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by

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The fish bone from The Swan, a 17th century shipwreck off Duart Point, Mull: 2000-2003 excavations

Rachel L. Parks and James H. Barrett

Introduction

Underwater excavation of the Swan, a Cromwellian shipwreck of 1653 off Duart Point, Mull, Scotland, produced a small assemblage of 789 fish bones. The excavation was directed by Dr. Colin Martin of St. Andrew's University and the fish bone derived from the 2000, 2002 and 2003 field seasons. In 2000, a very small quantity of fish bone (49 fragments, of which only a few ling bones were identifiable) was hand collected from the ship's bilge. These were recovered along with more abundant mammal bone (Martin pers comm.), but given the tiny sample and the biases inherent in hand recovery (Jones 1982; Vale & Gargett 2002) little can be said about them. In contrast, a slightly larger deposit of concentrated fish bone (743 specimens) was identified at the base of the ship's stern in 2002. Some of this material was hand collected that year, but in 2003 a bulk sample of 5 litres of this sediment was removed and sieved on land using a 1.5mm mesh (Martin pers comm.). Fragments of barrels were also found, but the location of the fish bone deposit is inappropriate for storage and human bone (probably all belonging to one individual) was also scattered across the area. Thus the base of the stern presumably acted as a 'trap' for waterborne flotsam within the wreck until the material was immobilised by sediment. The material must therefore be interpreted in terms of both human and natural accumulation processes.

Although the number of bones from the stern deposit is modest, it does show a very narrow species diversity and an unusual element distribution, both of which can be interpreted in terms of cured (probably dried and salted) fish. The assemblage thus adds to the story of early modern maritime provisioning emerging from other broadly contemporary wreck sites (e.g. Brinkhuizen 1994; Hamilton-Dyer 1995).

Methods

The assemblage was recorded following the York protocol, which is described by Harland *et al*. (2003). It entails the detailed recording of c.20 diagnostic elements. These bones are identified to the finest possible taxonomic group and recorded in detail – typically including, as appropriate, element, side, count, measurements, weight, modifications (including burning and butchery), fragmentation, texture and estimates of fish size. Although identified as diagnostic elements, fish vertebrae are recorded in slightly less detail (measurements are not taken and texture is not scored, for example). 'Non-diagnostic' elements (quantification category 0) are not typically identified beyond class. Given the tiny sample from The Swan, however, all identifiable cranial elements were quantified in this case. Fin rays and pterygiophores make up the bulk of the remaining 'unidentified' specimens, but virtually all of these are probably from ling. The small number of measurements follow Harland *et al*.(2003) and references therein.

The assemblage has been quantified by number of identified specimens (NISP), including all bones or only the diagnostic elements as indicated. The complete archive has been submitted to Colin Martin with this report, as a Microsoft Access database file and a series of text files that duplicate its content, and will be kept on file at the University of York *Fishlab*.

Preservation

The bones from the Swan were not highly fragmented. Most were over 60% complete and many over 80% complete. This observation may imply little post-depositional disturbance after an initial episode of fluvial transport. However, the preservation of the bone tissue itself was rather poor, with many specimens exhibiting extensive flaky or powdery areas. None of the material showed evidence of burning, but three vertebrae were crushed. One of these also exhibited a tooth impression, suggesting that the bones had been chewed. The tooth mark is not characteristic of carnivore gnawing (cf. Lyman 1994) and may well be human.

Results and Discussion

A total of 789 fish bones weighing c.401g were examined (Table 1). Of these, 131 were identified cranial, appendicular or vertebral elements. The remainder were tiny fragments of bone, fin rays and pterygiophores – most or all of which were from the species (particularly ling) represented by the identified elements.

The assemblage includes a very narrow species diversity. It is almost entirely comprised of ling. The only exceptions are one salmonid (probably salmon) vertebra, three cod vertebrae and two bones that could only be identified as cod family (probably cod or ling). The salmon aside, the bones are all from large fish, even if the hand collected material is excluded to avoid recovery bias. The cod bones are from fish of 50 to 80cm total length and all of the ling bones are from fish of more than 100cm total length. The largest ling specimens may have been from individuals of greater than 150cm total length (Table 2).

Ling are known to inhabit wreck sites (Wheeler 1978), but the narrow species diversity and size range represented makes it unlikely that this is a natural death assemblage – an observation that is corroborated by the presence of cut marks on at least two of the specimens (Table 3). The skeletal element distribution is also inconsistent with whole fish (Table 1).

The three cod bones are caudal vertebrae, but little can be inferred from so few specimens. The number of ling bones is also small, but a distinctive element distribution is nevertheless clear. Firstly, the most abundant elements are caudal (tail) vertebrae of different kinds and cleithra. These are the bones typically left in dried (or salted) cod and ling during storage and transport (Barrett 1997). Two cut marks on supracleithra, which imply the decapitation of ling anterior to the cleithrum, are also consistent with this distinctive butchery pattern. The assemblage may thus have been partly composed of preserved ling. Stockfish, dried by wind alone, tend to be made from fish of less than 100cm total length (Perdikaris 1999), so The Swan's provisions were either salted or, most likely, salted and dried as a klipfisk (split, salted and dried flat) style product.

Secondly, however, ling dentaries (from the lower jaw) were also abundant, and other cranial elements were present in trace numbers. These bones were from fish of approximately the same size as the cleithra (Table 2). Superficially the dentaries look to be from slightly larger fish, but the difference is not statistically significant at this sample size (T=-2.15, P=0.060, DF=9). They indicate either that a mixture of whole and cured ling were present on The Swan, or that ling heads were also dried and/or salted as provisions. The drying of fish heads is known among Scandinavian stockfish producers, so the latter interpretation is not unreasonable, but they were typically used for animal fodder (Vollan 1974). It is not surprising that these fish heads are best represented by dentaries, as they are one of the heaviest and most robust elements in a ling cranium. They would be least susceptible to onward fluvial transport once 'trapped' in the stern and thus imply an assemblage that has in effect been winnowed (cf. Butler 1993).

The Swan assemblage can be interpreted in the context of material from other broadly contemporary wrecks. For example, the warship the Mary Rose was wrecked in 1545 off Portsmouth, England (Hamilton-Dyer 1995), and the merchant vessel Scheurrak SO1, was wrecked off Holland, sometime after 1589 (Brinkhuizen 1994). The fish bone assemblages from both are considerably larger than that from the Swan and have conclusive evidence that the ships were carrying stockfish (or a similar product).

The fish bone assemblage from the Mary Rose was recovered from a sealed deposit in the first deck and hold area of the stern (Hamilton-Dyer 1995). Over 30,000 bones were recovered, the majority of which were cod. The element distribution and butchery evidence was typical of stockfish. In addition to cod, smaller quantities of haddock, pollack and hake were represented by caudal vertebrae only. Hamilton-Dyer (1995) suggests that the tails of these species were included with the stockfish to inflate the number of fish.

Brinkhuizen's (1994) analysis of the bone from Scheurrak SO1 also revealed variation in the species and parts of fish included as stockfish. The assemblage was recovered from barrels in the first deck. One contained almost exclusively appendicular elements (such as the cleithrum) and vertebrae of cod. The other contained similarly processed fish, but with a wider range of species, sizes and elements present.

Clearly cured gadid fish played a role in the provisioning of 16th-17th century shipping. In this the Swan is not unique. The use of ling may, however, be significant given the ship's apparently Scottish sphere of activity. This species has a northerly distribution (Wheeler 1978) and formed one mainstay of Shetland's salt fish trade in the early modern period (Goodlad 1971; Smith 1984). To qualify this possible connection, however, Shetland's catches were widely exported and ling were also caught elsewhere (e.g. Nicholson 1988). They may not have been acquired by The Swan anywhere near where they were originally caught and processed.

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Table 1. Species and element distributions by NISP (all specimens).

Element	**2000**	**2002**	**2003**	**Total**
Salmonidae				
Caudal Vertebra		1		1
Gadidae				
Cleithrum			1	1
Epihyal			1	1
Gadus morhua				
Caudal Vertebra Group 2			2	2
Caudal Vertebra Group 1			1	1
Molva molva				
Caudal Vertebra Group 1		1	21	22
Cleithrum	1	6	13	20
Caudal Vertebra Group 2			13	13
Dentary		5	8	13
Supracleithrum		4	3	7
Caudal Vertebra		1	5	6
Ceratohyal	1	1	4	6
Ectopterygoid		3	2	5
Epihyal	1	1	3	5
Articular			4	4
Vomer		3		3
Abdominal Vertebra Group 3			2	2
Frontal		2		2
Interopercular		1	1	2
Opercular		1	1	2
Preopercular		1	1	2
Quadrate			2	2
Scapula			2	2
Basipterygium			1	1
Hyomandibular			1	1
Maxilla			1	1
Parietal		1		1
Premaxilla			1	1
Subopercular			1	1
Ultimate Vertebra			1	1
Unidentified (most or all *Molva molva*)				
Fin Rays, Pterygiophores, Etc.	43	17	598	658
Total	46	49	694	789

Table 2. Measurements and estimated total length (after Jones 1991; Harland *et al*. 2003) for ling cleithra and dentaries from the sieved deposit

Sample	**Element**	**Measurement 1**	**Estimated Total Length (mm)**
33.16	Cleithrum	20.96	1182
34.15	Cleithrum	18.16	1080
34.16	Cleithrum	21.32	1194
34.16	Cleithrum	19.46	1128
34.16	Cleithrum	17.12	1040
Mean	**Cleithrum**	19.40	1125
34.15	Dentary	15.06	1551
34.15	Dentary	10.60	1175
34.16	Dentary	11.70	1270
34.16	Dentary	11.15	1223
34.16	Dentary	11.13	1221
34.16	Dentary	8.81	1015
34.16	Dentary	11.30	1236
34.16	Dentary	15.78	1609
Mean	**Dentary**	11.94	1287

Table 3. Butchery marks and other modifications (all specimens).

Modification	**Element**	**2000**	**2002**	**2003**
Molva molva				
Crushed	Caudal Vertebra Group 1			2
Knife Cut	Supracleithrum		1	
Knife Cut	Supracleithrum		1	
Crushed and Possibly Cut	Caudal Vertebra Group 1			1