JA/P Report 3124

753

NONSUCH PALACE

The Fish Bones

A total of 2,536 fish bones were recovered, no sieving was carried out, but soil was sorted on large trays under low magnification to ensure that the smaller bones were not missed.

The following species were identified; Elasmobranchs (cartilaginous fish), roker (Raja clavata), sturgeon (Acipenser sturio), eel (Anguilla anguilla), conger eel (Conger conger), salmon (Salmo salar), trout (Salmo trutta), pike (Esox lucius), carp (Cyprinus carpio), barbel (Barbus barbus), chub (Leuciscus cephalus), roach (Rutilus rutilus), cod (Gadus morhua), haddock (Melanogrammus aeglefinus), whiting (Merlangius merlangus), ling (Molva molva), ?hake (Merluccius merluccius), tub gurnard (Trigla lucerna), perch (Perca fluviatilis), red sea bream (Pagellus bogaraveo), thick lipped grey mullet (Chelon labrosus), turbot (Scophthalmus maximus), plaice/flounder (Pleuronectes platessa/Platichthys flesus).

Of the above 87% belonged to the garde robe pits, which are dated to the mid-1600s when Nonsuch was used as government offices as the plague made it undesirable to remain in london.

Unfortunately it was not possible to identify the elasmobranch vertebrae any more closely, however the presence of roker dermal denticles suggest that these vertebrae could also belong to roker.

The high quantity of unidentifiable bone (64%) frequently encountered when identifying fish bone is the result of 2 main factors, firstly fish bone is very friable, especially when closely packed with mammal bone which being more robust tends to fragment the fish bone if any pressure is applied. Secondly some bones such as fin rays are very difficult to assign to species, and many fin rays are found in each skeleton.

The chart shows the species that were present, the different parts of the skeleton identified and the proportion of unidentifiable bone.

Some notes follow on the biology of each of the species identified, largely based on Wheeler (1978), which are of importance for the section on the different types of fishing they represent.

Roker - this is the commonest ray in shallow water, found on muddy, sandy or gravelly bottoms. Rokers are most common between depths of 10-60 metres.

Dermal denticles are frequently found on archaeological sites, they are much more robust than the rest of the skeleton which is cartilaginous. These denticles are commonly known as 'bucklers'.

Sturgeon - in the sea this fish is mainly found in shallow water living on the bottom. However their presence far from their spawning rivers suggests mid-water swimming. The breeding stock enters rivers in spring (staying in the lower reaches) to spawn, the adults leave after spawning and the young fish stay in fresh water for up to 3 years. Sturgeon seem to be caught mainly on soft bottoms, sand or mud.

The sturgeon also has a cartilaginous skeleton, and the remains most commonly found on archaeological sites are 'scutes' which are bony plates running along the length of the body.

Eel - metamorphosis from the larval form to elvers takes place in coastal waters and the elvers then enter rivers where they mature sexually, continue growing and feeding and then descend the rivers to the sea.

Conger eel - this fish is common on rocky shores and offshore. Small young fish can be caught in deep shore pools. Congers also colonise sunken wrecks, harbour walls and loose stone groynes.

Salmon - salmon spawn far upstream in freshwater, usually in November and December the eggs hatch in April or May., the fry live for a month or so in the gravel feeding off their yolks, and start to feed actively in the mid-summer. The parr may spend up to 3 years in the stream before migrating to the sea.

Trout - a close relative of the salmon, trout spawn in winter from October to January in river gravel usually in upstream reaches, although many spawn in the gravel below weirs. Trout require cool water of relatively high quality to thrive.

Pike - this fish is typically found in lowland rivers and lakes, especially those which contain submerged vegetation. The pike is a predator feeding mainly on other fish but will sometimes take waterfowl and aquatic mammals. The pike is a valuable

food fish in Europe, but as a predator it is never very numerous and can easily be over exploited.

Carp - lowland lakes and rivers with abundant vegetation suit this fish preferring warm water conditions and the carp requiring a temperature of at least 18° C to spawn. The carp is a popular food fish in Europe and carp farming is now an industry. This species was introduced to Britain sometime before the (17th

Barbel - a bottom living fish found in the middle reaches of lowland rivers, on clean gravel beds and a moderate current, it can also be found in weir pools in the lower reaches and in deep pools in upstream regions. The barbel is a major sporting fish and is most active by night and in the half light.

Chub - A fish that is most abundant in the middle reaches of rivers, extending both upstream into more typically fast flowing trout streams, and downstream into the lowland reaches.

Roach - this fish lives in lowland lakes and rivers, possibly more common in a slow current, but it is widely adaptable and can survive in poor conditions, however its growth rate varies greatly with the food supply.

Cod - a marine fish widely distributed in a number of habitats from the shoreline to well down the continental shelf in depths of 600 metres. To the south of its range it is found in shallow water only in the winter, (the younger fish live close inshore), and cod will forage for food both on the sea bed and in mid-water.

Haddock - haddock live close to the sea bed in depths of 40-300 metres, in the north of its range it is found in shallow inshore water during the summer, retiring to deep water in the winter, in the warmer southern end of its range the reverse occurs.

Whiting - a common fish in shallow inshore waters, abundant between 30 and 100 metres, living both in mid-water and on sandy or muddy bottoms, the smaller fish live closer inshore.

Ling - essentially a deep water fish, occuring most frequently in 300-400 metres, and large numbers live in shallower water where the bottom is suitable on open ocean coasts. Common on rocky ground the ling also colonises wrecks in inshore waters.

Hake - a moderately deep water fish found in depths of 165-550 metres and may also be found in shallower water in the summer. It lives near the bottom and feeds in mid water at night.

Tub Gurnard - an abundant gurnard in inshore waters of 20-150 metres, a few are found in depths of up to 200 metres, it usually lives in small schools on mud and muddy-sandy bottoms.

Perch - this fish is common in lowland lakes, ponds and rivers where the current is slow, it is not generally found at high altitudes. The perch is well known as an anglers' fish.

Thick lipped Grey Mullet - common in coastal waters of all Europe except the most northern parts. This fish is partially migratory moving northwards with summer-time warming of the sea and southwards in the winter. It is particularly common close inshore in harbour mouths, estuaries, sandy bays and channels of saltings, sometimes venturing into fresh water during the summer. This is a good sporting fish and has some food value.

Red sea bream - relatively common in the seas south and west of the British Isles, but less so further north. The young come into inshore waters, usually over or close to rocks, and rough ground, and wrecks; the larger fish live in depths of up to 200 metres.

Turbot - this fish is close to the edge of its range in northern European waters, and rapidly becomes scarce to the north, but is common in the southern North Sea, Irish Sea and the English Channel. The turbot lives in shallow water, inshore, from just below the shoreline to 80 metres on shell gravel, gravel and sandy bottoms. A valuable marine food fish, its flesh is highly regarded.

Plaice - a bottom living fish, especially on sand, and also on muddy bottoms and gravel from 0-200 metres, but it is most commonly found from 10-50 metres. Young fish can be found in intertidal pools, and large fish come into the tidal zone to feed at high tide on sandy and mud flats.

Flounder - this is a widespread European fish living from the tideline to 55 metres, it also penetrates into fresh water, especially in northern cooler conditions, it lives on muddy and sandy bottoms. The flounder can interbreed with the plaice, the hybrid is an intermediate form between the 2 parent species.

All the above fish can be found either in British rivers or lakes, or could be caught off the British coast, many are important food fish and all can be eaten.

They suggest 4 basic fishing types; freshwater (rivers, lakes and artificial fishponds), salmon fishing, an inshore fishery and a distant water white fish fishery.

Freshwater

This can be divided into 2 types, river fishing and fish supplied from artificially stocked fish ponds, although many of the freshwater species identified could be found in both.

Fish ponds were common on many large estates, both monastic and lay, and Nonsuch Palace was no exception. A survey of Nonsuch Great Park in 1650 says 'Memorandum that in the said greate park there are severall fishponds very well imbanked, ordered and fitted for preservation of fish and foule and if stored may be much improved.' (Dent 1962).

Small fish bought to stock fish ponds were referred to as 'stored' these are then fattened up for eating. Details of fish pond stocking and management can be found in a journal kept by William More, who was Prior of Worcester from 1518-1536, (Hickling 1971), in which details of the cleaning of the ponds, restocking etc are recorded. Stocking appears to have been carried out twice a year, in the summer eels were put in the ponds, while other fish were introduced in the winter and early spring. In the winter the fish are easier to handle being sluggish because of the cold weather, they are also less likely to suffer any damage from handling. The suppliers of fish probably brought them on carts packed in grass and straw as well as eels. Prior More's stock fish were brought from distances of 13 miles so they must have been able to survive several hours out of water. He kept eels, tench, pike, bream, perch, and roach in his ponds.

At long intervals the ponds were fished out, this was recommended by Taverner (writing in 1600) to be carried out every autumn, for stocktaking. Taverner also suggested that after draining the ponds should be left to lie in

the sun for a year to sweeten the soil and restore fertility, this practise is still approved of today. Taverner (writing in 1600), considered carp, bream, tench and perch to be the best fish for culture, (see Hickling 1971).

Izaak Walton (1653) also has much to say on the making of fish ponds, quoting Dr Lebault's Maison Rustique, discussing both their construction and subsequent management, advising that if the ponds are small the fish should be fed 'by throwing into them chippings of bread, curds, grains and the entrails of chickens or of any fowl or beast that you kill to feed yourselves, for these afford fish a great relief'. (Taverner was also an advocate of extra feeding). Walton also gives advice on what sort of conditions suit different fish, ie the nature of the bottom, vegetation etc.

However at the time Evelyn the diarist was writing (1640-1665), and Defoe (1661-1731), the function of fish ponds was partly ornamental, fishing along with fowling became the poor man's recreation being free from the restriction of the Game Laws, (Cutting 1955).

The carp was probably only kept in artificially stocked fish ponds at this time. The species was introduced between 1450 and 1500 (Hickling 1971). Pennant (1776) describes carp being held in a net, well wrapped in wet moss and hung in a cellar, they can stay alive as long as the moss is kept wet and are often fed bread and milk which makes them very fat. They are superior in taste to those killed straight from the pond, (see Zeuner 1963). Feeding them bread and milk would probably eliminate the muddy taste carp are often said to have. This can also be eliminated by keeping them in flowing water for a few days. (Hickling 1962).

Pike were named according to their size, 'pickerel' are up to 3 lb in weight, after which they become 'pike' and still larger specimens are 'luce', (Hickling 1971). The stocking of ponds with predatory fish such as pickerel, perch and eel would reduce the overpopulation that would result from breeding within the pond at the same time providing a ready food supply for these fish.

Eel traps were placed in the ponds at all times of the year, these would give a steady supply of table eels all year, and if the eels were too small they could be thrown back as the traps did not harm them, (Hickling 1971). As eels do not breed in freshwater the ponds had to be restocked periodically.

River fishing always seems to have been a common and popular past-time. Izaak Walton discourses at length on the best ways to catch over 20 species of freshwater fish, with enthusiasm, (if not always with complete accuracy), in the Compleat Angler. (1653).

Apart from rods and lines traps were also used, especially for eels, (Wheeler 1979), the whole of the Thames and its tributaries were important for eel fisheries. They were mainly captured in traditional 'eel-bucks', wicker baskets fixed to weirs in millstream or occasionally free standing (Yarrell 1836), and in grig weels. Eel-bucks faced upstream to catch the eels as they migrated seawards, these were fished at night mainly in the autumn. Bucks were the main method of capture on the river and their use is hundreds, probably thousands of years old. The reverse migration took place when the elvers made their way up the river, this occurred in the spring in the Thames, the elvers were probably also eaten in great quantities.

All these fish are 'good eating' except the barbel which Walton says is good sport but 'he is not accounted to be the best fish to eat, neither for his wholesomeness nor his taste, but the male is reputed much better than the female whose spawn is very hurtful'. However, he does go on to say that the barbel suffers from 'ill-cookery' rather than being unpalatable. He goes on to say much the same about the chub, that its flesh is often watery and tastless through 'ill-cookery' and is also rather bony.

The recipe Walton recommends for chub involves cleaning the fish, and filling the belly with herbs, tie it to a spit with 2 or 3 splinters, roast, basting frequently with vinegar, or verjuice and butter mixed with salt. Walton also emphasises that the fish should be very fresh.

The Compleat Angler contains many recipes for freshwater fish, usually based on wine, anchovies, oysters, butter, salt and many herbs.

The high price of purchasing fresh fish (which continued until transport was improved in the C 18th) must have offset the cost of artificially stocking fish ponds (which also provided a very convenient source of fresh fish), and maintaining them. Fresh fish must have also provided a welcome relief from the monotony of dried and salted fish which formed a major part of the winter diet and also during Lent.

Although the numbers of bones of some of these freshwater fish are not very high it seems likely that most of them were served whole at the table, especially carp whose whole skeleton is well presented.

Salmon Fishing

The salmon appears to have been common in the Thames if not abundant, the Thames salmon fishery was important, (the closest source for Nonsuch), although it did not produce enough to supply the whole London market as in the C 17th and early C 18th salmon was brought to Billingsgate from the Lake District, (Wheeler 1979).

Salmon were caught by salmon-bucks, which were placed in the river to catch the salmon going upstream to spawn, they were also caught by nets and rod and line.

Izaak Walton regards the salmon as the 'King of freshwater fish', and no salmon caught in England has such an excellent taste as those caught in the Thames.

Fresh salmon always seems to have commanded a high price, in the C 16th when gurnards cost 1s 5d to 2s each and turbot cost 4s to 6s 8d salmon cost 10s to 15s (Cutting 1955) which must have put it out of the reach of all but the wealthy. As a royal palace that was also used as government offices it is quite likely that fresh salmon was eaten at Nonsuch, although it is not possible to comment on this from the bone evidence.

Much of the salmon that had to be transported any distance before distribution was pickled, and salmon that were caught after they had spawned were not eaten fresh, they were low in fat content and appeared quite emaciated, these were 'kippered' (split and smoked) to make them more palatable. The low fat content meant there was less chance of rancidity once the salmon was dried, (Cutting 1955). This was probably one of the cheapest forms of salmon.

Inshore Fishery.

The following fish were probably caught by an inshore fishery; the roker, conger eel, sturgeon, whiting and red sea bream were all probably caught on hooks and lines from small boats, the latter 2 may also have been caught in nets.

Grey mullet, plaice, flounder, gurnard, salmon, trout, eel and also roker may have been caught in kiddles, which are V shaped constructions pointing towards the sea or deep water with a holding box, these will catch intertidal species and migratory species. Kiddles were originally made of timbers with osiers and brushwood, later on these were made of netting, these were in use on the outer estuary of the Thames at Maplin and on the Kent coast at Seasalter until the end of the last century (Wheeler 1979).

Sturgeon has always been regarded as a delicacy not only for its roe which is salted as caviare, but the flesh which can be 'hot smoked', (other fish prepared in this way include herring, mackerel, salmon and eel). However 'hot smoked' fish only keep for 4 or 5 days so it has no real value as a preservative, (Cutting 1955). In 1558 Master Anthony Jenkinson describing his trip to Astrakhan said that the inhabitants lived largely on fish especially sturgeon, which they hung out in the streets to dry. The season for sturgeon lasted from May to August when 500 boats passed down the Volga every year, the sturgeon were salted with natural salt by the shores of the Caspian Sea, (Cutting 1955).

After Billingsgate was declared a free and open market in 1690 the importation of fish caught in 'foreign bottoms' was forbidden, with a list of exceptions of which sturgeon was one, so it must have been popular as a food fish.

In 1724 Turbot was also added to this list of exceptions, the turbot has long been prized as a food fish, it was eaten both fresh and salted, and as most parts of the skeleton are represented at Nonsuch it might be suggested that the fish was eaten fresh since salted fish are frequently headed. By the C 16th fresh turbot was just under half the price of fresh salmon which probably still put it beyond the means of all but the wealthy. Although the prices in London would have been much higher than in the rest of the country.

Conger eel was eaten both fresh and salted, and was mentioned in a petition protesting against the export of fish from Britain in 1578, 'whereas divers kinds of sea fishes, as congers, hakes, pilchards, rays, thornebags, (thornback) papillons (butterfly rays), and dogs (dogfish) being necessary victuals for the people of this realm' .... (Cutting 1955) implying that conger eel was considered

one of the staple food fishes at that time. This also applies to the thornback ray or roker also mentioned above which today forms most of the skate landed by inshore fishing vessels. Both the thick lipped grey mullet and the tub gurnard were of moderate importance as food fish, and whiting were often salted and dried along with the other gadoids caught in a deep water fishery.

The mullet was well regarded as a food fish; Izaak Walton says of it 'the mullet may contend with all seafish for precedency and daintiness of taste, and that being in the right season the most dainty palates have allowed precedency to him'. While Daniel Defoe speaking of Arundel Castle says that in the river there are catch'd the best mullets, and the largest in England, a fish very good in itself, and much valued, by the gentry round, and often sent up to London. From Defoe's comments it seems that mullet could also have been discussed in the section on fresh water fish.

The Distant Water White Fish Fishery

The main fish brought back from deeper water were cod and ling, which formed part of the mainstay of the fish salting and drying industry. This constituted a major part of the diet (especially in winter) up until the C 18th when the duties on imported salt became very high, followed by the development of the railways and the use of ice and steam trawling which enormously increased the market for fresh fish. Improved transport would lower the price of fresh fish and therefore make it available to a far greater proportion of the population.

However until that time salted and dried fish was far cheaper than fresh fish, and during the winter months and Lent was of great importance. For example the household accounts of Sir William Petre of Ingate Hall, Essex, showed that in 1549 he laid in the following store for Lent, 'haberdine 75½ couple ling 46½ couple, stockfish 56 couple, red herring 2 cades, white herring a barrel and 6 salted congers besides a barrel of frying oil', 'Cutting 1955).

'Ling' appears to be a term used for saltfish, 'greenfish' seems to refer to wet salted cod, which after drying becomes 'ling'. 'Stockfish' may be a generic name for all fish dried in the round or partly severed state, sometimes with the head on, as distinct from the much improved cleaned and headed 'saltfish' or 'ling' from which the backbone had been removed, after splitting down the middle, (Cutting 1955).

Ling, as a deepwater species, is commonly taken by hook and line, and is most common in the northern North Sea, cod is abundant in the North Sea, coming inshore in winter and can be caught by hook and line, sometimes by shore seine in the winter, as well as by trawling.

The high proportion of vertebrae of cod and ling at Nonsuch suggest that these may have been 'stockfish' where in preparation for drying the head was taken off but the backbone was left intact. However the 'saltfish' or 'ling' previously mentioned would leave no skeletal evidence since they were both headed and had the backbone removed.

Today the haddock is common in the northern North Sea, but in the past it may have been more common in the southern and central North Sea. In the C 17th in addition to their flourishing herring industry the Dutch also fished all year on the Dogger Bank for cod, ling, tusk and haddock with 400 'pinks', flat bottomed square smacks, and narrow seined well boats in which the fish could be kept alive, (Cutting 1955). Haddock was also dried until smoked haddock became popular in the C 19th, and by the end of the century 3 types of curing were known in Scotland where the smoking was mainly carried out.

Hake was held in great esteem, and regarded as predominantly a west coast fish, it was salted and the term 'Poor John' referred to small salted cod or hake. Unfortunately today the hake is relatively scarce as a result of over-fishing and the specimens caught are not very large.

Discussion

The fish remains from Nonsuch Palace represent the fish consumed by the wealthy (if not always royalty) and their servants during the C 16th and C 17th. The high proportion of fish that came from the garde robes is not necessarily an indication that more fish were eaten at the time these pits were in use but that the highly organic nature of their fills was conducive to fish bone preservation.

In contrast only one bone (a carp cleithrum) was recovered from the Banqueting Hall, where only light refreshments were taken, whereas the main meals were taken in the Palace itself. Perhaps in earlier periods (pre garde robe

construction) food refuse was disposed of indiscriminately and fish bone was less likely to be well preserved.

The species list indicates a combination of cheap salted fish, (often deep sea), fish caught near the shoreline, freshwater river fish, the produce of artificially stocked ponds, and expensive delicacies such as sturgeon and fresh salmon.

Very little butchery was observed, only 7 examples were noted, 3 vertebral centra were chopped, (2 of ling and 1 of cod), 3 cod supracleithra and one 1st intehaemal of a plaice.

The chops on the supracleithra may be evidence of heading, prior to salting and drying, however the examples of butchery are so few that any interpretation is bound to be speculative.

The absence of butchery on the freshwater fish could be used as negative evidence in supporting the earlier suggestion that these fish were brought to the table whole. None of Walton's recipes in the Compleat Angler involve heading the fish except for the eel. He does recommend gutting and also slitting the throat to remove any food lodged there, this would leave little or no evidence on the bones.

Few measurements could be taken, due to a lack of cod dentaries and premaxillaries, however bones of other species were compared with modern specimens of known length, turbot bones were similar to, or larger than, a specimen of 62 cms, which is an average size today. Carp were mainly similar to a specimen of 50 cms. The cyprinids apart from carp were mostly represented by pharyngeals, these probably preserve better than other parts of the skeleton, as they are very dense, they are also easily identifiable to species.

Most of the fish that were not easily accessible from within the grounds or close to Nonsuch, ie the marine fish, were probably brought from London (Billingsgate) by cart, despite the appalling state of the roads.

Defoe comments on the improvement in fish carrying that would result from repairing the roads, citing herring and mackerel that were already being brought

from the Sussex and Kent coasts to London, salmon brought down from the rivers of the Severn and the Trent, and the carrying of herring, mackerel, sprats in season, and whitings and flatfish at other times from the coasts around Yarmouth and Colchester to inland countries arriving there while still fresh.

The wide variety of fish found at Nonsuch, together with the large variety of birds, domestic animals and game suggests that even though Nonsuch was not solely used as a royal residence the quality of food was of the highest standards.

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	Roker	Elasmo	Sturgeon	Eel	Conger Eel	Salmon	Trout	Pike	Carp	Barbel	Chub	Roach	Cod	Ha
Premaxilla	-	-	-	-	-	-	-	3	6	-	-	-	-	
Dentary	-	-	-	3	-	-	-	3	1	-	-	1	1	
Pharyngeals	-	-	-	-	-	-	-	-	14	1	1	11	-	
Skull frags	-	-	-	-	-	-	-	5	44	-	1	1	13	
Fin rays	-	-	-	-	-	-	-	-	22	-	-	-	-	
Vertebrae	-	2	-	23	22	1	3	4	15	1	3	-	68	
1st intehaemal	-	-	-	-	-	-	-	-	-	-	-	-	-	
Dermal denticle	7	-	-	-	-	-	-	-	-	-	-	-	-	
Scute	-	-	5	-	-	-	-	-	-	-	-	-	-	
Unident	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	7	2	5	26	22	1	3	15	102	2	5	13	82	

Cod	Haddock	Whiting	Ling	?Hake	Tub Gurnard	Perch	Red Sea Bream	Grey Mullet	Turbot	Plaice/Flounder	Unident
-	-	-	-	-	-	-	1	-	-	-	-
1	-	7	2	-	-	1	-	-	1	-	-
-	-	-	-	-	-	-	-	-	-	-	-
13	4	6	11	-	32	-	-	2	13	50	55
-	-	-	-	-	-	-	-	-	-	-	364
68	1	3	51	1	3	-	-	12	27	307	141
-	-	-	-	-	-	-	-	-	-	88	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	1,068
82	5	16	64	1	35	1	1	14	41	445	1,628

Total = 2,536