4418		cf *Macoma* sp				1 (mortar adhering)
7	1783	3321		*Ostrea*		1		
7	1787	4424		*Ostrea*	1	1	1	
7	1787	4424		*L obtusata*				1
8	269	356	4703	*Mytilus edulis*				+
8	269	356	4703	*L littorea*				1 (embedded in mortar)
8	269	356	4703	*L littorea*				1 (very small)
8	269	356	4703	cf *Macoma* sp				1
8	269	356	4703	*Gibbula* sp				1
8	269	356	4703	Gastropod				+
8	269	356	4703	Unidentified sp				1 fragment in mortar
8	1045	3283		*Nucella*				1
8	1051	2935		*Ostrea*		2	2	
8	1051	2935		Unidentified (abraded fragment with mortar adhering)				1
8	1098	3803		*Ostrea*		2		

Table 2.20 (*cont.*) Mollusc catalogue (retents)

					Oyster (*Ostrea edulis*)			
					Valve			
Phase	Context	Sample	IADB	Species	Upper	Lower	Fragment	Other species
9	1069	3240		*Ostrea*			1	
9	1093	3541	3532	*Ostrea*			2	
9	1619	4339		Unidentified sp				+
9	1666	4362		*Ostrea*			+	
9	1666	4362		*L littorea*				2 (very small)
9	1666	4362		*Littorina* sp				3 (very small)

Note: + indicates up to 10 small fragments; ++ indicates more than 10 small fragments

Latin name	Common name	Latin name	Common name
Ostrea edulis	Oyster	*Nucella lapillus*	Dog whelk
Littorina littorea	Edible periwinkle/Whelk	*Gibbula* sp	Topshell
Littorina obtusata	Flat periwinkle	*Cerastoderma* sp	Cockle
Littorina sp	Flat or edible periwinkle	*Buccinum ondatum*	Buckie
Macoma sp	Tellin	Pectinidae	Scallop family
Turritella	Tower shell		

2.4 Fish remains

RUBY CERÓN-CARRASCO

2.4.1 Methodology

The fish remains from Holyrood derived from a variety of contexts. One hundred and one contexts were chosen for this analysis according to their functional description, in order to be able to assess the fish remains in terms of social and economic basis. The selected contexts, from middens, rubbish dumps, drain fills and other domestic deposits, were considered to be the most representative of the site for this purpose. The identification of the fish bone elements was done by comparison with modern fish bone reference material. All the fish bones were examined and identified to the highest taxonomic level, usually to species or to the family group. Broken fragments were classed as unidentifiable. Nomenclature follows Wheeler and Jones (1989, 122–3). Where appropriate, all major paired elements were assigned to the left or right side of the skeleton. All elements were examined for signs of butchery and burning. The preservation of the remains was recorded in terms of texture on a scale of 1–5 (indicating fresh to extremely crumbly bone) and erosion, also on a scale of 1–5 (none to extreme). The sum of both was then used as an indication of the condition of the bone; fresh bone would score 1 while extremely poorly preserved bone would score 10 (after Nicholson 1991). The fragmentation of the bone was also noted in terms of percentage to show how much of the element had survived.

The size of the cod family fish, the Gadidae, was calculated by giving an approximate size range. This was done by matching the archaeological material to modern skeletons of known size based on 'total body length'. Therefore, the elements were categorised as 'very small' (<150mm), 'small' (150–300mm), 'medium' (300–600mm), 'large' (600mm–1.2m) and 'very large' (1.2–1.5m). The size of the identified non-gadoid species was calculated by comparison with modern specimens of known size and these were categorised as 'juvenile' and 'mature' specimens. In the case of the salmon family, only vertebrae were recovered at Holyrood. These could not be identified to species level and thus were assigned to family Salmonidae, and could therefore have come from either trout (*Salmo trutta*) or salmon (*Salmo salar*).

Minimum number of individuals (MNI) was not calculated, since the assemblage was analysed as one unit, that is, regardless of the retrieval methods used, in this case hand-collected and sieved material. The sieved samples contained most of the smaller elements while the hand-retrieved samples contained the larger most robust material as well as elements from small specimens. This was considered to be a well-balanced representation as most contexts also produced both sieved and hand-collected material. Quantification was instead calculated as NISP (Number of Identified Species) by fragment count.

2.4.2 Results

A full catalogue of results is available in the site archive, and displays the results of identification by context, sample number and by retrieval method (sieved or hand-collected). Table 2.21 summarises the species representation by period and NISP.

The assemblage is dominated by fish of the cod family (Gadidae). Haddock (*Melanogrammus aeglefinus*), cod (*Gadus morhua*), whiting (*Merlangius merlangus*), saithe (*Pollachius virens*) and pollack (*Pollachius pollachius*) are the most significant species of the Gadidae group present in the assemblage. Other significant marine species include herring (*Clupea*

Table 2.21 Fish species represented in each period, by NISP

Species	Period							
	2.1	2.2	2.3	3	4.1	4.2	5.1	5.2
Cod	2	15	11	14	53	2		2
Pollack				14	12	1		
Saithe		4	1	5	45	1		
Haddock	3	7	7	16	27			8
Whiting		7	9	12	17		1	1
Gadidae	5	12	10	14	33	2	9	3
Herring	1	1	27	40	28	1		6
Mackerel				3				
Dab	1	1						
Plaice				1				
Rocker	2	6	9	7	1			
Gurnard					3			3
Dogfish			1	2				
Elasmobranch				1				
Salmon/Trout			1	1	1			
Eel					1			
3-spined stickleback			1					
Total	14	53	77	130	221	7	10	23

harengus), which was present in most contexts. Mackerel (*Scomber scombrus*), another shoaling fish, was also present in the assemblage. Rocker or thornback ray (*Raja clavata*) was also important. Flatfishes included dab (*Limanda limanda*) and plaice (*Pleuronectes platessa*). Gurnard (*Eutrigla gurnardus*) was also recovered. Non-marine species include Salmonidae (salmon/trout) and eel (*Anguilla anguilla*). A few remains of the tiny three-spined stickleback (*Gasterosteus aculeatus*) were also recovered.

2.4.3 Discussion by period

Period 2 (14th/15th centuries)

In Period 2.1 very few fish remains were recovered (table 2.21). These consisted mainly of cod family fishes (Gadidae) of which haddock and cod were the main species represented. Rocker was also present, as well as herring and dab. In Period 2.2 the main species represented was cod, while haddock, whiting and saithe were important too. Rocker was another important species represented in this period, and herring and dab were also present. In Period 2.3 herring was the main species represented. Cod, whiting and haddock were also significantly represented, as well as rocker. Dogfish and salmon/trout were also present. One bone from a three-spined stickleback was also recovered.

Period 3 (16th/17th centuries)

The main species represented was herring. Haddock, cod, whiting, pollack and saithe were all important Gadidae species present in this phase, haddock being the most plentiful. Rocker, mackerel, plaice and dogfish as well as salmon/trout were also present.

Period 4 (17th/18th centuries)

In Period 4.1 the main species represented was cod, while saithe, haddock, whiting and pollack were also present. Herring was also an important species in this phase. Rocker, gurnard and salmon/trout were present too. One eel bone was recovered.

Few fish remains were recovered from Period 4.2, though cod, pollack, saithe and herring were present.

Period 5 (18th/19th/20th centuries)

Period 5.1 also contained very few fish remains. Gadids were present in this phase, the only identified species being whiting. In Period 5.2 haddock was the main species present, while cod and whiting were also recovered. Herring and gurnard were also present in this phase.

General discussion of the fish remains

Fish resources have played an important part in the social, political, economic and religious history of Scotland. The relative safety of the East Lothian shores has offered a variety of fish species since antiquity. Fishing has been important in contributing to the food supply in Scotland, and from medieval times onwards fish have also featured prominently in Scottish commerce (Coull 1996). The importance of fishing in Scotland is related to the main concentrations of the population relatively close to the coast, which rendered sea fish relatively easily available to large numbers of the population.

The main fish stocks in Scotland are generally divided into three groups of species. These include demersal or 'white' fish such as cod, haddock, flatfishes, skates etc, which are bottom-dwellers, and the pelagic species which include herring and mackerel, species which spend part of their lives in the upper levels of the sea and move in shoals. In addition there are also freshwater fish, among which the most important is the anadromous salmon (*Salmo salar*).

Documentary records such as the Exchequer Rolls attest to the importance of fish and fishing, and, for example, they indicate an extensive trade in 'mullones' or 'stockfish', which generally means dried and salted cod. Cod is the best species suitable for this type of preservation because of its relatively large size. This process does not require barrels. Various other species have also been used for this purpose, for example saithe (coalfish), hake (*Merluccius merluccius*), ling (*Molva molva*) and haddock can also be so preserved (Coull 1996). Haddock and saithe, as well as cod, were recovered at Holyrood.

The burghs played a leading role in commercial fisheries, and matters relating to herring fishery and white fishery (fishing for cod, haddock, flatfishes, etc) were frequently mentioned in the records of the Convention of Royal Burghs (ibid). Fishing was controlled by the Laws of the Four Burghs, and thus the fishing industry was strictly a burghal monopoly. Each burgh had the powers to pass regulations affecting the price, quality and sale of fish. The building of boats and harbours, also wood for barrels, and the provision of salt, all connected with the fishing industry, were controlled by these regulations (Anson 1950).

In the Firth of Forth, the ports were well-placed in relation to the rich fishing grounds of the North Sea. Saithe or coalfish (*Pollachius virens*), which breed in large shoals near the beach or among kelp and seaweed, has provided a tasty source of nutrition (Gibson 1994). Herring spawning grounds were not far from the east coast and stretched from Berwickshire to Sutherland. Herring was also caught in the Firth of Forth. Most were dried and exported. The earliest records from the 12th century show that rights to herring fishing were vested in the Crown, and that herring was one of the most important fish species (Coull 1996). In the fisheries of the Forth, there is also a record of the granting of a right to fish herring in the 12th century by David I to the Abbey of Holyrood (Cochran-Patrick 1892) (the Augustinian Order was in charge of Holyrood Abbey (McGowran 1985)). Red herring are documented in the records relating to Berwick in 1299–1300 (ibid; Anson 1950). The term 'red herring' refers to herring processed by smoking (Samuel 1918), although herring appears to have been regarded as of little commercial importance, in terms of trading, until the middle of the 18th century.

Fishing villages around the east coast of Scotland are well known. Eyemouth, for example, flourished as one of the main white fishery ports from the 13th century and by 1850 it had become one of the main herring ports in Scotland. Throughout the 18th century Dunbar was the main herring fishing port in the country. Other important ports were North Berwick, Port Seton, Cockenzie, Fisherrow and, situated closer to the Holyrood location, were the fishing ports of Newhaven and Leith. The fishing port of Newhaven has been in operation since the 15th century (Anson 1950).

Fishing must have been one of the earliest activities of the settlers at Leith although shore fishing became more peripheral once the harbour was developed to accommodate larger vessels. Newhaven on the other hand maintained an unbroken tradition of fishing and by the mid 16th century the Free Fishermen's Society of Newhaven was an active organisation. Fishing was mainly for herring, from open, undecked boats, suitable only for inshore coastal waters. At times, herring was plentiful and a short trip from Newhaven brought the boats to the fishing ground (Marshall 1986).

The fishermen of Newhaven, however, were not entirely dependent on herring fishing, since haddock, saithe and pollack were also available not far from the coast (ibid). From the 1700s at Newhaven the general pattern of the fishing year was a summer of net fishing for herring, while oyster dredging and line fishing for haddock and cod took place during the winter months. Herring was also caught to a lesser extent during November and December (McGowran 1985).

Other fish besides herring and the gadids were also commercially important. The range of flatfish in Scottish coastal waters is considerable. In the Holyrood assemblage, plaice (*Pleuronectes platessa*) and dab (*Limanda limanda*) were identified. Plaice are found all around the Scottish coast (Lockhart 1997) and are easily caught in sandy beaches by line.

Mackerel is found in large shoals in Scotland during summer and early autumn and can easily be caught on lines. Mackerel decomposes quite rapidly once caught, particularly during warm weather, and thus during the 17th and 18th centuries this fact allowed for their being sold immediately, even on Sundays after divine service (ibid).

Remains of ray (*Raja clavata*) were also recovered in significant numbers at Holyrood; these were probably caught by line while fishing for cod and haddock.

As well as marine species, a small number of freshwater fish were represented in the assemblage from Holyrood: these could derive from a number of sources. The River Almond, which enters the Forth at Cramond, is still a popular spot for fishing sea trout and salmon during September and October when the fish enter the tidal waters. Other sources of salmonid and other freshwater species would have been the River Esk, where the sea trout and salmon are plentiful, especially when these enter the tidal waters in April and again during September. The salmon fishery was carried out using stake-nets during the 1800s at the mouth of the River Esk, the season beginning early in February until mid September (NSAS 1845). The Water of Leith is at present a small river but must have been larger before five reservoirs sucked up its headwaters. During medieval times, however, the construction of weirs ended the runs of salmon, and the use of the river as a sewer by the growing populations along its banks must have made the trout an unpalatable dish (Graham 1980). Eels were probably caught while fishing for salmon and trout. The tiny three-spined stickleback may have been used as bait or could have come from the stomach contents of a larger fish.

The consumption of fish must be considered in its contemporary context. Until the 15th century, throughout Britain, the rules of the Church were quite strict. Until the early 13th century, adults were forbidden 'four-footed freshmeat' on three days a week and in other fasting periods of one or more nights and days. By the 15th century these rules had been relaxed in lay society and monasteries, and only Fridays were obligatory weekly fasting or 'fysshe' days, although Wednesdays and Saturdays may have been respected by the pious, and by Church dignitaries in public. Annual fasts such as Advent and Lent, which then as now lasted six weeks, were more seriously observed and were the only time when eggs and dairy products were banned as well as meat (Black 1992).

The fish remains recovered during the excavation of the Holyrood site have allowed for an interesting insight into the development of the fishing industry of Scotland, particularly in terms of the social, economic and religious aspects of life in the medieval and post-medieval periods in Edinburgh and the surrounding areas. With increasing population strong markets quickly developed and Edinburgh, with its developing importance, must have provided a strong demand. Fish have played a considerable part in the development of the Scottish nation and their remains recovered from sites such as Holyrood are an important source of evidence to support the early historical records. The fish remains from Holyrood further demonstrate the important role of fish in Scotland's history, contributing invaluable nutrition to the diet of its population, while providing the country with a valuable export industry.

2.5 SOILS AND SEDIMENTS

STEPHEN CARTER

2.5.1 Sediment sources and processes of accumulation

Archaeological excavation of the Scottish Parliament site was characterised by the recording of isolated stone structures and cut features set in deep and extensive layers of soil. Up to 2.5m of accumulated deposits were excavated, all of which had accumulated or been modified from existing natural soils since the 12th century AD. Deep soil deposits are a characteristic feature of medieval burghs, but there has been little effort made in the past to determine how and why they accumulated (Carter 2001). The purpose of this section of the report is to present the evidence for the sources of this large volume of sediment and the processes that led to its accumulation.

The extensive soil layers have been divided into three main stratigraphic units, based on their field characteristics and stratigraphic relationships. These have been assigned to Periods 2, 3 and 4.

Period 2 (14th/15th centuries)

The basal soil layer identified in all of the main excavation areas. Defined by its distinctive brown colour (contrasting with all overlying layers, which were very dark brown). Diffuse upper boundary with Period 3 soil.

Period 3 (16th/17th centuries)

Very dark brown soil layer/s overlying the Period 2 soil and cut by the widespread Period 4 cultivation trenches. Present in all of the main excavation areas.

Period 4 (17th/18th centuries)

Very dark brown soil layer/s overlying the cultivation trenches. Extensively truncated by Period 5 buildings and only recorded in some areas of the western half of the site.

Information has been collected about these soils at various scales of observation. The principal source of data for the analysis of the soils is a series of soil thin sections taken from three stratigraphic sequences in the western half of the site. These provide quantitative information on the composition of the soils at a microscopic level. The thin-section data are supported by the results of a programme of wet sieving of bulk soil samples from Period 2 and 3 soils in the western half of the site. Wet sieving has been used to quantify larger, rarer components in the soils, for example pottery and bone. Finally, field observations and records have been used to provide relevant information on the largest scale.

2.5.2 Soils

It is necessary to establish the nature of the soils prior to significant human modification to allow those modifications to be detected. The natural soil profile has been highly altered over the whole site and the upper soil horizons have been incorporated into what were excavated as Period 2 soils. Therefore the position of the natural ground surface (as opposed to the natural level of the subsoil) is difficult to determine. There are no stone-built surfaces or other structures from the earliest medieval phases of activity from which the level of the ground surface can be deduced, so total natural soil depth can only be estimated.

Composition of the basal Period 2 soils comes closest to the natural soil. These are generally brown, freely draining, slightly stony sandy silt loams. The parent material for this soil is the underlying till which is derived from local sedimentary and igneous rocks. It is suggested that the natural soil profile was roughly 0.5m deep over the surviving subsoil surface, based on comparisons with similar present-day soils in the Lothians.

Excavation close to the foot of the steep slope at the Canongate frontage exposed relatively deep Period 2 soil deposits (up to 0.8m deep compared with a maximum of only 0.4m out on the terrace). These deposits are interpreted as a deeper wedge of colluvial soils at the foot of the slope, possibly up to 1m deep. Colluvium is the product of natural soil erosion, possibly augmented in this case by disturbance-induced erosion once the Canongate was established. It is coarser in texture than the terrace soils: the colluvium is a moderately stony sandy loam.

2.5.3 Materials and methodology

Undisturbed block samples were collected in 8 × 5 × 5cm Kubiena tins from three stratigraphic sequences in the western half of the site.

Trench 22 (western baulk on Reid's Close)

Sample 11 (Period 4)
Sample 12 (Period 3)
Sample 13 (Period 3/2 intergrade)
Sample 14 (Period 2)

Table 2.22 Composition of the thin sections

Sample	Period	Component (% of area of thin section excluding voids)				
		Rocks	Sand	Silt/clay	Coal	Other exotics
Trench 22 (Reid's Close)						
11	4	12	10	48	24	6
12	3	7	13	50	30	0
13	3/2	8	26	54	12	0
14	2	10	29	48	13	0
Trench 1						
15	3	9	21	54	16	0
16	3/2	15	27	47	9	2
17	2	21	33	46	0	0
Trench 22 (Queensberry House Gardens)						
18	4	5	19	45	27	4
19	3	4	19	57	20	0
20	2	3	26	69	2	0
Trench 21						
3725	2	18	44	38	0	0

Trench 1 (NW corner of site)

Sample 15 (Period 3)
Sample 16 (Period 3/2 intergrade)
Sample 17 (Period 2)

Trench 22 (centre of Queensberry House Garden)

Sample 18 (Period 4)
Sample 19 (Period 3)
Sample 20 (Period 2)

One additional sample (3725) was collected from a Period 2 soil in Trench 21 adjacent to the east end of Queensberry House. Resin impregnation of the soil blocks and thin section preparation was undertaken by the Department of Environmental Science, University of Stirling, and followed standard procedures (Murphy 1986). The thin sections were interpreted using the descriptive scheme and terminology recommended by Bullock et al (1985). Quantification of the principal components was achieved using point counting (100 points per section).

The principal soil layers assigned to Periods 2 and 3 from the western half of the site (Trench 22) were bulk sampled for on-site wet sieving. The following layers were sampled:

Period 2: 298, 612, 667, 671, 839 (Total: 76 samples)
Period 3: 215, 563 (Total: 52 samples)

Soil samples were collected with a standard volume of 60 litres and wet sieved through a 10mm mesh. The retent in the mesh was sorted and all artefacts and other exotic inclusions (coal for example) collected. These were bagged by material type and quantified by fragment number and weight. In the analysis only weights have been quoted, as this was considered to be a more meaningful measure of abundance for highly fragmented material.

2.5.4 Results

Composition in thin section

The composition of the thin sections is summarised in table 2.22 and the various classes of material are discussed further here.

Rocks

This includes all rock fragments greater than 2mm in size with the exception of coal, which is treated as a separate category because it is definitely an introduced component. Abundance of rock fragments varies between 3% and 21%, with both the highest and lowest values occurring in Period 2 soils; Period 4 soils are much less variable. The Period 2 soils in Trenches 1 and 21 are considerably stonier than the other soils.

The local subsoil contains a mixture of sedimentary and igneous rocks and this is reflected in the rock types observed in thin section: siltstone, sandstone, tuff and basalt. All types occur throughout the stratigraphic sequence but sandstone and basalt are most abundant. A few fragments of sedimentary rock have been burnt so it is reasonable to suggest that they were introduced with the coal as fuel ash. However, there is no evidence that sedimentary rocks vary in abundance with coal so the majority of the rock fragments must have a different source.

Sand

Sand has been defined as all mineral grains between 50µm and 2mm in size. It is most abundant in the Period 2 soils (44% in Sample 3725) and declines up through the stratigraphic sequence to as little as 10% in Sample 11. Highest values are seen in Trenches 1 and 21 (matching the results for rocks).

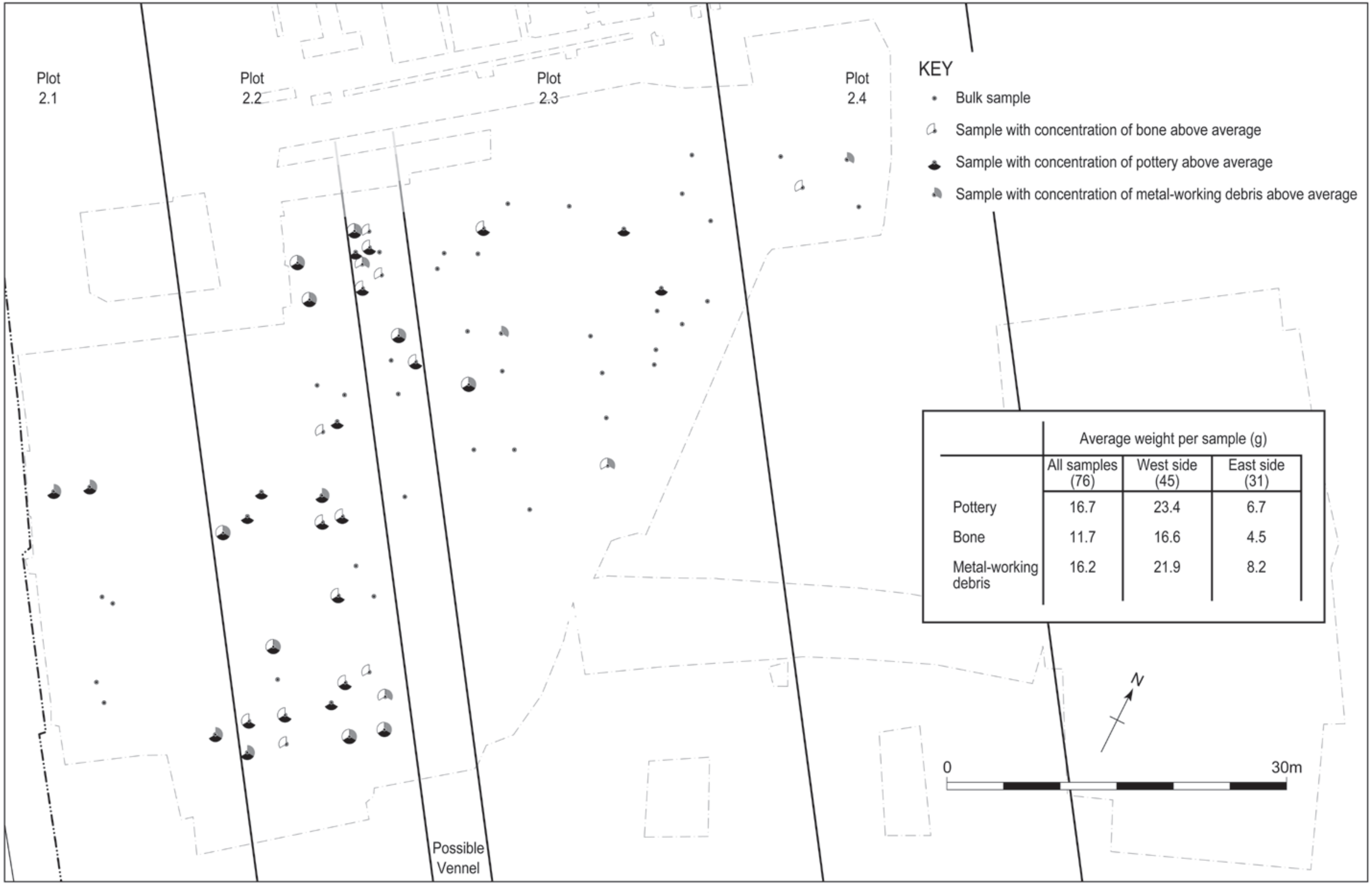


Fig. 2.1 Period 2: concentration of finds in bulk soil samples

Silt/clay

This is the fine fraction of the soil comprising all mineral grains less than 50µm in size. There is little variation in the abundance of this component, with most soils containing between 45% and 55% silt and clay. Sample 3725 (Period 2) has an exceptionally low value, emphasising the coarse texture of this soil sample. Individual grains cannot be readily identified but there is evidence of systematic variation in the composition of the fine fraction. In Period 4 samples and, to a lesser degree, Period 3 samples, the fine fraction is highly reflective, with numerous red and black reflective particles. These indicate the presence of very fine burnt mineral particles in the Period 3 and 4 soils, but their absence from Period 2. These fine particles probably account for the dark colour of the Period 3 and 4 soils compared with Period 2.

Coal

Coal is by far the most abundant exotic component in these soils, rising as high as 30% in Sample 12 (Period 5). Coal can occur naturally in the soils of the Edinburgh area but if it is present naturally on the Holyrood Parliament site it is apparently in very low concentration. It is absent or very rare in three out of four Period 2 soils and in the fourth the fragments of coal are burnt, proving that they have been used as fuel. It is therefore assumed that all of the coal present in these soils has originated as partially burnt fuel discarded with coal ashes.

Other exotic components

This category includes a wide variety of introduced materials but all are rare, totalling no more than 6% in one Period 4 sample. Only bone, mortar, charcoal and slag were abundant enough to register in the point counting, but marine shell and pottery fragments were also noted. These material types too rare to be quantified in small soil thin sections are best assessed from the results of the wet sieving (see below).

Distribution of exotic components in bulk soil samples

The programme of on-site wet sieving recovered a wide range of artefacts and other exotic materials, but only three material types were common enough in the Period 2 and 3 samples to allow further analysis of their abundance and distribution. They were pottery, bone and metal-working debris (mainly iron slag). Figures 2.1 and 2.2 show the location of the samples from Periods 2 and 3 respectively. Average weights per sample were calculated for each of the three material types and these are tabulated in figures 2.1 and 2.2. Variation in abundance has been demonstrated by highlighting the location of samples producing concentrations higher than the average for any material type in that period.

The results for Period 2 (fig. 2.1) reveal a clear difference between samples on the west side of Trench 22 and those on the east side. If the samples are split into two groups along the line of the possible vennel between burgage Plots 2.2 and 2.3, 85% of the above-average results lie to the west. Recalculation of average concentrations for the two data sub-sets (fig. 2.1) shows that all three material types are present in significantly higher concentrations in the west of Trench 22.

Inspection of the Period 3 results (fig. 2.2) reveals no such pattern. Individual high concentrations are uniformly distributed and if the samples are split along the same boundary as the Period 2 samples, the resulting sub-sets produce similar average concentrations.

2.5.5 Sediment depth and distribution

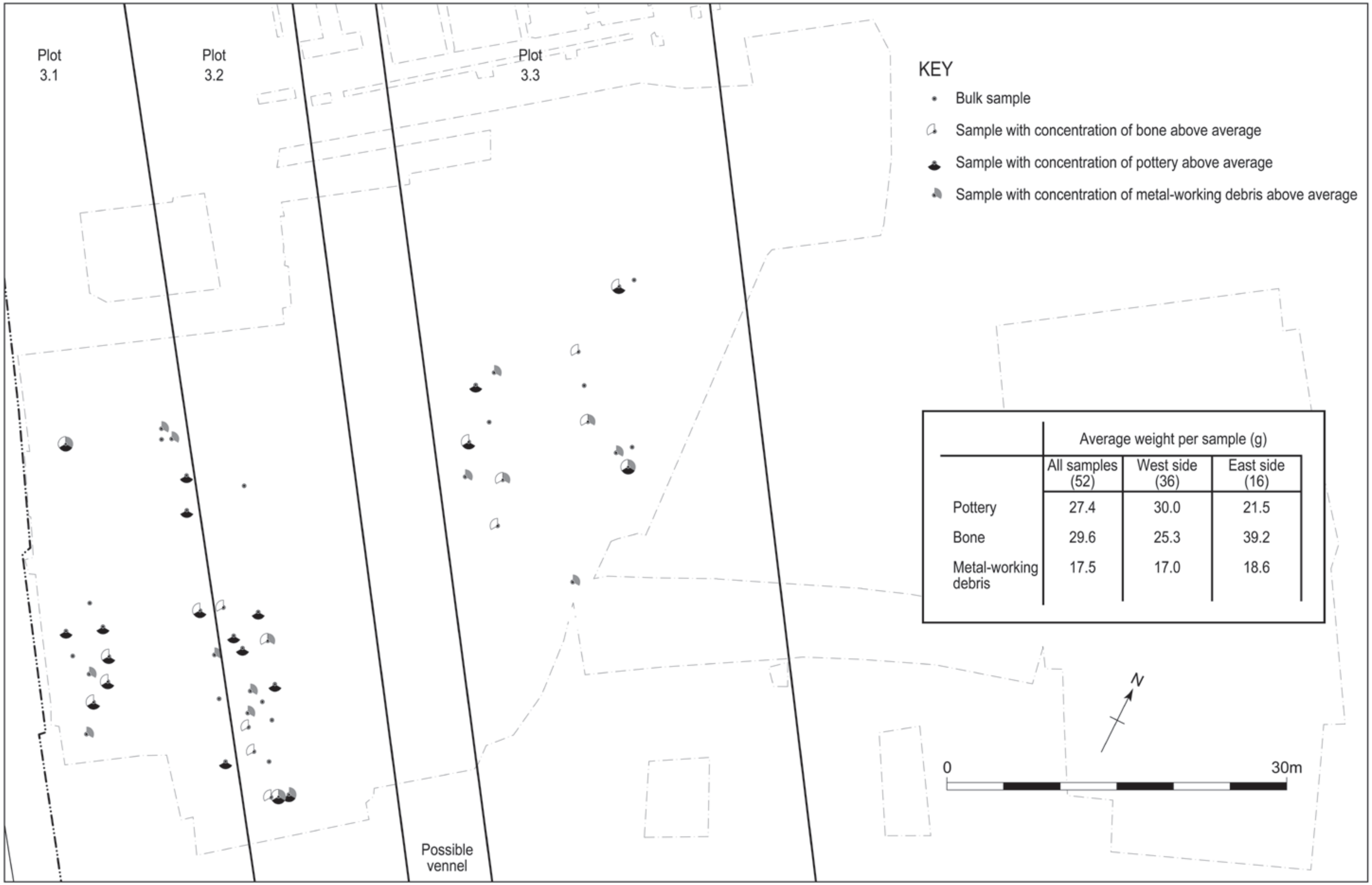
Compilation of level data from drawn site sections and plans reveals that the accumulation of deposits on the site has not been uniform. The total depth of deposits on the site can be calculated by plotting the difference between the level of the natural subsoil and the 1998 ground surface. As noted above, this depth will include the upper part of the natural soil profile and allowance must be made for this in any calculation of total sediment accumulation. The total depth of deposits across the site is shown in fig. 2.3. The calculation of total depth was complicated by the presence of standing buildings, and in these areas the depth is based on the ground level immediately outside the building.

The site can be divided into two distinct blocks of sediment, divided along a property boundary that marks a sudden drop in sediment depth. To the west there is 2.0–2.5m of sediment on the level terrace, but total depth rapidly declines as the ground surface rises towards the Canongate. To the east there is only 1.0–1.5m of sediment over the terrace, but sediment depth increases to over 2.5m as the natural ground level falls away in the south-east corner of the site. This area has therefore been levelled up, hiding the presence of the natural slope.

The major difference in sediment depth on either side of this property boundary was reflected in an actual difference in ground level of roughly 1m before demolition for the new Parliament building commenced in 1998. The property boundary (a substantial stone wall) marked the division between the Scottish & Newcastle Brewery and the grounds of Queensberry House Hospital. The site was therefore divided up to 1998 into two roughly level terraces: the brewery site partially levelled up but also deeply cut into solid rock on the north side of the site (thereby destroying all archaeological deposits in this area), and the hospital site with Queensberry House perched on the slope beside the Canongate overlooking a levelled area of gardens with subsidiary buildings.

The total depth of deposits as mapped in fig. 2.3 is not the same as the total depth of soils accumulated on the site. Total deposit depth includes significant thicknesses of deposits of 19th- and 20th-century date. These include levelling deposits for the military parade ground to the south of Queensberry House, created when it was converted into barracks and deep foundation rafts for the brewery buildings.

Recorded total soil depth (excluding modern deposits: table 2.23) ranges from a maximum of 2.2m on the west side of Trench 22 adjacent to Reid's Close to only 0.8m on the brewery site (Trench 26). This difference was initially assumed to reflect a higher level of truncation on the brewery site, given the total loss of archaeological deposits over much of this area. However, despite severe truncation on the brewery site and elsewhere, it is possible to demonstrate that much more soil has accumulated in the western half of the site. This can be demonstrated by the difference in depth of soil



	Average weight per sample (g)		
	All samples (52)	West side (36)	East side (16)
Pottery	27.4	30.0	21.5
Bone	29.6	25.3	39.2
Metal-working debris	17.5	17.0	18.6

Fig. 2.2 Period 3: concentration of finds in bulk soil samples

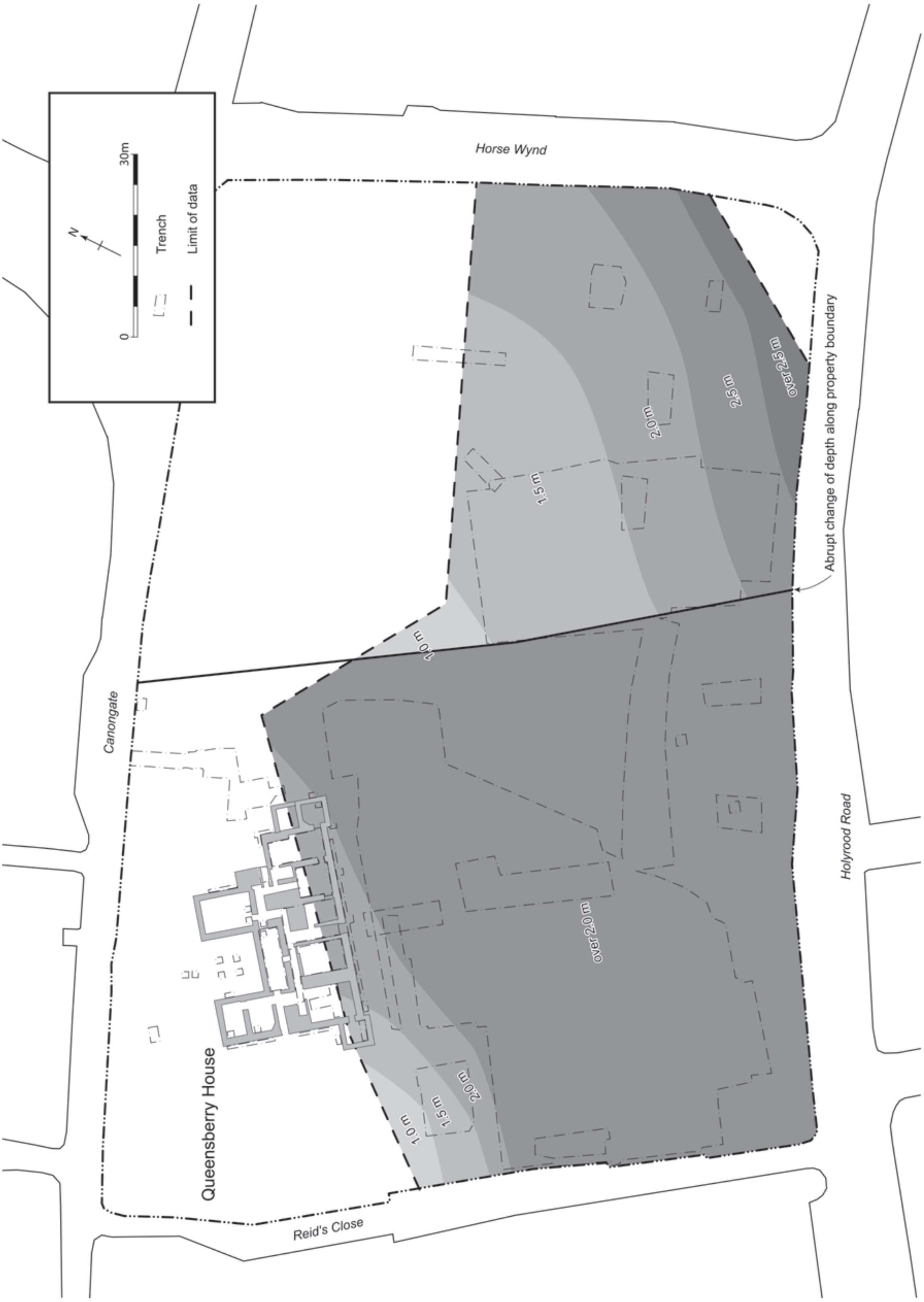


Fig. 2.3 Total depths of soil over subsoil

Table 2.23 Estimates of total accumulated soil depth

Area	Recorded soil depth below trench	Total depth of soil (estimate)	Accumulated soil depth by 17th/18th century (estimate)
Trench 22, west side	1.5m	2.2m	1.7m
Trench 22, east side	0.9m	1.6m	1.1m
Trench 26, Brewery	0.2m	0.9m	0.4m

below the cultivation trenches that were dug over most of the undeveloped land in Period 4. If it is assumed that all were dug to a similar depth below ground level, the trench bases provide an index of contemporary ground surface in the 17th or 18th centuries. Actual ground surfaces do not generally survive, but the more complete sequences have a maximum trench depth of 0.4m below roughly 0.3m of topsoil. Therefore the ground surface may have been roughly 0.7m above the bases of the trenches. Total accumulated soil above original (pre-burgh) ground surface may be obtained by subtracting an allowance for the natural soil horizons (already estimated at 0.5m).

Estimates of total accumulated soil depth have been calculated for three locations across the level terrace that occupies the centre of the site. This avoids the natural slopes where soil accumulation will have been affected by local topographic factors. The results are tabulated in table 2.23. The results indicate that there is a significant decrease in the total depth of accumulated soils from west to east across the site.

2.5.6 Discussion

Sediment sources

Calculations of total accumulated soil depth demonstrate that significant volumes of mineral material have been imported onto this site and become incorporated in the deepening soil layers. The results of the thin-section analysis and wet-sieving programme suggest that there is only one exotic material present in significant volumes in the accumulating soil layers: coal ash. This is represented by fragments of partially burnt coal, rarer burnt sedimentary rock fragments (reflecting the burning of low-grade or poorly sorted coal) and fine burnt residues (ash). It is not possible to calculate the volume occupied by the ash but it seems unlikely that coal ash would have been dominated by fragments of unburnt fuel, so it may be assumed that the fine ash was more abundant than the coal fragments. Further evidence for significant additions of fines is provided by the declining quantity of sand relative to fines between Period 2 and 4 soils. It is clear that the later soils are relatively enriched in silt/clay and the highly reflective nature of this material indicates the source is ash. Given that coal fragments constitute between 15% and 30% of the Period 3 and 4 soils examined in thin section, it seems likely that coal ash (coal, rocks and fines together) is the dominant constituent of these accumulated soils (as high as 50–75%).

The Period 3 and 4 soils can be assumed to contain a proportion of the original soil, mixed upwards as sediment gradually accumulated, and this is demonstrated by the presence of large numbers of medieval pottery fragments in Period 4 soils. The local soil component would become progressively diluted through time as further sediment accumulated, but it could be argued that it accounts for the remainder of the Period 3 and 4 soils. However, it does not account for the relatively coal-free nature of the Period 2 soils. The comparative absence of coal in the Period 2 soils could indicate either that coal or coal ash was not being spread in significant quantities at this time or that soil-mixing processes failed to incorporate the coal ash, i.e. the Period 2 soils are simply the relatively 'clean' lower portions of a soil profile unaffected by surface-mixing processes. This latter option is refuted by the presence of pottery, bone and slag in the Period 2 soils and in concentrations similar to those recorded in Period 3 soils (figs 2.1 & 2.2). This demonstrates that soil-mixing processes were operating in the Period 2 soil and therefore we must conclude that coal ash was not being applied in any quantity.

In the absence of coal ash, what explains the accumulation of soil during Period 2? There is certainly no direct evidence for another major external source of sediment after coal ash but this, in itself, does point to one other possible source of sediment: local soil or turfs. Turf was widely used in medieval burghs for construction, animal bedding and in some cases as fuel. If it had been collected from a nearby area with similar soils, once degraded it would be impossible to distinguish from the in situ soil. Given the ubiquity of turf in the medieval burgh, at least before building in stone became common, it would be hard to argue that there is not a turf component in the accumulating soils, although it is simply impossible to prove. Similarly, there could be a component of local soil washed off the ridge that the Canongate occupies, and accumulating at the foot of the slope. Clearly this process has not been dominant because the only evidence for deepened colluvial soils probably reflects much earlier (early Holocene) slope instability. In any event, these colluvial deposits are restricted to the foot of the slope off the Canongate and cannot account for the uniformly deep accumulations of soil covering the level terrace to the south.

Processes of accumulation

From the preceding analysis of sediment sources, it seems that there are two significant processes to discuss: the deposition of coal ashes and the deposition of turf/soil. The wide distribution of the coal ash demonstrates that it was being spread and not simply allowed to accumulate in large piles. This indicates use of the ash rather than the accumulation of a waste product; the most likely use is as a soil fertiliser. It is unlikely that the ash would have been spread fresh, directly onto the soil. It is more likely to have been one component of a midden that was periodically spread onto cultivated ground. Other material in the midden could include the low concentration of pottery, bone and other artefacts recorded in the soils – domestic refuse. However, a midden is likely to have been dominated by organic waste, particularly excrement (human and animal) and the ashes would have served a useful role in soaking up and helping to retain liquid waste. Organic components have not survived on this site and it is important to remember the heavy bias this places on our understanding of the soils and sediments. The dominance of coal ash in the Period 3 and 4 soils in part results from the loss through oxidation of any organic components in these soils.

The possible role of turf as a component of the accumulating soils, particularly in Period 2, has been mentioned above. Whatever the original reason for bringing turf onto the site, disposal along with other midden material is the most likely route for it to reach the backlands. Turf would have performed the same function in the midden as the ashes, soaking up the nutrient-rich organic waste before being spread as part of the fertiliser.

Rate and duration of soil accumulation

Having identified the main processes leading to sediment accumulation, it is possible to consider the rate at which accumulation occurred and the duration of the process. There are two particular observations that relate to these issues and require explanation: the comparative absence of coal in the Period 2 soils, and the variable depth of soil accumulated in different parts of the site.

Analysis of the carbonised plant remains has shown that wood charcoal is rare throughout the deposits of all periods compared to coal and therefore it seems probable that coal was the common fuel from the origins of the burgh onwards. The rarity of coal in Period 2 soils and its abundance from Period 3 onwards can therefore be interpreted as evidence for increasing availability of hearth ashes. The quantity of ash may be taken as proxy evidence for the number of hearths and therefore dwellings in the vicinity: few during Period 2, many from Period 3 onwards.

The low-density scatter of artefacts in Period 2 soils suggests manuring at this time. Deposition of turf, or turf-derived sediment, was also occurring at the same time and, again, manuring is the mostly likely process in what appear to have been relatively undeveloped backlands during Period 2. The change in inputs between Periods 2 and 3 therefore records a transition from relatively undeveloped plots used primarily for cultivation to developed plots with large volumes of domestic waste (primarily ash) deposited in the backlands.

The variable depth of accumulated soils across the site presents a different problem. It can be explained either as the product of variation in the rate of accumulation or the duration of accumulation. The lack of precise chronological markers makes it difficult to offer evidence in support of either of these alternative explanations; pottery date ranges are simply too broad. However, some relevant observations can be made. The stratigraphic position of the 17th/18th-century cultivation trenches suggests that accumulation had stopped by this date: no more than 0.3m of soil is recorded over the trenches and they were designed to function beneath a cultivated topsoil. This sets an upper time limit on the duration of soil accumulation that appears to be roughly the same across the whole site. Therefore any variation in the duration of accumulation must relate to the start date, not the end date.

Did plots of land further to the west start to receive organo-mineral manures before those to the east? One piece of evidence tends to support this proposition. The depth of the Period 2 soils in the western half of the site (Trench 22) is roughly 0.4m, away from the deeper colluvial profiles adjacent to Queensberry House. The Period 2 soil as identified in the eastern half of the site (Trench 26) is described as a shallow interface layer between the Period 3 soil and the natural subsoil; it contained very few finds. This would be consistent with a late start to soil accumulation; if coal ash was present from the start, no coal-free Period 2 soil would be preserved. This evidence does not rule out the possibility of variable rates of soil accumulation, and indeed some variation is to be expected as adjacent plots developed along different lines, reflecting the owner's use of the land. The contrasting concentrations of artefacts in the Period 2 soils of Trench 22 (fig. 2.1) may be evidence of this type of variation in land-use.

2.5.7 Conclusions

Analysis of the composition of the Period 3 and 4 soils indicates that coal ash was the dominant material responsible for the accumulation of these soils. It is assumed that the coal ash was initially cleared out into a midden and was subsequently spread on cultivated plots as a component of the manure. The process of soil accumulation through deposition of ash appears to have ended before the 17th/18th centuries. This may reflect a decline in the importance of cropping in the backlands as the status of the area rose and formal gardens became the norm. The relative absence of coal ash from Period 2 soils indicates a period of sediment accumulation when little ash was being deposited. Turf, used initially for construction and then for manure, may have been the source of sediment at this time.

The depth of soil that accumulated varies considerably across the site. Estimates of total accumulated soil depths range from 1.7m on the western edge of the site to only 0.4m in the east. There is some evidence to suggest that this reflects a later start to soil accumulation on the east side of the site. Variation in depth may also have resulted from differing rates of accumulation. Both of these processes are indicative of different land-use histories for the medieval burgage plots that lie within the excavated areas.