A 15th c Archaeofauna from Akurvík, an early Fishing Station in NW Iceland

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Abstract

This is a report of analysis of 15th c bone materials from the site of Akurvík in NW Iceland excavated in 1990. A small international project in Árneshreppur district recovered a series of stratified midden deposits associated with small turf structures on an eroding beachfront. Radiocarbon dates identify at least two major phases of occupation and use, one extending into the mid 13th century, and the other dating to the mid 15th century. This report documents the animal bone collection from the later 15th c occupation. Dominated by cod fish, these deposits appear to be the product of seasonal fishery carried out from small temporary "booths" and are clearly not the product of a normal medieval Icelandic farmstead. Clear zooarchaeological signatures for cod and haddock preserved fish production are evident and comparisons are drawn to later 18th c contexts. Whale bone was extensively used in construction and craftwork, but it is unclear whether active whaling was carried out from the site or if stranded carcasses were extensively scavenged. Seals and sea birds provided minor supplement to the station and shellfish were probably mainly collected for bait.

Project Background

In the summer of 1990, an international team carried out survey, excavation, and paleoenvironmental research in Árneshreppur, Strandasysla, NW Iceland. Two small scale excavations were carried out on nearby sites located at the end of the peninsula between Reykjarfjorður and Norðurfjorpur. One excavation centered on the deeply stratified midden associated with the farm mound at Gjögur. The other excavation attempted to recover information from the site of Akurvík approximately 3 km to the NW (arrow in figure 1). The Akurvík site had been exposed and badly damaged by marine erosion, and a substantial portion of the site may have been affected by the cultivation of potato fields on part of the small embayment. Small sod structures and dense concentrations of fish bones had been observed in 1987 near an active erosion face in the NW corner of the small bay during a preliminary survey, and small collections of bones had been recovered from the erosion face. While the large Akurvík archaeofauna (far in excess of 150,000 potentially identified fragments) is still under analysis, it may be useful to provide a report on the upper 15th c contexts (over 97,000 fragments) to provide timely data to planned and ongoing field projects in NW Iceland and to scholars dealing with issues of medieval commercial fishery in the N Atlantic.

The objectives of the 1990 investigations were to clarify the nature of the deposits at Akurvík, recover useful collections of artifacts and animal bones from stratified contexts, and provide evidence for dating of the site. Despite a shortened season and some challenging

weather, the Icelandic, UK, Canadian, Greek, US and Danish crew did an excellent job of recovering the large bone collections and small number of artifacts and documenting a series of small sod structures (ca 2m wide x 3-5 m long). Several of these small structures were visible in a long exposure that had been created by storm wave erosion of the beach deposit, and additional sub-rectangular depressions probably representing additional structures of the same sort were visible in the undisturbed grassy meadow just to the SW of the erosion face. The erosion face was also clearly banded by successive layers of medium brown soil horizons, thick bands of grey-black shell sand, and several horizons of bone and other organic material that were apparently associated with the small structures visible in profile, or with other structures not intersected by the erosion face. These layers of bone and organic material (ranging from ca 3 cm- 40 cm in thickness) were also full of fist-sized fire cracked stones, and included a few iron objects (mainly boat nails) and substantial amounts of worked whalebone. When the erosion face was cleared and cut back 30-50 cm, a very large amount of animal bone was collected (100% sieved through 4 mm and 1 mm mesh) from the clearly defined cultural layers, and one end of one of the small structures (Structure F) was exposed and documented both horizontally and vertically. Structure F was a small, lightly built, roughly rectangular construction, made primarily of turf but including several large fragments of whale bone (great whale, sp indeterminate) at base of the two corners exposed by the excavation. These may have provided footings for supports for a light roof, though they could not have supported a very heavy superstructure given the loose sandy matrix. The structure was constructed directly upon a pre-existing deposit of fish, bird, and mammal bone (context 24), which itself rested on natural pre-occupational beach sands. The interior of the structure F was filled with a hard packed set of layers including fish, bird, and mammal bone, fire cracked stones (possibly trampled into a rough pavement) and substantial amounts of turf ash and small flecks of wood charcoal. These formed a series of floor layers (contexts 29-32), each separated by small layers of culturally sterile sand). Following deliberate demolition and abandonment, Structure F was later capped by a thick layer of fish bones and other refuse (context 22) that was generated by a later structure (G) at a stratigraphically higher position. This later structure appeared to be of the same approximate size and construction as the earlier Structure F, and employed a complete right whale (*Eubalaena glacialis)* vertebra as a corner support. This report documents the contents of the midden context 22 produced by Structure G and overlying Structure F.

The small turf structures are definitely not buildings of a normal Icelandic farm, and most closely resemble in size and shape the many Afishing booths@ still visible in many localities around Iceland, though smaller and less solidly built than more recent structures (Edvardsson 2001, 2004, Edvardsson et al 2004). Many of these documented booth structures date to the 16th-19th centuries, and are often associated with the period of full scale seasonal commercial fishing (Edvardsson 2004). Most of the known booth sites are on highly acidic volcanic sands with providing little organic preservation. The Akurvík site is in a fairly typical location for known fishing booths, exposed at the tip of a long peninsula, with immediate access to deep water fishing, but limited pasturage around the site area. Fortunately Akurvík

has a shell-sand matrix, with a neutral to slightly basic pH (6.9-7.5), allowing for excellent bone preservation. The small buildings, with hearths (burning peat and turf rather than large amounts of wood), light roofing and low turf walls (despite immediately available building stone on the shingle beach), suggest a series of short term, specialized, and probably seasonal occupations.

Dating Evidence

Table 1 presents three AMS radiocarbon dates from caprine (sheep or goat) bone collagen for the basal SU 24 midden context (calibrated intercept AD 1215), the floor layers of the small structure G (calibrated intercept AD 1275) and the SU 22 midden deposit overlying structure G (calibrated intercept AD 1440). These age determinations follow stratigraphic order and the top and bottom samples are clearly well within the terrestrial C13/12 ratio range, though Beta 116971 suggests some potential marine component (perhaps seaweed fodder?).

TABLE 1 Akurvík Radiocarbon Assay Results
All samples were terrestrial mammal (caprine) bone
Processing (AMS, bone collagen extraction) by Beta Analytic Inc., Miami FL ,

Context	SU 22	SU 30/31	SU 24
Stratigr. Position	Over str. G	Floor layers of str. G	Midden below str. G
Sample #	Beta116969	Beta116971	Beta116970
C13/12 ratio	-22.50%	-16.10%	-20.60%
measured C14 Age	420 "70 BP	600"40 BP	780 "70 BP
Conventional C14 Age	460 "70 BP	750"40 BP	850 "70 BP
Calibrated Intercept	AD 1440	AD 1275	AD 1215
1 sigma calibrated range	AD 1420-1475	AD 1260-1290	AD 1065-1075 and AD 1155-1265 (major peak)
2 sigma calibrated range	AD 1395-1535 and 1545-1635 (minor peak)	AD 1225-1300	AD 1025-1290

No glass, ceramic, or kaolin tobacco pipe fragments were recovered. These are all common finds on sites dating after ca 1650 in Iceland, and were recovered in quantity from a disturbed 18th-early 20th century midden at the neighboring farm site of Reykjarnes (ca 5-6 km to the NW of Akurvík) and the 18th c contexts at Finnbogastaðir further to the north (Edvarssson et al 2004). The entry to the small bay at Akurvik is now effectively closed by eustatic uplift, and even small craft do not normally land at the beach today. No mention is made of an active or recently abandoned site in the area in the comprehensive Jarðabók land survey of 1703-12. Multiple horizons of apparently non-cultural brown soil inter-band with the cultural deposits and layers of what appear to be stabilized grass surfaces in the long erosion face profile. It would appear that the beach area underwent multiple periods of sand drifting, human occupation, and sod formation (possibly at the same time in different parts of the small bay). It would thus appear that the complex of booth structures at Akurvík probably established in the 13th century was finally abandoned well before the early modern period. The 15th c context 22 reported here was deposited near the end of two centuries of periodic medieval occupation of this small bay.

Laboratory Methods

Analysis of the Akurvík collection was carried out at the Brooklyn College and Hunter College Zooarchaeology Laboratories and made use of extensive comparative skeletal collections at both laboratories and the holdings of the American Museum of Natural History. All fragments were identified as far as taxonomically possible (selected element approach not employed) but most mammal ribs, long bone shaft fragments, and vertebral fragments were assigned to "Large Terrestrial Mammal" (cattle-horse sized), "Medium terrestrial mammal" (sheep-goat-pig-large dog sized), and "small terrestrial mammal" (small dog-fox sized) categories. Only elements positively identifiable as *Ovis aries* were assigned to the "sheep" category, with all other sheep/goat elements being assigned to a general "*caprine*" category potentially including both sheep and goats. Following NABO Zooarchaeology Working Group recommendations and the established traditions of N Atlantic zooarchaeology we have made a simple identified fragment count (NISP) the basis for most quantitative presentation. Measurements (Mitoyo digimatic digital caliper) of fish bones follow Wheeler & Jones (1989), mammal metrics follow Von Den Dreisch (1976) and mammal tooth eruption and wear recording follows Grant (1982). Digital records of all data collected were made following the 8th edition NABONE recording package (Microsoft Access database supplemented with specialized Excel spreadsheets, see discussion and downloadable version at www.geo.ed.ac.uk/nabo) and all digital records (including archival element by element bone records) and the bone samples will be permanently curated at the *National Museum of Iceland*. CD R versions of this report and all archived data are also available on request from nabo@voicenet.com.

Overview of Species Present

Table 2 presents the count of the bones of major taxa identified from context 22 at Akurvík. There were very few mammal bones of any sort in the deposit, and the low number of less fully identified large, medium, and small terrestrial mammal bones and unidentifiable mammal fragments reinforce the impression provided by the low number of mammal bones identified to species level. While substantial numbers of mollusca and whale bone fragments were also recovered, the archaeofauna is clearly dominated by fish.

Table 2		count
Domestic Mammals		13
Seals		8
Whales		1,528
Birds		124
Fish		93,345
Mollusca		2,312
	NISP	97,330
Large terrestrial mammal		-
Medium terrestrial mammal		23
Small terrestrial mammal		4
Unident. Mammal		229
	TNF	97,586

Mammals

Table 3 presents the count of identified (NISP) mammal fragments, illustrating the very limited number and range of domestic mammals present at Akurvik.

Table 3 Context 22 Mammals	NISP
Sheep (Ovis aries)	4
Caprine sp.	9
Harbor seal (Phoca vitulina)	4
Seal (Phocid) sp.	4
Whale (Cetacea) sp.	1528

Due to small sample size, it is unclear if the caprine bones represent entire animals brought to the site and slaughtered there, or cuts of meat provided as fresh or preserved provisions. One caprine distal metatarsus came from a newborn lamb, suggesting either early spring occupation (virtually all Icelandic lambs are born in early May) or preserved meat. Bones of a nestling gull and another unidentified bird nestling further suggest a spring/ summer occupation, but full seasonality investigations are probably best held until the completion of the entire archaeofauna. Harbor seal (*P. vitulina*) colonies are present all along the coast, and both young and adults were regularly taken down to early modern times (Edvardsson et al 2004). During initial site clearing, bones of the ice-riding harp seal (*Pagophilus groenlandicus*) were found in the collapsed erosion face, but these cannot yet be tied to a stratigraphic context. Sealing does seem to have taken place from the site, but it appears to have been a minor activity compared to fishing.

The large number of whale bone fragments recovered at Akurvík presents a more difficult interpretive problem. It is possible to bring home tons of boneless whale meat, or alternatively possible to transport meatless whale bone for construction material or craft work from stranded carcasses. The district is historically known for whale strandings, and prior to the early modern decimation of N Atlantic populations such stranding events were probably far more common, but it is also possible that active whaling was pursued from Akurvík at some point in the occupation. The large number of whale fragments recovered range in size from small chips produced by craft work to the complete great whale vertebra used as a corner support for Structure F. Whalebone was extensively used in reinforcing the foundations of the small turf huts, and also seems to have been used as one element in the rough pavement of their floor layers. Craft debris and partially completed whalebone artifacts also make up a large proportion of the finds, including the remains of the production of a whalebone disk (perhaps destined to become a gaming piece) from context 31. Whether the occupants of the booths at Akurvík actively hunted great whales or not, they certainly made extensive use of their bones, perhaps engaging in whalebone craft activities during periods of bad weather.

Birds

Table 4 presents the count of bird bones and the relative percentages of the identified specimens. Bird bones make up a small portion of the Akurvík context 22 archaeofauna, and the species represented are all associated with local shoreline communities today (the duck is probably an eider). The substantial percentage of sea gulls (nearly 70%) is unusual on Icelandic sites, which tend to be dominated by the more palatable auks (puffins, guillemots, razorbill). It is tempting to see the gulls as casualties of human defense of fish drying racks

(gulls are regularly entangled in the old nets used to protect modern fish racks), but it is probable that gulls would congregate around medieval fish processing stations in any case. Fowling clearly was not a major activity at Akurvík.

Table 4 Scientific Name	***English***	***NISP***	***% ID Birds***
Larus ridibundus	Black headed gull	4	14.81
Larus canus	Common gull	10	37.04
Larus sp.	Gull sp	4	14.81
Phalacr. carbo	Cormorant	1	3.70
Sula bassana	Gannet	1	3.70
Alcidae sp	Auk sp	1	3.70
Alca torda	Razorbill	1	3.70
Uria sp.	Murre or Guillemot	4	14.81
Anatidae sp	Duck sp.	1	3.70
Aves sp	Bird species indet	97	

Fish

Fishing was certainly a major activity at Akurvík, and fish bones make up 96% of the context 22 archaeofauna. Table 5 provides the count of identified fish bones from context 22.

Table 5 Scientific Names	***English***	***NISP Count***
Gadus morhua	Atlantic cod	4,981
Pollachius virens	Saithe	92
Melanogramus aeglfinus	Haddock	528
Molva molva	Ling	81
Brosme brosme	Torsk	7
Gadidae, sp. Indet.	Gadid family	6,356
Clupea harengus	Herring	
Hippoglossus hippoglossus	Halibut	19
Scophthalmus rhombus	Brill	4
Pleuronectidae sp.	Skate sp	4
Anarchichas lupus	Wolfish	78
Arajidae	Ray sp	5
Salmonidae	Salmonid family	1
Fish, sp. & family Indet.	Fish species	81,193

A limited number of flatfish species, wolf fish, and a single salmonid bone are present in the collection, but gadid (cod family) fish dominate the collection (and definitely make up most of the fish bones not assignable securely to family). As figure 2 illustrates, the great majority of these gadid fish are Atlantic cod.

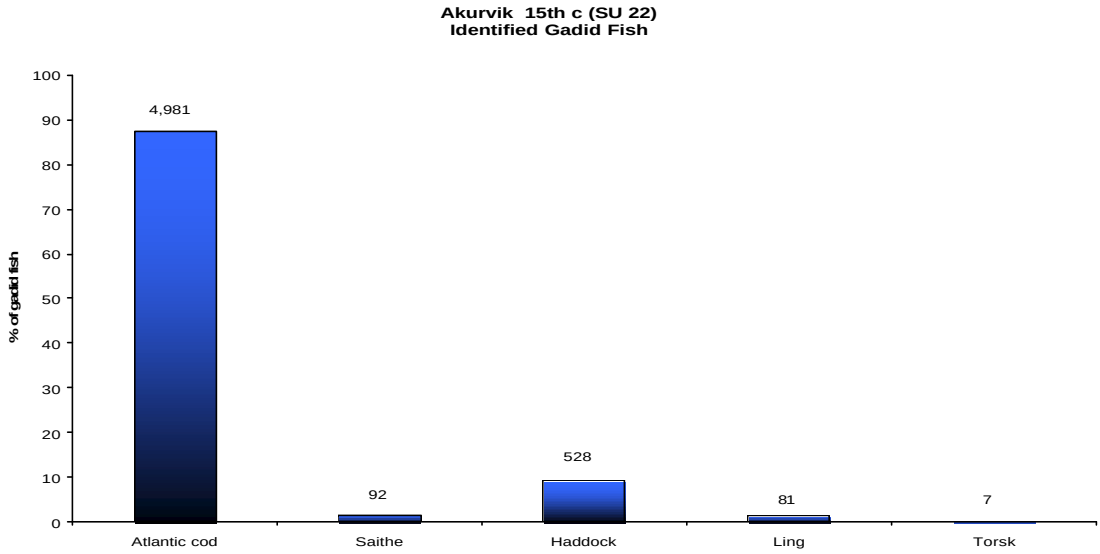

Figure 2

Such concentration upon cod is characteristic of medieval commercial fisheries in Norway (Perdikaris 1999) and in early modern Iceland (Amundsen 2004, Edvardsson et al 2004, Perdikaris et al 2001, Perdikaris & McGovern 2004,). This specialization and associated reduction in species diversity in the landed catch was part of a process of commoditization, which transformed the natural diversity of subsistence catch seen in Norwegian Iron Age and Viking Age Icelandic archaeofauna (Perdikaris et al 2004, Perdikaris 2000) into a focused effort to land the species most salable on the international market. By the high Middle Ages, preserved cod products (mainly air dried) had become highly standardized into multiple grades and price ranges, and were traded as commodities in European counting houses far from the North Atlantic fishing grounds. Was Akurvík part of this network?

Fish Element Distribution

In addition to sheer numbers of fish bones in an archaeofauna and a concentration upon cod, the distribution of skeletal elements can provide evidence of patterns of production and consumption suggesting at least local level exchange. Figure 3 illustrates the contrasting pattern of distribution of cod-family fish bones at 15th c Akurvík and the 10th and 11th c phases of the inland farm Sveigakot near Lake Mývatn. The absence of most cranial bones and the higher percentage of cleithra (in pectoral girdle) and caudal (tail) vertebrae in the inland sites (60 km from the sea) indicate that these fish arrived as headless provisions rather than whole fish. Note that the distribution of vertebral elements on the inland sites suggests the importation of a flat-dried product lacking concentrations of upper vertebrae (pre-caudal and thoracic)which would have been left in the medieval *skreið* (stockfish, dried in the round with most pre-caudal vertebrae left in the body).

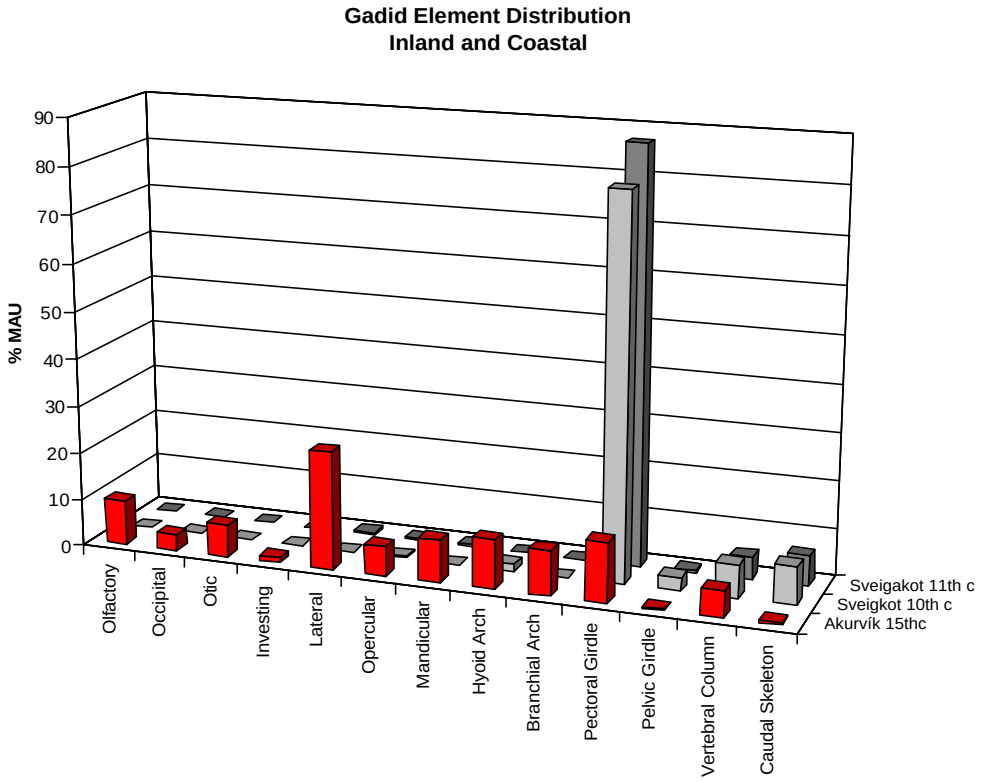

Figure 3

Large fish sample size allows us to look at Akurvík gadid element distribution by species (rather than lumping all gadids together) and to compare the context 22 collection to the very large 18th- early 19th c archaeofauna from Tjarnargata 3c under modern Reykjavik(fish NISP 63,629). The Tjarnargata 3c fish are mainly cod and mainly derive from the well documented commercial fisheries production of the 18th-19th c, but also included substantial numbers of haddock apparently consumed locally (Perdikaris et al 2002). A comparison of the overall skeletal distribution pattern of cod and haddock at both sites indicates generally similar patterns between Akurvík and Tjarnargata 3c, both reflecting large numbers of cranial elements present (figure 4).

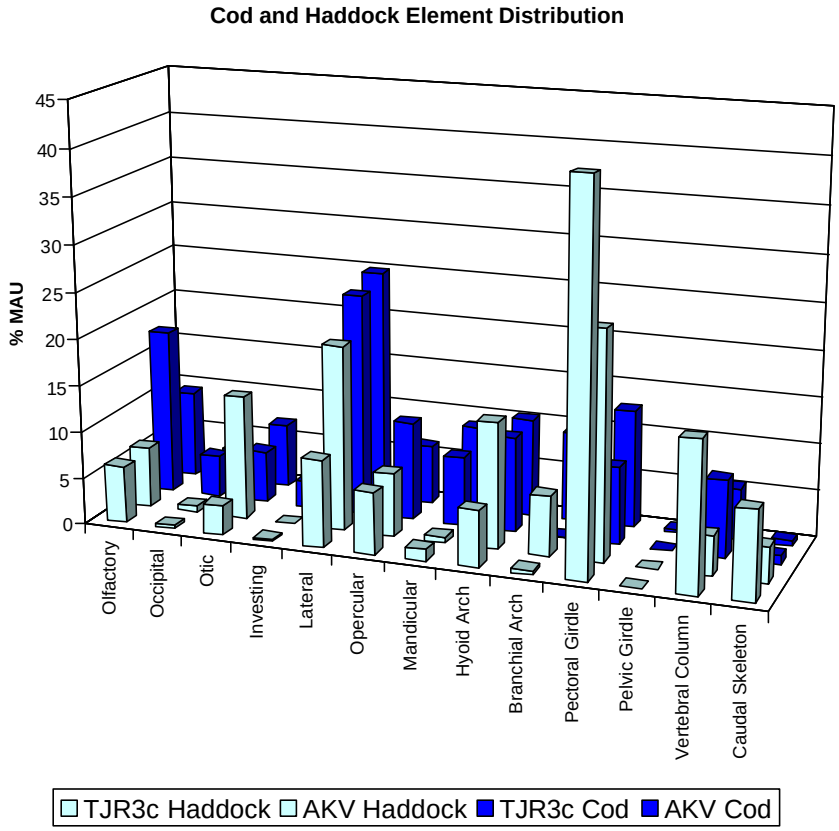

Figure 4

A comparison of all cranial and all vertebral elements for haddock and cod on the two sites reveals some differences in treatment of the two fish species (figure 5)

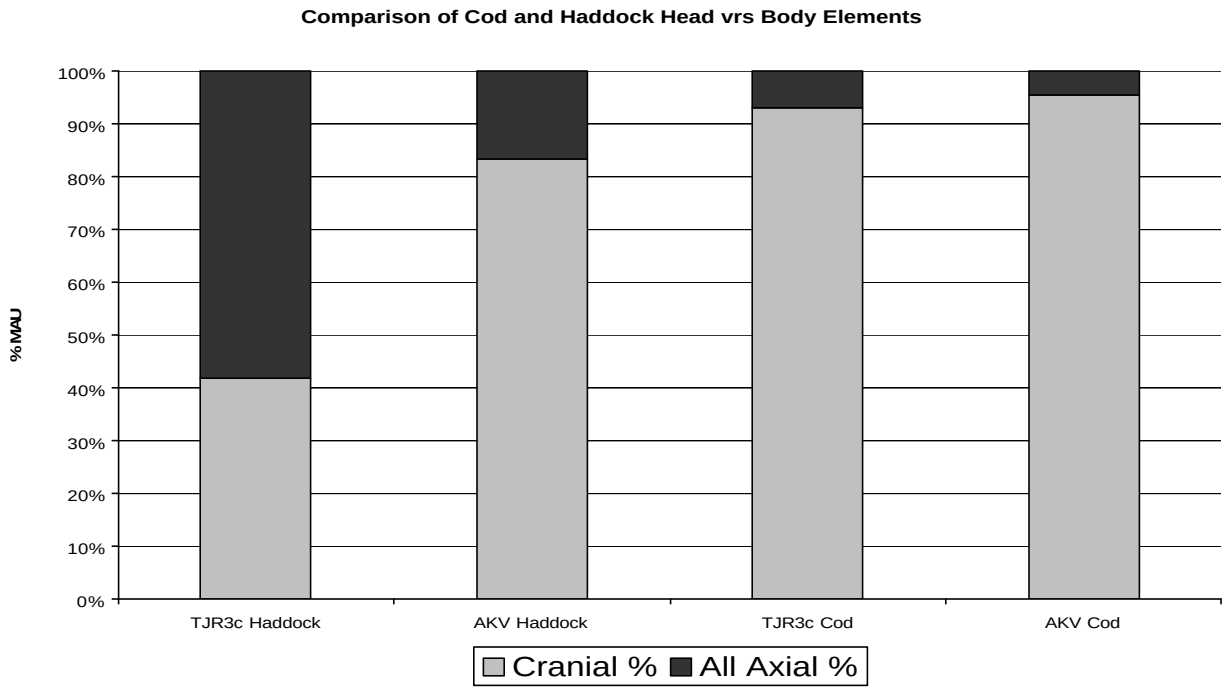

Figure 5

As figure 5 illustrates, cod bone distribution on both sites shows a marked surplus of cod head bones (MAU% normalizes for different skeletal frequencies in the live animal). This suggests that a large proportion of cod bodies were being transported off site as some sort of processed fish product, and the heads were left behind as refuse (in fact cod head meat was consumed by Icelandic fishing communities in early modern time). The Tjarnargata 3c haddock cranial/axial proportions are close to natural, and suggest that most haddock were being consumed locally in early modern Reykjavik with head and body elements disposed of in a similar manner. While the cranial/axial proportions of haddock at Akurvík show more body parts relative to heads than do the cod remains, the balance is nowhere near that found in whole fish. At Akurvík, some haddock seem to have been consumed or discarded as whole fish, but the great majority of haddock bodies were not deposited locally.

The cleithrum is a large robust bone near the gill slit area in gadid fish, and it has regularly been left with the body when the other fish head bones were cut away. The cleithrum helps to keep the headless body together, and when spread apart helps to keep the gutted body cavity open for more effective drying or salting. As the Viking Age Mývatn gadid collections indicate, the cleithrum traveled with the body to this inland region at least. A variety of fish butchery strategies will tend to leave the cleithrum in any exported preserved body, and its relative abundance on sites may have some implications for their role as producer or consumer of fish products.

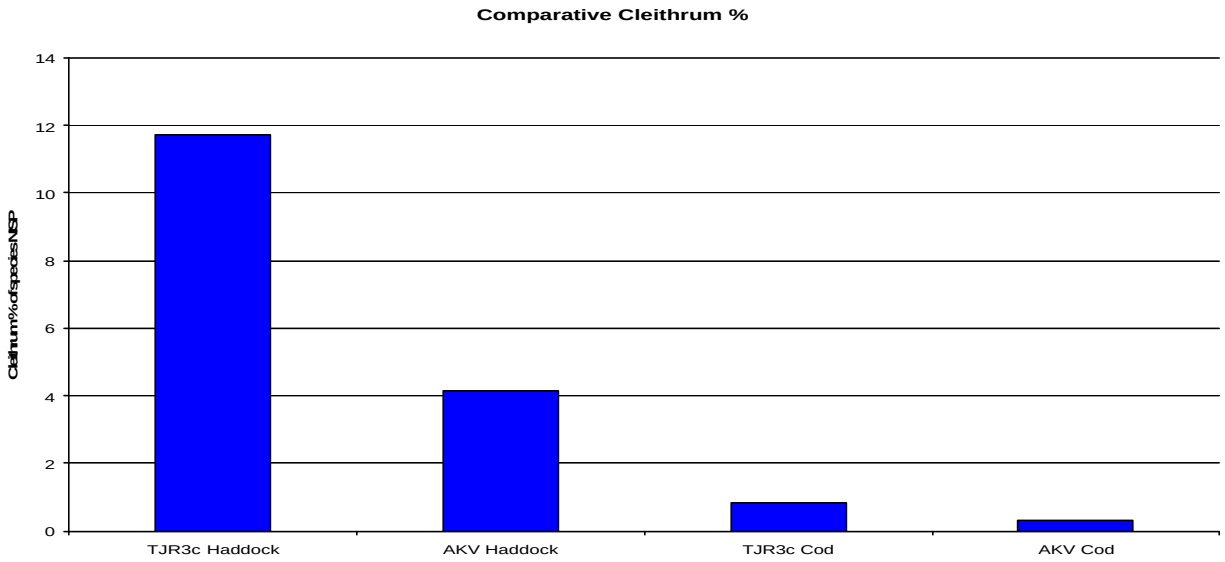

Figure 6

Figure 6 illustrates the cleithrum percent of species NISP for the haddock and cod from Tjarnargata 3c and Akurvík. While the Tjarnargata 3c haddock cleithra percentage approaches that normal for a whole fish, the cod cleithra from both sites are clearly disproportionately missing. Again, the Akurvík haddock sample occupies a middle position between the different element distribution patterns. It would appear that at both Akurvík and Tjarnargata 3c most cod cleithra left the site, presumably as part of an exported preserved cod product, whether flat-dried or prepared as stockfish. Haddock at Akurvík do not appear to have been butchered exactly as cod, but their pattern of cleithrum frequency suggests a large proportion of "missing" bodies.

The proportions of different gadid vertebrae in an archaeofauna should also provide an indicator of past fish butchery and marketing practices, and may provide some clues to the nature of the particular preserved product. Figure 7 presents a comparison of the relative proportions of the haddock and cod vertebral series from Tjarnargata 3c and Akurvík. Both sites cod vertebral distributions are identical and send the same strong message that nearly all precaudal (mid body) and caudal (tail) cod vertebrae have gone elsewhere. Virtually all cod vertebrae at both sites are the thoracic series directly behind the head, and regularly removed during stockfish preparation. This pattern would appear to represent the producer's signature for stockfish production (or production of any preserved fish product that leaves the body in the round). The vertebral series distribution for haddock at both sites provides a strong contrast to this signature. At both Akurvík and Tjarnargata 3 c haddock are clearly not being prepared for preservation in the same way as cod. At Tjarnargata 3c our impression from other skeletal element distribution patterns (and documentary sources) is that haddock were largely being consumed fresh by the local fishing population, and the larger cod reserved for

export as stockfish. Our data for haddock element distribution at Akurvík suggests a more complex situation, with some haddock being consumed fresh, but most being processed in some way (clearly not as stockfish) with bodies (and cleithra) differentially removed from the site.

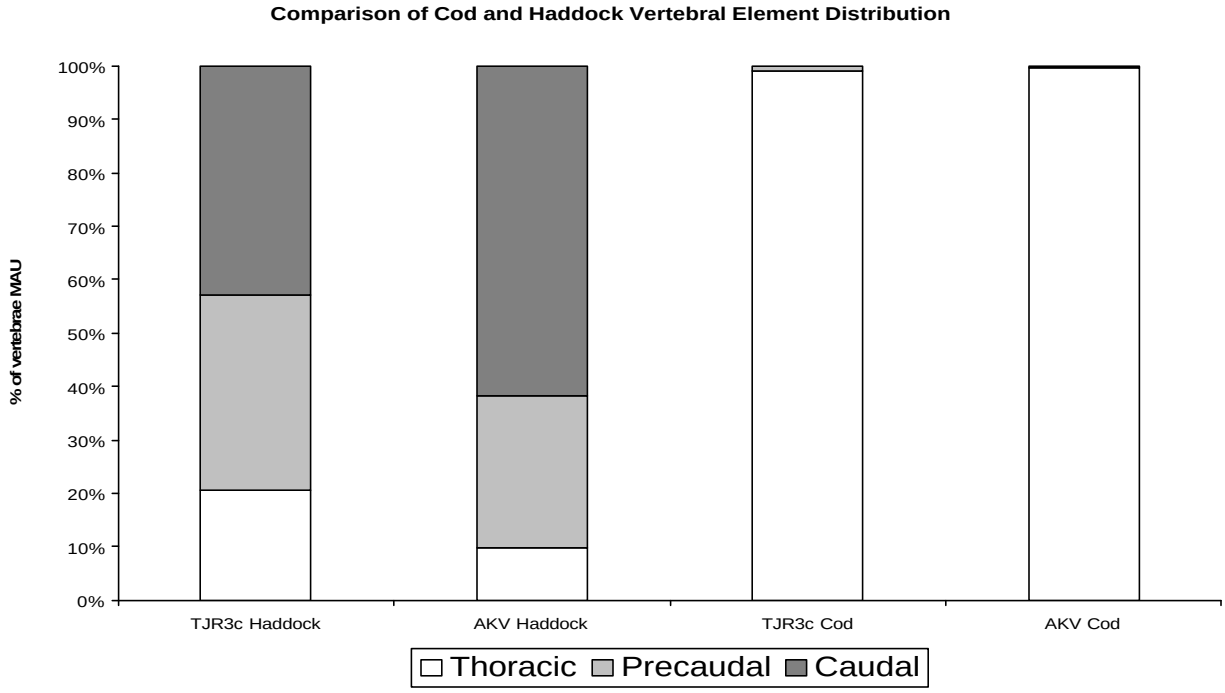

Figure 7

Reconstructed Cod Length

Thanks to the work of Wheeler & Jones (1989) it is possible to reconstruct the live length of cod based on several elements. The Akurvík context 22 archaeofauna provides a substantial number of cod premaxillary, dentary, and atlas bones suitable for size reconstruction. Figure 8 presents the distribution of reconstructed cod live length based on these three elements. Note that (despite variation in sample size) all three elements provide closely similar reconstructions, with peak around 80 cm in estimated live length. Stockfish production requires a fairly restricted range of cod body size: fish much smaller than 60 cm dry too hard and fish much larger than 110 cm tend to rot rather than cure. Figure 8 indicates this "stockfish window" relative to the Akurvík context 22 reconstructed cod live length distribution. As suggested by the cod element distribution patterns, it would appear that most cod landed at Akurvík were intended for stockfish production.

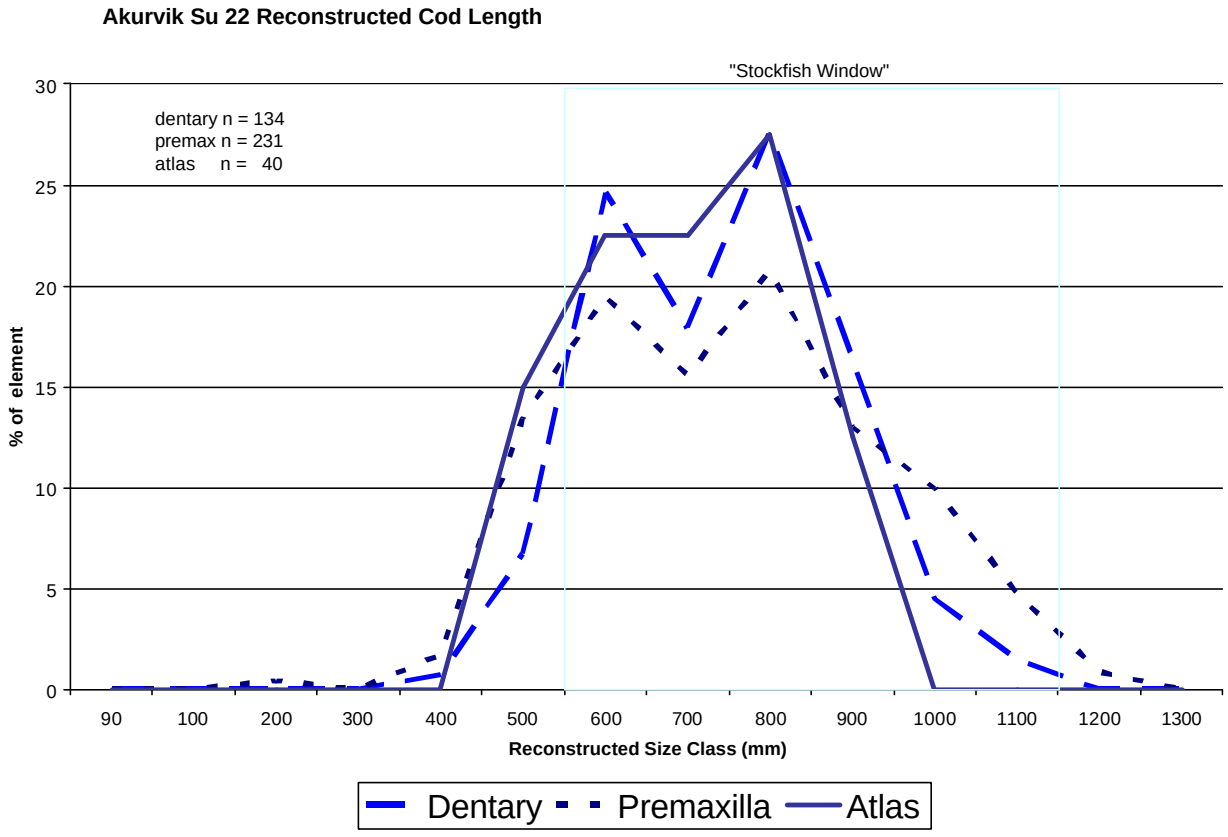

Figure 8

Mollusca

Table 6 presents the count and relative percentage of identified shellfish from the context 22 archaeofauna. As on most coastal Icelandic sites, the most common shellfish is the blue mussel. It is never possible to be entirely certain of the anthropogenic character of shells found on a coastal site, but the find context in association with peat ash, fire cracked stone, and masses of bone refuse suggests most of these mollusks were deliberately collected. While mussels and other shellfish were collected as famine food (and may well have helped feed the occupants of Akurvík during periods of bad weather), their major role was probably as a source of bait. Most shells were highly fragmented, leading to the large mollusca sp. category.

Table 6 *Scientific Name*	*English*	*NISP*	*% ID Mollusca*
Littorina littorae	Winkle	3	0.13
Mytilus edulis	Mussel	1805	78.07
Mya sp.	Clam sp.	504	21.80
Mollusca sp.		2495	
Total Mollusca		4807	

Discussion:

By the mid-15th century Akurvík had a long history as a seasonal station for the exploitation of a variety of marine resources. By the time context 22 was deposited, fishing and the preparation of preserved fish products were probably the most important tasks performed at the site. Cod were the main subject of this fishery, with haddock and flatfish as opportunistic secondary targets. The cod size range targeted and the fish bone element patterns created by thousands of repeated butchery events strongly indicate that most cod fish landed at Akurvík were prepared as stockfish and their bodies transported elsewhere for consumption or sale. The status of haddock fishery at Akurvík is somewhat more equivocal, with indications of a different butchery strategy and probably a different consumption pattern. If (as in 18th-19th c Reykjavik) cod was the major export and haddock the major local staple, then it is possible that haddock was being processed for Icelandic subsistence consumption or for sale in local markets in earlier times as well, contributing to the differences in cod and haddock patterns at Akurvík.

The 15th century was a period of widespread hardship in Iceland, and represents a low point in the impressive production of medieval Icelandic literature and administrative records. The later Middle Ages also saw increasing contact with a variety of British and Continental voyagers intent on exploiting Iceland's rich fishing grounds. Dried fish, especially stockfish, became a critical "cash crop" for communities all across the N Atlantic as the infant European world system began to fully exploit the economic potential of this ancient northern product. Within Iceland, accelerated soil erosion and cooling climate combined to drastically reduce the productivity of agriculture in many districts, perhaps especially in the NW. For most residents of the west fjords, the only possible avenue for intensification of subsistence or market production was the sea. By early modern times, a system of local and regional fishing stations provided both much needed household provisioning and a cash product that could be used for rents and imported goods (Edvardsson et al 2004). The site of Akurvík and its archaeofauna suggest that these 18th-19th c stations had deeper medieval roots, and that environmental archaeology can make a significant contribution to an understanding of earlier Icelandic maritime traditions.

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