

Introduction to archaeological fish remains

BAJR Practical Guide

by
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This guide aims to outline the importance of fish remains in the understanding of people in the past, discussing what fish remains can tell us and why they tend not to receive the same attention as mammal bones.

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Working with fish-bones was getting under his skin!

1. Aim

This guide aims to outline the importance of fish remains in the understanding of people in the past, discussing what fish remains can tell us and why they tend not to receive the same attention as mammal bones. It also provides a practical guide to the recovery of fish remains and a brief introduction to identification and analysis. A list of useful resources for the identification of fish remains from archaeological sites is included for those who wish to pursue an interest in fish remains.

2. Why collect fish remains?

Fish has constituted an important part of the human diet during many periods in the past. However, fish remains can tell us much more about human behaviour than just establishing diet.

Given the appropriate resources fish remains can indicate:

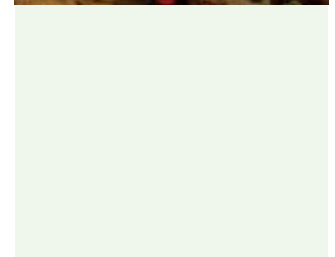
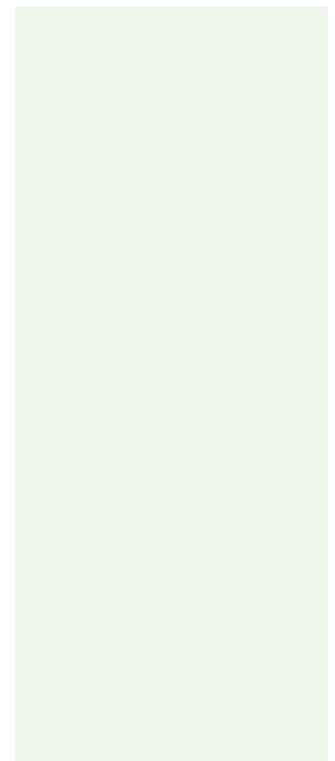
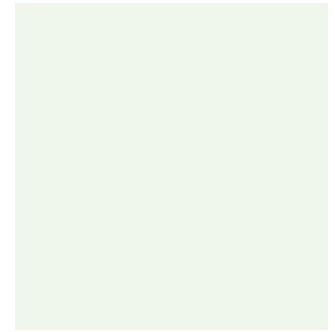
- What type of fish are being eaten
- Site type – processor or consumer
- Processing methods
- Technological capabilities – e.g. if they are using boats to exploit deep sea fish
- What kinds of fishing gear is being used
- If fishing was a seasonal activity

Fish remains tend to receive much less attention than the remains of mammals recovered from archaeological sites. There are several reasons for this (see below), but the identification of fish bones from a site is important as it will allow a more complete interpretation of human life (especially diet) in the past.

- Fish bones can be very small, and therefore only recovered by environmental sampling
- Fish bone identification is difficult and there are few specialists
- Fish is often not considered an important dietary resource

Be aware! People are not the only agents that deposit fish remains. For most sites humans can be identified as the accumulation agents based on the associated finds within discreet contexts.

At some sites this association is much more difficult – for example where there is complex stratigraphy or where there has been heavy bioturbation. It is important to be sure that you have fish bones that are deposited by people before interpretations regarding human diet and economy are made.

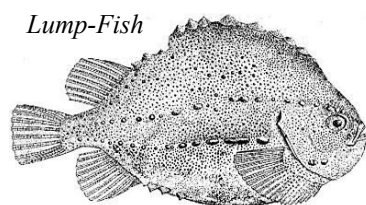


3. Why collect fish remains?

Fish bones should survive on any sites where mammalian and avian bone is preserved, they are usually absent in acidic soils. Common context types which frequently yield fish remains include cave deposits, latrines, middens and pits dating to most periods. Fish scales, dermal denticles, teeth and ossified cartilage can also be recovered from archaeological sites in some cases. All can be used in the identification of species, although fish scale identification is a very specialist area.

4. What species might you find and why?

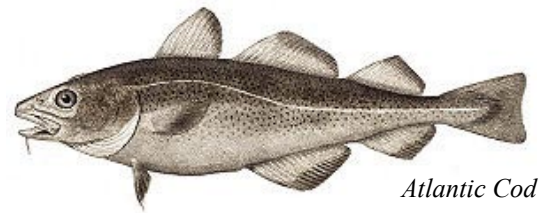
The chemical and physical characteristics of fish bones vary between species; this affects their representation in the archaeological record. Some species, such as the **Atlantic cod** (*Gadus morhua*) have fairly robust bones, while bones of others, such as the **lump-fish** (*Cyclopteridae*) are paper



Lump-Fish

thin. It is also thought that the varying lipid content in fish bones of different species has an effect on preservation, although little research has been done on this. Species representation also varies by period and location. Prior to

the Roman period, marine species are more common on coastal sites, while freshwater species are usually found further inland. Diadromous species (fish that travel between freshwater and marine environments – such as salmon, trout and eels) can be found on both coastal and inland sites. In later periods, when preservation and transportation methods have improved, marine species can be found on sites many miles from the coast. Certain species were also more or less popular during certain periods, for example, the medieval period is known for a focus on cod fishing for the trade of dried cod across Europe (Barrett et al. 2008).



Atlantic Cod

Barrett, J., C. Johnstone, J. Harland, W. Van Neer, A. Erynck, D. Makowiecki, D. Heinrich, A. K. Hufthammer, I. B. Enghoff, C. Amundsen, J. S. Christiansen, A. K. G. Jones, A. Locker, S. Hamilton-Dyer, L. Jonsson, L. Lóugas, C. Roberts & M. Richards 2008.

Detecting the medieval cod trade: a new method and first results.

Journal of Archaeological Science 35(4): 850-861.

5. Which fish parts are present and why?

Similarly, some skeletal elements are more frequently recovered than others. Uneven skeletal element representation patterns are often used to interpret fish processing behaviour. For example, at Grotta di Pozzo (an Upper Palaeolithic cave site in central Italy) there were many cranial elements and few vertebrae. I interpreted this as the use of the cave as a processing site, where the heads (and possibly tails) of fish were removed to aid the transportation (by reducing weight and size) to another location for consumption, and that this may also imply that the fish were being preserved in some way – either by smoking, salting or air drying. Other sites yield abundant vertebrae, but very few or no cranial remains. In

many cases these sites may be interpreted as consumption sites – where fish have been brought after the removal of the head (and possibly tail) portions. Element representation patterns can also be affected by glue making, cooking and disposal practices. However, all interpretations should be made after considering a range of taphonomic processes that could create similar element representation patterns. The effects of digestion, bioturbation, burial conditions, trampling and animal scavenging are all to be considered before interpretation. Some of these processes have been investigated quite thoroughly, however, many have not. There is a great need for further research, especially in experimental taphonomy.

6. How to recover fish bones

In some cases fish bones can be hand collected on-site along with other faunal remains, these will typically represent the remains of the larger fish species such as Atlantic cod (*Gadus morhua*) and Atlantic salmon (*Salmo salar*). To ensure an un-biased representation of fish species sediments need to be either wet or dry sieved, or preferably taken as bulk environmental samples for flotation (see Figure 1). Even with the larger fish remains it can be beneficial to take areas with concentrations as bulk samples for flotation which will cause less damage to the bones.

In cases where skeletal material is extremely fragile it may not be possible to recover fish remains intact, in these cases good photographs with scales are the best way of preserving the information. It is also useful to photograph any remains that are articulated prior to excavation as this information can be useful for interpretation.



Figure 1: Lynne Gardiner-Jones using the Flotation tank at Birnie (2006)

7. Identification and interpretation.

Fish bone identification can be a tricky process, and something that requires experience and expertise. It is however, something that can be self taught if you are prepared to invest a substantial amount of time and effort. The best way to introduce yourself to fish osteology (see Figures 2 and 3) is to go to the fish mongers, buy a whole fish, and dissect it. Trout (brown/sea trout (*Salmo trutta*) or rainbow trout (*Oncorhynchus mykiss*)) are good starter species – they are not too small and not too expensive (for dissection instructions see Wheeler & Jones 1989, 178-183).

For the identification of archaeological fish remains you need:

- A good reference collection of modern specimens (see Wheeler and Jones (1989, 177-185))
- Access to identification guides (see publication list below)
- A hand lens



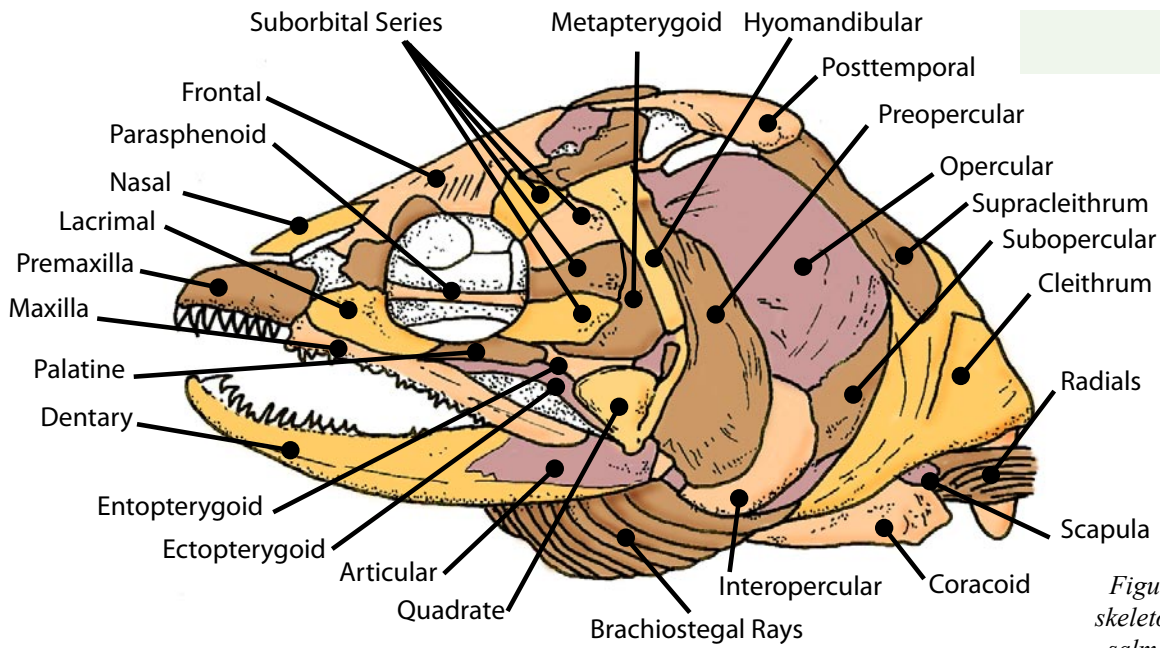


Figure 2: The cranial skeleton of an Atlantic salmon (*Salmo salar*)

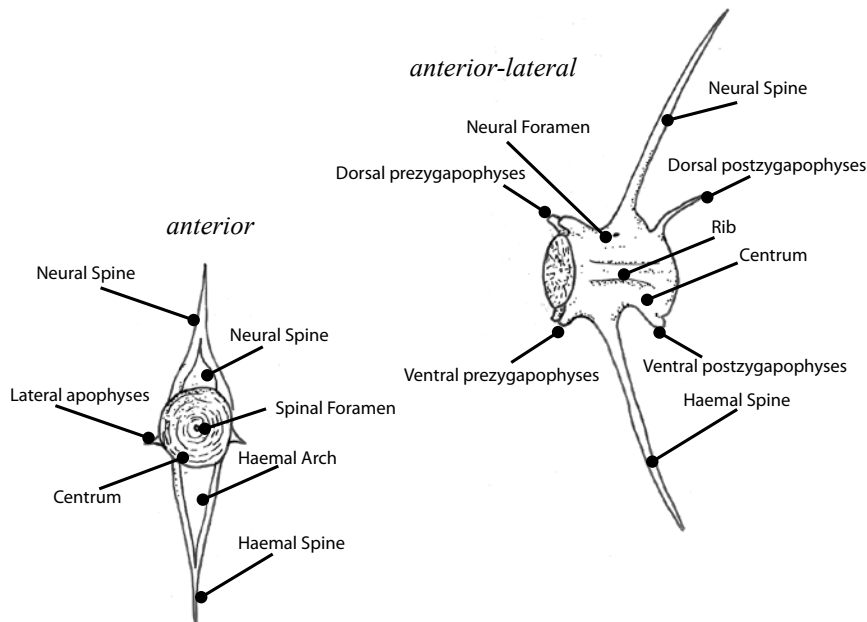


Figure 3: View of caudal vertebra

Identifications are usually recorded in a database or spreadsheet (see Figure 4), although all the data is not usually presented in a report, which is more likely to contain tables and graphs which summarise the information. In some cases the spreadsheet or database is included as an appendix. The most basic fish bone report will simply comprise a list of fish species present; however, it is more useful to include:

- **Weight by context and total weight**
- **NISP (number of individual specimens present) for each species**
- **MNI (minimum number of individuals) for each species**
- **Element representation patterns – either by element or simply cranial vs. post cranial**
- **Any evidence for burning, cut-marks, gnawing**
- **Measurements (see Morales and Rosenlund 1979) (for more detailed reports only)**

Do not try to push identification further than is possible, for example it can be difficult to distinguish between the different species and sub-species of the *Salmo* genus based on skeletal morphology. In these cases it is better to attribute them to *Salmo* sp. or *Salmo* spp. rather than a specific species.

Interpretation of fish remains relies heavily on a sound understanding of each fish species' diet, behaviour and habitats. Understand the conditions and habitat range in which a fish lives can help identify if fishing is seasonal and whether fishing occurred in rivers, lakes, esturine, coastal or deep sea environments.

It is important that when discussing fish remains that you are made aware of any artefacts from the site that might be linked to the exploitation and/or consumption of fish e.g. fish hooks, gouges, harpoons, net weights, as these will enhance your interpretation.

Site	Context	Phase	Sample No	Species	Element	L/R	Frequency	Cut marks	Burning
ZZ09	654	VII	16	<i>Salmo salar</i>	Dentary	L	1	0	1
ZZ09	677	V	32	<i>Anguilla anguilla</i>	Vertebrae	-	7	0	3
ZZ09	523	VIIb	7	<i>Gadus morhua</i>	Cleithrum	R	1	1	0

Figure 4: Example recording sheet for fish remains

8. Useful Resources

Books

Casteel, R. W. 1976. *Fish Remains in Archaeology and Palaeo-Environmental Studies*. London: Academic Press.

Härkönen, T. 1986. *Guide to the Otoliths of the Bony Fishes of the Northeast Atlantic*. Hellerup: Danbiu ApS.

Morales, A. & K. Rosenlund 1979. *Fish Bone Measurements; An Attempt to Standardize the Measuring of Fish Bones from Archaeological Sites*. København: Zoologisk Museum.

Watt, J., G. J. Pierce & P. R. Boyle 1997. *Guide to the Identification of North Sea Fish Using Premaxillae and Vertebrae*. ICES Cooperative Research Report No. 220. Aberdeen: International Council for the Exploration of the Sea.

Webb, J. B. 1980. *Otter Spraint Analysis Occasional Publication of the Mammal Society No. 13*. London: The Mammal Society.

Wheeler, A. 1978. *Key to the Fishes of Northern Europe*. London: Frederick Warne Ltd.

Wheeler, A. & A. K. G. Jones 1989. *Fishes*. Cambridge Manuals in Archaeology. Cambridge: Cambridge University Press.

Yee Cannon, D. 1987. *Marine Fish Osteology; A Manual for Archaeologists*. Burnaby: Archaeology Press Simon Fraser University.

Journal Articles

Casteel, R. W. 1972. Some archaeological uses of fish remains. *American Antiquity* 37(3): 404-419.

Granadeiro, J. P. & M. A. Silva 2000. The use of otoliths and vertebrae in the identification and size-estimation of fish in predator-prey studies. *Cybium* 24(4): 383-393.

Gregory, W. K. 1933. Fish skulls: A study of evolution of natural mechanisms. *Transactions of the American Philosophical Society* 23: 75-481.

Vale, D. & R. H. Gargett 2002. Size Matters: 3-mm Sieves Do Not Increase Richness in a Fishbone Assemblage from Arrawarra I, an Aboriginal Australian Shell Midden on the Mid-north Coast of New South Wales, Australia. *Journal of Archaeological Science* 29: 57-63.

Websites

FishBase is an information system available on-line at www.fishbase.org, covering all fishes of the world. FishBase, an accompanying book is available in English, French and Portuguese, and covers over 30,600 species of fish (most of the extant species in the world). It addresses the needs of a vast array of potential users, ranging from ichthyologists, fisheries biologists, ecologists and managers to biology teachers, administrators and the public at large. The features of FishBase that enable it to meet such a wide range of needs reside in its architecture, which makes extensive use of modern relational database techniques.

Other features of FishBase are:

- All information on a given species in the database is accessible through a unique scientific or common name or through common names in many languages;
- The wide use of multiple choice field structures standardized qualitative information;
- Numeric fields record quantitative information that has been previously standardized;
- Numerous cross-relationships between data tables enable previously unknown relationships to be discovered; and
- Complementary databases provided by colleagues and linked to FishBase proper contribute to making the combined package the most comprehensive data source of its kind.

NABONE fish has 3D images for 5 Gadid species:

www.nabohome.org/products/manuals/fishbone/index.html

ICAZ (International Council for Archaeozoology) Fish Remains Working Group web page:

www.cs.otago.ac.nz/research/foss/ICAZ/

The AHRC (Arts and Humanities Research Council) have just funded a project which will produce a digital archive of fish bones for at least 80 marine and freshwater, Mediterranean and North Atlantic species. This is due for completion March 2011, and will be linked to fishbase (address above).

Advice

For advice on any aspect of the recovery, identification or analysis of fish remains you can contact me by e-mail: hannahruss1@yahoo.co.uk
