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Gutted and Salted: A Fish Bone Assemblage from John Street, Waterford, Ireland

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ABSTRACT: A post-medieval deposit consisting solely of herring (*Clupea harengus*) bones was excavated from John Street, Waterford, Ireland. A total of 3534 fragments were identified, deriving from at least 300 individuals. Most of the sample consisted of branchiostegal rays, fin spines and the bones of gill arches, in what appears to represent gutting waste. The sample seems to represent specialised activity, possibly relating to industrial herring processing or at least to the curing of a few barrels of herring.

KEYWORDS: FISH, FISH BONE ASSEMBLAGES, HERRING, IRELAND, POST-MEDIEVAL, GUTTING WASTE

RESUMEN: Se describe en este trabajo un acúmulo postmedieval excavado en John Street, (Waterford, Irlanda) formado exclusivamente por huesos de arenque (*Clupea harengus*). Dicho depósito estaba constituído por 3534 restos identificados que derivaban de cuando menos 300 individuos de esta especie. La mayor parte de la muestra estaba formada por radios branquióstegos, radios aletiles y elementos de los arcos branquiales en lo que parece a todas luces representar vestigios de una actividad de evisceración de los peces. La muestra evidencia, por tanto, una actividad especializada posiblemente relacionada con el procesamiento industrial de arenques o, cuando menos, con la preparación de algunos barriles de esta especie en conserva.

PALABRAS CLAVE: PEZ, ACÚMULOS DE HUESOS DE PECES, ARENQUE, IRLANDA, PERIODO POST-MEDIEVAL, DESPOJOS

INTRODUCTION

The town of Waterford is situated in the south-east of Ireland (Figure 1). The first settlement was established by the Vikings, probably in the 9th century, in the junction of rivers Suir and St John (Bradley & Halpin, 1992: 105). The town continued to develop throughout the Middle Ages and in the 16th century it was described as the 'Second City in Ireland' (Maxwell, 1925: 232). However, it declined in importance during the unsettling times in the 17th century (Maxwell, 1925: 232). In the 18th century, the city was developing and expanding again but never fully gained its past glory (Dowling, 1998: xviii).

Fishermen are mentioned in connection with herring fishing in Waterford already in late medieval documents (Ireland, 1981: 21; O'Neill, 1987: 34). The Irish fishing industry was thriving during the medieval period (Ireland, 1981; O'Neill, 1987). This was partly due the migratory nature of herring; they appeared in increasing numbers in Irish Sea about from AD 1450 onwards (O'Neill, 1987: 30). However, this very same mechanism may have caused a decline in the herring fishing in Ireland in the early 17th century as the shoals deserted the Irish coast (Clarke, 1976: 181). Robert Cogan commented in year 1611 that there is no fish among the exports of Waterford (Maxwell, 1923: 373). In the 18th century the coast of Co. Waterford is mentioned as being suitable for fishing, the most important fishing port being Dungarvan, 30 km west from Waterford (Smith, 1746: 259). However, by the early 18th century,

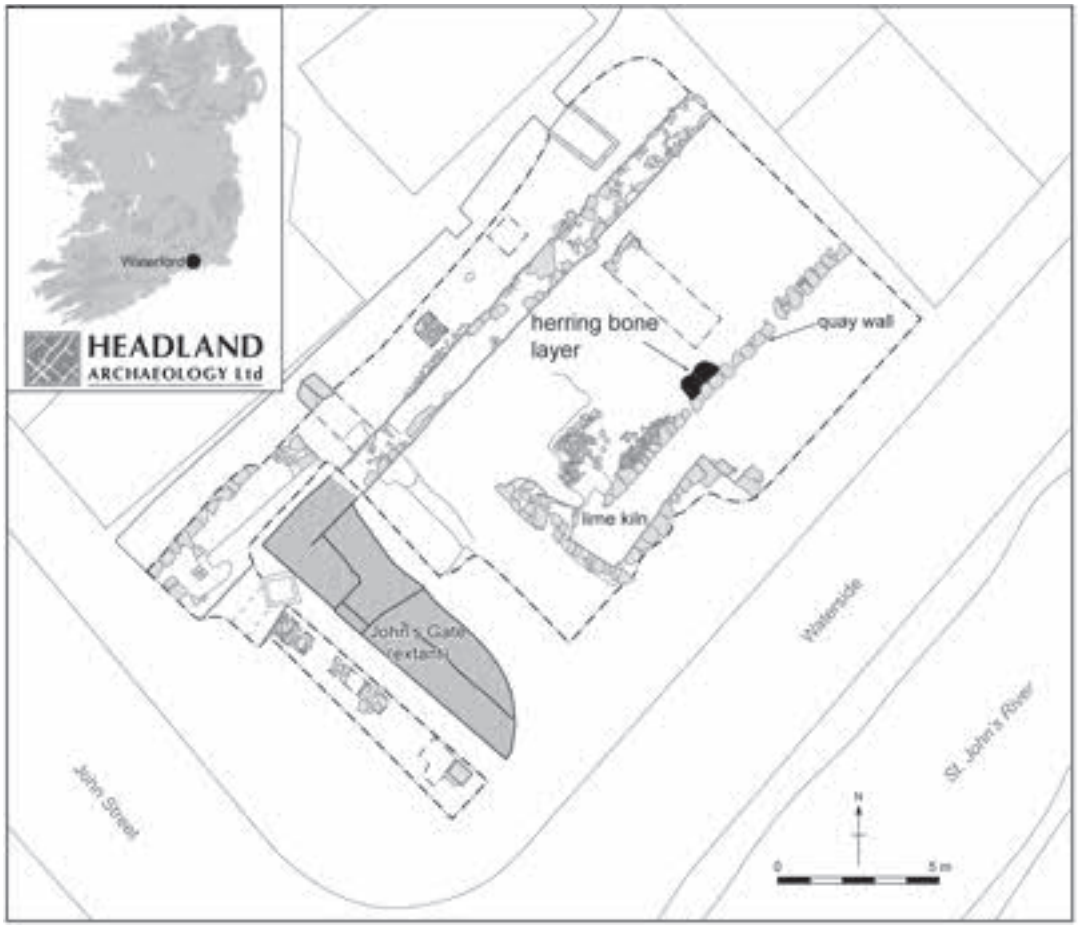

FIGURE 1

The site plan of John Street excavations, Waterford, Ireland.

Irish fishing industry as a whole was in decline (Rynne, 2006: 200).

Excavations in John Street were conducted in 2006 (McCarthy, 2007). The site is located at the junction of John Street and Waterside, and it runs parallel with John's River, near the medieval city wall. Recovered pottery proved to be post-medieval, dating to the 17th and 18th centuries. A limekiln and number of horn cores recovered from the site refer to the industrial activities. According to the written sources, tanning establishments, a bark mill, malt houses, and a kiln house were situated on John Street in the 17th century (Dowling, 1998: 100). Inside the quay wall, and level with the top of the wall, was a thin deposit of fish bones (Figure 2), measuring 1.3 m x 0.65 m x 0.02 m. The quay wall still held back the tide thus protecting the layer, as was seen on site during the high tide.

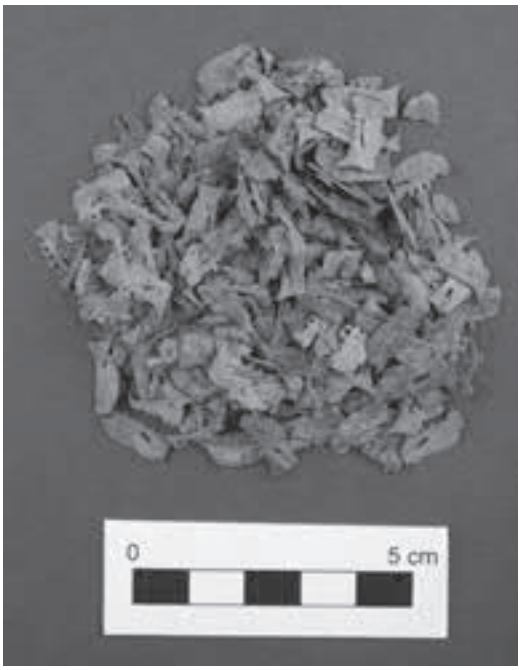

FIGURE 2
Sample from the deposit of fish bones at John Street.

A five litre sample was taken from the layer, estimated to be approximately 60% of the surviving deposit. The sample was water sieved with 1mm sieve and dried. During sorting, all identifiable bone fragments were picked out for closer examination.

The retrieved sample proved to consist almost solely of fish bones. No complete anatomical structures were evident during the excavations. Scales were present but not abundant. A few fragments of shell were recovered as well as seeds of *Rubus* sp. (blackberry of raspberry) (pers. comm. Susan Lyons, Headland Archaeology Ltd). Only one mammal bone was recovered among the fish bones, a small unidentifiable fragment. Some fin bones were still articulated and the bones in general were in a good state of preservation, although partially crushed. The survival of these features indicates a rapid burial of the layer; it is likely that these bones represent a short period of activity, possibly a single depositional event.

THE SAMPLE

The whole sample, a total of 3534 identified fragments, consisted solely of herring (*Clupea harengus*) bones. The species identification was done through a careful examination of herring, shad (*Allosa fallax*) and pilchard (or sardine, *Sardina pilchardus*) and sprat (*Sprattus sprattus*) bones.

One scale, belonging to the perch family, is the only indication of another species present in the assemblage (Percidae, likely perch, *Perca fluviatilis,* the only member of this family in Ireland).

The anatomical distribution of the sample proved to be interesting. Most of the sample consisted of branchiostegal rays, fin spines (mostly from the pectoral fin) and the bones of gill arches.

The bones in the sample were not found in equal proportion as they are in the complete skeleton (Table 1). The most abundant elements were bones from the shoulder girdle and hyoid arch. Lateral skull bones (from gill covers and the sides of the head) were found in moderation. Bones from the neurocranium and spine (vertebrae) were few.

As the bones were found in a rather fragmented state, NISP figures are likely to be affected, exaggerating the number of easily breakable bones. MNE figures were counted to further evaluate the anatomical distribution (Table 2, Figure 3). These were in turn used for counting %MAU in order to examine the relative abundance of elements. It seems that bones from the hyoid arch are the most abundant, closely followed by the bones from the shoulder girdle. To obtain an idea of the size of the

ELEMENT	NISP
coracoid	408
cleithrum	689
posttemporal	4
scapula	336
supracleithrum	111
fin spines	++
ceratohyal	452
epihyal	279
hypohyal	566
branchiostegal rays	++
urohyal	341
gill arches: not specified	++
interopercular	10
opercular	20
preopercular	20
subopercular	24
articular	36
dentary	26
hyomandibular	12
maxilla	25
quadrate	17
supramaxilla	28
exoccipital	2
frontale	2
parasphenoid	21
prootic	17
neurocranium	37
basioccipital	5
vertebra	46
scales	+
Total	**3534**

TABLE 1

Anatomical distribution of the sample. ++ = abundant but not quantified, + present but not quantified.

find, the minimum number of individuals (MNI) of the sample was estimated. The highest value, MNI 288, was derived from the urohyal.

TAPHONOMIC HISTORY

The abundance of the different elements in the sample is related to several factors. The more fragile elements have been crushed, the smaller elements have been difficult to recover and the bones with few diagnostic parts are more likely to remain unidentified.

Element	MNE	%MAU
ceratohyal	191	33.2
epihyal	199	34.5
urohyal	288	100.0
cleithrum	172	29.9
coracoid	272	47.2
supracleithrum	111	19.3
posttemporal	4	0.7
opercular	20	3.5
subopercular	12	2.1
articular	32	5.6
dentary	16	2.8
hyomandibular	12	2.1
maxilla	25	4.3
quadrate	17	3.0
parasphenoid	11	3.8
basioccipital	5	1.7

TABLE 2

MNE and %MAU figures of the sample.

However, it is felt that the most important factor in the formation of this assemblage has been processing of the fish. As the elements of the throat are common and those of the vertebra scarce, it is possible that the assemblage represents curing waste, removed from the fish with the intestines before preservation. There were two main methods to preserve herring or herring related oily fish that could not be dried: salting and smoking (Cutting, 1955: 53 ff). In practice, they could be gutted and stored in air-tight barrels with salt ('white herrings', however this term is sometimes used also for fresh fish) or preserved using heavy salting and smoking ('red herrings') (Cutting, 1955: 62, 71). The same processes that were used to cure herring were applicable for other oily species like pilchards (sardines) or sprats (Smith, 1746: 269; Cutting, 1955: 79-82). Red herrings were apparently not gutted and the gutting waste must therefore be from salted fish (Cutting, 1955: 76-77).

Only the hyoid arch, branchial apparatus (not quantified) and shoulder girdle were supposed to be removed during the gutting process. It seems that the removal did not necessarily include the gill covers (opercular series). Some descriptions of

the gutting of herrings in the 15th century are available. The gills were removed with some of the viscera and long gut through an incision in the throat (Cutting, 1955: 62, for modern example see Enghoff, 1996: 45). This is indicated by the pictorial evidence: salted herring are missing a triangular section behind the head but the operculars seem to be attached (Seeman, 1986: 138). The anatomical pattern and the nature of the sample found in Waterford resembles closely that seen in medieval site of Selsø-Vestby, Denmark, also interpreted as gutting waste (Enghoff, 1996). Both samples consisted solely of herring bones, with elements from the hyoid arch and shoulder girdle dominating (Enghoff, 1996: 44).

It seems, that part of the bones have entered the assemblage through mistakes made during processing (accidentally removing more bones than necessary) or from the complete fish being discarded during the curing process. As the vertebrae

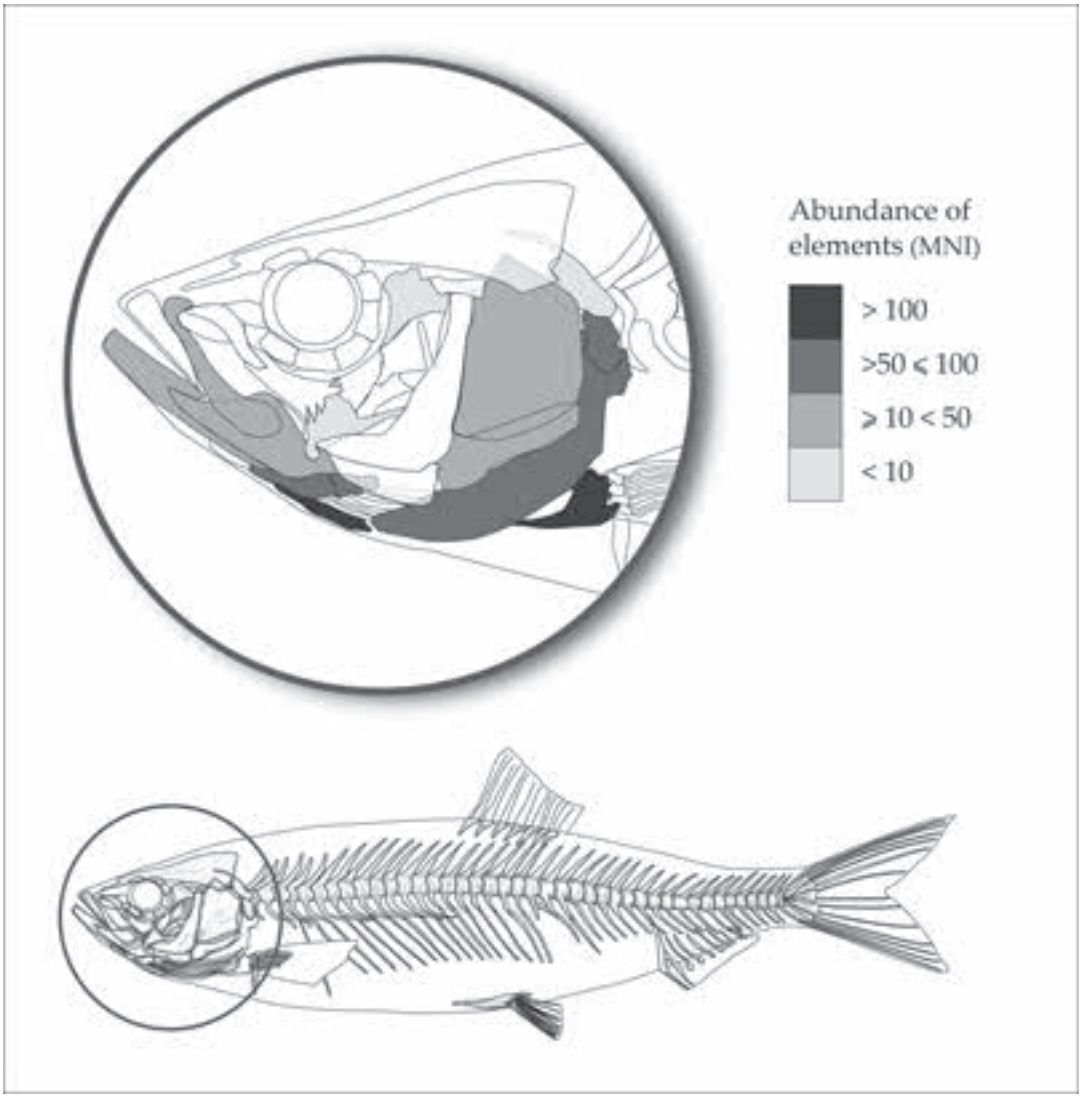

FIGURE 3

The abundance of different elements in the herring bone assemblage, John Street, Waterford (%MAU). Drawing Sara Nylund, Headland Archaeology Ltd.

are clearly less abundant in the material than the cranial bones, the former explanation seems more likely.

Enghoff (1996: 44) notes that in the Selsø-Vestby assemblage bones connecting the hyoid arch and shoulder girdle to the neurocranium (hyomandibular and posttemporal) were scarce or absent. This is also true with the Waterford sample. The gill covers and lower jaw seem to be removed more often than the palatoquadratum. The gill covers consist of thin and easily fragmented bones with only few identifiable parts. On the contrary, e.g. the quadrate from the palatoquadratum is robust and easily identifiable. Thus it seems likely, that fewer palatoquadratums than opercular series and lower jaws were originally deposited. The most common cranial bone is the parasphenoid, situated in the basal section of the cranium. It seems likely that fish neurocrania were not always deposited with the opercular series and lower jaws.

The urohyal, part of the hyoid arch, exhibits the highest MNE (and MNI) of the sample. However, results from the other studies indicate that the hyoid arch was not always removed during the curing. In the material interpreted as remains of cured herrings recovered from Smeerenburg, Spitsbergen some epi- and ceratohyal bones were present, even if not abundant (Seeman, 1986: 137). Thus, if the Smeerenburg assemblage originates from cured herrings, it is evident that in some cases the hyoid arch elements are retained with cured fish, probably by mistake.

The high numbers of hyoid arch bones found at John Street might be related to factors of preservation, as these bones are particularly robust and easily identifiable (98 complete ceratohyals but only one complete cleithrum were recovered from the sample). However, it is also possible, that curing methods varied in detail in different areas and times.

THE IMPORTANCE OF HERRING IN WATERFORD

Herring bones have been recovered from a number of medieval and post-medieval sites across the Baltic region and the North Sea, reflecting their importance in the area (e.g. Van Neer & Ervynck, 1996; Enghoff, 1999). In Ireland herring bones have rarely been recovered from medieval or post-medieval sites (McCarthy, 2003: 389; McCormick & Murray, 2007: 77). This partly reflects the lack of bulk sieving on Irish sites; however, sometimes even effective sieving has failed to provide any fish bones (McCormick & Murray, 2007: 77).

Historical sources provide us with some information about the importance of herring fishing in the Waterford during the post-medieval period. Yearly fluctuations of the herring shoals were notable in the 18th century. Charles Smith, writing at the time, comments that even if herrings are plentiful in Waterford, in later years they are 'scarce enough for home-consumption' (Smith, 1746: 268). He also provides us a list of fish species found off the Waterford coast (Smith, 1746: 259). Among 17 species, herring is mentioned last. In 1776, Arthur Young travelling in Waterford noted that "There is a fishery upon the coast for a great variety of fish, herring particularly in the mouth of Waterford Harbour…but the herring barrelled is not considerable" (Young, 1776-1778: 137).

It is possible, that the John Street herring assemblage derives from industrial herring curing activity. However, it has to be remembered that the professional herring fishery and export managed considerable amounts of individual herrings. For example, in 1641 Ireland exported 16252 barrels of herrings (Ireland, 1981: 36). One barrel of salted herrings held 1000 fish (Salzman, 1923). One fishing boat could catch up to 1600 herrings a night (Young, 1776-1779: 179). The small physical size of the John Street fish layer (3 m x 0.65 m) and MNI number representing not even one barrel of herring, seems modest compared to the evidence such an activity should display. However, there is not much information available on how and where exactly curing took place. The quayside seems a suitable place even for large scale curing, as water was readily available (Rynne, 2006: 203).

CONCLUSIONS

The John Street fish bone assemblage includes gutting waste of ca. 300 herrings, representing a short period (e.g. single day) of activity and deposition. As the analysed sample was only a part of the original layer, the total bone count would have been higher. The John Street neighbourhood was used as an industrial area, probably also as a waste land where various kinds of 'messy' activities

could be carried out. The rapid burial of the bones may indicate deliberate filling of the site soon after the curing episode.

The historical sources do not emphasise the fish industry as an important livelihood in Waterford – in contrast to Dungarvan. However, the sample clearly represents specialised activity, possibly relating to industrial herring processing or at least curing for a few barrels of herring, perhaps for 'home-consumption' as mentioned above.

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