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FISH BONES FROM MEDIEVAL AND POST-MEDIEVAL LAYERS OF THE INNER BAILEY AT PORTCHESTER CASTLE, HAMPSHIRE

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Jennie Coy

Numerous factors affect both the deposition and retrieval of fish remains. At Portchester, fish bones from the medieval layers may be from fish used as food; from those discarded uneaten, through small size or decay; from fish used for bait; or from any fish fresh in the guts of larger ones. Unusual or attractive fish could always have been brought back out of interest.

The species and sizes available locally would vary according to season. Fish migrations are complex and are linked both with age and time of year.

There may have been a number of people involved in fishing at Portchester itself and fishing could have taken place off the shore here, on sand or mud flats exposed at low tide, from boats within 'Portsmouth Harbour ', or from boats further afield. By the Medieval period there was likely to have been short and long distance importation, especially of salt fish. By the year 1300 Southampton at least was trading with Lowestoft (Studer 1910, 5). By the early 15th century the port books suggest that trade included, for example, congers from the Channel Isles, salmon from Suffolk, herrings from Suffolk, Dieppe and Étaples, stockfish (probably split cod) from Norfolk, pollack from Cornwall, Devon and Brittany, and ling and cod from the Netherlands (Studer, 1913). Portsmouth cargo boats were often in Southampton according to port books and overland export of fish may also have occurred from Southampton, as it did to Winchester. With all this going on, ecological interpretations from Portchester medieval fish bones are probably irrelevant.

Added to these depositional factors is the difficulty that the deposits studied are not necessarily comparable, although a number of them are from apparent kitchen refuse. Retrieval must also play a controlling rôle in any fish sample produced for archaeozoological study. The necessity to water-sieve with a carefully controlled experimental design is only just now being realised in British archaeology. Only the fine sieves in this process can check the relative 'drop off' that occurs in small fish (Clason & Prummel 1977, 174). Fish bone retrieval at Yarmouth (Wheeler & Jones, 1976) and work at Southampton Archaeological Research Committee have shown that the picture of fish exploitation for a settlement may need complete revision after sieving reveals quantities of small fish like herring

and eel. These species have only been shown in two layers in the Portchester sample and it is likely that their actual importance was much greater.

Inspite of these limitations the sample is useful as supplementary information on diet and some trends are visible even with such a small and limited sample.

THE FISH REPRESENTED

Table 1 shows the overall results for periods A, B and C and totals. Bones from known kitchen refuse are included in all totals and given also in parenthesis. Kitchen refuse layers involved are as follows:

Period A	C41 (6) + C42 (43) (45) (46) (47)
Period B	C49 (11)
Period C	C49 (8) (9)

Most of the 1,200 or so fish fragments examined were not possible to take to species and attention was concentrated on the well-preserved head bones and vertebrae. Bones were assessed for fish size by comparing cod premaxillary and dentary measurements with the graph produced by Wheeler and Jones (1976, 215) or, for other bones and species, by comparing measurements taken according to Morales and Rosenlund (1979) and the general overall size of the fragments with modern skeletons of weighed and measured fish in the Faunal Remains Project's collections. This is not so reliable, as the true relationship between bone size and body weight has not been worked out, as it has for cod jaws, and the weights given must be regarded as purely a rough guide to size class.

I am grateful to Mr Alwynne Wheeler not only for all the information provided in his books (e.g. Wheeler 1969 and 1978) but for his kindness in allowing me access to the collections at the British Museum (Natural History) for some problem bones. Neither of these collections had large enough specimens to match some of the Portchester remains and some fragments can therefore only be referred to as 'larger than..' a particular fish in the collections.

PERIOD A Pre-1320

Conger eel was well represented. The kitchen refuse contained remains of four individuals roughly similar in size to a 3.5kilogram conger(2), a 16 kg specimen, and a single vertebra (in C42 (43)) to an even larger

1 THE OVERALL DISTRIBUTION OF FISH FRAGMENTS

Species	Period A	Period B	Period C	TOT
Anguilla anguilla, common eel		4		4
Conger conger, conger eel	26(17)*	27	13(12)	66
Clupea harengus, herring		11		11
Salmo salar, salmon		3	2	5
Salmo sp. Salmon or trout	1(1)			1
Gadus morhua, cod	14(10)	9(2)	20(19)	43
Melanogrammus aeglefinus, haddock		1		1
Merlangius merlangus, whiting	1	1(1)	6(6)	8
Trisopterus minutus, poor cod	4(4)			4
Pollachius pollachius, pollack	2(2)		2(2)	4
Molva molva, ling	10	1	40	51
Merluccius merluccius, hake	1		13	14
Gadoids (see bracket above)- not identifiable to species	1	11(1)	3(3)	15
Belone belone, garfish	1	3		4
Eutriglia gurnardus, grey gurnard			1(1)	1
Dicentrarchus labrax, bass	9(6)	5	4(4)	18
Trachurus trachurus, horse mackerel	1(1)			1
Mugilidae, mullet **	5		8(8)	13
Crenilabrus melops, corkwing wrasse		1	1	2
Sparidae, sea bream	2	2		4
Scophthalmus maximus, turbot		1		1
Scophthalmus sp. turbot or brill		1	1(1)	2
Pleuronectes platessa, plaice	5	1		6
Platichthys flesus, flounder	1(1)			1
Plaice or flounder	55(31)	25		80
Solea solea, sole	2(2)			2
Unidentified fragments	335(251)	320(4)	190(182)	845
TOTALS	476	427	304	1,207

* Figures in brackets show the number in kitchen deposits

** Mullet bones were comparable with those of thick-lipped grey mullet, Crenimugil labrosus, but lack of comparative material of the other species makes specific distinction unwise.

conger. Elsewhere at least six more congers were represented, one around 16 kg, two slightly less than that, and three smaller ones probably between two and four kilograms.

The kitchen refuse sample contained the remains of at least six cod of c. 0.5, 1 - 1.5, 3 - 6 (2), c. 10, and C.14.5 kg respectively. Elsewhere layers gave evidence of at least five more cod, four of which could be roughly sized at c. 1.5, 3 - 6, c. 10, and c. 14.5 kg.

Ling was only in C50 (15) with some very large butchered fragments representing at least two fish much larger than a modern 6.4 kg specimen and one smaller than 5.5 kg. Of the other cod-like fishes, the pollack represented in C41 (6) was a very small fish but the hake in C48 (40) was comparable with a modern fish of 2.5 kg. Throughout this account the term 'gadoid' is used to cover all species of the cod and hake families.

Kitchen refuse contained the remains of three large specimens of bass, two greater than a 5.5 kg specimen, one roughly comparable with it, and a small bass of less than a quarter of a kilo in weight. A bone from a large bass (c.5.5 kg) was also in C48 (39).

Flatfish represented in the kitchen refuse comprised a dover sole (from a well-preserved neurocranium) of 0.3 - 0.5 kg and nine plaice or flounder. One plaice neurocranial fragment was well-enough preserved to be specifically identified. Bones of four compared with modern specimens of 0.2-0.3kg, two with those of 0.4 kg (all normal fish-shop size by modern standards) whereas three individuals were larger than a modern 2.5 kg plaice described by the collector as 'the size of a dustbin lid' . Plaice or flounders of this size or larger were retrieved from four other layers in Period A in addition to remains of six individuals of the smaller size groups and one intermediate one. In C50 (15) there was a second positive identification of plaice from a jawbone and in C48 (38) one of flounder.

Other species found were of less significance in terms of food than those above and the distribution of identifications within the deposits of this period may be linked as much with preservation and retrieval methods as with distribution. The kitchen refuse, being more carefully sampled, produced remains of a very small species - the poor cod, Trisopterus minutus, as well as the pollack and a dermal scute of horse mackerel. There were also traces of shell of mussel , Mytilus edulis and many unidentifiable fish spines and rays. C48 (40) bones were also well-preserved, giving the only evidence for the period of garfish, and some possible sea bream vertebrae.

PERIOD B 1320-1400

The four groups mentioned in detail for Period A - conger, gadoids, bass, and flatfish - were again in evidence. The individual congers represented ranged over the same size categories as those in Period A. Individual cod represented were less than 0.5, c. 0.5 (2), 2 - 3, 3,8, and greater than 15kg respectively. The small cod here and some other small gadoid remains may result from better retrieval. There were at least three big bass represented comparable with those in Period A and one a little larger than a modern 0.3 kg one. Flatfish included a turbot (probably slightly less than 3.5 kg) and a larger turbot or brill in C50 (12). Most of the plaice or flounder came from fish around 0.3 - 0.5 kg except for two specimens bigger than the 2.5 kg modern one mentioned abcve. These were from C47 (12) and C50 (12).

The single bone of ling from this period (in C50 (12) was from a very large specimen. Salmon, from C42 (24) and C47 (7) was roughly comparable with a 2 kg specimen.

The deposits of kitchen refuse of 1320-1350 date contained the remains of a 5 - 10 kg cod which had possibly been split longitudinally, and a small whiting (less than 0.5 kg). Bone from C42 (24) and (27) was also well-preserved, so well that it may be more representative than all other samples from the site. Salmon, garfish, and possible sea bream came from here as well as traces from two good sized herrings and a tiny bone from a corkwing wrasse.

Pit 265 contained a number of bones from a big conger (larger than a 16 kg specimen). Many of the bones had been chopped right through as if the fish had been roughly longitudinally split . It also contained bones of bass, cod and flatfish.

PERIOD C late 16th-early 17th C

There are more differences here. Kitchen refuse in C49 (8) and (9) forms most of the collection and shows a higher concentration of gadoid bones - representing four butchered ling all around 5 - 6 kg size; six cod (less than 1, c.0.7, c. 3, c. 6, and c. 9.7 (2) kg) - one with butchery; three whiting (less than 1 kg); a pollack a bit less than 3 kg; and four hake (c.0.5, 0.5 - 2.5, and c. 2.5 (2) kg).

These same deposits also contained the mullet, grey gurnard, salmon, and the only flatfish bone from the period - a vertebra of a large turbot or brill (in excess of 3.5 kg). Three bass were

represented, two around 5-6 kg size and one a very small one not much over 0.25 kg.

Bone from C48 (15) produced cod and a small corkwing wrasse and that from C50 (6) conger eel. The presence of many delicate rays and cranial fragments in the kitchen layers suggests that sampling and preservation was as good as in the kitchen layers in other periods so that alteration in emphasis from flatfish to gadoids may represent an actual trend.

CONCLUSIONS

Apart from the euryhaline fishes salmon and eel, and the flounder, which may travel up rivers, the remains are all from marine fishes. Table 2 compares the representation of conger, gadoids, and flatfish for the three periods using the numbers of fragments as a percentage of the total identified fragments from that period. This compares well with the corresponding Minimum Numbers of Individuals given in Table 3. Unlike Table 2 these are actual figures and are not corrected for sample size.

TABL
2 :
HER

While accepting the problems of sampling stressed throughout this report, especially the difficulty of comparing different types of samples, there does at least seem to be a rise in the importance of deeper water species, especially ling and hake, in Period C and a complete absence of plaice and flounder. Perhaps easier supply of large salted fish made local collection of fish less important. Some of the butchery observed may have taken place before salting.

It is probably not coincidental that amongst the commonest fish imports recorded by Robert Florys in the early 15th century were ling and hake (Studer 1913). There is a slight decline in the significance of flatfish observable by comparing results from Period B with those from A but it is not until the post-medieval period that this becomes marked. Herrings may have become important in Period B but the remains of these are difficult to assess without fine water-sieving. Imports if they existed are obviously mixed with local catches here but samples of the other species are too small to discuss in detail.

The waters around Portchester are, and probably were then, relatively shallow. Today Portsmouth Harbour yields bass, pollack, mullet, flounders, silver eels, and plaice; with small cod (codling) in late Autumn; congers around wrecks; red bream, grey gurnard, and sharks in Summer; and whiting in cold frosty weather (Stoker 1963). Unless building and repair work around the castle created

TABLE 2

Percentage representation of certain groups, by fragment count compared with the total fragment count for the period

	Period A	Period B	Period C
Conger Eel	21%	25	11
Gadoid	23	21	74
Flatfish	48	26	1
Others	8	28 *	14

* This high figure may be partly a result of better preservation and/or retrieval from one or two layers.

TABLE 3

Minimum Numbers of Individuals recognised in each period

	Period A	Period B	Period C
Conger	10	12	4
Gadoid	15	13	19
Flatfish	22	11	1
Others	6	12	5

pseudo-rocky conditions it is difficult to see this as a good place for conger but with the exception of these, and very large cod, and ling, and the herring and hake, all the fish could have been caught locally from the shore or from boat-based fishing near it. Comparable fish have been donated to the Faunal Remains Project over the last three years by Southampton anglers or Fawley Power Station. It is likely therefore that throughout the time span covered by these deposits the small flatfish, all bass, mullet, salmon, garfish, and gurnard were locally caught. Flatfish were transported around Britain in the medieval period and although the large flatfish might have been locally line-caught import is again a possibility.

The splitting of large fish, possibly as an aid to preservation (Cutting 1955) occurred in Periods B and C.

Finally it should be stressed that, in spite of the absence of their remains, it is likely that cartilaginous fishes - skates, rays, dogfish, and sharks - and very small fishes like sprats may also have played a part in the diet.

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Layer By Layer Summaries

These are provided incase you wish to extract further information. The weights given must be regarded as approximate only and should serve merely as a guide. Those for cod are sometimes assessed by measurement (in the case of dentary and premaxilla) and the use of the figures given in Wheeler and Jones (1976). Others are by direct comparison with specimens in our own collections.

PERIOD A Pre 1320		MNI	WEIGHT (kg)
C41 (6) Kitchen refuse of 13th C date			
Cod	1 dentary 1 operculum 2 posttemporals	1	c.0.5
	1 basioccipital + parasphenoid	1	1-1.5
Pollack	1 dentary 1 maxilla	1	
Bass	1 preopercular	1	5.5 +
Plaice/flounder	4 anal pterygiophores 1 cleithrum 1 precaudal vertebra 2 caudal vertebrae	4	0.25 +
unidentified	1 hyomandibular 4 cranial fragments 5 branchiostegal rays 4 vertebrae		
Additional bones found in mammal bags			
Conger eel	1 glossohyal	1	3.5 +
	1 epihyal	1 ?	c.3.5
Salmon	1 caudal vertebra	1	
Dover sole	1 neurocranium 1 caudal vertebra	1	0.3 +
C42 (43) Kitchen refuse of 13th C date			
Conger	1 operculum 1 preoperculum 1 suboperculum 1 quadrate 1 articular 4 thoracic vertebrae 1 caudal vertebra	1	c.3.5

		MNI	WEIGHT (kg)
Conger	1 hyomandibular/quadrate 2 thoracic vertebrae 1 caudal vertebra	1	c 16
	1 caudal vertebra	1	16 +
Poor Cod	2 dentary 1 premaxilla 1 articular	1	less than 50g
Horse mackerel	1 scute	1	
Bass	1 cleithrum	1	less than 0.25
	1 cleithrum	1	5.5 +
Plaice	1 basioccipital + parasphenoid	1	c. 0.4
Plaice/flounder	1 anal pterygiophore 1 cleithrum 5 interoperculum 1 ceratohyal 1 maxilla 2 caudal vertebrae	1 + 2	2.5 + "
	1 cleithrum	1	less than 2.5
	1 cleithrum 1 hyomandibular 1 scapula 1 operculum 1 supracleithrum 1 ceratohyal 2 precaudal vertebrae 2 caudal vertebrae		c. 0.4
fragmentary & not identified	18 cranial fragments 11 vertebral fragments 4 branchiostegal rays 200 rays etc		

There was also a fragment of Mussel shell in this collection

C42 (45)	same area as above	Pit 261	Kitchen refuse	
	Bass 1 preopercular		1	c. 5.5
	unidentified 1 cranial fragment 1 spine			
C42 (46)	same area as above	Pit 261	kitchen refuse (see above)	c. 5.5
	Bass 1 innominate 1 parasphenoid			
	unidentified 1 cranial fragment 1 spine			
C42 (42)	1 spine of large flatfish		kitchen refuse 1	

		MNI	WEIGHT
C43 (36)			
Cod	1 caudal vertebra	1	
C48 (37)			
Conger	1 fragment neurocranium	1	less than 2.75
unidentified	1 ray		
C48 (38)			
Conger	1 ceratohyal	1	c. 16
	1 epihyal		
	1 parasphenoid	1	c.3.5
cod family (gadoid)	1 quadrate	1	c. 5
Flounder	1 articular	1	0.5 - 2
Plaice/flounder	1 cleithrum	1	2.25
	3 epipleural spines		
	1 anal pterygiophore	1	c.0.35
	1 hyomandibular		
unidentified	11 cranial fragments		
	2 branchiostegal rays		
	30 spines		
C48 (39)			
Bass	1 operculum	1	c.5.5
C48 (40)			
Conger	1 quadrate (chopped)	1	less than 16
	1 interoperculum		
	1 hyomandibular	1	less than 2.75
	1 operculum		
	1 weberian vertebra		
	1 caudal vertebra		
Whiting	1 dentary	1	less than 0.5
Cod	1 supracleithrum (chopped)	1	c. 9.75
	3 precaudal vertebrae	1	c.14.5
Hake	1 supratemporal	1	c. 2.5
Garfish	1 premaxilla	1	0.4
Mullet	4 precaudal vertebrae	1	less than 1.5

		MNI	WEIGHT
Plaice/flounder	1 anal pterygiophore 2 caudal vertebrae	1	c.2.25
	1 precaudal vertebra 11 caudal vertebrae 1 hyomandibular		c.0.38
	1 maxilla 1 posttemporal	1	less than 0.38
	2 cleithra	2	c.0.38
? Sea bream	1 caudal vertebra 1 precaudal vertebra	1	
unidentified	10 cranial fragments 3 branchiostegal rays 3 vertebra fragments 10 spines and rays		

C50 (15)

Conger	1 operculum 2 precaudal vertebrae	1	less than 16
Ling	5 cleithra (1 butchered) frs 2 1 vomer 3 caudal vertebrae		5.5 +
	1 supracleithrum (butchered)	1	less than 5.5
Cod	1 supracleithrum	1	less than 3.5
	2 precaudal vertebrae 1 caudal vertebra	1	3 - 6
Mullet	1 precaudal vertebra	1	1.5 +
Plaice	1 articular 1 hyomandibular	1	c.0.32
Plaice/flounder	1 preopercular 1 anal pterygiophore		
	1 1st caudal vertebra	1	c. 0.30
	1 1st caudal vertebra	1	2.25 +
unidentified	1 cranial fragment 1 vertebral fragment 8 spines 1 branchiostegal ray		

C50 (16)

Plaice/flounder	1 anal pterygiophore	1	2.25 +

C50 17

unidentified	1 cranial fragment 1 spine		

PERIOD B 1320 - 1400		MNI	WEIGHT (kg)
C42 (22)			
cod family	1 postcleithrum	1	
unidentified	1 cranial fragment		
	4 rays		
C42 (24)	This is an exceptionally well-preserved assemblage and therefore may be more representative than some of the others.		
Conger	1 lacrymal	1	slightly less 16
	1 operculum	1	c. 2.75
	1 maxilla/premaxilla, 1 vomer	1	less than 2.75
	1 Weberian vertebra	1	c.3.5
	1 glossohyal (butchered)	1	3.5 +
	1 supracleithrum		c.16
Herring	3 ceratohyal	2	good size
	1 parasphenoid		
	1 cleithrum		
Salmon	1 articular	1	less than 2.25
cod family	1 ceratohyal, 1 supracleithrum, 1 maxilla	1	c.0.5
Cod	1 caudal vertebra (split longitudinally)	1	2.5 +
Garfish	2 distal dentaries	1	
? Sea bream	2 caudal vertebrae	1	(chopped)
Bass	1 branchiostegal	1	5.5+
	1 vomer	1	c.5.5
	scales of bass ?		
Plaice	1 hyomandibular	1	0.35
Plaice/flounder	1 anal pterygiophore, 1 operculum		
	1 innominate	1	0.38 +
unidentified	12 cranial fragments		
	2 vertebrae		
	3 branchiostegal rays		
	130 rays		

C42 27 — Either retrieval or preservation good here as well

		MNI	WEIGHT
Conger	2 premaxillae	1	slightly less 16
		1	3.5 +
	1 hyomandibular	1	very small
Common eel	1 premaxilla 3 caudal vertebrae	1	0.85 +
Herring	2 ceratohyal 2 epihyal 1 hyomandibular 1 opercular	2	good size
Corkwing wrasse	1 dentary	1	less than 0.05
Garfish	1 premaxilla	1	very small
Turbot	1 urohyal	1	less than 3.5
Plaice	1 articular	1	c. 0.33
Plaice/flounder	1 dentary 2 thoracic vertebrae 7 caudal vertebrae 2 innominates		
cod family	2 maxillae	1	less than 0.5
	1 postcleithrum 1 pterygoid 1 suboperculum		
Whiting	1 dentary	1	c. 0.5
unidentified	110 cranial fragments 10 vertebrae 40 spines		

C42 41

Conger	1 dentary	1	2.75 +
Cod	1 parasphenoid	1	c.3

C42 42

unidentified	1 dentary 1 cranial fragment 2 branchiostegal		

C43 9

cod family	1 fragment vomer	1	15 +

C43 18

Conger	1 Weberian vertebra	1	less than 16
Plaice/flounder	1 caudal vertebra	1	
unidentified	1 cranial fragment		

			MNI	WEIGHT
C43 (20)				
	unidentified	7 fin rays		
C44 (3)	Pit 265			
	Conger	* 1 basioccipital	1	16 +
		* 1 parasphenoid		
		1 nasal		
		1 frontal		
		* 1 glossohyal		
		1 sphenotic		
		1 premax/maxilla		
		* 1 ethmoid (cut)		
		1 vomer		
		1 epihyal		
		1 pterygoid		
		1 ceratohyal		
	* All chopped longitudinally right through			
	Bass	1 preoperculum	1	0.3 +
	Cod	1 dentary	1	c.0.5
		2 parietals		
	Plaice/flounder	1 preopercular	1	
C44 (9)	no fish			
C44 (24)				
	unidentified	1 cranial fragment		
	(?flatfish)	1 vertebral fragment		
		1 branchistegal ray		
C47 (12)				
	Bass	1 preoperculum	1	c. 5.5
		1 1st pharyngeal		
	Plaice/flounder	1 anal pterygiophore	1	0.25 +
		1 operculum	1	2.25 +
		1 thoracic vertebra		
		1 1st caudal		
		1 caudal		
	unidentified	2 cranial fragments		
		3 spines		
C47 (7)				
	Cod	1 coracoid	1	c.8
	Salmon	1 premaxilla	1	
	unidentified	1 branchiostegal		

			MNI	WEIGHT
c49 (11)	kitchen refuse of 1320-1350			
	Cod	2 caudal vertebrae (1 split)	1	5 - 10
	cod family	1 urohyal		
	Whiting	1 articular	1	less than 0.5
	unidentified	4 rays		
c50 (12)				
	Conger	1 premaxilla/maxilla 1 precaudal vertebra 1 branchiostegal	1	less than 16
	Ling	1 cleithrum	1	very large
	Cod	1 supracleithrum (chopped longitudinally)	1	c.6
	Salmon	1 caudal	1	
	Plaice/fl.	1 anal pterygiophore	1	c. 0.5
		1 cleithrum 1 caudal vertebra	1	2.25 +
	? Turbot/brill	1 caudal vertebra	1	very large
	unidentified	1 hyomandibular fragment 3 rays		

PERIOD C Late 16th-early 17th c MNI WEIGHT

C48 (9)

unidentified 1 ray

C48 (15)

Cod	1 caudal vertebra	1	
Corkwing wrasse	1 cleithrum	1	0.08 +
unidentified	2 cranial fragments		
	7 rays		

C49 (8) kitchen deposit together with 9 below *see over for Conger

Ling	1 neurocranial fragment	1	very large fish
	11 precaudal vertebrae 1 postcleithrum 7 caudal vertebrae	1	c.5.5
	2 precaudal vertebrae 4 caudal vertebrae	1	less than 5.5
	1 precaudal vertebra 4 caudal vertebrae 3 supracleithrum 2 R cleithra 2 L cleithra	1	5.5 +
	1 posttemporal		less than 5.5

(several vertebrae show butchery, one is burnt, 1 cleithrum chopped

Cod	2 articular 1 maxilla (burnt) 1 preoperculum	1	less than 1
	1 dentary	1	c.0.75
	1 articular 2 precaudal vertebrae	1	c.6
	2 precaudal vertebrae 8 caudal vertebrae	1	c.9.75
	1 supracleithrum (butchered)	1	c. 3
Pollack	2 precaudal vertebrae	1	less than 3
cod family	1 precaudal 1 caudal		
Whiting	1 symplectic	1	c.0.75
Hake	2 supracleithrum 2 posttemporal 3 caudal	2	c.2.5
	1 proatlas	1	c.0.5
	6 caudal vertebrae	1	0.5 - 2.5

C49 (8) continued

		MNI	WEIGHT
Conger	1 basioccipital	1	c.16
	1 ceratohyal		
	3 Weberian vertebrae	1	4 - 16
	3 precaudal vertebrae		
	3 caudal vertebrae		
	1 ceratohyal	1	less than 2.7
Mullet	1 precaudal	1	1.5 +
	4 precaudal	1	c. 1.5
	3 caudal		
Bass	1 preoperculum	1	c. 5.5
	1 dentary		
	1 cleithrum		
	1 operculum	1	less than 5.5
	1 spina pinnae dorsalis	1	0.25 +
Grey gurnard	1 cleithrum	1	less than 0.3
Salmon	2 caudal	1	2.25 +
Turbot/brill	1 thoracic	1	3.25 +
unidentified	1 vomer		
	14 cranial fragments		
	1 vertebra		
	12 branchiostegal rays		
	150 rays		

C49 (9) Kitchen deposit as above

Whiting	1 parasphenoid	1	c.0.5
	1 parasphenoid	1	(bit bigger) "
	2 maxilla		
	1 cleithrum		
cod family	1 cleithrum	1	c.9.75
unidentified	2 rays		

C50 (6) Conger 1 premaxilla/maxilla 1 c.16

	18th C AND CONTAMINATED		MNI	WEIGHT (kg)
C31 20	Pit 241			
	unidentified	1 ray		
C32 3	disturbed			
	Cod	2 caudal vertebrae		
	rest unidentified			
C32 4	18C			
	Cod	1 precaudal	1	c. 6kg
	Plaice/flounder	1 caudal	1	
	unidentified	1 caudal.		
C32 8	18C			
	Cod	remains of at least 6 cod weights :		c.6
			2	c.8
				c.9.75
				c.14.5
				14.5 +
C33 3	18C			
	unidentifiable fin rays			
C33 6	18 C			
	Cod	1 precaudal	1	c.9.5
C39 8	18 /19			
	unidentified branchiostegal			
C45 29	? 18C			
	Mullet	1 operculum	1	

Highlights only noted above for records and as contrast to the medieval material.

PIT SUMMARIES

Only three of the pits contained fish bone

1. Pit 241 : C31 20

A fish spine not identified to species

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2. Pit 261 : C42 45 46

Bass, Dicentrarchus labrax	1 preoperculum)	
	1 innominate)	cf 5.5 kg specimen
	1 parasphenoid	cf 0.75 kg specimen
unidentifiable fish bones	2 cranial fragments	
	2 spines	

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3. Pit 265 : C44 3

Conger eel, Conger conger	1 basioccipital	butchered
	1 parasphenoid	butchered
	1 nasal	
	1 frontal	
	1 glossohyal	butchered
	1 ceratohyal	
	1 sphenotic	
	1 premaxilla/maxilla	
	1 ethmoid	butchered
	1 vomer	cuts
	1 epihyal	
	1 pterygoid	

The bones marked 'butchered' above were all chopped in a roughly longitudinal direction in relation to the whole fish. The bones above could all have come from a fish greater than a 16 kg eel in our collections.

Bass, Dicentrarchus labrax	1 preoperculum	probably just over 0.3 kg
Cod, Gadus morhua	1 dentary	0.5 kg or less
Plaice or flounder	1 preopercular	cf 2.25kg